A TAXONOMIC AND ECOLOGIC STUDY OF THE FORAMINIFERA OF TREMADOC BAY, NORTH WALES

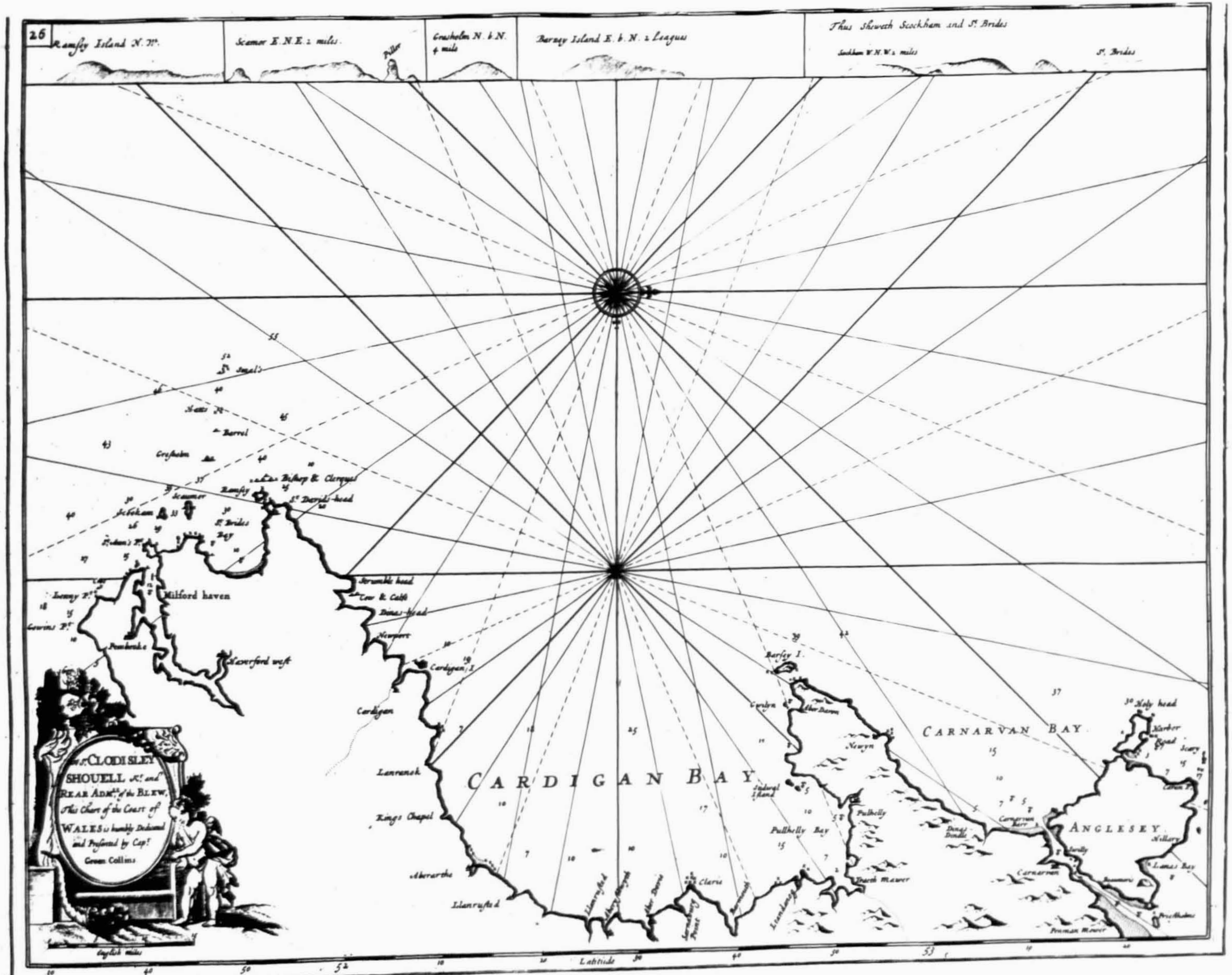
Thesis presented for the degree of

Doctor of Philosophy

Drew Haman, B.Sc., F.R.M.S., F.G.S. April 1965.

FRONTESPIECE

Reproduction of a 17th. Century chart of Cardigan Bay.


26
Ramsey Island N.W.
Scamor E.N.E. 2 miles.
Grasholm N. b. N. 4 mile
Barney Island E. b. N. 2 Leagues
Thus Sheweth Scockham and St. Brides
Scockham W.N.W. 2 miles
St. Brides
St. Smal's
Barrel
Grasholm
Bishop & Clerques
Ramsey
St. Davids head
Scaumor
St. Brides Bay
Milford haven
Pembroke
Haverford west
Strumble head
Cow & Calfe
Dinas head
Newport
Cardigan I.
Cardigan
Lanranok
Kings Chapel
Aberarthe
Llanrusted
CARDIGAN BAY
Barsey I.
Newyn
Pullhelly
Pullhelly Bay
Clarie
Traeth Mawer
CARNARVAN BAY
Holy head
ANGLESEY
Carnarvan
Beaumaris
Penman Mawer
Latitude
English miles
To Sr. CLODISLEY SHOUELL Kt. and Rear Adml. of the Blew, This Chart of the Coast of WALES is humbly Dedicated and Presented by Capt. Green Collins

This is to certify that the work submitted for the degree of Doctor of Philosophy under the title "A taxonomic and ecologic study of the Foraminifera of Tremadoc Bay, North Wales", is the result of an original investigation. All authors and works are fully acknowledged. No part of this work has been accepted in substance for any other degree.

Signed: .... Candidate
Drew Haman

.... Director of Research
Dr. J. R. Haynes

ACKNOWLEDGEMENTS

I wish to thank Professor Alan Wood who suggested the topic of research.

I am indebted to my research supervisor, Dr. J. R. Haynes, for carefully checking the taxonomic section, for critical examination of the remainder of the text, and for many invaluable discussions and guidance.

Thanks are also due to Mr. H. Williams for photographic work, Mr. J. Garroway for slide preparation, Miss R. Pugh for typing part of the script, and Mr. W. Lucas (R.V.Anbur).

My parents and parents in law also deserve my deepest thanks for their understanding and help during the research period.

Lastly, I would like to pay full acknowledgement to my wife, Pat, who helped greatly with the typing of the script, and without whose help, love, and understanding this work would not have been possible.

The research was pursued during the tenure of the J.J.Thomas of Kendal Research Scholarship in Geology.

ABSTRACT

One hundred and thirteen species and varieties of foraminifera are described from the Recent bottom sediments of Tremadoc Bay.

The following species is new :-

Oolina patannae

Three new varieties are described, these being :-

Marsipella elongata var. A
Discorbis malovensis var. *nudiformis*
Elphidium crispum var. *spinosum*

A detailed study of the genus *Technitella* was carried out and the genus emended in the light of new evidence.

The morphological characters, geographical distribution and stratigraphic range of each species and variety is discussed. Forty three species and varieties have not been previously recorded from the British area, and five have not been previously obtained from Recent sediments. Forms without a prior redord in the British region are :-

Rhabdammina scabra
Bathysiphon acuta
Marsipella elongata var. A.
Psammosphaera parva
Lagenammina laguncula
Reophax arctica
Haplophragmoides subinvolutum
Cribrostomoides jeffreysi
Ammobaculites agglutinans var. *filiformis*
* *Ammobaculites subagglutinans*
Verneuilina media
Clavulina gracilis
**PPlanispirinella tenuis*
Spiroloculina subimpressa
Triloculina trihedra
Miliolinella chuckchiensis
Lagena sulcata var. *spirata*
Lenticulina suborbicularis
* *Lenticulina varians*
Oolina laevigata
Oolina lineato-punctata
Oolina patannae
Cassidulinoides tenuis
Discorbis bradyi
Discorbis malovensis var. *nudiformis*
Elphidium bartletti
Elphidium crispum var. *spinosum*

Massilina planisparoidea
Quinqueloculina agglutinata
Quinqueloculina angularis
Quinqueloculina aspera
Quinqueloculina frigida
Quinqueloculina inconstans
* *Quinqueloculina seminulangulata*
Triloculina angulata
Triloculina dubia
Elphidium discoidale
Elphidium magellanicum
Globigerina hexagona
Cibicides fletcheri
Dyocibicides biserialis
Astrononion gallowayi
Nonionella atlantica

Forms prefixed with an asterisk indicate first recorded occurrences in Recent sediments.

The ecological factors in Tremadoc Bay are discussed and evaluated.

Two major foraminiferal associations are noted in Tremadoc Bay, and four main environmental zones are proposed with ten subzones.

A foraminiferal variation study was carried out at two stations, sampled each month for a year. This study indicated two peaks of reproductive activity, and the reasons for this are discussed.

A review of some foraminiferal collections lodged in the British Museum of Natural History is included.

CONTENTS

CHAPTER 4

CHAPTER 5

CORRIGENDA

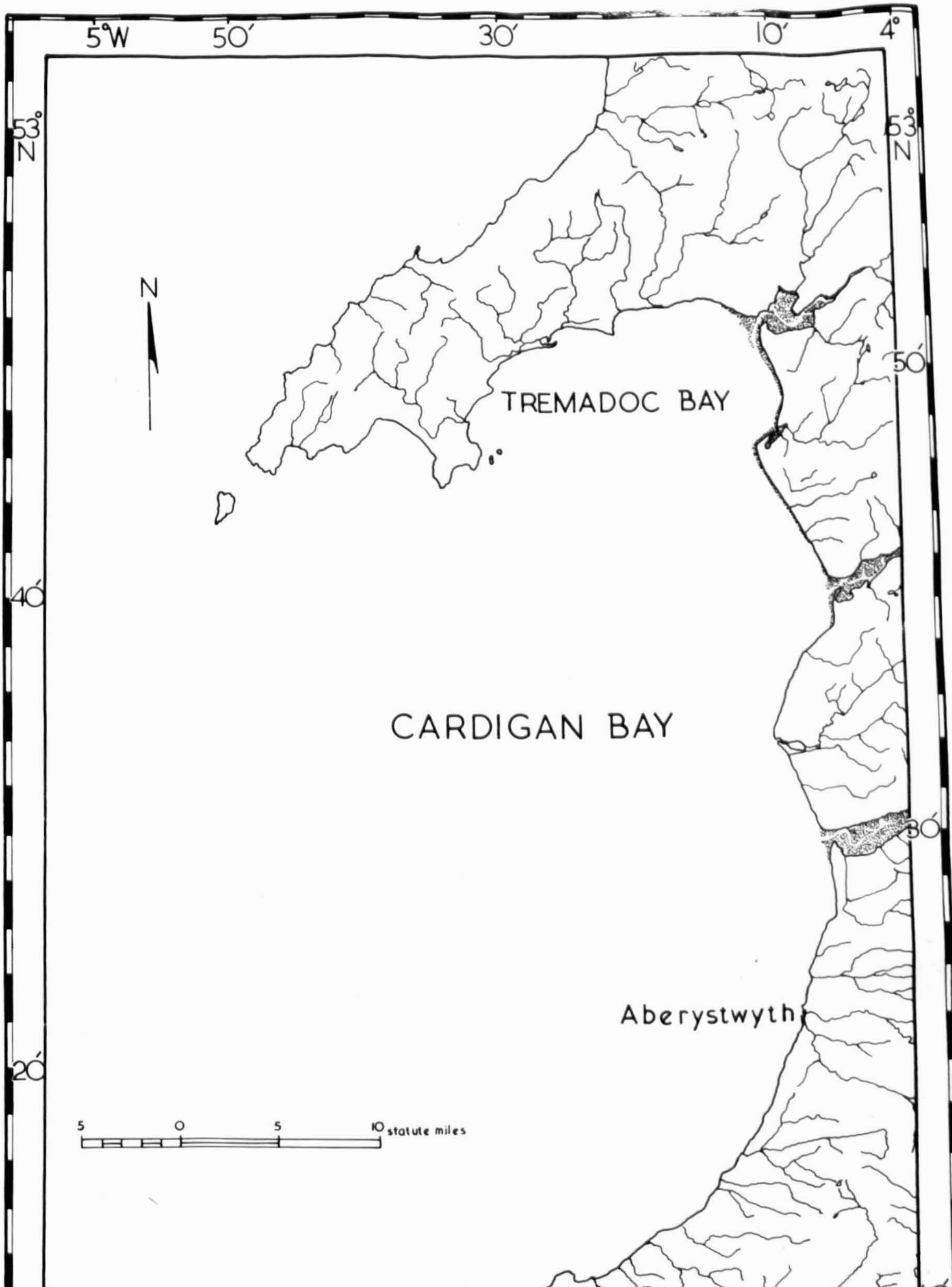
Read Contr.Cush.Lab.Foram.Res. for Contr.Cush.Found. Foram.Res. for dates prior to 1950.

CHAPTER 1

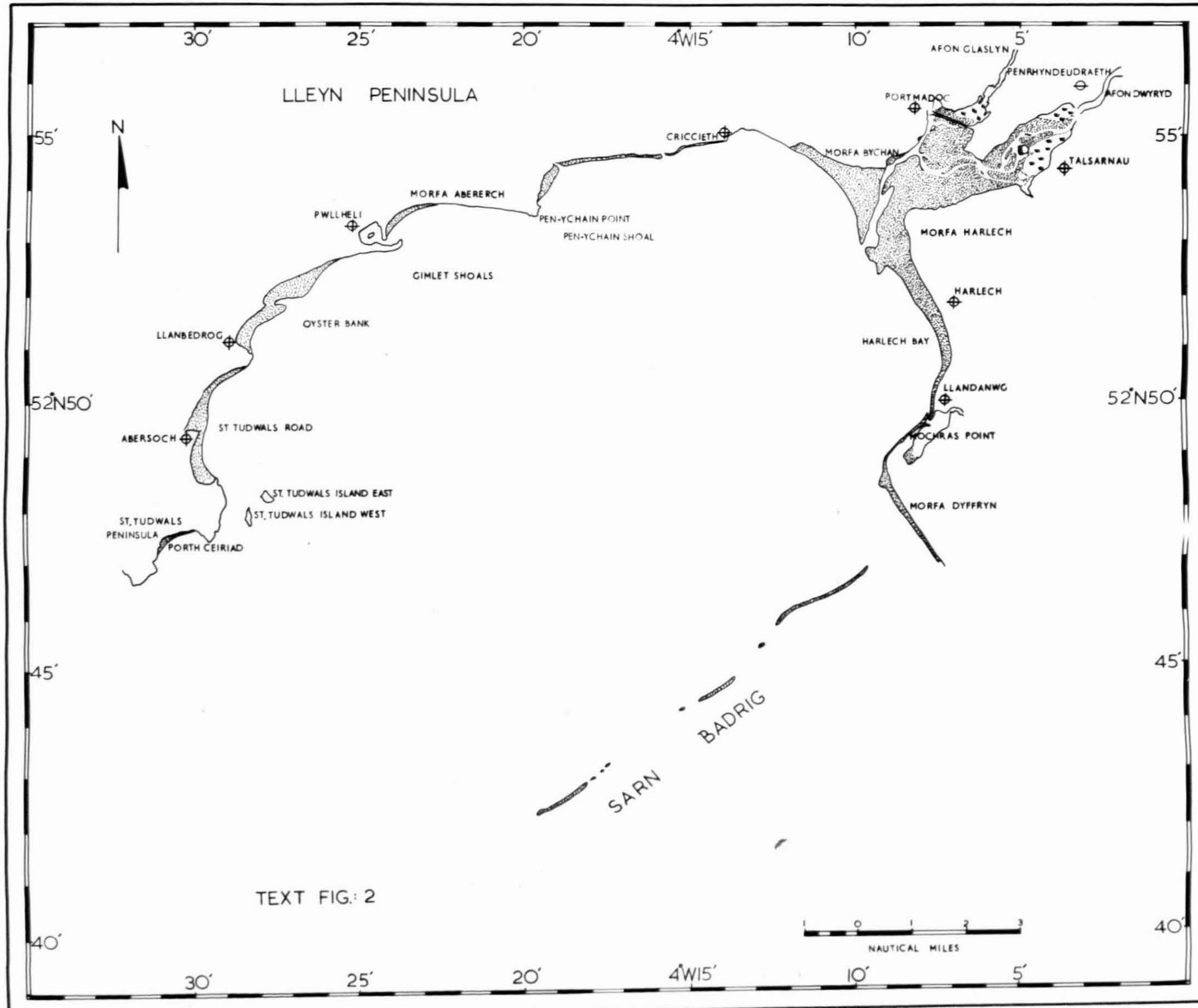
a) Introduction

Tremadoc Bay, situated west of Wales, is the Northern portion of Cardigan Bay and is bounded on the North by the Lleyn peninsula, to the East by High Water Mark in the Port Madoc estuary, and to the South by Sarn Badrig. The western limit to the study area is taken as being along a line from Trwyn Cilan to Sarn Badrig Bell Buoy (Text - figs 1,2). Throughout the glacial epoch this area was occupied by southward moving Irish Sea ice, and also outflow ice from Snowdonia and the Harlech Dome. The eastern limit of the Irish Sea ice, at its maximum development, is taken as being at or near the present day mouth of the Port Madoc estuary, this forming the main outflow channel for the Welsh ice. Subsequent changes in the sea level have caused the area to assume its present day outline.

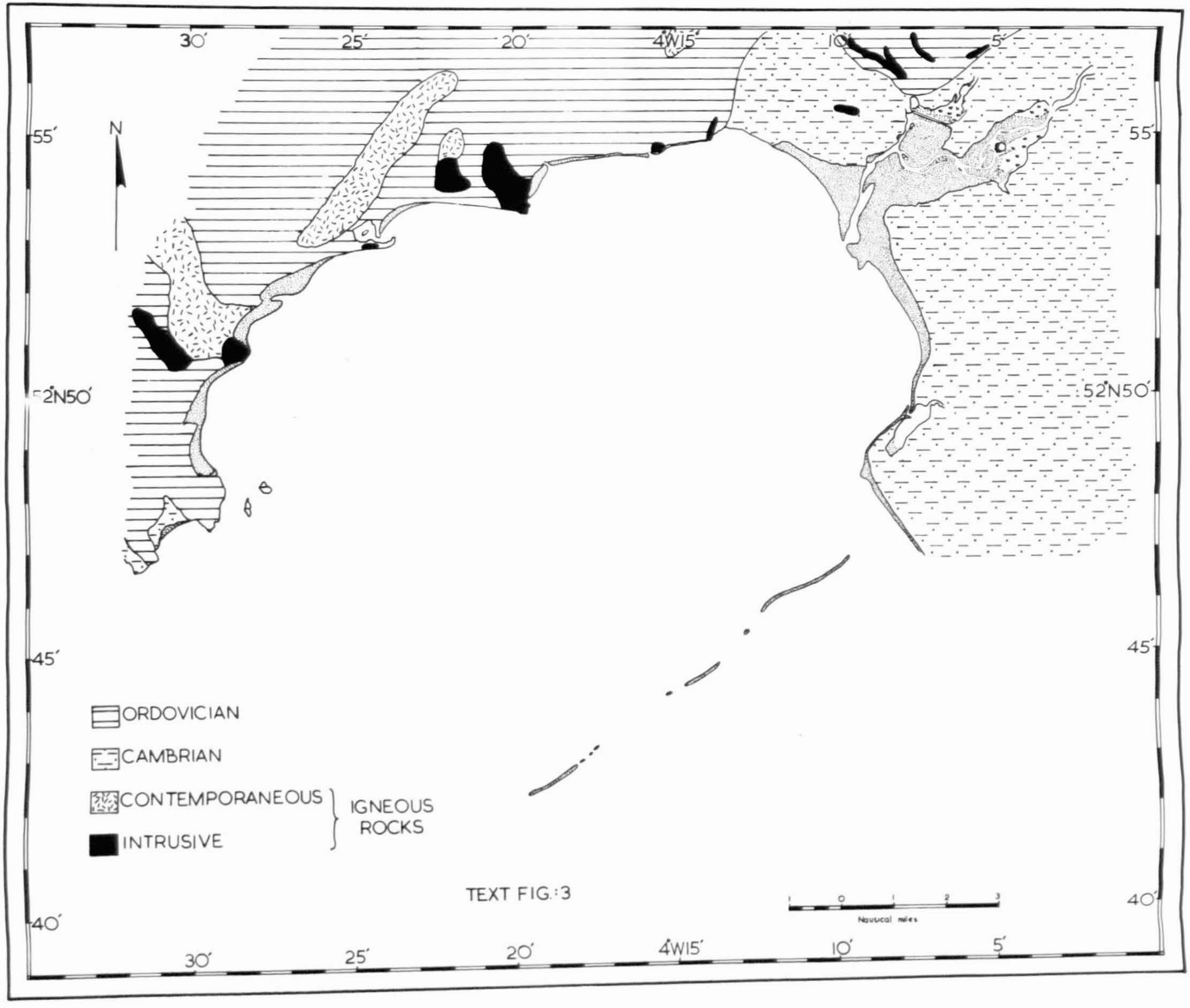
The land adjacent to the bay is of a very complex geological nature (Text - fig.3) being composed of Cambrian and Ordovician rocks with numerous igneous intrusions of variable nature and composition, such as granite porphyry, keratophyre, dolerite, felsite, diorite and rhyolite. The East and West headlands of St. Tudwals peninsula (Text - fig.5E) are formed of Tudwal Sandstones and Flags, and the two small islands of St. Tudwals West Island and St. Tudwals East Island are also formed of sandstone, except where the Lingula Flags comprise about half of the latter


5°W
50′
30′
10′
4°
53°
N
53°
N
N
TREMADOC BAY
50′
40′
CARDIGAN BAY
30′
Aberystwyth
20′
5
0
5
10 statute miles
10′
5°W
40′
20′
4°

TEXT FIG: 1


30′
25′
20′
4°W15′
10′
5′
LLEYN PENINSULA
N
55′
52°N50′
45′
40′
AFON GLASLYN
PENRHYNDEUDRAETH
AFON DWYRYD
PORTMADOC
CRICCIETH
MORFA BYCHAN
TALSARNAU
MORFA ABERERCH
PWLLHELI
PEN-YCHAIN POINT
PEN-YCHAIN SHOAL
MORFA HARLECH
GIMLET SHOALS
HARLECH
OYSTER BANK
LLANBEDROG
HARLECH BAY
LLANDANWG
ST TUDWALS ROAD
ABERSOCH
MOCHRAS POINT
ST. TUDWALS ISLAND EAST
ST. TUDWALS ISLAND WEST
MORFA DYFFRYN
ST. TUDWALS
PENINSULA
PORTH CEIRIAD
SARN BADRIG
1 0 1 2 3
NAUTICAL MILES

TEXT FIG.: 2


30′
25′
20′
4W15′
10′
5′
N
55′
52N50′
45′
40′
ORDOVICIAN
CAMBRIAN
CONTEMPORANEOUS
INTRUSIVE
IGNEOUS ROCKS
Nautical miles

TEXT FIG.:3

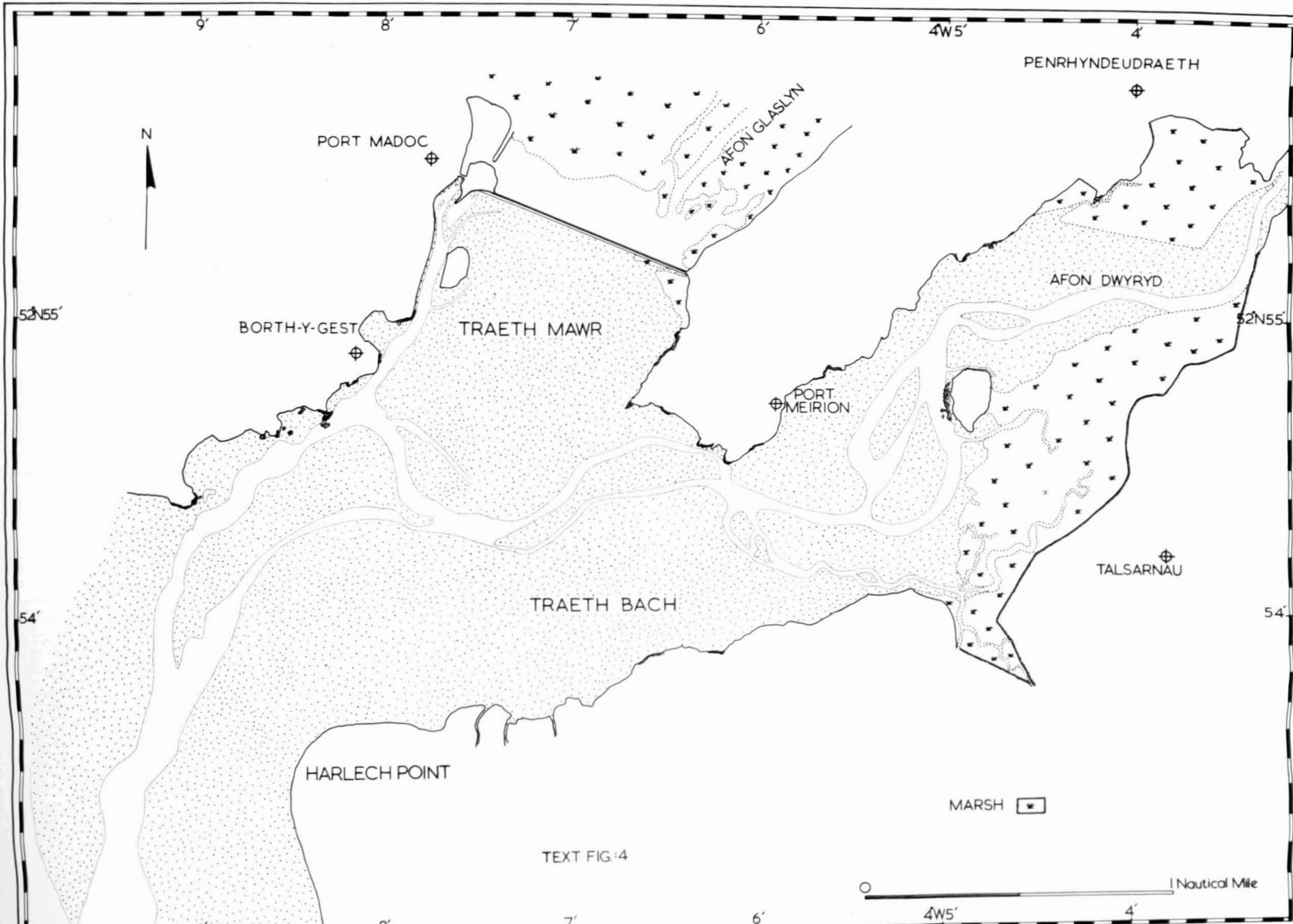
island. The bays on the south of the Lleyn Peninsula, east to Criccieth are formed in an arc like series, backed by shingle and sand dunes, and then further inland by a 50 ft. O.D. terrace. The eastern extremities of these bays are all marked by small outcrops of resistant igneous rocks such as those mentioned above. A distinct smooth stretch of shore is present between Pwllheli to the Pen-ychain headland, and near Pwllheli the sandy beach is backed by a narrow line of dunes which become wider and more irregular to the East (Text - Fig.6A,B.C). A boulder clay outcrop is present near Abererch Station, west of which there is little or no shingle, but eastwards the shingle increases in amount, and three or four high storm ridges are present at Pen-ychain. The Lower Boulder Clay outcrops extensively, north of Pen-ychain Point extending as far as Afon Wen, with another outcrop on the east of the river, extending behind the shingle beach as far east as Criccieth, where an outcrop of rhyolite forms the headland on which stands Criccieth Castle. Angular unworn rock, or shore talus, the oldest known Pleistocene deposit of the area is banked east and west of the Castle Rock (Text-fig.6D,E). A shingle beach extends from this point to Graig Ddu, where it increases both in amount and size of the pebbles. The beach, south east of Graig Ddu is hard and sandy, with the Graig Ddu shingle occurring locally at 6 - 7 ft. below the level of the sand. Morfa Bychan is present between the beach and the high ground inland, this area being a complex dune system. Seaward of Morfa

Dychan extensive sand flats are present, a hazard to navigation, and from Morfa Dychan to Portmadoc, the coast is formed of small sandy bays.

Port Madoc estuary (Text - fig.4) is formed by the confluence of two river systems, the Afon Glaslyn and the larger Afon Dwyryd in the southern part. The form of the Afon Glaslyn valley has been partially determined by human interference and this occurred in the early 19th century, with the construction of an embankment running from Penrhyn-isaf to Portmadoc. Prior to this construction the tide reached nearly to the Aber-Glaslyn bridge, but post construction silting and sedimentation has converted what was formerly an island studded estuary of sand banks and shallow water into a flat land agricultural area north of the embankment (Text - Fig.5A,B).

The Penrhyndeudraeth peninsula separates Traeth Mawr, described above, and Traeth Bach, the Dwyryd region, the peninsula being formed with a rocky shore line with small sandy bays.

A narrow glacial gorge forms the entrance of the Afon Dwyryd into the estuary proper (Text - fig.5D). The river has been embanked and much reclamation has been carried out in the estuary, but a certain amount of open marsh still exists in its lower parts, and south of Pont Briwfad, at the narrow gorge there is an extensive series of marshes, extending on the south side of Traeth Bach as far as Llanfihangel-y-traethau.


9'
8'
7'
6'
4W5'
4'
PENRHYNDEUDRAETH
N
PORT MADOC
AFON GLASLYN
AFON DWYRYD
52N55'
BORTH-Y-GEST
TRAETH MAWR
52N55'
PORT MEIRION
TALSARNAU
54'
TRAETH BACH
54'
HARLECH POINT
MARSH
O
1 Nautical Mile
9'
8'
7'
6'
4W5'
4'
TEXT FIG. 4

A

B

C

D

E

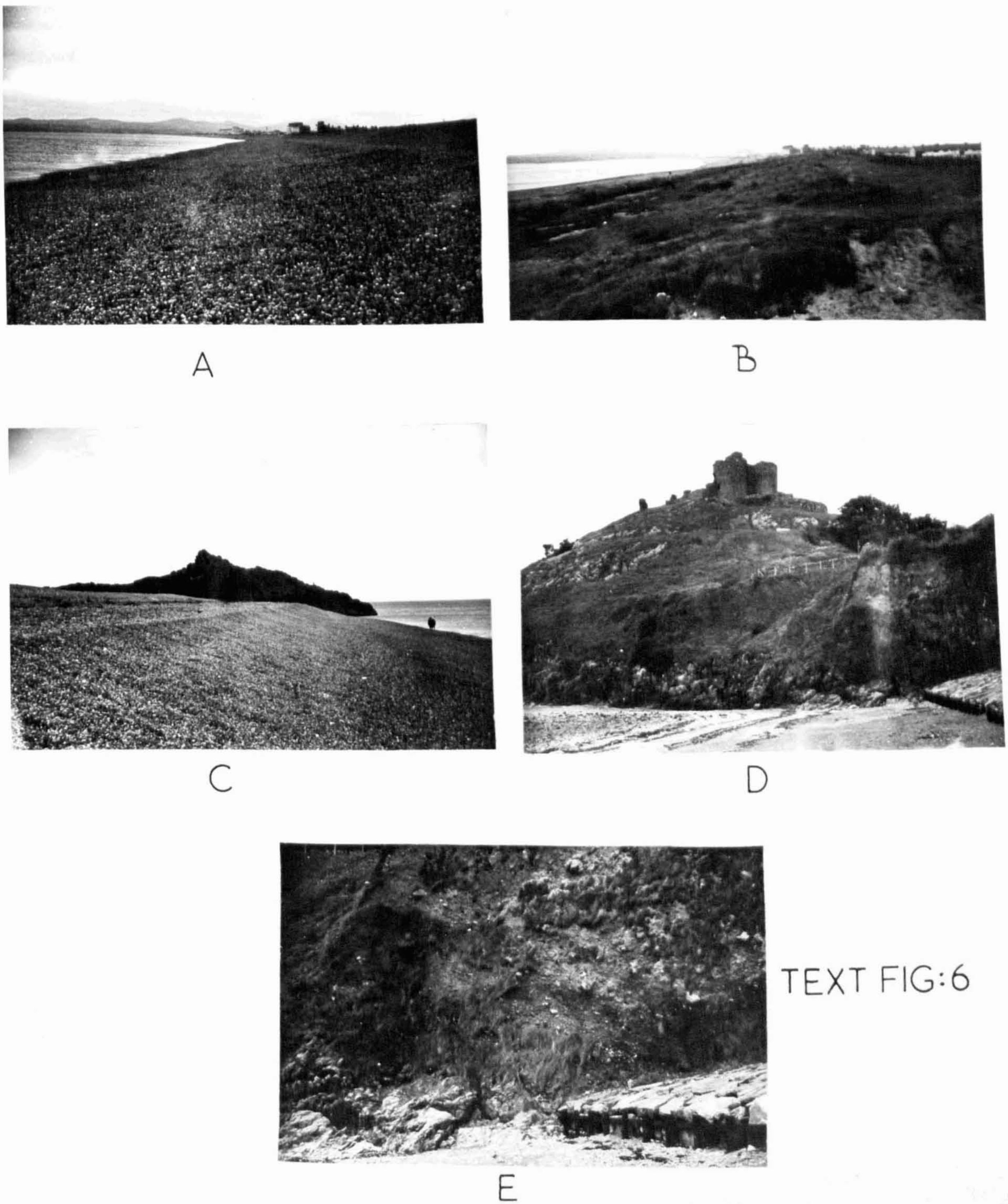
TEXT FIG: 5

The remaining areas, Morfa Harlech and Morfa Duffryn are prominent coastal features. Morfa Harlech is a broad triangular foreland area, formed of a number of interelated sediment types, the seaward sand being backed by shingle, dune, dune slack, blown sand, sandy pasture, wet pasture, salt marsh and a swamp patch. Two main dune trends are present, and the inner landward dunes are encroaching onto the pasture land within at a rate calculated since 1901 at the rate of 12 ft. per annum maximum (Steers 1948).

Dune formation on Morfa Harlech is interesting and one theory put forward is that in this area large amounts of seaweed are swept up onto the beach and left as hummocks, which act as sand traps and therefore lead to embryonic dune formation. The northward extension of Morfa Harlech is now largely restricted by the river channel, and as examination of the 1819 and 1838 O.S. maps shows that the northwestward growth of Harlech Point has been about one eighth of a mile. Marsh development is well exemplified between Llanfihangel-y-traethau and the recurved dune ends of Harlech Point.

Morfa Dyffryn (Text - fig.5C) is also an extensive sand flat area attached to the old coast and fringed on its outer side by dunes although in the southern part there is little dune growth. Landward this area is backed by sandy pasture, dune slack, blow-outs, freshwater and salt marsh, and again incursion landward by dunes is evident.

Mochras, the northern portion of Morfa Dyffryn, is an old



TEXT FIG:6

A

B

C

D

TEXT FIG:7

E

A

B

C

D

TEXT FIG: 8

moraine formed of boulder clay. This clay supplies abundant material of boulders and coarse shingle, which spreads over all the beach alongside it. The shingle travels northwards and forms a long shingle spit to the North East, with dunes, which curves around at the mouth of the river. The Llandanwg spit (Text - fig.7A-E) is, in fact, a continuation of the shingle and dune spit of Mochras, and this runs northward to join the boulder clay cliffs south of Harlech. Within Mochras itself is a broad sand flat, with fresh water marsh grading into salt marsh seawards.

The southern area of Morfa Dyffryn has the foreshore covered with large boulders, this indicating the landward end of Sarn Badrig which runs from this point southwest for about 14 miles into Cardigan Bay, and forms the southern limit of Tremadoc Bay (Text - fig.8A-D).

Sarn Badrig is a continuously shifting sand and boulder area which dries out in places at low water, and is the subject of a number of controversial theories concerning the origin of this feature.

b) Bathymetry

Tremadoc Bay proper is an area of over 200 square miles and constitues what can be termed a shallow water coastal zone extending from High Water Mark to 20 fathoms (Text - fig.9).

Sarn Badrig, a somewhat sinuous linear feature, 14 miles in length, lies on an approximate northeast-southwest line and in places dries out at Lower Water. The Sarn, a boulder and


35′
30′
25′
20′
15′
10′
5′
4°W
55′
52°N50′
45′
N
0
1
2
3
4 Nautical miles
ISOBATHS AT TWO FATHOM INTERVALS

TEXT FIG.: 9

sand area is in constant movement and at the south western end is curved north westwards to form a small spit like feature, which to a certain extent is transient in nature. Due to the constant movement the Sarn presents a hazard to navigation as channels cannot be charted with certainty over any length of time. Just offshore of Morfa Dyffryn, at the landward end of the Sarn, there is one channel at a depth of about 4 fathoms which does appear to remain fairly constant in form. The reason for this will be discussed later. There is a shallow shoal area extending for about 3 miles northwest of the Sarn, at a depth of 4-6 fathoms, extending laterally along the northern edge of the Sarn and around past the mouth of the Port Madoc estuary. Here the shoal area becomes much narrower in extent, narrowing to about ½ to 1 mile in width, and then continues around the south coast of the Lleyn where it again becomes 3 - 4 miles wide. When St. Tudwals headlands are reached the shoal becomes very narrow and marginal and almost ceases to exist, mainly due to the seaward steeply dipping coastal rocks which, in this region give rise to moderately deep channels past the headlands and around the two small islands.

In the centre of the bay there is an elongate depression lying on a north east-south west axis, with depths ranging from about 6 fathoms to over 20 fathoms. This depression is continuous along the centre of the bay except for one area where is a sandy patch situated about halfway along the depression on a north west - south east line. The hollow, as this depression has been termed is therefore divided into two portions, the inner hollow, lying off Port Madoc estuary, and the outer hollow lying to the south west of this. The inner hollow shelves down gradually from the shoal areas to depths just over 10 fathoms, the sides of this hollow being reasonably equal in slope on both the north west and south east sides. The north east end of this hollow does have a steeper slope as Port Madoc estuary is approached.

The outer hollow is the region of greatest depths in the area, and this hollow differs from the previous one described in that the sides of this hollow are much steeper, especially so on the south eastern edge where there is a marked change from the sandy shoal area to the muddy hollow area over a very short distance. This hollow, to the south west runs into the Irish Sea proper and it is possible that it forms an offshoot from St. Georges Channel.

Bathymetrically Tremadoc Bay is virtually an entity in itself, being land locked on the North and East sides, with Sarn Badrig acting as a barrier to the South East, the only open area being to the Irish Sea.

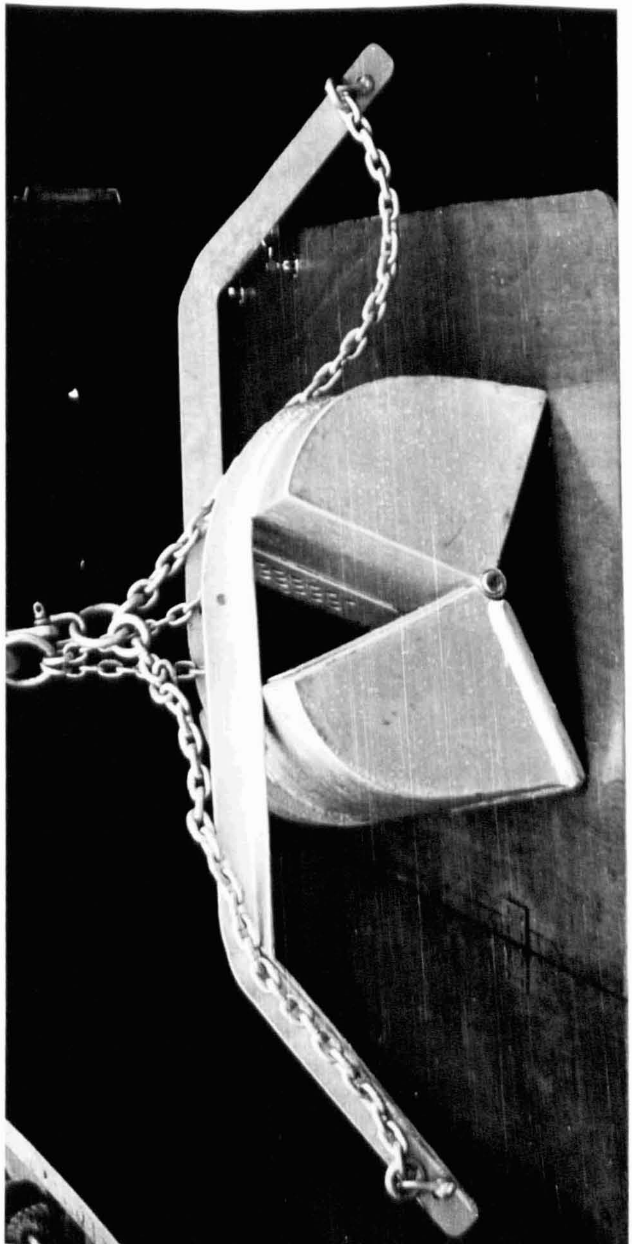
The predominant winds and currents in this area are Southwesterly and the tide range is in general, at high water, about $12\frac{1}{2}$-$13\frac{1}{2}$ feet, and at neap tides about 7-8 feet.

c) Collection of Samples

Sample collection was carried out in three stages in relation to the area being investigated and the type of study required.

TEXT-FIG. 10.

Photograph of the Van Veen sediment grab.



In September 1963 the R.V. "Antut" was used for sample collection at sea. In this collection period 118 sediment samples were obtained by means of a modified Hughes Vacuum Grab and by a Van Veen Grab. The Van Veen Grab (Text - fig.10) was found to be the more successful type of grab in sand, shingle, and especially so in the mud areas where a wedge of the bottom sediment was obtained with very little distortion, and the upper oxidised layer of ½-1 inch, and the lower less oxidised layer could easily be differentiated. This type of grab was also more successful on rocky or course gravel bottoms, as whole boulders, up to 6 inches in diameter could be obtained, and these were then scraped for sediment. The Hughes Vacuum Grab (Text - fig.11) although more convenient to handle on board the research vessel, was less successful, as samples obtained with this type of grab were, as a result of the vacuum mechanism, completely mixed up and differentiation, as mentioned above, in the muds was impossible. In addition, on rocky or gravelly shingle bottoms the grab often failed to obtain a sample due to a large pebble blocking the mouthpiece. Both grabs often tended to "go off" before reaching the bottom, butthis occurred more frequently with the Hughes Vacuum Grab, especially when working in the deeper areas, when the vacuum mechanism was affected.

100 ml. jars were used on board the launch to store the sediment while at sea, a small amount of sea water being allowed to cover the sediment in each jar so that further oxidation was

TEXT-FIG. 11.

Photograph of the Hulme Vacuum sediment grab.

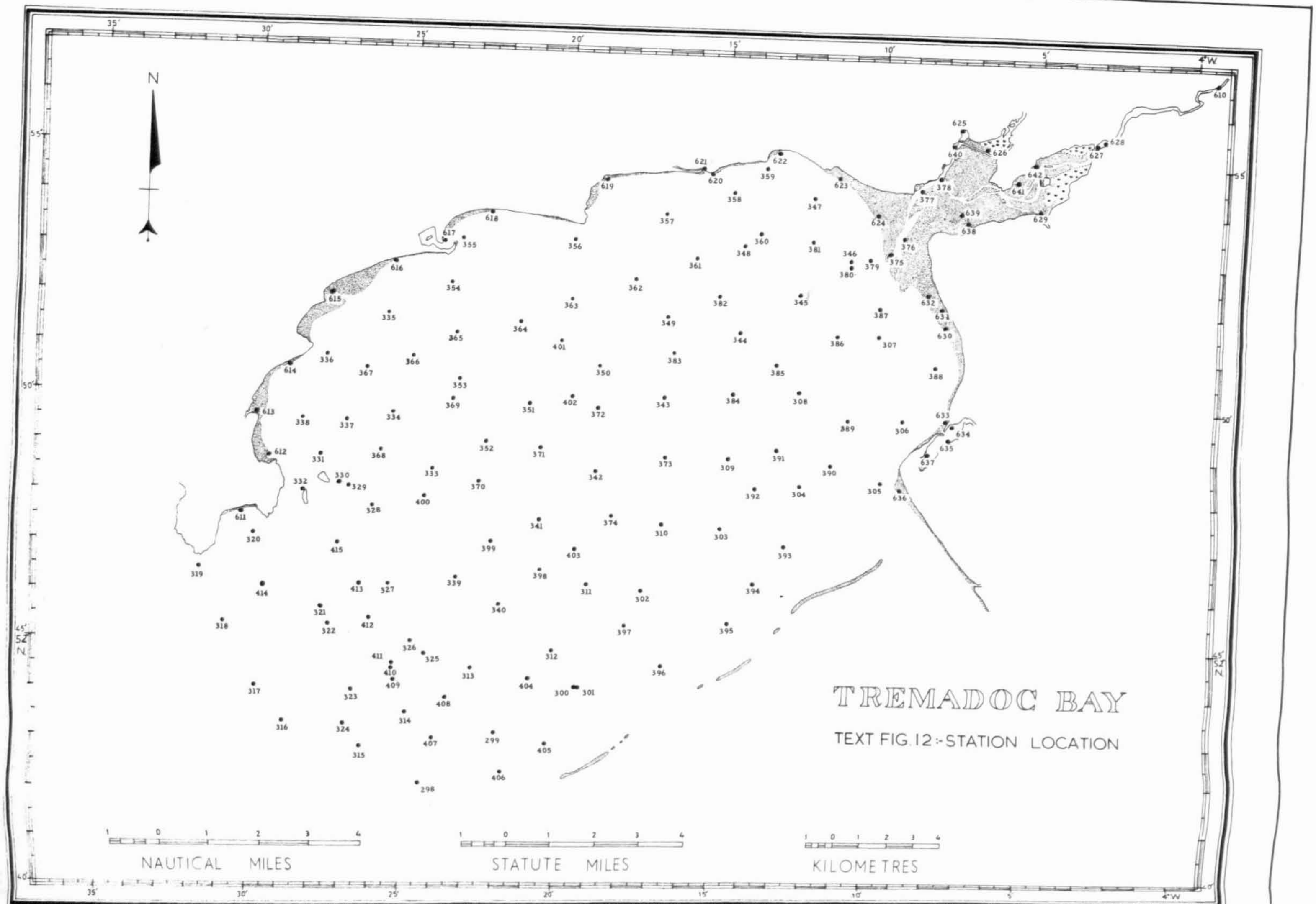
8x10

avoided. A solution of neutralized formaldehyde was prepared and added to each jar (10 ml. per jar) in order to prevent rotting of any organism, or of any living foraminifera protoplasm.

The time of collection was noted at each station, and each station was accurately plotted by means of Decca Navigational Equipment (Text - fig.12) depth being recorded by means of a Marconi Echo Sounder. During this first period of sample collection, ten water samples were taken so that salinity values could be calculated in the laboratory.

The second period of sample collection took place in September 1964 and was concerned with beach, river, and estuary sampling. 33 sediment samples were obtained during this period, and were collected by means of obtaining a "scrape" of the sediment just below water level, and in addition by scraping rocks and seaweed on the shore. The samples were stored and treated in exactly the same way as those collected at sea. 30 water samples for salinity values were collected at this time.

The third stage of sample collection took place over a number of months, two samples being collected early each month from the same locations, one station being on Llandanwg beach and one in Llandanwg lagoon. The purpose for this monthly sampling was to study any variation in foraminifera population counts, on both a short and long term basis. These samples were treated after collection in an identical manner to those above. In addition two samples had been collected from these stations in January 1963



TREMADOC BAY

TEXT FIG. 12:- STATION LOCATION

by Dr. J. R. Haynes, and these have been studied and incorporated in the results obtained from the total samples.

d) Preparation of Samples

All samples were prepared in exactly the same way and standardized cuts of 10 ml. were taken from each 100 ml. storage jar. The sample cut was placed on a 200 size sieve (75 microns) and washed thoroughly with a jet of clean water. The sample was then immersed in a solution of Rose Bengal ($C_{20}H_2O_5T_4CI_4NA_2$)(Walton 1952) for a minimum period of twenty minutes. This immersion was carried out in order that any protoplasm adhering to a foraminiferal test would be stained a dark red colour and thus making possible rapid counts of the living and dead forms. After this immersion the sample was again washed with a jet of clean water, so that any excess stain material would be removed, and then allowed to dry.

The dry sediment was placed in a set of sieves of the following sizes, 30, 60, 100, 200 (500, 250, 152, 75 microns) and a correlation drawn up between these mesh sizes and the Wentworth sediment size classifications. This was carried out to obtain the degree of sorting of the sediments and to enable any correlation that exists between foraminifera and size sorting to be drawn up. The correlation between the mesh sizes and the Wentworth scale is as follows:-

Mesh Size	Aperture diameter	Grain size retained	Wentworth classification
30	.500 mm	½ mm up	Coarse sand up
60	.251 mm	¼ - ½ mm	Medium sand
100	.152 mm	⅛ - ¼ mm	Fine sand
200	.076 mm	1/16 - ⅛ mm	Very fine sand

With this method of preparation sand-silt/mud ratios can be easily calculated in that sediment washed through the 200 mesh sieve on initial preparation is of silt/mud size and therefore the ratio can be calculated by comparing the residue to the original 10 ml. sample cut.

A rapid, efficient method to calculate salinity values was utilised (Harvey 1955). The method necessitated titrating 10 cm^3 of the sea water obtained with a solution containing 27.25 grams of Silver Nitrate per litre from an ordinary burette. Potassium Chromate is used as an indicator of the end point in this titration, and the volume (in c.c.s) required of the Silver Nitrate solution to achieve the brick red end point will roughly equal the salinity of the sample, in parts per thousand. The 40 water samples collected were treated with this method.

e) Mechanics of Sample Analysis

Every sample was picked manually for foraminiferal and associated faunal content. Flotation was attempted in some cases where the greater bulk of the sample was found to be concentrated on the 200 sieve, but this was not found to be particularly successful due to organic material being present and so was discarded in favour of the standard quartile methods in these cases. The quartile method was not employed in the variation samples collected from Llandanwg.

With specimens that had difficult indefinable details in ordinary light the specimen was immersed in xylene on a glass slide and then viewed in transmitted light.

A number of specimens were sectioned so that the wall structure could be examined and a new method was used for this purpose (Moore and Garroway 1963). The specimen was soaked for 24 hours in xylene and was then immersed in a matrix of Polymethyl Methactylate. This was allowed to solidify and then sectioned in the normal way. By using the above compound, the slides are chemically and physically stable, and the polymerized Polymethyl Methactylate does not discolour with time or temperature changes. Optical properties of the tests are in no way affected and the resulting thin sections are extremely strong.

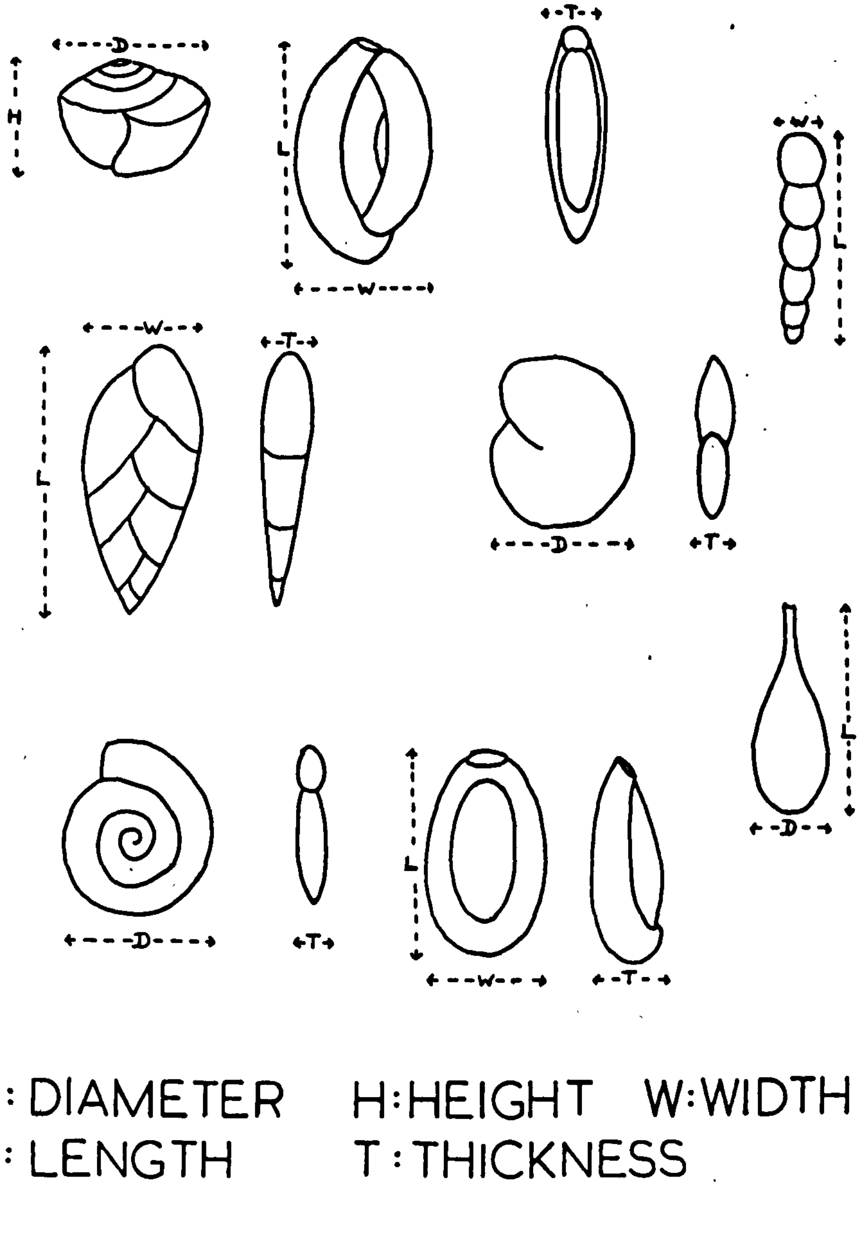
Illustrations of the various specimens were carried out by means of a Camera Lucida attachment, and this sections photographed by means of a Leitz Photomicroscope. Dimensions have been given in accordance with text - fig.13.

After removal of foraminifera and associated fauna from a sample the residue was re-mixed and a portion of the residue was, by means of the Polymethyl Methacrylate method, made into a thin section which was then petrologically examined. In addition some pebbles were sectioned so that an attempt could be made to discover the source of this material.

f) Statistical Analysis of Samples

i) Tremadoc Bay Samples

The foraminifera specimens and associated fauna specimens from each 10 ml. of sediment were counted and recorded as absolute numbers,



D : DIAMETER H : HEIGHT W : WIDTH
L : LENGTH T : THICKNESS

TEXT FIG : 13

not as percentages, as the percentage presentation tends to mask the true overall picture in an ecological study. In the finer grained sediments where excessive numbers of specimens per sample occurred, splitting according to a standard quartile method was utilised (Twenhofel-Tylet 1941).

ii) Beach, river and estuary samples

These samples were examined in exactly the same way as above.

iii) Llandanwg variation samples

The same method as above was used for these samples except that the quartile technique was not utilised at all, as absolute numbers were essential for a variation study of this type.

iv) Petrological samples

Over 300 grains were counted in each sediment slide and the absolute numbers of each type of faction, quartz, lithoclasts and bioclasts, were recorded and in this set percentages calculated.

v) Water Samples

Salinity values were calculated in parts per thousand and from the salinity values, chlorinity content was calculated by means of the Knudson Method (Woods Hole Oceanographic Institute 1962).

In all maps and graphs concerning Tremadoc Bay specimens absolute numbers were used throughout for the above reasons. In the world wide distribution maps, occurrence was simply noted on a geographical and not statistical basis. In sediment maps percentages were used in plotting as in this case the overall picture was not marred by this method.

g) Species Identification

Species identifications have been carried out on the foraminifera, and a note made on whether the specimens were living or dead. The identification of the species has been based on a number of morphological characteristics, the recognition of similarities and differences and the evaluation of degrees of similarity. Internal structure examination was facilitated by means of thin sectioning (Wood 1948; Moore & Garroway 1962). Crushes were examined under polarized light for the determination of wall structure (Wood 1949). When the chamber number per whorl was determined in spirally coiled species, the proloculus was included as part of the initial whorl. A visit was paid to the British Museum to examine certain foraminifera collections. No generic or specific identification of the associated fauna has been carried out, except in certain cases, the main groups simply being noted, and also a note being made on whether the organisms are living or dead.

h) Review of Previous Work

This study is the first work to be concerned with foraminifera of Tremadoc Bay, but as Tremadoc Bay forms the northern part of Cardigan Bay, and as this study has been carried out as part of the Cardigan Bay - Irish Sea Research Project of the Geology Department, U.C.W., Aberystwyth, it is proposed to give a brief resume of previous work carried out in Cardigan Bay as a whole.

In 1963 T. D. Adams completed his Ph.D. Wales (unpublished) on the "Holocene Foraminifera from the Dovey Estuary and Cardigan Bay" in which he examined the taxonomy of foraminifera and attempted to delimit foraminiferal associations in the Holocene of the Dovey Estuary.

Dr. J. R. Haynes published a note on "Live and Dead Foraminifera between the Sarns, Cardigan Bay" in 1964 in which he stated that the Sarns themselves provide an amenable habitat for foraminifera which when they die are then swept out into the surrounding sands, and pointed out that the mud areas also include species which may have been winnowed out from the sands. In examining a dead assemblage he noted that there are forms that occur neither on the Sarns, nor, living in the mud and these are presumed to have been swept in from the deeper parts of St. Georges Channel or beyond.

Also in 1964 J. R. Haynes and Z. R. el-Naggar, in a paper on "Reworked Upper Cretaceous and Danian Planktonic Foraminifera in the type Thanetian", remark on the fact that Globorotalites michelinianus (d'Orbigny) has been retrieved from sediments in Cardigan Bay and state that this form is probably reworked from drift left by the Irish Sea ice and doubtless was derived from the Campanian of Northern Ireland.

J. R. Moore III, completed his Ph.D. Wales (unpublished) on "Sedimentation in the Northern part of Cardigan Bay" and this work included a large amount of data on the sediments of the area, including data on X-Ray analysis of the sediments.

As a result of the work carried out in the Dovey Estuary by T. D. Adams and J. R. Haynes a joint paper was published in 1965 on "Foraminifera in Holocene Marsh Cycles at Borth, Cardiganshire, Wales" and these two authors in conjunction with C. T. Walker published in the same year a paper entitled "Boron in Holocene Illites of the Dovey Estuary, Wales, and its relationship to Palaeosalinity in Cyclothems".

The most recent publication on foraminifera was by J. R. Haynes on "Symbiosis, Wall Structure and Habitat in Foraminifera" and the author stated that from an examination of the dominant living foraminifera in the Dovey Estuary suggests that symbiosis and radial hyaline wall structure in foraminifera may be connected.

Contemporaneous with this present study, studies are also being carried out in this department on recent foraminifera from Aberystwyth Harbour, from an area extending from Aberystwyth to Newquay, and from the Dovey estuary, and also further work on the Holocene foraminifera of the Dovey estuary is being carried out. A detailed sediment study is being carried out in Tremadoc Bay, and work is in progress on heavy mineral analysis in sediments off Aberystwyth.

Apart from research on foraminifera and sediments, Cardigan Bay has received attention from geophysicists, especially in Tremadoc Bay.

A suggestion that Tremadoc Bay may be a Triassic basin was put forward by D. W. Powell in 1956 in his paper on "Gravity and Magnetic anomalies in North Wales".

This theory received attention and in 1961 D. H. Griffiths, R. F. King and C. D. V. Wilson published on "Geophysical Investigations in Tremadoc Bay, North Wales", and in the conclusion to this paper put forward two theories to account for the origin of Tremadoc Bay, one, that it has a structural origin and secondly, that the regional gravity low found in this area is due to a major granitic intrusion. In this work the authors proposed three layers of strata to underly Tremadoc Bay, layer 1 being characterised by low velocity, low density sediments (6000-8000 ft/sec) nearly 2000 feet deep under Morfa Dyffryn and thinning westward, and it is suggested that these sediments may be Mesozoic clays. They also suggest that layer 2 is to be identified with the Ordovician (13,000 ft/sec) and layer 3 was left open to conjecture.

This paper was followed up in 1964 by a paper by D. J. Blundell, R. F. King and C. D. V. Wilson on "Seismic investigations of the rocks beneath the Northern part of Cardigan Bay, Wales" in which the hypothesis of layer 2, mentioned above, to be of Ordovician age is supported.

The latest work to be carried out in Tremadoc Bay was by the Royal Navy Hydrographic Survey, and the results of this survey have been incorporated into this present work. A bibliography of completed works with reference to Cardigan Bay, follows:-

Adams T. D.	1963	Holocene Foraminifera from the Dovey Estuary and Cardigan Bay. Unpublished Ph.D. thesis, Wales.
Adams T. D. & Haynes J. R.	1965	Foraminifera in Holocene Marsh Cycles at Borth, Cardiganshire (Wales) Paleontology, V.8, Pt.1, pp 27-38, 3 text figs.
Adams T. D. Haynes J. R. & Walker C. T.	1965	Boron in Holocene Illites of the Dovey Estuary, Wales, and its relationship to Palaeosalinity in Cyclothems. Sedimentology, Vol.4, pp.189-195, 3 tables.
Blundell D. J. King R. F. & Wilson C.D.V.	1964	Seismic investigations of the rocks beneath the northern part of Cardigan Bay, Wales. Q.J.G.S.Vol.120, pp.35-50, 6 figs.
Griffiths D. H. King R. F. & Wilson C.D.V.	1961	Geophysical investigations in Tremadoc Bay, North Wales. Q.J.G.S.Vol.117, pp.171-187, 9 figs, 1 table.
Haynes J. R.	1964	Live and Dead Foraminifera between the Sarns, Cardigan Bay, Nature, Vol.204, No.4960, p.774.
Haynes J. R.	1965	Symbiosis, Wall Structure and Habitat in Foraminifera. Contr.Cush.Found.For. Res.Vol.XVI, Pt.1, pp.40-43.
Haynes J. R. & El-Naggar Z.R.M.	1964	Reworked Upper Cretaceous and Danian Planktonic foraminifera in the type Thanetian. Micropaleontology. Vol.10, No.3, pp. 354-356.
Moore III, J.R.	1964	Sedimentation in the Northern part of Cardigan Bay. Unpublished Ph.D. thesis, Wales.
Powell D. W.	1956	Gravity and magnetic anomalies in North Wales. Q.J.G.S. Vol.III, pp.375-397.

i) Aims of Research

This present overall study is of a threefold nature, each study project including a number of secondary or "sub-projects".

Primarily the study is concerned with an attempt to determine the prevailing ecological conditions that influence the distribution of foraminifera in Tremadoc Bay, and to evaluate their importance. The attempt has also been made to delimit the foraminiferal associations. For this reason a study has been carried out on the associated fauna and on the petrology of the sediments.

The second aim is to establish a taxonamic series of recent foraminifera from the deposits described earlier. In the time permitted in this study an attempt has been made to make synonomys of the species as comprehensive as possible, also notes made on morphological characteristics of the species, on the present day geographical distribution, and also on the stratigraphical range, where applicable, of these species, both these last two studies being attempted on a world wide basis.

Included in this taxonomic portion is a study of the genus, Technitella Norman 1878 and although not all the species of this genus occur in Tremadoc Bay this interesting foraminifera has been taxonomically studied and synonomys drawn up for all the species. Practically all literature apertaining to this genus has been studied and commented on, and specimens of this genus and its species examined in the British Museum.

The third study is that of the variation in foraminifera populations from two stations of differing environments, on a monthly basis, this study enabling examination of seasonal variation in foraminifera and reasons for this variation.

CHAPTER 2

A review of some collections deposited in the British Museum of Natural History

A visit was paid to the British Museum of Natural History in July 1965 to examine the collections of recent foraminifera from around the British Isles, and also to examine the collections of foraminifera from some of the more famous cruises and expeditions. One collection of Holocene foraminifera was examined for comparison with Holocene foraminifera collected from the Dovey Estuary, and one collection of New Zealand foraminifera was examined, this area being of a general similar environment as the British Isles. In addition all the specimens of the genus Technitella were carefully examined and the findings concerning this genus will be commented on later.

Primarily the visit was carried out in order that species indentification of Tremadoc Bay specimens could be checked, and secondly so that variation in certain species could be examined.

Each collection examined and each species and variety looked at are enumerated below and in certain cases geographical area, where stated, is included, also comments on the validity of collection identifications are included, along with notes on whether the collection species differ or not, and in what respect from the Tremadoc Bay species. A note is also included on the range of variation exibited by collection specimens. Due to time limitation not all the specimens in each collection were examined and thus specimens examined were restricted to those with counterparts in Tremadoc Bay. In the listing below present day names are used throughout, in alphabetical order for easy reference, and if the specimen agrees in every detail with Tremadoc Bay specimens it is simply listed without any comment.

Collection I: H. B. Brady	British Recent Foraminifera
ACERVULINA inhaerens	Hebrides; Dogs Bay
AMMONIA beccarii	Tenby; off Helensburgh; West coast of Scotland.
BULIMINA marginata	Shetland; Hebrides.
BULIMINELLA elegantissima	North of Cumbrae; off Helensburgh.
CIBICIDES lobatulus	Shetland; Cornwall.
CIBICIDES refulgens	Butt of Lewis; Shetland.
CYCLOGYRA involvens	Isle of Man; Stranraer; Lochgare.
DISCORBIS williamsoni	Belfast.
ELPHIDIUM crispum	North of Cumbrae; East Solent. Remarks: Spinose forms are included in this species.
FISSURINA marginata	Shetland; Bute.
GLOBULINA gibba	Shetland; Bute.
GUTTULINA lactea	Clifden; Isle of Man.
LAGENA laevis	Roundstone; Mumbles. Remarks: Curved types are included in this species as well as the typical straight types.
LAGENA semistriata	Mumbles; North side of Cumbrae.

LAGENA sulcata	Lambay. Remarks: The specimens assigned to this species also include the varietal form LAGENA sulcata var.spirata.
MASSILINA secans	Clifden; Guernsey; Isle of Wight.
MILIAMMINA fusca	Wansbeck; Tarbert Argyll; West Point, Ireland.
MILIOLINELLA oblonga	Shetland; off Eddystone.
MILIOLINELLA subrotunda	East Solent; off Eddystone. Remarks: Forms recorded from both areas include examples of PATEORIS hauerinoides.
NONION depressulum	East Solent.
NONIONELLA turgida	South West of Ireland; Loch Eriboll
OOLINA hexagona	Shetland.
OOLINA williamsoni	Lambay.
PATELLINA corrugata	Clifden Bay; Roundstone; off Helensburgh; Shetland.
PLANORBULINA mediterranensis	Off Salcombe, Devon.
QUINQUELOCULINA bicornis	Hebrides; Guernsey. Remarks: This name appears to have been used to include a number of striated forms as well as the typical species. Included are aberrent forms of QUINQUELOCULINA bicornis and also species such as QUINQUELOCULINA pulchella and tending through to forms similar to QUINQUELOCULINA granulo-costata.
QUINQUELOCULINA pulchella	Strongford Loch; off Cumbrae Remarks: This name includes forms more akin to QUINQUELOCULINA granulo-costata.
QUINQUELOCULINA seminulum	Hebrides; Tenby.
REOPHAX fusiformis	North of Cumbrae.

SPIRILLINA vivipara	Dingle Bay; Shetland.
TRILOCULINA trigonula	Shetland; Hebrides; Bute.
TROCHAMMINA globigeriniformis	Roundstone; Shetland.
TROCHAMMINA inflata	Mumbles; Yarmouth; Tees estuary; Alnmouth.

Collection 2: A. M. Norman British Recent Foraminifera

AMMONIA beccarii	Killarny Bay; Skye; Salcombe; Valentia Harbour; Roundstone; Seaton Sluice.
BULIMINA marginata	Roundstone; Loch Fyne; Valentia Harbour; Killarney Bay.
BULIMINELLA elegantissima	Berehaven Harbour; Ireland.
CIBICIDES lobatulus	Skye; Shetland; Valentia; Roundstone.
CIBICIDES refulgens	Valentia; Shetland.
DENDROPHYRA arborescens	Wemyss Bay.
DISCORBIS williamsoni	South West of Ireland; off Valentia; Belfast Lough.
ELPHIDIUM crispum	Valentia Harbour; Salcombe; Guernsey; Roundstone.
FISSURINA marginata	Off Valentia.
GLOBULINA gibba	Valentia; Shetland; Butterbuy Bay.
GUTTULINA lactea	Off Valentia.
JACULELLA acuta	Shetland.
LAGENA laevis	Loch Fyne; off Valentia; Inverary. Remarks: Wide range of test outline in specimens assigned to this species.
LAGENA semistriata	Valentia; Salcombe.

LAGENA sulcata	Salcombe; Butterbuy Bay; off Valentia. Remarks: A number of varietal forms are included in this species.
LAGENA sulcata var. interrupta	Roundstone; Burterbuy Bay.
MARSIPELLA elongata	Shetland. Remarks: Test composed mainly of sand grains with very rare foraminifera tests.
MASSILINA secans	Valentia Harbour; Clew Bay; Salcombe.
MILIAMMINA fusca	Clew Bay; Seaton Sluice.
MILIOLINELLA oblonga	Southport; Valentia Harbour; the Minch.
MILIOLINELLA subrotunda	Shetland; off Valentia; Roundstone. Remarks: Typical specimens are included in this species as well as some specimens of PATEORIS hauerinoides.
NONION depressulum	Seaton Sluice; Valentia; Westport; Loch Fyne.
NONIONELLA turgida	Valentia Harbour; Shetland; Roundstone; the Minch.
OOLINA hexagona	Loch Fyne; Roundstone.
OOLINA williamsoni	Roundstone; Valentia; the Minch; Loch Fyne.
PATELLINA corrugata	Roundstone.
PLANORBULINA mediterranensis	Valentia; Shetland
QUINQUELOCULINA bicornis	Salcombe; the Minch; Shetland; Skye
QUINQUELOCULINA pulchella	Guernsey; Shetland; Skye; Valentia Harbour.
QUINQUELOCULINA seminulum	Salcombe; Shetland.
REOPHAX fusiformis	Inverary; Loch Fyne; Skye; Shetland.

SACCAMMINA sphaerica — Fair Isle.
Remarks: Very fine grained material composing the test of this species.

SPIRILLINA vivipara — Ireland.

TEXTULARIA gramen — Roundstone; Shetland; Skye; off Valentia.

TRILOCULINA trigonula — Shetland; the Minch; off Valentia.

TROCHAMMINA inflata — Seaton Sluice.

Collection 3. E. Heron-Allen and A. Earland — Recent Foraminifera, Plymouth District

ACERVULINA inhaerens

AMMONIA beccarii

BOLIVINA variablis

BULIMINA elongata — Remarks: Included in this species are a number of forms which should be called BULIMINA gibba

BULIMINA marginata

BULIMINELLA elegantissima

CIBICIDES lobatulus

CIBICIDES refulgens

CYCLOGYRA involvens

DISCORBIS williamsoni

ELPHIDIUM crispum

ELPHIDIUM macellum

ELPHIDIUM selseyense

FISSURINA lucida

FISSURINA marginata

GLOBULINA gibba

GUTTULINA lactea

JACULELLA acuta

LAGENA laevis

LAGENA semistriata

LAGENA sulcata

MASSILINA secans

MILIAMMINA fusca

MILIOLINELLA oblonga

Remarks: This species differs from the type to a certain degree in general appearance.

MILIOLINELLA subrotunda

NONION boueana

NONION depressulum

NONIONELLA turgida

OOLINA hexagona

OOLINA williamsoni

PATELLINA corrugata

PLANORBULINA mediterranensis

QUINQUELOCULINA bicornis

Remarks: A number of forms included here should be assigned to other striated quinqueloculine types.

QUINQUELOCULINA cliarensis

QUINQUELOCULINA pulchella

QUINQUELOCULINA seminulum

REOPHAX fusiformis

SPIRILLINA vivipara

SPIROPTHALMIDIUM acutimargo

TEXTULARIA gramen

TRILOCULINA trigonula

TROCHAMMINA inflata

Collection 4 | W. B. Carpenter | Recent Foraminifera

CIBICIDES lobatulus

CIBICIDES refulgens

MARSIPELLA elongata

MASSILINA secans — Remarks: A very large form which tends to be more like MASSILINA planisparoidea

QUINQUELOCULINA seminulum — Remarks: A number of forms with a massiline tendency are included here.

SACCAMMINA sphaerica — Remarks: A number of specimens here have protruding apertures

TROCHAMMINA globigeriniformis

Collection 5 | Hodley, Hurdle, Burdett | Recent New Zealand Foraminifera

ACERVULINA inhaerens — Whangaporoa; Maunganui; Wellington; New Plymouth.

CYCLOGYRA involvens — Intertidal Wellington; Christchurch. Whangaporoa; Maunganui; New Plymouth.

DISCORBIS bradyi — Mt. Maunganui; Whangaporaa; New Plymouth.

PATELLINA corrugata — Wellington; Whangaporoa; Maunganui.

PATEORIS hauerinoides — Wellington; Portobello; Whangaporoa; Mt. Maunganui.

QUINQUELOCULINA seminulum — Wellington; Christchurch; Whanaporoa; Maunganui.

SPIRILLINA vivipara — Christchurch; Portobello; Whangaporoa.

TROCHAMMINA inflata — Porirua.

Collection 6 Nyi Nyi Holocene Foraminifera, Altcar, Lancashire

All the specimens listed below are hypotypes.

ASTRONONION gallowayi — Remarks: More distinct stellate appearance to the umbilical region than those of Cardigan Bay.

BOLIVINA spatulata

BOLIVINA variabilis

BULIMINA gibba — Remarks: In adult portion of this test, the cross section is more triangular than Cardigan Bay specimens.

BULIMINA marginata

BULIMINELLA elegantissima

CIBICIDES lobatulus

CIBICIDES refulgens

CYCLOGYRA involvens

ELPHIDIUM cf.discoidale

ELPHIDIUM excavatum

ELPHIDIUM magellanicum

EOEPONIDELLA mamilla

FISSURINA lucida — Remarks: A slightly more globular form than is usual.

FISSURINA marginata

GUTTULINA lactea

LAGENA laevis

LAGENA semistriata

LAGENA substriata

LAGENA sulcata — Remarks: This specimen is not as designated but is the varietal form LAGENA sulcata var. spirata

MILIAMMINA fusca

MILIOLINELLA oblonga

MILIOLINELLA subrotunda

NONION depressulum — Remarks: A very poor specimen and identification is probably tentative.

NONIONELLA turgida

OOLINA hexagona

OOLINA williamsoni

PATELLINA corrugata

PLANORBULINA mediterranensis

PYRGO williamsoni

QUINQUELOCULINA cliarensis

SPIRILLINA vivipara

TRILOCULINA trigonula

TROCHAMMINA inflata

Collection 7 — H. B. Brady — Discovery Expedition Recent Foraminifera

BULIMINELLA elegantissima — Falkland Islands; off South Georgia

CIBICIDES lobatulus — Drake Straite

ELPHIDIUM excavatum — Falkland Islands.
Remarks: Retral processes poorly developed in this specimen.

ELPHIDIUM magellanicum — Falkland Islands.

JACULELLA acuta — South Sandwich Group; Scotia Sea.

LAGENA sulcata — Falkland Islands.
Remarks: There is considerable variation in the neck in these specimens, from a small stout neck to a long slender finely hispid type.

PATELLINA corrugata — Falkland Islands.

REOPHAX subfusiformis — South Georgia.

TROCHAMMINA inflata — Palmer Archipelago

Collection 8 — E. Heron-Allen & A. Earland — Recent Foraminifera Clare Island Survey

ACERVULINA inhaerens

AMMONIA beccarii

BOLIVINA variablis

BULIMINA elongata

BULIMINA marginata

BULIMINELLA elegantissima

CIBICIDES lobatulus

CIBICIDES refulgens

CAYCLOGYRA involvens

DISCORBIS williamsoni

ELPHIDIUM crispum

ELPHIDIUM macellum

FISSURINA lucida

FISSURINA marginata

GLOBULINA gibba

GUTTULINA lactea

LAGENA laevis

LAGENA semistriata

LAGENA sulcata

MASSILINA secans

MILIAMMINA fusca

MILIOLINELLA oblonga

Remarks: The comment "square types" is written on the slide containing this species, and this type is more akin to QUINQUELOCULINA lata than to the named form.

NONION depressulum

NONION pompilioides

NONIONELLA turgida

OOLINA hexagona

OOLINA williamsoni

PATELLINA corrugata

PLANORBULINA mediterranensis

QUINQUELOCULINA bicornis

QUINQUELOCULINA pulchella

Remarks: There are a number of differing forms included in this species.

QUINQUELOCULINA seminulum

REOPHAX fusiformis

SACCAMMINA sphaerica

SPIRILLINA vivipara

SPIROPTHALMIDIUM acutimargo

TEXTULARIA gramen

TRILOCULINA trigonula

TROCHAMMINA globigeriniformis

TROCHAMMINA inflata

Collection 9 E. Heron-Allen and A. Earland "Runa" cruise Recent Foraminifera

ACERVULINA inhaerens

AMMONIA beccarii

BULIMINA elongata

BULIMINA marginata

BULIMINELLA elegantissima

CIBICIDES lobatulus

CYCLOGYRA involvens

DISCORBIS williamsoni

ELPHIDIUM crispum

ELPHIDIUM macellum

FISSURINA lucida

Remarks: Typical and slightly more globular forms are included under this name.

FISSURINA marginata

GLOBULINA gibba

GUTTULINA lactea

JACULELLA acuta

LAGENA laevis

Remarks: Typical forms and forms tending towards LAGENA clavata are included under the one name.

LAGENA semistriata

LAGENA sulcata

MASSILINA secans

MILIAMMINA fusca

MILIOLINELLA oblonga

Remarks: This appears to include typical forms as well as forms very similar to QUINQUELOCULINA lata and elongate QUINQUELOCULINA seminulum.

MILIOLINELLA subrotunda

NONION boueana

NONION depressulum

NONIONELLA turgida

OOLINA hexagona

OOLINA williamsoni

PATELLINA corrugata

PLANORBULINA mediterranensis

QUINQUELOCULINA bicornis

Remarks: A wide range of form is evident in this type of miliolid and a number of different species have been grouped together under this name.

QUINQUELOCULINA pulchella

Remarks: Typical forms and forms tending toward QUINQUELOCULINA granulo-castata are grouped together.

QUINQUELOCULINA seminulum

REOPHAX fusiformis

SPIROPTHALMIDIUM acutimargo

TEXTULARIA gramen

TRILOCULINA trigonula

TROCHAMMINA inflata

Collection 10 | E. Heron-Allen & A. Earland | "Goldseeker" cruise Recent Foraminifera North Sea

ACERVULINA inhaerens

AMMOBACULITES agglutinans var. filiformis — Remarks: Slightly more slender with a less distinct initial portion compared to specimens from Tremadoc Bay.

AMMONIA beccarii

BOLIVINA variablis

BULIMINA elongata

BULIMINA marginata

BULIMINELLA elegantissima

CIBICIDES lobatulus

CIBICIDES refulgens

CYCLOGYRA involvens

ELPHIDIUM crispum — Remarks: Spinose types are included in this species and these forms are generally smaller than the non spinose types.

ELPHIDIUM macellum

FISSURINA lucida — Remarks: Typical and slightly more globose types are grouped together under this name.

FISSURINA marginata

GLOBULINA gibba

GUTTULINA lactea

LAGENA laevis

LAGENA semistriata

LAGENA sulcata

MASSILINA secans

MILIAMMINA fusca

MILIOLINELLA oblonga

Remarks: One specimen of an elongate QUINQUELOCULINA seminulum is included with typical forms under this name.

MILIOLINELLA subrotunda

Remarks: Along with typical forms are included MILIOLINELLA chuckchiensis and forms tending towards PATEORIS hauerinoides

NONION depressulum

NONIONELLA turgida

OOLINA hexagona

OOLINA williamsoni

PATELLINA corrugata

PLANORBULINA mediterranensis

QUINQUELOCULINA bicornis

Remarks: A number of forms apart from the typical type, such as QUINQUELOCULINA angularis, QUINQUELOCULINA pulchella, and QUINQUELOCULINA granulo-costata are included here.

QUINQUELOCULINA pulchella

QUINQUELOCULINA seminulum

REOPHAX fusiformis

SACCAMMINA sphaerica

SPIRILLINA vivipara

TEXTULARIA gramen

TRILOCULINA trigonula

TROCHAMMINA inflata

Collection 11	H. B. Brady	"Challenger" Expedition Recent Foraminifera
ACERVULINA inhaerens		Dogs Bay; off Tonatubu; Bass Strait
AMMONIA beccarii		
BULIMINA elongata		North West of Ireland Remarks: These specimens exhibit the same range of form as those of Tremadoc Bay.
BULIMINA marginata		West of Ireland; North Atlantic. Remarks: These specimens exhibit a wide range of form as shown by Tremadoc Bay forms.
BULIMINELLA elegantissima		Falkland Islands
CIBICIDES lobatulus		Cape Verde Islands; off Tonatubu; North Pacific; North of San Fernandez.
CIBICIDES refulgens		West coast of Patagonia.
CYCLOGYRA involvens		West Indies; off Tahiti; Herguelen Islands.
FISSURINA marginata		North of Juan Fernandez; North East New Zealand. Remarks: A great variety in the margin of this species is evident.
GLOBULINA gibba		Dogs Bay
GUTTULINA lactea		North Pacific; Bass Strait.
JACULELLA acuta		South East of Pernambuco. Remarks: These specimens are syntypes and are generally larger than the Tremadoc Bay type.
LAGENA laevis		Falkland Islands; Southern Ocean; South Atlantic; off Tahiti; South west of Canaries; North Pacific. Remarks: Variation of test globularity is exhibited.

LAGENA semistriata	East of Shetlands; South of New Guinea; Bass Strait; Papua.
LAGENA sulcata	South of Japan; Kerguelen Islands; South Pacific. Remarks: The length of the neck varies in these specimens.
LAGENA sulcata var. interrupta	North of Papua. Remarks: Variation in the type of neck is evident, from a short stout neck to a long slender neck.
MARSIPELLA elongata	Faeroe Channel; South east of Pernambuco. Remarks: The tests of this species are composed mainly of sand grains with very few foraminifera tests attached.
MASSILINA secans	Off Booby Island.
MILIOLINELLA oblonga	Fiji
MILIOLINELLA subrotunda	Bass Strait
NONION boueana	Vigo Bay
NONION depressulum	Sydney
NONION pompilioides	West coast of Ireland
NONIONELLA turgida	West Coast of Ireland; east of Shetland Remarks: Test size variation is evident in these specimens.
OOLINA hexagona	Honolulu; South Pacific
PATELLINA corrugata	Bass Strait; off Fiji; Kerguelen Islands; Admiralty Island; Prince Edward Island. Remarks: Cone height varies in these specimens.
PLANORBULINA mediterranensis	Bass Strait; off Bermudas; North west of Ireland.
QUINQUELOCULINA bicornis	Loch Scavaig; Skye. Remarks: A number of differing striate quinqueloculine forms are included under this name.

QUINQUELOCULINA granulo-costata	Admiralty Island; Honolulu Reefs; Booby Island.
QUINQUELOCULINA pulchella	West Coast of Scotland, Skye.
QUINQUELOCULINA seminulum	Loch Scavaig; Skye; West of Ireland Remarks: Apart from the typical forms a number of elongate forms are grouped together under this name.
REOPHAX fusiformis	Loch Fyne; Inverary; Cumbrae.
SACCAMMINA sphaerica	North Atlantic
SPIRILLINA vivipara	Kerguelen Island; Prince Edward Island; Honolulu Reefs; Admiralty Island; off Tahiti.
SPIROPTHALMIDIUM acutimargo	Off Fiji; Torres Strait; off Pernambuco.
TEXTULARIA gramen	Bass Strait; Honolulu Reefs. Remarks: Considerable variation is exhibite by these specimens.
TRILOCULINA trigonula	Azores; North west of Ireland; Skye,

One slide of LAGENAMMINA fusiformis of Williamsons collection was examined and found to be identical with Tremadoc Bay specimens of REOPHAX fusimormis.

It appears that from the collections examined above and from a study of relevant literature it is evident that a number of workers have experienced difficulty with identifications of certain "suites" of foraminifera such as the QUINQUELOCULINA bicornis, QUINQUELOCULINA pulchella and QUINQUELOCULINA granulo-costata group, the LAGENA laevis LAGENA clavata group, and the QUINQUELOCULINA seminulum QUINQUELOCULINA lata group.

It is noticable that it is possible to obtain a number of specimens from the above collections showing gradation from one species through to another. As a result, erection of new species on minor details, which are only of subspecific or varietal importance is to be condemned, as this practice only tends to add to the confusion existing at present in foraminifera taxonomy.

CHAPTER 3

The history of classification of foraminifera is fully and concisely dealt with in the Treatise on Invertebrate Paleontology Part C, Vols 1,2 (Loeblich and Tappan 1964) and in this work a new classification is put forward, with pertinent comments. This new classification recognises five sub-orders of protistons mainly defined on test wall composition, on mode of chamber and septal addition, on apertural characteristics and modifications of the same and on chamber form and arrangements. The five sub-orders proposed are the:-

Allogromiina	:	Membaneous and pseudochitinous tests
Textulariina	:	agglutinated tests
Fusilinina	:	calcareous, microgranular tests
Miliolina	:	porcellaneous, calcitic tests
Rotaliina	:	Hyaline, perforate calcareous tests

Within these five sub-orders seventeen super-families are recognised on the basis of the unilocular or multilocular nature of the tests, and the character of the wall microstructure.

The treatise has attempted to correlate the vast amount of literature that exists on foraminifera, and during the compilation of this work an attempt was made by the authors to check every type description and type species, the result being that in a number of cases former differently named species have now been equated. As this is the most recent, most comprehensive, work on the classification of the foraminifera it has been utilised throughout, with minor modifications in this present study. Below is the list of the one hundred and thirteen foraminifera species and varieties retrieved from Tremadoc Bay, this list being arranged taxonomically with full reference to authors and date of erection of the taxonomic divisions. Where a species or variety is of a doubtful type they have been designated 'A', 'B', and a synonomy has not been included for these forms. Where the form is very similar to the type, but with a minor degree of difference they have been noted c.f. and compared to the type.

Order : FORAMINIFERIDA Eichwald 1830
Sub-Order : TEXTULARIINA Delage & Herouard 1896
Super Family : AMMODISCACEA Reuss 1862
Family : ASTRORHIZIDAE Brady 1881

Sub-Family: ASTRORHIZINAE Brady 1881
Genus: RHABDAMMINA M.Sars in Carpenter 1869
<u>RHABDAMMINA scabra</u> Hoglund 1947

Sub-Family: RHIZAMMININAE Rhumbler 1895
Genus: BATHYSIPHON M.Sars in G.O.Sars 1872
<u>BATHYSIPHON acuta</u> (Hoglund) 1947

Genus: MARSIPELLA Norman 1878
<u>MARSIPELLA elongata</u> Norman 1878
<u>MARSIPELLA elongata</u> Norman var 'A'

Sub-Family: HIPPOCREPININAE Rhumbler 1895
Genus: JACULELLA Brady 1879
<u>JACULELLA acuta</u> Brady 1879

Sub-Family: DENDROPHYRINAE Haeckel 1894
Genus: DENDROPHYRA Wright 1861
<u>DENDROPHYRA arborescens</u> (Norman) 1878

Family: SACCAMMINIDAE Brady 1884

Sub-Family: PSAMMOSPHAERINAE Haeckel 1894
Genus: PSAMMOSPHAERA Schultze 1875
<u>PSAMMOSPHAERA parva</u> Flint 1899

Sub-Family: SACCAMMININAE Brady 1884
Genus: SACCAMMINA Carpenter 1869

SACCAMMINA cf.sphaerica Brady 1871

Genus: LAGENAMMINA Rhumbler 1911

LAGENAMMINA laguncula Rhumbler 1911

Genus: TECHNITELLA Norman 1878

TECHNITELLA sp. Norman 1878

Super Family LITUOLACEA de Blainville 1825
Family HORMOSINIDAE Haeckel 1894

Sub-Family: HORMOSININAE Haeckel 1894
Genus: REOPHAX Montford 1808

REOPHAX artica Brady 1881
REOPHAX fusiformis (Williamson)emend. Loeblich & Tappan 1955
REOPHAX subfusiformis Earland emend. Hoglund 1947

Family RZEHAKINIDAE Cushman 1933

Genus: MILIAMMINA Heron-Allen and Earland 1930

MILIAMMINA fusca (Brady) 1870

Family LITUOLIDAE de Blainville 1825

Sub-Family: HAPLOPHRAGMOIDINAE Mayne 1952
Genus: HAPLOPHRAGMOIDES Cushman 1910

HAPLOPHRAGMOIDES carariensis (d'Orbigny) 1884
HAPLOPHRAGMOIDES subinvolutum Cushman and McCulloch 1939

Genus: CRIBROSTOMOIDES Cushman 1910

CRIBROSTOMOIDES jeffreysi(Williamson) 1858

Sub-Family: LITUOLINAE de Blainville 1825
Genus: AMMOBACULITES Cushman 1910

AMMOBACULITES agglutinans (d'Orbigny) var.filiformis Earland 1934
AMMOBACULITES subagglutinans Bandy 1949

Family TEXTULARIIDAE Ehrenberg 1838

Sub-Family: TEXTULARIINAE Ehrenberg 1838
Genus: TEXTULARIA Defranc in de Blainville 1824

TEXTULARIA bocki Hoglund 1947
TEXTULARIA gramen D'Orbigny 1846

Family TROCHAMMINIDAE Schwager 1877

Sub-Family: TROCHAMMININAE Schwager 1877
Genus: TROCHAMMINA Parker and Jones 1859

TROCHAMMINA globigeriniformis (Parker and Jones) 1865
TROCHAMMINA inflata (Montagu) 1808

Family ATAXOPHRAGMIDAE Schwager 1877

Sub-Family: VERNEUILININAE Cushman 1911
Genus: VERNEUILINA d'Orbigny in de la Sagra 1839

VERNEUILINA media Hoglund 1947

Sub-Family: VALVULININAE Berthelin 1880
Genus: CLAVULINA d'Orbigny 1826

CLAVULINA gracilis (Cushman and Bronniman) 1948

Sub Order: MILIOLINA Delage and Herouard 1896
Super Family: MILIOLACEA Ehrenberg 1839
Family: FISCHERINIDAE Millett 1898

Sub-Family: CYCLOGYRINAE Loeblich and Tappan 1961
Genus: CYCLOGYRA Wood 1842

CYCLOGYRA involvens (Reuss) 1850

Sub-Family: FISCHERININAE Millett 1899
Genus: PLANISPIRINELLA Wiesner 1931

PLANISPIRINELLA tenuis Collins 1953

Family: NUBECULARIIDAE Jones 1875

Sub-Family: OPHTHALMIDIINAE Wiesner 1920
Genus: OPHTHALMIDIUM Kubler and Zwingli 1870

OPHTHALMIDIUM acutimargo (Brady) 1884

Sub-Family: SPIROLOCULININAE Wiesner 1920
Genus: SPIROLOCULINA d'Orbigny 1826

SPIROLOCULINA subimpressa Parr 1950

Family: MILIOLIDAE Ehrenberg 1839

Sub-Family: QUINQUELOCULININAE Cushman 1917
Genus: QUINQUELOCULINA d'Orbigny 1826

QUINQUELOCULINA agglutinata Cushman 1917
QUINQUELOCULINA angularis d'Orbigny 1826
QUINQUELOCULINA aspera d'Orbigny 1826
QUINQUELOCULINA bicornis (Walker and Jacob) 1758
QUINQUELOCULINA cliarensis (Heron-Allen and Earland) 1913

QUINQUELOCULINA frigida Parker 1952
QUINQUELOCULINA cf.granulo-costata Germeraad 1946
QUINQUELOCULINA inconstans Terquem 1874
QUINQUELOCULINA lata Terquem 1876
QUINQUELOCULINA pulchella d'Orbigny 1826
QUINQUELOCULINA seminulangulata McLean 1956
QUINQUELOCULINA seminulum (Linne) 1758

Genus: MASSILINA schlumberger 1893

MASSILINA planisparoidea Martinotti 1921
MASSILINA secans (d'Orbigny) 1826

Genus: PATEORIS Loeblich and Tappan 1953

PATEORIS hauerinoides (Rhumbler) 1936

Genus: PYRGO Defranc 1824

PYRGO williamsoni (Silvestri) 1923

Genus: TRILOCULINA d'Orbigny 1826

TRILOCULINA angulata Karrer 1867
TRILOCULINA dubia d'Orbigny 1826
TRILOCULINA trigonula (Lamarck) 1804
TRILOCULINA trihedra Loeblich & Tappan 1953

Sub-Family: MILIOLINELLINAE Vella 1957
Genus: MILIOLINELLA Wiesner 1931

MILIOLINELLA chuckchiensis Loeblich and Tappan 1953
MILIOLINELLA oblonga (Montagu) 1803
MILIOLINELLA subrotunda (Montagu) 1803

Sub Order: ROTALIINA Delage and Herouard 1896
Super Family: NODOSARIACEA Ehrenberg 1838
Family: NODOSARIIDAE Ehrenberg 1838

Sub Family: NODOSARIINAE Ehrenbert 1838
Genus: LAGENA Walker & Jacob in Kanmacher 1798

LAGENA laevis (Montagu) 1803
LAGENA semistriata Williamson 1848
LAGENA substriata Williamson 1848
LAGENA sulcata (Walker & Jacob) 1798
LAGENA sulcata (Walker & Jacob) var. interrupta Williamson 1848
LAGENA sulcata (Walker & Jacob) var. spirata Bandy 1949

Genus: LENTICULINA Lamarck 1804

LENTICULINA suborbicularis Parr 1950
LENTICULINA varians (Bornemann) 1854

Family: POLYMORPHINIDAE d'Orbigby 1839

Sub Family: POLYMORPHININAE d'Orbigny 1839
Genus: GLOBULINA d'Orbigny in de la Sagra 1839
GLOBULINA gibba (d'Orbigny) 1826

Genus: GUTTULINA d'Orbigny in de la Sagra 1839
GUTTULINA lactea (Walker & Jacob) 1798

Family: GLANDULINIDAE Reuss 1860

Sub Family: OOLININAE Loeblich and Tappan 1961
Genus: OOLINA d'Orbigny 1839
OOLINA hexagona (Williamson) 1848
OOLINA laevigata d'Orbigny 1839
OOLINA lineato-punctata(Heron-Allen & Earland) 1922
OOLINA patannae n.sp.
OOLINA williamsoni (Alcock) 1865

Genus: FISSURINA Reuss 1850
FISSURINA lucida (Williamson) 1848
FISSURINA marginata Sequenza 1862

Super Family: BULIMINACEA Jones 1875
Family: TURRILINIDAE Cushman 1927

Sub Family: TURRILININAE Cushman 1927
Genus: BULIMINELLA Cushman 1911
BULIMINELLA elegantissima (d'Orbigny) 1839

Family: BOLIVINITIDAE Cushman 1927

Genus: BOLIVINA d'Orbigny 1839
BOLIVINA spathulata (Williamson) 1858
BOLIVINA variablis (Williamson) 1858

Family: ISLANDIELLIDAE Loeblich and Tappan 1964

Genus: CASSIDULINOIDES Cushman 1927
CASSIDULINOIDES tenuis Phleger and Parker 1951

Family: BULIMINIDAE Jones 1875

Sub Family: BULIMININAE Jones 1875
Genus: BULIMINA d'Orbigny 1826
BULIMINA elongata d'Orbigny 1826
BULIMINA gibba Fornasini 1901
BULIMINA marginata d'Orbigny 1826

Super Family: DISCORBACEA Ehrenberg 1838
Family: DISCORBIDAE Ehrenberg 1838

Sub Family: DISCORBINAE Ehrenberg 1838
Genus: DISCORBIS Lamarck 1804

DISCORBIS bradyi Cushman 1915
DISCORBIS malovensis Heron-Allen & Earland 1932 var. nudiformis n.var
DISCORBIS williamsoni Chapman & Parr 1932

Genus: EOEPONIDELLA Wickenden 1949

EOEPONIDELLA mamilla (Williamson) 1858

Super Family: SPIRILLINACEA Reuss 1862
Family: SPIRILLINIDAE Reuss 1862

Sub Family: SPIRILLININAE Reuss 1862
Genus: SPIRILLINA Ehrenberg 1843

SPIRILLINA vivipara Ehrenberg 1843

Sub Family: PATELLININAE Rhumbler 1906
Genus: PATELLINA Williamson 1858

PATELLINA corrugata Williamson 1858

Super Family: ROTALIACEA Ehrenberg 1839
Family: ROTALIIDAE Ehrenberg 1839

Sub Family: ROTALIINAE Ehrenberg 1839
Genus: AMMONIA Brunnich 1772

AMMONIA beccarii (Linne) 1758

Family: ELPHIDIIDAE Galloway 1933

Sub Family: ELPHIDIINAE Galloway 1933
Genus: ELPHIDIUM de Montford 1808

ELPHIDIUM bartletti Cushman 1933
ELPHIDIUM crispum (Linne) 1758
ELPHIDIUM crispum (Linne) var. spinosum n.var
ELPHIDIUM discoidale (d'Orbigny) 1839
ELPHIDIUM excavatum (Terquem) 1875
ELPHIDIUM macellum (Fichtel and Moll) 1798
ELPHIDIUM magellanicum Heron-Allen and Earland 1932
ELPHIDIUM selseyense (Heron-Allen and Earland) 1911

Super Family: GLOBIGERINACEA Carpenter, Parker and Jones 1862
Family: GLOBIGERINIDAE Carpenter, Parker and Jones 1862

Sub Family: GLOBIGERININAE Carpenter, Parker, and Jones 1862
Genus: GLOBIGERINA d'Orbigny 1826

GLOBIGERINA hexagona Natland 1938

Super Family: ORBITOIDACEA Schwager 1876
Family: CIBICIDIDAE Cushman 1927

Sub Family: CIBICIDINAE Cushman 1927
Genus: CIBICIDES de Montford 1808

CIBICIDES fletcheri Galloway and Wissler 1927
CIBICIDES lobatulus (Walker & Jacob) 1798
CIBICIDES refulgens Montford 1808

Genus: DYOCIBICIDES Cushman and Valentine 1930

DYOCIBICIDES biserialis Cushman and Valentine 1930

Family: PLANORBULINIDAE Schwager 1877

Genus: PLANORBULINA d'Orbigny 1826

PLANORBULINA mediterranensis d'Orbigny 1826

Family: ACERVULINIDAE Schultze 1854

Genus: ACERVULINA Schultze 1854

ACERVULINA inhaerens Schultze 1854

Super Family: CASSIDULINACEA d'Orbigny 1839
Family: NONIONIDAE Schultze 1854

Sub Family: NONIONINAE Schultze 1854
Genus: NONION de Montford 1808

NONION boueana d'Orbigny 1846
NONION depressulum (Walker & Jacob) 1798
NONION pompilioides (Fichel and Moll) 1798

Genus: ASTRONONION Cushman and Edwards 1937

ASTRONONION gallowayi Loeblich and Tappan 1953

Genus: NONIONELLA Cushman 1926

<u>NONIONELLA atlantica</u> Cushman 1947
<u>NONIONELLA turgida</u> (Williamson) 1858

CHAPTER 4

The AMMODISCACEA and LITUOLACEA

The forms assigned to the first SuperFamily the AMMODISCACEA, are those forms with an irregular nonseptate test, but with occasional irregular constriction of the test wall which is of the simple agglutinated type, the aperture being simple. The LITUOLACEA is comprised of multilocular forms, agglutinated with calcareous, ferruginous or siliceous cement, spirally coiled or uncoiled with a straight uniserial biserial, or triserial arrangement, the aperture being single.

Both Superfamilies belong to the Sub Order TEXTULARIINA Delage and Herouard 1896.

Super Family: Ammodiscacea Reuss 1862

Family: Astrorhizidae Brady 1881

Sub Family: Astrorhizinae Brady 1881

Genus: Rhabdammina M.Sars in Carpenter 1869

Rhabdammina scabra Hoglund 1947

Pl. 1, figs 2a,2b.

1947 Rhabdammina scabra HOGLUND. Uppsala Univ.Zool.Bidrag Fran Uppsala, Bd.26, p.28, pl.1, figs. 3-4.

Test free, large, elongate, cylindrical, straight to slightly irregularly curved, open at both ends, the open ends forming the apertures. Wall agglutinated composed of medium to coarse grains roughly cemented together.

Dimensions: Length 1.12 mm. Diameter 0.17 mm.

Occurrence: Dead CB.360.

Distribution: This species was recorded as being fairly common to abundant in the Gullmar Fjord and the Skagerak (Hoglund 1947). It was only retrieved from the one station in Tremadoc Bay, where the four individuals found were all dead.

Sub Family: Rhizammininae Rhumbler 1895

Genus: Bathysiphon M.Sars in G.O.Sars 1872

Bathysiphon acuta (Hoglund) 1947

Pl. 1, figs. 7a, 7b.

1947 Hippocrepinella acuta HOGLUND. Uppsala Univ.Zool.Bidrag.Fran Uppsala Bd.26, p.46, pl.1, figs.17-23.

Test free, monothalmous, subcylindrical, two to three times as long as broad, the greatest width being at or just below the middle of the test. Test gently tapers to both the oral and aboral ends. Oral end truncate with aperture a simple, terminal, central, circular opening. Aboral end bluntly pointed. Wall moderately thick with loosely cemented very find grained material with occasional mica flakes, surface smooth and matte like with a number of transverse annular constrictions, dirty grey in colour.

Dimensions: Length 0.7 mm. Maximum diameter 0.4 mm.

Occurrence: Living CB.315, CB.324, CB.401, CB.413, CB.414.

Morphological remarks: Nyholm 1957, remarks on the orientation of this genus on the substrate, and states that the pseudopods do not reach a great depth and that, as a result, this genus has a superficial distribution. There is a certain agreement between this species and Hippocrepinella hirundinea but the wall material is finer and the wall as a whole exhibits a looser structure.

Distribution: This species has been recorded from the Gullmar Fjord and the Skagerak (Hoglund 1947).

Genus: Marsipella Norman 1878

Marsipella elongata Norman 1878

Pl.1, fig. 4

1878	Marsipella elongata	NORMAN.	Ann.Mag.Nat.Hist.London.Set 5, Vol.1, P.281, pl.16, Fig.7
1884	Marsipella elongata	Norman.	BRADY.Chall.Rep.Zool.Vol.9, p.264-5,pl.24,figs.10-19
1897	Marsipella elongata	Norman	FLINT. U.S.Nat.Mus.Ann.Rep. Wash.D.C. p.270-1, pl.12, fig.1.
1913	Armarsipella sant-elongatum	Norman	RHUMBLER. Erg.Plankton.Exped. Humboldt Stift.Bd.III, Tiel 2, p.382, Taf.11, fig.21.
1918	Marsipella elongata	Norman	CUSHMAN. U.S.Nat.Mus.Bull.104, Pt.1, p.23-4, pl.8, figs.2,3.
1933	Marsipella elongata	Norman	GALLOWAY. A manual of foraminifera. p.72, pl.5, fig.8.
1952	Marsipella elongata	Norman	AVNIMELECH.Contr.Cush.Found. Foram.Res. Vol.III, Pt.2, P.64, fig.15.
1960	Marsipella elongata	Norman	BARKER. Soc.Econ.Pol.and Min.Sp. Pub. No.9,p.48,pl.24,figs.10-19.
1961	Marsipella elongata	Norman	BOLTOVSKOY. Mus.Arg.de Ciencias Nat.Zool.Tome VI, No.6,P.285, pl.IV, fig.25.

Test free, monothalmous, elongate, slightly curved, the diameter of the test being equal to 1/5th to 1/8th of the length. Greatest width in the upper quarter of the test and tapering to the extremities, nearly equally so to the both ends. Test open at both ends, oral and aboral openings being simple terminal openings. Wall agglutinated with medium and coarse sand grains with occasional mica flakes.

Dimensions: Maximum length 4.00 m.m. Maximum diameter 0.45 mm.

Occurrence: Living. CB.304, CB.308, CB.317, CB.318.

Dead. CB.317, CB.360.

Morphological remarks: Hofker 1930, stated that the test of this species was composed essentially of sponge spicules with only a few grains present. Individuals obtained from the study area exhibit the converse of this, and other authors, in their descriptions of this species do not show complete agreement with Hofker. Examination of specimens at the British Museum, show that a number of Brady's specimens are composed wholly of sand grains.

Distribution: (Text. fig.14A). This species has been recorded from off the coast of Scotland (Norman 1878), is stated to be abundant in the warm area of the Faroe Channel at depths of 440 fathoms to 542 fathams (Brady 1884). Pearcey 1890 recorded many from the warm area of the Faroe Channel. It was recorded as rare in 1000 fathoms off the south west coast of Ireland (Wright 1889) and west of Valentia in 808 fathoms (Brady 1884).

The species was recorded from the Gulf of Gascogne (Folin 1881). It was noted in 1884 by Brady on the Rockall Bank in 54 fathoms, off the Canary Islands, off the Azores in 900 fathoms, south of Pernambuco in 350 fathoms, off the Ki Islands in 129 fathoms, and off the Fiji Islands in 210 fathoms. He stated that this species is essentially a North Atlantic type however. It was recorded from the Carribean, the Gulf of Mexico and off Cape Fear by Flint in 1897. Rhumbler in 1913 noted it from the North Atlantic, Gulf of Mexico, the Carribean, the south Atlantic, South Pacific, and the Arabian Sea. It was stated to be rare in the Georges Banks - Virginia Capes region by Cushman in 1918, and it was noted in material from the Siboga Expedition by Hofker in 1930. In 1937 Chapman and Parr stated that this species was very rare at one station in the Antarctic. Shubbings in 1939 recorded it from 1204 metres in the Zanzibar area and from the surface material of a core south east of Zanzibar. An Argentinian occurrence was noted by Boltovskoy in 1961 on the continental platform between Santo Tome and the Rio de la Plata.

Diagnosis: This arenaceous form appears to be quite widely distributed primarily in warm and temperate latitudes, with a depth range from shallow water to depths of about 5,000 feet.

Marsipella elongata Norman *var.A* var.nov.

Pl.1, Fig. 1.

Test free, monothalmous, elongate, slender, the diameter of the test equal to 1/4 to 1/6th of the length, nearly parallel sided, drawn out to both extremities, nearly equally so. Test open at both ends, oral and aboral ends being simple circular terminal openings of the tube. Wall agglutinated, composed of occasional large angular sand grains but primarily of shell fragments which have a preferred orientation aborally and each fragment overlaps the adjacent ones giving the test a scaliform appearance. Shell fragments comprise 95%+ of the test wall material.

Dimensions: Length 1.25 mm. Maximum diameter 0.35 mm.

Occurrence: Living. CB.360, CB.404

Remarks: This new variety has been erected on the basis of the very distinctive material comprising the wall, and also on the amount of this material, and also the preferred orientation exhibited by this material. The variety appears to have been very selective when building up the test wall.

Sub Family: Hippocrepininae Rhumbler 1895

Genus: Jaculella Brady 1879

Jaculella acuta Brady 1879

Pl.1, Figs. 6a,6b.

1879	Jaculella acuta	BRADY.	Quart.Jours.Micro.Soc.n.s.Vol.19. p.35,pl.3,figs.12-13.
1884	Jaculella acuta	Brady.	BRADY.Chall.Rep.Zool.Vol.9,p.255, pl.22,figs.14-18.
1897	Jaculella acuta	Brady.	FLINT. U.S.Nat.Mus.Ann.Rept.Wash. D.C. p.269,pl9,fig.4.
1902	Jaculella acuta	Brady.	CHAPMAN. The Foraminifera. p.124, pl.6,fig E.
1910	Jaculella acuta	Brady	CUSHMAN. U.S.Nat.Mus.Bull.71,pt.1, p.70, t-figs.90-91.
1918	Jaculolla acuta	Brady	CUSHMAN. U.S.Nat.Mus.Bull 104, Pt.1, p.84,pl.32,figs.1-4.
1921	Jaculella acuta	Brady	CUSHMAN. U.S.Nat.Mus.Bull 100, vol.4. p.59,pl3,fig.7.
1925	Jaculella acuta	Brady	CUSHMAN. Smiths.Miscell.Coll.Vol.77, No.4,p.63,pl2,fig.7.
1931	Jaculella acuta	Brady	WIESNER. Deutsche Sudpolar Exped. Band XX, bd.12,p.87,Taf.VIII,fig.92.
1933	Jaculella acuta	Brady	GALLOWAY. A manual of foraminifera. p.75,pl.5,fig.16.
1934	Jaculella acuta	Brady	EARLAND. Discovery Repts.Vol.X, Pt.III,p.72-73,pl.II,figs.19,20.
1959	Jaculella acuta	Brady	BOLTOVSKOY.Sec.de Marina Pub.H 1005, Buenos Aires. p.39,pl.II,fig.1.
1960	Jaculella acuta	Brady	BARKER. Soc.Econ.Pal. and Min.Sp. Pub.no.9,p.44,pl.22,figs.14,16-18.
1960	Jaculella acuta	Brady	HOFKER. Palaontalogische Zeitschriff. Band 34,Nr.3/4,p,234,fig.1.
1962	Jaculella acuta	Brady	McKNIGHT. Bull.Am.Pal.Vol.44,No.201, p.99,pl.9,fig.5.

Test free, an elongate, conical, nonseptate tube tapering to one extremity and gradually widening to a large circular opening at the other extremity. Opening somewhat constricted and forms the aperture which is terminal. Wall agglutinated, very compact and hard, surface rough. Inner lining appears to be slightly smoother but still rough to a certain degree.

Dimensions: Length 1.05 mm. Maximum diameter 0.25 mm. Minimum diameter 0.05 mm.

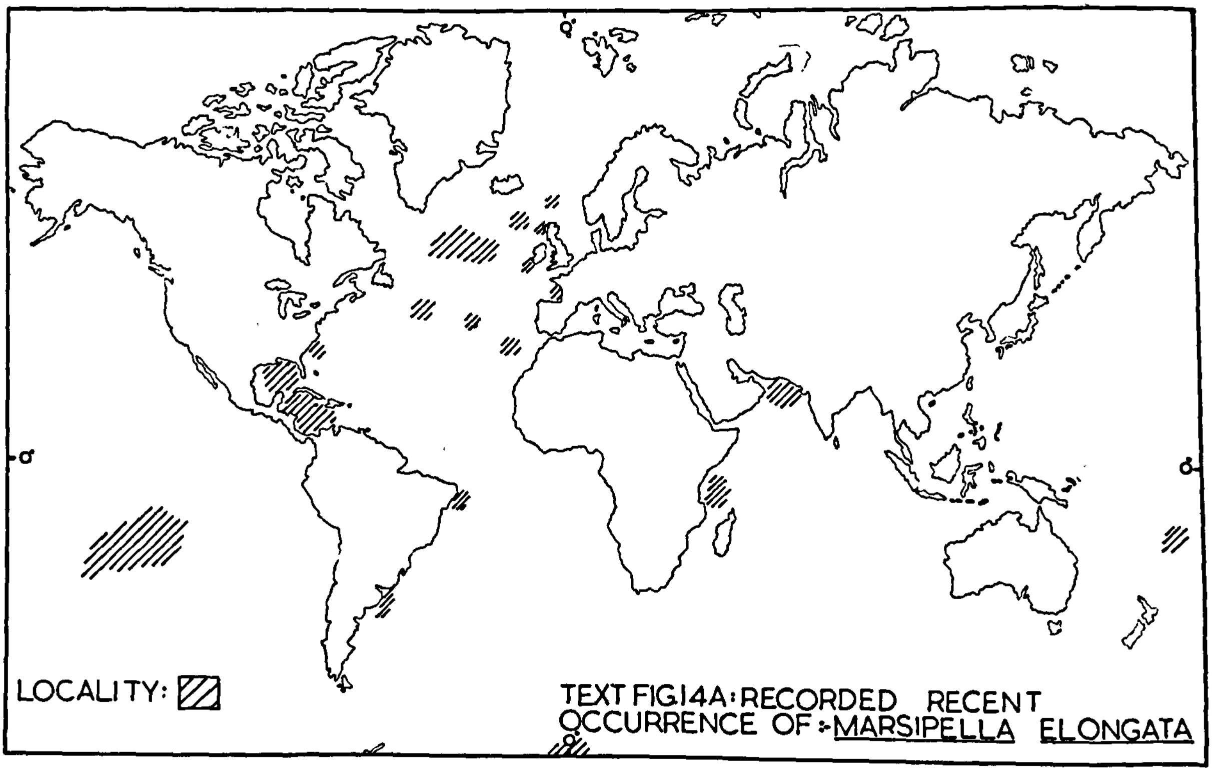
Occurrence: Dead. CB.360.

Morphological remarks: A complete specimen has not been found in Tremadoc Bay, the initial portion being broken, this however, is not uncommon (Brady 1884). Earland 1934 has recorded this species with a well marked and pointed proloculus formed of chetin with ferruginous cement.

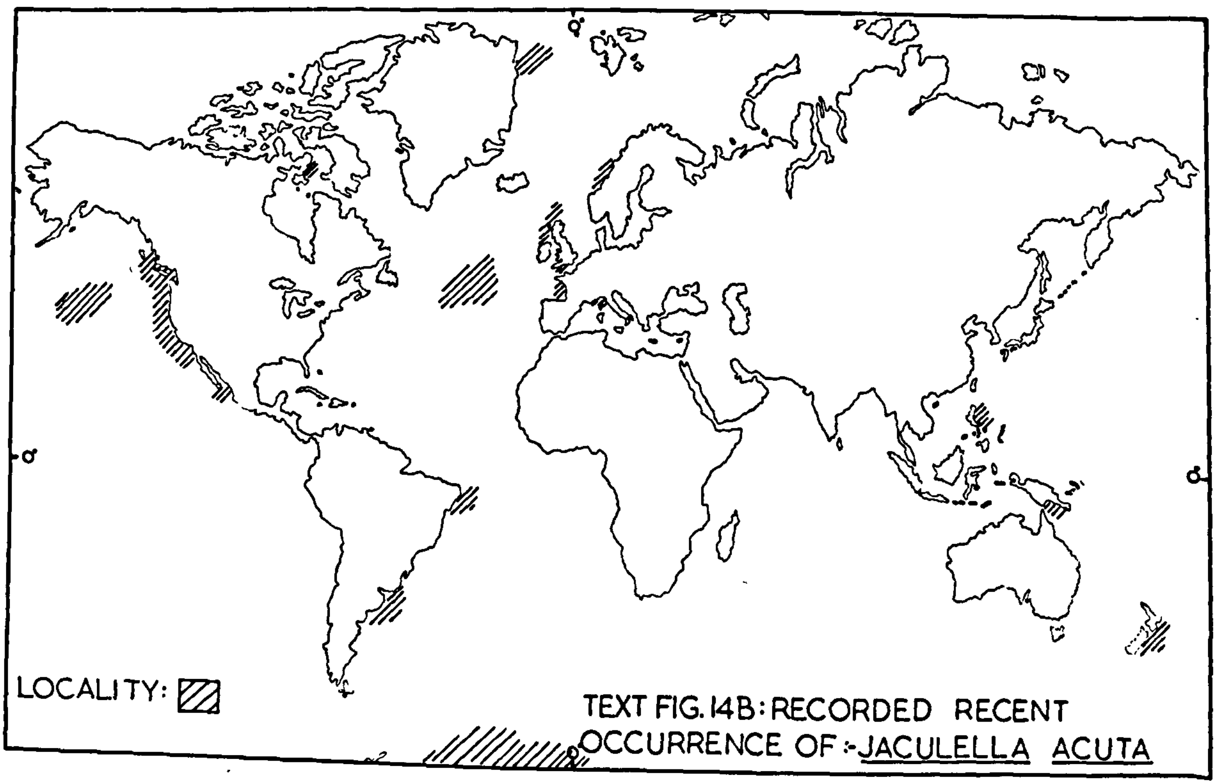
Distribution: (Text fig.14B). Recorded British occurrences of this species have been noted from off Shetland (Brady 1884), not common at Portree Bay, Isle of Skye (Robertson 1892), frequent at Rathlin Island (Wright 1902), Red Bay, Ireland (Gough 1906). Sound of Mull in 20 fathoms (Heron-Allen & Earland 1914), west of Scotland (Heron-Allen & Earland 1916), frequent at one station in the Plymouth district (Heron-Allen & Earland 1930), and from one station off Plymouth (Marine Biological Association 1957).

This species has been widely recorded from other regions of the world. Folin 1881 noted it from the Gulf of Gascogne, Brady 1884 from 1750 fathoms in the North Atlantic from off Norway, south east of Pernambuco in 350 fathoms, off Buenos Aires in 1,900 fathoms, north of Papua in 2,900 fathoms and east of New Zealand in 1,100 fathoms. Cushman recorded it from the North Pacific in 1910, in small numbers from the Atlantic in 1918, from the Philippine Islands and adjacent seas in 1921, and off the west coast of America in 1927. An Antarctic occurrence was noted in 1931 by Wiesner, and from the ice free areas of the Falkland Islands and adjacent seas by Heron-Allen and Earland, who recorded single specimens at two stations in 1932. Natland in 1933 recorded it from the southern California region, and it was again recorded from the Falklands sector of the Antarctic as being very rare by Earland in 1934. In 1937 Chapman and Parr also noted it as being rare to frequent at two stations in this area. Cushman 1948 noted the occurrence from Fox Basin, Canada, and north east Greenland. An Italian occurrence was noted by Ruscelli in 1949 from the Ligurian Sea. It was recorded off Brazil by Boltovskoy in 1959, and in 1961 by the same author, from the continental platform between Santo Tome and the Rio de la Plata, Argentina. It was again noted in the Antarctic area by McKnight in 1962, who recorded it as a common form with a depth range of 365 to 2,995 metres off the Antarctic coast.

Diagnosis: This species appears to have a wide range of habitat, from warm temperate regions to cold water areas, and also appears to have a considerable depth range.



TEXT FIG.14A: RECORDED RECENT OCCURRENCE OF :- MARSIPELLA ELONGATA



TEXT FIG. 14B: RECORDED RECENT OCCURRENCE OF :- JACULELLA ACUTA

Sub Family: Dendrophyrinae Haeckel 1894

Genus: Dendrophyra Wright 1861

Dendrophyra Arborescens (Norman) 1878

Pl.1, figs. 8a, 8b.

1884	Hyperammina arborescens (Norman)	BRADY. Chall.Rep.Zool.Vol.9, p.263, pl.28, figs.12-13.
1886	Hyperammina arborescens (Norman)	WRIGHT.Proc.Belfast Nat.Field Club. p.319, pl.26, fig.1.
1894	Hyperammina arborescens (Norman)	GOES.Kongl.Svensk.Akad.Handl.N.F. Bd.25, No.9, p.18, Tab.IV, figs.63, 64.
1918	Psammotodendron arborescens (Norman)	CUSHMAN.U.S.Nat.Mus.Bull 104, Pt.1, p.78-80, pl.30, figs.1-2.
1933	Psammotodendron arborescens (Norman)	GALLOWAY. A manual of foraminifera. p.77, pl.6, fig.4.
1944	Psammotodendron arborescens (Norman)	CUSHMAN. Contr.Cush.Found. Foram. Res.Sp.Pub.no.12, p.7, pl.1, fig.14.
1947	Psammotodendron arborescens (Norman)	CUSHMAN and TODD.Contr.Cush Found.Foram.Res.Sp.Pub.no.21, p.3, 4, pl.1, fig.2.
1948	Psammotodendron arborescens (Norman)	CUSHMAN, Contr.Cush.Found. Foram.Res.Sp.Pub.no.23, p.22, 23, pl.2, fig.6.
1960	Psammotodendron arborescens (Norman)	BARKER.Soc.Econ.Pal. and Min. Sp.Pub.no.9, pl.28, figs.12.13.

Test presumably attached, an elongate, nonseptate, irregularly branching tube of nearly even diameter. Apertures are formed by the open ends of the branches which are slightly thickened at these points. Test is hollow, and is compactly cemented externally, smooth except for some very faint transverse growth wrinkles in places. Wall agglutinated, brown in colour which may be due to ferriginous cement.

Dimensions: Length 1.55 mm. Diameter 0.05 mm.

Occurrence: Dead CB.360

Morphological remarks: It is quite possible that this species has been overlooked by some authors, or treated as an organic fragment, due to the test appearance, especially when broken. A broken, branching fragment was noted by Earland in 1934, and Cushman and Todd in 1947 noted that specimens tend to be very slender and they comment on the fact that individuals are easily broken.

Distribution: This species has not been widely recorded around British shores, except for records of its occurrence at Belfast Lough (Wright 1886), and off the Isle of Man (Herdman 1897).

World occurrences have not been widely recorded by many authors. Norman in 1881 recorded this species from Greenland, and Brady in 1884 from off Pernambuco. Goes in 1894 recorded it from the Arctic and Scandinavia, and Cushman in 1918 simply noted it from the Atlantic. It was noted in the Falklands sector of the Antarctic by Earland in 1934, from the coast of Maine, (Cushman 1944), and from Iceland (Norvang 1945). It was recorded from a number of stations off the Washington coast by Cushman and Todd in 1947, and the former author in 1948 noted it from Hudson Bay. Harrington in 1955 noted its occurrence in the Bay of Fundy, and Cockbain in 1963 in the Juan de Fuca and Georgia Straits, British Columbia.

Diagnosis: This species appears to havea distribution primarily limited to cool temperate and cold water regions, on the basis of recorded occurrence but these records are probably not comprehensive due to the facts mentioned above.

Family: Saccamminidae Brady 1884

Sub Family: Psammosphaerinae Haeckel 1894

Genus: Psammosphaera Schultze 1875

Psammosphaera parva Flint 1899

Pl. 1, Fig. 9.

1884	Pars Psammosphaera fusca	BRADY	Chall.Rep.Zool.Vol.9,p.249, pl.18,figs.2-4.
1897	Psammosphaera parva	FLINT	U.S.Nat.Mus.Ann.Rep.(1897), Washington Pt.1,p.268,pl.9, fig.1.
1910	Psammosphaera parva	Flint	CUSHMAN. U.S.Nat.Mus.Bull.71, Pt.1,p.36,37, text figs.29-30.
1918	Psammosphaera parva	Flint	CUSHMAN. U.S.Nat.Mus.Bull.104, Pt.1,p.35,36,pl.12,figs.4-6.
1921	Psammosphaera parva	Flint	CUSHMAN. U.S.Nat.Mus.Bull.100, Vol.4,p.47,pl.2,fig.7.
1925	Psammosphaera parva	Flint	CUSHMAN. Smiths Miscell.Col. Vol.77,No.4,p.62,pl.1,fig.6.
1927	Psammosphaera parva	Flint	CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.3,Pt.1,p.11,pl.1, fig.27.
1936	Psammosphaera parva	Flint	FRANKE. Abh.Preub.Geol.Land. Heft.169,p.12,13,Taf.1,fig.6.
1937	Psammosphaera parva	Flint	CORYELL and EMBICH. Journ.Pal. Vol.II, No.4,p.292,pl.41,fig.1.
1960	Psammosphaera parva	Flint	BARKER. Soc.Econ.Pal. and Min. Sp.Pub.no.9,p.36,pl.18,figs.2-4.
1961	Psammosphaera parva	Flint	BRAGA.Pub.Inst.de Zool.Fac.Cienc. do Porto 77,p.15,pl.1,fig.3.
1962	Psammosphaera parva	Flint	McKNIGHT. Bull.Am.Pal.Vol.44, No.201,p.99,pl.9,fig.4.
1963	Psammosphaera parva	sp.nov.	CRESPIN. Dept.Nat.Devel.Aust. Bull no.66,p.20,pl.1,figs.4-9.

Test free, unilocular, spherical. Wall thin, composed of fine grade sand grains with one or two larger sand grains and occasional mica flakes firmly united, the cement amount being small, filling interstices between the grains. Five slender sponge spicules also attached to the test apparently transfixing it. Aperture indefinite.

Dimensions: Diameter 0.20 mm.

Occurrence: Living: CB.331, CB.353.

Dead: CB.318.

Morphological remarks: Cushman in 1918 stated that the habit of building a large sponge spicule into the test appears distinctive, however Earland in 1934 noted that where sponge spicules are not an important element in the sample material, specimens of this selective form, with a transfixing spicule were rare. The presence of more than one of the spicules, as in Tremadoc Bay specimens, transfixing the test may therefore be logically expected where, in numerous samples sponge spicules occur in abundance, as occurs in this area. McKnight 1962 commented on the close similarity between this species and Psammosphaera fusca but does differentiate the two species on the basis of test size and texture of material composing the test wall. Crispin 1963 appears to be in error when she designated this form as a spinov, and figures forms identical with the type specimen.

Distribution: This species has not been recorded from British waters to the present date.

It has been recorded from the Atlantic, South Pacific, and south east of Pernambuco (Brady 1884), off the Brazil coast (Flint 1897), North Pacific (Cushman 1910), Atlantic (Cushman 1918), Philippine Islands and adjacent seas (Cushman 1921), Wiesner in 1931 recorded this species from one station at 3,410 metres in the South Pole region, and here he attributed this species to M.Sars. Earland stated that this species was very rare to very common, but widely distributed over the Falklands sector of the Antarctic in 1934, and in 1936 recorded one specimen from each of two stations in the Weddell Sea. Chapman and Parr in 1937 also recorded this species from six stations in the Antarctic where it was noted to be very rare to common. It was recorded off the Mozambique coast by Braga in 1961, and again in 1962 from the Antarctic coast by McKnight.

Stratigraphic Occurrence: This species was recorded from the Lias of Germany by Franke in 1936, from the Lower Cretaceous of Australia by Crespin in 1963, and as being very rare in the Upper Eocene of Panama by Coryell and Embich 1937.

Diagnosis: The presence or absence of a sponge spicule in test construction does not appear to be of important diagnostic value. It appears to prefer a cold water environment, although temperature does not seem to be the controlling factor in the distribution of this species. It has little or no value in stratigraphic correlation.

Sub Family: Saccammininae Brady 1884

Genus: Saccammina Carpenter 1869

Saccammina cf. sphaerica Brady 1871

Pl.1, figs. 5a,5b.

1872	Saccammina sphaerica	SARS.	Vidansk-Silsk Christiana Forhandl. Christiana, Norge 1872, Aar 1871, p.250, op.cit.CARPENTER. The Microscope and its revelations. 5th Ed.figs.272 a-c.
1884	Saccammina sphaerica	Sars	BRADY. Chall.Rep.Zool.Vol.9, p.253-254, pl.XVIII,figs.11-15,17.
1894	Saccammina sphaerica	Sars	GOES. Kongl.Svensk Vet.Akad.Handl. N.F.Stockholm. Bd.25,No.9,p.13, Tab.3,figs.16-18.
1897	Saccammina sphaerica	Sars	FLINT. U.S.Nat.Mus.Ann.Rept. Washington. p.269,pl.9,fig.2.
1902	Saccammina sphaerica	Sars	CHAPMAN. Foraminifera. Longmans, p.123,pl.6,fig.D.
1910	Saccammina sphaerica	Sars	CUSHMAN. U.S.Nat.Mus.Bull 71, Pt.1, p.39,text-figs.33-36.
1918	Saccammina sphaerica	Sars	CUSHMAN. U.S.Nat.Mus.Bull 104, Pt.1, p.44,45,pl.19,figs.2-5.
1922	Saccammina sphaerica	Sars	HOFKER. Flora en Fauna der Zuidersee, Protozoa. p.133,fig.10.
1925	Saccammina sphaerica	Sars	CUSHMAN. Smith.Miscell.Coll.Vol.77, No.4,p.62,pl.1,fig.9.
1927	Saccammina sphaerica	Sars	CUSHMAN.Contr.Cush.Found.Foram. Res.Vol.3,Pt.1,p.11,pl.1,fig.9.
1931	Saccammina sphaerica	Sars	WIESNER. Deutsche Sud Polar Exped. Band XX, Bd.XII,p.81,Taf.V,figs. 48-52.
1933	Saccammina sphaerica	Sars	GALLOWAY. A manual of foraminifera p.59,pl.4,fig.2.
1937	Saccammina cf.S.sphaerica	Sars	ALBRITTON.Jr. Journ.Pal.Vol.II, No.1,p.20,pl.4,fig.7.
1944	Saccammina sphaerica	Sars	CUSHMAN.Contr.Cush.Found.Foram. Res.Vol.20,Pt.1,p.18,pl.3,fig.20.
1945	Saccammina sphaerica	Sars	CUSHMAN and STAINFORTH. Contr.Cush. Found.Foram.Res.Sp.Pub.no.14,p.13, pl.1,fig.5

1947	*Saccammina sphaerica*	Sars	HOGLUND.Zool.Bidrag.Fran.Uppsala Band 26,p.50,51,pl.4,figs.15-17.
1948	*Saccammina sphaerica*	Sars	CUSHMAN.Contr.Cush.Found.Foram. Res.Sp.Pub.no.23,p.10,pl.1,fig.4.
1948	*Saccammina sphaerica*	Sars	CUSHMAN and RENZ.Contr.Cush.Found. Foram.Res.Sp.Pub.no.24,p.5,pl.1, fig.6.
1949	*Saccammina cf.sphaerica*	Sars	CUSHMAN and STONE.Contr.Cush.Found. Foram.Res.Vol.25,Pt.4,p.75,pl.13, figs.4,5.
1954	*Saccammina cf.sphaerica*	Sars	FRIZZELL.Bur.Econ.Geol.Univ.Texas. Invest.Repts.no.22,p.57,pl.1,fig.3.
1957	*Saccammina sphaerica*	Sars	TODD and BRONNIMANN.Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.22, pl.1,fig.16.
1958	*Saccammina sphaerica*	Sars	ARNAL.Contr.Cush.Found.Foram.Res. Vol.9,Pt.2,p.40,pl.9,fig.17.
1960	*Saccammina sphaerica*	Sars	BARKER.Soc.Econ.Pal.and Min.Sp. Pub.no.9,p.36,pl.18,figs.11-15,17.
1961	*Saccammina sphaerica*	Sars	BRAGA.Pub.Inst.de Zool.Fac.Ciencias do Porto.77,p.15,16,pl.1,fig.4.

Test free, small, globular, unilocular, circular in outline and section. Aperture terminal, tubular, simple, circular. Test agglutinated, composed of a single layer of angular sand grains cemented with a slightly silicified cement, not absolutely rigid, but slightly soft, fairly rough exterior, slightly smoother internally.

Dimensions: Diameter 0.47 mm.

Occurrence: Living CB.331

Dead CB.318

Living, Variation sample CB.711

Morphological remarks: The Tremadoc Bay specimens have not definitely assigned to the species *Saccammina Sphaerica* as there

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	5	0	5
	100	2	0	2
	200	-	-	-
PLANISPIRINELLA tenuis	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA cliarensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA cf.granulo-costata	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA inconstans	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	3	0	3
	60	4	0	4
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A4'	30	1	1	0
	60	-	-	-
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	8	1	7
	60	56	0	56
	100	7	1	6
	200	1	0	1
	Total	72	2	70

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	1	2	3	34	0	16	0	5	4	57
Gastropods	0	42	0	29	0	4	0	2	0	77
Hydrozoans	1	0	1	9	1	6	1	0	4	15
Pelecypods	1	2	1	1	0	0	0	2	2	5
Bryozoans	9	1	1	0	0	0	0	0	10	1
Echinoid spines	-	29	-	40	-	6	-	2	-	77
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	4	-	0	-	0	-	0	-	4
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	5	-	4	-	0	-	0	-	9
'A'?	0	2	0	0	0	0	0	0	0	2

Total Faunal Content:- 267
Living:- 20
Dead:- 247

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	196	60.9
Lithoclasts	65	20.2
Bioclasts	61	18.9
	(322)	

Sample: CB.333

Date: 19.9.63

Time: 17.23 hours

Location: Decca Fix: Red F3.66
Green D41.0

Depth: 39'6"

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	13	0	13
	100	2	0	2
	200	-	-	-
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	1	0	1
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	3	0	3
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
MILIOLINELLA subrotunda	30	-	-	-
	60	5	0	5
	100	2	0	2
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA seminulum	30	4	0	4
	60	6	1	5
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	2	0	2
	100	2	0	2
	200	-	-	-
Total	30	4	0	4
	60	33	1	32
	100	11	0	11
	200	5	0	5
	Total	53	1	52

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	1	4	7	22	2	13	0	12	10	51
Gastropods	0	15	0	5	0	1	0	0	0	21
Hydrozoans	0	0	2	1	0	3	0	2	2	6
Pelecypods	1	1	0	0	0	0	0	0	1	1
Bryozoans	4	0	0	0	0	0	0	0	4	0
Echinoid spines	-	15	-	19	-	0	-	0	-	34
Mussels	0	13	0	0	0	0	0	0	0	13
Crustaceans (exl.Ostracods)	0	0	0	2	0	0	0	0	0	2
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	-	3	-	2	-	0	-	0	-	5

Total Faunal Content:- 151
Living:- 18
Dead:- 133

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	89	29.8
Lithoclasts	70	23.4
Bioclasts	141	46.8
	(300)	

Sample: CB.334

Date: 19.9.63

Time: 17.45 hours

Location: Decca Fix: Red F4.2
Green D38.94

Depth: 38'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	1	0	1
	60	83	3	80
	100	16	0	16
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	16	1	15
	60	163	3	160
	100	8	0	8
	200	4	0	4
ELPHIDIUM crispum var.spinosum	30	1	0	1
	60	31	5	26
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	25	0	25
	100	32	0	32
	200	4	0	4
EOEPONIDELLA mamilla	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	2	0	2
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	1	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspera	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	3	0	3
	60	18	0	18
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	1	0	1
	60	3	0	3
	100	1	0	1
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	8	1	7
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	22	0	22
	100	-	-	-
	200	-	-	-
Aberrant Form	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	27	1	26
	60	381	13	368
	100	65	0	65
	200	8	0	8
	Total	481	14	467

are slight differences between these specimens and the type, mainly in the size of the grains composing the test wall, and on apertural characteristics. A number of forms assigned this specific name examined in the British Museum, exhibit a wide range in the size of the test material, however the study area forms are being noted cf. as there appears to be a tendency among many authors to include in this species any globular, arenaceous forms.

Loeblich and Tappan 1961 examined the taxonomic validity of this species being attributed to Sars and state:-

"Saccammina sphaerica Sars n.g.et sp." was reported in lists of the material obtained from off the coast of Norway (1869) but no generic or specific descriptions were given nor was it figured, hence it remained a nomen nudem. M. Sars published his first valid description of the species Saccammina sphaerica in G.O.Sars 1872 p.250 and a problem thus arises as to its validity as type species of Saccammina Carpenter 1869. Some of the specimens sent to Carpenter were seen by Brady, who believed them closely related to small spherical bodies he had found in the English Carboniferous and for which he had previously proposed at a meeting in 1869 the new generic name Carteria. This had been validated in publication in 1870 by Brady but no species were assigned to it either. In 1871 Brady decided that the Carboniferous Carteria and the Recent Saccammina

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	2	2	71	280	0	96	0	12	73	390
Gastropods	0	10	0	13	0	0	0	0	0	23
Hydrozoans	0	0	1	0	0	0	0	0	1	0
Pelecypods	0	11	0	14	0	0	0	0	0	25
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	10	-	33	-	0	-	0	-	43
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	0	0	0	0	0	0	2	0
Echinoid plates	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 558
Living:- 76
Dead:- 482

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	236	64.5
Lithoclasts	80	21.9
Bioclasts	50	13.6
	(366)	

Sample: CB.335

Date: 19.9.63

Time: 18.05 hours

Location: Decca Fix: Red F3.69
Green D37.00

Depth: 14'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	15	0	15
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	4	0	4
	60	22	0	22
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	16	0	16
	100	4	0	4
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	3	0	3
ELPHIDIUM selseyense	30	-	-	-
	60	2	0	2
	100	2	0	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	4	0	4
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	4	1	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
Total	30	9	0	9
	60	70	1	69
	100	7	0	7
	200	3	0	3
	Total	89	1	88

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	28	29	4	12	0	3	32	45
Gastropods	0	30	0	26	0	2	0	0	0	58
Hydrozoans	1	0	0	0	0	0	0	1	1	1
Pelecypods	0	10	1	6	0	2	0	0	1	18
Bryozoans	3	0	0	0	0	0	0	0	3	0
Echinoid spines	-	2	-	1	-	3	-	2	-	8
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	1	0	0	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 168
Living:- 38
Dead:- 130

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	292	82
Lithoclasts	46	12.9
Bioclasts	18	5.1
	(356)	

Sample: CB.336

Date: 19.9.63

Time: 18.34 hours

Location: Decca Fix: Red F5.33
Green D36.23

Depth: 18'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	55	1	54
	100	16	0	16
	200	-	-	-
ELPHIDIUM crispum	30	10	0	10
	60	29	0	29
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	4	0	4
	100	16	0	16
	200	-	-	-
MASSILINA secans	30	2	0	2
	60	-	-	-
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLID "B"	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	60	0	60
	100	8	0	8
	200	6	0	6
QUINQUELOCULINA inconstans	30	-	-	-
	60	4	2	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	6	1	5
	100	8	0	8
	200	-	-	-
TECHNITELLA fragments	30	-	-	-
	60	frags		
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
Total	30	14	0	14
	60	174	4	170
	100	64	0	64
	200	6	0	6
	Total	248	4	244

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	2	17	33	16	48	0	10	33	93
Gastropods	0	22	0	29	0	8	0	0	0	59
Hydrozoans	14	0	3	14	8	8	0	0	25	22
Pelecypods	0	4	2	4	0	0	0	0	2	8
Bryozoans	6	0	0	0	0	0	0	0	6	0
Echinoid spines	-	0	-	5	-	24	-	0	-	29
Mussels	0	7	0	6	0	0	0	0	0	13
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 291
Living:- 67
Dead:- 224

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	266	87.8
Lithoclasts	25	8.3
Bioclasts	12	3.9
	(303)	

Sample: CB.337

Date: 19.9.63

Time: 18.42 hours

Location: Decca Fix: Red F5.32
Green D37.87

Depth: 36'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ACERVULINA inhaerens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	1	0	1
	60	179	0	179
	100	72	0	72
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	15	0	15
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
DISCORBIS bradyi	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	3	0	3
	60	140	0	140
	100	24	0	24
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	21	0	21
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	10	0	10
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	87	0	87
	100	96	0	96
	200	8	0	8
EOEPONIDELLA mamilla	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
LAGENA sulcata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	41	0	41
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-

were congeneric and he then described the Carboniferous form as Saccammina carteri. With this species dating from 1871 and Saccammina sphaerica Sars dating from 1872 (as commonly considered), Saccammina carteri would thus automatically become the type of Saccammina by subsequent monotypy. Saccammina Sphaerica may therefore be regarded as validated by Brady in 1871, but the valid specific name should be credited to Brady 1871, rather than to Sars 1872. As discussed the correct citation should be Saccammina Carpenter 1869, type species S.sphaerica Brady 1871.

Hedley in 1963, examining this species noted its composition as the following:-

SiO_2	78%
CaO	4.9%
Fe_2O_3	0.7%
Al_2O_3	5.1%

Distribution: (Text fig.15A) Pearcey 1890 recorded this species as few in both the warm and cold areas of the Faeroe Channel. It was recorded in considerable numbers from the shore sands of Selsey Bill, Sussex in 1911 by Heron-Allen and Earland, in 1913 from the Clare Island material and by the same authors in 1914 from 20 fathoms off Ardnamucham.

This species has been quite widely recorded from various regions of the world. Folin in 1881 noted its occurrence in the Gulf of Gascogne, and in 1884 Brady recorded it from deep water in the North Atlantic, from the Hardanger Fiord, Norway, from off the Kerguelen Islands, from 2,050 fathoms in the North

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	52	0	52
	100	16	0	16
	200	-	-	-
SPIRILLINA vivipara	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	7	1	6
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	5	0	5
	60	624	1	623
	100	200	0	200
	200	8	0	8
	Total	837	1	836

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	1	234	334	0	48	0	0	234	383
Gastropods	0	17	0	42	0	0	0	0	0	59
Hydrozoans	1	0	6	0	0	0	0	0	7	0
Pelecypods	2	40	6	204	0	8	0	0	8	252
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	4	-	36	-	8	-	0	-	48
Mussels	0	2	0	6	0	0	0	0	0	8
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	0	-	18	-	0	-	0	-	18
Sponge Spicules	-	0	-	6	-	0	-	0	-	6

Total Faunal Content:- 1023
Living:- 249
Dead:- 774

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	264	84.1
Lithoclasts	17	5.4
Bioclasts	33	10.5
	(314)	

Sample: CB.338

Date: 19.9.63

Time: 18.53 hours

Location: Decca Fix: Red F6.32
Green D36.64

Depth: 24'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ACERVULINA inhaerens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	63	0	63
	100	-	-	-
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	2	0	2
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	4	0	4
	100	16	0	16
	200	-	-	-
NONION boueana	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	20	0	20
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	21	0	21
	100	8	0	8
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	2	0	2
	60	131	0	131
	100	24	0	24
	200	8	0	8
	Total	165	0	165

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	1	18	0	0	0	0	1	18
Gastropods	0	2	0	1	0	0	0	0	0	3
Hydrozoans	0	0	0	2	0	0	0	0	0	2
Pelecypods	0	12	0	6	0	0	0	0	0	18
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	5	-	0	-	0	-	7
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	1	-	0	-	0	-	0	-	1

Total Faunal Content:- 50
Living:- 1
Dead:- 49

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	307	87.7
Lithoclasts	35	10
Bioclasts	8	2.3
	(350)	

Sample: CB.339

Date: 20.9.63

Time: 10.15 hours

Location: Decca Fix: Red F3.89
Green D43.34

Depth: 76'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	63	0	63
	100	24	0	24
	200	4	0	4
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
ELPHIDIUM crispum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	4	0	4

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	7	0	7
	100	56	0	56
	200	20	0	20
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	48	0	48
	100	44	0	44
	200	8	0	8
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	7	0	7
	100	12	1	11
	200	-	-	-
Total	30	2	0	2
	60	142	0	142
	100	148	1	147
	200	48	0	48
	Total	340	1	339

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	6	16	0	24	0	32	6	72
Gastropods	0	5	0	4	0	0	0	0	0	9
Hydrozoans	0	0	2	0	0	0	0	0	2	0
Pelecypods	1	62	1	31	0	0	0	0	2	93
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	5	-	58	-	52	-	4	-	119
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	1	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	14	-	0	-	0	-	0	-	14
Fish Bones	-	0	-	5	-	0	-	0	-	5

Total Faunal Content:- 323
Living:- 11
Dead:- 312

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	277	79.1
Lithoclasts	50	14.3
Bioclasts	23	6.6
	(350)	

Pacific, and from 1,300 fathoms near the Antarctic ice barrier. Goes noted it from the Artic and Scandinavia in 1894, and Flint 1897 from off the coast of Brazil. Cushman in 1910 stated that this species was fairly well distributed in the colder waters of the North Pacific. Heron-Allen and Earland in 1912 recorded it from the North Sea. It was recorded from five stations in considerable numbers, of large size and typical in all its characters, in the Antarctic by Pearcey in 1914. Cushman in 1918 recorded it as being rare to common from Nova Scotia south to the Gulf of Mexico, and in 1921 from the Philippin Islands and adjacent seas. It was recorded by Hofker in 1922 from the Zuidersee, and by Cushman in 1927 from off the west coast of America. In 1931 Kindle noted the occurrence of this species in the Cabot Strait, and Wiesner noted it from 350-2720 metres in the Antarctic. Chapman and Parr in 1937 also noted an Antarctic occurrence, and stated that this species was very rare to rare at three stations. Stubbings recorded it from 2931 metres in the Zanzibar region, and from 2001 metres in the Gulf of Aden in 1939. This species was recorded as being well represented off Bergen by Norvang in 1941, and in 1946 Rutten and Hotz recorded it from the Island of Ceram. Hoglund 1947 noted its occurrence in the Gullmar Fjord and the Skagerak, Cushman 1948 off the north east Greenland coast, and Parr in 1950 recorded it as being common in the Antarctic. It was recorded from the tidal zone and mangrove area of the eastern Gulf of Paria by Todd and

Sample: CB.340

Date: 20.9.63

Time: 10.38 hours

Location: Decca Fix: Red F3.12
Green D44.88

Depth: 84'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	36	0	36
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	19	0	19
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	11	0	11
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	12	0	12
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	18	0	18
	100	3	0	3
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	1	0	1
	60	8	0	8
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA frigida	30	-	-	-
	60	1	0	1
	100	2	0	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA lata	30	-	-	-
	60	8	0	8
	100	15	0	15
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	20	0	20
	100	-	-	-
	200	-	-	-
SPIROLOCULINA subimpressa	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	7	0	7
	100	4	0	4
	200	-	-	-
Total	30	4	0	4
	60	151	0	151
	100	24	0	24
	200	-	-	-
	Total	179	0	179

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	3	14	9	120	0	10	0	4	12	148
Gastropods	0	5	0	10	0	3	0	0	0	18
Hydrozoans	1	7	0	19	0	10	0	1	1	37
Pelecypods	1	30	2	16	0	0	0	0	3	46
Bryozoans	2	0	0	0	0	0	0	0	2	0
Echinoid spines	-	55	-	70	-	25	-	6	-	156
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	0	7	0	0	0	0	0	0	0	7
Fish Bones	0	1	0	1	0	0	0	0	0	2

Total Faunal Content:- 432
Living:- 18
Dead:- 414

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	258	73.8
Lithoclasts	32	9.1
Bioclasts	60	17.1
	(350)	

Sample: CB.341

Date: 20.9.63

Time: 11.07 hours

Location: Decca Fix: Red F1.54
Green D44.71

Depth: 64'

Salinity: 34.3‰

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	23	0	23
	100	-	-	-
	200	-	-	-
	Total	23	0	23

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	1	1	0	0	0	0	1	1
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	1	0	0	0	0	0	1	0
Pelecypods	1	14	2	13	0	0	0	0	3	27
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	15	-	0	-	0	-	15
Mussels	0	1	0	1	0	0	0	0	0	2
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0
Echinoid Plates	-	1	-	0	-	0	-	0	-	1
Fish Bones	-	0	-	2	-	0	-	0	-	2

Total Faunal Content:- 55
Living:- 6
Dead:- 49

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	248	78.7
Lithoclasts	47	14.9
Bioclasts	20	6.4
	(315)	

Sample: CB.342

Date: 20.9.63

Time: 11.22 hours

Location: Decca Fix: Red F0.00
Green D45.45

Depth: 60'6"

Salinity: 34.00‰

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	17	0	17
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	24	0	24
	100	-	-	-
	200	-	-	-
	Total	24	0	24

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	4	0	2	0	0	0	0	0	6
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	0	-	0	-	0	-	1
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	1	-	0	-	0	-	0	-	1

Total Faunal Content:- 9
Living:- 0
Dead:- 9

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	240	80
Lithoclasts	46	15.3
Bioclasts	14	4.7
	(300)	

Sample: CB.343

Date: 20.9.63

Time: 11.45 hours

Location: Decca Fix: Red E21.96
Green D46.06

Depth: 72'

Salinity: 33.7‰

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	60	0	60
	100	102	0	102
	200	20	0	20
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	1	0	1
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	6	0	6
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	3	1	2

Bronnimann in 1957, from off the Mozambique coast by Braga in 1961, and from 0-10 cms. from a core in the Hardangerfjord, Norway in 1965 by Holtedahl.

Stratigraphic Occurrence: (Text fig.15B) A Lower Cretaceous occurrence of this species was noted in strata of this age in Texas Cretaceous by Frizzell in 1954. It was recorded as rare by Cushman in 1944 from the Eocene of Virginia, as numerous by Cushman and Renz in 1948 from the Eocene of Trinidad, and again as numerous in the Eocene of Peru by Cushman and Stone in 1949. Cushman and Stainforth recorded only one specimen from the Oligocene of Trinidad in 1945. Todd 1958 stated that this form ranged from the Pleistocene to Recent in a core from the western Mediterranean. Feyling-Hanssen 1964 recorded one specimen from the Late Quaternary of the Oslo Fjord area.

Diagnosis: This species has a world wide distribution, this appearing to be irrespective of temperature or depth. Stratigraphically, this form does not appear to be restricted to the Recent, but ranges from the Recent to Cretaceous in varying abundance, the most common occurrences being in the Recent and Eocene.

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	76	0	76
	100	576	0	576
	200	60	0	60
NONIONELLA atlantica	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
OOLINA williamsoni	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	15	0	15
	100	6	0	6
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	3	0	3
	100	6	0	6
	200	-	-	-
REOPHAX subfusiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	9	0	9
	100	30	0	30
	200	-	-	-
Total	30	-	-	-
	60	169	0	169
	100	746	0	746
	200	85	1	84
	Total	1000	1	999

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	3	24	0	36	0	6	3	66
Gastropods	0	2	0	0	0	0	0	0	0	2
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	6	0	2	0	0	0	0	0	8
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	3	-	75	-	60	-	10	-	148
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	1	-	3	-	0	-	0	-	4
Echinoid Plates	-	2	-	0	-	0	-	0	-	2

Total Faunal Content:- 233
Living:- 3
Dead:- 230

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	195	62.9
Lithoclasts	10	3.2
Bioclasts	105	33.9
	(310)	

Sample: CB.344

Date: 20.9.63

Time: 12.06 hours

Location: Decca Fix: Red E19.81
Green D47.00

Depth: 70'

Salinity: 33.7‰

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	176	0	176
	100	288	0	288
	200	32	0	32
ELPHIDIUM crispum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	32	0	32
ELPHIDIUM macellum	30	-	-	-
	60	4	0	4
	100	72	0	72
	200	32	0	32
ELPHIDIUM selseyense	30	-	-	-
	60	92	0	92
	100	750	0	750
	200	320	0	320

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	8	0	8
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	20	0	20
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	60	0	60
	100	192	0	192
	200	-	-	-
Total	30	-	-	-
	60	371	0	371
	100	1326	0	1326
	200	416	0	416
	Total	2113	0	2113

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	28	6	82	0	152	0	96	6	358
Gastropods	0	3	0	4	0	0	0	0	0	7
Hydrozoans	1	0	2	10	0	0	0	0	3	10
Pelecypods	1	21	2	30	0	0	0	0	3	51
Bryozoans	1	0	0	0	0	0	0	0	1	0
Echinoid spines	-	10	-	102	-	552	-	105	-	769
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	2	-	0	-	0	-	3
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	15	-	2	-	0	-	0	-	17
Fish Bones	-	7	-	46	-	0	-	0	-	53
Annelids	0	0	2	0	0	0	0	0	2	0

Total Faunal Content:- 1283
Living:- 15
Dead:- 1268

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	242	66.1
Lithoclasts	24	6.6
Bioclasts	100	27.3
	(366)	

Sample: CB.345

Date: 20.9.63

Time: 12.25 hours

Location: Decca Fix: Red E18.2
Green E30.01

Depth: 67'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
AMMONIA beccarii	30	1	0	1
	60	67	0	67
	100	8	0	8
	200	-	-	-
CIBICIDES Refulgens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	3	0	3
	100	6	0	6
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
LAGENA sulcata var. interrupta	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
OOLINA hexagona	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	7	0	7
	100	3	0	3
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	21	0	21
	100	30	0	30
	200	-	-	-
Total	30	1	0	1
	60	113	0	113
	100	56	0	56
	200	-	-	-
	Total	170	0	170

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	1	11	6	35	0	43	0	10	7	99
Gastropods	0	1	0	1	0	0	0	0	0	2
Hydrozoans	1	1	2	1	1	1	0	0	4	3
Pelecypods	0	10	0	6	0	4	0	0	0	20
Bryozoans	3	0	0	0	0	0	0	0	3	0
Echinoid spines	-	20	-	358	-	209	-	40	-	627
Mussels	0	2	0	0	0	0	0	0	0	2
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Sponge Spicules	0	1	0	1	0	0	0	0	0	2

Total Faunal Content:- 773
Living:- 14
Dead:- 759

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	238	78
Lithoclasts	22	7.2
Bioclasts	45	14.2
	(305)	

Sample: CB.346

Date: 20.9.63

Time: 13.15 hours

Location: Decca Fix: Red E16.76
Green E31.1

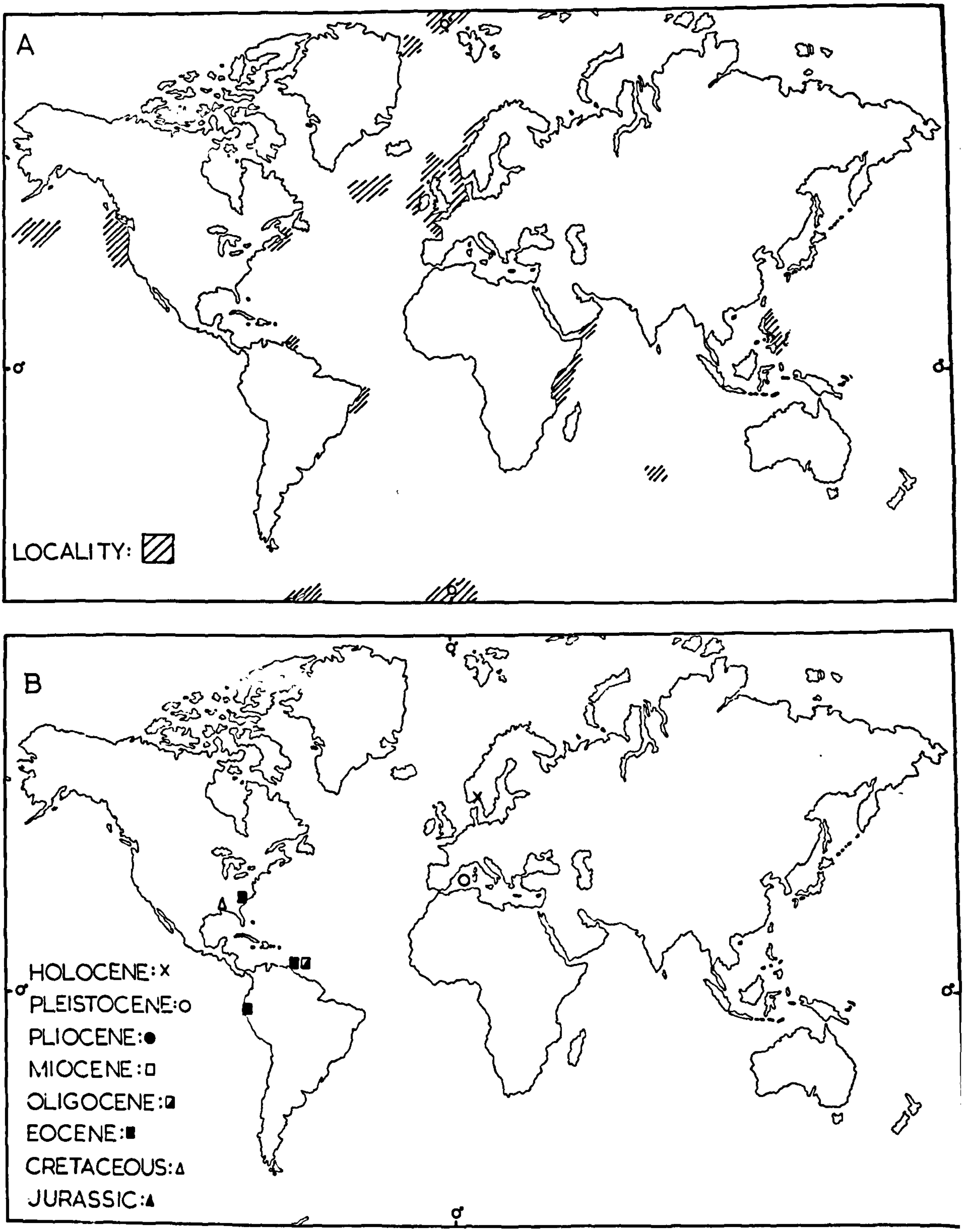
Depth: 54'

Salinity: 33.2‰

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	40	0	40
	100	116	4	112
	200	16	0	16
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-



TEXT FIG. 15 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- SACCAMMINA SPHAERICA

Specimen	Grade	Total Number	Living	Dead
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
ELPHIDIUM crispum	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	5	0	5
	100	88	0	88
	200	24	0	24
ELPHIDIUM excavatum	30	-	-	-
	60	2	0	2
	100	36	0	36
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	6	0	6
	100	8	0	8
	200	8	0	8
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	18	0	18
	100	276	0	276
	200	72	0	72
GUTTULINA lactea	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
LAGENA laevis	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
LAGENA sulcata var. spirata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	3	0	3
	100	48	0	48
	200	16	0	16
NONION depressulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
OOLINA patannae	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	3	0	3
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	13	0	13
	100	4	0	4
	200	16	0	16
TRILOCULINA angulata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8
VERNEUILINA media	30	-	-	-
	60	14	0	14
	100	12	0	12
	200	-	-	-
Total	30	4	0	4
	60	117	0	117
	100	493	4	489
	200	184	0	184
	Total	798	4	794

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	5	70	27	263	0	24	32	357
Gastropods	0	1	0	0	0	0	0	0	0	1
Hydrozoans	0	0	5	10	0	0	0	0	5	10
Pelecypods	0	6	0	20	0	9	0	8	0	43
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	305	-	288	-	24	-	618
Mussels	2	6	0	10	0	0	0	0	2	16
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	5	-	30	-	18	-	0	-	53

Total Faunal Content:- 1137
Living:- 39
Dead:- 1098

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	260	74.2
Lithoclasts	34	9.8
Bioclasts	56	16.0
	(350)	

Sample: CB.347

Date: 20.9.63

Time: 13.42 hours

Location: Decca Fix: Red E17.1
Green D46.81

Depth: 34'

Salinity: 33.2‰

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	11	0	11
	100	40	0	40
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	8	0	8
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	12	0	12
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	88	0	88
	200	16	0	16
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	3	0	3
	100	12	0	12
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	-	-	-
	60	18	0	18
	100	228	0	228
	200	32	0	32
	Total	278	0	278

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	9	8	44	0	0	8	53
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	7	4	16	0	0	4	24
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	48	-	0	-	49
Mussels	0	0	1	0	0	0	0	0	1	0
Crustaceans (exl.Ostracods)	0	0	1	0	4	0	0	0	5	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	0	0	2	0	0	0	0	0	2	0

Total Faunal Content:- 147
Living:- 20
Dead:- 127

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	296	81.3
Lithoclasts	48	13.2
Bioclasts	20	5.5
	(364)	

Sample: CB.348

Date: 20.9.63

Time: 14.03 hours

Location: Decca Fix: Red E19.02
Green D45.65

Depth: 55'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	68	1	67
	100	96	0	96
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	104	0	104
	200	40	0	40

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	32	0	32
	200	8	0	8
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	48	0	48
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	1	0	1
	100	64	0	64
	200	24	0	24
ELPHIDIUM selseyense	30	-	-	-
	60	29	0	29
	100	536	0	536
	200	112	0	112
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	8	0	8
PATELLINA corrugata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA seminulum	30	-	-	-
	60	21	0	21
	100	8	0	8
	200	8	0	8
VERNEUILINA media	30	-	-	-
	60	52	0	52
	100	112	0	112
	200	-	-	-
Total	30	0	0	0
	60	176	1	175
	100	1040	0	1040
	200	201	0	201
	Total	1417	1	1416

Genus: <u>Lagenammina</u> Rhumbler 1911

<u>Lagenammina laguncula</u> Rhumbler 1911

Pl.1, figs. 3a,3b.

1911	<u>Lagenammina laguncula</u>	RHUMBLER	Plankton-Exped.Humboldt Stiftung Ergeb.Kiel u Leipzig.Tiel 1, Bd.3,L.c.,pp.92,111,pl.1,fig.4.
1918	<u>Lagenammina Laguncula</u>	Rhumbler	CUSHMAN. U.S.Nat.Mus.Bull 104, Pt.1,p.51,pl.19,fig.8.
1927	<u>Lagenammina laguncula</u>	Rhumbler	CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.3,Pt.1,p.12,pl.1, fig.12.
1933	<u>Lagenammina laguncula</u>	Rhumbler	GALLOWAY. A manual of foraminifera p.66,pl.4,fig.19.

Test free, unilocular, fusiform, elongate, three times, as long as broad, greatest width about half way up the test and tapering to a bluntly rounded basal end, and to the apertural end which is produced into a slight neck. Aperture a simple, circular, central terminal opening at the end of the neck. Wall agglutinated with medium to coarse arenaceous material with some mica flakes, thick, dense, fairly rough.

Dimensions: Length 0.5 mm. Maximum diameter 0.25 mm.

Occurrence: Dead CB.317, CB.321, CB.323, CB.326, CB.327, CB.352, CB.363, CB.370, CB.371, CB.374, CB.382, CB.386, CB.402, CB.412, CB.413.

Distribution: Rhumbler in 1911 recorded this species from 1524 and 2400 metres in the North Atlantic, and an Atlantic occurrence was also noted by Cushman in 1918.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	1	3	30	8	126	8	72	19	229
Gastropods	0	10	0	3	0	0	0	0	0	13
Hydrozoans	1	1	0	2	0	0	0	0	1	3
Pelecypods	1	6	2	6	0	0	0	0	3	12
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	14	-	284	-	272	-	0	-	570
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	0	0	0	0	0	0	2	0
Fish Bones	-	16	-	24	-	0	-	0	-	40

Total Faunal Content:- 893
Living:- 26
Dead:- 867

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	247	69.6
Lithoclasts	48	13.4
Bioclasts	60	17
	(355)	

Sample: CB.349

Date: 20.9.63

Time: 14.37 hours

Location: Decca Fix: Red F21.32
Green D44.74

Depth: 62'

Salinity: 33.7‰

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	2	0	2
	60	53	2	51
	100	90	2	88
	200	25	0	25
ASTRONONION gallowayi	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	8	0	8
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	7	0	7
ELPHIDIUM selseyense	30	-	-	-
	60	16	0	16
	100	89	0	89
	200	32	0	32

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	2	0	2
	60	2	0	2
	100	-	-	-
	200	1	0	1
VERNEUILINA media	30	-	-	-
	60	20	0	20
	100	56	0	56
	200	-	-	-
Total	30	4	0	4
	60	93	2	91
	100	245	2	243
	200	73	0	73
	Total	415	4	411

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	6	0	4	0	0	0	10
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	4	0	0	0	0	0	0	0	4	0
Pelecypods	0	1	0	0	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	4	-	18	-	59	-	10	-	91
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	[illegible]	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	1	0	0	0	0	0	3	0

Total Faunal Content:- 111
Living:- 8
Dead:- 103

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	147	49
Lithoclasts	113	37.7
Bioclasts	40	13.3
	(300)	

Sample: CB.350

Date: 20.9.63

Time: 15.10 hours

Location: Decca Fix: Red F23.24.
Green D43.67

Depth: 66'

Salinity: 34.00‰

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	22	0	22
	100	29	0	29
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	6	0	6
	100	56	0	56
	200	32	0	32
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
Total	30	0	0	0
	60	29	0	29
	100	92	0	92
	200	32	0	32
	Total	153	0	153

Sample: CB.351

Date: 20.9.63

Time: 15.43 hours

Location: Decca Fix: Red F1.0
Green D42.5

Depth: 64'

Salinity: 33.9‰

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	83	0	83
	100	93	0	93
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	12	0	12
	100	72	0	72
	200	36	0	36

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	6	0	6	0	16	0	28
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	9	-	3	-	0	-	12
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 41
Living:- 1
Dead:- 40

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	190	57.6
Lithoclasts	100	30.3
Bioclasts	40	12.1
	(330)	

Sample: CB.352

Date: 20.9.63

Time: 16.00 hours

Location: Decca Fix: Red F2.29
Green D41.98

Depth: 63'

Salinity: 33.2‰

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	159	0	159
	100	104	4	100
	200	-	-	-
BOLIVINA spathulata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	4	0	4
BULIMINELLA elegantissima	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4

Specimen	Grade	Total Number	Living	Dead
CIBICIDES lobatulus	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	4	0	4
ELPHIDIUM selseyense	30	-	-	-
	60	101	0	101
	100	352	0	352
	200	52	0	52
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspora	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	26	0	26
	100	24	0	24
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	27	0	27
	100	36	0	36
	200	-	-	-
Total	30	-	-	-
	60	341	0	341
	100	560	4	556
	200	68	0	68
	Total	969	4	965

Genus: *Technitella* Norman 1878

Technitella sp. Norman 1878

A taxonomic study of this genus and its species has been carried out, and a discussion of this genus is included in Chapter 10.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	30	73	12	76	0	12	42	161
Gastropods	0	3	0	4	0	4	0	0	0	11
Hydrozoans	0	0	0	3	0	0	0	0	0	3
Pelecypods	0	5	1	5	0	0	0	0	1	10
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	5	-	28	-	0	-	0	-	33
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	2	0	12	0	0	0	14	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	4	-	0	-	0	-	0	-	4
Fish Bones	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 280
Living:- 57
Dead:- 223

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	236	75.2
Lithoclasts	55	17.5
Bioclasts	23	7.3
	(314)	

Sample: CB.353

Date: 20.9.63

Time: 16.34 hours

Location: Decca Fix: Red F2.46
Green D40.19

Depth: 26'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	-	-	-
	100	2	1	1
	200	1	0	1
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	6	6	0
	100	1	1	0
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	2	0	2
PSAMMOSPHAERA parva	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	1	1	0
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	11	11	0
	100	7	2	5
	200	3	0	3
	Total	22	13	9

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	1	0	1	2	1	1	0	0	3	3
Gastropods	0	11	0	1	0	0	0	0	0	12
Hydrozoans	1	1	0	0	2	0	0	2	3	3
Pelecypods	0	6	0	1	1	0	0	0	1	7
Bryozoans	3	1	4	0	0	2	0	0	7	3
Echinoid spines	-	0	-	1	-	0	-	2	-	3
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 46
Living:- 15
Dead:- 31

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	132	33.3
Lithoclasts	40	10.1
Bioclasts	224	56.6
	(396)	

Sample: CB.354

Date: 20.9.63

Time: 17.05 hours

Location: Decca Fix: Red F2.00
Green D38.18

Depth: 18'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	44	0	44
	100	8	0	8
	200	-	-	-
DISCORBIS malovensis var. nudiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	4	0	4
	60	27	0	27
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	9	1	8
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	24	0	24
	200	1	0	1

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	8	0	8
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA aspera	30	-	-	-
	60	10	0	10
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA inconstans	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	1	0	1
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	4	0	4
	60	7	0	7
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
SPIRILLINA vivipara	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
TECHNITELLA fragments	30	-	-	-
	60	frags	frags	frags
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	1	0	1
	60	7	0	7
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	1	0	1
	60	5	0	5
	100	-	-	-
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	20	0	20
	60	129	1	128
	100	32	0	32
	200	3	0	3
	Total	185	1	184

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	1	2	40	52	0	32	0	0	41	86
Gastropods	0	42	0	21	0	0	0	0	0	63
Hydrozoans	4	0	1	5	0	0	0	0	5	5
Pelecypods	1	13	0	4	0	0	0	0	1	17
Bryozoans	6	0	0	0	0	0	0	0	6	0
Echinoid spines	-	5	-	9	-	0	-	0	-	14
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	2	0	3	0	0	0	0	0	5	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	3	-	0	-	0	-	0	-	3
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	3	0	1	0	0	0	0	0	4	0

Total Faunal Content:- 250
Living:- 62
Dead:- 188

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	274	79.2
Lithoclasts	42	12.1
Bioclasts	30	8.7
	(346)	

Sample: CB.355

Date: 20.9.63

Time: 17.35 hours

Location: Decca Fix: Red F1.44
Green D37.63

Depth: 2'6"

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
Total	30	0	0	0
	60	2	0	2
	100	9	0	9
	200	0	0	0
	Total	11	0	11

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	2	3	2	0	0	3	4
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	1	0	0	0	0	0	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	2	-	0	-	2
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	3	0	0	0	4	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 15
Living:- 7
Dead:- 8

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	288	87.3
Lithoclasts	33	10.0
Bioclasts	9	2.7
	(330)	

Super Family: Lituolacea de Blainville 1825

Family: Hormosinidae Haeckel 1894

Sub Family: Hormosininae Haeckel 1894

Genus: <u>Reophax</u> Montford 1808

<u>Reophax artica</u> Brady 1881

pl.2, figs.2a,2b.

1881	<u>Reophax artica</u>	BRADY	Quart.Journ.Micro.Soc.N.S.Vol.21, Pt.3,p.405,pl.21,fig.2.
1952	<u>Reophax artica</u>	Brady	PARKER. Bull.Mus.Comp.Zool.Vol.106, no.9,p.395,pl.1,figs.6,7.
1952	<u>Reophax artica</u>	Brady	PHLEGER. Contr.Cush.Found.Foram.Res. Vol.3,Pt.2,p.84,pl.13,fig.3.
1953	<u>Reophax artica</u>	Brady	LOEBLICH and TAPPAN.Smith.Miscell.Coll. Vol.121,No.7,p.21,pl.1,figs.19,20.
1957	<u>Reophax artica</u>	Brady	BOLTOVSKOY.Mus.Arg. de Ciencias Nat. Geol.Tome 6, no.1,p.18,pl.III,figs.1-3,4.
1963	<u>Reophax artica</u>	Brady	BOLTOVSKOY.Contr.Cush.Found.Foram.Res. Vol.14,Pt.2,p.64,pl.7,fig.13.
1964	<u>Reophax artica</u>	Brady	COOPER.Contr.Cush.Found.Foram.Res. Vol.15,Pt.3,p.92,pl.5,fig.3.

Test free, small, uniserial, elongate, three to four times as long as broad, increasing gradually and evenly in size with growth, the later portion becoming parallel sided, slightly compressed, circular to sub-circular in section, periphery very slightly lobate. Chambers fairly distinct, uniserial, eight present, wider than high initially, and increasing in relative height as added. Sutures horizontal, slightly depressed. Aperture terminal, circular to ovate, at the end of a short stout neck developed from the ultimate chamber. Wall agglutinated, with fine material with little cement, very rough.

Sample: CB.356

Date: 21.9.63

Time: 11.50 hours

Location: Decca Fix: Red E22.87
Green D40.77

Depth: 33'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	13	0	13
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	25	0	25
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	9	0	9
	100	8	0	8
	200	-	-	-
GUTTULINA lactea	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	10	1	9
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	63	1	62
	100	16	0	16
	200	-	-	-
	Total	79	1	78

<u>GENERAL FAUNA</u>

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
<u>Fauna</u>										
Ostracods	0	0	1	3	0	0	0	0	1	3
Gastropods	0	1	0	3	0	8	0	0	0	12
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	13	4	2	8	0	0	0	12	15
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	4	-	0	-	0	-	4
Mussels	0	1	0	1	0	0	0	0	0	2
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	0	0	0	0	0	0	2	0
Fish Bones	0	0	0	1	0	0	0	0	0	1

Total Faunal Content:- 53
Living:- 16
Dead:- 37

<u>PETROLOGICAL ANALYSIS</u>

Grain	Total	Percentage
Quartz	254	81.9
Lithoclasts	42	13.6
Bioclasts	14	4.5
	(310)	

Sample: CB.357

Date: 21.9.63

Time: 12.16 hours

Location: Decca Fix: Red E20.63
Green D42.86

Depth: 24'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead

NO FORAMINIFERA OBTAINED

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spi nes	0	0	0	0	0	0	0	0	0	0
Mussels	0	1	0	0	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	0	0	0	0	0	0	0	0	0	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Seaweed fragments	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 2
Living:- 1
Dead:- 1

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz		
Lithoclasts	No sediment obtained	
Bioclasts		

Sample: CB.358

Date: 21.9.63

Time: 12.40 hours

Location: Decca Fix: Red E18.92
Green D44.36

Depth: 37'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	22	4	18
	100	88	2	86
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
CYCLOGYRA involvens	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	10	0	10
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	10	0	10
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	6	0	6
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	48	0	48
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	7	0	7
	100	138	0	138
	200	24	0	24
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	10	0	10
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
OOLINA patannae	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	-	-	-
	100	10	0	10
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	16	0	16
	100	10	0	10
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	2	0	2
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	17	0	17
	100	18	0	18
	200	-	-	-
Total	30	-	-	-
	60	67	4	63
	100	433	2	431
	200	32	0	32
	Total	532	6	526

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	3	16	8	272	0	8	11	296
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	1	0	0	0	0	0	0	0	1	0
Pelecypods	2	43	11	7	16	40	0	0	29	90
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	4	-	84	-	8	-	96
Mussels	0	3	0	4	0	4	0	0	0	11
Crustaceans (exl.Ostracods)	1	0	13	0	8	0	0	0	22	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	3	0	0	0	0	0	4	0
Echinoid Plates	-	1	-	0	-	0	-	0	-	1
Fish Bones	-	0	-	6	-	0	-	0	-	6

Total Faunal Content:- 567
Living:- 67
Dead:- 500

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	240	74.1
Lithoclasts	54	16.7
Bioclasts	30	9.2
	(324)	

Dimensions: Length 0.27 mm. Maximum diameter 0.09 mm.

Occurrence: Dead CB.384.

Dead, variation Sample CB.700

Distribution: Up to the present day there has not been any record of this form occurring in British waters.

This form has been recorded as occurring off Portsmouth, New Hampshire (Parker 1952), (Phleger 1952); and with frequencies up to 10% at the majority of stations in the Canadian and Greenland Artic (Phleger 1952). In 1953 the form was recorded from the Artic by Loeblich and Tappan, and from the Great Pond, Falmouth, Massachussetts by Said. In 1957 Boltovskoy noted its occurrence in the estuary of the Rio de la Plata. In 1963 Anderson recorded this species from the Bering Sea, Boltovskoy recorded few from Puerto Deseado, Patagonia, Argentina, and Leslie from Hudson Bay, Canada. In 1964 Cooper stated that the species occurred at forty stations throughout the whole area of the Chukchi Sea, north Bering Sea, but had its greatest concentration at deeper stations with sediments in the silt range. The author also noted that the summer temperatures varied between 2.5°C and 5.0°C, that salinites were greater than 31.5‰ and that this form constituted over 20% of the fauna.

Diagnosis: This species appears to be a cool or cold water species with a preference for an environment with a substrate composed of fine grained sediment of the silt and silt-mud grades.

Sample: CB.359

Date: 21.9.63

Time: 12.53 hours

Location: Decca Fix: Red E17.91
Green D44.91

Depth: 16'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	1	0	1
	100	100	0	100
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	32	0	32
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	7	1	6
	100	28	0	28
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	12	4	8
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	12	0	12
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	2	0	2
	100	168	0	168
	200	-	-	-
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
FISSURINA lucida	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	4	4	0
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
Total	30	-	-	-
	60	16	1	15
	100	460	8	452
	200	-	-	-
	Total	476	9	467

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	13	0	48	0	0	0	61
Gastropods	0	0	0	0	0	4	0	0	0	4
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	6	0	24	0	0	0	31
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	2	-	44	-	0	-	46
Mussels	0	0	0	1	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	2	0	0	0	0	0	3	0
Fish Bones	0	0	0	1	0	0	0	0	0	1

Total Faunal Content:- 148
Living:- 4
Dead:- 144

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	270	79.4
Lithoclasts	48	14.1
Bioclasts	22	6.5
	(340)	

Sample: CB.360

Date: 21.9.63

Time: 13.10 hours

Location: Decca Fix: Red E18.6
Green D45.83

Depth: 56'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
AMMOBACULITES subagglutinans	30	-	-	-
	60	3	0	3
	100	2	0	2
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	25	0	25
	100	62	0	62
	200	25	0	25
BOLIVINA variablis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
BULIMINELLA elegantissima	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
CASSIDULINOIDES tenuis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	3	0	3
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	5	0	5
DENDROPHYRA arborescens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	3	0	3
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	28	0	28
	200	19	0	19
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	25	0	25
	200	12	0	12

Specimen	Grade	Total Number	Living	Dead
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	2	0	2
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	6	0	6
	100	20	0	20
	200	10	0	10
QUINQUELOCULINA seminulum	30	1	0	1
	60	11	0	11
	100	10	0	10
	200	-	-	-
REOPHAX fusiformis	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	1	0	1
REOPHAX subfusiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
RHABDAMMINA scabra	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	25	0	25
	100	153	0	153
	200	40	0	40
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	1	0	1
	60	84	3	81
	100	614	0	614
	200	322	0	322
	Total	1021	3	1018

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	3	5	35	0	28	0	0	5	68
Gastropods	0	1	0	0	0	2	0	0	0	3
Hydrozoans	0	1	3	5	0	1	0	3	3	10
Pelecypods	0	20	2	10	0	4	0	0	2	34
Bryozoans	2	3	0	0	0	0	0	0	2	3
Echinoid spines	-	2	-	110	-	36	-	20	-	168
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	4	0	6	0	3	0	13	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	-	1	-	0	-	0	-	0	-	1
Fish Bones	-	1	-	7	-	1	-	4	-	13

Total Faunal Content:- 325
Living:- 25
Dead:- 300

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	236	61.8
Lithoclasts	127	33.3
Bioclasts	19	4.9
	(382)	

Sample: CB.361

Date: 21.9.63

Time: 13.37 hours

Location: Decca Fix: Red E20.2
Green D44.5

Depth: 56'6"

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	88	1	87
	100	160	0	160
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	120	0	120
	200	8	0	8

Reophax fusiformis (Williamson) emend.Loeblich and Tappan 1955

Pl.2, figs.1a,1b.

1858	Proteonina fusiformis	WILLIAMSON	Rec.For.Gt.Brit.Ray Soc. London, p.1,Pl.1,fig.1.
1884	Reophax fusiformis	(Williamson)	BRADY.Chall.Rep.Zool.Vol.9, p.290,pl.30,figs.7-11.
1892	Reophax Fusiformis	(Williamson)	CHAPMAN.Journ.Roy.Micro.Soc. p.2,pl.V,fig.3.
1899	Reophax fusiformis	(Williamson)	MILLETT.Journ.Roy.Micro.Soc. p.253,pl.IV,fig.11.
1910	Proteonina fusiformis	Williamson	CUSHMAN.U.S.Nat.Mus.Bull.71, Pt.1,p.41,text - fig.39.
1947	Proteonina fusiformis	Williamson	HOGLUND.Zool.Bidrag.Fran. Uppsala.Band 26,p.52,pl.4, fig.21.
1955	Reophax fusiformis	LOEBLICH and TAPPAN.	Smith.Inst.Miscell. Coll.Vol.128,no.5,(pub.4214) p.8,pl.1,figs.2-3.
1960	Reophax fusiformis	(Williamson)	emend.Loeblich and Tappan. BARKER.Soc.Econ.Pal. and Min. Sp.Pub.no.9,p.62,pl.30, figs.7-11.

Test free, fusiform, uniserial, elongate, circular in section, greatest width about the centre of the test, tapering to the rounded base, and to the drawn out apertural end. Chambers indistinct. Aperture terminal, central, at the end of the ultimate chamber, on a short neck, a simple circular opening. Wall agglutinated, with medium to coarse material with little cement, fairly rough.

Dimensions: Length 0.47 mm. Maximum diameter 0.20 mm.

Occurrence: Dead CB.318, CB.360, CB.371, CB.413.

Distribution: (Text fig.16A) Williamson 1858 originally recorded this species from off the Isle of Skye, and Brady in 1884 recorded

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	72	0	72
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	31	0	31
	100	212	0	212
	200	8	0	8
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	9	0	9
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	2	0	2
	60	71	0	71
	100	114	0	114
	200	-	-	-
Total	30	3	0	3
	60	205	1	204
	100	602	0	602
	200	16	0	16
	Total	826	1	825

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	4	35	0	64	0	0	4	99
Gastropods	0	0	0	2	0	0	0	0	0	2
Hydrozoans	6	0	6	0	0	0	0	0	12	0
Pelecypods	0	4	0	8	0	0	0	0	0	12
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	7	-	112	-	104	-	0	-	223
Mussels	0	3	0	0	0	0	0	0	0	3
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	1	-	0	-	0	-	0	-	1
Fish Bones	-	0	-	3	-	0	-	0	-	3
Annelids	0	0	2	0	0	0	0	0	2	0

Total Faunal Content:- 361
Living:- 18
Dead:- 343

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	236	63.8
Lithoclasts	28	7.6
Bioclasts	106	28.6
	(370)	

Sample: CB.362

Date: 21.9.63

Time: 13.55 hours

Location: Decca Fix: Red E21.75
Green D43.24

Depth: 55'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	4	0	4
	60	81	0	81
	100	44	0	44
	200	20	0	20
BOLIVINA spathulata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
BULIMINA marginata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	4	0	4
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	10	0	10
	200	4	0	4
ELPHIDIUM macellum	30	-	-	-
	60	6	0	6
	100	40	0	40
	200	12	0	12
ELPHIDIUM selseyense	30	-	-	-
	60	14	0	14
	100	88	0	88
	200	36	0	36
GLOBIGERINA hexagona	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
LAGENA laevis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
LAGENA substriata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
OOLINA williamsoni	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	34	0	34
	100	28	0	28
	200	4	0	4
Total	30	4	0	4
	60	137	0	137
	100	218	0	218
	200	80	0	80
	Total	439	0	439

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	1	0	52	0	20	0	10	0	83
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	3	0	0	0	0	0	0	0	3	0
Pelecypods	0	1	0	0	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	7	-	50	-	30	-	40	-	127
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	0	2	0	0	0	0	0	0	0	2

Total Faunal Content:- 216
Living:- 3
Dead:- 213

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	276	65.7
Lithoclasts	84	20.0
Bioclasts	60	14.3
	(420)	

Sample: CB.363

Date: 21.9.63

Time: 14.13 hours

Location: Decca Fix: Red E23.35
Green D41.8

Depth: 52'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	102	0	102
	100	160	0	160
	200	8	0	8
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	8	0	8
	100	24	0	24
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	7	0	7
	100	8	0	8
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	8	0	8
ELPHIDIUM macellum	30	-	-	-
	60	17	0	17
	100	36	0	36
	200	8	0	8
ELPHIDIUM selseyense	30	-	-	-
	60	66	0	66
	100	436	0	436
	200	56	0	56
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
NONIONELLA turgida	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
PATELLINA corrugata	30	-	-	-
	60	-	-	-
	100	4	4	0
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	11	0	11
	100	20	0	20
	200	8	0	8
TRILOCULINA angulata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	15	0	15
	100	48	0	48
	200	-	-	-
Total	30	-	-	-
	60	238	0	238
	100	760	4	756
	200	89	0	89
	Total	1087	4	1083

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	13	106	20	240	0	24	33	370
Gastropods	0	1	0	0	0	4	0	0	0	5
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	4	0	29	0	8	0	0	0	41
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	73	-	124	-	0	-	199
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	4	0	0	0	5	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	3	-	8	-	0	-	0	-	11

Total Faunal Content:- 714
Living:- 38
Dead:- 676

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	204	63.7
Lithoclasts	92	28.8
Bioclasts	24	7.5
	(320)	

Sample: CB.364

Date: 21.9.63

Time: 14.35 hours

Location: Decca Fix: Red F0.69
Green D40.82

Depth: 42'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	214	1	213
	100	88	0	88
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	2	0	2
	60	53	0	53
	100	56	0	56
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	14	0	14
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

it from various points around the British Isles, especially on the west coast of Scotland at depths seldom exceeding 40 or 50 fathoms, and west of Ireland from 630 and 1443 fathoms. Pearcey recorded a few specimens from both the warm and cold areas of the Faroe Channel in 1890, and in 1891 recorded it from Liverpool Bay. It was listed as occurring in the Irish Sea in 1896, by the British Association. Pearcey again noted it, this time in 1902, as frequent and living in the Firth of Forth. In 1911 Heron-Allen and Earland recorded it from the shore sands of Selsey Bill, in 1913 as frequent from Clare Island, in 1914 from 12 fathoms in Loch Sunart, in 1916 as being very rare west of Scotland, and in 1930 from the Plymouth District.

Brady in 1884 stated that this species was found in the Artic Ocean, in the North Atlantic, and from one Philippine Islands station at 95 fathoms. Millett in 1899 recorded the species as being tolerably plentiful from the Malay Archipelago. Cushman 1910 noted that this form was not common in the North Pacific. Heron-Allen and Earland in 1913 recorded this species as being very rare to very common in the North Sea, and in 1932 as rare and small at four stations in the ice free areas of the Falkland Islands. In 1934 Earland noted the species as being widely distributed but generally rare in the Falklands sector of the Antarctic, and in 1936 recorded one specimen from the Weddell Sea. Occurrences in the Gullmar Fjord and the Skagerak were noted by

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	21	0	21
	100	80	0	80
	200	-	-	-
QUINQUELOCULINA agglutinata	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	8	0	8
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	94	0	94
	100	48	0	48
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	6	0	6
	100	16	0	16
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	4	0	4
	60	418	1	417
	100	312	0	312
	200	-	-	-
	Total	734	1	733

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	6	41	8	56	0	8	14	107
Gastropods	0	2	0	3	0	24	0	0	0	29
Hydrozoans	0	0	2	0	0	0	0	0	2	0
Pelecypods	1	24	6	27	0	16	0	0	7	67
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	7	-	31	-	16	-	0	-	54
Mussels	0	4	0	0	0	0	0	0	0	4
Crustaceans (exl.Ostracods)	0	0	1	0	16	0	0	0	17	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	1	-	0	-	0	-	0	-	1
Annelids	2	0	0	0	0	0	0	0	2	0

Total Faunal Content:- 304
Living:- 42
Dead:- 262

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	336	78.5
Lithoclasts	66	15.4
Bioclasts	26	6.1
	(428)	

Sample: CB.365

Date: 21.9.63

Time: 14.55 hours

Location: Decca Fix: Red F2.21
Green D39.21

Depth: 26'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
TECHNITELLA fragments	30	frags	-	-
	60	frags	-	-
	100	-	-	-
	200	-	-	-
Total	30	frags	0	0
	60	2	1	1
	100	1	0	1
	200	0	0	0
	Total	3	1	2

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	1	0	2	1	3	0	0	1	6
Gastropods	0	1	0	3	0	0	0	0	0	4
Hydrozoans	0	0	4	0	3	1	0	0	7	1
Pelecypods	0	5	0	0	0	0	0	0	0	5
Bryozoans	12	2	6	2	1	0	0	0	19	4
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	2	0	1	0	0	0	3
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	2	-	0	-	0	-	0	-	2
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 52
Living:- 27
Dead:- 25

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	264	80.5
Lithoclasts	42	12.8
Bioclasts	22	6.7
	(328)	

Sample: CB.366

Date: 21.9.63

Time: 15.12 hours

Location: Decca Fix: Red F3.42
Green D38.49

Depth: 21'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
AMMONIA beccarii	30	4	0	4
	60	58	0	58
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	26	0	26
	60	114	0	114
	100	16	0	16
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	2	0	2
	60	60	0	60
	100	8	0	8
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	16	0	16
	200	4	0	4
ELPHIDIUM macellum	30	-	-	-
	60	17	0	17
	100	16	0	16
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	6	0	6
	100	40	0	40
	200	12	0	12
FISSURINA lucida	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	1	0	1
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	4	0	4
	60	34	0	34
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA bicornis	30	1	0	1
	60	19	0	19
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA cliarensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	3	0	3
	60	7	0	7
	100	-	-	-
	200	-	-	-
SPIRILLINA vivipara	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
TECHNITELLA 'B'	30	2 + frags	2	0
	60	-	-	-
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	3	0	3
	60	21	0	21
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	1	0	1
	60	19	0	19
	100	7	0	7
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	10	0	10
	100	28	0	28
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Aberrent Form	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	47	2	45
	60	387	0	387
	100	151	0	151
	200	18	0	18
	Total	603	2	601

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	8	10	144	198	16	108	16	36	184	352
Gastropods	0	49	0	26	0	0	0	0	0	75
Hydrozoans	0	0	0	1	0	0	0	0	0	1
Pelecypods	2	31	5	26	0	0	0	0	7	57
Bryozoans	1	0	0	0	0	0	0	0	1	0
Echinoid spines	-	7	-	9	-	0	-	0	-	16
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	2	0	0	0	0	0	2	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	0	0	0	0	0	0	2	0

Total Faunal Content:- 698
Living:- 196
Dead:- 502

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	295	79.7
Lithoclasts	60	16.2
Bioclasts	15	4.1
	(370)	

Sample: CB.367

Date: 21.9.63

Time: 15.38 hours

Location: Decca Fix: Red F4.51
Green D37.46

Depth: 20'6"

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	2	0	2
	60	56	5	51
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	8	0	8
	60	52	0	52
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	27	2	25
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
EOEPONIDELLA mamilla	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Hoglund in 1947.

Stratigraphic Occurrence: (Text - fig.16B). Only rare occurrences of this species have been recorded stratigraphically from the British Isles, from the Gault of Folkestone (Chapman 1892), and from the Post Tertiary deposits of Greenock (Robertson 1885).

This species was recorded from the Cretaceous and Eocene deposits of Australia by Howchin in 1893. Two occurrences were noted from the Blue Marl, Middle Eocene of the Cotes des Basques, Biarritz, by Halkyard in 1917 and 1919, the species being recorded as very rare on both occasions.

Diagnosis: This is quite a common species in the British area, and throughout the world appears to prefer the colder water habitat, in shallow water zones.

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	4	0	4
QUINQUELOCULINA agglutinata	30	1	0	1
	60	23	0	23
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	59	2	57
	100	-	-	-
	200	-	-	-
QUINQULOCULINA pulchella	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	5	0	5
	60	7	0	7
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	1	0	1
	60	4	0	4
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
Total	30	18	0	18
	60	243	9	234
	100	20	0	20
	200	12	0	12
	Total	293	9	284

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	1	0	25	55	8	20	0	20	34	95
Gastropods	0	44	2	45	0	0	0	4	2	93
Hydrozoans	0	0	0	2	0	0	0	0	0	2
Pelecypods	3	16	9	20	8	0	8	0	28	36
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	8	-	12	-	0	-	22
Mussels	0	0	0	8	0	0	0	0	0	8
Crustaceans (exl.Ostracods)	2	0	16	0	12	0	0	0	30	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	3	-	0	-	0	-	0	-	3
Annelids	3	0	0	0	0	0	0	0	3	0

Total Faunal Content:- 356
Living:- 97
Dead:- 259

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	256	85.3
Lithoclasts	30	10.0
Bioclasts	14	4.7
	(300)	

Sample: CB.368

Date: 21.9.63

Time: 16.04 hours

Location: Decca Fix: Red F4.73
Green D39.23

Depth: 38'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	41	0	41
	100	8	0	8
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
CIBICIDES lobatulus	30	1	0	1
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	2	0	2
	60	44	0	44
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	3	0	3
	100	2	0	2
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selscyense	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	1	0	1
OOLINA williamsoni	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	1	0	1
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA cliarensis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	1	0
	60	25	1	24
	100	18	0	18
	200	2	0	2
REOPHAX subfusiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	5	0	5
	100	2	0	2
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	8	0	8
	100	8	0	8
	200	-	-	-
Aberrent Form	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
Total	30	5	1	4
	60	156	1	155
	100	76	0	76
	200	3	0	3
	Total	240	2	238

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	1	57	115	4	49	1	6	62	171
Gastropods	0	3	0	7	0	4	0	0	0	14
Hydrozoans	2	0	3	8	0	0	0	0	5	8
Pelecypods	0	2	0	3	0	0	0	0	0	5
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	19	-	30	-	0	-	51
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	3	0	3	0	0	0	6	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	0	0	1	0	0	0	0	0	1	0

Total Faunal Content:- 323
Living:- 74
Dead:- 249

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	244	56.5
Lithoclasts	134	31.0
Bioclasts	54	12.5
	(432)	

Sample: CB.369

Date: 21.9.63

Time: 16.27 hours

Location: Decca Fix: Red F2.76
Green D40.32

Depth: 32'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	6	0	6
	100	3	0	3
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	1	0	1
	60	5	0	5
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	17	0	17
	100	5	0	5
	200	0	0	0
	Total	23	0	23

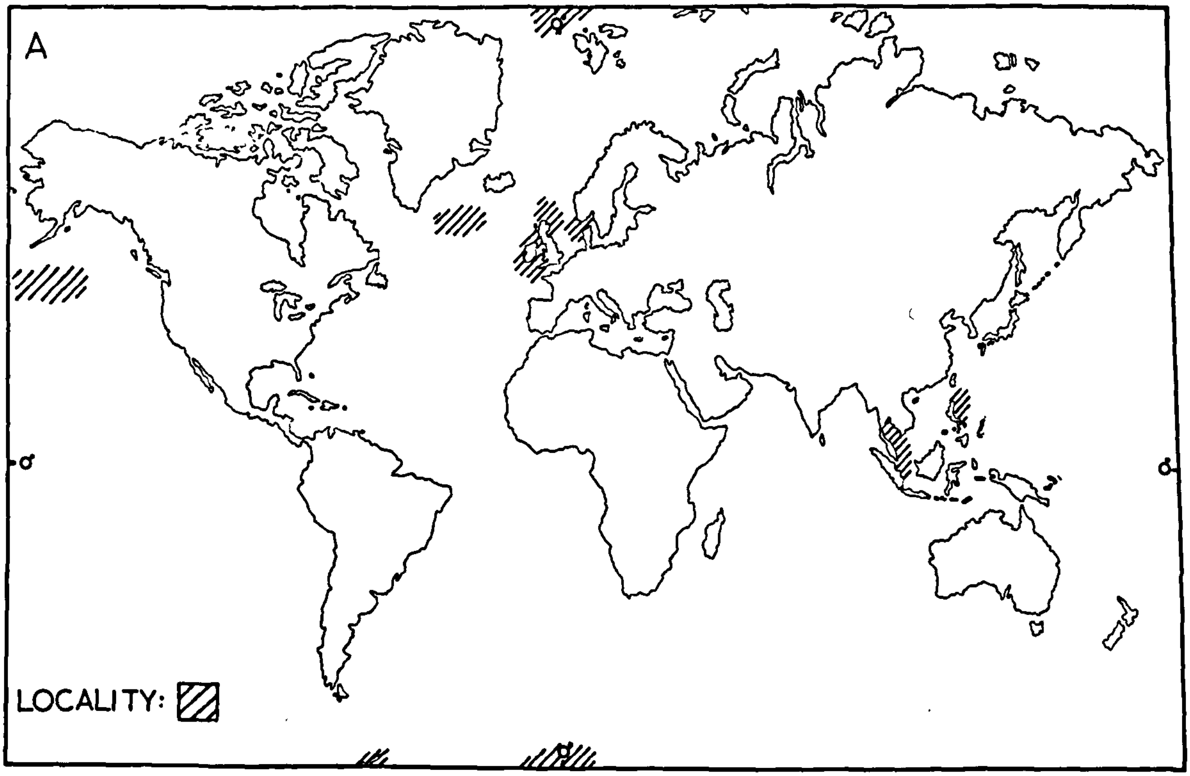
GENERAL FAUNA

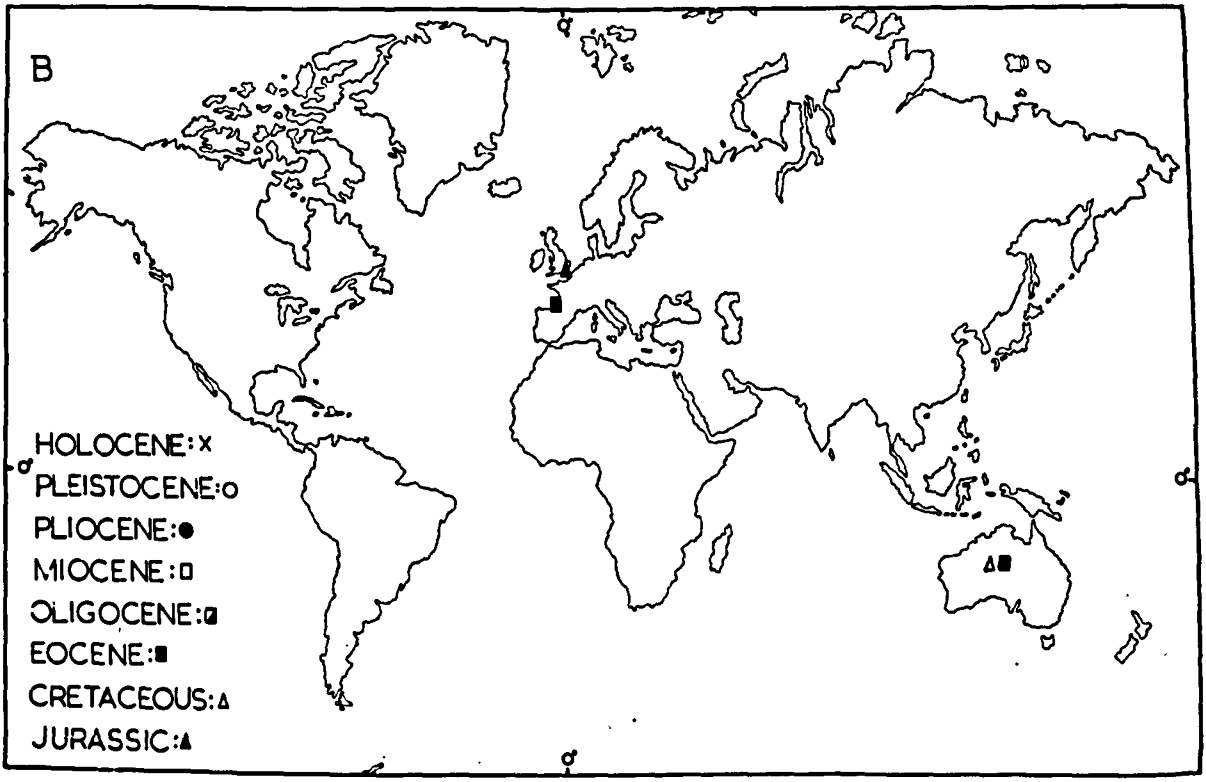
Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	7	5	3	5	0	14	10	24
Gastropods	0	20	0	8	0	0	0	0	0	28
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	5	0	2	0	0	0	0	0	7
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	3	-	13	-	7	-	1	-	24
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	0	1	0	0	0	0	0	0	0	1

Total Faunal Content:- 94
Living:- 10
Dead:- 84

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	92	28.2
Lithoclasts	118	36.2
Bioclasts	116	35.6
	(326)	





TEXT FIG. 16 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- REOPHAX FUSIFORMIS

Sample: CB.370

Date: 21.9.63

Time: 16.57 hours

Location: Decca Fix: Red F2.74
Green D42.42

Depth: 68'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
AMMOBACULITES subagglutinans	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	71	0	71
	100	40	0	40
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
BULIMINELLA elegantissima	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	1	0
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
CLAVULINA gracilis	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM crispum	30	-	-	-
	60	15	0	15
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	2	0	2
ELPHIDIUM selseyense	30	-	-	-
	60	17	0	17
	100	92	0	92
	200	12	0	12
LAGENAMMINA laguncula	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA frigida	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	10	0	10
	100	12	0	12
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	11	0	11
	100	8	0	8
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	20	0	20
	100	36	0	36
	200	-	-	-
Total	30	0	0	0
	60	54	0	54
	100	193	0	193
	200	16	1	15
	Total	263	1	262

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	4	36	0	4	2	4	6	44
Gastropods	0	0	0	0	0	4	0	0	0	4
Hydrozoans	0	0	2	0	0	0	0	0	2	0
Pelecypods	0	5	0	11	0	0	0	0	0	16
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	18	-	12	-	0	-	32
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	3	-	0	-	0	-	0	-	3
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0
Crustacean Appendages	-	0	-	0	-	0	-	1	-	1

Total Faunal Content:- 109
Living:- 9
Dead:- 100

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	232	72.9
Lithoclasts	46	14.5
Bioclasts	40	12.6
	(318)	

Sample: CB.371

Date: 21.9.63

Time: 17.26 hours

Location: Decca Fix: Red F1.05
Green D43.51

Depth: 60'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	3	0	3
	100	4	0	4
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	122	0	122
	100	84	0	84
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
BULIMINA marginata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	17	0	17
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	49	0	49
	100	412	4	408
	200	-	-	-
LAGENA sulcata var.spirata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	13	0	13
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	9	0	9
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	49	0	49
	100	128	4	124
	200	-	-	-
REOPHAX fusiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
REOPHAX subfusiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	30	0	30
	100	48	0	48
	200	-	-	-
Total	30	-	-	-
	60	310	0	310
	100	716	8	708
	200	-	-	-
	Total	1026	8	1018

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	19	110	4	44	0	16	23	170
Gastropods	0	3	0	6	0	0	0	0	0	9
Hydrozoans	7	1	8	3	0	0	0	0	15	4
Pelecypods	1	36	2	57	12	0	0	0	15	93
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	9	-	50	-	20	-	0	-	79
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	3	0	12	4	0	0	15	4
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	5	-	15	-	0	-	0	-	20
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 448
Living:- 69
Dead:- 379

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	224	74.6
Lithoclasts	38	12.7
Bioclasts	38	12.7
	(300)	

Sample: CB.372

Date: 21.9.63

Time: 17.58 hours

Location: Decca Fix: Red E23.51
Green D44.41

Depth: 64'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	10	0	10
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	3	0	3
	200	-	-	-
Total	30	0	0	0
	60	13	0	13
	100	3	0	3
	200	0	0	0
	Total	21	0	21

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	4	1	9	0	0	1	13
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	0	0	0	0	0	0	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	16	-	6	-	23
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 39
Living:- 1
Dead:- 38

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	288	91.7
Lithoclasts	20	6.4
Bioclasts	6	1.9
	(314)	

Reophax subfusiformis Earland emend.Hoglund 1947

Pl.2, figs. 3a,3b.

1894	Pars Reophax Scorpiurus GOES	Svensk.Vet.Akad.Handl.Stockholm N.F.Bd.25,No.9,p.25,pl.6,figs. 166-167.
1933	Reophax subfusiformis EARLAND	Disc.Repts.Vol.7,p.74,pl.2, figs.16-19.
1945	Reophax subfusiformis Earland	CUSHMAN.Proc.Am.Phil.Soc.Vol.89, No.1,p.285,figs.4,5.
1947	Reophax subfusiformis(Earland)	HOGLAND.Zool.Bidrag.Fran.Uppsala. Bd.26,p.82,pl.9,figs.1-4,pl.26, figs.1-36,pl.27,figs.1-19, text figs.43-50.
1964	Reophax subfusiformis Earland	FEYLING-HANSSEN. Nordes Geol. Undersokelse Nr.225,p.223,pl.1, figs.12-15.

Test free, uniserial, elongate, composed of two chambers in a slightly curved linear series, chambers increasing rapidly in size as added, the second chamber being twice the size of the initial chamber. Chambers moderately adpressed to each other with a distinct marked, impressed suture between them. Ultimate chamber fusiform with a tubular prolongation, the terminal aperture situated at the end of this prolongation, a simple, circular opening, set slightly to one side of the ultimate chamber. Wall agglutinated with medium to coarse material, with little cement, fairly rough.

Dimensions: Length 0.50 mm. Maximum diameter 0.20 mm.

Occurrence: Dead CB.343, CB.360, CB.368, CB.371, CB.402, CB.403.

Distribution: This species was recorded from the Mer Celtique by Le Calvez in 1958, who listed localities, south of Ireland, west of France, and from the English Channel.

Sample: CB.373

Date: 21.9.63

Time: 18.30 hours

Location: Decca Fix: Red E22.35
Green D47.05

Depth: 55'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	133	6	127
	100	248	0	248
	200	8	0	8
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
BULIMINA marginata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
BULIMINELLA elegantissima	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
DISCORBIS bradyi	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	128	0	128
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	80	0	80
	200	4	0	4
ELPHIDIUM selseyense	30	-	-	-
	60	58	0	58
	100	112	0	112
	200	36	0	36
FISSURINA marginata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
PLANORBULINA mediterranensis	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	55	0	55
	100	151	0	151
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	9	0	9
	100	40	0	40
	200	-	-	-
Total	30	2	0	2
	60	276	6	270
	100	1855	0	1855
	200	60	0	60
	Total	2193	6	2187

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	20	56	8	104	0	8	28	168
Gastropods	0	3	0	6	0	0	0	0	0	9
Hydrozoans	0	0	0	8	0	0	0	0	0	8
Pelecypods	1	22	4	86	8	8	0	0	13	116
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	3	-	186	-	151	-	0	-	340
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	1	10	0	0	0	0	0	10	1
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	5	-	86	-	0	-	0	-	91
Echinoid Plates	-	4	-	0	-	0	-	0	-	4
Annelids	0	0	4	0	0	0	0	0	4	0

Total Faunal Content:- 792
Living:- 55
Dead:- 737

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	275	79.7
Lithoclasts	20	5.9
Bioclasts	50	14.4
	(345)	

Sample: CB.374

Date: 21.9.63

Time: 19.00 hours

Location: Decca Fix: Red F0.00
Green D46.56

Depth: 55'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	122	0	122
	100	192	8	184
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	24	0	24
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	40	8	32
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	96	0	96
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	14	0	14
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	120	0	120
	200	24	0	24
ELPHIDIUM macellum	30	-	-	-
	60	5	0	5
	100	8	0	8
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	48	0	48
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	82	0	82
	100	1320	0	1320
	200	48	0	48

Specimen	Grade	Total Number	Living	Dead
BOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
LAGENA sulcata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	12	0	12
	100	32	0	32
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	30	0	30
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	0	2
	100	16	0	16
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	9	0	9
	100	16	0	16
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	66	0	66
	100	192	0	192
	200	8	0	8
SPIROLOCULINA subimpressa	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	16	0	16
	100	48	0	48
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	380	0	380
	100	2362	16	2346
	200	104	0	104
	Total	2846	16	2830

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	32	156	0	220	8	0	40	376
Gastropods	0	2	0	8	0	0	0	0	0	10
Hydrozoans	1	2	10	6	0	0	0	0	11	8
Pelecypods	1	60	12	142	0	0	8	0	21	202
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	27	-	590	-	140	-	16	-	773
Mussels	0	4	0	6	0	0	0	0	0	10
Crustaceans (exl.Ostracods)	0	0	6	0	0	0	0	0	6	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	18	-	76	-	0	-	0	-	94
Echinoid Plates	-	10	-	0	-	0	-	0	-	10
Annelids	3	0	2	0	0	0	0	0	5	0
Sponge Spicules	-	0	-	4	-	0	-	0	-	4

Total Faunal Content:- 1570
Living:- 83
Dead:- 1487

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	232	71.2
Lithoclasts	22	6.7
Bioclasts	72	22.1
	(326)	

Sample: CB.375

Date: 22.9.63

Time: 11.30 hours

Location: Decca Fix: Red E15.9
Green E31.96

Depth: 11'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	0	0	0
	60	2	0	2
	100	0	0	0
	200	0	0	0
	Total	2	0	2

In 1933 Earland recorded this form from the Drygalski Fjord, South Georgian Island, and from the South Atlantic, and in 1934 noted it as being generally distributed in the Falklands sector of the Antarctic. An Antarctic occurrence was also noted by Cushman 1945, as few from the Neny Fjord. Hoglund in 1947 noted it in the Gullmar Fjord and Skagerak, Parr in 1950 from the Antarctic, and Uchio 1960 from San Diego, California.

Stratigraphic Occurrence: Crouch 1954 in examination of a core from the San Pedro Shelf recorded a Miocene occurrence of this species as rare, and also a few from the Recent portion of the core. Risdal in 1963 recorded it from a core from the Inner Oslo Fjord, and Feyling-Hanssen 1964 also recorded it from this area as rare in the Late Quaternary.

Diagnosis: This species inhabits a similar environment to the allied form Reophax fusiformis, although it does appear to be more tolerant of more temperate and warmer waters.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	0	0	0	0	0	1	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	frags		0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 1
Living:- 1
Dead:- 0

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	164	53.9
Lithoclasts	118	38.8
Bioclasts	22	7.3
	(304)	

Sample: CB.376

Date: 22.9.63

Time: 11.35 hours

Location: Decca Fix: Red E15.45
Green E32.12

Depth: 24'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	39	0	39
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum	30	2	0	2
	60	25	0	25
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	1	0	1
MASSILINA secans	30	18	0	18
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	13	0	13
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	4	0	4
	60	34	0	34
	100	1	0	1
	200	-	-	-
Aberrent Form	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
Total	30	25	0	25
	60	118	0	118
	100	6	0	6
	200	1	0	1
	Total	150	0	150

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	3	32	11	1	0	0	0	0	14	33
Gastropods	0	43	0	16	0	1	0	0	0	60
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	82	0	2	0	0	0	0	0	84
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	6	-	15	-	1	-	0	-	22
Mussels	0	25	0	4	0	0	0	0	0	29
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	1	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	17	-	0	-	1	-	0	-	18
Crustacean Appendages	-	1	-	0	-	0	-	0	-	1
Fish Bones	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 264
Living:- 15
Dead:- 249

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	264	70.6
Lithoclasts	74	19.8
Bioclasts	36	9.6
	(374)	

Sample: CB.377

Date: 22.9.63

Time: 11.48 hours

Location: Decca Fix: Red E14.75
Green E31.72

Depth: 14'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	25	0	25
	100	9	0	9
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
Total	30	0	0	0
	60	37	0	37
	100	9	0	9
	200	0	0	0
	Total	46	0	46

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	1	0	0	0	0	1	1
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	frags	1	0	0	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	2	-	0	-	0	-	2
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 6
Living:- 1
Dead:- 5

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	340	82.9
Lithoclasts	58	14.1
Bioclasts	12	3.0
	(410)	

Sample: CB.378

Date: 22.9.63

Time: 11.53 hours

Location: Decca Fix: Red E14.25
Green E32.04

Depth: 20'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	18	0	18
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	0	0	0
	60	19	0	19
	100	0	0	0
	200	0	0	0
	Total	19	0	19

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	2	0	0	0	0	0	3
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	3	0	0	0	0	0	0	0	3
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	frags		0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	0	0	0	0	0	0	0	0	0	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 6
Living:- 0
Dead:- 6

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	258	84.3
Lithoclasts	38	12.4
Bioclasts	10	3.3
	(306)	

Sample: CB.379

Date: 22.9.63

Time: 12.17 hours

Location: Decca Fix: Red E16.35
Green E31.47

Depth: 38'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	-	-	-
	100	72	0	72
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
BULIMINA marginata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	4	0	4
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	76	4	72
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	4	0	4
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	2	0	2
	100	12	0	12
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	11	0	11
	100	220	4	216
	200	-	-	-
	Total	231	4	227

Family: Rzehakinidae Cushman 1933

Genus: Miliammina Heron-Allen and Earland 1930

Miliammina fusca (Brady) 1870

Pl.2, figs.8a,8b,8c.

1870	Quinqueloculina fusca	BRADY	Ann.Mag.Nat.Hist.Ser 4,Vol.6, p.47,pl.11,figs.2-3.
1930	Quinqueloculina fusca	Brady	CUSHMAN and VALENTINE.Contr.Dept. Geol.Stanford Univ.Vol.1,No.1, p.9,pl.1,fig.6.
1931	Quinqueloculina fusca	Brady	COLE.Florida State Geol.Survey Bull.No.6,p.20,pl.1,fig.13.
1947	Quinqueloculina fusca	Brady	CUSHMAN and TODD.Contr.Cush. Found Foram.Res.Sp.Pub.no.21, p.5,6,pl.1,fig.17.
1948	Quinqueloculina fusca	Brady	CUSHMAN.Contr.Cush.Found Foram. Res.Sp.Pub.no.23,p.33,34,pl.3, figs.16,17.
1950	Miliammina fusca	(Brady)	PHLEGER and WALTON.Am.Journ.Sci. Vol.248,p.280,pl.1,fig.19.
1951	Quinqueloculina fusca	Brady	VOORTHUYSEN.Med.Geol.Stichting. n.s.,No.5,p.24,25,pl.1,fig.5.
1951	Quinqueloculina fusca	Brady	VOORTHUYSEN.Proc.3rd.,Int.Cong. Sed.Neder.p.270,pl.1,fig.5.
1952	Miliammina fusca	(Brady)	PARKER.Bull.Mus.Comp.Zool.Vol.106, no.9,p.404,405,pl.3,figs.15,16.
1952	Miliammina fusca	(Brady)	PARKER.Bull.Mus.Comp.Zool.Vol.106, no.10,p.452,pl.2,fig.6.
1953	Miliammina fusca	(Brady)	MILLER Jr.Contr.Cush.Found Foram. Res.Vol.4,pt.2,p.51,pl.7,fig.10.
1953	Miliammina fusca	(Brady)	PARKER,PHLEGER and PEIRSON.Contr. Cush.Found Foram.Res.Sp.Pub.no.2, p.10,pl.1,figs.40,41.
1954	Quinqueloculina fusca	Brady	BOLTOVSKOY.Mus.Arg.de Ciencias Nat.Geol.Tomo 3,no.3,p.123,pl.1, fig.12.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	19	4	44	0	8	6	71
Gastropods	0	0	0	4	0	0	0	0	0	4
Hydrozoans	0	0	1	1	0	0	0	0	1	1
Pelecypods	1	1	1	19	0	20	0	0	2	40
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	24	-	56	-	0	-	82
Mussels	0	2	0	9	0	0	0	0	0	11
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish?	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 218
Living:- 9
Dead:- 209

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	315	79.7
Lithoclasts	55	13.9
Bioclasts	25	6.4
	(395)	

Sample: CB.380

Date: 22.9.63

Time: 12.25 hours

Location: Decca Fix: Red E16.8
Green E31.0

Depth: 50'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	20	5	15
	100	148	4	144
	200	8	0	8
BOLIVINA variablis	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	20	0	20
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	88	0	88
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	68	0	68
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	48	0	48
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	4	0	4
	100	344	0	344
	200	24	0	24
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
LAGENA sulcata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
LAGENA sulcata var.spirata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	64	0	64
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8
PLANORBULINA mediterranensis	30	-	-	-
	60	4	0	4
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	3	1	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	11	0	11
	100	76	0	76
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
TROCHAMMINA inflata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	21	0	21
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	76	6	70
	100	968	4	964
	200	40	0	40
	Total	1084	10	1074

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	7	55	144	992	0	16	151	1063
Gastropods	0	1	0	1	0	1	0	0	0	3
Hydrozoans	2	0	0	0	0	0	0	0	2	0
Pelecypods	4	7	5	37	16	144	0	0	25	188
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	98	-	688	-	24	-	810
Mussels	0	8	0	29	0	32	0	0	0	69
Crustaceans (exl.Ostracods)	0	0	0	0	16	0	0	0	16	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	0	0	0	0	0	0	2	0
Fish Bones	-	2	-	10	-	0	-	0	-	12

Total Faunal Content:- 1441
Living:- 196
Dead:- 1245

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	232	67.1
Lithoclasts	78	22.5
Bioclasts	36	10.4
	(346)	

Sample: CB.381

Date: 22.9.63

Time: 12.37 hours

Location: Decca Fix: Red E17.5
Green D47.51

Depth: 65'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	44	0	44
	100	132	0	132
	200	8	0	8
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	36	0	36
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	1	0	1
	100	60	0	60
	200	24	0	24

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	40	0	40
	100	492	0	492
	200	96	0	96
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	12	0	12
	200	-	-	-
OOLINA williamsoni	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
PATELLINA corrugata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA seminulum	30	-	-	-
	60	19	0	19
	100	24	1	23
	200	8	0	8
VERNEUILINA media	30	-	-	-
	60	18	0	18
	100	48	0	48
	200	8	0	8
Total	30	0	0	0
	60	126	0	126
	100	1140	1	1139
	200	145	0	145
	Total	1411	1	1410

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	3	19	0	216	0	8	3	243
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	1	0	0	0	0	0	0	0	1
Pelecypods	0	13	1	18	0	0	0	0	1	31
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	4	-	105	-	204	-	0	-	313
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	1	0	0	0	0	0	2	0
Fish Bones	-	0	-	9	-	0	-	0	-	9

Total Faunal Content:- 603
Living:- 6
Dead:- 597

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	236	62.1
Lithoclasts	70	18.4
Bioclasts	74	19.5
	(380)	

Sample: CB.382

Date: 22.9.63

Time: 13.00 hours

Location: Decca Fix: Red E20.00
Green D45.80

Depth: 68'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ACERVULINA inhaerens	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	65	1	64
	100	100	2	98
	200	4	0	4
BOLIVINA variablis	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
BULIMINA marginata	30	-	-	-
	60	-	-	-
	100	2	1	1
	200	-	-	-

1954 Miliammina fusca (Brady) PHLEGER.Bull.A.A.P.G.Vol.38,No.4, p.642,pl.2,figs.22,23.

1955 Miliammina fusca (Brady) RONAI.Contr.Cush.Found Foram.Res. Vol.6,Pt.4,p.143,pl.20,fig.7.

1955 Miliammina fusca (Brady) WALTON.Journ.Pal.Vol.29,no.6,p.1010, pl.100,figs.12,13.

1957 Miliammina fusca (Brady) LEHMANN.Micropaleontology.Vol.3, No.4,p.346,pl.1,figs.10,11.

1957 Miliammina fusca (Brady) TODD and BRONNIMAN.Contr.Cush.Found Foram.Res.Sp.Pub.no.3,p.26,pl.3,fig.1.

1958 Miliammina cf.fusca(Brady) SAUNDERS.Micropaleontology Vol.4,No.1, p.86,pl.1,fig.9.

1959 Miliammina fusca (Brady) LANKFORD.Bull A.A.P.G.Vol.43,No.9, pl.1,fig.18.

1959 Miliammina fusca (Brady) PARKER and ATHEARN.Journ.Pal.Vol.33, No.2,p.340,pl.50,figs.11.12.

1960 Miliammina fusca (Brady) PHLEGER.Bull.A.A.P.G.Vol.44,pl.4,fig.16.

1961 Miliammina fusca (Brady) TODD and LOW.Contr.Cush.Found Foram. Res.Vol.12,Pt.1,p.14,pl.1,fig.6.

1962 Miliammina fusca (Brady) McKENZIE.Journ.Roy.Soc.W'n.Aust.Vol.45, Pt.4,p.119,pl.1,fig.1.

1963 Miliammina fusca (Brady) AYALA-CASTANARES.Univ.Nac.Autonoma de Mexico Inst.Geol.Bol.no.67,Pt.3,p.47, pl.1,figs.1a-c.

1963 Miliammina fusca (Brady) BOLTOVSKOY.Contr.Cush.Found Foram.Res. Vol.14,Pt.2,p.63,pl.7,fig.5.

1964 Miliammina fusca (Brady) FEYLING-HANSSEN.Nordes Geol.Undersokelse Nr.225,p.224,225,pl.2,figs.1,2.

Test free, elongate-ovate in outline, two and a half times as long as broad, compressed, oval in transverse section, basal and rounded, apertural end very slightly produced, periphery rounded. Chambers distinct, quinqueloculine, elongate, four visible on one side and three on the other. Sutures distinct, impressed. Aperture terminal, simple, circular, with the inner edge involded to form a tooth. Wall agglutinated with very fine arenaceous material, matte, siliceous, green-brown in colour.

Specimen	Grade	Total Number	Living	Dead
BULIMINELLA elegantissima	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	23	0	23
	200	4	0	4
ELPHIDIUM excavatum	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	7	0	7
	200	8	0	8
ELPHIDIUM selseyense	30	-	-	-
	60	24	0	24
	100	203	0	203
	200	20	0	20
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
NONIONELLA turgida	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	38	0	38
	100	99	0	99
	200	-	-	-
Total	30	-	-	-
	60	131	1	130
	100	452	3	449
	200	37	0	37
	Total	620	4	616

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	11	3	10	2	34	0	12	5	67
Gastropods	0	1	0	0	0	0	0	0	0	1
Hydrozoans	1	3	0	0	0	0	0	0	1	3
Pelecypods	0	2	0	3	0	0	0	0	0	5
Bryozoans	2	1	0	0	0	0	0	0	2	1
Echinoid spines	-	5	-	53	-	45	-	0	-	103
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	3	0	10	0	0	0	13	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	4	0	1	0	0	0	0	0	5	0
Fish Bones	-	1	-	4	-	0	-	0	-	5

Total Faunal Content:- 211
Living:- 26
Dead:- 185

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	138	43.4
Lithoclasts	108	33.9
Bioclasts	72	22.7
	(318)	

Sample: CB.383

Date: 22.9.63

Time: 13.25 hours

Location: Decca Fix: Red E21.44
Green D45.51

Depth: 60'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	2	0	2
	60	33	0	33
	100	22	0	22
	200	-	-	-
ELPHIDIUM discoidale	30	2	0	2
	60	-	-	-
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	3	0	3
	60	12	0	12
	100	59	0	59
	200	7	0	7
VERNEUILINA media	30	-	-	-
	60	14	0	14
	100	24	0	24
	200	-	-	-
Total	30	7	0	7
	60	59	0	59
	100	105	0	105
	200	7	0	7
	Total	178	0	178

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	1	1	3	0	2	0	0	1	6
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	6	-	24	-	1	-	0	-	31
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	0	-	3	-	0	-	0	-	3

Total Faunal Content:- 41
Living:- 1
Dead:- 40

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	130	38.2
Lithoclasts	130	38.2
Bioclasts	80	23.6
	(340)	

Sample: CB.384

Date: 22.9.63

Time: 13.47 hours

Location: Decca Fix: Red E20.45
Green D47.84

Depth: 64'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	69	0	69
	100	112	0	112
	200	16	0	16
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	1	0	1
	100	32	0	32
	200	8	0	8
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	176	0	176
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	3	0	3
	100	96	0	96
	200	8	0	8
ELPHIDIUM selseyense	30	-	-	-
	60	69	1	68
	100	848	0	848
	200	48	0	48
MILIOLINELLA subrotunda	30	-	-	-
	60	12	0	12
	100	32	0	32
	200	-	-	-
NONION boueana	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
OOLINA patannae	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
PLANORBULINA mediterranensis	30	-	-	-
	60	11	0	11
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	34	0	34
	100	32	0	32
	200	8	0	8
REOPHAX artica	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
SPIROPTHALMIDIUM acutimargo	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	30	0	30
	100	32	0	32
	200	8	0	8
Total	30	-	-	-
	60	245	1	244
	100	1395	0	1395
	200	96	0	96
	Total	1736	1	1735

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	12	56	24	144	0	32	36	232
Gastropods	0	2	0	2	0	8	0	0	0	12
Hydrozoans	3	0	10	10	0	0	0	0	13	10
Pelecypods	0	10	6	54	8	24	0	0	14	88
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	9	-	276	-	56	-	8	-	349
Mussels	0	3	0	18	0	0	0	0	0	21
Crustaceans (Exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	9	-	66	-	0	-	0	-	75
Echinoid plates	-	3	-	2	-	0	-	0	-	5

Total Faunal Content:- 855
Living:- 63
Dead:- 792

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	288	79.6
Lithoclasts	24	6.6
Bioclasts	50	13.8
	(362)	

Samplo: CB.385

Dato: 22.9.63

Timo: 14.10 hours

Location: Decca Fix: Red E19.29
Green E30.56

Depth: 62'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	80	1	79
	100	72	0	72
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	32	0	32
	200	16	0	16
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
DISCORBIS williamsoni	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	-	-	-

Dimensions: Length 0.47 mm. Width 0.25 mm, Thickness 0.12 mm.

Occurrence: Dead. CB.346,CB.347,CB.621,CB.626,CB.629,CB.638, CB.640,CB.641,CB.642.

Dead. Variation sample CB.696.

Morphological remarks: Heron-Allen and Earland in 1930 commenting on the genus Miliammina stated that it is evidently closely related to the Upper Cretaceous Silicosigmoilina Cushman-Church, that the chambers are on a sigmoiline plan and that it is apparently isomorphous with Sigmoilina in the porcellaneous group except for its simple aperture which lacks the tooth found in the calcareous genus. They then referred this genus to the Silicinidae. The same authors state again in 1930 that in the tests of the Silicinidae there are but two layers, chitinous and sandy. Ronai in 1955 commented on the texture of the test wall stating that it was variable, ranging from coarse to fine. Loeblich and Tappan 1964 state that the siliceous nature of the test wall makes it insoluble in hydrochloric acid. The Tremadoc Bay specimens were given this acid test and found to comply with the above statement.

Distribution: (Text - fig.17A) Brady in 1870 stated that this species occurred in brackish waters off the British Isles, and in the same year gave the following localities, 'River Aln', Clyde, River Coquet, River Wansbeck, Seaton Sluice, River Wear, River Tees, Islay, Hinckling Broad, Yarmouth, Portree Harbour, and Westport, Ireland. It was recorded from the Firth of Clyde by

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	3	0	3
	100	128	0	128
	200	8	0	8
ELPHIDIUM excavatum	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	9	0	9
	100	24	0	24
	200	16	0	16
ELPHIDIUM magellanicum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	75	0	75
	100	880	0	880
	200	152	0	152
LAGENA sulcata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
LAGENA sulcata var.spirata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	5	0	5
	100	32	0	32
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	12	0	12
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA cliarensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	30	1	29
	100	16	0	16
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	23	0	23
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	271	2	269
	100	1232	0	1232
	200	208	0	208
	Total	1712	2	1710

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	20	80	0	200	0	8	20	288
Gastropods	0	2	0	0	0	0	0	0	0	2
Hydrozoans	0	1	0	0	0	0	0	0	0	1
Pelecypods	1	5	10	125	0	0	0	0	11	130
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	10	-	715	-	16	-	48	-	789
Mussels	0	3	0	10	0	0	0	0	0	13
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	5	-	365	-	0	-	0	-	370
Echinoid plates	-	2	-	5	-	0	-	0	-	7

Total Faunal Content:- 1631
Living:- 31
Dead:- 1600

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	362	73.9
Lithoclasts	44	8.9
Bioclasts	84	17.2
	(490)	

Sample: CB.386

Date: 22.9.63

Time: 14.35 hours

Location: Decca Fix: Red E17.74
Green E31.74

Depth: 58'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	22	0	22
	100	96	0	96
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
DISCORBIS malovensis var. nudiformis	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	120	0	120
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	4	0	4
	100	48	0	48
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	15	0	15
	100	696	0	696
	200	40	0	40
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	4	0	4
	100	16	0	16
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	5	0	5
	100	24	0	24
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
PLANORBULINA mediterranensis	30	-	-	-
	60	6	0	6
	100	16	0	16
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	6	0	6
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	8	0	8
	100	32	0	32
	200	8	0	8
TRILOCULINA dubia	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	16	0	16
	100	40	0	40
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	0	0	0
	60	99	0	99
	100	1211	0	1211
	200	48	0	48
	Total	1358	0	1358

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	11	86	16	120	0	24	27	230
Gastropods	0	7	0	2	0	8	0	8	0	25
Hydrozoans	0	0	1	5	0	8	0	0	1	13
Pelecypods	2	32	6	52	0	32	0	0	8	116
Bryozoans	1	1	0	0	0	0	0	0	1	1
Echinoid spines	-	17	-	90	-	120	-	40	-	267
Mussels	1	44	0	12	0	0	0	0	1	56
Crustaceans (exl.Ostracods)	0	2	1	0	0	0	0	0	1	2
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	6	-	0	-	0	-	0	-	6
Fish Bones	-	4	-	24	-	0	-	0	-	28

Total Faunal Content:- 783
Living:- 39
Dead:- 744

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	256	78.5
Lithoclasts	34	10.4
Bioclasts	36	11.1
	(326)	

Sample: CB.387

Date: 22.9.63

Time: 14.53 hours

Location: Decca Fix: Red E16.56
Green E32.57

Depth: 48'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	37	0	37
	100	84	0	84
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	1	0	1
	100	20	0	20
	200	16	0	16
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	1	0	1
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	13	0	13
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	28	0	28
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	12	0	12
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	22	0	22
	100	336	0	336
	200	24	0	24
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
GLOBULINA gibba	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	6	0	6
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	1	0	1
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	12	0	12
	200	-	-	-

Robertson in 1875, and as rather rare from the River Dee by Sidall in 1876. This form was noted as rare in the River Mersey (Burgess 1891), as common in Portree Bay, Isle of Skye (Robertson 1892), and was listed as occurring in the Irish Sea by the British Association in 1896. Heron-Allen and Earland in 1909 and 1911 recorded the occurrence of this species from the shore sands of Selsey Bill, Sussex, and as never common from the Clare Island region in 1913, when they stated that it is noticeable that the majority of the records are from stations at which the salinity would probably be below the normal, owing to the influx of fresh water. The species was recorded as very rare from 20 fathoms off the Isle of Man by Heron-Allen in 1915, and in 1916 Heron-Allen and Earland recorded it as very rare west of Scotland, and from the shore sands and shallow water zone of the South coast of Cornwall where this species is frequent and finely developed, and the same authors in 1930 noted one specimen from the Plymouth district. The Marine Biological Association in 1957 recorded the species from one station in the Plymouth area. A Mer Celtique occurrence west of the Cornish peninsular was recorded by Le Calvez in 1958, and one specimen was recorded from the Isle of Man and surrounding areas by Bruce, Colman and Jones in 1963.

This species was recorded as rare, but large and well developed from the Lord Howe Island in the South Pacific in 1923 by Heron-Allen and Earland. Cushman and Valentine 1930 recorded

Specimen	Grade	Total Number	Living	Dead
OOLINA williamsoni	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	35	0	35
	100	28	0	28
	200	-	-	-
SPIRILLINA vivipara	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	21	0	21
	100	12	0	12
	200	-	-	-

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	1	2	15	81	12	124	0	8	28	215
Gastropods	0	2	0	5	0	2	0	0	0	9
Hydrozoans	0	0	0	14	0	0	0	0	0	14
Pelecypods	8	54	12	70	0	20	0	0	20	144
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	17	-	122	-	142	-	0	-	281
Mussels	0	10	0	1	0	0	0	0	0	11
Crustaceans (exl.Ostracods)	1	0	2	0	0	0	0	0	3	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	6	-	15	-	8	-	0	-	29
Echinoid Plates	-	4	-	0	-	0	-	0	-	4
Fish Teeth	-	1	-	0	-	0	-	0	-	1
Annelids	0	0	1	0	0	0	0	0	1	0

Total Faunal Content:- 760
Living:- 52
Dead:- 708

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	252	72.8
Lithoclasts	42	12.1
Bioclasts	52	15.1
	(346)	

Sample: CB.388

Date: 22.9.63

Time: 15.11 hours

Location: Decca Fix: Red E15.84
Green E35.1

Depth: 24'6"

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	4	0	4
	100	12	0	12
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	4	0	4
	100	8	0	8
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	2	0	2
	60	12	0	12
	100	56	0	56
	200	-	-	-
	Total	70	0	70

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	8	0	12	0	0	0	20
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	1	0	0	0	0	0	1
Pelecypods	0	6	1	2	0	0	0	0	1	8
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	6	-	8	-	0	-	14
Mussels	0	4	0	3	0	0	0	0	0	7
Crustaceans (exl.Ostracods)	0	0	5	0	0	0	0	0	5	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 56
Living:- 6
Dead:- 50

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	234	75.5
Lithoclasts	44	14.2
Bioclasts	32	10.3
	(310)	

Sample: CB.389

Date: 22.9.63

Time: 15.36 hours

Location: Decca Fix: Red E18.16
Green E33.42

Depth: 30'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	15	0	15
	100	20	0	20
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
GUTTULINA lactea	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	3	0	3
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	29	0	29
	100	40	0	40
	200	-	-	-
	Total	69	0	69

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	7	0	4	0	0	1	11
Gastropods	0	2	0	2	0	0	0	0	0	4
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	13	0	6	0	4	0	0	0	23
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	4	-	0	-	0	-	4
Mussels	0	1	0	0	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	2	-	0	-	0	-	0	-	2
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 47
Living:- 2
Dead:- 45

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	270	79.4
Lithoclasts	45	13.2
Bioclasts	25	7.4
	(340)	

Sample: CB.390

Date: 22.9.63

Time: 15.55 hours

Location: Decca Fix: Red E18.89
Green E33.61

Depth: 30'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	13	0	13
	100	8	0	8
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
DISCORBIS malovensis var. nudiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	3	0	3
	60	18	0	18
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
MASSILINA secans	30	3	0	3
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	5	0	5
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	7	0	7
	100	14	0	14
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	4	0	4
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	10	0	10
	100	17	0	17
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

it from shallow water around the channel islands of Southern California, and Natland in 1933 also recorded it from this area. Hedberg in 1934 stated that this species occurs Recent and Fossil in Venezuela, and records one interesting occurrence in tap water at the Venezuela Gulf Terminal. It was recorded from the Island of Ceram in 1946 by Rutten and Hotz, from off the Washington coast by Cushman and Tood 1947, and from North East Greenland by Cushman in 1948. Phleger and Walton in 1950 examined the distribution of this species from Barnstable, Massachussetts, and stated that it occurred almost entirely in the harbour area, with a few specimens in the Bay, and that the greatest frequency was encountered on the high marsh. In 1951 an occurrence in Narragansett Bay was noted by Said, and in the Netherlands Wadden Sea by Voorthuysen. In 1952 Parker found this species only at the nearshore stations in the Portsmouth(N.H) area, and also in the Long Island Sound - Buzzards Bay area. The author recorded the following ecologic data for this species in this area, temperature range 1 - 21°C, salinity range 25 - 30‰ and went on to state that occurrences at nearshore stations are caused by outwash from marshes. Phleger 1952 also recorded this species from the Portsmouth (N.H) area, where it occurred at seven stations in the nearshore sand area and noted that all occurrences are from off the mouth of the Merrimack River. In 1953 the species was recorded from one station in Mason Inlet,

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	11	0	11
	60	70	0	70
	100	49	0	49
	200	0	0	0
	Total	130	0	130

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	7	14	8	16	0	0	15	30
Gastropods	0	4	0	8	0	0	0	0	0	12
Hydrozoans	0	0	0	6	0	8	0	0	0	14
Pelecypods	2	13	1	13	0	8	0	0	3	34
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	23	-	16	-	0	-	41
Mussels	0	6	0	2	0	0	0	0	0	8
Crustaceans (exl.Ostracods)	1	0	0	0	4	0	0	0	5	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 163
Living:- 24
Dead:- 139

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	244	78.7
Lithoclasts	28	9.0
Bioclasts	38	12.3
	(310)	

Sample: CB.391

Date: 22.9.63

Time: 16.10 hours

Location: Decca Fix: Red E19.89
Green E31.94

Depth: 38'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	22	0	22
	100	16	0	16
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	11	0	11
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	4	0	4
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	21	0	21
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	3	0	3
	60	27	0	27
	100	8	0	8
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	9	0	9
	60	93	0	93
	100	72	0	72
	200	-	-	-
	Total	174	0	174

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	7	20	8	0	0	0	15	20
Gastropods	0	5	0	11	0	4	0	0	0	20
Hydrozoans	0	0	0	5	0	0	0	0	0	5
Pelecypods	0	18	4	19	0	16	0	0	4	53
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	8	-	12	-	0	-	22
Mussels	0	5	0	8	0	0	0	0	0	13
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	3	0	1	0	0	0	0	0	4	0
Echinoid plates	-	1	-	1	-	0	-	0	-	2
Fish Bones	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 161
Living:- 25
Dead:- 136

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	280	81.4
Lithoclasts	38	11.0
Bioclasts	26	7.6
	(344)	

Sample: CB.392

Date: 22.9.63

Time: 16.30 hours

Location: Decca Fix: Red E20.7
Green E31.9

Depth: 33'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	21	0	21
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	2	0	2
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	3	0	3
	60	48	0	48
	100	-	-	-
	200	-	-	-
	Total	51	0	51

GENERAL FAUNA

Grado	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	1	0	0	0	0	2	1
Gastropods	0	3	0	8	0	0	0	0	0	11
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	5	0	9	0	0	0	0	0	14
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	3	-	0	-	0	-	3
Mussels	0	2	0	0	0	0	0	0	0	2
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 35
Living:- 3
Dead:- 32

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	252	79.2
Lithoclasts	42	13.2
Bioclasts	24	7.6
	(318)	

Sample: CB.393

Date: 22.9.63

Time: 16.50 hours

Location: Decca Fix: Red E20.51
Green E33.52

Depth: 26'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	10	1	9
	100	-	-	-
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
GUTTULINA lactea	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-

North Carolina by Miller, from Great Pond, East Falmouth, Massachussetts, by Said, and from the Matagorda Island marsh stations, and Grassy Island marsh, in San Antonio Bay, south west Texas by Parker, Phleger and Peirson. Boltovskoy in 1954 recorded the species off Argentina in the Gulf of San Jorge, and in the same year, Phleger noted it in the Mississippi Sound area where the species was characteristic of both the marsh and the estuary facies. He stated that in these environments this form was the dominant species in most samples, averaging 30 - 50% of the faunas. He also noted that this species occurred in a fringe like distribution in Mississippi Sound bordering the mainland and the eastern island marshes but that it was not present in either the Lower Mississippi Sound, except in the east, or in the open gulf. It was recorded in the marsh facies of the South Eastern Mississippi Delta area by Phleger 1955, in brackish water New York Bight by Ronai 1955, and in Todos Santos Bay, where living specimens were rare, with a corresponding distribution of dead specimens (Walton 1955). The form was noted as living in the bays along the central Texas coast by Phleger in 1956. In 1957 it was noted on the Texas Gulf coast, where it comprised 1.5% of the offshore bar marsh facies, and where it was noted as rare in the mainland marsh pond facies by Lehmann; from the Central Texas bays by Phleger and Lankford; from the tidal zone mangrove area of the eastern Gulf of Paria by Todd and Bronniman,

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	2	0	2
	60	28	1	27
	100	8	0	8
	200	-	-	-
	Total	38	1	37

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	6	0	4	0	0	1	10
Gastropods	0	1	0	3	0	0	0	0	0	4
Hydrozoans	0	0	0	4	0	0	0	0	0	4
Pelecypods	1	1	0	12	0	0	0	0	1	13
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	7	-	8	-	0	-	15
Mussels	0	1	0	1	0	0	0	0	0	2
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 51
Living:- 3
Dead:- 48

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	264	80.5
Lithoclasts	38	11.6
Bioclasts	26	7.9
	(328)	

Sample: CB.394

Date: 22.9.63

Time: 17.02 hours

Location: Decca Fix: Red E21.5
Green E33.22

Depth: 26'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	28	0	28
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
GUTTULINA lactea	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	46	0	46
	100	8	0	8
	200	-	-	-
	Total	55	0	55

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	3	0	0	0	0	1	3
Gastropods	0	0	0	2	0	0	0	0	0	2
Hydrozoans	0	0	2	1	0	0	0	0	2	1
Pelecypods	0	0	2	7	0	0	0	0	2	7
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	2	-	0	-	0	-	2
Mussels	0	0	0	3	0	0	0	0	0	3
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0
Echinoid plates	-	2	-	0	-	0	-	0	-	2

Total Faunal Content:- 27
Living:- 7
Dead:- 20

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	254	83.6
Lithoclasts	28	9.2
Bioclasts	22	7.2
	(304)	

Sample: CB.395

Date: 22.9.63

Time: 17.23 hours

Location: Decca Fix: Red E23.3
Green E33.14

Depth: 28'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	12	0	12
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	2	0	2
	60	11	0	11
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
HAPLOPHRAGMOIDES canariensis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MASSILINA secans	30	10	2	8
	60	7	0	7
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	1	0	1
	60	7	0	7
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	2	0	2
	60	4	1	3
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	15	2	13
	60	55	0	55
	100	1	0	1
	200	0	0	0
	Total	71	2	69

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	3	14	13	27	7	6	0	2	23	49
Gastropods	0	9	0	4	0	0	0	0	0	13
Hydrozoans	14	17	11	19	9	8	0	0	34	44
Pelecypods	0	1	0	1	0	0	0	0	0	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	3	-	1	-	0	-	6
Mussels	0	52	0	0	0	0	0	0	0	52
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	1	-	0	-	0	-	0	-	1

Total Faunal Content:- 224
Living:- 57
Dead:- 167

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	276	80.3
Lithoclasts	48	13.9
Bioclasts	20	5.8
	(344)	

Sample: CB.396

Date: 22.9.63

Time: 17.40 hours

Location: Decca Fix: Red F0.00
Green E32.0

Depth: 34'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	20	0	20
	100	11	0	11
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	2	0	2
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	2	0	2
QUINQUELOCULINA aspera	30	-	-	-
	60	6	0	6
	100	5	0	5
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	6	0	6
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	6	0	6
	100	2	0	2
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	39	0	39
	100	22	0	22
	200	4	0	4
	Total	65	0	65

and from the Buras-Scofield Bayou region of south east Louisiana where it had an almost universal distribution by Warren.Le Calvez and Le Calvez in 1958 noted an occurrence of this species in Villefranche Bay, and in the same year Saunders recorded it from the North coast of Trinidad where it occurs in great numbers throughout the brackish water section of the Maracas Bay River. This species was recorded from the marsh, interdistributary bay, and fluvial marine environments of the East Mississippi Delta margin by Lankford in 1959, and in the same year from Poponesset Bay, Massachussetts, by Parker and Arhearn who stated that this species is an ubiquitous marsh form occurring at all stations at very high frequencies, up to 62% of the total fauna. The largest living population was found in February, the smallest in August, although it was stated that production is presumably fairly high throughout the year. In 1960 Phleger noted this form, with variants in the marsh and fluvial-marine environments of the Northern Gulf of Mexico and in the following year, 1961, Todd and Low found this species living in abundance in the brackish channels draining marshes and small ponds, and also present in areas adjacent to these more brackish environments, from Marthas Vineyard Island, Massachussetts. In 1962 the form was noted from Langeoog Island and mainland, North Sea, by Haake, from upper Florida Bay and the associated sounds by Lynts, and as common from shallow water brackish environments in Oyster Harbour, Western Australia by McKenzie. It was noted in 1963 from the Bering Sea

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	1	1	1	0	0	2	2
Gastropods	0	1	0	3	0	1	0	0	0	5
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	4	0	1	6	0	0	0	0	5	6
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	21	-	24	-	22	-	8	-	85
Mussels	0	3	0	1	0	0	0	0	0	4
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 110
Living:- 8
Dead:- 102

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	298	80.1
Lithoclasts	46	12.4
Bioclasts	28	7.5
	(372)	

Sample: CB.397

Date: 22.9.63

Time: 18.00 hours

Location: Decca Fix: Red F0.48
Green E30.5

Depth: 30'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	17	0	17
	100	8	0	8
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	30	0	30
	100	12	0	12
	200	-	-	-
	Total	42	0	42

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	12	0	0	0	0	0	13
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	9	0	0	0	0	0	11
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 25
Living:- 1
Dead:- 24

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	244	79.2
Lithoclasts	36	11.7
Bioclasts	28	9.1
	(308)	

Sample: CB.398

Date: 22.9.63

Time: 18.18 hours

Location: Decca Fix: Red F1.99
Green D45.45

Depth: 68'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	21	0	21
	100	64	0	64
	200	16	0	16
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	24	8	16
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	40	0	40
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	3	0	3
	100	24	0	24
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	120	0	120
	200	16	0	16
ELPHIDIUM macellum	30	-	-	-
	60	3	0	3
	100	24	0	24
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	40	0	40
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	9	0	9
	100	392	0	392
	200	32	0	32

Specimen	Grade	Total Number	Living	Dead
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
LAGENA sulcata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	13	0	13
	100	48	0	48
	200	16	0	16
OOLINA williamsoni	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	3	0	3
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	24	0	24
	100	112	0	112
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	12	0	12
	100	16	0	16
	200	-	-	-
Total	30	-	-	-
	60	103	0	103
	100	992	8	984
	200	80	0	80
	Total	1175	8	1167

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	1	4	83	32	208	0	16	36	308
Gastropods	0	9	0	3	0	16	0	0	0	28
Hydrozoans	0	2	2	7	16	0	0	0	18	9
Pelecypods	1	17	2	56	16	0	0	0	19	73
Bryozoans	0	1	0	0	0	0	0	0	0	1
Echinoid spines	-	5	-	154	-	96	-	32	-	287
Mussels	0	6	0	1	0	0	0	0	0	7
Crustaceans (exl.Ostracods)	0	0	0	0	8	0	0	0	8	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	8	-	20	-	0	-	0	-	28
Annelids	2	0	2	0	0	0	0	0	4	0
Echinoid plates	-	2	-	0	-	0	-	0	-	2

Total Faunal Content:- 828
Living:- 85
Dead:- 743

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	268	79.3
Lithoclasts	22	6.5
Bioclasts	48	14.2
	(338)	

Sample: CB.399

Date: 22.9.63

Time: 18.37 hours

Location: Decca Fix: Red F2.83
Green D43.71

Depth: 53'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	17	0	17
	100	8	0	8
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	13	0	13
	100	16	0	16
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

by Anderson, from the Laguna de Terminos, Campeche, Mexico, by Ayala-Castanares, as an abundant marsh species from Southern California and the Gulf of California, by Bandy, and as occurring in large numbers from Puerto Deseado, Patagonia, Argentina, by Boltovskoy. Bartlett 1964 noted it from the intertidal zone of South Eastern Nova Scotia, and Wilcoxin in the same year from off the southern Atlantic coast of the United States, where it occurred in all the depth zones, except the littoral zone in this areas, with the most concentrated occurrences from depths of 20 to 33 metres. It was recorded as living by Phleger in 1965 from the Guerrero Negro Lagoon, Baja, California.

Stratigraphic Occurrence: (Text - fig.17B) There are a number of recorded occurrences of this species from the British Holocene; from Great Crosby (Wright 1908). County Antrim, Skye, (MacFadyen 1937), English Fenlands (MacFadyen 1938), Swansea Docks (MacFadyen 1942), Borth (Adams and Haynes 1965).

It has been recorded as ranging from the Lower Miocene to the Pleistocene of Southern Florida by Schroeder and Bishop in 1954, as very rare from the Tertiary of Australia by Rao in 1955, as common in the Pliocene and Pleistocene of Florida in 1931 by Cole, from a core in the Inner Oslo Fjord by Risdal 1963, and from the Late Quaternary of Norway in 1964 by Feyling-Hanssen.

An occurrence in the Holocene of the N.O. Polder of the Netherlands was noted by Voorthuysen in 1951, and by the same author in 1960 in the Holocene of the Dollart-Ems estuary.

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	37	0	37
	100	32	0	32
	200	4	0	4
	Total	73	0	73

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	1	0	0	0	0	2	1
Gastropods	0	2	0	6	0	8	0	0	0	16
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	27	2	10	0	0	0	0	2	37
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	8	-	0	-	0	-	9
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	2	-	0	-	0	-	0	-	2
Annelids	1	0	1	0	0	0	0	0	2	0

Total Faunal Content:- 71
Living:- 6
Dead:- 65

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	280	75.3
Lithoclasts	72	19.4
Bioclasts	20	5.3
	(372)	

Sample: CB.400

Date: 22.9.63

Time: 18.55 hours

Location: Decca Fix: Red F4.02
Green D41.23

Depth: 54'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	12	0	12
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	7	0	7
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	3	1	2
	60	5	0	5
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A2'	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	3	1	2
	60	26	1	25
	100	3	0	3
	200	0	0	0
	Total	32	2	30

GENERAL FAUNA

Grade	x 30		x 60		x 100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	3	8	1	4	0	0	4	12
Gastropods	0	5	0	4	0	0	0	0	0	9
Hydrozoans	1	0	9	1	1	0	0	0	11	1
Pelecypods	1	1	1	1	0	1	0	0	2	3
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	15	-	13	-	2	-	0	-	30
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	1	0	0	0	2	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	2	-	1	-	0	-	0	-	3
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 78
Living:- 20
Dead:- 58

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	160	48.8
Lithoclasts	134	40.9
Bioclasts	34	10.3
	(328)	

Sample: CB.401

Date: 23.9.63

Time: 11.55 hours

Location: Decca Fix: Red E23.91
Green D42.22

Depth: 66'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	79	0	79
	100	112	0	112
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	3	0	3
	100	8	0	8
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	40	0	40
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	43	1	42
	100	544	0	544
	200	28	0	28
BATHYSIPHON acuta	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	26	0	26
	100	32	0	32
	200	-	-	-
Total	30	-	-	-
	60	59	3	56
	100	744	0	744
	200	28	0	28
	Total	831	3	828

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	3	56	0	73	0	0	3	129
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	1	0	0	0	0	0	1	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	3	-	51	-	48	-	0	-	102
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	1	-	0	-	0	-	0	-	1
Fish Bones	-	0	-	3	-	0	-	0	-	3
Annelids	0	0	2	0	0	0	0	0	2	0

Total Faunal Content:- 241
Living:- 6
Dead:- 235

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	190	47.9
Lithoclasts	116	29.3
Bioclasts	90	22.8
	(396)	

Sample: CB.402

Date: 23.9.63

Time: 12.20 hours

Location: Decca Fix: Red F0.00
Green D43.54

Depth: 76'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ACERVULINA inhaerens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	104	0	104
	100	76	0	76
	200	-	-	-
BOLIVINA spathulata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	4	0	4
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
DYOCIBICIDES biserialis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	4	0	4
ELPHIDIUM selseyense	30	-	-	-
	60	32	0	32
	100	68	0	68
	200	20	0	20
EOEPONIDELLA mamilla	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
LAGENA semistriata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
LAGENAMMINA laguncula	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	16	0	16
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Feyling-Hanssen 1964 stated that it occurred in the shallow water facies of the marine Holocene deposits of the Oslo Fjord area, and that it was especially frequent in sediments deposited in more or less stagnant water of reduced salinity.

Diagnosis: This brackish water, marsh inhabiting species appears to be most common in estuarine, lagoonal or deltaic environments, the main ecological factor determining its distribution being that of salinity. The salinity tolerance of this species appears to be in the range of 25 to 30% according to Parker 1952, but Ovey in 1948 stated that it can tolerate water one thirtieth the salinity of sea water. Holocene records indicate a similar environmental preference during this time.

Specimen	Grade	Total Number	Living	Dead
REOPHAX subfusiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	28	0	28
	100	28	0	28
	200	-	-	-
Total	30	0	0	0
	60	191	0	191
	100	100	0	100
	200	32	0	32
	Total	323	0	323

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	5	47	0	52	0	12	5	111
Gastropods	0	1	0	0	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	1	0	0	0	0	0	3
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	5	-	31	-	8	-	0	-	44
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 166
Living:- 6
Dead:- 160

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	214	50.7
Lithoclasts	134	31.8
Bioclasts	74	17.5
	(422)	

Sample: CB.403

Date: 23.9.63

Time: 13.00 hours

Location: Decca Fix: Red F1.06
Green D46.04

Depth: 72'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	1	0	1
	60	43	0	43
	100	90	0	90
	200	-	-	-
ASTRONONION gallowayi	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	2	0	2
DISCORBIS williamsoni	30	-	-	-
	60	1	0	1
	100	6	0	6
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	45	0	45
	200	16	0	16
ELPHIDIUM macellum	30	-	-	-
	60	6	0	6
	100	2	0	2
	200	1	0	1
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	35	0	35
	100	418	0	418
	200	30	0	30
HAPLOPHRAGMOIDES canariensis	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
LAGENA laevis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
LAGENA sulcata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
LAGENA sulcata var.spirata	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	5	0	5
	100	10	0	10
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA cliarensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	7	0	7
	100	3	0	3
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	24	1	23
	100	42	0	42
	200	16	0	16
REOPHAX subfusiformis	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
SPIROLOCULINA subimpressa	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	21	0	21
	100	126	0	126
	200	-	-	-
Total	30	1	0	1
	60	180	1	179
	100	791	0	791
	200	63	0	63
	Total	1035	1	1034

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	3	11	94	20	114	0	73	31	284
Gastropods	0	5	0	15	0	0	0	0	0	20
Hydrozoans	0	0	1	8	0	9	0	0	1	17
Pelecypods	2	12	3	53	0	8	0	0	5	73
Bryozoans	1	0	0	0	0	0	0	0	1	0
Echinoid spines	-	0	-	93	-	123	-	64	-	280
Mussels	0	1	0	3	0	0	0	0	0	4
Crustaceans (exl.Ostracods)	0	0	0	1	1	0	0	0	1	1
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	1	-	3	-	0	-	0	-	4
Echinoid Plates	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 723
Living:- 39
Dead:- 684

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	260	81.8
Lithoclasts	18	5.7
Bioclasts	40	12.5
	(318)	

Sample: CB.404

Date: 23.9.63

Time: 14.00 hours

Location: Decca Fix: Red F2.93
Green D46.76

Depth: 63'

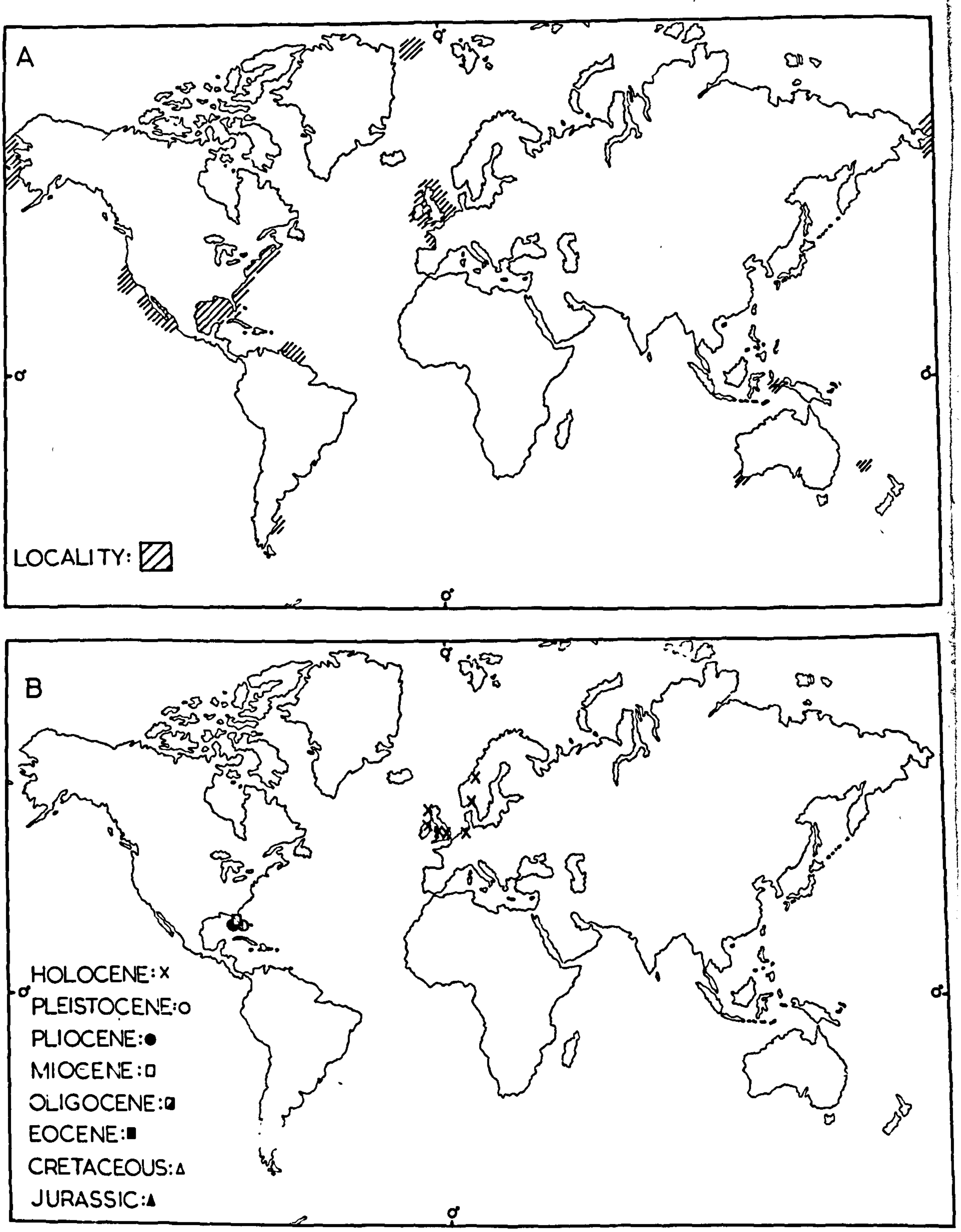
Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Total	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	59	1	58
	100	8	0	8
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	1	0	1
	100	2	0	2
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	24	0	24
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	10	0	10
	100	48	0	48
	200	8	0	8
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
LAGENA sulcata var.interrupta	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
LAGENA sulcata var.spirata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MARSIPELLA elongata var. A	30	2	2	0
	60	-	-	-
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	2	0	2
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	16	0	16
	100	16	0	16
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	22	0	22
	100	16	0	16
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	6	0	6
	60	-	-	-
	100	-	-	-
	200	-	-	-



TEXT FIG. 17 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- MILIAMMINA FUSCA

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	1	0	1
	60	72	3	69
	100	16	0	16
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	14	0	14
	100	8	0	8
	200	-	-	-
Total	30	12	2	10
	60	250	4	246
	100	106	0	106
	200	8	0	8
	Total	376	6	370

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	10	113	8	48	0	8	18	159
Gastropods	0	28	0	43	0	0	0	0	0	71
Hydrozoans	1	0	5	88	0	16	0	0	6	104
Pelecypods	1	28	0	64	0	8	0	0	1	100
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	5	-	51	-	16	-	0	-	72
Mussels	2	17	0	5	0	0	0	0	2	22
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	5	-	1	-	0	-	0	-	6
Annelids	1	0	0	0	0	0	0	0	1	0
Fish Bones	-	0	-	4	-	0	-	0	-	4

Total Faunal Content:- 568
Living:- 29
Dead:- 539

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	262	76.2
Lithoclasts	54	15.7
Bioclasts	28	8.1
	(344)	

Sample: CB.405

Date: 23.9.63

Time: 14.21 hours

Location: Decca Fix: Red F2.98
Green E30.13

Depth: 40'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	11	0	11
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	3	0	3
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA lata	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	10	0	10
	60	16	0	16
	100	1	0	1
	200	-	-	-
TRILOCULINA angulata	30	1	0	1
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	15	0	15
	60	44	0	44
	100	2	0	2
	200	0	0	0
	Total	61	0	61

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	15	0	13	0	0	0	0	0	28
Hydrozoans	0	2	1	2	0	2	0	0	1	6
Pelecypods	2	7	0	7	0	0	0	0	2	14
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	19	-	12	-	0	-	0	-	31
Mussels	0	4	0	0	0	0	0	0	0	4
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	1	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 87
Living:- 4
Dead:- 83

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	240	66.7
Lithoclasts	80	22.2
Bioclasts	40	11.1
	(360)	

Sample: CB.406

Date: 23.9.63

Time: 14.38 hours

Location: Decca Fix: Red F4.12
Green D47.40

Depth: 44'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA lata	30	-	-	-
	60	-	-	-
	100	1	1	0
	200	-	-	-
QUINQUELOCULINA seminulum	30	6	0	6
	60	4	0	4
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	6	0	6
	60	7	0	7
	100	1	1	0
	200	1	0	1
	Total	15	1	14

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	1	0	0	1	2	0	0	0	3	1
Gastropods	0	23	0	5	0	1	0	0	0	29
Hydrozoans	0	0	0	0	0	4	0	0	0	4
Pelecypods	frags		frags		0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	4	-	5	-	1	-	0	-	10
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	2	0	0	0	2
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	4	-	0	-	0	-	0	-	4
Annelids	0	0	0	0	0	0	1	0	1	0

Total Faunal Content:- 54
Living:- 4
Dead:- 50

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	150	50.0
Lithoclasts	90	30.0
Bioclasts	60	20.0
	(300)	

Sample: CB.407

Date: 23.9.63

Time: 15.00 hours

Location: Decca Fix: Red F5.36
Green D45.16

Depth: 67'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	68	0	68
	100	16	0	16
	200	2	0	2
CIBICIDES fletcheri	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	12	0	12
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	40	4	36
	100	24	0	24
	300	2	0	2
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	4	0	4
	100	8	0	8
	200	-	-	-
Total	30	3	0	3
	60	141	4	137
	100	80	0	80
	200	4	0	4
	Total	228	4	224

Family: Lituolidae de Blainville 1825

Sub Family: Haplophragmoidinae Mayne 1952

Genus: Haplophragmoides Cushman 1910

Haplophragmoides carariensis (d'Orbigny) 1884

Pl.2, figs. 5a, 5b.

1884	Haplophragmoides canariensis (d'Orbigny)	BRADY.Chall.Rep.Zool. Vol.9,p.310,pl.35, figs.1-5.
1910	Haplophragmoides canariensis (d'Orbigny)	CUSHMAN.U.S.Nat.Mus. Bull.71,Pt.1,p.101,102, text fig.149.
1933	Haplophragmoides canariensis (d'Orbigny)	GALLOWAY. A manual of foraminifera p.187,pl.16, fig.15.
1948	Haplophragmoides canariensis (d'Orbigny)	BARKER.Soc.Econ.Pal. and Min.Sp.Pub.No.9,pl.35, figs.1-3,5.

Test free, small, compressed, planispiral, involute, the outermost whorl composed of 6 chambers. Chambers have triangular lateral surfaces which are constricted towards the umbilicus by an inflexion of the septal lines which are depressed and extremely flexuose. Umbilicae quite small and deep. Peripheral border rounded, lobate. Apertural face, sub-rounded, convex. Aperture equatorial, interiomarginal, semi-circular, at the basal suture, with a slight development of an upper lip. Wall agglutinated, grains appearing to be in transluscent scale form instead of angular form so that the test outline is not marred.

Dimensions: Diameter 0.36 mm. Thickness 0.15 mm.

Occurrence: Dead, CB.299, CB.330, CB.333, CB.395, CB.403, CB.641.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	3	13	0	4	0	0	3	17
Gastropods	0	6	0	31	0	8	0	0	0	45
Hydrozoans	0	0	1	11	0	8	0	0	1	19
Pelecypods	1	8	0	18	0	4	0	0	1	30
Bryozoans	0	2	0	0	0	0	0	0	0	2
Echinoid spines	-	4	-	25	-	0	-	0	-	29
Mussels	0	1	0	0	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	3	0	0	0	0	0	0	0	3	0
Echinoid Plates	-	2	-	0	-	0	-	0	-	2

Total Faunal Content:- 153
Living:- 8
Dead:- 145

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	300	76.9
Lithoclasts	50	12.8
Bioclasts	40	10.3
	(390)	

Sample: CB.408

Date: 23.9.63

Time: 15.15 hours

Location: Decca Fix: Red F4.86
Green D44.87

Depth: 52'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	29	0	29
	100	-	-	-
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM selseyense	30	-	-	-
	60	3	0	3
	100	8	0	8
	200	2	0	2
EOEPONIDELLA masilla	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	10	0	10
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	4	0	4
	60	20	2	18
	100	4	0	4
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	4	0	4
	60	70	2	68
	100	16	0	16
	200	3	0	3
	Total	93	2	91

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	2	0	0	0	0	2	2
Gastropods	0	5	0	15	0	0	0	0	0	20
Hydrozoans	0	0	1	3	0	0	0	0	1	3
Pelecypods	1	6	2	3	0	0	0	0	3	9
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	12	-	0	-	0	-	13
Mussels	0	1	0	0	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 56
Living:- 7
Dead:- 49

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	276	78.9
Lithoclasts	44	12.6
Bioclasts	30	8.5
	(350)	

Sample: CB.409

Date: 23.9.63

Time: 15.40 hours

Location: Decca Fix: Red F5.81
Green D43.33

Depth: 40'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	3	1	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
TROCHAMMINA inflata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	0	0	0
	60	7	2	5
	100	0	0	0
	200	0	0	0
	Total	7	2	5

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	3	9	2	2	0	0	5	11
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	5	0	1	0	0	0	6	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	1	0	0	0	0	0	0	0	1	0
Echinoid spines	-	0	-	1	-	1	-	0	-	2
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	2	0	4	0	0	0	6	0
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 32
Living:- 19
Dead:- 13

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	180	60.0
Lithoclasts	96	32.0
Bioclasts	24	8.0
	(300)	

Sample: CB.410

Date: 23.9.63

Time: 16.05 hours

Location: Decca Fix: Red F5.76
Green D43.16

Depth: 60'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	12	0	12
	100	2	0	2
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
PLANORBULINA mediterranensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA frigida	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	5	0	5
	100	1	1	0
	200	-	-	-
QUINQUELOCULINA seminulum	30	3	0	3
	60	21	0	21
	100	-	-	-
	200	-	-	-
TEXTULARIA gramen	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
Total	30	4	0	4
	60	54	0	54
	100	6	1	5
	200	0	0	0
	Total	64	1	63

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	4	15	11	8	2	2	0	1	17	26
Gastropods	0	11	0	9	0	1	0	0	0	21
Hydrozoans	0	5	0	14	0	3	0	0	0	22
Pelecypods	1	5	0	1	0	0	0	0	1	6
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	4	-	17	-	2	-	0	-	23
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 117
Living:- 18
Dead:- 99

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	250	76.2
Lithoclasts	32	9.8
Bioclasts	46	14.0
	(328)	

Sample: CB.411

Date: 23.9.63

Time: 16.26 hours

Location: Decca Fix: Red F5.74
Green D43.06

Depth: 109'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	3	0	3
	100	7	0	7
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Morphological remarks: Cushman 1910 stated that there is considerable variation in the texture of the wall, some being smooth and of very fine material while others are of much coarser material.

It is noticeable that a number of authors have included in this species numerous forms with differing degrees of the tightness of coiling, and in a number of cases have included partially evolute forms.

The genus Haplophragmoides as defined by Cushman (1910) included the various coiled, planispiral, arenaceous species with simple apertures. Hoglund (1947) distinguished two subdivisions of Cushmans grouping, on apertural characteristics, one with an interio-marginal, Haplophragmoides proper, and the other with an interio-areal aperture, Labrospira, n.gen. In erecting Labrospira as a new genus Hoglund suppressed the name Cribrostomoides, this suppression being rejected by Ellis and Messina (1949, Catalogue of Foraminifera, supplement for 1949, Pt.1), and by Frizzel and Schwartz (1951) who state that the use of Labrospira "is biologically valid, but nomenclaturally intenable, as it is a junior synonym of Cribrostomoides." Loeblich and Tappan (1964) use the generic names Haplophragmoides and Cribrostomoides, including in the latter genus, Hoglunds Labrospira.

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	0	0	0
	60	16	0	16
	100	7	0	7
	200	0	0	0
	Total	23	0	23

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	1	0	53	0	4	0	1	0	59
Gastropods	0	0	0	0	0	1	0	0	0	1
Hydrozoans	0	1	3	17	0	1	0	0	3	19
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	2	0	0	0	0	0	2	0
Echinoid spines	-	2	-	18	-	1	-	2	-	23
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 108
Living:- 5
Dead:- 103

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	210	63.6
Lithoclasts	70	21.2
Bioclasts	50	15.2
	(330)	

Sample: CB.412

Date: 23.9.63

Time: 16.40 hours

Location: Decca Fix: Red F6.00
Green D41.74

Depth: 84'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	41	0	41
	100	8	0	8
	200	-	-	-
ASTRONONION gallowayi	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	1	0	1
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	12	0	12
ELPHIDIUM macellum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	7	0	7
	100	64	0	64
	200	36	0	36
LAGENAMMINA laguncula	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
LENTICULINA varians	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	3	0	3
	100	8	0	8
	200	8	0	8
OOLINA hexagona	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1

Specimen	Grade	Total Number	Living	Dead
PATEORIS hauerinoides	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	28	1	27
	100	24	0	24
	200	4	0	4
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	8	0	8
	100	8	0	8
	200	4	0	4
Total	30	1	0	1
	60	106	1	105
	100	134	0	134
	200	76	0	76

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	1	5	28	8	64	4	84	17	177
Gastropods	0	4	0	7	0	0	0	0	0	11
Hydrozoans	1	1	4	1	0	0	0	0	5	2
Pelecypods	2	20	5	23	0	24	0	4	7	71
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	5	-	62	-	0	-	8	-	75
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	2	0	0	0	0	0	2	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	1	-	2	-	0	-	0	-	3
Echinoid Plates	-	1	-	0	-	0	-	0	-	1
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 382
Living:- 32
Dead:- 350

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	208	58.8
Lithoclasts	72	20.8
Bioclasts	74	20.9
	(354)	

Sample: CB.413

Date: 23.9.63

Time: 17.00 hours

Location: Decca Fix: Red F6.00
Green D41.0

Depth: 55'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	1	0
	60	3	0	3
	100	1	0	1
	200	-	-	-
BATHYSIPHON acuta	30	-	-	-
	60	10	10	0
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA lata	30	-	-	-
	60	7	0	7
	100	2	0	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	19	3	16
	100	1	0	1
	200	-	-	-
REOPHAX fusiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	1	0	1
TECHNITELLA fragments	30	-	-	-
	60	frags	-	-
	100	frags	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	4	0	4
	100	1	0	1
	200	-	-	-
Total	30	1	1	0
	60	46	13	33
	100	7	0	7
	200	2	0	2
	Total	54	14	42

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	1	5	5	3	11	0	4	8	21
Gastropods	0	1	0	0	0	0	0	0	0	1
Hydrozoans	0	0	0	0	1	6	0	2	1	8
Pelecypods	2	0	1	0	0	1	0	1	3	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	0	-	2	-	2	-	5
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	2	0	0	0	2	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	3	0	0	0	0	0	5	0

Total Faunal Content:- 56
Living:- 19
Dead:- 37

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	170	56.7
Lithoclasts	88	29.3
Bioclasts	42	14.0
	(300)	

Sample: CB.414

Date: 23.9.63

Time: 17.25 hours

Location: Decca Fix: Red F8.2
Green D38.5

Depth: 95'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	50	0	50
	100	3	0	3
	200	-	-	-
BATHYSIPHON acuta	30	-	-	-
	60	-	-	-
	100	1	1	0
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Distribution: This species was recorded from off the Hebrides (Brady 1884), from the Salcombe estuary (Worth 1900), and from the Exe estuary (Worth 1902).

Brady 1884 noted this species at seven 'Challenger' stations at depths ranging from 1,850 to 3,950 fathoms, at 40 fathoms on the coral reefs of Honolulu, and from the South Atlantic. Goes 1894 recorded it from off the coasts of Mexico and Central America at depths of 660 to 1,879 fathoms. It was recorded at 93 fathoms off the coast of Oregon by Flint in 1897. In 1910 Cushman recorded it from off California, and off Japan, and in 1948 the same author noted its occurrence in the Artic.

Diagnosis: This form appears to be widely distributed, with a considerable depth range. Too much importance must not be paid to the records however, due to the incorrect identifying by various authors.

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	6	0	6
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	48	1	47
	100	6	0	6
	200	1	0	1
TECHNITELLA fragments	30	frags	-	-
	60	-	-	-
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	frags	frags	frags
	60	119	1	118
	100	15	1	14
	200	1	0	1
	Total	135	2	133

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	1	3	2	0	0	0	0	3	3
Gastropods	0	2	0	6	0	1	0	0	0	9
Hydrozoans	2	0	1	3	0	0	0	0	3	3
Pelecypods	2	7	3	6	2	0	0	0	7	13
Bryozoans	6	5	0	0	0	0	0	0	6	5
Echinoid spines	-	1	-	20	-	1	-	0	-	22
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	1	0	3	2	0	0	0	0	4	2
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	1	-	1	-	0	-	0	-	2

Total Faunal Content:- 82
Living:- 23
Dead:- 59

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	276	78.4
Lithoclasts	56	15.9
Bioclasts	20	5.7
	(352)	

Sample: CB.415

Date: 23.9.63

Time: 17.45 hours

Location: Decca Fix: Red F6.26
Green D39.75

Depth: 83'

Instrument: Van Veen Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	2	0	2
	60	159	0	159
	100	12	0	12
	200	-	-	-
CLAVULINA gracilis	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM crispum	30	-	-	-
	60	17	0	17
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspera	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA frigida	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA inconstans	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	25	0	25
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	1	0	1
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	2	0	2
	60	85	0	85
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	7	0	7
	60	314	0	314
	100	20	0	20
	200	1	0	1
	Total	522	0	522

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	9	11	0	0	0	0	9	11
Gastropods	0	36	0	54	0	0	0	0	0	90
Hydrozoans	0	0	4	3	0	4	0	0	4	7
Pelecypods	2	119	4	16	0	0	0	0	6	135
Bryozoans	0	0	0	2	0	0	0	0	0	2
Echinoid spines	-	29	-	149	-	8	-	0	-	186
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	2	-	0	-	0	-	2
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	31	-	3	-	0	-	0	-	34
Fish Bones	-	4	-	2	-	0	-	0	-	6
Fish Teeth	-	3	-	0	-	0	-	0	-	3

Total Faunal Content:- 495
Living:- 19
Dead:- 476

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	200	64.8
Lithoclasts	54	17.6
Bioclasts	54	17.6
	(308)	

Sample: CB.610

Date: 19.9.64

Time: 09.10 hours

Location: Grid 663402

River Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead

NO FORAMINIFERA OBTAINED

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	1	0	0	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	1	0	0	0	0	0	0	0	1
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 2
Living:- 0
Dead:- 2

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	80	22.9
Lithoclasts	265	75.7
Bioclasts	5	1.4
	(350)	

Sample: CB.611

Date: 19.9.64

Time: 11.10 hours

Location: Grid 310248

Salinity: 33.9‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	7	0	7
	100	-	-	-
	200	-	-	-
	Total	8	0	8

Haplophragmoides subinvolutum Cushman and McCulloch 1939

Pl.2, figs.6a,6b.

1939 Haplophragmoides subinvolutum CUSHMAN and McCULLOCH.Al.Han.Pac. Exped.S.Calif.Univ.Vol.6, p.83,pl.7,figs.5a,5b. non.figs.3a,3b,4a,4b.

1954 Haplophragmoides subinvolutum Cushman and McCulloch.PHLEGER.Bull A.A.P.G.Vol.38,no.4,p.641, pl.2,figs.17,18.

Test free, small, planispiral, involute, slightly compressed the last whorl being composed of 7 chambers, periphery rounded, lobate, especially so in the last two chambers. Chambers distinct, slightly inflated, triangular in outline, increasing gradually in size as added. Sutures distinct, impressed, Umbilicae small, deep. Apertural face rounded, flat to gently convex. Aperture equatorial, interiomarginal, low, arched, at the base of the apertural face, with a slight development of an upper lip present. Wall very finely, arenaceous, matte, very smooth finish, greenish grey in colour.

Dimensions: Diameter 0.55 mm. Thickness 0.25 mm.

Occurrence: Dead, CB.641.

Morphological remarks: Cushman and McCulloch in their type description state that this form is involute, with a lip development around the aperture but in the type figures, three individuals are illustrated, not all conforming with the type description. The range of variation includes both involute and slightly evolute forms, sub radial to flexuose sutures, a "hooded" aperture to an aperture without any development of lips, smooth and lobate types.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	1	0	0	0	0	0	2
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	1	0	1	0	0	0	0	0	2
Echinoid spines	-	2	-	3	-	0	-	0	-	5
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 10
Living:- 0
Dead:- 10

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	210	56.9
Lithoclasts	106	28.7
Bioclasts	54	14.4
	(370)	

Sample: CB.612

Date: 19.9.64

Time: 11.55 hours

Location: Grid 318265

Salinity: 33.9‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	15	0	15
	100	8	0	8
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	57	0	57
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	6	0	6
	100	8	0	8
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	48	0	48
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	48	0	48
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	3	0	3
	100	8	4	4
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
QUINQUELOCULINA agglutinata	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	2	0	2
	60	39	0	39
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	12	0	12
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	3	0	3
	60	147	0	147
	100	102	4	98
	200	64	0	64
	Total	316	4	312

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	1	0	6	96	0	16	0	0	7	112
Gastropods	0	3	0	3	0	0	0	0	0	6
Hydrozoans	0	0	3	12	0	0	0	0	3	12
Pelecypods	1	5	0	21	0	0	0	0	1	26
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	45	-	0	-	0	-	47
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	2	0	3	0	0	0	0	0	5	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	0	-	3	-	0	-	0	-	3

Total Faunal Content:- 222
Living:- 16
Dead:- 206

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	240	70.6
Lithoclasts	60	17.7
Bioclasts	40	11.7
	(340)	

Sample Specimen CB.613

Date: (TRILOCULINA ...lum) 19.9.64

Time: 12.15 hours

Location: Grid 315383

Salinity: 5.0‰

Beach Sample

Specimen	Grade	Total Number	Living	Dead
	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
TOTAL	30	3	0	3
	60	153	0	153
	100	16	0	16
	200	-	-	-
	Total	172	0	172

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	59	0	59
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	55	0	55
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	28	0	28
	100	-	-	-
	200	-	-	-

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	6	8	0	0	0	0	6	8
Gastropods	0	12	0	7	0	0	0	0	0	19
Hydrozoans	0	1	0	2	0	0	0	0	0	3
Pelecypods	0	1	0	5	0	0	0	0	0	6
Bryozoans	0	2	0	0	0	0	0	0	0	2
Echinoid spines	-	4	-	19	-	0	-	0	-	23
Mussels	1	4	0	2	0	0	0	0	1	6
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 74
Living:- 7
Dead:- 67

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	275	79.7
Lithoclasts	45	13.1
Bioclasts	25	7.2
	(345)	

Sample: CB.614

Date: 19.9.64

Time: 12.45 hours

Location: Grid 330302

Salinity: 33.1‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	2	0	2
	60	9	0	9
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	12	0	12
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	9	0	9
	100	-	-	-
	200	-	-	-
Total	30	3	0	3
	60	113	0	113
	100	27	0	27
	200	-	-	-
	Total	143	0	143

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	4	0	0	0	0	0	5
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	6	-	0	-	0	-	7
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	2	-	0	-	0	-	0	-	2

Total Faunal Content:- 15
Living:- 0
Dead:- 15

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	244	77.7
Lithoclasts	46	14.6
Bioclasts	24	7.7
	(314)	

Sample: CB.615

Date: 19.9.64

Time: 13.30 hours

Location: Grid 342328

Salinity: 33.1‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	9	0	9
	100	8	0	8
	200	-	-	-
	Total	17	0	17

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	90	0	14	0	0	0	0	0	104	0
Hydrozoans	1	0	0	1	0	0	0	0	1	1
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	4	0	0	0	0	0	4	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 111
Living:- 110
Dead:- 1

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	244	77.7
Lithoclasts	46	14.6
Bioclasts	24	7.7
	(314)	

Distribution: There has been no record of this species occurring in the British region to the present day.

Cushman and McCulloch in 1939 recorded the type species from low tide, Excursion Bay, Alaska. Phleger (1954) stated that this species occurs at several marsh stations in the Mississippi Sound area generally with frequencies of less than 5% but in places much higher. The same author in 1955 recorded the occurrence of this species in the South Eastern Mississippi Delta area.

Diagnosis: This variable species appears to prefer a marsh, deltaic type of environment, and thus has a limited world distribution.

Sample: CB.616

Date: 19.9.64

Time: 13.45 hours

Location: Grid 370340

Salinity: 33.1‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead

NO FORAMINIFERA OBTAINED

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	2	0	0	0	0	0	0	0	2	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 2
Living:- 2
Dead:- 0

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	290	85.3
Lithoclasts	50	14.7
Bioclasts	0	0

Sample: CB.617

Date: 19.9.64

Time: 14.30 hours

Location: Grid 386346

Salinity: 33.1‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	1	1	0
	200	-	-	-
Total	30	-	-	-
	60	1	0	1
	100	1	1	0
	200	-	-	-
	Total	2	1	1

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	0	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	3	0	1	0	0	0	4	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 6
Living:- 4
Dead:- 2

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	278	92.7
Lithoclasts	19	6.3
Bioclasts	3	1.0
	(300)	

Sample: CB.618

Date: 19.9.64

Time: 14.45 hours

Location: Grid 405358

Salinity: 33.1‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	1	0	1
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	-	-	-
	60	7	0	7
	100	3	0	3
	200	-	-	-
	Total	10	0	10

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 1
Living:- 0
Dead:- 1

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	286	81.7
Lithoclasts	60	17.2
Bioclasts	4	1.1
	(350)	

Sample: CB.619

Date: 19.9.64

Time: 15.45 hours

Location: Grid 445370

Salinity: 2.8‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	4	0	4
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	10	0	10
	100	2	0	2
	200	-	-	-
	Total	12	0	12

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	2	0	1	0	0	0	3
Gastropods	0	1	0	1	0	0	0	0	0	2
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	12	4	1	1	0	0	0	0	13	5
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 24
Living:- 13
Dead:- 11

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	274	86.2
Lithoclasts	38	11.9
Bioclasts	6	1.9
	(318)	

Sample: CB.620

Date: 19.9.64

Time: 16.45 hours

Location: Grid 481371

Salinity: 20.0‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
	Total	2	0	2

Genus: Cribrostomoides Cushman 1910

Cribrostomoides jeffreysi (Williamson) 1858

Pl.2, figs.7a,b,

1858	Nonionina jeffreysi	WILLIAMSON	Rec.For.Gt.Brit.Ray.Soc. London.p.34,pl.3,figs.72,73.
1947	Labrospira jeffreysi	(Williamson)	HOGLUND. Univ.Zool.Bidrag. Fran.Uppsala.Bd.26,p.146, pl.11,fig.3,p.139,text-figs. 72,73.
1952	Labrospira jeffreysi	(Williamson)	PARKER.Bull.Mus.Comp.Zool. Vol.106,No.9,p.401,pl.2, figs.15,17-20.
1952	Labrospira jeffreysi	(Williamson)	PHLEGER. Contr.Cush.Found. Foram.Res.Vol.3,Pt.2,p.85, pl.13,figs.14,15.
1957	Labrospira jeffreysi	(Williamson)	BOLTOVSKOY. Mus.Argentina de Ciencias Nat.Geol.Tome 6, no.1,p.18,pl.1,figs.1-6.
1961	Cribrostomoides jeffreysi	(Williamson)	BOLTOVSKOY.Mus.Argentina de Ciencias Nt.Zool.Tome 6, no.6,p.266,pl.2,figs.15-17.

Test free, small, compressed, planispiral, involute, the outermost whorl being composed of 7 chambers. Chambers have triangular lateral surfaces which are constricted towards the umbilical border by an inflexion of the septal lines which are depressed and flexuose. Umbilicus fairly large and excavated. Peripheral border rounded, slightly lobate. Apertural face flat, to sub-convex. Aperture interioareal, elongate, transversely with upper and lower lips developed giving the aperture a hooded appearance. Wall agglutinated, grains appearing to be in transluscent scale form instead of angular so that the test outline is not marred.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 1
Living:- 1
Dead:- 0

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	214	64.8
Lithoclasts	114	34.6
Bioclasts	2	0.6
	(330)	

Sample: CD.621

Date: 19.9.64

Time: 17.00 hours

Location: Grid 478374

Salinity: 0.9‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
	Total	5	0	5

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	8	0	0	0	0	0	8
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	2	0	0	0	0	0	2
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	2	-	0	-	0	-	2
Mussels	0	0	0	3	0	0	0	0	0	3
Crustaceans (exl.Ostracods)	0	0	0	1	0	0	0	0	0	1
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 18
Living:- 0
Dead:- 18

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	254	81.4
Lithoclasts	52	16.7
Bioclasts	6	1.9
	(312)	

Sample: CB.622

Date: 19.9.64

Time: 17.20 hours

Location: Grid 505379

Salinity: 29.2‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead

NO FORAMINIFERA OBTAINED

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D

NO FAUNA OBTAINED

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	320	91.4
Lithoclasts	24	6.9
Bioclasts	6	1.7
	(350)	

Sample: CB.623

Date: 20.9.64

Time: 11.45 hours

Location: Grid 528370

Salinity: 32.3‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	17	0	17
	100	4	0	4
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	24	1	23
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	-	-	-
	60	48	1	47
	100	16	0	16
	200	-	-	-
	Total	64	1	63

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	15	0	0	0	0	0	15
Gastropods	0	0	0	3	0	0	0	0	0	3
Hydrozoans	0	0	0	2	0	0	0	0	0	2
Pelecypods	0	2	0	23	0	0	0	0	0	25
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	8	-	0	-	0	-	8
Mussels	0	2	0	7	0	0	0	0	0	9
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	3	-	0	-	0	-	0	-	3

Total Faunal Content:- 65
Living:- 0
Dead:- 65

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	272	86.6
Lithoclasts	32	10.2
Bioclasts	10	3.2
	(314)	

Sample: CB.624

Date: 20.9.64

Time: 12.30 hours

Location: Grid 542360

Salinity: 22.5‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	82	0	82
	100	32	0	32
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	5	0	5
	60	40	0	40
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	7	0	7
	100	8	0	8
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	10	0	10
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	5	0	5
	60	54	0	54
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	10	0	10
	60	200	0	200
	100	44	0	44
	200	-	-	-
	Total	254	0	254

Dimensions: Diameter 0.30 mm. Thickness 0.10 mm.

Occurrence: Dead. CB.298, CB.299, CB.315, CB.318, CB.327, CB.328, CB.346, CB.398.

Morphological remarks: The taxonomic validity of this generic name was discussed earlier.

Distribution: Single specimens were record ed by Hoglund in 1947 from the Gulmar Fjord and the Skagerak. In 1952 it was recorded as widespread but usually occurring at low frequencies in the Portsmouth area by Parker, from the Canadian and Greenland Artic, where it occurred at the majority of stations in the areas with frequencies of 5% or less, off Portsmouth, New Hampshire, where it was stated to be widely distributed and constituting generally less than 5% of the fauna, but has a higher frequency in the mud and mud-sand areas. It was also stated not to occur in inshore sand areas by Phleger. Boltovskoy in 1957 noted the occurrence of this species in the estuary of the Rio de la Plata, and in 1961 from the continental platform between Santo Tome and the Rio de la Plata, Argentina.

Diagnosis: There does not appear to be any preference exhibited by this species with regard to temperature, but a preference is indicated with regard to the substrate, and the sediment size comprising this substrate.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	3	50	0	0	0	0	3	50
Gastropods	0	0	0	7	0	0	0	0	0	7
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	11	0	53	0	0	0	0	0	64
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	24	-	4	-	0	-	30
Mussels	0	6	0	19	0	0	0	0	0	25
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	5	-	0	-	0	-	0	-	5

Total Faunal Content:- 184
Living:- 3
Dead:- 181

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	270	85.9
Lithoclasts	38	12.2
Bioclasts	6	1.9
	(314)	

Sample: CB.625

Date: 20.9.64

Time: 13.55 hours

Location: Grid 572389

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead

NO FORAMINIFERA OBTAINED

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	1	0	0	0	0	0	2
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Seed Pod	-	1	-	0	-	0	-	0	-	1

Total Faunal Content:- 3
Living:- 0
Dead:- 3

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	38	11.4
Lithoclasts	292	87.4
Bioclasts	4	1.2
	(334)	

Sample: CB.626

Date: 20.9.64

Time: 14.10 hours

Location: Grid 581381

Salinity: 1.1‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	-	-	-
	100	5	0	5
	200	1	0	1
TROCHAMMINA inflata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
Total	30	-	-	-
	60	-	-	-
	100	9	0	9
	200	1	0	1
	Total	10	0	10

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D

NO FAUNA OBTAINED

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	332	79.4
Lithoclasts	84	20.1
Bioclasts	2	0.5
	(418)	

Sample: CB.627

Date: 20.9.64

Time: 14.55 hours

Location: Grid 619382

Salinity: 0.5‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	26	0	26
	100	80	1	79
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	2	0	2
	100	32	0	32
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	26	0	26
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM excavatum	30	-	-	-
	60	2	0	2
	100	36	0	36
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
Total	30	-	-	-
	60	60	0	60
	100	180	1	179
	200	-	-	-
	Total	240	1	239

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	3	9	4	8	0	0	7	17
Gastropods	0	0	0	1	0	4	0	0	0	5
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	9	0	4	0	0	0	13
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	15	-	8	-	0	-	23
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 66
Living:- 8
Dead:- 58

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	270	84.4
Lithoclasts	40	12.5
Bioclasts	10	3.1
	(320)	

Sample: CB.628

Date: 20.9.64

Time: 15.05 hours

Location: Grid 623384

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	6	0	6
	100	118	0	118
	200	8	0	8
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	40	0	40
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	9	0	9
	100	12	0	12
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	12	0	12
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
OOLINA williamsoni	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	23	0	23
	100	218	0	218
	200	8	0	8
	Total	249	0	249

Sub Family: Lituolinae de Blainville 1825

Genus: Ammobaculites Cushman 1910

Ammobaculites agglutinans (d'Orbigny) var. filiformis Earland 1934

Pl.3, figs. 7a,7b,7c.

1934 Ammobaculites agglutinans (d'Orbigny) var. filiformis EARLAND. Disc. Repts. Vol.10, p.92, pl.3, figs.11-13.

Test free, elongate, filiform, biform, initially planispiral, later uniserial. Planispiral portion close coiled with a rounded periphery, sutures indistinct in this portion. Uniserial portion composed of five chambers, as long as broad, slightly inflated, and circular to oval in section. Sutures in this portion depressed and distinct except at the junction with the initial part where the suture becomes irregular. Aperture simple, terminal, circular. Test covered with angular sand grains and mica flakes, externally rough.

Dimensions: Length 0.70 mm. Maximum diameter 0.20 mm.

Occurrence: Dead CB.315, CB.327, CB.346, CB.352, CB.355, CB.358 CB.360, CB.363, CB.366, CB.370, CB.371, CB.386. CB.387 CB.405.

Dead, variation sample CB.695

Morphological remarks: This variety differs from the species in the more slender and curved adult portion of the test.

Distribution: Earland in 1934 obtained this variety from twenty five Antarctic stations.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	11	0	0	0	0	0	11
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	1	0	0	0	0	0	1	0
Pelecypods	0	0	0	7	0	4	0	0	0	11
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	19	-	12	-	0	-	31
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Sponge Spicules	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 55
Living:- 1
Dead:- 54

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	296	85.8
Lithoclasts	44	12.7
Bioclasts	6	1.5
	(346)	

Sample: CB.629

Date: 20.9.64

Time: 15.30 hours

Location: Grid 598359

Salinity: 2.5‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	13	0	13
	100	124	0	124
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	24	0	24
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	68	0	68
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	16	0	16
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	9	0	9
	100	44	4	40
	200	4	0	4
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	32	4	28
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	12	4	8
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	6	0	6
	100	-	-	-
	200	-	-	-
TROCHAMMINA inflata	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	1	0	1
	60	38	0	38
	100	376	12	364
	200	4	0	4
	Total	419	12	407

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	9	36	12	48	0	4	21	88
Gastropods	0	2	0	2	0	0	0	0	0	4
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	18	0	4	0	0	0	22
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	16	-	124	-	0	-	140
Mussels	0	2	0	8	0	4	0	0	0	14
Crustaceans (exl.Ostracods)	0	0	0	1	4	0	0	0	4	1
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 295
Living:- 25
Dead:- 270

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	300	79.8
Lithoclasts	52	13.8
Bioclasts	24	6.4
	(376)	

Sample: CB.630

Date: 20.9.64

Time: 16.30 hours

Location: Grid 568315

Salinity: 31.3‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	16	0	16
	100	32	0	32
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	36	0	36
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	7	0	7
	100	8	0	8
	200	-	-	-
Total	30	-	-	-
	60	33	0	33
	100	88	0	88
	200	-	-	-
	Total	121	0	121

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	20	0	8	0	0	0	28
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	4	0	8	0	0	0	0	0	12
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	8	-	64	-	8	-	81
Mussels	0	5	0	28	0	16	0	0	0	39
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 160
Living:- 0
Dead:- 160

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	300	81.9
Lithoclasts	46	12.6
Bioclasts	20	5.5
	(366)	

Sample: CB.631

Date: 20.9.64

Time: 17.00 hours

Location: Grid 563323

Salinity: 22.7‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	32	0	32
	100	24	0	24
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	5	0	5
	100	20	0	20
	200	-	-	-
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
LAGENA sulcata var. interrupta	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	3	0	3
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	3	0	3
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	22	0	22
	100	12	0	12
	200	-	-	-

Diagnosis: This variety appears to prefer a cold to cool temperature shallow water environment.

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	7	0	7
	60	81	0	81
	100	76	0	76
	200	-	-	-
	Total	164	0	164

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	18	30	0	4	0	0	18	34
Gastropods	0	7	0	18	0	4	0	0	0	29
Hydrozoans	3	1	6	18	0	0	0	0	9	19
Pelecypods	0	17	0	30	0	0	0	0	0	47
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	78	-	8	-	0	-	87
Mussels	6	144	0	186	0	8	0	0	6	338
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	210	0	0	0	0	0	0	0	210
Echinoid Plates	-	1	-	0	-	0	-	0	-	1
Fish Bones	-	1	-	0	-	0	-	0	-	1

Total Faunal Content:- 610
Living:- 33
Dead:- 577

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	340	85.0
Lithoclasts	40	10.0
Bioclasts	20	5.0
	(400)	

Sample: CB.632

Date: 20.9.64

Time: 17.15 hours

Location: Grid 559331

Salinity: 29.8‰.

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	32	0	32
	100	32	0	32
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	2	0	2
	60	6	0	6
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	3	0	3
	60	42	0	42
	100	36	0	36
	200	-	-	-
	Total	81	0	81

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	3	0	0	0	0	0	3
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	3	0	7	0	0	0	0	0	10
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	4	-	0	-	4
Mussels	0	2	0	12	0	12	0	0	0	26
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 43
Living:- 0
Dead:- 43

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	280	81.4
Lithoclasts	42	12.2
Bioclasts	22	6.4
	(344)	

Sample: CB.633

Date: 20.9.64

Time: 18.00 hours

Location: Grid 567283

Salinity: 28.5‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	16	0	16
	100	-	-	-
	200	-	-	-
GUTTULINA lactea	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	18	0	18
	100	-	-	-
	200	-	-	-
	Total	18	0	18

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	2	0	0	0	0	0	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 3
Living:- 0
Dead:- 3

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	294	89.6
Lithoclasts	14	4.3
Bioclasts	20	6.1
	(328)	

Sample: CB.634

Date: 20.9.64

Time: 18.15 hours

Location: Grid 569278

Salinity: 28.3‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	1	0	1
	100	14	0	14
	200	-	-	-
BULIMINELLA elegantissima	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	48	11	37
	100	82	8	74
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
NONION depressulum	30	-	-	-
	60	-	-	-
	100	38	8	30
	200	8	4	4
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	51	11	40
	100	146	16	130
	200	12	4	8
	Total	207	31	178

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	2	1	18	18	126	72	0	4	146	95
Gastropods	127	0	0	54	0	8	0	0	127	62
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	5	0	10	2	0	8	0	0	15	10
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	2	-	0	-	0	-	2
Mussels	6	0	4	0	0	16	0	0	10	16
Crustaceans (exl.Ostracods)	0	0	4	0	80	0	0	0	84	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 567
Living:- 382
Dead:- 185

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	262	74.4
Lithoclasts	82	23.3
Bioclasts	8	2.3
	(352)	

Ammobaculites subagglutinans Bandy 1949

Pl.2, figs.4a, 4b.

1949 *Ammobaculites subagglutinans* BANDY Bull.Am.Pal.Vol.32,no.131, p.27,pl.3,figs.5a,b.

1964 *Ammobaculites subagglutinans* Bandy LEROY.U.S.Geol.Survey Pref. Paper 454-F,p.F17,pl.1,figs.3,4.

Test free, elongate, biform, initially planispiral, later uniserial. Planispiral portion close coiled with a rounded periphery and five to six chambers in the last whorl, sutures very indistinct. Uniserial part composed of three chambers, longer than broad except for the first chamber which appears to be compressed to a marked degree. Chambers slightly inflated, circular in cross section in this portion. Sutures distinct and depressed in uniserial portion except at the junction between the planispiral and uniserial portions where the suture becomes irregular and indistinct. Aperture simple, terminal, circular. Test covered with angular sand grains and occasional mica flakes, giving a rough appearance.

Dimensions: Length 0.55 mm. Maximum diameter 0.20 mm.

Occurrence: Living CB.325.

Dead CB.298, CB.307, CB314, CB.334, CB.340, CB.345 CB.350, CB.360, CB.368, CB.370, CB.374, CB.380, CB.386 CB.388, CB.390, CB.398, CB.403, CB.404.

Distribution: This species has not been recorded from Recent deposits to the present day.

Sample: CB.635

Date: 21.9.64

Time: 10.20 hours

Location: Grid 568273

Salinity: 27.8‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	10	0	10
	100	12	0	12
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	5	1	4
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	13	0	13
	100	16	0	16
	200	5	1	4
	Total	34	1	33

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	4	0	7	0	11	0
Gastropods	0	1	0	2	0	0	0	0	0	3
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	2	0	0	0	0	0	4
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 18
Living:- 11
Dead:- 7

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	286	83.1
Lithoclasts	48	13.9
Bioclasts	10	3.0
	(344)	

Sample: CB.636

Date: 21.9.64

Time: 10.45 hours

Location: Grid 550260

Salinity: 32.1‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	19	0	19
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	2	0	2
	60	9	0	9
	100	2	0	2
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
Total	30	3	0	3
	60	36	0	36
	100	8	0	8
	200	-	-	-
	Total	47	0	47

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	1	0	0	0	0	1	1
Gastropods	0	9	0	2	0	0	0	1	0	12
Hydrozoans	5	0	1	1	0	1	0	0	6	2
Pelecypods	1	38	0	8	0	1	0	0	1	47
Bryozoans	1	0	0	0	0	0	0	0	1	0
Echinoid spines	-	2	-	11	-	5	-	0	-	18
Mussels	12	15	1	3	0	0	0	0	13	18
Crustaceans (exl.Ostracods)	0	0	0	0	1	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0
Echinoid Plates	-	1	-	1	-	0	-	0	-	2

Total Faunal Content:- 125
Living:- 24
Dead:- 101

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	246	77.4
Lithoclasts	42	13.2
Bioclasts	30	9.4
	(318)	

Sample: CB.637

Date: 21.9.64

Time: 11.00 hours

Location: Grid 562267

Salinity: 35.3‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	35	0	35
	100	16	0	16
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	1	0
	100	4	0	4
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	43	1	42
	100	28	0	28
	200	-	-	-
	Total	71	1	70

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	4	0	4	4	0	4	8
Gastropods	0	2	0	2	0	0	0	0	0	4
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	6	0	4	0	0	0	0	0	10
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	3	-	0	-	0	-	3
Mussels	0	0	0	3	0	0	0	0	0	3
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 32
Living:- 4
Dead:- 28

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	306	84.1
Lithoclasts	42	11.5
Bioclasts	16	4.4
	(364)	

Sample: CB.638

Date: 21.9.64

Time: 12.45 hours

Location: Grid 573353

Salinity: 30.7‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	8	0	8
	100	76	0	76
	200	8	0	8
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	8	0	8
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	12	0	12
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	28	0	28
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	80	4	76
	100	128	4	124
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8
ELPHIDIUM selseyense	30	-	-	-
	60	3	0	3
	100	36	0	36
	200	-	-	-
LAGENA laevis	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Stratigraphical Occurrence: Bandy in 1949 obtained the type species from the Oligocene of Alabama, and LeRoy in 1964 obtained it from the Miocene and Pliocene of Southern Okinawa.

Diagnosis: This shallow water temperate form ranges from the Oligocene to Recent, although it is not common at any one time.

Specimen	Grade	Total Number	Living	Dead
NONION depressulum	30	-	-	-
	60	1	0	1
	100	12	0	12
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
TROCHAMMINA inflata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	103	4	99
	100	464	4	460
	200	24	0	24
	Total	591	8	583

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	1	37	20	44	48	0	0	81	69
Gastropods	0	0	0	9	0	0	0	0	0	9
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	1	7	4	0	0	0	5	7
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	16	-	44	-	0	-	60
Mussels	2	0	0	4	0	0	0	0	2	4
Crustaceans (exl.Ostracods)	8	0	2	0	4	0	0	0	14	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	-	1	-	0	-	0	-	0	-	1
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 253
Living:- 103
Dead:- 150

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	298	84.9
Lithoclasts	46	13.1
Bioclasts	8	2.0
	(352)	

Sample: CB.639

Date: 21.9.64

Time: 13.00 hours

Location: Grid 572356

Salinity: 26.8‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	10	0	10
	100	36	0	36
	200	4	0	4
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	4	0	4
	100	8	0	8
	200	-	-	-
OOLINA patannae	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	26	0	26
	100	76	0	76
	200	8	0	8
	Total	110	0	110

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	20	0	20	0	0	2	40
Gastropods	0	0	0	2	0	0	0	0	0	2
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	23	0	0	0	0	0	24
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	6	-	16	-	0	-	22
Mussels	1	0	0	10	0	0	0	0	1	10
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 101
Living:- 3
Dead:- 98

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	300	92.0
Lithoclasts	12	3.7
Bioclasts	14	4.3
	(326)	

Sample: CB.640

Date: 21.9.64

Time: 15.15 hours

Location: Grid 570383

Salinity: 11.9‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ACERVULINA inhaerens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	6	0	6
	100	26	0	26
	200	-	-	-
ASTRONONION gallowayi	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	10	0	10
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
NONION pompilioides	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
Total	30	-	-	-
	60	7	0	7
	100	66	0	66
	200	-	-	-
	Total	73	0	73

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	16	4	16	0	0	6	32
Gastropods	0	0	0	3	0	0	0	0	0	3
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	1	7	0	6	0	0	1	13
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	7	-	16	-	0	-	23
Mussels	0	3	0	9	0	0	0	0	0	12
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 90
Living:- 7
Dead:- 83

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	328	88.7
Lithoclasts	34	9.2
Bioclasts	8	2.1
	(370)	

Sample: CB.641

Date: 21.9.64

Time: 15.45 hours

Location: Grid 590370

Salinity: 17.0‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	4	0	4
	100	20	0	20
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	23	0	23
	100	42	0	42
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
HAPLOPHRAGMOIDES canariensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
HAPLOPHRAGMOIDES subinvolutum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
LAGENA sulcata var.spirata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
NONION depressulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
OOLINA williamsoni	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
TROCHAMMINA inflata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	42	0	42
	100	90	0	99
	200	-	-	-
	Total	132	0	132

Family: Textulariidae Ehrenberg 1838

Sub Family: Textulariinae Ehrenberg 1838

Genus: <u>Textularia</u> Defranc in de Blainville 1824

<u>Textularia bocki</u> Hoglund 1947

Pl.3 figs. 1a,1b.

1894	<u>Textularia agglutinans</u>	d'Orbigny	GOES.Kongl.Sv.Vet.Akad.Handl. Band 25,no.9,p.35,pl.7, figs.281-284,294-296.
1947	<u>Textularia bocki</u>	HOGLUND	Zool.Bidrag.Fran.Univ.Uppsala Band 26,p.171,pl.12,figs.5-7, text-figs.152-153.
1956	<u>Textularia cf.bocki</u>	Hoglund	McLEAN.Jr.Bull.Am.Pal.Vol.36, no.160,p.317,pl.36,figs.100-6.
1958	<u>Textularia bocki</u>	Hoglund	Le CALVEZ.Rev.Trav.Inst.Peches Marit.22(2),p.150,pl.1,fig.4.
1964	<u>Textularia bocki</u>	Hoglund	FEYLING-HANSSEN.Nordes Geol. Undersokelse.Nr.225,p.234,235, pl.3,figs.6,7.
1964	<u>Textularia bocki</u>	Hoglund	LeROY.U.S.Geol.Survey Prof. Paper 454-F,p.F17,pl.2,figs.1,2

Test free, medium sized, subtriangular in outline, ovate in transverse section, compressed at first, later inflated, microspheric form, acute initially, widening gradually to the apertural end, periphery sharp in initial portion becoming rounded later. Initial portion indistinct, later portion uniserial throughout. Chambers numerous, about 12 to 14 present, about twice as wide as high gradually increasing in size as added at first, then rapidly, so that the last 4 chambers comprise about half the length of the rest, last chambers inflated. Chambers closely adpressed throughout. Sutures distinct, slightly depressed, especially in the adult portion. Apertural face semi-circular to avate, slightly convex. Aperture

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	9	26	1	4	0	0	10	30
Gastropods	0	2	0	9	0	0	0	0	0	11
Hydrozoans	1	4	0	0	0	0	0	0	1	4
Pelecypods	1	0	4	1	1	1	0	0	6	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	62	-	4	-	0	-	66
Mussels	1	3	0	0	0	0	0	0	1	3
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 134
Living:- 18
Dead:- 116

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	242	76.2
Lithoclasts	38	11.9
Bioclasts	38	11.9
	(318)	

Sample: CB.642

Date: 21.9.64

Time: 16.15 hours

Location: Grid 600378

Salinity: 3.3‰

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ACERVULINA inhaerens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	27	0	27
	100	248	0	248
	200	8	0	8
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	12	0	12
	100	48	0	48
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	21	0	21
	100	24	0	24
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	32	0	32
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	25	0	25
	100	144	0	144
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	6	0	6
	100	48	0	48
	200	-	-	-
MILIAMMINA fusca	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TROCHAMMINA inflata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	108	0	108
	100	460	0	460
	200	16	0	16
	Total	585	0	585

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	10	110	16	40	0	0	26	150
Gastropods	0	0	0	5	0	0	0	0	0	5
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	1	7	0	20	0	0	0	0	1	27
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	10	-	105	-	16	-	0	-	131
Mussels	0	2	0	15	0	8	0	0	0	25
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 365
Living:- 27
Dead:- 338

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	400	75.2
Lithoclasts	100	18.8
Bioclasts	32	6.0
	(532)	

Sample: CB.689

Date: 7.2.65

Time: 14.30 hours

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	20	0	20
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	29	0	29
	100	-	-	-
	200	-	-	-
	Total	29	0	29

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	3	0	4	0	0	0	0	0	7
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	13	0	5	0	0	0	0	0	18
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	5	-	0	-	0	-	0	-	5
Mussels	0	1	0	1	0	0	0	0	0	2
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 32
Living:- 0
Dead:- 32

Sample: CB.690

Date: 7.2.65

Time: 14.40 hours

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	4	0	4
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	4	0	4
ELPHIDIUM excavatum	30	-	-	-
	60	2	2	0
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM magellanicum	30	-	-	-
	60	1	0	1
	100	12	0	12
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
MILIOLINELLA oblonga	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
NONION depressulum	30	1	0	1
	60	8	0	8
	100	8	0	8
	200	4	0	4
Total	30	1	0	1
	60	14	2	12
	100	64	0	64
	200	28	0	28
	Total	107	2	105

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	20	20	0	32	0	0	20	52
Gastropods	47	0	0	40	0	0	0	0	47	40
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	5	0	8	12	0	0	0	0	13	12
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	8	-	4	-	4	-	17
Mussels	0	0	0	4	0	0	0	0	0	4
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 205
Living:- 80
Dead:- 125

a long distinct slit, slightly irregular, at the base of the ultimate chamber. Wall agglutinated, composed of well separated medium sized sand grains with much cement, fairly thin, surface fairly smooth.

Dimensions: Length 0.45 mm. Maximum width 0.30 mm. Maximum Thickness 0.15 mm.

Occurrence: Dead CB.323

Distribution: A Mer Celtique occurrence of this species was noted by Le Calvez in 1958, who recorded it from south of Ireland, the English Channel, and west of France. Bruce, Colman and Jones 1963, listed it as occurring around the Isle of Man and adjacent areas.

Hoglund 1947, stated that it occurred at most of the stations in the Malmo Fjord, Gullmar Fjord, the Skagerak and Kattegat.

Stratigraphic Occurrence: Two single specimens were noted by McLean in 1956 occurring in the Miocene of Virginia, and LeRoy in 1964, recorded it as rare in the Miocene and Pliocene of Southern Okinawa. It was recorded in limited numbers in the Post-Glacial deposits of the Oslo Fjord area in 1964 by Feyling-Hanssen.

Diagnosis: From the limited number of records for this species it would appear that this form prefers the shallow water zones in the world, probably with a sandy substrate. The stratigraphical range is taken as being from the Miocene to Recent.

Sample: CB.693

Date: 8.3.65

Time: 12.45 hours

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	6	0	6
	100	8	0	8
	200	4	0	4
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
GUTTULINA lactea	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	12	0	12
	100	8	0	8
	200	4	0	4
	Total	25	0	25

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	6	0	4	0	0	0	10
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	3	0	0	0	0	0	5
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 15
Living:- 0
Dead:- 15

Sample: CB.694

Date: 8.3.65

Time: 12.55 hours

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	12	0	12
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	1	0	1
	60	18	4	14
	100	8	0	8
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	16	0	16
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
NONION depressulum	30	1	0	1
	60	4	0	4
	100	12	0	12
	200	12	0	12
Total	30	2	0	2
	60	23	4	19
	100	32	0	32
	200	40	0	40
	Total	97	4	93

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	4	5	16	4	0	8	20	17
Gastropods	35	0	0	8	0	0	0	4	35	12
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	4	0	0	0	4	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	0	-	0	-	1
Mussels	0	1	0	1	0	4	0	0	0	6
Crustaceans (exl.Ostracods)	0	0	10	17	8	8	0	0	18	25
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 138
Living:- 77
Dead:- 61

Sample: CB.695

Date: 11.4.65

Time: 13.30 hours

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	68	0	68
	100	12	0	12
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	23	0	23
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	98	0	98
	100	16	0	16
	200	-	-	-
	Total	115	0	115

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	3	0	0	0	0	1	3
Gastropods	0	1	0	3	0	0	0	0	0	4
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	21	0	7	0	0	0	0	0	28
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	5	-	0	-	0	-	7
Mussels	0	2	0	8	0	0	0	0	0	10
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 53
Living:- 1
Dead:- 52

Sample: CB.696

Date: 11.4.65

Time: 13.40 hours

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	2	0	2
	60	14	0	14
	100	76	0	76
	200	40	0	40
ASTRONONION gallowayi	30	-	-	-
	60	4	0	4
	100	16	0	16
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	4	0	4
CYCLOGYRA involvens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	4	0	4
	100	68	0	68
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	25	3	22
	100	16	0	16
	200	20	0	20
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	10	0	10
	100	76	0	76
	200	36	0	36
ELPHIDIUM selseyense	30	-	-	-
	60	5	0	5
	100	72	4	68
	200	16	0	16
LAGENA laevis	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
LAGENA sulcata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
LAGENA sulcata var.spirata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIAMMINA fusca	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	6	0	6
	100	20	0	20
	200	-	-	-
NONION depressulum	30	-	-	-
	60	57	7	50
	100	68	16	52
	200	16	0	16
OOLINA hexagona	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	3	0	3
	100	4	0	4
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TROCHAMMINA inflata	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
Total	30	3	0	3
	60	145	10	135
	100	472	20	452
	200	126	0	126
	Total	746	30	716

Textularia gramen d'Orbigny 1846

Pl.3, figs.3a,3b.

1846	Textularia gramen	d'ORBIGNY	For.Tert.Vienna Basin.Gide et Comp.Paris.p.248,pl.15,figs.4-6.
1890	Textularia gramen	d'Orbigny	BURROWS, SHERBORN and BAILEY. Journ.Roy.Micro.Soc.p.5,pl.8, fig.13.
1892	Textularia gramen	d'Orbigny	CHAPMAN.Journ.Roy.Micro.Soc. p.10,pl.6,fig.17.
1897	Textularia gramen	d'Orbigny	FLINT.U.S.Nat.Mus.Ann.Repts. p.284,pl.29,fig.5.
1907	Textularia gramen	d'Orbigny	CHAPMAN.Journ.Linn.Soc.London Zool.Vol.30,pl.3.fig.53
1911	Textularia gramen	d'Orbigny	CUSHMAN.U.S.Nat.Mus.Bull 71, Pt.2,p.8,figs.6-8,9.
1921	Textularia gramen	d'Orbigny	CUSHMAN.U.S.Nat.Mus.Bull 100, Vol.4,p.105,pl.20,fig.7.
1922	Textularia gramen	d'Orbigny	HOFKER.Flora en Fauna der Zuidersee,Protozoa.p.138,fig.21.
1927	Textularia gramen	d'Orbigny	CUSHMAN.Contr.Cush.Found.Foram. Res.Vol.3,Pt.1,p.24,pl.5,fig.2.
1930	Textularia gramen	d'Orbigny	CUSHMAN and VALENTINE.Contr. Dept.Zool.Stanford Univ.Vol.1, no.1,p.8,pl.1,fig.2.
1940	Textularia gramen	d'Orbigny	LALICKER and McCULLOCH.Al.Han. Pac.Exped.Vol.6,no.2,p.129,130 pl.14,fig.13.
1946	Textularia gramen	d'Orbigny	BELLEN.von.Med.Geol.Stichting. Ser. C,V,No.4,p.26,pl.1,fig.8,9.
1949	Textularia gramen	d'Orbigny	SAID.Contr.Cush.Found.Foram.Res. Sp.Pub.no.26,p.7,pl.1,fig.11.
1956	Textularia gramen	d'Orbigny	McLEAN jr. Bull.Am.Pal.Vol.36, No.160,p.319,pl.36,figs.7,12-13.
1957	Textularia gramen	d'Orbigny	BHATIA and MANDWAL.Journ.Pal.Soc. India Vol.2,p.164,text-fig.A,1a, 1b.
1957	Textularia gramen	d'Orbigny	BOLTOVSKOY.Mus.Argentina de Ciencias Nat.Geol.Tome 6,no.1,p.19,pl.2, figs.1-9.

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	3	9	10	140	16	83	8	48	37	285
Gastropods	92	0	0	6	0	0	0	0	92	6
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	16	0	6	62	32	24	4	0	56	86
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	46	-	0	-	12	-	58
Mussels	0	0	0	18	0	8	0	0	0	26
Crustaceans (exl.Ostracods)	0	0	0	4	0	0	0	0	0	4
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 710
Living:- 185
Dead:- 525

Sample: CB.699

Date: 9.5.65

Time: 13.15 hours

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	39	0	39
	100	16	0	16
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	12	0	12
	100	-	-	-
	200	-	-	-
Total	30	1	0	1
	60	62	0	62
	100	16	0	16
	200	-	-	-
	Total	79	0	79

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	2	0	0	0	0	1	2
Gastropods	0	0	0	2	0	0	0	0	0	2
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	10	0	0	0	0	0	12
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	3	-	0	-	0	-	3
Mussels	0	0	0	4	0	0	0	0	0	4
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 25
Living:- 1
Dead:- 24

Sample: CB.700

Date: 9.5.65

Time: 13.30 hours

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	3	0	3
	100	16	0	16
	200	32	0	32
ASTRONONION gallowayi	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	16	0	16
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	8	0	8
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	24	0	24
ELPHIDIUM excavatum	30	-	-	-
	60	18	5	13
	100	48	8	40
	200	32	8	24
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	1	0	1
	100	36	0	36
	200	8	0	8
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	16	0	16
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
NONION depressulum	30	2	1	1
	60	15	3	12
	100	108	28	80
	200	120	16	104
PATELLINA corrugata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
PLANORBULINA mediterranensis	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
REOPHAX artica	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
Total	30	2	1	1
	60	41	8	33
	100	272	36	236
	200	296	24	272
	Total	981	69	912

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	2	2	55	15	120	168	48	48	225	233
Gastropods	203	0	50	0	0	0	0	0	253	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	30	1	65	1	24	0	0	0	119	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	2	1	0	0	8	8	0	0	10	9
Crustaceans (exl.Ostracods)	1	0	10	0	0	0	0	0	11	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	0	0	0	0	0	0	2	0

Total Faunal Content:- 844
Living:- 600
Dead:- 244

Sample: CB.705

Date: 13.6.65

Time: 14.30 hours

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	20	0	20
	100	20	0	20
	200	8	0	8
ELPHIDIUM crispum	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	13	0	13
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	41	0	41
	100	28	0	28
	200	12	0	12
	Total	81	0	81

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	4	0	0	0	0	0	4
Gastropods	0	0	0	3	0	0	0	0	0	3
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	2	0	0	0	0	0	3
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	0	-	0	-	1
Mussels	0	0	0	6	0	0	0	0	0	6
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 17
Living:- 0
Dead:- 17

Sample: CB.706

Date: 13.6.65

Time: 14.45 hours

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	4	0	4
	100	20	0	20
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CYCLOGYRA involvens	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	89	2	87
	100	112	8	104
	200	16	0	16
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4

1957	Textularia gramen	d'Orbigny	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.26, pl.2,figs.15-18.
1959	Textularia gramen	d'Orbigny	BHATIA and MOHAN.Journ.Pal.Vol.33, No.4,p.646,Text fig.1, figs.4a,b.
1959	Textularia gramen	d'Orbigny	BOLTOVSKOY.Sec.de Marina Pub.H1005, Buenos Aires.p.41,pl.1,fig.10.
1960	Textularia gramen	d'Orbigny	HOFKER.Palaontologische Zeitschrift Stuttgart.Band 34,Nr.3/4,p.237, pl.A,fig.16.
1961	Textularia gramen	d'Orbigny	BOLTOVSKOY.Mus.Argentina de Ciencias Nat.Zool.Tome 6,no.6,pl.9,p.316, figs.29-31.
1961	Textularia gramen	d'Orbigny	BRAGA.Pub.Inst.de Zool.Fac.Ciencias do Porto 77,p.32,pl.2,fig.15.
1962	Textularia gramen	d'Orbigny	CLOSS and BARBERENA.Inst.Rio Grande do Sul.Inst.Cienc.Nat.No.16,p.21, Est.5,figs.1a-b,2a-b.

Test free, biserial, compressed, slightly longer than broad, triangular in outline, sub-ovate in cross section, greatest width at the apertural end, tapering quite rapidly to the initial end, elongate triangular in side view, periphery sub-acute. Chambers distinct, 12 to 14 visible, initially small, wider than high, later as high as wide, slightly inflated. Sutures moderately distinct, impressed, with a crenulate appearance due to the agglutinated material being set flush in the cement, slightly overlapping the suture proper. Apertural face semi-circular to ovate. Aperture semi-circular, set in a depression at the base of the inner margin of the last chamber. Wall agglutinated with medium to fine material set flush on the wall.

Dimensions: Length 0.72 mm. Maximum thickness 0.35 mm. Maximum width 0.50 mm.

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8
NONION depressulum	30	-	-	-
	60	4	1	3
	100	8	0	8
	200	12	4	8
QUINQUELOCULINA seminulum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	4	0	4
Total	30	-	-	-
	60	103	3	100
	100	164	8	156
	200	44	4	40
	Total	311	15	296

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	1	0	9	5	8	16	0	24	17	45
Gastropods	17	0	1	1	0	8	0	0	18	9
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	4	-	0	-	4
Mussels	0	1	1	2	0	0	0	0	1	3
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 99
Living:- 37
Dead:- 62

Sample: CB.710

Date: 4.7.65

Time: 14.30 hours

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	14	0	14
	100	5	0	5
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	19	0	19
	100	1	0	1
	200	4	0	4
	Total	24	0	24

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	3	0	0	0	0	0	3
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	4	0	0	0	0	0	0	0	4
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 7
Living:- 0
Dead:- 7

Sample: CB.711

Date: 4.7.65

Time: 14.45 hours

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	4	0	4
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
SACCAMMINA cf.sphaerica	30	1	1	0
	60	-	-	-
	100	-	-	-
	200	-	-	-
Total	30	1	1	0
	60	3	0	3
	100	4	0	4
	200	4	0	4
	Total	12	1	11

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	14	0	0	0	0	0	0	0	14	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	1	0	0	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 15
Living:- 15
Dead:- 0

Sample: CB.712

Date: 1.8.65

Time: 13.15 hours

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	16	0	16
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	17	0	17
	100	-	-	-
	200	-	-	-
	Total	17	0	17

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	3	0	1	0	0	0	0	0	4
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	1	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 6
Living:- 0
Dead:- 6

Sample: CB.713

Date: 1.8.65

Time: 13.25 hours

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	8	0	8
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	8	0	8
	100	4	0	4
	200	-	-	-
	Total	12	0	12

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	2	0	0	0	0	0	3
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 3
Living:- 0
Dead:- 3

Occurrence: Dead CB.410

Morphological remarks: Brady 1884 referred a number of specimens to this specific name but Chapman and Parr 1937 re-designated them to Textularia pseudogramen. Heron-Allen and Earland (1913, Clare Island), (1916, West of Scotland), (1916, South Cornwall) refer to the extreme range of variation exhibited by this species, and state that they retrieved specimens illustrating every variation between Textularia conica, Textularia agglutinans, and Textularia gramen. Boltovskoy, 1955, 1959, also comments on this variation.

Distribution: (Text-fig.18A) In 1895 this species was recorded as frequent from Dogs Bay by Wright, and the British Association in 1896 included it in their list of foraminifera occurring in the Irish Sea. Wright again noted it from Dogs Bay in 1900, and Worth, in the same year, recorded a few specimens from Salcombe estuary. In 1902 Wright recorded this species from two localities, from Rathlin Island, and from Recent clay in the valley of the River Lune. In the same year it was recorded from the Exe estuary by Worth. It was noted as being rare in the Firth of Forth by Pearcey in 1903, as common from Plymouth by Worth in 1904, and by Gough in 1906 from Larne Lough, very rare, Gobbins, very common, and Red Bay, Ireland. Wright in 1907 noted it from Lambay, County Dublin. Heron-Allen and Earland noted the occurrence of this species on a number of occasions, from the shore sands of Selsey Bill, Sussex (1909),(1911), from off Clare Island (1913), from

Sample: CB.714

Date: 5.9.65

Time: 11.30 hrs.

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	30	0	30
	100	16	0	16
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	10	0	10
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Spedimen	Grade	Tótaln Number	Living	Dead
ELPHIDIUM crispum. var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM selseyehse	30	-	-	-
	60	1	0	1
	100	5	0	5
	200	4	0	4
MASSILINA secans	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	6	0	6
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	7	0	7
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUEDOCULINA seminulum	30	-	-	-
	60	13	0	13
	100	-	-	-
	200	4	0	4
Total	30	-	-	-
	60	52	0	52
	100	52	0	52
	200	12	0	12
	Total	116	0	116

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	9	0	0	0	0	0	9
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	2	0	0	0	0	0	4
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	19	-	0	-	0	-	19
Mussels	0	1	0	7	0	0	0	0	0	8
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 41
Living:- 0
Dead:- 41

Sample: CB.715

Date: 8.9.65

Time: 11.45 hrs.

Location: Grid 569278

Beach sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
ELPHIDIUM excavatum	30	-	-	-
	60	4	1	3
	100	4	4	0
	200	-	-	-
TROCHAMMINA inflata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	9	1	8
	100	4	4	0
	200	4	0	4
	Total	17	5	12

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	0	0	0	0	0	2	0
Gastropods	3	3	2	2	0	0	0	0	5	5
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	0	-	0	-	1
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 13
Living:- 7
Dead:- 6

Sample: CB.716

Date: 3.10.65

Time: 11.15 hrs.

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	26	0	26
	100	12	0	12
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
NONION depressulum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	3	0	3
	100	4	0	4
	200	-	-	-
Total	30	1	0	1
	60	38	0	38
	100	20	0	20
	200	-	-	-
	Total	59	0	59

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	1	2	0	0	0	0	1	23
Gastropods	0	5	0	3	0	4	0	0	0	12
Hydrozoans	0	0	0	1	0	0	0	0	0	1
Pelecypods	0	12	0	2	0	0	0	0	0	14
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinnids	-	3	-	0	-	4	-	0	-	7
Mussels	1	2	0	8	0	0	0	0	1	10
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 47
Living:- 2
Dead:- 45

Sample: CB.717

Date: 3.10.65

Time: 11.30 hrs.

Location: Grid 569278

Beach sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	8	0	8
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	16	0	16
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	11	11	0
	100	32	12	20
	200	8	0	8
Elphidium magellanicum	30	-	-	-
	660	-	-	-
	100	4	0	4
	200	8	0	8
NONION depressulum	30	-	-	-
	60	12	12	0
	100	84	64	20
	200	40	8	32
TROCHAMMINA inflata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	27	23	4
	100	128	76	52
	200	80	8	72
	Total	235	107	128

<u>GENERAL FAUNA</u>

GRADE	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	[illegible]	0	8	24	0	0	9	24
Gastropods	1	0	12	15	0	0	0	0	13	15
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	1	0	5	2	0	0	0	0	6	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 69
Living:- [illegible]8
Dead:- 41

Sample: CB.734

Date: 14.11.65

Time: 11.15 hrs.

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	26	0	27
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	12	0	12
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	41	0	41
	100	4	0	4
	200	-	-	-
	Total	45	0	45

5 fathoms off Jura, 20 fathoms off Ardnamuchan, 20 fathoms from the Sound of Mull, 12 fathoms from Loch Sunart (1914), from 20 fathoms off the Isle of Man (1915), off the West of Scotland, from the shore sands and shallow water zone of the South coast of Cornwall (1916), and from the Plymouth district in 1930. The Marine Biological Association listed this species as occurring at five stations in the Plymouth area in 1957. Bruce, Colman and Jones in 1963 noted the species occurring from the Isle of Man and surrounding areas.

Flint in 1897 noted the occurrence of this species in the Carribean and the Gulf of Mexico, Chapman in 1899 from the Funafuti Atoll, and Millett in 1899 from the Malay Archipelago where the form was numerous and widely dispersed. It was recorded as frequent in the lagoon, and common on the seaward side of Cocos Keeling Atoll in 1902 by Chapman. Cushman in 1911 noted it from the Hawaiian Islands, and the Western and Northern Pacific. A very rare occurrence was noted in 1913 by Heron-Allen and Earland from the North Sea. Cushman in 1921 recorded the species from 28 stations, usually occurring in considerable numbers, and as a rule in shallow waters in the Philippine Islands area. Hofker recorded it from the Zuidersee in 1922, and Heron-Allen and Earland from the Lord Howe Island, South Pacific in 1923. Hanna and Church recorded this form as being abundant off San Francisco Bay in 1927. It was noted from the Southern California

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	4	0	0	0	0	0	4
Bryocoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	2	-	0	-	0	-	2
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Staffish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 7
Living:- 0
Dead:- 7

Sample: CB.735

Date: 14.11.65

Time: 11.30 hrs.

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
	Total	7	0	7

<u>GENERAL FAUNA</u>

NO FAUNA OBTAINED

Sample: CB.743

Date: 12.12.65

Time: 11.30 hrs.

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	660	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
	Total	8	0	8

GENERAL FAUNA

NO FAUNA OBTAINED

Sample: CB.744

Date: 12.12.65

Time: 11.45 hours.

Location: Grid 569278

Beach sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	0	1	8
	100	-	-	-
	200	-	-	-
	Total	9	1	8

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	0	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	1	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	0	-	0	-	1
Mussels	1	0	0	0	0	0	0	0	1	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 46
Living:- 1
Dead:- 3

Sample: CB.745

Date: 9.1.66.

Time: 11.30 hrs.

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	16	0	16
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	22	0	22
	100	4	0	4
	200	-	-	-
	Total	26	0	26

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	1	0	0	0	0	0	2
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	0	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 3
Living:- 0
Dead:- 3

Sample: CB.746

Date: 9.1.66.

Time: 11.45 hrs.

Location: Brid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	3	0	3
	100	20	0	20
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM bartletti	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	37	8	29
	100	16	0	16
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

channel islands by Cushman and Valentine in 1930, and in the same year from the Florida area by Norton who retrieved it from between 5 to 60 fathoms with a temperature range of 18.9° to 24.8°C. Wiesner in 1931 noted it in the Antarctic area, as did Heron-Allen and Earland in 1932, from the ice free area of the Falkland Islands. Natland in 1933 noted it from the southern California region, Earland 1934 from the Scotia Sea, Stubbings 1939 from the Gulf of Aden at 37 and 275 metres, the Gulf of Oman at 73 metres, Zanzibar area at 209, 220, 280, 353, and 805 metres, and from the Maldive area at 57 and 797 metres. It was recorded from off the Channel Islands of California, off the Guadelupe Islands and off Ecuador (Lalicker and McCulloch 1940), as common, in the shallow water samples in the Gulf of Suez at depths of 59 to 64 metres (Said 1949), and from shore sands at Quequen, Buenos Aires (Boltovskoy 1955). In 1957 Boltovskoy noted it in the estuary of the Rio de la Plata, Said and Kamel from the Egyptian Mediterranean coast, and Todd and Bronnimann from the offshore zone in the Eastern Gulf of Paria. Blanc-Vernet in 1958 recorded this species from the Marseilles coast, Boltovskoy in 1959 noted it off Argentina and off Southern Brazil, and Hofker in 1960 from the Gulf of Naples. In 1961 the species was recorded from the continental platform between Santo Tome and the Rio de la Plata by Boltovskoy, and from the Mozambique coast by Braga, and in 1962 from Southern Brazil by Closs and Barberena.

Specimen	Grade	Total Number	Living	Dead
NONION depressulum	30	-	-	-
	60	1	1	0
	100	28	0	28
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	42	9	33
	100	88	0	88
	200	-	-	-
	Total	130	9	121

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	D	D	D	D
Ostracods	0	0	0	8	0	0	0	0	0	8
Gastropods	1	0	20	0	0	0	0	0	21	0
Hydrozoans	1	0	0	0	0	0	0	0	1	0
Pelecypods	5	0	0	8	0	0	0	0	5	8
Dryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	11	0	0	0	0	0	0	0	1	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 44
Living:- 28
Dead:- 16

Sample: CD.176

Date: 8.1.63

Time: -

Location: Grid 569278

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
NONION depressulum	30	-	-	-
	60	2	1	1
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	9	1	8
	100	16	0	16
	200	-	-	-
	Total	25	1	24

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	2	7	4	20	0	0	6	27
Gastropods	14	0	0	0	0	0	0	0	14	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	1	0	0	0	0	0	0	0	1	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	29	-	12	-	4	-	45
Mussels	0	0	0	1	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	3	0	0	0	0	0	3	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 96
Living:- 23
Dead:- 73

Sample: CB.177

Date: 8.1.63

Time: -

Location: Grid 567283

Beach Sample

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	14	0	14
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	17	0	17
	100	-	-	-
	200	-	-	-
	Total	17	0	17

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
Fauna	L	D	L	D	L	D	L	D	L	D
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	1	0	0	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	0	-	0	-	0	-	0
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 1
Living:- 0
Dead:- 1

Stratigraphic Occurrence: (Text - fig.18B) British Holocene occurrences have been recorded from Skye and County Antrim (MacFadyen 1937), from the English Fenlands where it was stated to be relatively intolerant to brackish water (MacFadyen 1938), and from Swansea Docks (MacFadyen 1942).

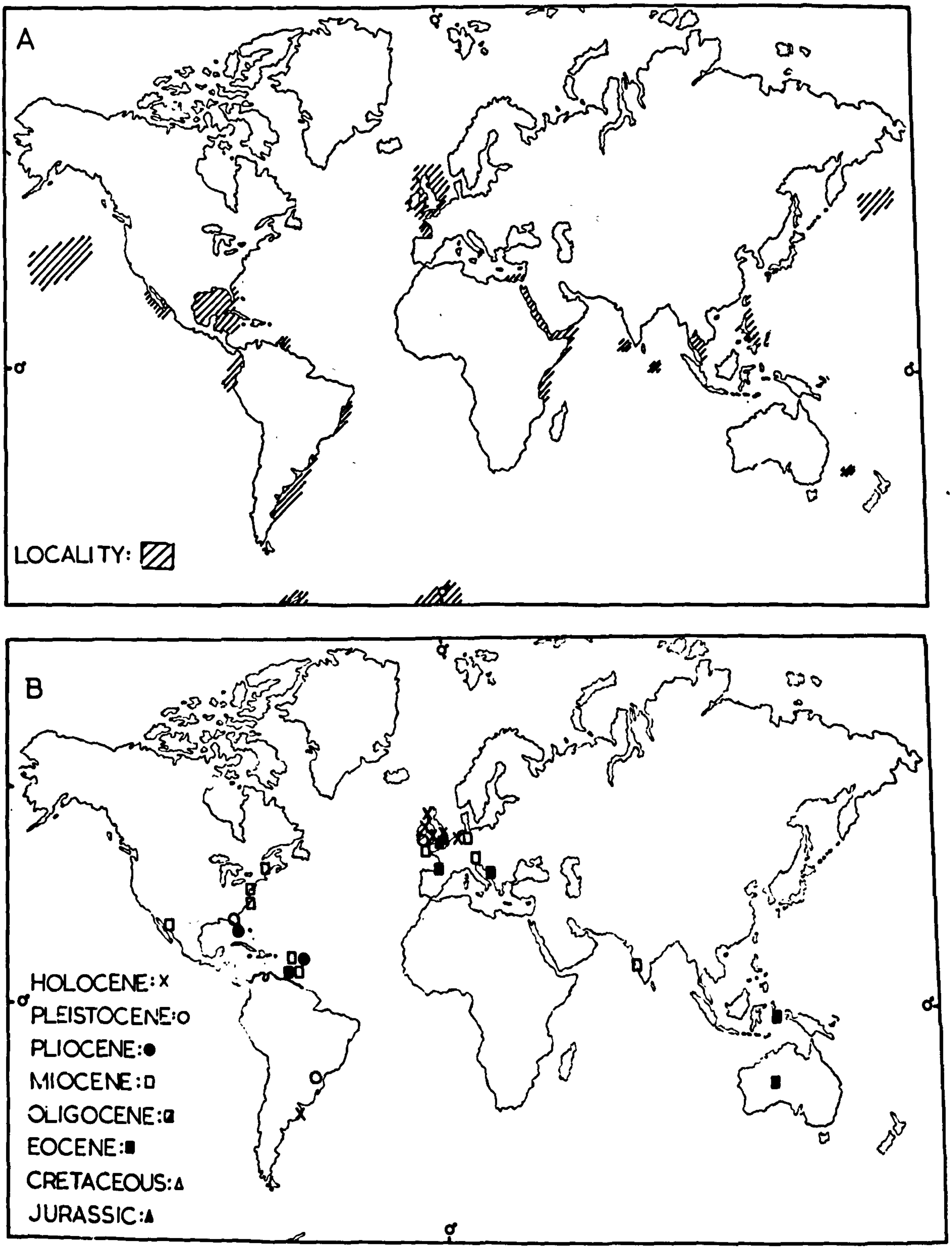
The oldest record of this species in the British area is that made by Chapman in 1892 who noted it occurring sparingly in the Gault of Folkestone. Two Lower Cretaceous occurrences have been noted from the Red Chalk at Speeton by Burrows, Sherbourn and Bailey in 1890, and the other from the Bargate Beds of Surrey, by Chapman in 1894. Curry, Murray and Whittard in 1965 noted a Miocene occurrence of this species in the western approaches to the English channel. MacFadyen 1940 noted it occurring in the Upper Clay of the Pleistocene of the Wexford coast, and Worth in 1902 retrieved it from Drift in County Cork.

Reade in 1898 recorded one specimen of this species from the Holocene at Bruges, and Boltovskoy in 1959 recorded it from the Holocene at Quequen, Buenos Aires.

Howchin in 1893 recorded this species from the Eocene of Australia, Chapman and Crespin in 1935 from the Eocene of Western Australia, and from the Eocene of the Island of Ceram in 1946 by Rutten and Hotz, where they stated it ranged through to the Recent. Halkyard noted the species from the Middle Eocene, Blue Marl of Biarritz in 1917 and 1919. Bellen in 1946 stated that the form occurred in the Eocene of Jugoslavia, and that it ranges from the Oligocene to the Recent in Europe and America. It was stated to range from the Upper Eocene to Miocene of Trinidad by Nutall in 1928.

A number of occurrences of this species have been recorded from the Miocene as follows:- from the Barbados Islands (Chapman 1898) where it ranges through to the Pliocene, Lower Miocene of California (Cushman and Hobson 1935), Upper Miocene of the Netherlands Antilles (Drooger 1953), Miocene of New Jersey, Maryland and Virginia (Malkin 1953), Miocene of Virginia (McLean 1956), Miocene of Western India (Bhatia and Mandwal 1957), Miocene of Carpathian Foreland (Luczkowska 1957), Miocene of Western India (Bhatia and Mohan 1959) and the Miocene of Cagliare (Caria 1959). Tertiary occurrences have been recorded from the following localities, Port Phillip, Victoria, Australia (Chapman 1907), Netherlands (Ten Dam 1944), and Cape Range, Western Australia (Crespin 1955). Cole 1931 recorded a few specimens from the Pliocene and Pleistocene of Florida, and Boltovskoy in 1959 recorded it from the Pleistocene of South America.

Diagnosis: This variable species has a cosmopolitan distribution both in cool and warm latitudes, with a wide depth and temperature range. It appears to be a typical marine form intolerant of brackish water. Records have this form possibly ranging from the Gault to the present day, certainly from the Eocene, with considerable development from the Miocene onwards.



TEXT FIG. 18 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- TEXTULARIA GRAMEN

Family: Trochamminidae Schwager 1877

Sub Family: Trochammininae Schwager 1877

Genus: Trochammina Parker and Jones 1859

Trochammina globigeriniformis (Parker & Jones) 1865

Pl.3, figs. 5a,5b.

1865 Lituola nautiloidea Lamarck var.globigeriniformis PARKER and JONES Trans.Phil.Roy.Soc.London.Vol.155, p.407,pl.15,figs.46-47,pl.17,figs. 96-98.

1894 Haplophragmium globigeriniforme (Parker and Jones) GOES. Kongl. Svensk.Veren.Akad.Handl.N.F.Bd.25, No.9,p.22,TabV,fig.128-133.

1909 Haplophragmium globigeriniforme (Parker and Jones) RHUMBLER.Erg. Plankton Exped.Humboldt.Stiftung. Bd.III,L.c.Tiel 1, p.91,Taf.XXIV, fig.16a-b.

1910 Trochammina globigeriniformis (Parker and Jones) CUSHMAN.U.S.Nat. Mus.Bull.71,Pt.1,p.124,text-figs. 193-194,195.

1920 Trochammina globigeriniformis (Parker and Jones) CUSHMAN.U.S.Nat. Mus.Bull.104,Pt.2,p.78-80,pl.16, figs.5,6.

1921 Trochammina globigeriniformis (Parker and Jones) CUSHMAN.U.S.Nat. Mus.Bull.100,Vol.4,p.96,7,pl.11, figs.4,5.

1928 Trochammina globigeriniformis (Parker and Jones) CUSHMAN AND JARVIS. Contr.Cush.Found.Foram.Res.Vol.4, Pt.4,p.95,pl.13,figs.12a,b.

1930 Trochammina globigeriniformis (Parker and Jones) CUSHMAN and MOYER Contr.Cush.Found.Foram.Res.Vol.6, pt.3,p.53,pl.7,figs.11a,b.

1932 Trochammina globigeriniformis (Parker and Jones) CUSHMAN and JARVIS, Proc.U.S.Nat.Mus.Vol.80,Art.14, p.21,pl.6,figs.2-5.

1943 Trochammina globigeriniformis (Parker and Jones) FRIZZELL.Journ. Pal.Vol.17,no.4,p.340,pl.55,fig.16.

1947 _Trochammina globigeriniformis_ (Parker and Jones) CUSHMAN.Contr. Cush.Found.Foram.Res.Vol.23,pt.1, p.9,pl.2,figs.21,22.

1948 _Trochammina globigeriniformis_ (Parker and Jones) PARKER.Bull. Mus.Comp.Zool.Vol.100,no.2,pl.2, fig.4.

1952 _Trochammina globigeriniformis_ (Parker and Jones) USBECK.Neues. Jb.Geol.Palaont.Abh.Bd.95,Taf.15, fig.13.

1955 _Trochammina globigeriniformis_ (Parker and Jones) WEISS.Journ. Pal.Vol.29,No.1,p.8,pl.1,figs. 18,19.

1959 _Trochammina globigeriniformis_ (Parker and Jones) CIFELLI.Bull. Mus.Comp.Zool.Vol.121,No.7,p.290, pl.1,figs.23-24.

1959 _Trochammina globigeriniformis_ (Parker and Jones) LLOYD. Palaeontology.Vol.1,Pt.4,p.317, pl.54,fig.31,text-fig.5c.

1961 _Trochammina globigeriniformis_ (Parker and Jones) BOLTOVSKOY. Mus.Argentine de Ciencias Nat. Zool.Tome VI, no.6,p.319,pl.10, fig.7.

Test free, small, trochospiral, plano-convex, globose, close coiled, globigerine, low spire, indistinct, wider than high, periphery broadly rounded, lobate. Dorsal strongly convex, evolute, chambers at first indistinct, later distinct, rapidly increasing in size and inflation as added, about 9 present, in 2+ sinistral whorls. Dorsal sutures distinct, sub radial, deeply impressed, spiral suture fairly distinct, flush to very slightly impressed Ventral flat, involute only the chambers of the last whorl visible, 4 in number, globular, rapidly increasing in size as added, sutures depressed. Aperture interiomarginal, an arched opening on the ventral side of the last chamber at its contact with the adjacent chamber of the preceding whorl. Wall agglutinated, composed of fine to medium grains with occasional small flakes of mica, exterior fairly smooth.

Dimensions: Diameter 0.21 mm. Height 0.15 mm.

Occurrence: Dead CB.318.

Distribution: (Text - fig.19A) This species was recorded as rare off the South West coast of Ireland by Wright in 1889, and it was included in the British Association list of foraminifera occurring in the Irish Sea in 1896. Wright in 1900 noted the form as being very rare in Dogs Bay, and again as very rare in 1902 from Rathlin Island. It was found in small numbers by Worth in 1904 from the Plymouth district. Heron-Allen and Earland in 1914 retrieved this species from 20 fathoms off Ardnamuchan, and from 12 fathoms in Loch Sunart, from the shore sands and shallow water zone of the South coast of Cornwall in 1916 and from the Plymouth district in 1930. The Marine Biological Association in 1957 also recorded this species from the Plymouth district.

Parker and Jones 1865 recorded this species from off the west coast of Greenland, Baffin Bay, Newfoundland Bank, Red Sea, South Atlantic, Mediterranean, and Indian Ocean. Artic and Scandinavian occurrences were noted in 1894 by Goes. Cushman 1910 noted this form as being common in the North Pacific with the greatest concentrations about Japan. Pearcey 1914 noted it occurring in the Antarctic, and Cushman 1920 off the North East coast of the United States, in the Gulf of Mexico, Caribbean, and off the South

American coast. Cushman in 1921 recorded fine large specimens at a great number of stations in the Philippine area, and in 1927 as widely distributed off the west coast of America. In 1930 Cushman and Mayer obtained the species from 18 fathoms off San Pedro, California, and in the same year Norton stated that it seemed to be restricted to the deep waters in the Flòrida area. Wiesner in 1931 recorded this form from the Antarctic area, and in 1932 Heron-Allen and Earland obtained it from the ice free area of the Falkland Islands and adjacent areas, as did Earland in 1934. A Weddell Sea occurrence was noted by Earland in 1936, and Chapman and Parr in 1937 stated that this species is common and widely distributed in deep cold waters of the Antarctic area. Marie in 1938 noted it in the estuary of the Rance, and Stubbings at 2,001 metres in the Gulf of Aden in 1939. Norvang recorded this species off Bergen in 1941, and Parker in 1948 recorded it extending from the Gulf of Maine to Maryland where it constituted less than 1% of the fauna, occurring at depths between 90 and 300 metres. Nagahama 1951 recorded it from Japan, and in 1960 it was recorded by Green from the Artic Basin, and by Uchio from San Diego, California. In 1961 Bandy recorded the species in the Gulf of California, and Boltovskoy from the continental platform between Santo Tome and the Rio de la Plata. In 1963 Zenkevitch commented on occurrences in the Kara Sea, U.S.S.R., as noted by Shchedrina (1938) and Gorshkova (1957). Uchio in 1964 obtained the species in the sea off the River Shinano, Japan, where it constituted between 50% and 80% of the fauna and appeared to be very sensitive to fresh water.

Stratigraphic Occurrence: (Text-fig.19B) Hollins and Neaverson in 1921 noted this species as being rare in the Gault of Buckinghamshire, and Khan in 1950 and 1952 from the Gault of South East England.

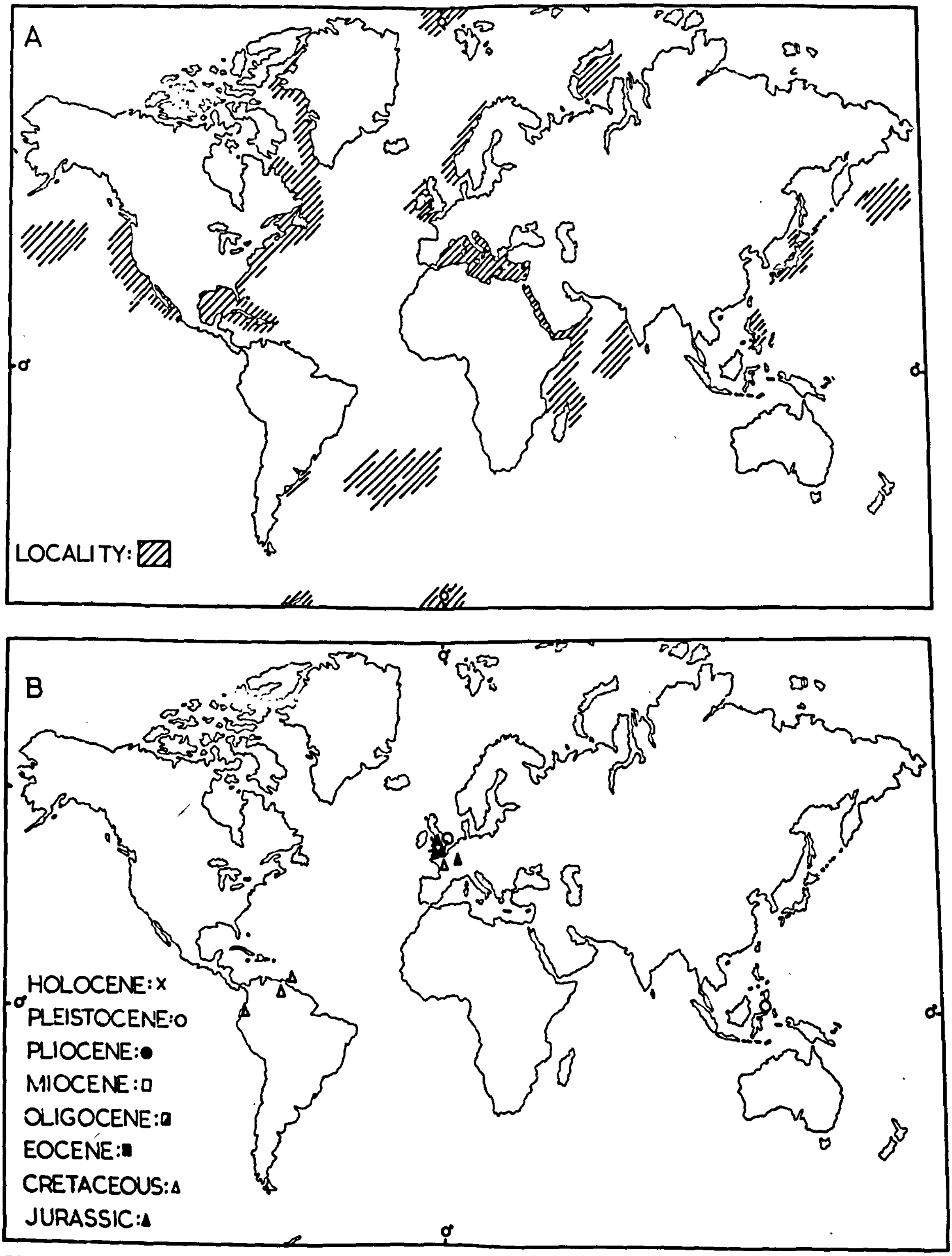
Cifelli in 1959 noted the species as occurring sporadically throughout the Jurassic of England, and commented on the fact that the Jurassic specimens are morphologically identical to Recent forms. In the same year Lloyd stated that this species occurs frequently throughout the Upper Jurassic, Kimmeridgian of the Dorset coast. An East Anglian Pleistocene occurrence was noted in 1932 by MacFadyen.

Jurassic occurrences of this species have been noted from the Lias of the Stuttgart area (Usbeck 1952) and from Germany (Seibold & Seibold 1953), (Pietrzenuk 1961).

This species has been recorded from the Cretaceous of Trinidad (Cushman and Jarvis 1928, 1932), Upper Cretaceous of North Western Peru, where the forms obtained were larger than Recent specimens (Frizzell 1943), Upper Cretaceous of Venezuela (Cushman 1947) and from the Cretaceous of France (Deloffre and Poignant 1963).

Weiss 1955 recorded a few forms from the Palaeocene of Peru, and a Pleistocene occurrence was noted by Reyment in 1959, from the Mindano Trough, in the Western Pacific.

Diagnosis: This species appears to prefer cold and cool temperate latitudes, with a great range of depth. Salinity is probably one of the main factors controlling the distribution of this form. The stratigraphic range is from Cretaceous to Recent, being very well developed in the Jurassic.



TEXT FIG. 19 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- TROCHAMMINA GLOBIGERINIFORMIS

Trochammina inflata (Montagu) 1808

Pl.3, figs.4a,4b,4c.

1808	Nautilus inflatus	MONTAGU	Test.Brit.Supplement Exeter,pl.18, p.81,fig.3.
1858	Rotalina inflatus	Montagu	WILLIAMSON.Rec.For.Gt.Brit.Ray.Soc. London pl.4,figs.93-94.
1884	Trochammina inflata	(Montagu)	BRADY. Chall.Rep.Zool.Vol.9,p.338, 339,pl.XLI,fig.4.
1894	Trochammina inflata	(Montagu)	GOES.Kongl.Svensk.Veren.Akad.Handl. N.F.Bd.25,No.9,p.29,TabVI,figs.222-224
1900	Trochammina inflata	(Montagu)	READE.Geol.Mag.Vol.7,p.99,pl.V,fig.1
1910	Trochammina inflata	(Montagu)	CUSHMAN.U.S.Nat.Mus.Bull.71, Pt.1, p.121,122,text fig.188.
1922	Trochammina inflata	(Montagu)	HOFKER.Flora en Fauna der Zuidersee Protozoa, p.146,fig.39.
1931	Trochammina inflata	(Montagu)	WIESNER.Deutsche SudPolar Exped. Bd.XX,Bd.XII,p.111,Taf.XVII,fig.201.
1933	Trochammina inflata	(Montagu)	GALLOWAY.A manual of foraminifera. p.182,pl.16,figs.1,2.
1934	Trochammina inflata	(Montagu)	EARLAND.Discovery Repts.Vol.X,p.98, pl.III,figs.41-43.
1944	Trochammina inflata	(Montagu)	CUSHMAN.Contr.Cush.Found.Foram.Res. Sp.Pub.no.12,p.17.18,pl.2,fig.8.
1944	Trochammina inflata	(Montagu)	TEN DAM.Med.Geol.Stichting.Serie-C-V No.3,p.87,Taf.2,fig.5.
1949	Trochammina inflata	(Montagu)	CUSHMAN.Inst.Roy.des Sci.Nat.de Belgique Mem.111,p.18,pl.III,figs.3,4.
1950	Trochammina inflata	(Montagu)	PHLEGER and WALTON.Am.Journ.Sci.Vol. 248,p.280,pl.2,figs.1-3.
1951	Trochammina inflata	(Montagu)	VOORTHUYSEN.Med.Geol.Stichting.n.s. No.5,p.24,25,pl.1,fig.2.
1951	Trochammina inflata	(Montagu)	VOORTHUYSEN.Proc.3rd.Int.Cong.Sed. Neder.p.270,pl.1,fig.1.
1952	Trochammina inflata	(Montagu)	PARKER.Bull.Mus.Comp.Zool.Vol.106, no.9,p.407,pl.4,figs.6,10.
1952	Trochammina inflata	(Montagu)	PARKER.Bull.Mus.Comp.Zool.Vol.106, no.10,p.459,pl.3,fig.1.

1952 Trochammina inflata (Montagu) PHLEGER. Contr. Cush. Found. Foram. Res. Vol. 3, pt. 2, p. 86, pl. 13, figs. 27, 28.

1953 Trochammina inflata (Montagu) MILLER, Jr. Contr. Cush. Found. Foram. Res. Vol. 4, pt. 2, p. 54, pl. 8, fig. 9.

1953 Trochammina inflata (Montagu) PARKER, PHLEGER and PEIRSON. Contr. Cush. Found. Foram. Res. Sp. Pub. no. 2, p. 15, pl. 3, figs. 5, 6.

1954 Trochammina inflata (Montagu) PHLEGER. Bull. A.A.P.G. Vol. 38, no. 4, p. 646, pl. 3, figs. 22, 23.

1955 Trochammina inflata (Montagu) KRUIT. Ken. Med. Geol. Mijnb. Gen. Verh. Doel 15, p. 470, pl. 2, figs. 5a, b.

1955 Trochammina inflata (Montagu) RONAI. Contr. Cush. Found. Foram. Res. Vol. 6, pt. 4, p. 144, pl. 20, fig. 11.

1955 Trochammina inflata (Montagu) WALTON. Journ. Pal. Vol. 29, no. 6, p. 1016, pl. 100, figs. 27-29.

1957 Trochammina inflata (Montagu) LEHMANN. Micropaleontology Vol. 3, no. 4 p. 347, pl. 2, figs. 13-15.

1958 Trochammina inflata (Montagu) DETLING. Contr. Cush. Found. Foram. Res. Vol. 9, pt. 2, p. 26, pl. 7, fig. 11.

1959 Trochammina inflata (Montagu) LANKFORD. Bull. A.A.P.G. Vol. 43, no. 9, pl. 1, fig. 21.

1959 Trochammina inflata (Montagu) PARKER and Athearn. Journ. Pal. Vol. 33, No. 2, p. 341, pl. 50, figs. 18-20.

1960 Trochammina inflata (Montagu) PHLEGER. Bull. A.A.P.G. pl. 2, figs. 8, 14.

1961 Trochammina inflata (Montagu) TODD and LOW. Contr. Cush. Found. Foram. Res. Vol. 12, pt. 1, p. 15, 16, pl. 1, figs. 22, 23.

1962 Trochammina inflata (Montagu) HAAKE. Geol. Inst. Univ. Kiel Meyniana, Band 12, p. 30, Taf. 1, figs. 5-6.

1962 Trochammina inflata (Montagu) McKENZIE. Journ. Roy. Soc. Western Aust. Vol. 45, pt. 4, p. 119, pl. 1, fig. 7.

1963 Trochammina inflata (Montagu) BOLTOVSKOY. Contr. Cush. Found. Foram. Res. Vol. 14, pt. 2, p. 64, pl. 7, fig. 19.

Test free, low trochospire, plano-convex, close coiled, periphery rounded, slightly lobate. Dorsal convex, evolute, chambers moderately distinct, as high as long initially, later longer than high, inflated, sub-globose, increasing gradually and regularly as added except for the ultimate chamber which is markedly inflated, 20 chambers present, arranged in 3+ dextral whorls. Dorsal sutures distinct, slightly impressed, radial to slightly curved with some posterior deflection, spiral suture distinct, flush to slightly impressed. Ventral raised with a wide umbilicus, involute, only the chambers of the last whorl visible, 5, triangular in outline, inflated. Ventral sutures radial, impressed. Aperture interiomarginal, an elongate arch at the base of the last chamber on the periphery trending towards the umbilical side with a small outer lip. Wall agglutinated with very fine material and much cement, slightly smooth externally.

Dimensions: Diameter 0.55 mm. Height 0.20 mm.

Occurrence: Dead CB.380, CB.409, CB. 626, CB.629, CB.638, CB.641, CB.642.

Dead, Variation sample CB.696, CB.715, CB.717.

Morphological remarks: Millett in 1899 commented on the fact that in this species, the primary chambers are of a dark colour, which is quite consistent with the Tremadoc Bay specimens.

Distribution: (Text - fig.20A) A number of recorded occurrences of this species have been noted from the British area, the first being from the Shetland Seas in 1868 by Waller. In 1870 the species was recorded from the Montrose Basin, Budle Bay, the River Aln, River Wansbeck, River Blyth, River Wear, River Tees, Seaton Sluice, Whittlesea Mere, Yarmouth, Breydon Water, and Islay by Brady, and from South East of Eddystone by Robertson. In 1875 Robertson recorded it from the Firth of Clyde and in 1876 Sidall noted it as common in the River Dee. It was recorded from Almouth in brackish water (Brady 1884), from the River Mersey (Burgess 1891), from Liverpool Bay (Pearcey 1891), from Portree Bay, Isle of Skye (Robertson 1892), as frequent from Barry Dock (Chapman and Jones 1896), and it was included in the 1896 British Association list of foraminifera in the Irish Sea. In 1902 this form was noted in the Exe estuary by Worth, and from recent clay in the valley of the River Lune by Wright. Pearcey in 1903 recorded it as rare in the Firth of Forth and Worth 1904 from silty areas in the Plymouth region. Heron-Allen and Earland noted it occurring in the shore sands at Selsey Bill, Sussex, in 1909 and 1911, and stated that it had been possibly derived from Chichester Harbour and the mud flats of Bosham. The same authors recorded it from the Clare Island area occurring at localities where a greater or less amount of fresh water entered the sea, in 1913, from west of Scotland, from shore sands and the shallow water zone on the South coast of Cornwall, 1916, and from the Plymouth district in 1930. Another occurrence in the Plymouth area was noted in 1957 by the Marine Biological Association.

Other recorded occurrences have been made from Crete (Jones and Parker 1860), from the Gulf and River St.Lawrence where the form was rare to common (Dawson 1870), from Scandinavia and the Artic (Goes 1894) from the Malay Archipelago (Millett 1899), from off the coast of Japan (Cushman 1910), from shallow waters around the coast of the United Stated (Cushman 1920), from the Zuidersee (Hofker 1922), off San Francisco Bay (Hanna and Church 1927) and from three stations in the Antarctic at depths between 46 and 3410 metres (Wiesner 1931).

Heron-Allen and Earland recorded a single specimen at three stations in the ice free area of the Falkland Islands in 1932, Natland recorded it from the Southern California area in 1933, Earland in 1934 from the Falklands sector of the Antarctic in 1936 from two stations in the Weddell Sea, and Cushman in 1944 from shallow waters off the New England coast, and in 1949 from off Belgium. In 1950 Phleger and Walton working on material from Barnstable Harbour, Massachussetts, noted this form occurring in the harbour fauna at frequencies of 10% to 100% in each harbour sample, the specimens showing a size variation but generally being large and well developed. Said in 1951 noted this species in Narrangansett Bay, and in the same year Voorthuysen recorded it from the Netherlands Wadden Sea. In 1952 Parker obtained this form from nearshore stations off Portsmouth (N.H) and noted a very scattered distribution in the Long Island Sound - Buzzards Bay area where this species composed a very low percentage of the fauna. The author set up two facies divisions from which this species was obtained, each facies characterised by the following ecologic data: Facies 1, 1-21°C, 25‰ salinity, Facies 2, 1-21°C 28‰ - 30‰ salinity. Phleger in 1952 also recorded this species in the Portsmouth (N.H) area, and noted it occurring south of the Merrimack River, and off the mouth of the Piscataqua River. In this year the same author recorded this species from Melville Sound, Dundas Harbour, and the Canadian and Greenland Artic, and stated that this species is a brackish water indicator on Cape Cod and Long Island Sound. In 1953 Miller obtained this form from Mason Inlet, North Carolina, Parker, Phleger and Peirson from San Antonio Bay and environs where it occurred in the true salt marshes, and not the brackish types, and Said from the Great Pond, Massachussetts. The species was recorded from several marsh stations with frequencies that were generally low, but in places as high as 15% in the Mississippi Sound in 1954 by Phleger who also noted that the form did not generally occur in the estuary stations. In 1955 Harrington recorded this species from the Bay of Fundy, Knuit from brackish basins in the Rhone delta, in which the salinity varied between oligohaline and mesohaline, Phleger from the South Eastern Mississippi Delta area, Ronai from brackish water in the New York Bight, and Walton from Todos Santos Bay, California, where it was one of the most common forms in the marsh subfacies, the living specimens being restricted to this subfacies, whereas the dead specimens were also found in the channel stations. Phleger found the form living in bays along the Central Texas coast in 1956. Lehmann in 1957 recorded this species as being rare in delta facies along the Texas Bulf coast, in the same year Said and Kamel noted it on the Egyptian Mediterranean coast, and Warren noted it from the Buras-Scofield Bayou area of South East Louisiana. In the following year, 1958, it was recorded as rare at Sunset Bay, Oregon, by Detling. In 1959 Boltovskoy obtained this form from the Bay of Flamengo, Southern Brazil, Lankford from marsh - interdistributory channels of the Eastern Mississippi Delta margin, and Parker and Arhearn from Poponesset Bay, Massachusetts, where the form occurred with frequencies up to 30% of the total fauna, the largest living population being found in August, and the smallest in February. Phleger in 1960 noted this form, with variants, at marsh stations in the northern Gulf of Mexico, Boltovskoy in 1961, from the continental platform between Santo Tome and the Rio de la Plata, Argentina, and Todd and Low in the same year from Marthas Vineyard, Massachusetts, where they noted that this species appeared to be characteristic of both salt marshes and brackish waters. The greatest abundances were found in this area where the open waters of Nantucket Sound wash over a submerged bog and where salinities of 31.2 to 32.4‰ are similar to those found in other open sea localities around the island. They went on to state that in this kind of environment, it would appear that other factors, such as pH and the nutrient elements available on the disintegrating bog might be the determining influences favouring the existence of Trochammina almost to the exclusion of all other foraminifera. Haake in 1962 recorded the species from Langeoog Island and mainland, and McKenzie from Oyster Harbour, Western Australia, where he stated that this is a distinctive shallow water species, tolerant of the brackish conditions in the mouths of creeks and estuaries. In 1963 Bandy recorded this form as a marsh species from the Gulf of California, and Boltovskoy recorded large numbers from Puerto Deseado, Patagonia. In 1964 Hulme noted the species in Manukau Harbour, Auckland, New Zealand, and Phleger in 1965 recorded it as living in Guerrero Negro Lagoon, Baja, California.

Stratigraphic Occurrence: (Text - fig.20B) There are a number of Holocene recorded occurrences in the British area, from Leasowe and Formby (Reade 1900), Altcar (Wright 1904) Great Crosby (Wright 1908), Kings Lynn (MacFadyen 1933), County Antrim (MacFadyen 1937), English Fenlands (MacFadyen 1938), Swansea Docks (MacFadyen 1942), Anglesey(Earland for McMillan 1949), and Borth, Cardiganshire (Adams and Haynes 1965).

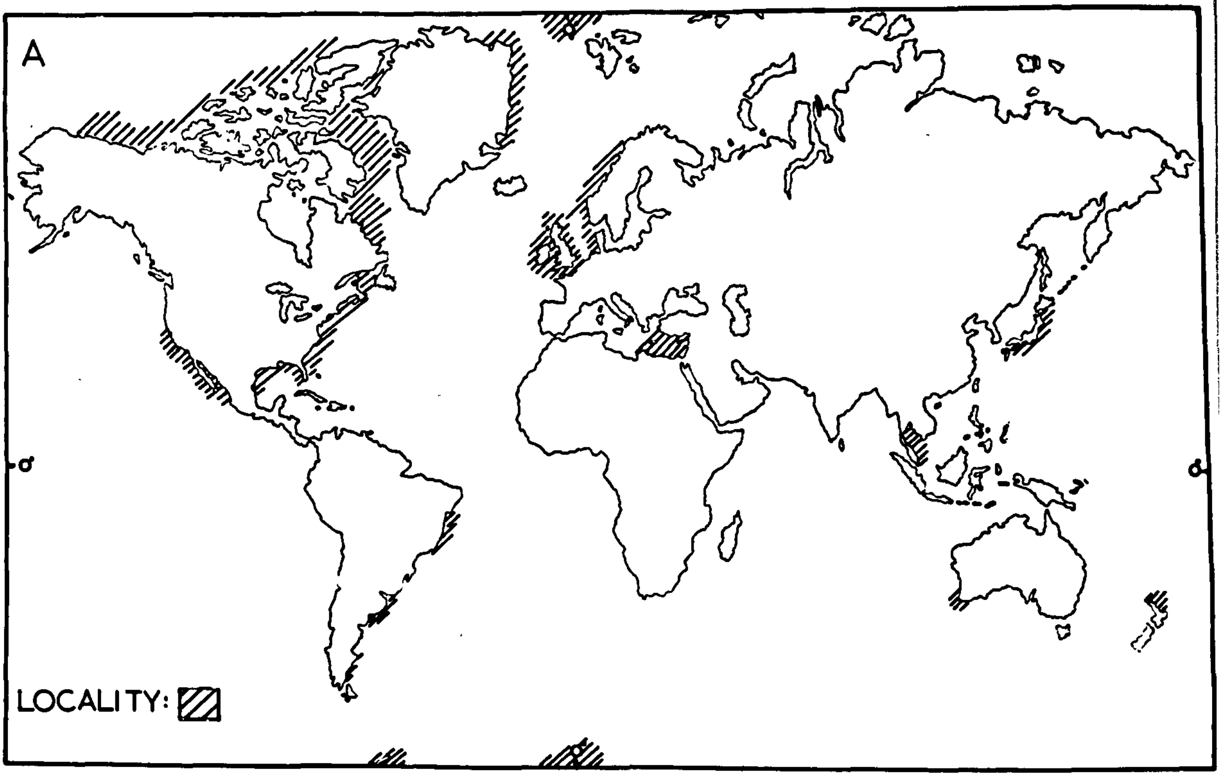
Post-Tertiary records have been noted from Caithness (Crosskey and Robertson 1868), Duntroon (Crosskey and Robertson 1869), Stobcross and Ayrshire (Crosskey and Robertson 1874).

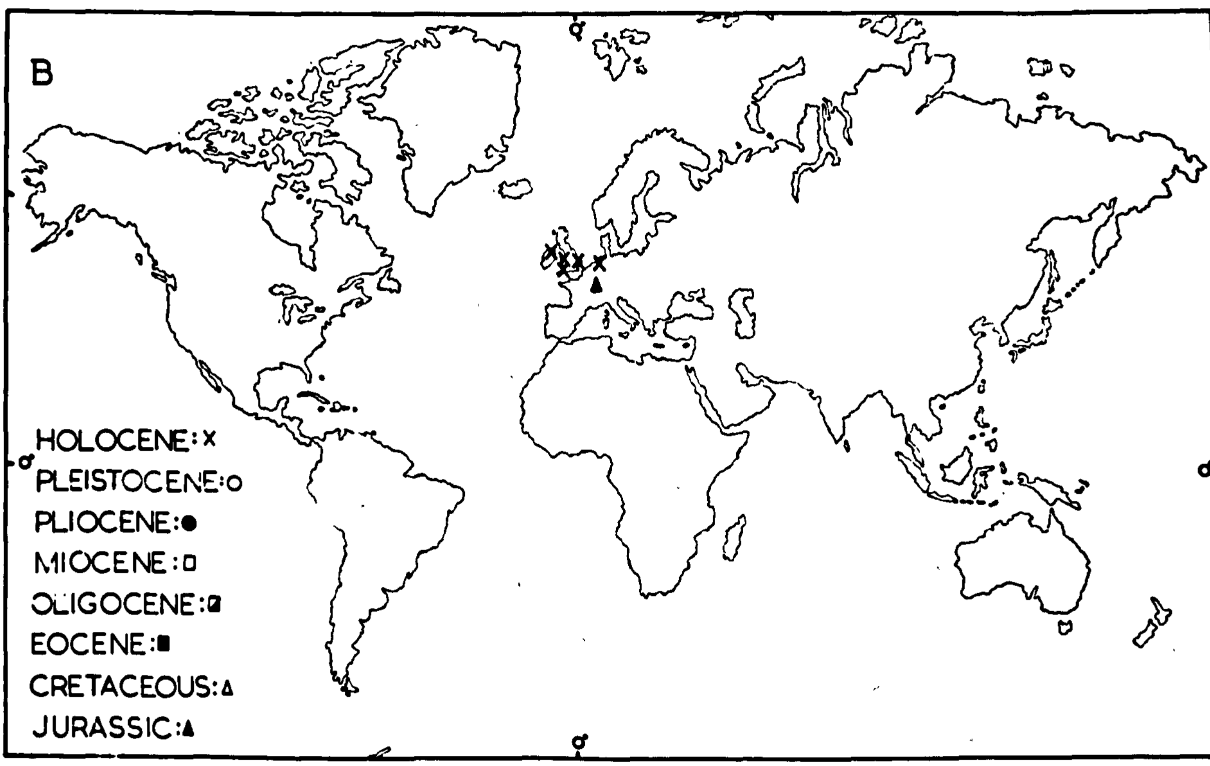
World Holocene occurrences have been noted from Bruges (Reade 1898), from the N.O.Polder, Netherlands (Voorthuysen 1951), and from the Dollart-Ems estuary (Voorthuysen 1960)

This species has been recorded from the Lias of the

Stuttgart area (Usbeck 1952) and from the Tertiary of the Netherlands (Ten Dam 1944).

Diagnosis: This widely recorded species appears to be tolerant of brackish water conditions, and would seem to prefer this type of environment. When the species has been found in more saline conditions, other factors appear to influence the occurrence of this form, and so it does not appear that salinity is alone responsible for the distribution of this form, but that factors such as pH and the amount of nutrient elements present are also important. Stratigraphically the form does not appear to be of value, although it is well distributed throughout the Holocene.





TEXT FIG. 20 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- TROCHAMMINA INFLATA

Family: Ataxophragmidae Schwager 1877

Sub Family: Verneuilininae Cushman 1911

Genus: Verneuilina d'Orbigny in de la Sagra 1839

Verneuilina media Hoglund 1947

Pl.3, figs.6a,6b.

1947	Verneuilina media	HOGLUND	Uppsala Univ.Zool.Bidrag.Uppsala. Bd.26,p.184,pl.13,figs.7-10,pl.30, fig.21.
1964	Verneuilina media	Hoglund	FEYLING-HANSSEN.Nordes Geol. Undersokelse Nr.225,p.242,pl.4, figs.1-3.

Test free, elongate, one and a half to two and a half times as long as broad, triangular in outline, sub-triangular in section, greater width at the apertural end tapering gradually and regularly to the bluntly rounded initial end, triserial throughout, with an apical proloculum. Initial chambers indistinct, later distinct, about 15 present, inflated, generally broader than long, rapidly increasing in size and inflation as added, the last three chambers comprising about 30% of the test length. Sutures distinct, depressed. Apertural face semi-circular, convex. Aperture a low arch, to a slightly loop shaped opening at the inner margin of the last chamber. Wall agglutinated with medium to fine material and much calcareous cement. Test generally brown in colour, due to ferrüginous material incorporated in the test wall, often with a white or much lighter brown ultimate chamber.

Dimensions: Length 0.70 mm. Maximum diameter 0.43 mm.

Occurrence: Living. CB.298, CB.315, CB.319, CB.339, CB.353

Dead. CB.298, CB.299, CB.304, CB.306, CB.307, CB.308, CB.309, CB.310, CB.311, CB.312, CB.314, CB.315, CB.316, CB.317, CB.318, CB.319, CB.321, CB.322, CB.323, CB.324, CB.325, CB.326, CB.327, CB.328, CB.329, CB.330, CB.331, CB.333, CB.334, CB.335, CB.336, CB.337, CB.338, CB.339, CB.340, CB.341, CB.343, CB.344, CB.345, CB.346, CB.348, CB.349, CB.350, CB.351, CB.352, CB.354, CB.358, CB.360, CB.361, CB.362, CB.363, CB.364, CB.366, CB.367, CB.368, CB.370, CB.371, CB.372, CB.373, CB.374, CB.380, CB.381, CB.382, CB.383, CB.384, CB.385, CB.386, CB.387, CB.388, CB.390, CB.391, CB.393, CB.394, CB.395, CB.398, CB.399, CB.401, CB.402, CB.403, CB.404, CB.406, CB.407, CB.408, CB.410, CB.412, CB.413, CB.414, CB.415, CB.628, CB.639.

Morphological remarks: This species often tends to be confused with Eggerella Scabra (Williamson), but it should be noted that Eggerella Scabra has a proloculus of five chambers whereas Verneuilina media is triserial throughout. In Tremadoc Bay specimens great variation is exhibited by this species with regard to relative length and width, and also with regard to inflation and degree of globularity of the last three chambers. Great difficulty was experienced in determining living and dead forms of this species, without actually crushing the specimens obtained. As crushing was considered to be impracticable with the large number of specimens obtained from the study area only those forms with protoplasm protruding from the aperture were regarded as living.

Distribution: No occurrences of this species in the British area have been recorded to the present day.

Höglund 1947 stated that this form occurred in profusion over the Gullmar Fjord and Skagerak area, except in the shallowest parts.

Stratigraphic Occurrence: Only one Holocene occurrence has been noted in the British region, this being by Adams and Haynes 1965, from Borth, Cardiganshire.

In 1963 Risdal obtained this form from a core in the Inner Oslo Fjord, and Feyling-Hanssen 1964 noted this form occurring in post-glacial deposits of the Oslo Fjord area.

Diagnosis: Incorrect identification of this species is probably the cause of the paucity of the number of recorded occurrences, but from existing records it appears that this is a typical cool temperate, shallow water form, possibly tolerant of somewhat less saline water.

Sub Family: Valvulininae Berthelin 1880

Genus: Clavulina d'Orbigny 1826

Clavulina gracilis (Cushman and Bronniman) 1948

Pl.3, figs.2a, 2b.

1948 Pseudoclavulina gracilis CUSHMAN and BRONNIMANN. Contr.Cush. Found.Foram.Res. Vol.24,pt.2,p.40,pl.7, figs.17-18.

Test free, small, elongate, slender, biform, initially pointed, later with parallel sides, greatest width in the adult portion, circular in cross section. Initially triserial, somewhat indistinct, 6 to 9 chambers present, later uniserial, 6 chambers visible, low and broad, moderately adpressed to each other, slightly inflated. Ultimate chamber slightly more globular, with a very faint suggestion of a neck present. Aperture terminal, rounded. Sutures fairly distinct, impressed. Wall agglutinated with much calcareous cement present, fairly rough exterior.

Dimensions: Length 0.40 mm. Diameter 0.10 mm.

Occurrence: Dead CB.415.

Distribution: This species has not been recorded as occurring in the British area to the presen6 day.

Cushman and Bronniman 1948 recorded the type species from 0-2 fathoms in the Gulf of Paria. An Eastern Gulf of Paria occurrence was noted by Todd and Bronniman 1957.

Diagnosis: This rarely recorded form appears to have a distribution in warm and temperate latitudes.

CHAPTER 5

The MILIOLACEA

This Super Family belongs to the Sub Order MILIOLINA Delage and Herouard 1896, and includes forms with a porcellaneous wall, commonly with a pseudochitinous inner lining, with occasional adventitious material on the exterior. Test composed of a proloculus with a spiral passage followed by numerous chambers which may be planispirally coiled, or arranged in definite planes. Aperture terminal, in a number of cases variously modified.

Super Family: Miliolacea Ehrenberg 1839

Family: Fischerinidae Millett 1898

Sub Family: Cyclogyrinae Loeblich and Tappan 1961

Genus: *Cyclogyra* Wood 1842

Cyclogyra involvens (Reuss) 1850

Pl.4, figs.1a, 1b.

1850 *Operculina involvens* REUSS K.Akad.Wiss.Wien.Math.Nat. Osterreich Bd.1,p.370,pl.46, fig.20.

1884 *Cornuspira involvens* (Reuss) BRADY. Chall.Rep.Zoel.Vol.9,p.200, 201,pl.XI,figs.1-3.

1889 *Cornuspira involvens* (Reuss) SHERBORN and CHAPMAN. Journ.Roy. Micro.Soc.p.2,pl.XI,figs.4,5.

1891 *Cornuspira involvens* (Reuss) CHAPMAN. Journ.Roy.Micro.Socl p.11,pl.IX,fig.12.

1897 *Cornuspira involvens* (Reuss) FLINT. U.S.Nat.Mus.Ann.Rep.Wash. p.303,pl.48,fig.3.

1902 *Cornuspira involvens* (Reuss) CHAPMAN. Foraminifera, p.99,pl.4, fig.19.

1907 *Cornuspira involvens* (Reuss) CHAPMAN. Journ.Linn.Soc.Zool.London, Vol.30,pl.2,fig.46.

1913 *Arcornuspirum vu-involutum* (Reuss) RHUMBLER. Erg.Plankton-Exped. Humboldt.Stift.Bd.III,L.c,Tiel.2, p.425,Taf.V,fig.4.

1917 *Cornuspira involvens* (Reuss) CUSHMAN. U.S.Nat.Mus.Bull.71,pt.6, p.25,26,pl.1,fig.2,pl.2,fig.2.

1921 *Cornuspira involvens* (Reuss) CUSHMAN. U.S.Nat.Mus.Bull.100, Vol.4,p.239,290,pl.77,figs.3,4.

1922 *Cornuspira involvens* (Reuss) HOFKER. Flora en Fauna der Zuidersee, Protozoa,p.135, fig.11.

1927 *Cornuspira involvens* (Reuss) CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.3,pt.1,pl.8,fig.1.

1927	Cornuspira involvens	(Reuss)	HARLTON. Journ.Pal.Vol.1,No.1, p.25,pl.5,figs.9a,b.
1929	Cornuspira involvens	(Reuss)	BERRY and KELLEY. Proc.U.S.Nat. Mus.Vol.76,Art.19,p.15,pl.1,fig.6.
1931	Cornuspira involvens	(Reuss)	WIESNER. Deutsche SudPolar Exped. Bd.20,Bd.12,p.101,Taf.XIV, figs.161,162.
1932	Cornuspira involvens	(Reuss)	CUSHMAN. U.S.Nat.Mus.Bull.161, pt.1,p.67,68,pl.16,figs.2a,b.
1933	Cornuspira involvens	(Reuss)	GALLOWAY. A manual of foraminifera, p.109,pl.9,fig.1.
1944	Cornuspira involvens	(Reuss)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.17,pl.2,fig.26.
1945	Cornuspira involvens	(Reuss)	CUSHMAN. Proc.Am.Phil.Soc.Vol.89, no.1,p.287,fig.12.
1946	Cornuspira involvens	(Reuss)	CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res.So.Pub.no.19,p.10,pl.2, fig.7.
1949	Cornuspira involvens	(Reuss)	CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique Mem.111,p.16,pl.II,fig.16.
1952	Cornuspira involvens	(Reuss)	COLOM. Bull.Inst.Espanol.Ocean. No.51,p.21,Lam.VII,fig.21.
1953	Cornuspira involvens	((Reuss)	LOEBLICH and TAPPAN. Smith.Miscell. Coll.Pub.4105,Vol.121,No.7,p.49, pl.7,figs.4,5.
1954	Cornuspira involvens	(Reuss)	BOLTOVSKOY. Mus.Arg.de Ciencias Nat. Geol.Tome III,no.3,p.135,pl.II,fig.10.
1954	Cornuspira involvens	(Reuss)	BOLTOVSKOY. Mus.Arg.de Ciencias Nat. Geol.Tome III,no.4,p.264,265,pl.XXII, fig.3.
1957	Cornuspira involvens	(Reuss)	FORAMINIFERI PADANI. Agip.Mineraria pl.VIII,fig.10.
1958	Cornuspira involvens	(Reuss)	DETLING. Contr.Cush.Found.Foram.Res. Vol.9,pt.2,p.26,pl.7,fig.9.

1959 *Cornuspira involvens* (Reuss) BOLTOVSKOY. Sec.de Marina Pub.H1005, Buenos Aires, p.57,58, pl.VI, fig.20.

1960 *Cornuspira involvens* (Reuss) ASANO. Sci.Rep.Tohoku Univ.Ser.2, (Geol), Spec.p.80, pl.7, fig.1.

1960 *Cornuspira involvens* (Reuss) BARKER. Soc.Econ.Pal. and Min.Sp. Pub.no.9, pl.11, figs.1-3.

1961 *Cornuspira involvens* (Reuss) BOLTOVSKOY. Mus.Arg.de Ciencias Nat. Zool.Tome VI, no.6, p.266, pl.II, fig.14.

1961 *Cornuspira involvens* (Reuss) KAASSCHIETER. Inst.Roy.des Sci.Nat. de Belgique. Mem.147, p.137, pl.1, fig.3.

1963 *Cornuspira involvens* (Reuss) BOLTOVSKOY. Contr.Cush.Found.Foram. Res.Vol.14, pt.2, p.61, pl.6, fig.12.

1963 *Cornuspira* cf. *involvens* (Reuss) KUMMERLE. Abhand.Hess.Landes.Boden. Heft.45, p.26, Taf.1, figs.3a,b.

1964 *Cyclogyra involvens* (Reuss) FEYLING-HANSSEN. Norges.Geol. Undersokelse, Nr.225, p.246, pl.4, fig.9.

Test free, small, megalospheric, discoidal, partially evolute, compressed, each face slightly concave with a rounded periphery. Composed of a globular proloculus and a long, undivided, planispirally coiled tube of nearly even diameter at first, later increasing gradually in size so that ultimately it is very gently flaring and tending to overlap slightly the previous whorl. Spiral suture distinct, very slightly impressed. Aperture semi-circular to circular, terminal at the end of the tubular portion. Wall calcareous, imperforate, porcellaneous, smooth except for some weak transverse growth lines on the later portion of the test.

Dimensions: Diameter 0.30 mm. Thickness 0.10 mm.

Occurrence: Dead CB.358.

Dead, variation samples CB.696, CB.706.

Morphological remarks: In the Tremadoc Bay specimens both generations occur, and it is interesting to note that dead forms were found which were still attached to seaweed.

Cushman and Warner 1940 working on the genus in general stated that a petrographic study of the test structure shows crypto-crystalline calcite and chitin mixed throughout the wall, with a darker material existing at the whorl junction.

C. tasmanica Parr 1950 resembles this species but is larger and less regularly coiled.

Considerable variation is exhibited by this species, both in the degree of test compression, and in megalospheric forms, in the size of the megalosphere.

Distribution: (Text-fig. 21A). In 1876 Sidall recorded this species as being rather rare in the River Dee, in 1890 Pearcey noted it from the warm and cold areas of the Faeroe channel, and in 1891 Burgess noted it as common in the River Mersey, and Pearcey obtained it from Port Dinorwic, Caernarvon Bay, and off Penrhos. In 1896 Chapman and Jones recorded the form from Barry Dock, and in the same year the British Association list of foraminifera occurring in the Irish Sea included this species. Wright in 1900 noted this form as very rare at Dogs Bay, in 1902, as frequent from Recent Clays in the Valley of the River Lune, and in the same year Pearcey recorded it as very rare in the Firth of Forth. In 1904 this species was recorded as being generally distributed in the Plymouth area by Worth, and in 1906 as being frequent in Larne Lough, Ireland by Gough. Heron-Allen and Earland in 1911 recorded this species from Selsey Bill, Sussex, in 1913, from the North Sea, where the form was widely distributed over the area, occurring in most of the shore sands and dredgings, and in 1914 from 20 fathoms in the Sound of Mull, and from the same depth off Ardnamuchan. The former author obtained this form in 1915 from off the Isle of Man in 20 fathoms. Again Heron-Allen and Earland in 1916 recorded the occurrence of this species from the shore sands and shallow water zone of the South coast of Cornwall, where they stated that it was generally distributed but never common, and from off the West of Scotland. In 1930 the same authors noted this form occurring in the Plymouth district as did the Marine Biological Association in 1957. Bruce, Colman and Jones in 1963 noted this species as being very rare from the Isle of Man and surrounding areas.

This species was recorded from the Arctic by Brady in 1878, and by the same author in 1884, from the West Indies, Tahiti, Kerguelen Islands, North and South Atlantic, Southern Ocean, and the North and South Pacific. He stated that the bathymetric range of this form is 7 to 700 fathoms. Scandinavian and Arctic occurrences were noted in 1894 by Goes, it was recorded from the Carribean, Yucatan Straits, and off the coast of Georgia in 1897 by Flint, and Millett 1898 recorded both microspheric and megalospheric forms from the Malay Archipelago. Chapman recorded the form from Funafuti Atoll and lagoon in 1899 and 1900, and it was recorded as rare in the Antarctic in 1914 by Pearcey. Cushman noted this species from the Galapagos Islands, Hawaiian Islands and off Japan in 1917, from the Philippine Islands, and adjacent seas a6 depths of 78 to 569 fathoms and at temperatures of 41.2 to 59.6°F in 1921, and from the Tortugas region in 1922. Hofker in 1922 noted an occurrence of this form in the Zuidersee. Heron-Allen and Earland in 1923 recorded minute forms from Lord Howe Island. Cushman in 1925 obtained a few small specimens from off British Columbia, and in 1926 recorded this form as rare at two stations off Porto Rico. In 1927 this species was noted as common off San Francisco Bay by Hanna and Church, and in 1930 it was recorded as being common at 5½ fathoms in the Florida area by Norton, and Wiesner in 1931 recorded it at one station at a depth of 380-385 metres in the Antarctic region. In 1932 Cushman recorded the species as being common and well distributed in the Tropical Pacific and Heron-Allen and Earland as rare in the ice free area of the Falkland Islands. This species was recorded in 1933 by Natland from the Southern California region, in 1934 by Earland from the Falklands sector of the Antarctic, in 1937 by Chapman and Parr from five Antarctic stations, in 1938 by Marie from the Rance estuary, in 1939 by Stubbings at a depth of 797 metres in the Maldive area, in 1941 by Norvang off Bergen, in 1944 by Cushman along the New England coast where it was common on algae and hydroids, and by the same author in 1945 off Horshoe Island in the Antarctic. In 1949 Cushman obtained this form from a number of Belgian stations, and Ruscelli obtained it from the Ligurian Sea, Italy. It was recorded in 1952, from Hachijo Island, Tokyo, where it constituted less than 0.1% of the fauna by Uchio, and in 1953 from the Arctic by Loeblich and Tappan. Boltovskoy in 1954 recorded this species from the Gulf of San Jorge and from San Blas Bay, Argentina. The same author in 1957 noted it occurring in the estuary of the Rio de la Plata. In 1958 Detling obtained this form from Sunset Bay, Oregon, Norin from the Central Tyrrhenian Sea, and Todd from a core in the Western Mediterranean. In 1959 Boltovskoy noted this form as being frequent in the Bay of Flamengo, Brazil, and off Argentina. Asano in 1960 noted this form in the adjacent seas of Japan, at depths of 90 to 296 metres, with a temperature range of 12.6 to 19.3°C. Green in the same year noted this species in the Arctic Basin. In 1961 Boltovskoy noted the occurrence of this form on the continental platform between Santo Tome and the Rio de la Plata, Argentina, Cooper obtained it from the intertidal zone of the California and Oregon coasts, and Watkins obtained it from the Orange County outfall area in Southern California In 1962 Lynts noted this form from Upper Florida Bay and associated sounds, and Wagner obtained it from the Arctic continental shelf at a temperature of 0.34°C, and at a depth of 487 metres. Isolated living individuals were recorded from Puerto Deseado, Patagonia in 1963 by Boltovskoy. In 1964 Boltovskoy again obtained this species from Puerto Deseado, but unfortunately numbers were too small to give reliable average data with regard to seasonal occurrence. He did however note that the greatest numbers of this species occurred during January-February, and went on to state that this was due probably to the better food conditions and other properties of the milieu. In the same year Colom noted this form from the coast of Galicia, and Hulme from Manukau Harbour, New Zealand. In 1965 Phleger noted this form as living in the Guerrero Negro Lagoon, Baja, California.

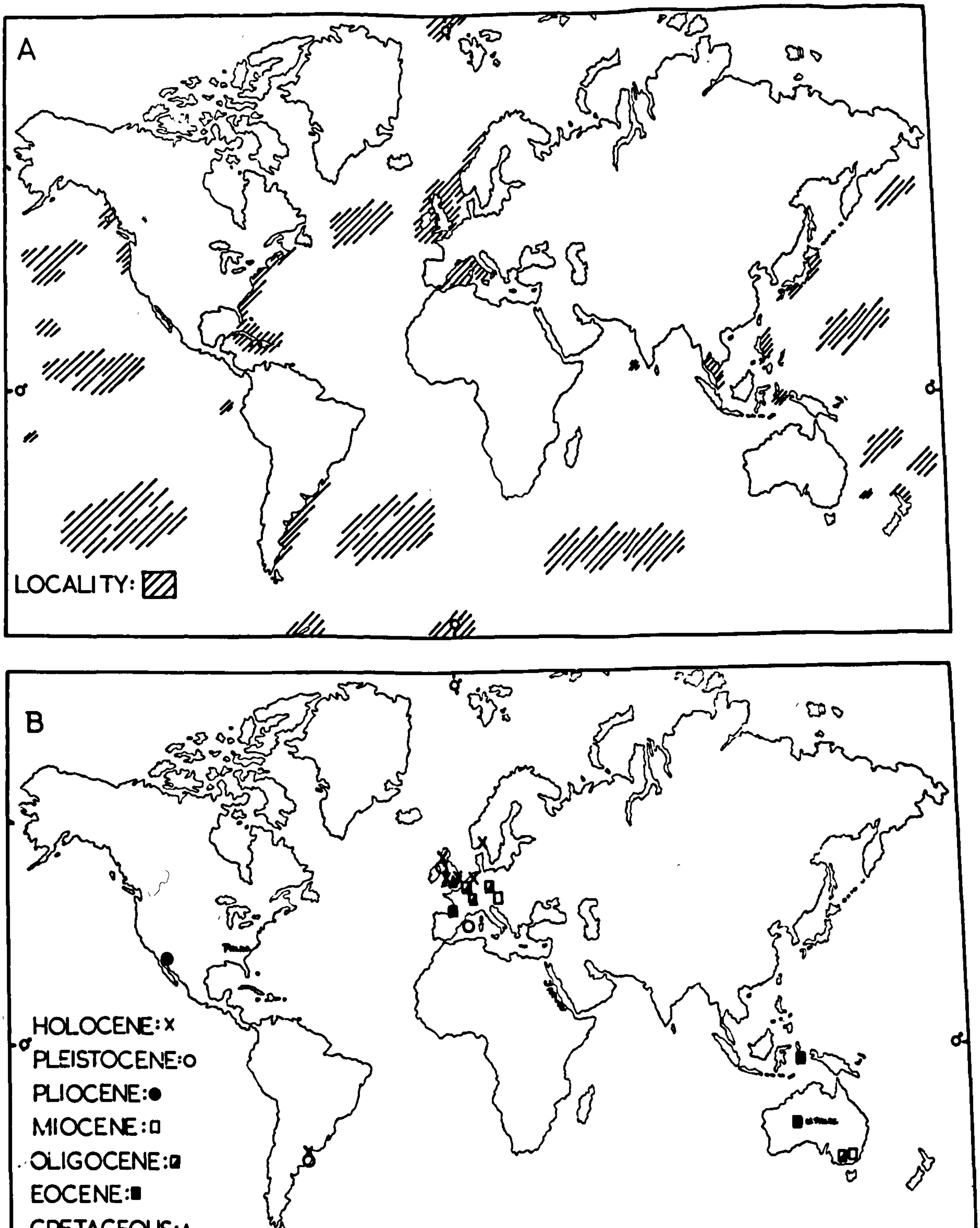
Stratigraphic Occurrence: (Text-fig.21B). Recorded British Holocene occurrences have been made from the following localities; Cleongart, South West Scotland (Munthe 1897), Formby and Leasowe (Reade 1900) Altcar (Wright 1904), County Antrim (MacFadyen 1937), English Fenlands (MacFadyen 1938), and Swansea Docks (MacFadyen 1942).

The oldest stratigraphic occurrence of this species was noted by Chapman in 1891 from the Gault of Folkestone. Heron-Allen and Earland in 1910 retrieved individuals from shore sands at Selsey Bill and stated that these forms were Cretaceous derived. Occurrences in the London Clay were noted by Sherborn and Chapman in 1889, and by Bowen in 1954, from the London Clay of the Isle of Sheppey. A post-Tertiary occurrence was noted at Greenock in 1885 by Robertson, and one specimen was retrieved from the Pleistocene of the Isle of Man in 1906 by Reade and Wright. Boulder Clay occurrences were noted from West Cheshire and Liverpool by Shone in 1878, from Carrickfergus by Wright in 1903, and from County Down by Wright in 1904.

This species was recorded from the Holocene of Bruges by Reade in 1898, and from the Holocene of Porto Quequen, Buenos Aires by Boltovskoy in 1959.

A number of world Palaeozoic occurrences of this species have been noted, Howchin in 1898 recorded this form from the Upper Palaeozoic and Eocene of Australia, Harlton in 1927 recorded it from the Pennsylvanian of Southern Oklahoma, and Omara in 1965 recorded it from the Carboniferous of of the Gulf of Suez region. A Palaeocene occurrence was noted in 1942 from North Dakota by Fox and Ross. Halkyard in 1917 and 1919 recorded this species from the Blue Marl (Middle Eocene) of the Cotes des Basques, Biarritz. Other Eocene occurrences have been noted from the Island of Ceram by Rutten and Hotz in 1946, who stated that this species ranged through to the Recent, and from Belgium by Kaasschieter in 1961. Majzon in 1940 noted this form in the Hungarian Oligocene, and Kummerle in 1963 noted its occurrence in the Upper Oligocene of Germany. It was stated to be scarce to common in the Oligo-Miocene of Victoria, Australia by Reed in 1965. Luczkowski in 1957 noted this form as rare in the Tortonian (Miocene) of the Carpathian Foreland. Chapman in 1907 noted that this form was present in the Tertiary of Victoria, Australia. Cushman and Gray in 1946 recorded this species from the Pliocene of Timms Point, California. Todd in 1958, recorded this form from the Pleistocene in a core from the Western Mediterranean and stated that this species ranged through to the Recent. Another Pleistocene record was made in 1959 by Boltovskoy from Puerto Quequen, here the form ranging through to the Holocene. Risdal in 1963 obtained this form from a core in the Inner Oslo Fjord, and Feyling-Hanssen in 1964 noted this form as being very rare in the Late Quaternary of the Oslo Fjord area.

Diagnosis: In most recorded occurrences both generations of this species are present. Distribution does not appear to be limited by temperature, depth, or salinity, but does appear to be dependant on food supply to a certain degree. It is quite a common Holocene form and ranges to the Jurassic, in the British area, and to the Palaeozoic in other parts of the world.



TEXT FIG. 21 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- CYCLOGYRA INVOLVENS

Sub Family: Fischerininae Millett 1899

Genus: Planispirinella Wiesner 1931

Planispirinella tenuis Collins 1953

Pl.4, figs.2a, 2b,

1953 Planispirinella tenuis COLLINS Mem.Nat.Mus.Victoria,Melbourne, no.18,p.99,pl.1,fig.5.

Test free, discoid, minute, planispiral, involute, circular in outline, periphery rounded. Test composed of a planispiral tube, the initial portion being hidden by a thin cover of secondary shell material. Examined in xylène this secondary material is semi-transparent and the test is seen to consist of a rounded proloculum from which the planispiral portion arises, increasing slightly in diamèter with growth, the late portion of the tube becoming septate. Chambers moderately distinct, increasing very little in size as added, longer than high, sub-circular in section, forming a rounded periphery. Both faces of the test are slightly concave and the sutures very indistinct, straight, slightly depressed. Aperture circular to sub-circular formed by the somewhat constricted opening at the end of the last chamber. Wall calcareous, thin, imperforate, porcellaneous, smooth.

Dimensions: Diameter 0.16 mm. Thickness 0.03 mm.

Occurrence: Dead, CB.332.

Stratigraphic Occurrence: The type specimen was retrieved from the Pleistocene of Western Victoria, Australia.

Diagnosis: This is the first Recent occurrence noted, and was from a shallow water area with fairly strong current action.

Family: Nubeculariidae Jones 1875

Sub Family: Ophthalmidiinae Wiesner 1920

Genus: Ophthalmidium Kübler and Zwingli 1870

Ophthalmidium acutimargo (Brady) 1884

Pl.4, figs.3a, 3b, 3c.

1884	Spiroloculina acutimargo	BRADY	Chall. Rep.Zool.Vol.9,p.154 155,pl.10,fig.13.
1913	Spiroloculina acutimargo	Brady	HERON-ALLEN and EARLAND. Proc.Roy.Irish.Acad.Vol.31, pt.64,p.24,pl.1,fig.8.
1917	Spiroloculina acutimargo	Brady	CUSHMAN. U.S.Nat.Mus.Bull.no.71, pt.6,p.31,32,pl.5,fig.1.
1927	Spiropthalmidium acutimargo	(Brady)	CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.3,pt.1,p.37,pl.8,fig.5.
1932	Spiropthalmidium acutimargo	(Brady)	CUSHMAN. U.S.Nat.Mus.Bull. no.161,pt.1,p.71,71,pl.16,fig.5.
1946	Spiropthalmidium acutimargo	(Brady)	WOOD and BARNARD. Quart.Journ. Geol.Soc.Vol.102,pt.2,p.84, pl.IV,fig.d.
1949	Spiropthalmidium acutimargo	(Brady)	CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique.Mem.111,p.16,pl.II, figs.14,15.
1953	Spiropthalmidium acutimargo	(Brady)	PHLEGER, PARKER, and PEIRSON. Rep.Swed.Deep Sea Exped.Vol.7, fasc.1,p.29,pl.5,figs.28,29.
1960	Spiropthalmidium acutimargo	(Brady)	BARKER. Soc.Econ.Pal. and Min. Sp.Pub.no.9,p.20,pl.X,fig.13.
1961	Spiropthalmidium acutimargo	(Brady)	BRAGA. Pub.Inst.de Zool.Fac. Ciencias.do Porto,77,p.89,90, pl.VIII,fig.12.

Test free, elongate, fusiform, one and a half times as long as broad, greatest width in the lower half of the test, tapering to a bluntly rounded base and to an elongate, tapering, slender neck. Test compressed, planispiral throughout, with a carinate peripheral margin, ovate to sagittate in transverse section. Chambers moderately distinct, composed of a proloculum followed by a spirally coiled second chamber, non septate, and then by chambers half a coil in length separated by a wide flange. Neck has a well developed lip present, surrounding the rounded, terminal, central aperture. Wall calcareous, imperforate, porcellaneous, smooth.

Dimensions: Length 0.85 mm. Width 0.25 mm. Thickness 0.12 mm.

Occurrence: Dead CB.384.

Morphological remarks: In this species a tendency has been shown to exist in that the later chambers tend to enfold and envelop the earlier ones (Heron-Allen and Earland 1916).

Distribution: In 1896 the British Association included this form in the list of foraminifera occurring in the Irish Sea. Heron-Allen and Earland recorded a few specimens from Clare Island in 1913, and noted the form as being very rare West of Scotland in 1916. In 1957 the Marine Biological Association obtained this form from two stations in the Plymouth area.

Brady 1884 noted this species occurring off Bermuda at a depth of 435 fathoms, from four stations in the South Atlantic at depths of 350 to 1425 fathoms, from three stations in the South Pacific at depths of 15 to 255 fathoms, and also in shore sands on the East coast of Madagascar. Millett recorded a few small specimens in the Malay Archipelago in 1898, Cushman recorded this species off Guam in 1917, from the North Pacific in 1927, and as being rare in the Tropical Pacific in 1932. Earland in 1934 recorded a single specimen occurring in the Falklands sector of the Antarctic. It was noted at a depth of 37 metres in the Gulf of Aden in 1939 by Stubbings, and Cushman in 1949 obtained it from a number of Belgian stations. In 1958 Norin noted this form fhom the Central Tyrrhenian Sea, and Parker from the Eastern Mediterranean where it occurred at sixteen stations, with a frequency of up to 14% of the fauna, and at depths ranging from 205-1378 metres. In 1961 Braga recorded this species from the Mozambique coast.

Stratigraphic Occurrence: The only stratigraphic record for this species in the British area is from the Holocene of Borth, Cardiganshire (Adams and Haynes 1965).

Reade in 1898 recorded ohe specimen from the Holocene of Bruges, and Voorthuysen in 1960 recorded it from the Holocene of the Dollart-Ems estuary.

Phleger, Parker and Peirson 1953, and Todd 1958, have obtained this species from cores, the former authors from cores in the North Atlantic, and Todd from Western Mediterranean cores, but none of these authors give the stratigraphic horizon, and so these records cahnot be used reliably.

Diagnosis: This species appears to be a cold to temperate form, not often found in warm latitudes. Stratigraphically it is restricted to the Holocene and Recent deposits throughout the world.

Sub Family: Spiroloculininae Wiesner 1920

Genus: Spiroloculina d'Orbigny 1826

Spiroloculina subimpressa Parr 1950

Pl.4, figs.4a, 4b, 4c.

1950 Spiroloculina subimpressa PARR Foraminifera. B.A.N.Z.Antarctic Research Exped.1929-31,Repts. Adelaide. Ser.B,Vol.5,pt.6,p.291, pl.6,figs.12-13.

Test free, slightly longer than broad, elliptical to fusiform in outline, quadrate in transverse section, faces flat to concave, periphery flat to slightly grooved, greatest width about the centre of the test, tapering gradually and evenly to both ends. Chambers distinct, 8 to 10 visible on either side of the test, quadrate in cross section, regularly curved, each successive chamber longer and of greater diameter than the predecessor, chamber faces slope in towards the centre of the test with the outer margin slightly raised. Chambers added two to a whorl on alternate sides in one plane. Sutures distinct, but not impressed. Aperture terminal at the end of the ultimate chamber, a semi-circular opening with aslight lip and a small indistinct bifid tooth. Wall calcareous, imperforate, porcellaneous, white.

Dimensions: Length 0.66 mm. Width 0.38 mm. Thickness 0.15 mm.

Occurrence: Dead CB.316, CB.323, CB.340, CB.374, CB.403.

Distribution: This is the first recorded occurrence of this species in the British area.

Parr 1950 recorded the type species and other specimens of this species as occurring frequently off Tasmania but not elsewhere.

Diagnosis: This is a temperate shallow water form which has been possibly assigned to S.depressa d'Orbigny by a number of authors.

Family: Miliolidae Ehrenberg 1839

Miliolid sp. 'A'

Pl.4, figs.5a, 5b, 5c, 5d.

Test free, small, circular in outline, oval in cross section, biconvex, carinate, Two chambers present, a large globose initial chamber followed by a planispirally coiled, long, undivided second chamber which is produced slightly beyond the body limit. Suture distinct, slightly impressed. Aperture terminal, at the end of the second chamber at the end of the neck, a simple circular opening with lip. Indication of a tooth present, very small and indistinct.

Wall calcareous, smooth, imperforate, porcellaneous.

Dimensions: Length 0.21 mm. Width 0.18 mm. Thickness 0.12 mm.

Occurrence: Dead, CB.321, CB.360.

Morphological remarks: This specimen could be assigned to a number of species, as a young stage, but it is preferable to leave this form unassigned.

Miliolid sp. 'B'

Pl.4, figs.6a,6b,6c,6d.

Test free, small, circular to sub-circular in outline, biconvex. Two chambers present, a large globose initial chamber, followed by a rather more elongate second chamber, set slightly oblique to the first, which is drawn out into a neck. Aperture a simple opening at the end of the neck surrounded by a somewhat reflexed lip. Indication of a tooth present, very small and indistinct. Chambers ornamented with a number of continuous longitudinal costae. Wall calcareous, costate, imperforate, porcellaneous, opaque.

Dimensions: Length 0.38 mm. Width 0.35 mm. Thickness 0.20 mm.

Occurrence: Dead CB.336.

Morphological remarks: Brady 1884 refers figures very similar to the above species, to Adelosina soldanii d'Orbigny, Adelosina laevigata d'Orbigny and as probably young stages of Quinqueloculina pulchella d'Orbigny. Barker 1960 reviewing the Challenger material logically refers to Bradys specimens as 'youhg miliolidae'.

Since much confusion already exists with a large number of miliolid species, especially the striate quinqueloculine types even in the adult forms, it would be virtually impossible, and even foolhardy, to attempt to refer these young miliolid forms to species level.

In both the above cases Miliolid sp.'A' and Miliolid sp.'B' they are being left as "young miliolidae".

Sub Family: Quinqueloculininae Cushman 1917

Genus: Quinqueloculina d'Orbigny

Quinqueloculina agglutinata Cushman 1917

Pl.7, figs.1a, 1b, 1c.

1917 Quinqueloculina agglutinata CUSHMAN. U.S.Nat.Mus.Bull.71, p.43,pl.9,fig.21-

1922 Quinqueloculina agglutinata Cushman. HOFKER. Protozoa. Flora en Fauna der Zuidersee. p.136,137, fig.18.

1947 Quinqueloculina agglutinata Cushman. CUSHMAN and TODD. Contr. Cush.Found.Foram.Res.So.Pub. no.21,p.61,pl.14,figs.12,13.

1948 Quinqueloculina agglutinata Cushman. CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.23,p.33,pl.3, fig.13.

1953 Quinqueloculina agglutinata Cushman. Loeblich and Tappan. Smith. Miscell.Coll.Vol.121,No.7,p.39, pl.5,figs.1-4.

1957 Quinqueloculina agglutinata Cushman. VOORTHUYSEN. Med.Geol. Stichting N.S.No.11,p.37,Taf.26, figs.45a,b,c.

Test free, longer than broad, sub rounded to ovate in section. Chambers distinct, quinqueloculine, three visible on one side, foud on the other, sub rounded to quadrate in section, all very slightly inflated, periphery rounded to sub rounded. Ultimate chamber tends to be produced very slightly beyond the limit of the test. Sutures distinct, impressed. Aperture terminal, at the end of the ultimate chamber, circular with a thick lip developed. Short to fairly long bifid tooth present. Wall agglutinated with fine material, slightly rough.

Dimensions: Dength 0.62 mm. Width 0.45 mm. Thickness 0.20 mm.

Occurrence: Living CB.334.

Dead CB.309, CB.312, CB.316, CB.322, CB.323, CB.328, CB.332, CB.334, CB.337, CB.338, CB.339, CB.352, CB.363, CB.364, CB.366, CB.367, CB.371, CB.374, CB.385, CB.391, CB.395, CB.398, CB.404, CB.407, CB.418, CB.412, CB.612, CB.613. CB.614, CB.615, CB.631.

Dead variation sample CB.695, CB.699, CB.745.

Morphological remarks: This species is similar to Q.agglutinans d'Orbigny but can be differentiated on the basis that Q.agglutinata has a distinct quadrate antipenultimate chamber.

Distribution: This species has not been recorded from the British area to the present day.

Cushman in 1917 noted that this form occurred throughout the Arctic region, and Hofker in 1922 recorded it occurring in the Zuidersee. Cushman and Todd in 1947 noted it along the Washington coast. It was again recorded from the Arctic by Loeblich and Tappan in 1953, who noted it occurring at depths of 3-24 fathoms.

Stratigraphic Occurrence: This species has been recorded from the Holocene of Borth, Cardiganshire by Adams and Haynes 1965. This species was retrieved from a Netherlands core by Voorthuysen in 1957, and Feyling-Hanssen in 1965 obtained it from the Holocene of Spitsbergen.

Diagnosis: This species appears to prefer a cold to temperate shallow water environment and appears to be stratigraphically restricted to the Holocene and Recent.

Quinqueloculina angularis d'Orbigny 1826

Pl.8, figs.1a, 1b, 1c.

1905 *Quinqueloculina angularis* d'Orbigny FORNASINI. Acad.Sci.Inst. Bologna Mem.Sci.Nat.Ser.6, Vol.2,p.66,pl.3,fig.12.

Test free, broadly fusiform, longer than broad, with five chambers visible, faces slightly concave. Chambers distinct, quinqueloculine, rapidly increasing in size as added, slightly quadrate in section, especially so the ultimate which has a slightly development of a double keel. Four chambers visible on one side and three on the other. Apertural end produced into a short rounded neck with quite a distinct lip present. Aperture terminal, at the end of the neck, circular, with a very small bifid tooth raised above the general surface of the apeeture. Wall ornamented with numerous fine to medium straight longitudinal costae. Wall calcareous, imperforate, porcellaneous.

Dimensions: Length 0.85 mm. Width 0.51 mm. Thickness 0.30 mm.

Occurrence: Dead CB.299, CB.316, CB.328.

Morphological remarks: This species is very similar to *Q.angulo-striata* except for the slight development of the double keel on the ultimate chamber.

Distribution: d'Orbigny 1826 metrieved the type species from the Mediterranean.

Diagnosis: This is the first recorded occurrence of this species in the British area, and it appears to have been poorly recorded throughout the world.

Quinqueloculina asnera d'Orbigny 1826

Pl.7, figs.2a,2b,2c.

1826 Quinqueloculina aspera d'ORBIGNY Ann.Sci.Nat.Paris.Ser.1,Tome 7, p.301,type fig.op.cit.PARKER, JONES and BRADY. Ann.Mag.Nat. Hist.1871,Ser.4,Vol.8,pl.8,fig.11, also FORNASINI, Acad.SciIInst. Bologna. Mem.1905,Ser.6,Vol.2, pl.3,fig.1,1a,1b.

Test free, longer than broad, sub rounded to ovate in section. Chambers distinct, quinqueloculine, three visible on one side and foud on the other, rounded to sub rounded in section, gently inflated. Apertural end slightly produced beyond the limit of the test. Sutures distinct, impressed. Aperture terminal, at the end of the ultimate chamber, circular, with a lip developed, and with a short bifid tooth present. Wall agglutinated with fine material, slightly rough.

Dimensions: Length 0.57 mm. Width 0.40 mm. Thickness 0.27 mm.

Occurrence: Living CB.328, CB.331, CB.353, CB.367,

Dead, CB.304, CB.307, CB.308, CB.309, CB.310, CB.311,
CB.312, CB.313, CB.314, CB.315, CB.316, CB.317,
CB.319, CB.320, CB.321, CB.322, CB.324, CB.327,
CB.328, CB.329, CB.330, CB.331, CB.332, CB.334,
CB.335, CB.336, CB.337, CB.338, CB.339, CB.340,
CB.341, CB.343, CB.345, CB.347, CB.352, CB.353,
CB.354, CB.360, CB.363, CB.364, CB.366, CB.367,
CB.368, CB.370, CB.371, CB.373, CB.374, CB.376,
CB.377, CB.384, CB.385, CB.386, CB.387 CB.388,
CB.389, CB.390, CB.391, CB.392, CB.393, CB.394,

CB.395, CB.396, CB.398, CB.403, CB.404, CB.407, CB.408, CB.412, CB.414, CB.415, CB.612, CB.613, CB.614, CB.618, CB.623, CB.624, CB.629, CB.630, CB.631, CB.632, CB.636, CB.637, CB.639, CB.640.

Dead, variation samples CB.689, CB.714, CB.716.

Distribution: This species has not been recorded in the British area to the present day, d'Orbigny having, in 1826, recorded the type species from the Mediterranean.

Diagnosis: This species appears to be characteristic of warm temperate to cool temperate shallow water areas.

Quinqueloculina bicornis (Walker and Jacob) 1758

Pl. 7, figs.4a, 4b, 4c.

1758 *Serpula bicornis* WALKER and JACOB in Kanmacher 'Adams essays on the microscope'. Ed.2, London, p.633, pl.14, fig.2.

1858 *Miliolina bicornis* (Walker and Jacob) WILLIAMSON. Rec.For. Gt.Brit.Ray Soc.London, pp.88, pl.7, figs.190-192.

1884 *Miliolina bicornis* (Walker and Jacob) BRADY. Chall.Rep.Zool. Vol.9, p.171, 172, pl.VI, fig.9.

1894 *Miliolina bicornis* (Walker and Jacob) GOES. Kongl.Svensk. Veten.Akad.Handl.N.F.Bd.25, No.9, p.113, Tab.21, fig.860-861e.

1897 *Miliolina bicornis* (Walker and Jacob) FLINT. U.S.NatlMus. Ann.Rept.Wash.p.300, pl.46, fig.2.

1902 *Miliolina (Adelosina) bicornis* (Walker and Jacob). CHAPMAN. Foraminifera. p.91, pl.3, fig.C.

1906 *Miliolina bicornis* (Walker and Jacob) BULLEN. Geol.Mag.Vol.III, p.357, pl.XVIII, fig.9.

1912 *Miliolina bicornis* (Walker and Jacob) BAGG. U.S.Geol.Survey Bull.513, p.27, pl.III, figs.4, 5. pl.IV, fig.4, pl.V, fig.1.

1917 *Quinqueloculina bicornis* (Walker and Jacob) CUSHMAN. U.S.Nat.Mus. Bull.no.71, pt.6, p.48, pl.13, fig.2.

1944 *Quinqueloculina bicornis* (Walker and Jacob) CUSHMAN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.12, p.14, pl.2, fig.19.

1949 *Quinqueloculina bicornis* (Walker and Jacob) CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique. Mem.111, p.10, pl.II, fig.2.

1954 *Quinqueloculina bicornis* (Walker and Jacob) BOLTOVSKOY. Mus Argentino de Ciencias Naturales Geol.Tome III, no.3, p.121, pl.1, fig.14.

1957 Quinqueloculina bicornis (Walker and Jacob) FORAMINIFERI PADANI. Agip.Mineraria, pl.V, fig.10 bis.

1958 Quinqueloculina bicornis (Walker and Jacob) LE CALVEZ. Rev.Trav. Inst.Peches.Marit.22(2),p.157, pl.1, figs.8,9.

1958 Quinqueloculina bicornis (Walker and Jacob) LE CALVEZ and LE CALVEZ. Ann.l'Inst.Ocean.Paris,N.S.Tome XXXV, fasc.3,p.180,pl.4,figs.28,32.

1960 Quinqueloculina bicornis (Walker and Jacob) BARKER. Soc.Econ.Pal. and Min.Sp.Pub.no.9,p.12,pl.6, fig.9.

1964 Quinqueloculina bicornis (Walker and Jacob) FEYLING-HANSSEN. Nordes. Geol.Undersokelse,Nr.225,p.249, pl.5, figs.1,2.

Test free, slightly convoluted, inequilateral, longer than broad, periphery rounded. Chambers distinct, quinqueloculine, five visible, four on one side and three on the other. Ultimate and penultimate chambers are set slightly obliquely to one another. Chambers oval in cross section, rapidly increasing in size as added. Sutures distinct, slightly impressed. Chambers ornamented with distinct, longitudinal costae, which tend to bifurcate on the penultimate chamber. Aperture terminal, at the end of the ultimate chamber, elongate, with a slight lip present. Tooth straight, long, prominent. Wall calcareous, imperforate, porcellaneous.

Dimensions: Length 0.72 mm. Width 0.46 mm. Thickness 0.35 mm.

Occurrence: Living CB.298, DB

Dead, CB.298, CB.299, CB.309, CB.312, CB.315, CB.316, CB.317, CB.318, CB.319, CB.321, CB.324, CB.327, CB.328, CB.329, CB.330, CB.331, CB.332, CB.335,

CB.337, CB.339, CB.340, CB.354, CB.366, CB.368, CB.371, CB.376, CB.392, CB.403, CB.404, CB.405, CB.407, CB.408, CB.410, CB.414, CB.415.

Morphological remarks: In this species there is exhibited a wide range in the character of the ornament, ranging from delicately striate types to coarsely costate types.

Distribution: (Text-fig.22A). The first recorded occurrence of this species in the British area was noted from the Shetland Seas in 1868 by Waller. Brady 1870 noted it from Budle Bay, and Robertson 1875 from the Firth of Clyde. In 1876 it was recorded off the coasts of Durham and North Yorkshire by Robertsons and Brady from off Skye by Brady 1884 and as frequent in the River Dee by Sidall. Pearcey in 1891 noted it from off Penrhos and Liverpool Bay, Robertson 1892 from Portree Bay, Isle of Skye, Wright 1895 from Dogs Bay, and the British Association in 1896 included this form in the list of foraminifera occurring in the Irish Sea. In 1900 Worth noted a few specimens from Salcombe estuary, and Wright recorded it again from Dogs Bay. Wright in 1902 obtained this species from Rathlin Island, Worth in 1904 from Plymouth, and Gough in 1906 from Larne Lough, Red Bay, and the Gobbins, Ireland. A Lambay, County Dublin occurrence was noted by Wright in 1907. Heron-Allen and Earland recorded this form from Selsey Bill, Sussex in 1909, and 1911, from Clare Island and the North Sea in 1913, from 5 fathoms off Jura, 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart, and from 20 fathoms off Ardnamuchan in 1914. Heron-Allen in 1915 noted this form as being very rare at 20 fathoms off the Isle of Man. The two authors noted this species West of Scotland, and from the shallow water zone of the South coast of Cornwall in 1916, and in 1930 from the Plymouth district. In 1957 the Marine Biological Association obtained this form from six stations in the Plymouth area. A Mer Celtique occurrence was noted in 1958 by Le Calvez who recorded this species South of Ireland, West of France, and from the West English Channel. Bruce, Colman and Jones in 1963 stated that this form is very rare from the Isle of Man and surrounding areas.

Brady in 1884 stated that this species is confined to the temperate and tropical zones, from shore pools to depths of 40 or 50 fathoms, and in rare cases as deep as 120 fathoms. Goes however recorded this species from the Arctic and Scandinavia in 1894. Flint in 1897 noted this species in the Yucatan Straits and from the Florida coast, and it was recorded as numerous and abundant in the Malay Archipelago by Millett in 1898. This form was noted as being very rare at Funafuti Atoll by Chapman in 1899 and 1900, and as very rare in the lagoon, to common seaward of Cocos Keeling Atoll by the same author in 1902. Cushman 1917 noted this form from Honolulu, the Hawaiian Islands, and off Hong Kong, and Marie in 1938 obtained it from the Rance estuary. In 1944 Cushman noted this species occurring on the New England coast, and in 1949 occurring off Belgium. Boltovskoy in 1954 obtained the species from the Gulf of San Jorge, Argentina and in 1956 from the Argentinian continental shelf. In 1957 this species was recorded from the Northern Florida Keys, with a depth range of 0-40 feet, by Moore,

and from the Egyptian Mediterranean coast by Said and Kamel.
Le Calvez and Le Calvez 1958 noted this form as being not abundant in Villefranche Bay. In 1962 Lynts obtained this form from Upper Florida Bay and associated sounds, and McKenzie obtained it from Oyster Harbour, Albany, Western Australia. In 1963 it was recorded from Roscoff, Finistere by Dupeuble.

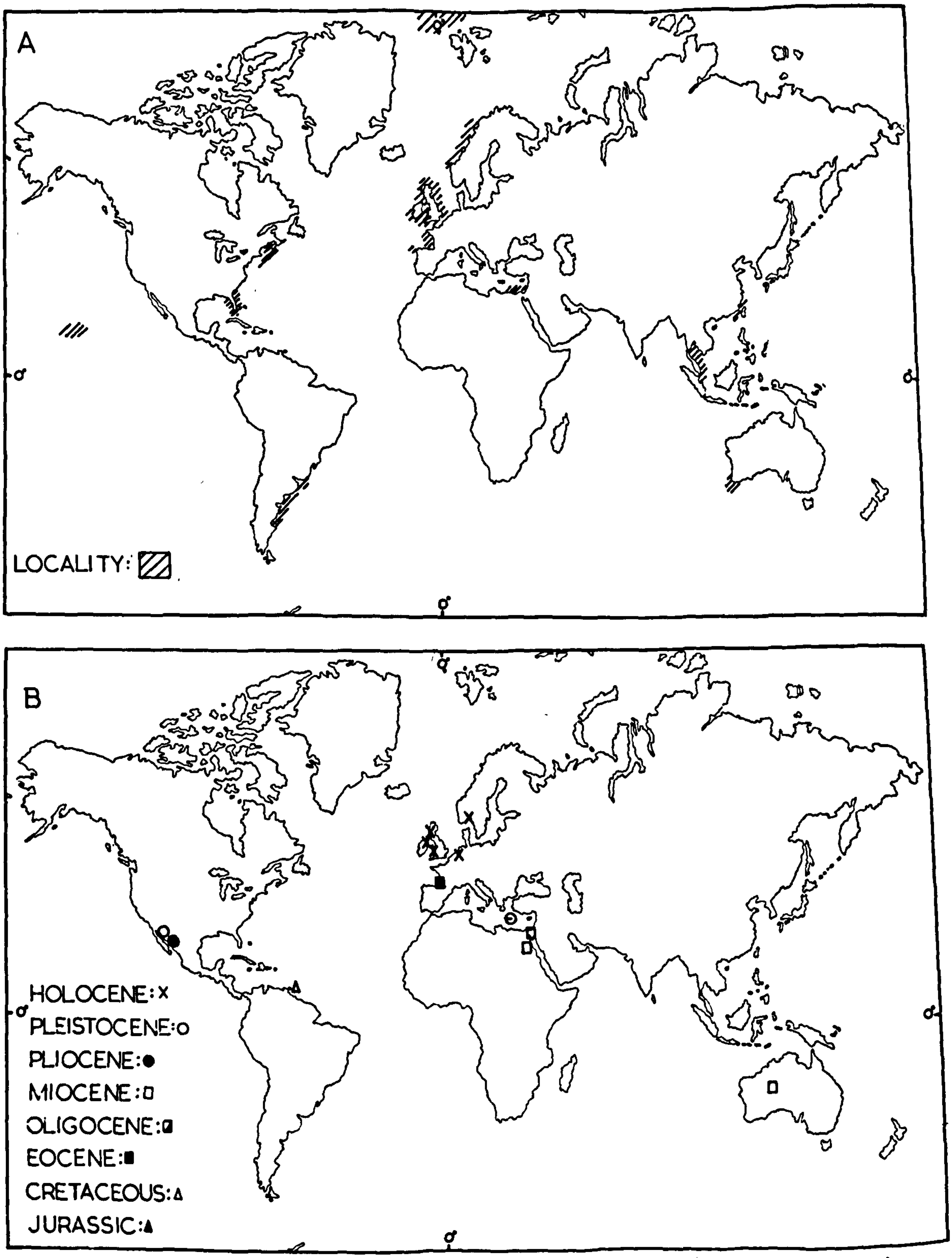
Stratigraphic Occurrence: (Text-fig.22B). British Holocene occurrences of this species have been recorded from Cumbrae (Robertson 1877), Altcar (Wright 1904), County Antrim (MacFadyen 1937), and Swansea Docks (MacFadyen 1942).

Two Post Tertiary occurrences have been noted, one from Duntroon (Crosskey and Robertson 1869), and the other from Garnock (Robertson 1877). Shone 1878 obtained this species from the Upper Boulder Clay of West Cheshire and Liverpool, and Worth 1902 from the drift of County Cork.

Reade in 1898 recorded this form as being rare in the Holocene of Bruges.

In 1892 an occurrence of this species in the Cretaceous of Trinidad was recorded by Guppy. Halkyard in 1917 and 1919 obtained this form from the Blue Marl, Middle Eocene, of Biarritz. Howchin 1893 obtained this species from the Miocene of Australia, and MacFadyen 1930 recorded it from the Miocene of Egypt and Sinai. A Tertiary occurrence was noted by Caudri 1932 from Java. Bagg in 1912 noted that this form from the Pliocene and Pleistocene of Southern California. Bullen 1906 obtained this species from the Pleistocene of East Crete, and Feyling-Hanssen in 1964 recorded it from the Late Quaternary of the Oslo Fjord area.

Diagnosis: Temperate and tropical fairly shallow water environments appear to be preferred by this species with only very rare occurrences in cold waters. It ranges stratigraphically from the Cretacoous, and appears to be quite common in the Holocene and Recent.



TEXT FIG. 22 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF:- QUINQUELOCULINA BICORNIS

Quinqueloculina cliarensis (Heron-Allen and Earland) 1913

Pl.6, figs.1a, 1b, 1c.

1913 Miliolina stelligera (Schlumberger) HERON-ALLEN and EARLAND. Proc.Roy.Irish Acad.Vol.31, p.31,pl.1,figs.14-15.

1930 Miliolina cliarensis HERON-ALLEN and EARLAND. Journ.Roy. Micro.Soc.p.58,pl.III,figs. 26-31.

1949 Quinqueloculina cliarensis (Heron-Allen and Earland) CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique. Mem.111,p.9, pl.1,fig.10.

1958 Quinqueloculina cliarensis (Heron-Allen and Earland) LE CALVEZ. Rev.Trav.Inst.Peches.Marit. 22(2),p.157,pl.1,figs.10,11.

1958 Quinqueloculina cliarensis (Heron-Allen and Earland). LE CALVEZ and LE CALVEZ. Ann.l'Inst. Ocean.Paris,N.S.Tome XXXV, Fasc.3,p.186,pl.5,figs.40,41.

Test free, elongate-ovate in outline, ovate in cross section, peripheral edges acute. Chambers distinct, quinqueloculine, five visible, four on one side and three on the other, increasing rapidly in size as added. Chambers sub-sagittate in section and the ultimate chamber is produced into a short, elliptical neck. Sutures distinct, impressed. Aperture terminal, at the end of the neck, circular, with a fairly thick lip, and a short, broad, simple tooth. Wall calmreous, imperforate, porcellaneous, smooth.

Dimensions: Length 0.85 mm. Width 0.51 mm. Thickness 0.25 mm.

Occurrence: Dead, CB.312, CB.316, CB.328, CB.332, CB.366, CB.368, CB.385, CB.403,

Morphological remarks: The quinqueloculine nature of this species is not always readily discernable, and it sometimes appears triloculine in type. Careful examination of the test does nowever reveal the correct type of chamber arrangement.

Distribution: Heron-Allen and Earland in 1930 recorded this species from the Plymouth district, the Marine Biological Association also obtained this form from the Plymouth area in 1957, and Le Calvez 1958 recorded it as fairly rare in the Mer Celtique, occurring at only two stations, one, West of France, and the other South West of Cornwall.

Cushman in 1949 noted this form as being rare in Belgian material, and Le Calvez and Le Calvez in 1958 obtained it from depths of 10-40 metres in Villefranche Bay.

Stratigraphic Occurrence: This species has been retrieved from the British Holocene at the following localities, County Antrim (MacFadyen 1937), Swansea Docks (MacFadyen 1942), and Borth, Cardiganshire, (Adams and Haynes 1965).

Diagnosis: It is possible that the "pseudo-triloculine" nature of this species allied with misidentification is responsible for the rare records of this form. From what records there are it appears that this is a shallow water temperate form restricted to the Holocene and Recent.

<u>Quinqueloculina</u> <u>frigida</u> Parker 1952

Pl.7, figs.3a, 3b, 3c.

1952	<u>Quinqueloculina</u> <u>frigida</u>	PARKER	Bull.Mus.Comp.Zool.Camb.Mass. Vol.106,(1951-2), no.9,p.406, pl.3,figs.20a,b.
1957	<u>Quinqueloculina</u> <u>aff.frigida</u>	Parker	BOLTOVSKOY. Mus.Arg.de Ciencias Nat.Geol.Tomo VI,no.1,p.24,25, pl.IV,fig.7.
1959	<u>Quinqueloculina</u> <u>aff.frigida</u>	Parker	BOLTOVSKOY. Sec.de Marina Pub. H1005,Buenos Aires,p.48,pl.IV, fig.5.
1961	<u>Quinqueloculina</u> <u>aff.frigida</u>	Parker	BOLTOVSKOY. Mus.Arg.de Ciencias Nat.Zool.Tomo VI,no.6,p.302, pl.VII,fig.10.
1962	<u>Quinqueloculina</u> <u>aff.frigida</u>	Parker	CLOSS and BARBERENA. Inst.Rio Grande do Sul.Inst.Cienc.Nat. No.16,p.25,Est.5,fig.5a-b.

Test free, slightly longer than broad, sub-circular in section. Chambers distinct, quinqueloculine, five visible, three on one side and four on the other, inflated, rapidly increasing in size as added, periphery broadly rounded. Sutures fairly distinct, impressed. Aperture terminal, a high circular opening at the end of the ultimate chamber, in line with it. Through the apertural opening part of the penultimate chamber can be seen. Tooth simple, short, triangular in shape, Wall agglutinated with fine arenaceous material, slightly rough.

Dimensions: Length 0.74 mm. Width 0.51 mm. Thickness 0.25 mm.

Occurrence: Dead CB.302, CB.304, CB.325, CB.340, CB.370, CB.386, CB.410, CB.415.

Morphological remarks: This species is similar to Q.agglutinata and Q.aspema, but can be differentiated on the basis of inflation in the ultimate chamber and the nature of the tooth.

Distribution: Up to the present day there have been no recorded occurrences of this species in the British area.

In 1952 this species was recorded from several stations in the Portsmouth (N.H.) area, but was noted as not being abundant by Parker, and also from this area by Phleger who obtained it at 21 stations at frequencies of less than 1%, the majority of these stations being mostly on the nearshore areas, and also at five stations on the south west mud-sand area. Boltovskoy recorded this species from the estuary of the Rio de la Plata in 1957, off Brazil in 1959, off Argentina in the same year, and from the continental shelf between Santo Tome and the Rio de la Plata, Argentina in 1961. Closs and Barberena in 1962 noted this form as being very rare to frequent in the littoral zone of Southern Brasil.

Stratigraphic occurrence: No stratigraphic occurrence of this species have been noted to the present day.

Diagnosis: This form appears to be a fairly shallow water temperate species occurring only in Recent sediments.

Quinqueloculina cf. granulo-costata Germeraad 1946

Pl.8, figs.2a, 2b, 2c.

1884 *Miliolina linnaeana* (d'Orbigny) BRADY. Chall.Rep.Zool. Vol.9,p.174,pl.6,figs.15-20.

1897 *Miliolina linnaeana* (d'Orbigny) FLINT. S.U.Nat.Mus. Ann.Rept.Wash.p.303,pl.46,fig.3.

1907 *Miliolina linnaeana* (d'Orbigny) CHAPMAN. Journ.Linn. Soc.Zool.London,Vol.30,pl.2, fig.37.

1912 *Miliolina linnaeana* (d'Orbigny) BAGG. U.S.Geol.Survey Bull.513,p.28,pl.III,figs.8,9.

1946 *Quinqueloculina granulo-costata* GERMERAAD in Rutten and Hotz, Amsterdam.J.de Bussy, Ser.3,(Geol), no.2,p.63,op.cit.BRADY,pl.6, figs.15-20.

1949 *Quinqueloculina linneanna* (d'Orbigny) RUSCELLI. Inst.Geol. Pal.Geog.Fis.Uni.Milano,Ser,P, N.62,Vol.VI,fasc.1,p.13,Tav.1, fig.4.

1960 *Quinqueloculina granulo-costata* Germeraad. BARKER. Soc.Econ.Pal. and Min.Sp.Pub.no.9,pl.6,figs. 15-20.

1962 *Quinqueloculina granulo-costata* (d'Orbigny) McKENZIE. Journ.Roy. Soc.W'n.Aust.Vol.45,pt.4,p.122, pl.II,fig.18.

Test free, elongate, with the apertural end extended beyond the main body wall as a tubular prolongation. Chambers moderately distinct, sub-quadrate in section, rapidly increasing in size as added, keeled, with five irregularly granulated longitudinal, coarse, wide costae to each side of the test. In addition there are finer longitudinal costae on the inner chambers, Sutures not very distinct, impressed. Aperture terminal, at the end of the prolongation, a large cifcular opening with a slight lip and also an indistinct, simple, short, thin tooth. Wall calcareous, imperforate, porcellaneous, granulated, with abundant foreign material adhering to the wall.

Dimensions: Length 1.70 mm. Width 1.10 mm. Thickness 0.40 mm.

Occurrence: Dead, CB.330, CB.332.

Morphological remarks: The Cuban species referred to by Brady as Miliolina linnaeana, was stated by Germeraad to be a triloculine type and he then proposed the name Q.granulo-costata for the Pacific species figured by Brady. Much confusion exists with these coarsely striate/costate quinqueloculine forms, as one species, if enough specimens are available can beeseen to grade into another. Examination of specimens in the British Museum also showed that confusion existed even with reknowned workers, as a number have included Quinqueloculina granulo-costata in with Quinqueloculina pulchella and vice-versa. The confusion is extended with such species as Q.intricata and slightly aberrent types of Q.bicornis. Enough specimens are available from the study area to illustrate a gradation from Q.pulchella to Q.granulo-costata, and it must be recognised that within each of these striate quinqueloculinas there is variation in :-

1) Shape of the test externally and in transverse section.
2) Degree of inflation, from compressed types to globose types.
3) Degree of prolongation of the ultimate chamber beyond the main test tody.
4) Ornamentation, amount, density, and size of the striae/costae.
5) Type of aperture and type of tooth.

As a result of specimens examined from the study area the view is put forward that if these species are not conspecific they do, at least, possibly form the ends of a bioseries.

Distribution: The only record of this species occurring in the British area is that made by Heron-Allen and Earland in 1911, who obtained this form from Selsey Bill, Sússex.

Brady 1884 recorded this form from eight stations, all in the neighbourhood of the coral islands of the Pacific, and within the the tropical zone. Flint 1897 recorded it from the Yucatan Straits, the Florida coast, and the Gulf of Mexico, Millett 1898 from the Malay Archipelago, Chapman 1899 from Funafuti Atoll, from the same location in 1900, and from Cocos Keeling Atoll in 1902. Heron-Allen and Earland retrieved a few very large specimens from Lord Howe Island, South Pacific in 1923. Germeraad 1946 obtained the renamed form from the Island of Ceram. A Ligurian Sea occurrence was noted by Ruscelli in 1949.

Stratigraphic Occurrence: Heron-Allen and Earland noted in 1909 that this form occurred as "fossil only" in the shore sands of Selsey Bill, and in 1910 stated that this species was Cretaceous derived.

Howchin 1893 noted the occurrence of this species in the Eocene and Miocene of Australia. The presence of this form in the Tertiary of Victoria, Australia was noted by Chapman in 1907, and in the Tertiary of Adelaide by Rao in 1955. Bagg in 1912 obtained this species from the Pliocene and Pleistocene of Southern California.

Diagnosis: This form appears to prefer a tropical to warm temperate environment. Stratigraphically it ranges from the Cretaceous to Recent.

Quinqueloculina inconstans Terquem 1874

Pl. 8, figs. 3a, 3b, 3c.

1874 Quinqueloculina inconstans TERQUEM Quart.Mem.Foram.de Fontay (Meselle) Paris, France. p.333,pl.36,figs.18-20,pl.37, figs.1-12.

1878 Quinqueloculina inconstans Terquem TERQUEM. Foram.de I'le de Rhodes Ser.3,tome 1,no.3,p.77,pl.9, figs.15-19.

Test free, fairly small, quinqueloculine, chambers rapidly increasing in size as added. Chambers moderately distinct, five visible, four on one side and three on the other, sub-triangular in cross section. Initial chambers small and indistinct, later distinct and large, elongate, especially so the ultimate chamber. Chambers ornamented with conspicuous longitudinal strations, well spaced, pronounced on the ultimate chamber and not so pronounced on the earlier ones. Ultimate chamber drawn out into a long tubular, tapering neck with a faint lip. Aperture terminal, at the end of the neck, small, circular, with a very small, bifid tooth. Wall calcareous, imperforate, porcellaneous.

Dimensions: Length 0.80 mm. Width 0.52 mm. Thickness 0.30 mm.

Occurrence: Living, CB.336.

Dead, CB.328, CB.332, CB.336, CB.354, CB.415.

Distribution: This is the first Recent occurrence of this species in British waters.

Stratigraphic occurrence: Terquem 1874 described the type species from the Ammonites parkinsoni zone of the French Jurassic, and in 1878 noted it in the Upper Pliocene of the Isle of Rhodes.

Diagnosis: This species, occurring sparingly from the Jurassic appears to prefer a temperate, present day, shallow water environment.

Quinqueloculina lata Terquem 1876

Pl.6, figs.2a,2b,2c.

1876 *Quinqueloculina lata* TERQUEM Class.animaux de Dunkerque,Mem. Dunkerque,deuxieme fasc.France, 1877,Vol.20,(1875/6),p.173,pl.11, figs.8a,b,c.

1930 *Miliolina oblonga var.lata* (Terquem) HERON-ALLEN and EARLAND. Journ.Roy.Micro.Soc.p.55,pl.II, figs.12-15.

1944 *Quinqueloculina lata* Terquem CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.14,pl.2,fig.16.

1949 *Quinqueloculina lata* Terquem CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique Mem.111,p.10,pl.II,fig.1.

1957 *Quinqueloculina cf. lata* Terquem VELLA. N.Zeal.Geol.Surv.Pal.Bull. 28,Pt.1,p.24,pl.6,figs.112-114.

1958 *Quinqueloculina lata* Terquem LE CALVEZ. Rev.Trav.Inst.Peches. Marit.22(2),p.158,pl.II,figs.26,27, 28.

1961 *Quinqueloculina lata* Terquem TODD and LOW. Cont.Cush.Found.Foram. Res.Vol.12,pt.1,p.15,pl.1,figs.10-13, 15.

1964 *Quinqueloculina lata* Terquem FEYLING-HANSSEN. Nordes.Geol.Undersokelse Nr.225,p.250,pl.4,fig.12.

Test free, ovate-elongate, in outline, one and a half times as long as broad, sub ovate in cross section. Chambers distinct, quinqueloculine, five visible, externally, long and narrow with prominent geniculations, four visible on one side and three on the other, gradually increasing in size as added, semi-circular in cross section, periphery broadly rounded. Sutures prominent, depressed. Aperture terminal, at the end of the ultimate chamber, only slightly raised above the level of the test, oval to semi-circular with a simple tooth extending from the base of the aperture, half way into it. Wall calcareous, imperforate, porcellaneous, smooth.

Dimensions: Length 0.55 mm. Width 0.30 mm. Thickness 0.20 mm.

Occurrence: Living, CB.315, CB.324, CB.380, CB.406, CB.410.

Dead, CB.301, CB.302, CB.304, CB.306, CB.308, CB.310, CB.312, CB.313, CB.314, CB.315, CB.316, CB.317, CB.318, CB.320, CB.321, CB.322, CB.324, CB.325, CB.326, CB.328, CB.329, CB.330, CB.333, CB.337, CB.338, CB.340, CB.344, CB.346, CB.358, CB.360, CB.364, CB.368, CB.369, CB.370, CB.376, CB.380, CB.386, CB.390, CB.396, CB.397, CB.400, CB.403, CB.404, CB.405, CB.407, CB.408, CB.410, CB.413, CB.414, CB.415, CB.645.

Dead, variation sample CB.696, CB.699, CB.700.

Morphological remarks: This species is similar to Q.seminulum (Linne) but may be differentiated on its more markedly rectangular outline, distinctly rounded periphery, and less variable aperture. Todd and Low 1961 state that this species grades into the varietal form Q.seminulum (Linne) var. jugosa, Cushman by the addition of faint costae. The rectangular outline of this species is due to the fairly sharp geniculation of the ultimate chamber at the basal end.

Distribution: This species was recorded from the Plymouth district in 1930 by Heron-Allen and Earland and by Myers in 1943 who calculated that this form comprised 5.3% of the fauna. A Mer Celtique record was made in 1958 by Le Calvez who noted this species occurring South of Ireland, West of France, and in the Western English Channel.

This form was recorded by Cushman from the New England coast in 1944 and as being very rare in Belgian material in 1949. Vella 1957 noted it from Cook Strait, New Zealand and in 1959 Berthois and Le Calvez dbtained it from 875 metres in the Gulf of Gascogne. Todd and Low in 1961 recorded this form from Marthas Vineyard Island, Massachusetts, where they noted it as being the "best represented miliolid found in the shallow water samples, being common to abundant in most samples, except off headlands and exposed beaches where the more robust miliolids, Q.seminulum and Q.subrotunda appear to replace it".

Stratigraphic occurrence: This species has only been recorded from one Holocene locality in the British area, at Borth, Cardiganshire by Adams and Haynes 1965.

Vella in 1963 recorded this form from the Upper Miocene of New Zealand, and Feyling-Hanssen in 1964 from the Late Quaternary of the Oslo Fjord area.

Diagnosis: This shallow water, temperate species appears to prefer an environment that is not subjected to vigorous wave and current action. Stratigraphically the range of this form is Upper Miocene to Recent.

Quinqueloculina pulchella d'Orbigny 1826

Pl.8, figs.4a, 4b, 4c.

1826	Quinqueloculina pulchella	d'ORBIGNY	Ann.Sci.Nat.Paris France. Ser.1,tome 7,p.303.
1884	Miliolina pulchella	(d'Orbigny)BRADY.	Chall.Rep.Zool.Vol.9, p.174,pl.VI,figs.13,14.
1894	Miliolina pulchella	(d'Orbigny)GOES.	Kongl.Svenk.Veten.Akad. Handl.N.F.Bd.25,No.9,p.114, Tab.21,figs.862-864.
1897	Miliolina pulchella	(dIOrbigny)FLINT.	U.S.Nat.Mus.Ann.Rep. Wash.p.301,pl.46,fig.4.
1905	Quinqueloculina pulchella	d'Orbigny FORNASINI.	Mem.Real.Accad. Sci.Inst.Bologna,Ser.6,Vol.2, p.69,Tav.IV,fig.11.
1912	Miliolina pulchella	(d'Orbigny) BAGG.	U.S.Geol.Survey Bull. 513,p.29,pl.V,figs.3,4.
1953	Quinqueloculina pulchella	d'Orbigny REDMOND.	Journ.Pal.Vol.27, No.5,p.716,pl.74,figs.5a-c.
1957	Quinqueloculina pulchella	d'Orbigny	FORAMINIFERA PADANI. Agip Mineraria, pl.VI,fig.5.
1958	Quinqueloculina pulchella	d'Orbigny	LE CALVEZ and LE CALVEZ. Ann.L'Inst.Ocean.Paris,N.S. Tome XXXV,Fasc.3,p.175,pl.3, figs.12,13,14.
1960	Quinqueloculina pulchella	d'Orbigny	BARKER. Soc.Econ.Pal. and Min.Sp.Pub.no.9,p.12,pl.VI, fig.9.
1964	Quinqueloculina pulchella	d'Orbigny	FEYLING-HANSSEN. Nordes Geol Undersokelse. Nr.225,p.250, 251,pl.5,figs.3-6.

Test free, elongate, one and a half times as long as broad, oval in cross section, apertural end extending as a tubular prolongation beyond the limits of the test. Chambers fairly distinct, quinqueloculine, sub-triangular in cross section, five visible, four on one side, three on the other, periphery sub-acute. Chambers ornamented with moderately coarse longitudinal costae. On the ultimate chamber these costae appear to be discontinuous, becoming finer and dying out when the neck is reached. Sutures indistinct, slightly impressed. Aperture terminal, at the end of the neck, circular, with a faint lip present and also a trace of a simple tooth. Wall calcareous, imperforate, porcellaneous.

Dimensions: Length 0.90 mm. Width 0.50 mm. Thickness 0.35 mm.

Occurrence: Living CB.319.

Dead, CB.311, CB.315, CB.316, CB.317, CB.318, CB.321, CB.322, CB.324, CB.327, CB.328, CB.330, CB.331, CB.332, CB.334, CB.337, CB.352, CB.354, CB.361, CB.366, CB.367, CB.368, CB.371, CB.374, CB.384, CB.385, CB.398, CB.405, CB.414, CB.415.

Dead, variation sample CB.734.

Morphological remarks: The complications that arise with the morphology of this species have already been discussed.

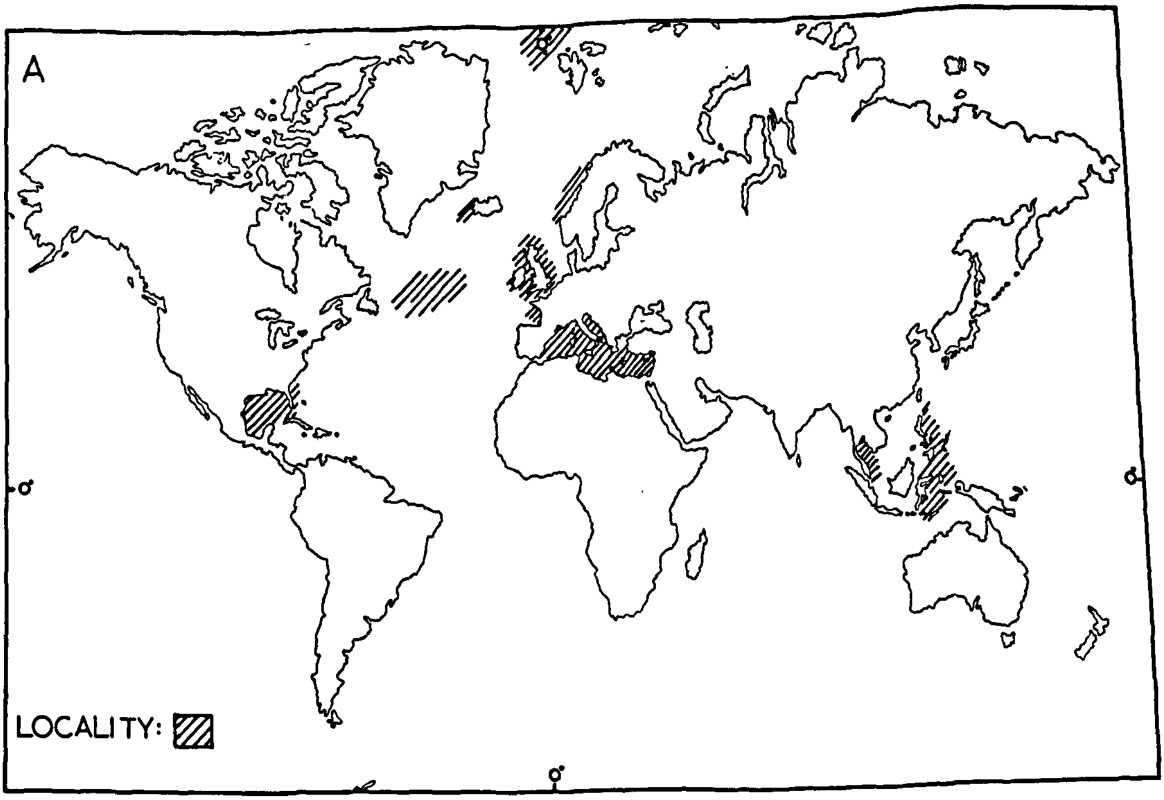
Distribution: (Text-fig.23A). One specimen of this species was obtained from Shetland by Brady in 1864, and Waller in 1868 obtained the species from the Shetland Seas. In 1876 the species was recorded 50 miles South West of Ushant by Jones and Parker, off the coasts of Durham and North Yorkshire by Robertson and Brady, and from the River Dee by Sidall. Brady 1884 noted it as being not uncommon in comparatively shallow water on the shores of Northern Britain. It was recorded off Penrhos and Liverpool Bay by Pearcey in 1891, and from the Irish Sea by the British Association in 1896. Heron-Allen and Earland recorded this species from the shore sands of Selsey Bill, Sussex in 1909 and 1911, from Clare Island in 1913, from 5 fathoms off Jura, and 12 fathoms in Loch Sunart in 1914, West of Scotland, from shore sands and the shallow water zone of the South coast of Cornwall in 1916, and from the Plymouth District in 1930. The Marine Biological Association also recorded this species from the Plymouth area in 1957.

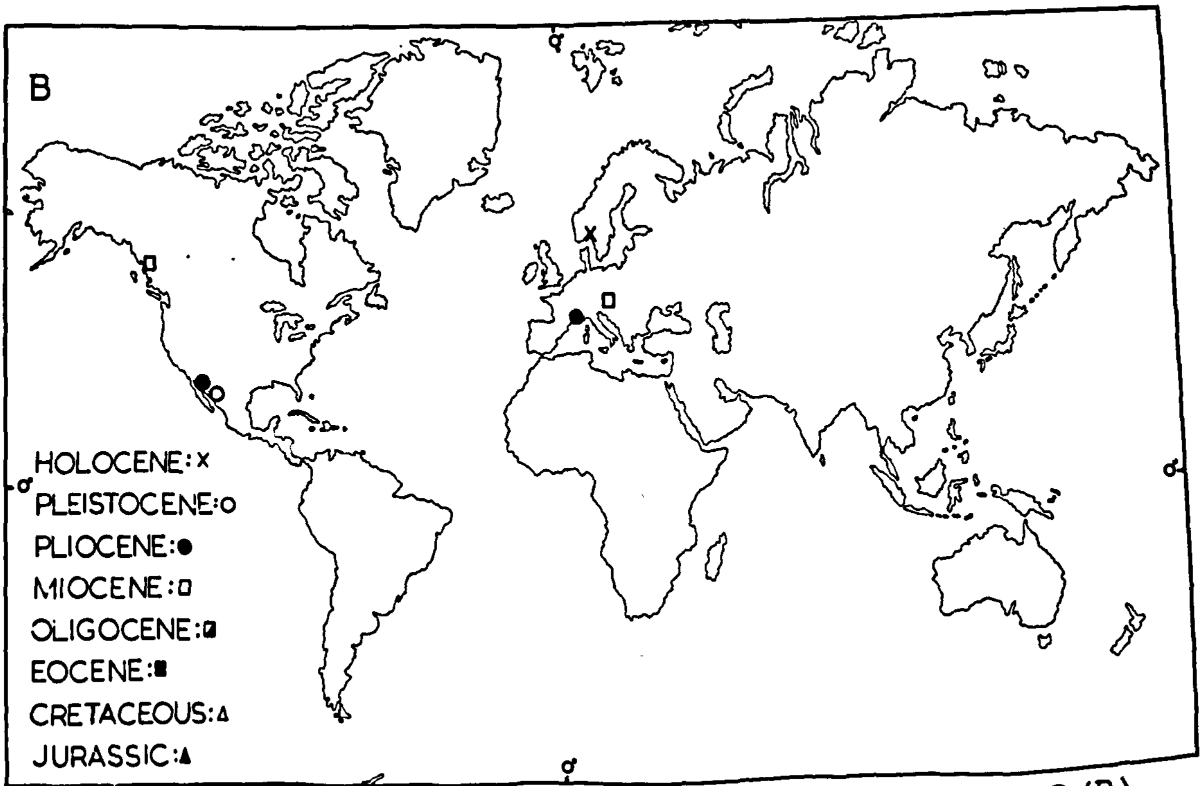
Jones and Parker in 1860 recorded this form from Crete and Syra, and Brady in 1884 recorded itfrom the North Atlantic, Mediterranean, and rarely among the East Indian Islands. Arctic and Scandinavian occurrences were noted in 1894 by Goes. It was recorded from the Florida coast by Flint in 1897, from the Malay Archipelago by Millett in 1898, and from Funafuti Atoll by Chapman in 1899. Marie 1938 noted this form in the Rance estuary. Norvang 1945 from Reykjavik, Iceland, and Said and Kamel 1957 on the Egyptian Mediterranean coast. In 1958 Le Calvez and Le Calvez obtained this species from Villefranche Bay, and noted a depth range of 40-250 metres for it. Segura 1963 noted the species in the littoral zone at Matamoros, Gulf of Mexico.

Stratigraphic Occurrence: (Text-fig.23B). This species has not been stratigraphically recorded from the British region.

Luczkowska 1957 recorded this species as being rare in the Miocene of the Carpathian foreland, and Redmond in 1953 obtained one specimen from the Miocene of Northern Columbia. Tertiary occurrences were noted from Palermo by Jones and Parker in 1860, and from Australia by Rao in 1955. Zanfra in 1961 noted this form as being rare in the Riviera Upper Pliocene and Bagg in 1912 noted it from the Pliocene and Pleistocene of Southern California. Feyling-Hanssen in 1964 noted the species occurring in post glacial warm interval terraces in the Oslo Fjord area.

Diagnosis: This form appears to be a typical shallow water species, characteristic of cool temperate and warm latitudes. Stratigraphically it ranges from the Miocene to Recent, although 'rare' occurrences, or single specimen occurrences must be viewed with some doubt due to the morphological complexities.





TEXT FIG. 23 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- QUINQUELOCULINA PULCHELLA

Quinqueloculina seminulangulata McLean 1956

Pl.5, figs.3a, 3b, 3c.

1956 *Quinqueloculina seminulangulata* McLEAN, Jr. Bull.Am.Pal.Vol.36, no.160,p.332,pl.37,figs.8a,8b.

Test free, large, somewhat longer than broad, elongate oval in outline, sub-sagittate in transverse section. Chambers distinct, quinqueloculine, sharply triangular in cross section, angles pronounced but not carinate, periphery acute, five visible, four on one side and three on the other, rapidly increasing in size as added. Aperture is at the truncate end of the ultimate chamber, non projecting, large, oval, elongate,with a long thin tooth which is raised above the general level of the aperture. Wall calcareous, imperforate, porcellaneous, smooth, white.

Dimensions: Length 0.61 mm. Width 0.42 mm. Thickness 0.26 mm.

Occurrence: Dead, CB.299, CB.304, CB.308, CB.309, CB.328, CB.329, CB.334, CB.346, CB.354. CB.387, CB.390, CB.391, CB.392, CB.393, CB.394, CB.395, CB.404, CB.415, CB.631.

Morphological remarks: This species is very similar to a young *Massilina secans* but may be distinguished by the characteristic oblique setting of the ultimate chamber.

Distribution: This is the first Recent occurrence of this species.

Stratigraphic Occurrence: McLean 1956 recorded his type species from the Miocene of Virginia.

Diagnosis: This is a shallow water, temperate form, inhabiting an area with a medium to coarse grained sandy substrate, open to somewhat vigorous wave and current action.

Quinqueloculina seminulum (Linne) 1758

Pl.6, figs. 3a, 3b, 3c.

1758	Serpula seminulum	LINNAEUS	Syst.Nat.Ed.10,Holmia,Suecia, (Sweden), impensis.Tome 1,p.786, PLANCUS. op.cit.pl.2,fig.1a-c.
1958	Miliolina seminulum	(Linne)	WILLIAMSON. Rec.For.Gt.Brit.Ray. Soc.London,p.86,pl.7,figs.183-1851
1865	Miliola (Quinqueloculina) seminulum	(Linne)	PARKER and JONES. Phil. Trans.Roy.Soc.Vol.155,p.410,pl.15, figs.35a,35b,pl.17,fig.87.
1884	Miliolina seminulum	(Linne)	BRADY. Chall.Rep.Zool.Vol.9,p.157-160,pl.V,fig.6.
1894	Miliolina seminulum	(Linne)	GOES. Kongl.Svenk.Veten.Akad.Handl. N.F.Bd.25,No.9,p.108,Tab.18,fig.838, 838A,Tab.19,fig.840-843.
1897	Miliolina seminulum	(Linne)	FLINT. U.S.Nat.Mus.Ann.Rep.Wash. p.297,pl.43,fig.2.
1902	Miliolina (Quinquelocuâina) seminulum		CHAPMAN. Foraminifera. Longmans p.92,pl.3,fig.E.e.
1906	Miliolina seminulum	(Linne)	BULLEN. Geol.Mag.Vol.III,p.357, pl.XVIIImfig.7.
1907	Miliolina seminulum	(Linne)	CHAPMAN. Journ.Linn.Soc.Zool.London, Vol.30,pl.2,fig.34.
1909	Milèolina seminulum	(Linne)	RHUMBLER. Erg.Plankton Exped. Humboldt-Stiftung.Bd.III,L.c,Tiel.1, p.106,Taf.XI,fig.12.
1912	Miliolina seminulum	(Linne)	BAGG. U.S.Geol.Survey Bull.513,p.30, pl.IV,fig.9a,b.
1917	Quinqueloculina seminulum	(Linne)	CUSHMAN. U.S.Nat.Mus.Bull.no. 71,pt.6,p.44,45,pà.11,fig.2,text-fig.29.
1921	Quinqueloculina seminulum	(Linne)	CUSHMAN. U.S.Nat.Mus.Bull.no.100, Vol.4,p.416,pl.88,figs.4a-c,text-fig.19,20.

1922	Quinqueloculina seminulum (Linne)	HOFKER. Protozoa, Flora en Fauna der Zuidersee. p.137,138,fig.20.
1927	Quinqueloculina seminulum (Linne)	STADNICHENKO. Journ.Pal.Vol.1, No.3,p.226,pl.38,fig.28.
1929	Quinqueloculina seminulum (Linne)	BERRY and KELLEY. Proc.U.S.Nat. Mus.Vol.76,Art.19,p.16,pl.2, figs.11,12.
1929	Quinqueloculina seminulum (Linne)	CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.5,pt.3,p.59,60,pl.9,figs. 16-18.
1930	Quinqueloculina seminula (Linne)	CUSHMAN and COLE. Contr.Cush. Found.Foram.Res.Vol.6,pt.4,p.95, pl.13,figs.1a-c.
1930	Quinqueloculina seminula (Linne)	CUSHMAN and VALENTINE. Contr. Dept.Geol.Stanford Univ.Vol.1, no.1,p.10,pl.1,fig.8.
1931	Quinqueloculina seminula (Linne)	KORNFIELD. Contr.Dept.Geol. Stanford Univ.Vol.1,no.3,p.83, pl.14,figs.4a,4b,4c.
1932	Miliolina seminulum (Linne)	HERON-ALLEN and EARLAND. Discl Repts.Vol.4,p.313,314,pl.VI, figs.25-40.
1933	Quinqueloculina seminulum (Linne)	GALLOWAY. A manual of foraminifera p.119,pl.10,figs.2,3.
1939	Quinqueloculina seminulum (Linne)	PHLEGER. Bull.Geol.Soc.Am.Vol.50, no.9,p.1421,pl.2,fig.15.
1944	Quinqueloculina seminula (Linne)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.13,pl.2,fig.14.
1945	Quinqueloculina seminulum (Linne)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.13,p.17,pl.2,fig.16.
1945	Quinqueloculina seminulum (Linne)	NORVANG. Zool.of Iceland,Pt.2, Vol.2,Foraminifera, p.7,8,fig.2.
1946	Quinqueloculina seminulum (linne)	BELLEN,van. Med.Geol.Stichting, Ser.C.V. no.4,p.32,pl.2,figs.14,15.

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Test free, elongate ovate in outline, ovate in section, slightly compressed on one side. Chambers distinct, quinqueloculine, five visible, four on one side and three on the other, semi-circular in cross section, gradually increasing in size as added, periphery rounded. Sutures distinct, slightly impressed. Aperture terminal, at the end of the ultimate chamber, semi-circular in shape, with a single prominent tooth. Wall calcareous, imperforate, porcellaneous, smooth.

Dimensions: Length 0.90 mm. Width 0.70 mm. Thickness 0.45 mm.

Occurrence: Living, CB.298, CB.299, CB.301, CB.302, CB.309, CB.311, CB.314, CB.315, CB.319, CB.324, CB.325, CB.329, CB.331, CB.333, CB.336, CB.353, CB.356, CB.368, CB.371, CB.381, CB.385, CB.400, CB.403, CB.404, CB.407, CB.408, CB.413, CB.413, CB.414,

Dead, CB.298, CB.299, CB.301, CB.302, CB.304, CB.305, CB.306, CB.307, CB.308, CB.309, CB.310, CB.311,

CB.312, CB.313, CB.314, CB.315, CB.316, CB.317, CB.318,

CB.319, CB.320, CB.321, CB.322, CB.323, CB.324, CB.325,

CB.326, CB.327, CB.328, CB.329, CB.330, CB.331, CB.332,

CB.333, CB.334, CB.336, CB.337, CB.338, CB.339, CB.340,

CB.341, CB.342, CB.343, CB.344, CB.345, CB.346, CB.347,

CB.348, CB.349, CB.352, CB.353, CB.354, CB.356, CB.358,

CB.359, CB.360, CB.361, CB.363, CB.364, CB.366, CB.367,

CB.368, CB.369, CB.370, CB.371, CB.373, CB.374, CB.376,

CB.377, CB.379, CB.380, CB.381, CB.383, CB.384, CB.385,

CB.386, CB.387, CB.388, CB.389, CB.390, CB.391, CB.392,

CB.393, CB.394, CB.396, CB.397, CB.398, CB.399, CB.400,

CB.401, CB.402, CB.403, CB.404, CB.405, CB.406, CB.407,

CB.408, CB.410, CB.412, CB.413, CB.414, CB.415, CB.611,

CB.612, CB.613, CB.614, CB.618, CB.619, CB.623, CB.624,

CB.627, CB.629, CB.630, CB.631, CB.632, CB.633, CB.634,

CB.635, CB.636, CB.637, CB.639, CB.640, CB.642,

Dead, variation samples, CB.176, CB.177, CB.633, CB.634,

CB.689, CB.695, CB.696, CB.699, CB.705, CB.706, CB.710,

CB.712, CB.714, CB.716, CB.754, CB.735, CB.743, CB.744,

CB.745, CB.746.

Morphological remarks: Cushman 1917 has stated that the synonomy of this species is very large and very difficult to unravel as the name has been used to include almost every sort of smooth quinqueloculine form. It has been noted from collections in the British Museum that Brady 1884 incorporated it with Q.oblonga (Montagu), and Heron-Allen and Earland 1932 included a number of similar forms in their _Miliolina seminulum_ group, although at this time they stated that this species was subject to great variation. Parr 1950 noted that this species varied in shape from the typical form to _Q.vulgaris_ d'Orbigny. Tremadoc Bay specimens suggest that there is a morphological continuum between _Q.lata_, _Q.seminulum_, _Q.seminulangulata_ and _Massilina secans_, the form tending to become more inflated, and then massiline through this series. Hay, Towe, and Wright worked on thin sections of this species in 1963 and noted that in reflected light the specimens were bright and clean, white and fully opaque, as is characteristic of the mioiolids. In transmitted light the specimens were deep brown to amber, depending on the size of the individual. Viewed in polarized light, thin sections of the wall of _Quinqueloculina_ show a low birefringence due to the mutual compensation of the tiny randomly orientated crystals, only the outer layer appearing a bright first order yellow, which may represent either an organic membrane covering the shell or possibly the orientated "tile-roof" patterned area seen in some electron micrographs. In phase-contrast microscopy the test showed a striking furry pattern indicating the presence of many tiny crystals matted together. This pattern tended to run parallel to the margin near the outer surface, and normal to the surface within the wall. In some areas, particularly at the end of the test this pattern becomes indistinct. Electron micrographs reveal that different areas on the surface of the test have a widely differing appearance. In certain areas there is the striking tile-roof pattern produced by tabular, idiomorphic crystals of calcite having the same orientation, being $1\frac{1}{2}$-2 μ in length and about $\frac{1}{2}\mu$ wide, the angles formed by the crystals varying between 71° and 78°. Some of these crystals may be paired, triple or quadruple with serrate sutures joining them. Other areas of the test are composed of subcylindrical rods of calcite more or less irregularly disposed, these rods being $\frac{1}{2}$-2 μ long and about $\frac{1}{4}\mu$ in diameter, this type of area showing a transition to the area with the tile roof pattern.

Blackman and Todd 1959 analyzing miliolids in general found that they were consistently composed of high magnesian calcite (10-16 mol. per cent.).

Distribution: (Text-fig.24A). This species has been widely recorded from the British region. It was noted in Belfast Bay by Williamson in 1858, from the Shetland Seas by Waller in 1868, from South East of Eddystone by Robertson in 1870, and by Brady in 1870 from the Montrose Basin, Budle Bay, River Aln, River Wansbeck, River Blyth, River Tees, the Firth of Forth, Hartlepool Slake, Barton Broad, Breydon Water, Yarmouth, Portree Harbour, and Westport, Ireland. Robertson in 1875 obtained this form from the Firth of Clyde and in 1876 it was recorded from the River Dee by Sidall, South of the Scilly Isles by Jones and Parker and off the coasts of Durham and North Yorkshire by Robertson and Brady. Robertson in 1883 obtained the species from the top silt of Atlantic Docks, Liverpool, and in the following year Brady recorded it off Skye, and West of Scotland. It was recorded as being frequent in 1,000 fathoms off the South West coast of Ireland in 1889 by Wright, and in 1890 Pearcey noted it as being very rare in the cold area to common to the warm area of the Faeroe Islands. In 1891 the species was noted in the River Mersey by Burgess, and at Port Dinorwic, Caernarvon Bay, off Penrhos and in Liverpool Bay by Pearcey. This form was noted as being common in Portree Bay, Isle of Skye in 1892 by Robertson, and Chaffer in 1894 obtained it from Port Erin. Wright in 1895 recorded it as frequent in Dogs Bay, and in 1896 the British Association listed it as occurring in the Irish Sea. Wright again recorded this species from Dogs Bay in 1900, and in the same year Worth recorded it from Salcombe estuary. In 1902 Wright noted this species occurring around Rathlin Island and in clay in the River Lune Valley and Worth noted it in the Exe estuary. Pearcey in 1903 stated that living forms of this species were rare in the Firth of Forth, and Worth in 1904 stated that it was common everywhere in the Plymouth district. In 1906 Gough noted the form occurring in Larne Lough, Red Bay, Gobbins, and Belfast Lough, Ireland, and in 1907 Worth stated that this species was common to abundant at Lambay, County Dublin. Heron-Allen and Earland recorded this species from the shore sands of Selsey Bill, Sussex in 1909 and 1911, from Clare Island, and the North Sea in 1913, from 5 fathoms off Jura, 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart, and 20 fathoms off Ardnamuchan in 1914, from 20 fathoms off the Isle of Man in 1915, West of Scotland, and the shore sands and shallow water zone of the South coast of Cornwall in 1916, and from the Plymouth district in 1930. Myers in 1943 also obtained this form from the Plymouth area where it constituted .4% of the fauna, as did the Marine Biological Association in 1957. A Mer Celtique occurrence was noted by

Le Calvez in 1958 from South of Ireland, West of France, and from the West English Channel. It was recorded as frequent from the Isle of Man and surrounding areas by Bruce, Colman, and Jones, in 1963.

There are abundant records of this species occurring throughout the world. Jones and Parker in 1860 recorded this form from Crete and Rimini, and in 1865 recorded it from the North Atlantic and Arctic. In 1870 it was recorded as rare to common in the Gulf and River St. Lawrence by Dawson, and fro m the River Scheldt by Brady. In 1878 this author noted the species occurring in the Arctic, and in 1884 stated that this form was common to every latitude from the furthest points of the Arctic seas to the equator, and from the equator to the Antarctic ice barrier, and to every depth from the shallowest shore pool down to 3,000 fathoms. Arctic and Scandinavian occurrences were noted by Goes in 1894. Flint in 1897 noted it from the Gulf of Mexico, the North Atlantic and the Brazil coast, and Millett in 1898 noted the species as being numerous and widely distributed in the Malay Archipelago. Chapman recorded this form as being frequent at Funafuti Atoll, in 1899, and as being frequent in the lagoon and on the seaward side of the Cocos Keeling Atoll in 1902. This species was recorded from the Antarctic by Pearcey in 1914, from the Philippine Islands at a depth of 18-159 fathoms by Cushman in 1921, from the Zuidersee by Hofker in 1922, from the Lord Howe Islands by Heron-Allen and Earland in 1923, and from San Francisco Bay by Hanna and Church in 1927. In 1930 Cushman and Moyer recorded the form from 35-50 fathoms off San Pedro, California, Cushman and Valentine from the shallow water channel islands of Southern California, and Norton from the deeper waters of the Florida area. Kornfield in 1931 obtained this species from the littoral zone of Texas and Louisiana, and Heron-Allen and Earland in 1932 obtained it from the ice free area of the Falkland Islands and adjacent seas, and stated that it presents nearly all the variations commonly associated with this species. Natland noted this species from the Southern California region in 1933, and in the following year Earland recorded it from the Falklands sector of the Antarctic, where hesstated that the occurrence frequency is generally inversely in ratio to the depth. Chapman and Parr in 1937 also recorded an Antarctic occurrence, although the frequency was stated to be rare to very rare. An occurrence of the Indochina coast was noted by Le Calvez in 1939, and Norvang in 1941 retrieved a good number of specimens from off Bergen. Cushman in 1944 recorded occurrences along the New England coast, while Norvang in 1945 recorded the form as being rare to common around Iceland. Rutten and Hotz in 1946 obtained this form from the Island of Ceram, and in 1948 Cushman noted the form from Hudson Bay and North East Greenland. In the same year Parker recorded this form on the continental shelf between the Gulf of Maine and Maryland. Thés worker set up four ecological zones:- Zone 1, o-15 metres, the littoral and sublittoral zone, with abundant specimens of this species, Zone 2, 15-90 metres, here the species comprising 5-20% of the fauna, Zone 3, 90-300 metres, where the species constituted less than 1% of the fauna, and Zone 4, 300-680+ metres where the species again comprised less than 1% of the fauna. Cushman in 1949 stated that this was a common species occurring in considerable numbers in Belgium. In 1950 the species was recorded as frequent off the West African coast by Colom, from the Antarctic, Kerguelen and Macquaria Islands, and from Tasmania by Parr, and as part of the bay facies in Barnstable Harbour, Massachusetts by Phleger and Walton. In 1951 Nagahama recorded the species off Japan, Said recorded it from Narraganset Bay, and Voorthuysen noted it occurring in the Netherlands Wadden Sea. Parker in 1952 recorded this species as being rare in the Portsmouth (N.H.) area, and in the Long Island Sound-Buzzards Bay area, where it was noted that there appeared to be a tendency for the species to be confined to sandy areas although it was seen that this is not consistently true. In the same year Phleger also noted that this form occurred in the Portsmouth (N.H.) area, only at a few nearshore stations with frequencies of less than 1%. Also in 1952 Colom noted the form on the coast of Galicia. In 1953 Parker, Phleger, and Peirson noted the form in San Antonio Bay and environs, widespread in shallow waters, with high frequencies (10-56%) a6 all beach stations, and with low frequency on innermost shelf stations. Hiller in the same year noted this species as being rare to abundant in Mason Inlet, North Carolina. In 1954 Andel and Postma noted this form as being scarce in the Gulf of Paria, and Boltovskoy recorded it from San Blas Bay, and the Gulf of San Jorge, Argentina. In the following year the same author noted this species as being most common in the shore sands at Quequen, Buenos Aires. Harrington in 1955 obtained this form from the Bay of Fundy. Ronai from the brackish water New York Bight, and Kruit from the Rhone delta, where the optimum environment was stated to be situated in muddy sediments irrespective of depth, although occasionally the species is present in fine sandy sediments. In 1956 the species was recorded from the shore sands of Western India by Bhatia, from the Argentinian shelf by Boltovskoy, and from the Central Texas coast, with very low frequencies by Phleger. Boltovskoy in 1957 recorded the form from the estuary of the Rio de la Plata, and Lehmann in the same year recorded it from the Texas Gulf coast, as common, comprising 6.6% in the littoral beach facies, 2.9% in the forebay facies, 5.3% in the offshore bar marsh facies, and as rare in the back bay facies, and the bay delta edge facies. Phleger and Lankford obtained the form from the Central Texas bays in this year, and Said and Kamel obtained it from the Egyptian Mediterranean coast. Also in 1957 Todd and Bronnimann noted this form occurring in both the nearshore and offshore zones in the Eastern Gulf of Paria. Blanc-Vernet in 1958 noted this species as being common on the Marseille coast, and Le Calvez and Le Calvez noted it as being abundant in 15-20 metres, and less so below 70 metres in Villefranche Bay. Also in 1958 it was recorded from the Central Turrhenian Sea by Norin, from the Santa Cruz Basin, California by Resig, and in the Recent portion of a core from the Western Mediterranean by Todd. Boltovskoy in 1959 recorded this species as part of a depauperate fauna on the Argentinian coastal zone, from off Southern Brazil, and off Argentina. In the following year Asano obtained this species from the adjacent seas of Japan, where the depth ranged from 75 to 539 metres, and the temperature ranged from 2.3 to 23.3°C.

In the same year Hofker recorded this species from the Gulf of Neapel, and Phleger recorded it from the beaches of the Northern Gulf of Mexico. In 1961 the species was recorded from the continental platform between Santo Tome and the Rio de la Plata by Boltovskoy, from Heald Bank, Gulf of Mexico by Shifflett, and from Marthas Vineyard, Massachusetts by Todd and Low, who stated that the form was most frequent in all the samples except those from the protected bays and brackish ponds. In 1962 Cita and Chierici obtained this form from the Adriatic Sea, and Closs and Barberena obtained it on two occasions from the littoral area of Southern Brazil. Haake in the same year noted the form occurring at Langeoog Island and mainland, North Sea, and Kane noted it occurring with frequencies of up to 5% in the Gulf of Mexico. Also in 1962 the species was recorded from Upper Florida Bay and associated sounds by Lynts, from Oyster Harbour, Western Australia by McKenzie, and from the Polar Arctic continental shelf by Wagner at 472, 487, 492 and 12 1239 metres and at temperatures of +0.28 to +0.25°C, and +0.30 to +0.34°C. Ayala-Castanares in 1963 obtained it from Laguna de Terminos, Campeche, Mexico and Boltovskoy from Puerto Deseado, Patagonia. In this year Dupeuble recorded the species from Roscoff, Finistere, and Segura recorded it from the littoral zone at Matamoros, Gulf of Mexico. Bartlett in 1964 noted this form as being widely distributed but most abundant in mildly turbulent, near shore environments on South Eastern Nova Scotia. In the same year Boltovskoy worked on the season occurrence of this species at Puerto Deseado, Patagonia, and noted that this species lived for only one year, its period of reproductive activity lasts for about five months, and that the peak of reproduction takes place in December. An interesting feature that he noted was that many specimens had their protoplasm protruding from the aperture, these protrusions being of differing lengths, the maximum being 95% of the length of the test itself. This species was also recorded in this year from the Chukchi and North Bering Sea by Cooper, from Tampa-Sarasota Bay, Florida with a depth range of 7 to 30 feet by Walton, and from the Southern Atlantic coast of the United States, in the middle shelf fauna at a depth of 15 to 61 metres by Wilcoxin. Adams and Frampton in 1965 obtained this species from Isafjordur, Iceland, Albani in the same year from Durban Bay, South Africa, Holtedahl noted this species in the Recent portion of a core in Hardanger Fjord, Norway, in 1965, and in the same year Phleger noted the species living in Guerrero Negro Lagoon, Baja, California.

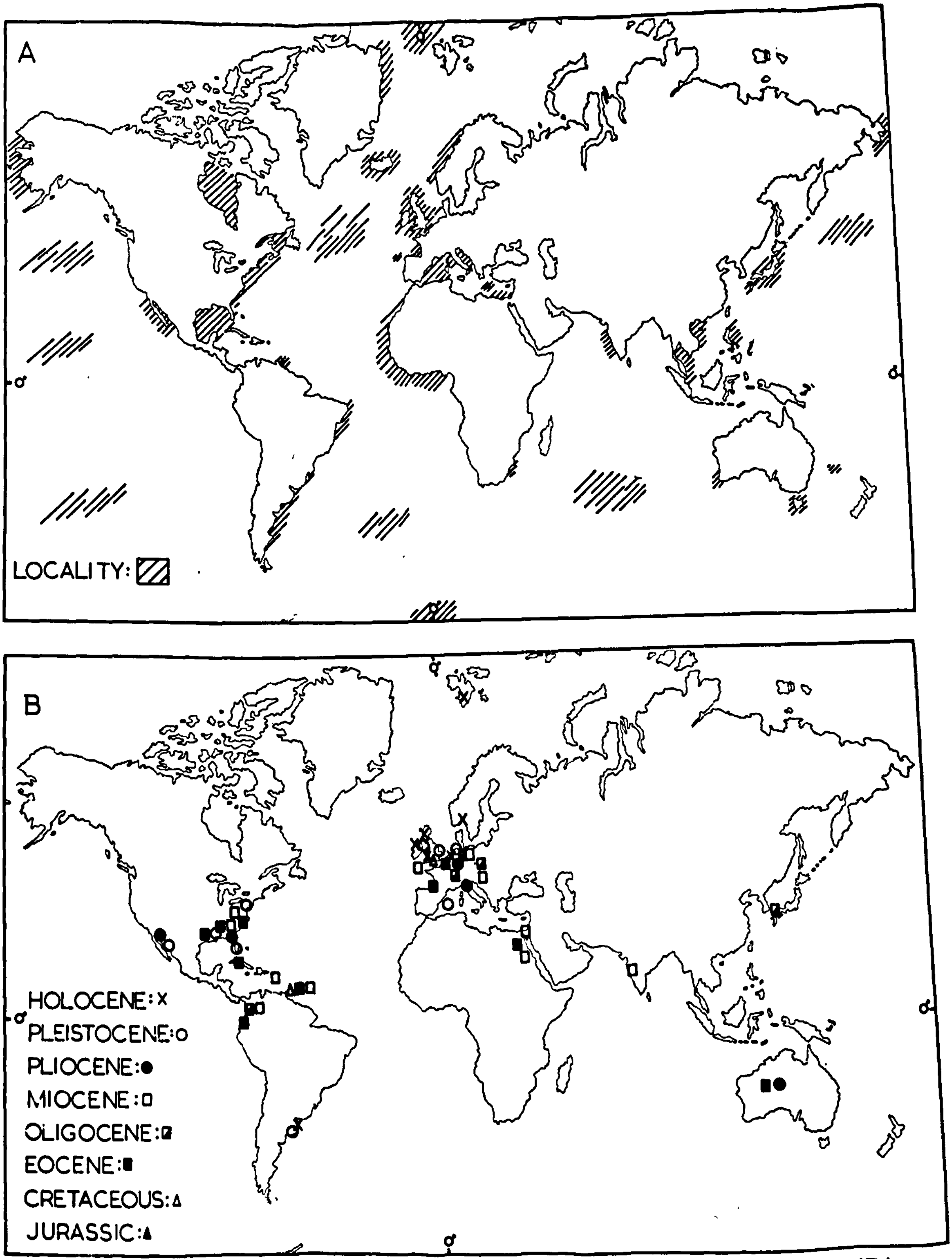
Stratigraphic Occurrence: (Text-fig.24B). This species has been recorded from the British Holocene at the following localities, Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Formby and Leasowe (Redde 1900), Altcar (Wright 1904), County Antrim (MacFadyen 1937), Swansea Docks (MacFadyen 1942), ahd Borth, Cardiganshire (Adams and Haynes 1965).

The stratigraphically oldest recorded occurrence of this species is that made by Jones in 1900 from the Chalk of Southern England. Heron-Allen and Earland in 1910 obtained this species from Selsey Bill, Sussex and stated that it was derived from the Cretaceous. Curry, Murray, and Whittard obtained this species from the Miocene, Paleogene, and Neogene of the Western approaches to the English Channel. Paleogene occurrences were noted from the Isle of Wight by Bhatia in 1955, and 1957, and from the Paleogene and early Pleistocene of Norfolk by Funnell in 1961. Crosskey and Robertson noted numerous Post Tertiary occurrences, at Dalmuir (1867), Isle of Cumbae, Loch Gilp (1868) Loch Fyne, Duntroon, Paisley (1869), Greenock, (1871), Bute, Campbeltown (1873), North West of Glasgow, Stobcross, Paisley, Ayrshire, and the Kyles of Bute (1874). Robertson alone also noted Post Tertiary occurences at Garnock, Kilwinning, and Paisley (1877), and at Greenock (1885). This species has been recorded from the Pleistocene of Moel Tryfaen by Wright in 1900, and from the Isle of Man by Reade and Wright in 1906. Wright in 1902 recorded this species from the Drift of County Cork, and in 1923 from the Drift of Herefordshire. Boulder Clay occurrences have been recorded from Cheshire (Shone 1874) Bridlington Quay (Crosskey 1884), the Vale of Clwyd (Reade 1897), Cheshire (Wright 1899), Carrickfergus (Wright 1903), and County Down (Wright 1904). This form has been recorded from the Lower Boulder Clay of Lancashire and Cheshire by Reade in 1874, and of Bridlington by Lamphigh in 1881. Upper Boulder Clay occurrences were noted from West Cheshire and Liverpool by Shone in 1878, and from Ayrshire and County Dublin by Wright in 1903.

In the rest of the world Holocene occurrences have been noted from Bruges, (Reade 1898), Quequen, Argentina (Boltovskoy 1959), Dollart Ems estuary (Voorthuysen 1960), South West Barants Island, and Spitzbergen (Feyling-Hanssen 1961, 1965).

Guppy in 1892 recorded this species from the Cretaceous of Trinidad. Eocene occurrences have been noted from East Texas, (Stadnichenko 1927), Mississippi (Mornhinveg 1941), Coastal Ecuador (Cushman and Stainforth 1951), and Belgium (Kaasschieter 1961). Halkyard in 1917 and 1919 recorded this form from the Middle Eocene Blue Marl of Biarritz. Upper Eocene occurrences have been recorded from Louisiana by Bellen in 1946, and from Egypt by Ansary in 1954. Howchin in 1893 noted the species ranging from the Eocene to the Post Tertiary of Australia. Nutall in 1928 noted the form in the Upper Eocene and Miocene of Trinidad, and Copeland in 1964 from the Eocene and Miocene of North Carolina. The species has been recorded from the Oligocene of Hungary by Majzon in 1940, and from Nagasaki, Japan by Murata in 19591. Bermudez in 1949 recorded this form from the Upper Oligocene of the Dominician Republic, and Kummerle in 1963 from the Upper Oligocene of Germany. Bellen in 1946 stated that in the Northern Netherlands this form ranges from the Oligocene to Miocene, and Petters and Sarmiento in 1956 noted the range as being from the Upper Oligocene to Lower Miocene in Colombia. In 1961 a Paleogene occurrence was noted by Murata from Kyushu, Japan. Guppy in 1874 recorded this species from the Miocene of Arguilla, and MacFadyen in 1930 recorded it from the Miocene of Egypt and Sinai. Other Miocene occurrences have been noted from the Netherland Antilles by Drooger in 1953, from Virginia by McLean in 1956, from the Carpathian foreland by Luczkowska, from Western India by Bhatia and Mohan in 1959, and from Northern Egypt by Souaya in 1953. Neogene occurrences were noted by Rutten and Hotz in 1946 from the Island of Ceram, and by Kleinpell in 1954 from Lau, Fiji. Cushman in 1945 obtained this form from the Pliocene of Castel Arquato, Italy, and in conjunction with Gray in 1946 recorded it from the Pliocene of Timms Point, California. In the same year Bellen noted this form in the Italian Pliocene. In 1953 Voorthuysen obtained this form from the Pliocene of Oosterhaut, Netherlands where it comprised .5 to 5% of the fauna. Howchin and Parr in 1938 noted this form in the Upper Pliocene of Australia. Bagg in 1912 noted this form in the Pliocene and Pleistocene of Southern California, Cole in the Pliocene and Pleistocene of Florida in 1931, Voorthuysen in the Pliocene and Pleistocene of the Western Netherlands, and Papani and Pelosio in 1962 in the Pliocene and Pleistocene of Parma. Tertiary occurrences have been noted from Malaga (Jones and Parker 1859), Palermo (Jones and Parker 1860), Victoria, Australia, (Chapman 1907), Java (Caudri 1932), Western Australia (Crespin 1955), Australia (Rao 1955), and one post-Tertiary occurrence from Fiji by Brady in 1888. Bellen in 1906 obtained this form from the Pleistocene of East Crete, and other Pleistocene occurrences have been noted from Maryland by Cushman and Cole in 1930, from the Netherlands by Voorthuysen in 1948, 1949, and 1950, from Louisiana by Anderson and Murray in 1953, from Eastern Long Island, New York by Weiss in 1954, from Western Mediterranean cores by Todd in 1958, and from Quequen, Argentina by Boltovskoy in 1959. In 1964 Feyling-Hanssen recorded this species from the Late Quaternary of the Oslo Fjord area.

Diagnosis: This cosmopolitan species does not appear to be limited in its distribution by either temperature or depth, and salinity does not appear to affect it greatly except in extreme cases. Ecologic factoss that do appear to play an important part in its distribution are firstly, the availability of a food supply, and secondly, the type of area where it is found, whether the area is open or sheltered as this species does appear to prefer a more robust environment irrespective of the type of substrate. One interesting feature concerning the distribution of this form is that it is only very rarely found living in association with species belonging to the Textulariina. Stratigraphically it certainly ranges from the Eocene to Recent, being quite common at all times, and possibly ranges from the Cretaceous to Recent, although Cretaceous occurrences must be viewed doubtfully due to the large number of forms very similar to this species, and the mode of preservation in strata of this age.



TEXT FIG. 24 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- QUINQUELOCULINA SEMINULUM

Genus: *Massilina* Schlumberger 1893

Massilina planisparoidea Martinotti 1921

Pl.5, figs.1a,1b,1c.

1921 *Massilina planisparoidea* MARTINOTTI Soc.Ital.Sci.Nat.Milano Atfi.Vol.59,fasc.3-4,p.314, pl.4,figs.1-3,text-fig.129, p.315,text-fig.130.

Test free, large, circular to sub-circular in outline, elliptical in transverse section, with a somewhat planispiral appearance, very compressed, periphery rounded to sub-rounded. Chambers distinct, the early quinqueloculine ones occupying the centre of the test, and the later chambers on alternate sides in one plane. On one side can be seen four chambers, and on the other side six chambers, increasing gradually at first, and then rapidly in size as added. The ultimate and penultimate chambers are quite widely separated at the apertural end, the ultimate chamber being slightly twisted at the end so that the aperture is directed towards one side. Aperture at the open end of the ultimate chamber, large, elongate, with a long prominent tooth which is straight at first and then becoming bifid at the tip. Tooth raised a little above the general surface of the aperture. Sutures distinct, impressed. Wall calcareous, imperforate, porcellaneous, white, speckled brown with algae.

Dimensions: Length 1.30 mm. Width 1.30 mm. Thickness 0.50 mm.

Occurrence: Dead CB.299.

Morphological remarks: Cushman and Warner in 1940 working on the genus *Massilina* in general stated that the test consists of crypto-crystalline, calcite containing much heterogenous foreign mineral matter scattered throughout the wall, the cement being calcium carbonate. Chitin in direct association with calcium carbonate is found as a lining in the chambers readily visible in section, this being optically birefringent.

Distribution: This is the first recorded occurrence of this species in the British area.

Martinotti in 1921 recorded his type species from Tripoli, Libya, and McKenzie in 1962 obtained one specimen from Oyster Harbour, Albany, Western Australia.

Stratigraphic Occurrence: There are no stratigraphic records for this species.

Diagnosis: This robust, shallow water, Recent species appears to prefer a temperate to warm environment.

Massilina secans (d'Orbigny)1826

Pl.5, figs.2a,2b,2c.

1826 Quinqueloculina secans d'ORBIGNY Tab.meth.de la classe des Cephalpods,p.303,Model no.96.

1894 Miliolina secans (d'Orbigny) GOES. Kongl.Svensk.Veten.Akad. Handl.N.F.Bd.25,No.9,p.112, Tab.20,fig.856-856g.

1927 Massilina secans (d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.3,pt.1,pl.7,fig.9.

1933 Massilina secans d'Orbigny) GALLOWAY. A menual of foraminifera. p.127,pl.11,fig.8.

1949 Massilina secans (d'Orbigny) CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique,Mem.111,p.11,12,pl.II, fig.4.

1955 Massilina secans (d'Orbigny) KAASSCHIETER in Drooger, Kaasschieter, and Key. Verh.Konin.Ned.Akad.Weten. Afd.Nat.Deel XXI,No.2,p.58,pl.2, figs.2a,b.

1957 Massilina secans (d'Orbigny) BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome VI,no.1,p.26,27, pl.VI,figs.1-5.

1957 Massilina secans (d1Orbigny) FORAMINIFERI PADANI. Agip.Mineraria pl.VI,fig.9.

1959 Massilina secans (d'Orbigny) BOLTOVSKOY.Sec.de Marina Pub.H1005, Buenos Aires,p.48,pl.IV,fig.4.

1961 Massilina secans (d'Orbigny) BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Zool.Tome VI,no.6,p.285,pl.IV, fig.27.

1961 Massilina secans (d'Orbigny) BRAGA. Pub.Inst.de Zool.Fac.de Ciencias do Porto 77, pl.66,pl.VI, fig.2.

1962 Massilina secans (d'Orbigny) CLOSS and BARBERENA. Inst.Rio Grande do Sul.Inst.Cienc.Nat.No.16, p.26,Est.2,fig.2,Est.5,figs.8a,b.c.

1964 Massilina secans (d'Orbigny) FEYLING-HANSSEN. Nordes Geol. Undersokelse Nr.225,p.254,pl.6,figs. 2,3.

Test free, large, compressed, discoid, circular to ovate in outline, elliptical in section. Chambers distinct, four visible on either side, large, arranged on a quinqueloculine plan at first, later added in a single plane. Periphery sub-acute, early chambers with acute angle. Sutures distinct, depressed. Aperture at the end of the ultimate chamber, a large elongate opening with a slight reflexed lip and a long simple to bifid tooth present. Wall calcareous, imperforate, porcellaneous, smooth, white, speckled brown with algae.

Dimensions: Length 1.45 mm. Width 1.10 mm. Thickness 0.40 mm.

Occurrence: Living CB.331, CB.395.

Dead, CB.299, CB.304, CB.308, CB.309, CB.310, CB.312, CB.319, CB.328, CB.330, CB.331, CB.334, CB.335, CB.336, CB.337, CB.340, CB.346, CB.354, CB.366, CB.367, CB.376, CB.387, CB.388, CB.390, CB.391, CB.392, CB.393, CB.395, CB.404, CB.405, CB.407, CB.415, CB.613, CB.631, CB.636.

Dead, variation samples CB.693, CB.695, CB.714, CB.716.

Morphological remarks: As Boltovskoy stated in 1959 this species is greatly variable, both in size and character of the peripheral margins.

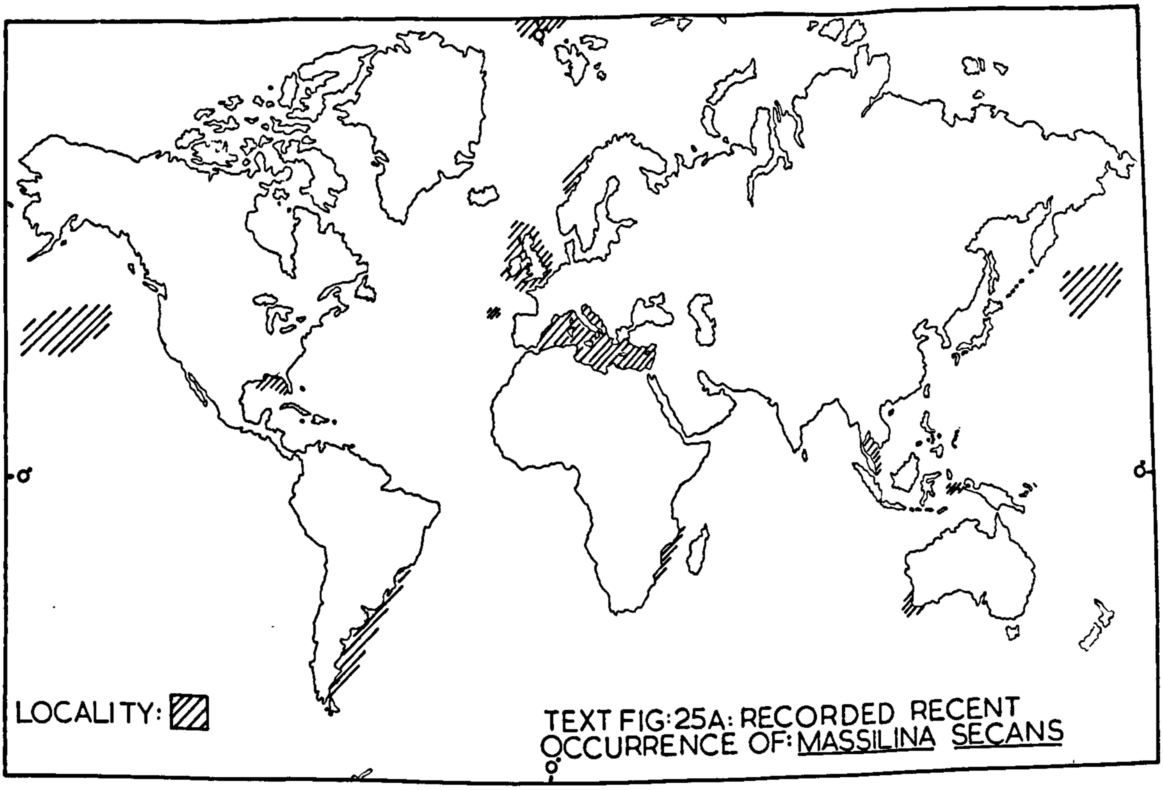
Distribution: (Text-fig.25) In 1868 Waller recorded this species from the Shetland Seas, and Brady, two years later noted it in Budle Bay, Breydon Water, Hartlepool Slake, the River Blyth and the River Wansbeck. Robertson in 1875 obtained it from the Firth of Clyde, and in the following year, in conjunction with Brady noted it occurring off the coasts of Durham and North Yorkshire. In the same year Sidall noted it as being frequent in the River Dee. It has been recorded from Portree Bay, Isle of Skye by Robertson in 1892, from Dogs Bay by Wright in 1895, from the Irish Sea by the British Association in 1896, again from Dogs Bay by Wright in 1900, and from Rathlin Island by the same author in 1902. It was recorded as rare in the Firth of Forth in 1903 by Pearcey, from Plymouth by Worth in 1904 who noted that this species seemed to prefer clean sands, and that it was ofteh common on the beaches, and from Lambay, County Dublin in 1907 by Wright. Heron-Allen and Earland recorded this species from shore sands at Selsey Bill, Sussex in 1909 and 1910, from Clare Island material, especially from shore sands and from the North Sea in 1913, from 5 fathoms off Jura in 1914, West of Scotland, from the shore sands and shallow water coastal zone of the South coast by Cornwall in 1916, and from the Plymouth district in 1930. The Marine Biological Association also obtained this species from the Plymouth district in 1957.

d'Orbigny in 1826 noted this species occurring in the Adriatic and Mediterranean seas, and Arctic and Scandinavian occurrences were noted by Goes in 1894. It was recorded from the Malay Archipelago in 1898 by Millett, from the North Pacific by Cushman in 1917, from the Island of Ceram by Rutten and Hotz in 1946, and from Belgian material by Cushman in 1949. Boltovskoy recorded this species from shore sands at Quequen, Buenos Aires in 1955, from the estuary of the Rio de la Plata in 1957, off Brazil and off Argentina in 1959, and from the continental platform between Santo Tome and the Rio de la Plata in 1961. In the same year Braga obtained this form from the Mozambique coast. In 1962 the species was noted from shore sands and the littoral zone of Southern Brazil by Closs and Barberena, from Upper Florida Bay and associated sounds by Lyntz, and from Oyster Harbour, Western Australia by McKenzie. Dupeuble in 1963 noted the species occurring at Roscoff, Finistere.

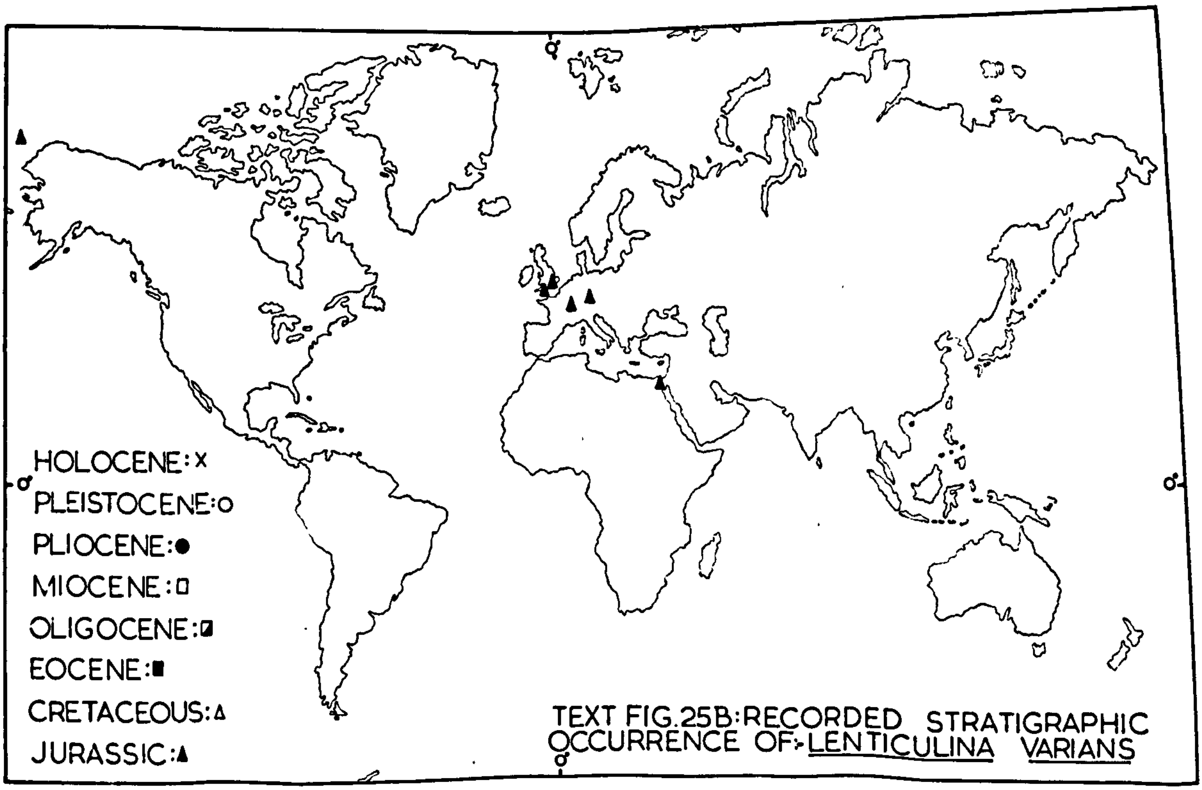
Stratigraphic Occurrence: This species has been recorded from the British Holocene at Cumbrae by Robertson in 1877, and at County Antrim by MacFadyen in 1937.

Robertson recorded Post Tertiary occurrences of this species at Kilwinning (1877), and Greenock (1885). Worth in 1902 recorded it from the Drift of County Cork, and Shone noted it from the Boulder Clay of Cheshire in 1874, and from the Upper Boulder Clay of West Cheshire and Liverpool in 1878. Howchin in 1893 recorded it from the Eocene and Miocene of Australia, and Feyling-Hanssen in 1964 recorded it from the Late Quaternary of the Oslo Fjord area.

Diagnosis: This species appears to prefer a shallow water environment in cool or warm latitudes, and ranges from the Paleogene to Recent.



TEXT FIG: 25A: RECORDED RECENT OCCURRENCE OF: MASSILINA SECANS



TEXT FIG. 25B: RECORDED STRATIGRAPHIC OCCURRENCE OF: LENTICULINA VARIANS

Genus: <u>Pateoris</u> Loeblich and Tappan 1953

<u>Pateoris hauerinoides</u> (Rhumbler) 1936
Pl.10, figs.4a,4b,4c,4d.

1858 *Miliolina seminulum* (Linne) var. *disciformis* (Macgillivray) WILLIAHSON. Rec.For.Gt.Brit.Ray Soc.London,p.86,pl.7,figs.188,189.

1916 *Miliolina subrotunda* (Montagu) HERON-ALLEN and EARLAND. Journ. Roy.Micro.Soc.p.35,pl.V,figs.6-8.

1953 *Pateoris hauerinoides* (Rhumbler) LOEBLICH and TAPPAN. Smith. Miscell.Coll.Vol.121,no.7,p.42, pl.6,figs.8-12,text-figs.1A,B.

1958 *Pateoris hauerinoides* (Rhumbler) DETLING. Contr.Cush.Found.Foram. Res.Vol.9,pt.2,p.26,pl.7,figs.3-5.

1961 *Pateoris hauerinoides* (Rhumbler) FEYLING-HANSSEN. Vort.Fridt. Nansen Geol.Symp.Spitzbergen. Vol.3,Bis.11,p.50,pl.1,fig.3.

1965 *Pateoris hauerinoides* (Rhumbler) REYLING-HANSSEN. Norsk Polarinstitutt Meddel.Nr.93,p.26,pl.1,fig.3.

Test free, large, sub-circular in outline, compressed, elongate oval in section, sides gently biconvex, one more so than the other. Chambers initially quinqueloculine with chambers half a coil in length, later planispiral with gradually shortening chambers, five visible on either side. Sutures distinct, slightly impressed. Aperture terminal, at the end of the ultimate chamber, a high arch with the lateral margins somewhat infolded. Wall calcareous, smooth, imperforate, porcellaneous, white.

Dimensions: Length 0.56 mm. Width 0.60 mm. Thickness 0.24 mm.

Occurrence: Dead CB.299, CB.311, CB.315, CB.316, CB.317, CB.319, CB.328, CB.330, CB.333, CB.360, CB.369, CB.385, CB.398, CB.404, CB.412, CB.642.

Morphological remarks: A number of workers have included this species in with Miliolinella subrotunda with which it is similar in appearance. They can be differentiated on chamber number however. This species is also similar to Miliolinella chuckchiensis, but can be distinguished by lack of the triangular apertural plate and non enveloping nature of the ultimate chamber. Massilina crescentensis Hamlin 1960 can be differentiated from this species on apertural characteristics, P.hauerinoides having the high arched aperture with no tooth, and M.crescentensis having a wider arched aperture with a tooth development.

Distribution: Heron-Allen and Earland in 1916 recorded this species occurring in the shore sands and shallow water zone of the South coast of Cornwall.

It has been noted from the Arctic (Loeblich and Tappan 1953; Green 1960), and from Sunset Bay, Oregon where it was one of the more conspicuous and abundant forms in the tide pools (Detling 1958).

Stratigraphic Occurrence: The only stratigraphic records are those made by Feyling-Hanssen who noted this form in the Holocene of South West Barents Island in 1961, and in the Holocene of Spitzbergen in 1965.

Diagnosis: This species is very closely allied to M.subrotunda (Montagu) both taxonomically and ecologically, being limited to cold or cool temperate latitudes in shallow waters. Stratigraphically it is restricted to the Holocene and Recent.

Genus: Pyrgo Defranc 1824

Pyrgo williamsoni (Silvestri) 1923

Pl.9, figs.4a,4b,4c.

1858	Pars Biloculina ringens	(Lamarck)	WILLIAMSON. Rec.For.Gt.Brit. Ray Soc.London,p.79,pl.6, figs.169,178,pl.7,fig.171.
1884	Biloculina elongata	d'Orbigny	BRADY. Chall.Rep.Zool.Vol.9, p.144,pl.2,fig.9.
1894	Pars Biloculina elongata	d'Orbigny	GOES.Kongl.Vet.Akad.Handl. Bd.25,No.9,p.119,pl.24, figs.906,912.
1948	Pyrgo elongata	(d'Orbigny)	CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.23,p.39, pl.4,figs.7,8.
1953	Pyrgo williamsoni	(Silvestri)	LOEBLICH and TAPPAN. Smith. Miscell.Coll.Pub.4105,Vol.121, No.7,p.49,pl.6,figs.1-4.
1964	Pyrgo williamsoni	(Silvestri)	FEYLING-HANSSEN. Nordes Geol. Undersokelse,Nr.225,p.264, 265,pl.7,figs.5,6.pl.8,figs.3-5.

Test free, biloculine, elongate ovate in outline, sub ovate in section. Chambers distinct, two visible, inflated, the last chamber surrounding the penultimate on all margins. Sutures distinct, impressed. Aperture terminal, sub circular to ovate, with a simple spathulate or bifid tooth present, projecting from the inner and lower margin of the aperture. Wall calcareous, imperforate, porcellaneous, smooth, white.

Dimensions: Length 0.41 mm. Width 0.20 mm. Thickness 0.27 mm.

Occurrence: Dead CB.316, CB.317, CB.322.

Morphological remarks: Loeblich and Tappan in 1953 noted that this species is highly variable and suggested that this is a factor of age, young forms possessing a test that is narrow and elongate in outline, adult forms exhibiting a rounding of the test outline. All stages of "growth" forms from young to adult stages can be found. It is possible that a number of species erected simply on test shape are invalid and should be incorporated into P.williamsoni.

Distribution: Heron-Allen and Earland have recorded this species from the following localities in the British area; Selsey Bill, Sussex (1911), Clare Island and North Sea (1913), West of Scotland and from the shore sands and shallow water zone of the South coast of Cornwall (1916).

Arctic occurrences for this species have been noted by Goes 1894, Cushman 1948, and Loeblich and Tappan 1953.

Stratigraphic Occurrence: Adams and Haynes reported this species occurring in the Holocene of Borth, Cardiganshire in 1965.

Feyling-Hanssen in 1964 noted it occurring in several samples from the Late Pleistocene and Holocene of the Oslo Fjord area.

Diagnosis: This species appears to be a characteristic cold to cool temperate shallow water form, ranging from the Upper Pleistocene to Recent.

Genus: *Triloculina* d'Orbigny 1826

Triloculina angulate Karrer 1867

Pl.9, figs.1a,1b,1c.

1867 *Triloculina angulata* KARRER K.Akad.Wiss.Math.Naturw.Cl.Sitzber. Wien.Osterreich.Bd.55,Abth.1,p.359, pl.2,figs.6a-6c.

Test free, circuiar in outline, sub-triangular to ovate in transverse section, periphery rounded to sub-acute. Chambers distinct, triloculine, three visible on either side, rounded to triangular in cross section, rapidly increasing in size as added, half a coil in length, longer than wide, slightly irregular in outline. Sutures distinct, impressed. Apertural face semi-circular. Aperture terminal, at the end of the ultimate chamber, large, elongate semi-circular, with a slight lip developed. Tooth present, long, bifid at the tip, raised above the general lefel of the aperture. Test calcareous, imperforate, porcellaneous.

Dimensions: Length 0.62 mm. Width 0.60 mm. Thickness 0.43 mm.

Occurrence: Living CB.319, CB.325, CB.331, CB.353, CB.395,

Dead, CB.309, CB.312, CB.315, CB.316, CB.318, CB.319, CB.320, CB.322, CB.323, CB.328, CB.329, CB.330, CB.331, CB.332, CB.334, CB.337, CB.346, CB.358, CB.363, CB.366, CB.367, CB.368, CB.369, CB.371, CB.373, CB.374, CB.385, CB.387, CB.390, CB.391, CB.394, CB.395, CB.404, CB.405, CB.408, CB.624, CB.631.

Dead, variation sample CB.696.

Morphological remarks: This species is very similar to T.angularis d'Orbigny, but can be distinguished on the more acute periphery of each chamber.

Distribution: This is the first occurrence of this species in Recent sediments.

Stratigraphic Occurrence: Karrer recorded the type species from the Neogene of Rumania.

Diagnosis: This form has possibly been confused with T.angularis by a number of workers, thus accounting for the rarity of records for this species. It appears to be a shallow water form tolerant of a sandy or sandy-muddy substrate, ranging stratigraphically from the Neogene to Recent.

Triloculina _dubia_ d'Orbigny 1826

Pl.6, figs.4a,4b,4c,4d.

1826	_Triloculina_ _dubia_		d'ORBIGNY. Ann.Sci.Nat.Paris.Vol. VII,p.300,no.24.
1905	_Triloculina_ _dubia_	d'Orbigny	FORNASINI. Accad.Sci:Inst.Bologna. Mem.Italia,ser.6,tome 2,p.62,pl.2, fig.3.
1958	_Triloculina_ _dubia_	d'Orbigny	LE CALVEZ and LE CALVEZ. Ann.L'Inst. Ocean.Paris N.S. Tome XXXV,Fasc.3. p.197,pl.14,figs.164,165,166.

Test free, quite large, elongate-ovate in outline, sub-triangular in transverse section, with the ultimate chamber drawn out beyond the limit of the main test body, periphery sub-acute. Chambers distinct, triloculine, three visible on either side, rounded to angular in section, half a coil in length, long and moderately narrow, rapidly increasing in size as added, the antipenultimate chamber with a sigmoid appearance. Sutures distinct, very slightly impressed. Apertural face rounded to sagitatte. Aperture simple, circular, terminal, an opening at the end of the extension of the ultimate chamber. Small simple tooth present, raised well above the general surface of the aperture. Wall smooth, with the exception of very faint striations on the penultimate and antipenultimate chambers, calcareous, imperforate, porcellaneous.

Dimensions: Length 0.90 mm. Width 0.40 mm. Thickness 0.30 mm.

Occurrence: Dead CB.309, CB.320, CB.322, CB.328, CB.334, CB.337, CB.339, CB.352, CB.354, CB.358, CB.359, CB.366, CB.373, CB.374, CB.379, CB.386, CB.391, CB.392, CB.398, CB.404, CB.407, CB.412, CB.612.

Morphological remarks: This species could be referred to as a young miliolid, but the large number of specimens obtained that are morphologically identical with the type do place this form on a specific level.

Distribution: This species has not been recorded from the British area to the present day.

d'Orbigny in 1826 recorded the type species from the Mediterranean, and Le Calvez and Le Calvez in 1958 recorded it as being very rare at one station at 100 metres in Villefranche Bay.

Stratigraphic Occurrence: There are no recorded stratigraphic occurrences available for this form.

Diagnosis: This species appears to be typically found in warm to temperate latitudes, at a shallow depth. It is restricted stratigraphically to the Recent.

Triloculina trigonula (Lamarck) 1804

Pl.9, figs.2a,2b,2c,2d.

1804	Miliolites trigonula	LAMARCK	Mus.Nat.Hist.Ann.Paris France (An.XIII), tome 5, p.351.
1807	Miliolites trigonula	Lamarck	LAMARCK. Mus.Nat.Hist.Ann.Paris France.Vol.9,pl.17,figs.4a-c.
1858	Miliolina trigonula	(Lamarck)	WILLIAMSON. Rec.For.Gt.Brit.Ray Soc.London,p.84,pl.7,figs.180-182.
1882	Triloculina trigonula	d'Orbigny	TERQUEM. Mem.Geol.Soc.France,Ser.3, Vol.2,Mem.3,p.165,pl.XVII,fig.3a,b.
1884	Miliolina trigonula	(Lamarck)	BRADY. Chall.Rep.Zool.Vol.9,p.164, pl.111,figs.15-16.
1889	Miliolina trigonula	(Lamarck)	SHERBORN and CHAPMAN. Journ.Roy. Micro.Soc.p.2,pl.XI, fig.1.
1894	Miliolina trigonula	(Lamarck)	GOES. Kongl.Svensk.Veten.Akad. Handl.N.F.Bd.25,No.9,p.115,Tab.22, fig.870.
1897	Miliolina trigonula	(Lamarck)	FLINT. U.S.Nat.Mus.Ann.Rep.Wash. p.298,pl.44,fig.3.
1907	Miliolina trigonula	(Lamarck)	CHAPMAN. Journ.Linn.Soc.Zool. London,Vol.30,pl.2,fig.30.
1912	Miliolina trigonula	(Lamarck)	BAGG. U.S.Geol.Survey Bull.513, p.32,pl.IV,fig.7,pl.VI,fig.4.
1917	Triloculina trigonula	(Lamarck)	CUSHMAN. U.S.Nat.Mus.Bull.No.71, pt.6,p.65,pl.25,fig.3,text-fig.31.
1930	Triloculina trigonula	(Lamarck)	CUSHMAN and THOMAS. Journ.Pal. Vol.4,No.1,p.36,pl.3,figs.3a,b.
1930	Triloculina trigonula	(Lamarck)	CUSHMAN and VALENTINE. Contr. Dept.Geol.Univ.Stanford. Vol.1, no.1,p.16,pl.4,fig.7.
1932	Triloculina trigonula	(Lamarck)	CUSHMAN. U.S.Nat.Mus.Bull.no.161, pt.1,p.56,pl.13,fig.1.

1933 Triloculina trigonula (Lamarck)	GALLOWAY. A manual of foraminifera, p.123, pl.10, figs.10,11.
1939 Triloculina trigonula (Lamarck)	HOWE. Louisiana Geol.Survey, Bull.no. 14, p.39, pl.3, figs.1,2.
1945 Triloculina trigonula (Lamarck)	CUSHMAN and STAINFORTH. Contr.Cush. Found.Foram.Res.Sp.Pub.no.14, p.21, pl.2, fig.18,
1945 Triloculina trigonula (Lamarck)	CUSHMAN and TODD. Contr.Cush.Found. Foram.Res.Vol.21, pt.4, p.84, pl.13, fig.16.
1946 Triloculina trigonula (Lamarck)	BELLEN, van. Med.Geol.Stichting, Ser-C-V no.4, p.33, pl.2, figs.20,21.
1946 Triloculina trigonula (Lamarck)	CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res.Sp.Pub.no.19, p.5,6, pl.1, fig.17.
1947 Triloculina trigonula (Lamarck)	CUSHMAN and TODD. Contr.Cush.Found. Foram.Res.Sp.Pub.no.21, p17, pl.1, fig. 24.
1949 Triloculina trigonula (Lamarck)	CUSHMAN. Inst.Roy des Sci.Nat.de Belgique.Mem.111, p.14, pl.II, fig.10.
1949 Triloculina trigonula (Lamarck)	SAID. Contr.Cush.Found.Foram.Res. Sp.Pub.no.26, p.19, pl.2, fig.12.
1953 Triloculina trigonula (Lamarck)	BECKMANN. Eclog.Geol.Helvet.Vol.46, No.1, p.346, Taf.XVIII, fig.4.
1953 Triloculina trigonula (Lamarck)	PARKER, PHLEGER, and PEIRSON. Contr.Cush.Found.Foram.Res.Sp.Pub. no.2, p.14, pl.2, fig.29.
1954 Triloculina trigonula (Lamarck)	ANDEL van, and POSTMA. Verhandl. Konin.NederkAkad.Weten.Afd.Nat. Eerste Reeks.Deel XX, No.5, Vol.1, p.209, pl.1, fig.8.
1954 Triloculina trigonula (Lamarck)	BANDY. U.S.Geol.Survey Prof.Paper 245F, p.139, pl.28, fig.5.
1954 Triloculina trigonula (Lamarck)	BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III, no.3, p.129, pl.2, fig. 7.

1955	Triloculina trigonula (Lamarck)	BHATIA. Journ.Pal.Vol.29,no.4, p.675,pl.67,fig.15.
1955	Triloculina trigonula (Lamarck)	KAASSCHIETER, in Drooger, Kaasschieter, and Key. Verhandl.Konin.Ned.Akad. Weten.Afd.Nat. Deel XXI,No.2,p.60, pl.3,figs.1a-c.
1955	Triloculina trigonula (Lamarck)	KRUIT. Kon.Ned.Geol.Mijnb.Gen.Verh. Deel 15,p.468,pl.2,figs.1a,b.
1955	Triloculina trigonula (Lamarck)	RONAI.Contr.Cush.Found.Foram.Res. Vol.6,pt.4,p.143,144,pl.20,fig.10.
1956	Triloculina trigonula (Lamarck)	HAQUE. Geol.Survey Pakistan.Vol.1, p.57,58,pl.26,fig.10.
1957	Triloculina trigonula (Lamarck)	BHATIA and MANDWAL. Journ.Pal.Soc. India, Vol.2,p.166,text-fig.A,6a,b.
1957	Triloculina trigonula (Lamarck)	FORAMINIFERI PADANI. Agip Mineraria, pl.VIII,fig.3.
1957	Triloculina trigonula (Lamarck)	TODD. U.S.Geol.Survey Prof.Paper 280-H,pl.86,fig.16.
1957	Triloculina trigonula (Lamarck)	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.27,pl.3, figs.18,19.
1958	Triloculina trigonula (Lamarck)	LE CALVEZ and LE CALVEZ. Ann.L'Inst. Ocean.Paris.N.S.Tome XXXV,Fasc.3, p.190,pl.6,figs.49,50.
1959	Triloculina trigonula (Lamarck)	BOLTOVSKOY. Sec.de Marina Pub.H1005, Buenos Aires,p.52,pl.4,fig.10.
1959	Triloculina cf.trigonula (Lamarck)	MURATA. Bull.Kyushu Inst.Tech. no.5,p.38,pl.1,fig.12.
1960	Triloculina trigonula (Lamarck)	ASANO.Sci.Rep.Tohoku Univ.Ser.2, (Geol),Spec.p.75,pl.8,fig.5.
1960	Triloculina trigonula (Lamarck)	BARKER. Soc.Econ.Pal. and Min.Sp.Pub. no.9,p.6,pl.3,figs.15,16.
1961	Triloculina trigonula (Lamarck)	BRAGA. Pub.Inst.de Zool.Fac.Cienc. Zool.do Porto 77,p.75,76,pl.VII, fig.1.

1961	<u>Triloculina</u> <u>trigonula</u> (Lamarck)	KAASSCHIETER. Inst.Roy.des Sci.Nat. de Belgique, Mem.147,p.164,pl.V, figs.8-10.
1962	<u>Triloculina</u> <u>trigonula</u> (Lamarck)	CITA and CHIERICI. Est.Arch.Ocean. Limnol.Vol.XII,fasc.3,p.342,pl.IV, fig.7.
1962	<u>Triloculina</u> <u>trigonula</u> (Lamarck)	CLOSS and BARBERENA. Inst.Rio Grande do Sul.Inst.Cienc.Nat.No.16, p.27,Est.5,figs.7a,b,c.
1962	<u>Triloculina</u> <u>trigonula</u> (Lamarck)	McKENZIE. Journ.Roy.Soc.Western Aust.Vol.45,pt.4,p.121,pl.II,fig.12.
1964	<u>Triloculina</u> <u>trigonula</u> (Lamarck)	FEYLING-HANSSEN. Nordes Geol. Undersokelse.Nr.225,p.258,259,pl.6, figs.11-13.
1964	<u>Triloculina</u> <u>trigonula</u> (Lamarck)	LEROY. U.S.Geol.Survey Prof.Paper 254-F,p.F20,pl.16,figs.3031.

Test free, circular in outline, circular to sub-triangular in section, with sub-acute angles and convex sides. Chambers distinct, triloculine, three visible on either side, half a coil in length, rounded in cross section, rapidly increasing in size as added, later chambers inflated. Sutures distinct, impressed. Apertural face semi-circular. Aperture terminal, circular, with a slight lip and a ppominent bifid tooth present. Wall calcareous, imperforate, porcellaneous.

Dimensions: Length 0.50 mm. Width 0.40 mm. Thickness 0.30 mm.

Occurrence: Living CB.334, CB.337, CB.409,

Dead, CB.309, CB.311, CB.312, CB.316, CB.322, CB.327, CB.328, CB.331, CB.334, CB.337, CB.338, CB.340, CB.352, CB.354, CB.356, CB.358, CB.364, CB.366, CB.367, CB.368, CB.373, CB.374, CB.380, CB.387, CB.389, CB.391, CB.392, CB.393, CB.396, CB.397,

CB.399, CB.403, CB.404, CB.407, CB.624, CB.636.

Morphological remarks: Cushman 1949 stated that some of the early stages are difficult to separate from the young of Q. seminulum. This form is subject to great variation, especially in the angularity of the test (Bandy 1954), relative length (Heron-Allen and Earland 1932), and peripheral characteristics (Kruit 1955).

Distribution: (Text-fig.26A). In 1868 Waller reported this species occurring in the Shetland seas, in 1870 Brady noted it at Breydon Water, and in 1875 Robertson obtained it from the Firth of Clyde. It was recorded as frequent in the River Dee by Sidall in 1876, and in the same year Robertson and Brady noted it off the coast of Durham and North Yorkshire. Brady in 1884 stated that this species was common on British coasts, and that it was a widely distributed inshore species, more abundant in the temperate zones that in the tropics, but never reaching the polar seas. Pearcey in 1891 noted this form in Liverpool Bay, and Robertson in 1892 recorded it as common in Portree Bay, Isle of Skye. It was included in the list of foraminifera occurring in the Irish Sea compiled by the British Association in 1896. This species was recorded from Dogs Bay by Wright in 1900, from Rathlin Island by the same author in 1902, from the Firth of Forth by Pearcey in 1903, from Plymouth by Worth in 1904, from Larne Lough, and the Gobbins, Ireland by Gough in 1906, and from Lambay, County Dublin by Wright in 1907. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909, and 1911, from Clare Island in 1913, from 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart and 20 fathoms off Ardnamuchan in 1914, from 20 fathoms off the Islo of Man in 1915, West of Scotland, and from the shore sands and shallow wpter coastal zone of the South coast of Cornwall in 1916, and from the Plymouth district in 1930. The Marine Biological Association also obtained this species in the Plymouth area in 1957. A Mer Celtique occurrence was noted by Le Calvez in 1958, West of France, and South West of the Cornish peninsula. In 1963 Bruce, Colman, and Jones recorded this form qs common from the Isle of Man and surrounding areas.

In 1860 this species was recorded from Rimini and Crete by Jones and Parker, and Goes in 1894 noted Arctic and Scandinavian occurrences. Flint in 1897 noted it from the Atlantic coast of the United States, and from the Gulf of Mexico, and in the following year it was noted from the Malay Archipolago by Millett. It was recorded from Funafuti Atoll by Chapman in 1899, from Cyrenacia by Gregory et.al. in 1911, and from the Antarctic by Pearcey in 1914. Cushman recorded this species from the North Pacific in 1917, from the Philippine Islands and adjacent seas in 1921, from depthh ranging from 12 to 318 fathoms ahd from the Tortugas region in 1922. It was recorded from Lord Howe Island in 1923 by Heron-Allen and Earland, from Porto Rico by Cushman in 1926, from the shallow water channel islands of Southern California by Cushman and Valentine in 1930, from the Trópical Pacific by Cushman in 1932, and in the same year from the ice free area of the Falkland Islands and adjacent seas by Heron-Allen and Earland. Natland in 1933 obtained this species from the Southern California area with a depth range of 125-900 feet, with a bottom temperature range of 8.50°C - 13.20°C. In the following year Earland recorded a few weak specimens from the Falkbands sector of the Antarctic, as did Chapman and Parr in 1937. In 1938 Marie noted this form in the estuary of the Ranco and in the following year it was recorded from the Indochina coast by Le Calvez and from 13.5 and 48 metres off the South Arabian coast, from 805 metres in the Zanzibar area, and from 366 metres in the Gulf of Adeh by Stubbings. In 1945 Norvang noted this form as being rare at Iceland and in 1946 Rutten and Hotz noted it occurring off the Island of Ceram. Cushman and Todd in 1947 obtained one specimen from the Washington coast, while the former author recorded it from Iceland in 1948, and from Belgium in 1949. In the same year Said obtained this form from the Red Sea and the Gulf of Suez, at a depth of 24-62 metres. Parr in 1950 noted its occurrence off Kerguelen,off Australia, and in the Antarctic. In 1952 Uchio noted this species off Hachijo Island, Tokyo where it constituted 0.1-1.0% of the total fauna. Parker, Phleger and Peirson in the following year noted the species occurring with low frequencies at several open gulf and beach samples in San Antonio Bay, Texas. In 1954 the species was recorded as scarce in the Gulf of Paria by Andel and Postma, as rare in the Gulf of Mexico,by Bandy, and from the Gulf of San Jorge, Argentina by Boltovskoy. Kruit in 1955 obtained it from the Rhone delta, and Ronai in the same year obtained it from brackish water in New York Bight. Bandy in 1956 recorded the species from Florida, and from the North Eastern Gulf of

Mexico. In 1957 the form was noted from the West coast of Central America by Bandy and Arnal, from the estuary of the Rio de la Plata by Boltovskoy, from the Egyptian Mediterranean coast by Said and Kamel, from the Mariana Islands by Todd, from the offshore zone of the Eastern Gulf of Paria by Todd and Bronnimann, and from Cook Strait, New Zealand by Vella. In 1958 Blanc-Vernet found this species well represented on the Marseille coast, and Drooger and Kaasschieter noted it occurring at low frequencies on the Orinoco-Trinidad-Paria Shelf. Also in 1958 this form was noted from the littoral zone and between 5 and 15 metres in Villefranche Bay by Le Calvez and Le Calvez, from the Santa Cruz Basin, California by Resig, and from the Recent portion of a core from the Western Mediterranean by Todd. Boltovskoy in 1959 recorded this species off Southern Brazil, and off Argentina, and in the same year McGlasson noted dead forms around Santa Catalina Island, California. It was recorded as a common form in the seas adjacent to Japan by Asano in 1960, who noted it occurring at depths of between 88-419 metres, with a temperature range of 0.7-21.1°C, and Waller in this year noted the species occurring off the South China coast. In 1961 the species was recorded from the Gulf of California by Bandy, from the continental platform between Santo Tome and the Rio de la Plata by Boltovskoy, from off the Mozambique coast by Braga, from Heald Bank, Gulf of Mexico by Shifflett, and from the Orange County Outfall area, Southern California by Watkins. In 1962 it was recorded from the Adriatic Sea by Cita and Chierici, from the shore sands and littoral zone of Southern Brazil by Closs and Barberena, from Upper Florida Bay and associated sounds by Lynts, and from Oyster Harbour, Western Australia by McKenzie. In 1963 Ayala-Castanares recorded this form from Laguna de Terminos, Campeche, Mexico, and in the same year Dupeuble obtained it from Roscoff, Finistere, and Segura noted it in the littoral zone at Matamoros, Gulf of Mexico. This species was recorded fno1964 from Manukau Harbour, New Zealand, by Hulme, and in the same year Walton obtained it from dep6hs of 5-30 feet in Tampa-Sarasota Bay, Florida. Also in 1964 Wilcoxin recorded the species off the Southern Atlantic coast of the United States. In 1965 Albani noted several specimens in Durban Bay, South Africa.

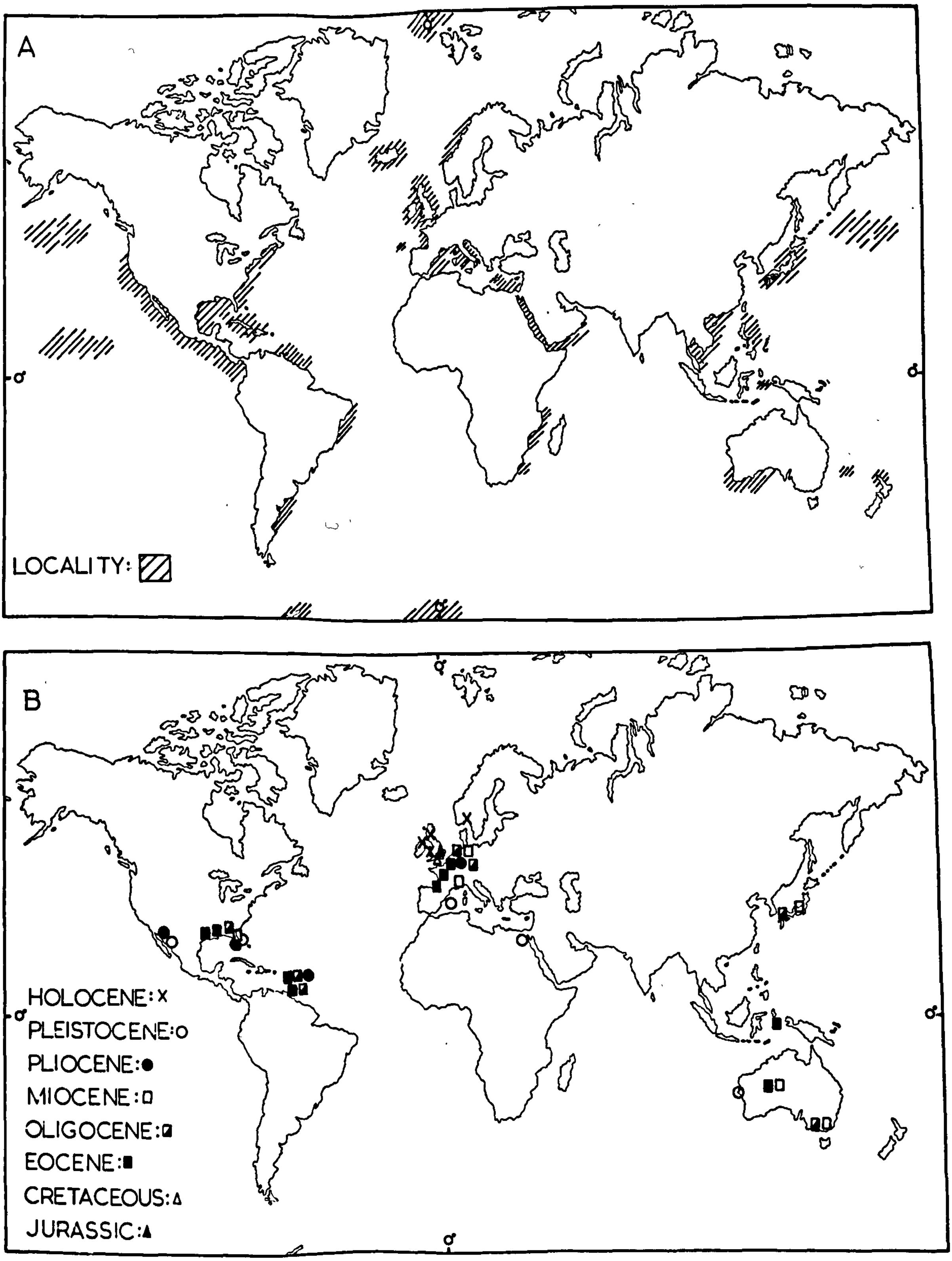
Stratigraphic Occurrence: (Text-fig.26B). Holocene occurrences in the British area have been recorded from Cumbrae (Robertson 1877), Altcar (Wright 1904), County Antrim (MacFadyen 1937), Swansea Docks (MacFadyen 1942), and Borth, Cardiganshire (Adams and Haynes 1965). Chapman in 1892 noted this form in the Chalk of Taplow, and Jones in 1900 also noted it in the Chalk of Southern England. It was recorded from the London Clay by Sherborn and Chapman in 1889, and by Sherborn and Burrows in 1891. Bhatia noted this species from the Late Paleogene sediments of the Isle of Wight ih 1955 and 1957, and Curry, Murray and Whittard recorded it in the Paleogene of the Western approaches to the English Channel in 1965. Robertson noted the species in the Post-Tertiary of Garnock in 1877, and Shone recorded it from the Boulder Clay of Cheshire in 1874, and the Upper Boulder Clay of West Cheshire in 1878.

Reade ih 1898 recorded this species from the Holocene of Bruges.

This species has been widely recorded from the Tertiary of various localities; of Palermo (Jones and Parker 1860), Victoria Australia (Chapman 1907), Southern Australia (Crespin 1954), Western Australia (Crespin 1955), Australia (Rao 1955), and West Emsland, Germany (Ellerman 1963). Murata in 1961 recorded the species from the Paleogene of North Kyushu, Japan. A Paleocene occurrence was noted by Haque in 1956 from the Nammal Gorge, Pakistan. Terquem in 1882 obtained this species from the Eocene of the Paris area, Cuppy in 1892 from the Eocene of Trinidad, and Howchin from the Eocene of Australia. Other Eocene occurrences have been noted from Biarritz (Middle Eocene) by Halkyard in 1917 and 1919, from the Texas Gulf area by Wienzierland Applin in 1929, from East Texas by Cushman and Thomas in 1930, from Louisiana Cook Mountain by Howe in 1939, from Mississippi by Cushman and Todd in 1945, from the Island of Ceram by Rutten and Hotz in 1946, from the Paris Basin (Middle Eocene) by Bellen in the same year, from the Eocene and Oligocene of Barbados by Beckmann in 1953, and from the Eocene of Belgium by Kaasschieter in 1961. Oligocene occurrences have been noted from Hungary (Majzon 1940), Alabama (Howe 1942), Trinidad (Cushman and Valentine 1945), Northern Netherlands, where the species ranges into Miocene (Bellen 1946), Mississippi (Cushman and Todd 1946), Nagasaki, Japan (Murata 1959), and an Oligo-Miocene occurrence was noted from Victoria, Australia by Reed in 1965. Drooger in 1953 noted the form occurring in the Lower Miocene of the NetherlandsAntilles, and Schroeder and Bishop in 1954 stated that it occurred from the Lower to Upper

Miocene, with occasional Pliocene occurrences in the Florida area. It was recorded from the Miocene of Australia by Howchin in 1893, from the Vienna Basin by Marks in 1951, and from Japan by Asano in 1949. Chapman in 1898 stated that in Barbados the form ranged from the Miocene to Pliocene. In 1946 Bellen noted the species in the Pliocene of the Northern Netherlands, and Cushman and Gray in the same year in the Pliocene of Timms Point, California. Another Pliocene occurrence was noted by LeRoy in 1964 from Southern Okinawa. A number of Plio-Pleistocene records have been made from Southern California (Bagg 1912), Florida (Cole 1931), Parma (Papani and Pelosio 1962) and from the Red Sea coast of Egypt (Souaya 1963). Howchin in 1893 stated that this species occurred in Post-Tertiary beds of Australia. In 1953 Collins recorded the form from the Pleistocene of Port Fairy, Western Australia, and Todd in 1958 retrieved it from the Pleistocene portion of a core from the Western Mediterranean. Drooger in 1953 recorded this species from the Quaternary of the Netherland Antilles, and Feyling-Hanssen in 1964 recorded it from the Late Quaternary of the Oslo Fjord area.

Diagnosis: This species appears to prefer a tropical to warm temperate environment, although a few weak forms have been retrieved from cold waters. This shallow water form ranges from the Cretaceous to Recent.



TEXT FIG. 26 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- TRILOCULINA TRIGONULA

Triloculina trihedra Loeblich and Tappan 1953

Pl.9, figs.3a,3b.3c,3d.

1953 *Triloculina trihedra* LOEBLICH and TAPPAN. Smith Inst.Misc.Coll. Vol.121,No.7,(pub.4105); p.45,pl.4,figs.10a,b.

1964 *Triloculina trihedra* Loeblich and Tappan. FEYLING-HANSSEN. Nordes.Geol.Undersokelse Nr.225,p.259,260,pl.6,fig.6.

Test free, small, ovate in outline, triangular in section, with sub-acute angles and somewhat convex sides. Chambers distinct, triloculine, three visible, oneone side and two on the other, sub-triangular in section, slightly enveloping, rapidly increasing in size as added. Sutures distinct, depressed. Apertural face triangular. Aperture terminal, circular, infilled, with a faint trace of a small bifid tooth present. Wall calcareous, imperforate, porcellaneous.

Dimensions: Length 0.27 mm. Width 0.24 mm. Thickness 0.20 mm.

Occurrence: Dead CB.298.

Morphological remarks: This species is similar to *T.trigonula* but can be distinguished by its sharper periphery and less inflation of the test walls. *T.carinata* is also similar, but the above form can be differentiated by the fact that it has less excavated sides, a more rounded periphery, and a distinct bifid tooth.

Distribution: This species has not been recorded from the British area to the present day. Loeblich and Tappan in 1953 described the type species from the Arctic. Green in 1960 also obtained this form from the Arctic Basin and recorded the following ecologic data:- shelf, 433-510 metres, +.03 to +.05°C, species constitutes 3% of the fauna; slope, 619-1142, +.03 to -.02°C, species constitutes 3% of the fauna; apron 1532-2000 metres, -.39 to -.42°C, species constitutes 4% of the fauna; and abyssal 2250-2760 metres, -.39 to -.40°C, species constitutes 2% of the fauna. Feyling-Hanssen in 1964 recorded this form from Spitzbergen and North East Greenland

Stratigraphic Occurrence: The only stratigraphic record of this species in the British area is from the Holocene of Borth, Cardiganshire (Adams and Haynes 1965).

Holocene occurrences have been noted by Feyling-Hanssen from South West Barents Island in 1961, and from Spitzbergen in 1965. Risdal in 1963 obtained this species from a core in the Inner Oslo Fjord, and Feyling-Hanssen in 1964 recorded it from the Late Quaternary of this region.

Diagnosis: This species appears to be restricted to cold or cool temperate shallow water to moderately shallow water environments. Stratigraphically it is restricted to the Quaternary and Recent.

Sub Family: Miliolinellinae Vella 1957

Genus: <u>Miliolinella</u> Wiesner 1931

<u>Miliolinella</u> <u>chuckchiensis</u> Loeblich and Tappan 1953

Pl.10, figs.3a,3b,3c.

1953 <u>Miliolinella</u> <u>chuckchiensis</u> LOEBLICH and TAPPAN. Smith Inst.Miscell. Coll.Vol.121,No.7,(pub.4105), p.47,pl.6,fig.7.

1961 <u>Miliolinella</u> <u>chukchiensis</u> Loeblich and Tappan. FEYLING-HANSSEN. Vort.Fridt.Nansen.Geol.Symp. Spitzbergen,Vol.3,Bis.11, p.49,pl.1,fig.4.

1965 <u>Miliolinella</u> <u>chukchiensis</u> Loeblich and Tappan. FEYLING-HANSSEN. Norsk.Polarinstitutt Meddel, Nr.93,p.25,pl.1,fig.4.

Test free, elongate ovate in outline, one and a half times as longaas broad, oval to triloculine in cross section, sides gently convex. Chambers distinct, slightly inflated, elongate, three visible externally, two on one side and three on the other, rapidly increasing in size as added in a triloculine series. Sutures distinct, impressed. Aperture terminal, at the end of the ultimate chamber, partially closed by a low broad flap leaving a narrow crescentric opening, surrounded by a slight lip. Wall calcareous, imperforate, porcellaneous, smooth, opaque.

Dimensions: Length 0.36 mm. Width 0.31 mm. Thickness 0.20 mm.

Occurrence: Living CB.335.

Dead, CB.315, CB.318, CB.319, CB.321, CB.323, CB.324, CB.328, CB.330, CB.331, CB.332, CB.333, CB.335, CB.336, CB.337, CB.340, CB.354, CB.366, CB.374, CB.376, CB.380, CB.385, CB.386, CB.390, CB.395, CB.398, CB.410, CB.411, CB.612, CB.618.

Morphological remarks: This species is very similar to *M.subrotunda* (Montagu), but the above species does not assume the sub-circular outline of *M.subrotunda* and is constantly triloculine. *M.chuckchiensis* is different in its elongate outline from another similar form *Triloculina circularis* Bornemann. Another distinctive feature of this species is the inflated and somewhat enveloping nature of the ultimate chamber.

Distribution: This species has not been recorded from the British area to the present day.

Loeblich and Tappan in 1953 recorded this species from Northern Alaska, Point Burrows, Southern Baffin Island, Northern Greenland, and the North West Territories.

Stratigraphic Occurrence: Adams and Haynes in 1965 recorded this species from Holocene deposits at Borth, Cardiganshire.

Feyling-Hanssen has also recorded this species from Holocene deposits, from South West Barents Island in 1961, and from Spitzbergen in 1965.

Diagnosis: This boreal form appears to prefer a shallow water environment, and is restricted stratigraphically to the Holocene and Recent.

Miliolinella oblonga (Montagu) 1803

Pl.10, figs.2a, 2b, 2c, 2d.

1884	Miliolina oblonga	Montagu	BRADY. Chall.Rep.Zool.Vol.9, p.160, pl.V, fig.4.
1894	Miliolina oblonga	Montagu	GOES. Kongl.Svensk.Veten.Akad. Handl.N.F.Bd.25, No.9, p.110, Tab.XX, fig.850-850f.
1897	Miliolina oblonga	Montagu	FLINT. U.S.Nat.Mus.Ann.Rep.Wash., p.297, pl.43, fig.3.
1898	Miliolina oblonga	Montagu	MILLETT. Journ.Roy.Micro.Soc. p.267, pl.V, fig.14.
1902	Miliolina oblonga	Montagu	CHAPMAN. Foraminifera. Longmans. p.91, pl.3, fig.D.
1906	Miliolina oblonga	Montagu	BULLEN. Geol.Mag.Vol.111, p.357, pl.18, fig.8.
1907	Miliolina oblonga	Montagu	CHAPMAN. Journ.Linn.Soc.Zool. London, Vol.30, pl.2, fig.26.
1912	Miliolina oblonga	Montagu	BAGG. U.S.Geol.Survey Bull.513, p.29, pl.IV, figs.5,6.
1954	Quinqueloculina oblonga	(Montagu)	KLEINPELL. Bernice P. Mus.Bull 211, p.35,36, pl.1, fig.4.
1955	Miliolinella oblonga	(Montagu)	BHATIA. Journ.Pal.Vol.29, no.4, p.671, pl.67, figs.17a,b.
1960	Miliolinella oblonga	(Montagu)	ASANO. Sci.Rep.Tohoku Univ.Ser. 2(Geol), Spec. p.72, pl.8, fig.3.
1960	Miliolinella (?) oblonga	(Montagu)	BARKER. Soc.Econ.Pal. and Min. Sp.Pub.no.9, p.10, pl.5, fig.4.
1961	Miliolinella oblonga	(Montagu)	KAASSCHIETER. Inst.Roy des Sci. Nat.de Belgique.Mem.147, p.152, pl.III, figs.7,8.

Test free, elongate, oblong, one and a half times as long as broad, oval in cross section. Chambers distinct, quinqueloculine in early stage, later triloculine, three chambers visible on one side, and four on the other. Chambers elongate, rapidly increasing in size as added, gently inflated. Sutures distinct, slightly impressed. Aperture terminal, at the end of the ultimate chamber, crescentric to sub-circular in shape with a very slight lip present. Wall calcareous, imperforate, porcellaneous, smooth, opaque.

Dimensions: Length 0.43 mm. Width 0.27 mm. Thickness 0.21 mm.

Occurrence: Dead, CB.314, CB.316, CB.317, CB.319, CB.326, CB.327, CB.328, CB.333, CB.339, CB.346, CB.360, CB.366, CB.367, CB.387, CB.391, CB.397, CB.406, CB.411, CB.412, CB.612.

Dead, variation sample CB.634, CB.690, CB.696, CB.700, CB.706.

Morphological remarks: This species exhibits considerable variation in size and relative length and width of tests.

Distribution: In 1891 this species was recorded as rare in the River Mersey by Burgess, and from the Menai Straits and Liverpool Bay by Pearcey. It was recorded as frequent in Portree Bay, Isle of Skye by Robertson in 1892. It was recorded from Dogs Bay by Wright in 1895, from Barry Dock by Chapman and Jones in 1896, and from the Irish Sea by the British Association in the same year. Wright recorded this species from Dogs Bay in 1900, and from Rathlin Island and the valley of the River Lune in 1902. In 1903 Pearcey recorded very rare living forms in the Firth of Forth and in the following year Worth recorded it as being numerous in the Plymouth district.

Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from Clare Island in 1913, from 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart, and from 20 fathoms off Ardnamuchan in 1914, from 20 fathoms off the Isle of Man in 1915, from West of Scotland, and from the shallow water zone and shore sands of the South coast of Cornwalliin 1916, and from the Plymouth district in 1930

The Marine Biological Association in 1957 obtained this form from eight stations in the Plymouth district and in 1963 Bruce, Colman and Jones recorded it as very rare from the Isle of Man and surrounding areas.

Brady in 1884 stated that this species occurs in every part of the world, almost irrespective of latitude or depth, and that fine specimens are found in shallow water of temperate seas. Arctic and Scandinavian occurrences were noted by Goes in 1894, and in 1897 Flint recorded this form from Trinidad and off the Brazil coast. Millet in 1898 noted this species in the Malay Archipelago, and in the following year Chapman recorded it as common around Funafuti Atoll. It was recorded from two stations in the Antarctic by Pearcey in 1914, from Lord Howe Island by Heron-Allen and Earland in 1923, from the ice free area of the Falkland islands and adjacent seas by the same authors in 1932, and from the Weddell Sea by Earland in 1936. It was recorded from the Japanese seas at depths of 126-516 metres, at a temperature of 0.9-19.3°C, by Asano in 1960. McKenzie in 1962 recorded this form as frequent in Oyster Harbour, Western Australia, and in 1965 Phleger noted this species living in Guerrero Negro Lagoon, Baja, California.

Stratigraphic Occurrence: This species has been recorded from the Holocene of Cleongart (Munthe 1897), and from Altcar (Wright 1904).

In 1900 Hénes recorded this form from the Chalk of Southern England, and Bhatia in 1955 and 1957 obtained it from Late Paleogene sediments. In the Isle of Wight. A Pliocene occurrence was noted by Burrows in 1895 from the Eastern Counties, ahd a Post-Tertiary occurrence was noted at Greenock by Robertson in 1885. Reade and Wright in 1906 obtained one specimen from the Pleistocene of the Isle of Man. Wright in 1902 recorded this species from the Drift of County Cork, and in 1903 from the Boulder Clay of Carrickfergus.

No Holocene occurrences have been recorded to the present day from other regions of the world.

Eocene occurrences have been recorded from Australia, where the species rangès through the Miocene, Pliocene, and Post Tertiary beds, by Howchin 1893, from the Middle Eocene of Biarritz by Halkyard in 1917 and 1919, from the Upper Eocene of Australia by Crespin in 1956, and from the Eocene of Belgium by Kaasschieter in 1961. A Neogene occurrence was noted from Lau, Fiji by Kleinpell in 1954. MacFadyen in 1930 recorded the species from the Miocene of Egypt and Sinai. Pliocene and Pleistocene occurrences were noted from Southern California by Bagg in 1912, and Bullen in 1906 obtained it from the Pleistocene of East Crete.

Diagnosis: This dosmopolitan species appears to prefer warm to temperate seas, although it has been found in cold areas. Temperature and depth do not appear to have much control over this species. Stratigraphically this form ranges from the Cretaceous to Recent.

Miliolinella subrotunda (Montagu) 1803

Pl.10, figs.1a,1b,1c,1d.

1803 Vermiculum subrotundum		MONTAGU. Test.Brit.p.521,type fig.op.cit.Walker and Boys 1784, pl.1,fig.4.
1894 Miliolina subrotunda	Walker and Boys.	GOES. Kongl.Svensk.Veten. Akad.Handl.N.F.Bd.25,No.9,p.109, Tab.19,fig.846-847a-h.
1897 Miliolina subrotunda	(Montagu)	FLINT. U.S.Nat.Mus.Ann.Rep. Wash.p.299,pl.44,fig.6.
1905 Quinqueloculina subrotunda	(Montagu)	FORNASINI. Mem.Real.Accad.Sci. Inst.Bologna Ser.6,Vol.2,p.68, Tav.IV,fig.6.
1906 Miliolina subrotunda	(Montagu)	BULLEN. Geol.Mag.Vol.111,p.357, pl.18,fig.10.
1916 Miliolina subrotunda	(Montagu)	HERON-ALLEN and EARLAND. Journ. Roy.Micro.Soc.p.35,pl.V,figs. 6-8.
1948 Quinqueloculina subrotunda	(Montagu)	CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.23,p.35, pl.3,figs.20,21,pl.4,fig.1.
1949 Quinqueloculina subrotunda	(Montagu)	CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique.Mem.111,p.9,pl.1,fig.8.
1951 Quinqueloculina subrotunda	(Montagu)	VOORTHUYSEN,van. Med.Geol. Stichting.n.s.no.5,p.24,25, pl.1,fig.7.
1952 Quinqueloculina subrotunda	(Montagu)	PARKER. Bull.Mus.Comp.Zool. Vol.106,no.9,p.406,pl.4,figs. 4a,b.
1952 Quinqueloculina subrotunda	(Montagu)	PARKER. Bull.Mus.Comp.Zool. Vol.106,no.10,p.456,pl.2, figs.9,10.
1954 Triloculina subrotunda	(Montagu)	BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tome III,no.3, p.127,pl.1,figs.8,9,pl.2,figs.11, 12.

1954 <u>Triloculina</u> <u>subrotunda</u> (Montagu) BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tome III,no.4, p.262,pl.21,figs.5,7,15.

1959 <u>'Triloculina'</u> <u>subrotunda</u> (Montagu) BOLTOVSKOY. Sec.de Marina Pub. H1005,Buenos Aires,p.52,pl.4, figs.15,16.

1960 <u>Miliolinella</u> <u>subrotunda</u> (Montagu) ASANO.Sci.Rep.Tohoku Univ.Ser. 2(Geol),Spec.p.72,pl.8,figs.1,2.

1960 <u>Miliolinella</u> <u>subrotunda</u> (Montagu) BARKER. Soc.Econ.Pal. and Min. Sp.Pub.no.9,p.8,pl.4,fig.3, p.10,pl.5,figs.13,14.

1961 <u>Miliolinella</u> <u>subrotunda</u> (Montagu) <u>forma</u> <u>typica</u> BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Zool. Tome VI,no.6,p.285,286,pl.IV, figs.28-30.

1961 <u>Quinqueloculina</u> <u>subrotunda</u> (Montagu) TODD and LOW. Contr.Cush.Found. Foram.Res.Vol.12,pt.1,p.15,pl.1, fig.8.

1963 <u>Miliolinella</u> <u>subrotunda</u> (Montagu) <u>forma</u> <u>typica</u> BOLTOVSKOY. Contr. Cush.Found.Foram.Res.Vol.14, pt.2,p.63,pl.7,fig.2.

1964 <u>Miliolinella</u> cf. <u>subrotunda</u> (Montagu) FEYLING-HANSSEN. Nordes Geol.Undersokelse Nr.225,p.261, 262,pl.7,fig.1.

1965 <u>Miliolinella</u> <u>subrotunda</u> (Montagu) ADAMS and FRAMPTON. Contr.Cush. Found.Foram.Res.Vol.16,pt.2, p.57,pl.5,fig.15.

Test free, large, sub-circular to circular in outline, compressed, oval in transverse section, sides very slightly convex. Chambers distinct, up to four being visible externally, more or less in one plane, moderately to markedly inflated, rapidly increasing in size as added. Sutures distinct, slightly impressed. Aperture terminal, at the end of the ultimate chamber, circular to semi-circular, set obliquely or in sequence with the curve of the ultimate chamber. Wall calcareous, imperforate, porcellaneous, smooth.

Dimensions: Length 0.45 mm. Width 0.40 mm. Thickness 0.20 mm.

Occurrence: Living CB.331.

Dead, CB.299, CB.307, CB.308, CB.309, CB.311, CB.312, CB.313, CB.314, CB.315, CB.316, CB.317, CB.318, CB.319, CB.320, CB.321, CB.322, CB.323, CB.325, CB.326, CB.327, CB.328, CB.330, CB.331, CB.332, CB.333, CB.334, CB.337, CB.339, CB.340, CB.344, CB.345, CB.346, CB.347, CB.348, CB.352, CB.354, CB.356, CB.358, CB.359, CB.360, CB.361, CB.363, CB.365, CB.366, CB.367, CB.368, CB.371, CB.373, CB.374, CB.379, CB.380, CB.381, CB.384, CB.385, CB.386, CB.387, CB.388, CB.390, CB.391, CB.395, CB.398, CB.400, CB.403, CB.405, CB.404, CB.407, CB.410, CB.411, CB.412, CB.413, CB.414, CB.627, CB.629, CB.630, CB.631, CB.634, CB.637, CB.638.

Dead, variation sample CB.690, CB.694, CB.696, CB.700, CB.705, CB.714, CB.716.

Morphological remarks: Forms similar to this species have been noted and differences discussed earlier. Great variation is exhibited by this species, especially in size, which is a factor of age according to Cushman in 1949, and chamber arrangement which does tend from the normal to the hauerine type, and this species does probably grade into P.hauerinoides. Heron-Allen and Earland in 1909 included into this species formsw which exhibited biloculine, triloculine, and hauerine types of chamber arranbement. Variation is also exhibited in general test appearance, from the "robust" forms of temperate latitudes to forms which are fine and delicate in colder waters.

Distribution: (Test-fig.27A). This species has been recorded from the Shetland Seas (Waller 1868), South East of Eddystone (Robertson 187), from Mmntrose Basin, Budle Bay, River Aln, River Wansbeck, River Blyth, River Tees, Firth of Forth, Whittlesea Mere, and Yarmouth (Brady 1870). Robertson in 1878 recorded this form from the Firth of Clyde, and with Brady in 1876 from off the coast of Durham and North Yorkshire. In the same year Sidall noted it as being frequent in the River Dee. Wright in 1890 recorded it as being very rare at 1,000 fathoms off the South West coast of Ireland, and in the following year it was recorded from the River Mersey by Burgess, and from the Menai Straits, Port Dinorwic, Caernarvon Bay, and off Penrhos by Pearcey. Robertson in 1892 noted it as rare in Portree Bay, Isle of Skye. It was also recorded from Dogs Bay (Wright 1895), from Barry Dock (Chapman and Jones 1896), from the Irish Sea (British Association 1896), Dogs Bay (Wright 1900), Rathlin Island, valley of the River Lune (Wright 1902), Plymouth (Worth 1904), and from Lambay, County Dublin (Wright 1907). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex, in 1909 and 1911, from Clare Island in 1913, from 20 fathoms in the Sound of Mull, 45 fathoms off Jura, and 20 fathoms off Ardnamuchan, in 1914, from 20 fathoms off the Isle of Man in 1915, West of Scotland, and from the shallow water zone and shore sands of the South coast of Cornwall in 1916, and from the Plymouth district in 1930. In 1957 the Marine Biological Association also noted this species from the Plymouth area, and in 1963 it was noted off the Isle of Man by Bruce, Colman, and Jones.

This species was recorded from the Gulf and River St. Lawrence by Dawson in 1870, from the Arctic by Brady in 1878, from Prince Edward Island, South Pacific by Brady in 1884, from the Arctic and Scandinavia in 1894 by Goes, from the Yucatan Straits by Flint in 1897, and from the Malay Archipelago in 1898 by Millett. Chapman recorded this species from Funafuti Atoll in 1899 and 1900 and from Cocos Keeling Atoll in 1902. Cushman in 1917 noted this form occurring in the North Pacific, and Heron-Allen and Earland in 1923 noted it from Lord Howe Island in the South Pacific. Wiesner in 1931 obtained this species from two stations in the Antarctic at depths of 200-2320 metres, and Heron-Allen and Earland in the following year noted it as being frequent in the ice free area of the Falkland Islands. Earland in 1934 obtained single specimens from this area, and in 1937 Chapman and Parr also noted it from the Antarctic. It was recorded as rare from Iceland (Norvang 1945), from the Arctic and North East Greenland (Cushman 1948), from Belgium (Cushman 1949), and from the Antarctic, Kerguelen and Macquarie Islands, and Tasmania (Parr 1950). In 1951 Voorthuysen noted this form occurring in the Netherlands Wadden Sea, and in the following year it was recorded from Portsmouth (N.H.) by Parker, from Long-Island Sound-Buzzards Bay area, where it occurred with a temperature range of 1-21°C, 3-15°C, and a salinity range of

$28-30^{o}/_{oo}$, by Parker, and again from Portsmouth (N.H.), by Phleger where it appeared to be restricted to the nearshore areas, constituting usually less than 1% of the fauna. Boltovskoy has recorded this species from the Gulf of San Jorge, Argentina (1954), San Blas Day, Argentina (1954), from shore sands at Quequen, Buenos Aires (1955), from the Argentinian shelf (1956), from the estuary of the Rio de la Plata (1957), from the Argentinian coastal zone 1959), and off Southern Brazil (1959). Drooger and Kaasschieter in 1958 noted this form occurring at a variable depth on the Orinoco-Trinidad-Paria Shelf. In 1960 Asano obtained this form from depths between 93-325 metres, in the adjacent seas of Japan, with a temperature range of 2.4-21.1°C. In 1961 Boltovskoy noted this form occurring on the continental platform between Santo Tome and the Rio de la Plata, and Todd and Low in the same year recorded it from Marthas Vineyard Sound, Massachusetts, and stated that it appeared to be a cosmopolital species found in shallow waters. Haake in 1962 obtained this speciesfrom the North Sea, and in 1963 it was recorded from Puerto Deseado, Argentina by Boltovskoy, and from Hudson Bay, Canada by Leslie. Adams and Frampton recorded this species from Isafjordur, Iceland in 1965.

Stratigraphic Occurrence: (Text-fig.27B). Recorded Holocene occurrences of this species in the British area have been made from Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Altcar (Wright 1904), County Antrim and Skye (MacFadyen 1937), the English Fens (MacFadyen 1938), Swansea Docks (MadFadyen 1942), Borth, Cardiganshire (Adams and Haynes 1865), Crosskey and Robertson recorded this species from the

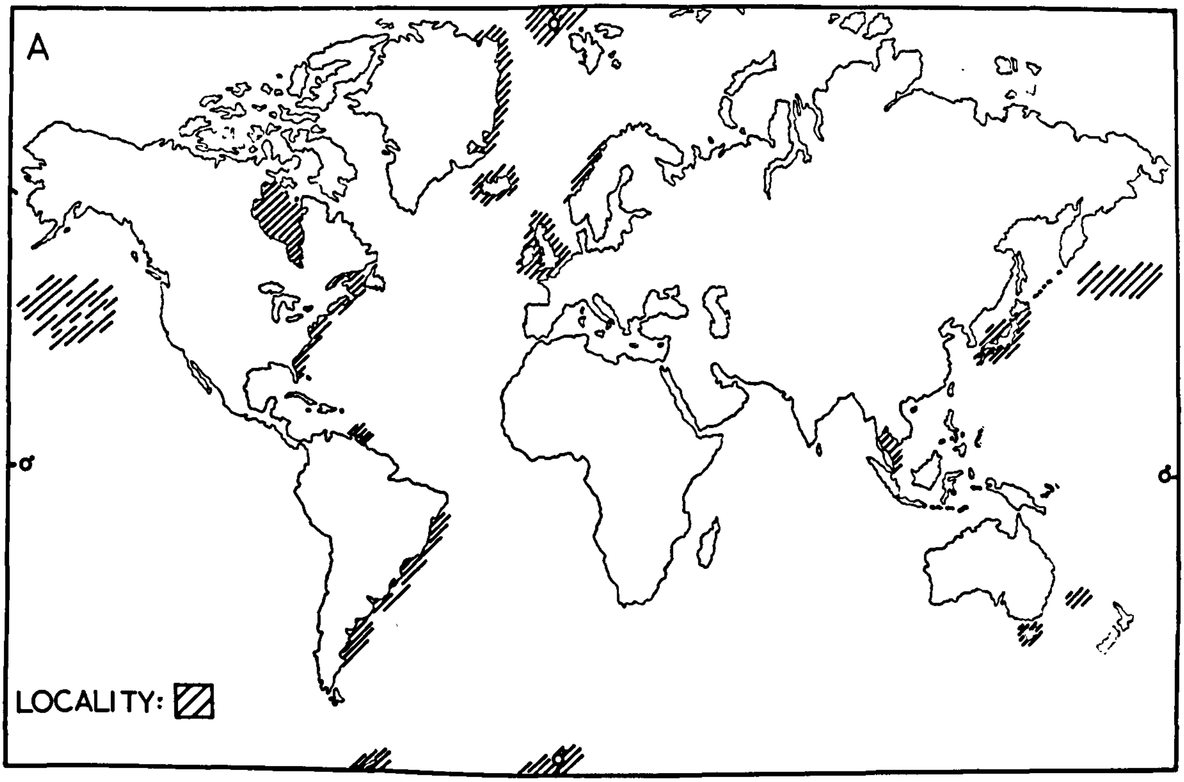
Post Tertiary beds of Dalmuir (1867), Isle of Cumbrae, Loch Gilp (1868), Loch Fyne, Duntroon, Paisley, (1869), Greenock (1871), Bute, Campbeltown (1873), North West of Glasgow, Stobcross, Paisley and Ayrshire (1874). Robertson also noted this species occurring in the Post-Tertiary of Garnock, Kilwinning, Paisley (1877), and of Greenock (1885). Reade and Wright in 1906 noted this form in the Pleistocene of the Isle of Man. Boulder Clay occurrences have been recorded from Caithness by Brady in 1867, from the Vale of Clwyd by Reade in 1897, from Great Crosby by Wright in 1898, from Cheshire by Wright in 1899, from Carrickfergus by Wright in 1903, from County Down by Wright in 1904, and from Lancashire by Wright in 1905. Shone in 1878 noted the species occurring in the Upper Boulder Clay of West Cheshire and Liverpool, and Wright in 1903 noted it from the High Level Boulder Clay of Ayrshire. Wright also recorded this species from the Drift of County Cork in 1902, and of Herefordshire in 1923.

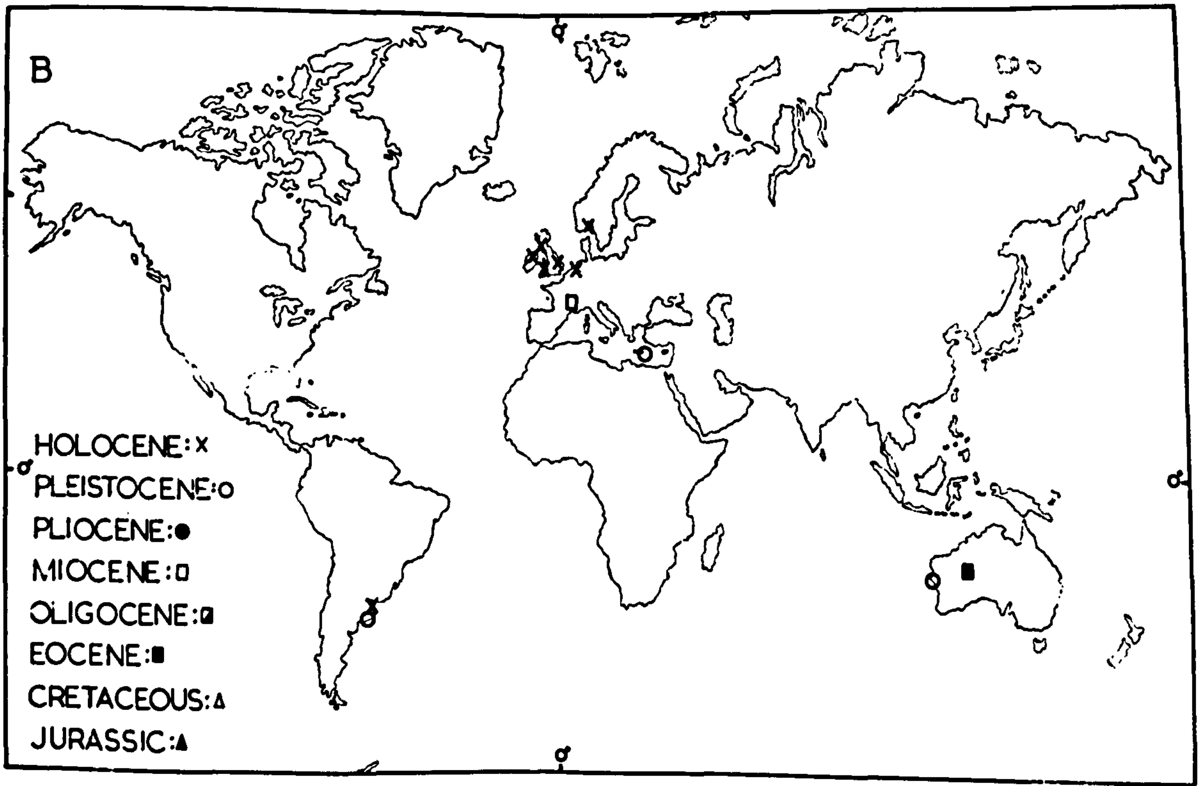
This species has been recorded from the Holocene of Quequen, Buenos Aires by Boltovskoy in 1959, and from the Holocene of the Dollart-Ems estuary by Voorthuysen in 1960.

Howchin in 1893 noted this form from the Eocene of Australia, and Marks in 1951 from the Miocene of the Vienna Basin. Rao in 1955 recorded an occurrence in the Tertiary of Adelaide, and Howchin in 1893 an occurrence in the Post Tertiary of Australia. Pleistocene occurrences have been recorded from East Crete by Bullen in 1906, from Port Fairy, Western Australia by Collins in 1953, and from Quequen, Buenos Aires by Boltovskoy in 1959. Feyling-Hanssen in

1964 obtained this species from the Late Quaternary of the Oslo Fjord region.

Diagnosis: This is a cosmopolitan species found at every latitude at variable depth. Temperature does have an effect on the test characters as discussed above. Stratigraphically it ranges from the Eocene to Recent, being well represented in the Boulder Clay Drift and Holocene of the British area.





TEXT FIG. 27 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- MILIOLINELLA SUBROTUNDA

CHAPTER 6

The NODOSARIACEA

This Super Family belongs to the Sub Order ROTALIINA Delage and Herouard 1896, and includes those forms that are planispirally coiled or uncoiled, straight, or coiled about a longitudinal axis, with a wall of finely perforate, radial, laminated calcite. The aperture may be typically radiate, slitlike or rounded, peripheral or terminal.

Super Family: Nodosariacea Ehrenberg 1838

Family: Nodosariidae Ehrenberg 1838

Sub Family: Nodosariinae Ehrenberg 1838

Genus: Lagena Walker and Jacob in Kanmacher 1798

Lagena laevis (Montagu) 1803

Pl. 11, figs. 2a, 2b.

1803 Vermiculum laeve MONTAGU Test. Brit. p.524, type fig.op.cit. Walker and Boys. pl.1, fig.9.

1848 Lagena laevis (Montagu) WILLIAMSON. Ann. Mag.Nat.Hist.Ser.2, Vol.1, p.12, pl.1, figs.1,2.

1865 Lagena sulcata Walker and Jacob var. laevis (Montagu) PARKER and JONES. Phil.Trans.Roy.Soc. Vol.155, p.349, pl.13, fig.22, pl.16, fig.9a.

1884 Lagena laevis (Montagu) BRADY, Chall.Rep.Zool. Vol.9, p.455, pl.56, figs.7-9, non figs.10-14.

1890 Lagena laevis (Montagu) BURROWS, SHERBORN, and BAILEY. Journ.Roy.Micro.Soc. pt.VIII, p.7, pl.IX, fig.3.

1893 Lagena laevis (Montagu) CHAPMAN. Journ.Roy.Micro.Soc. p.581,582, pl.VIII, fig.5.

1894 Lagena laevis Walker and Boys. GOES. Kongl.Svensk.Vet. Akad.Handle. Bd.25,no.9,p.74, Tab.XIII, figs.719-722.

1897 Lagena laevis (Montagu) FLINT. U.S.Nat.Mus.Ann.Rep.Wash. p.306,pl.53,fig.6.

1900 Lagena laevis (Montagu) READE. Geol.Mag.Vol.VII. p.100, pl.V, fig.12.

1912 Lagena laevis (Montagu) BAGG. U.S.Geol.Survey Bull.513. p.48,pl.XIV,figs.23,24.

1913 Lagena laevis (Montagu) CUSHMAN. U.S.Nat.Mus.Bull.no.71, pt.3,p.5,pl.1,fig.3,pl.38,fig.5.

1913 Lagena laevis (Montagu) HERON-ALLEN and EARLAND. Proc.Roy. Irish Acad. Vol.31,pt.64,p.77,pl.VI, fig.5.

1926 Lagena laevis (Montagu) CHAPMAN and PARR. Journ.Linn.Soc.Zool. London. Vol.36,p.373,pl.17,fig.1.

1933 Lagena laevis (Montagu) CUSHMAN. U.S.Nat.Mus.Bull.no.161,pt.2, p.19,20. pl.4,fig.5.

1939 Lagena laevis (Montagu) HOWE. Louisiana Geol.Survey Bull.no.14. p.50,51, pl.6,fig.12.

1940 Lagena laevis (Montagu) BUCHNER. Nova Acta Leopoldina. N.F.Bd. 9, No.62,p.418,Tof.III,figs.34,35,36. non 37-46.

1941 Lagena laevis (Montagu) TOULMIN. Journ.Pal.Vol.15,No.6,p.593, pl.80,fig.7.

1942 Lagena c.f. laevis(Montagu) CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.18,pt.2,p.34,pl.6,fig.4.

1945 Lagena laevis (Montagu) CUSHMAN and HERRICK. Contr.Cush.Found. Foram.Res. Vol.21,pt.3,p.59,pl.9,fig.20.

1946 Lagena laevis (Montagu) CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res. sp.Pub.no.19, p.18,pl.3, figs.21-23.

1946 Lagena c.f. laevis(Montagu) CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.22,pt.2,p.56,pl.9,fig.26.

1947 Lagena laevis (Montagu) PARR. Proc.Roy.Soc.Victoria Vol.58, n.s. pl.VI,fig.2.

1948 Lagena laevis (Montagu) CUSHMAN. Contr.Cush.Found.Foram.Res. Sp.Pub.no.23,p.47,pl.5,fig.11.

1949 Lagena laevis (Montagu) CUSHMAN. Inst.Roy.des.Sci.Nat.de, Belgique. Mem.111,p122,pl.IV,fig.8.

1949 Lagena laevis (Montagu) VOORTHUYSEN. van.Verh.Ned.Konin.Mijnb. Gen.Geol.Deel 15, p.66,pl.1,fig.5.

1950 Lagena laevis (Montagu) CUSHMAN and McCULLOCH. Al.Han.Pac. Exped.Vol.6,no.6,p.341,pl.45,figs.14-16.

1951 Lagena laevis (Montagu) VOORTHUYSEN van. Med.Geol.Stichting. n.s.No.5,p.24,25. pl.1,fig.10.

1953 Lagena laevis (Montagu) LOEBLICH and TAPPAN. Smith Miscell. Coll.Pub.4105,Vol.121,No.7,p.61, pl.11,figs.5-8.

1954 Lagena laevis (Montagu) BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III, no.3,p.149,pl.IX figs.7-9.

1956 Lagena laevis (Montagu) HAQUE. Geol.Survey Pakistan.Vol.1, p.93,94. pl.8,fig.11.

1957 Lagena laevis (Montagu) FORAMINIFERI PADANI. Agip.Mineraria. pl.18,fig.1.

1957 Lagena laevis (Montagu) SMIGIELSKA. Rocz.Polski.Tow.Geol. Tome.XXV,pt.3,p.266,pl.XVII,figs.5,6.

1959 Lagena laevis (Montagu) forma typica BOLTOVSKOY. Sec.de.Marina Pub.H1005, Buenos Aires.p.67,pl.IX, fig.7.

1960 Lagena laevis (Montagu) ASANO. Sci.Rep.Tohoku. Univ.Ser.2. (Geol). Spec.p.29,pl.5,figs.6,7.

1960 Lagena laevis (Montagu) BARKER. Soc.Econ.Pal. and Min. sp. Pub.no.9,p.114,pl.56,figs.7-9,p.118, pl.57,figs.14,16,17,18.

1960 Lagena laevis (Montagu) VOORTHUYSEN van. Verh.Kon.Ned.Geol. Mijnb.Gen.Geol.Serie.Deel 19,p.246, Taf.10,fig.10.

1962 Lagena c.f. laevis(Montagu) BIGNOT. Rev.de Micropal. Vol.5,No.3, p.165,pl.1,figs.14-16.

1962 Lagena laevis (Montagu) HAAKE. Geol.Inst.Univ.Kiel.Meyniana Band 12, p.33,34, Tof.1, figs.15-17.

1963 Lagena laevis (Montagu) forma typica BOLTOVSKOY. Contr.Cush. Found. Foram. Res. Vol.14,pt.2,p.62, pl.6,fig.22.

1964 Lagena laevis (Montagu) COPELAND. Bull.Am.Pal.Vol.47, No.215, p.244,pl.25,figs.3a,b.

1964 Lagena laevis (Montagu) FEYLING-HANSSEN. Nordes. Geol. Undersokelse. No.225,p.289.290,pl.11, figs.13-15.

1964 Lagena laevis (Montagu) PARKER. Journ.Pal.Vol.38,no.4,pl.97, fig.30.

Test free, monothalmous, elongate, fusiform, five times as long as wide, flask shaped, with a prolonged tubular neck, about one quarter the length of the test and grading gradually into the main test body. Greatest width at about a third of the way from the base which has a very small truncate spine present, circular in cross section. Aperture a simple circular opening at the end of the neck. Test wall thin, calcareous, transparent, finely and densely perforate.

Dimensions: Length 0.45 mm. Diamter 0.16 mm.

Occurrence: Dead CB.345, CB.362, CB.403, CB.638.

Dead, variation sample CB.696.

Morphological remarks: Lagena laevis is very similar to L. clavata but does not possess a basal mucro. This basal mucro is assumed to be a factor of age, and not of specific value. In this work L. clavata has been incorporated into the 'laevis' group as L. laevis exhibits considerable variation in relative length of neck, and main test body, and also in the nature of the aperture, from a simple terminal opening to a terminal opening with a development of a phialine lip, all intermediate forms between L. laevis and L. clavata being available. Examination of British Museum specimens indicates that confusion with these smooth lagenids has been common for a number of years, and "lumping" is evident. Transition from L. laevis by means of a few weak rudimentary striations at the aboral end of the test into L. semistriata, is also evident.

Distribution: (Text.fig.28A). This species has been recorded from Malbay (Thompson 1840), from Scarborough, Swansea, Sandwich, Aberdeen, Boston, and March (Williamson 1848), from the Shetland Seas (Waller 1868), South East of Eddystone (Robertson 1870), and from the Montrose Basin, Budle Bay, River Aln, River Wansbeck, River Blythe, Firth of Forth, River Ribble, Somerton Broad, Yarmouth, Breydon Water, and Westport, Ireland (Brady 1870). In 1875 Robertson recorded this form from the Firth of Clyde, and in the following year with Brady noted it off the coast of Durham and North Yorkshire. In the same year Sidall recorded it from the River Dee. Pearcey in 1890 recorded this species from the cold area of the Faroe channel, and in 1891 Burgess noted this form as very rare in the River Mersey. This species has also been recorded from Portree Bay, Isle of Skye (Robertson 1892), Port Erin (Chaffer 1894), the Irish Sea (British Association 1896), Barry Dock (Chapman and Jones 1896), Dogs Bay (Wright 1900), and Salcombe estuary (Worth 1900). Wright in 1902 obtained this form from the Recent clays of the valley of the River Lune, and in the following year Pearcey obtained it from the Firth of Forth. Worth stated that this species was present everywhere in the Plymouth area in 1904, Gough noted it in Larne Lough and Belfast Lough in 1906, and Wright in 1907 noted it as very rare at Lambay, County Dublin. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, in considerable numbers from Clare Island and from the North Sea in 1913, from 5 fathoms off Jura, 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart in 1914, from West of Scotland, and from the shore sands and shallow water zone of the South coast of Cornwall, in 1916. This form was recorded from the Plymouth district by Heron-Allen and Earland in 1930, and by the Marine Biological Association in 1957.

This species was recorded from the North Atlantic and Arctic (Parker and Jones 1865), the Gulf and River St. Lawrence (Dawson 1870), the Arctic (Brady 1878), and Brady in 1884 stated that this form is perhaps the commonest and most widely distributed of all the Lagenae and may be living in every sea, from the Arctic Ocean, within about 10° of the North Pole to the Antarctic ice barrier, and at every depth from the shore pools of the coast line to 2435 fathoms. Arctic and Scandinavian occurrences were noted by Goes in 1894, and it was noted in great profusion from the Malay Archipelago in 1901 by Millett. In 1912 Sidebottom obtained this form from the South West Pacific Ocean, and in the following year Cushman noted it from the North Pacific. It was recorded from the Antarctic by Pearcey in 1914, from Lord Howe Island by Heron-Allen and Earland in 1923, from the Philippine Islands and adjacent seas by Cushman in 1927, and from off San Francisco Bay, California by Hanna and Church in 1927. In 1932 Heron-Allen and Earland noted it as being "curiously rare" in the ice free areas of the Falkland Islands, and Cushman in 1933 noted it as being not common in the Tropical Pacific. Earland in 1934 noted this species from the Falklands sector of the Antarctic, where it had a wide depth range, and in 1936 obtained it from four stations in the Weddell Sea. Chapman and Parr in 1937 noted this species as very rare in the Antarctic, and Buchner in 1940 obtained it from the Gulf of Naples. Norvang in 1941 noted this form off Bergen, and in 1945 from Iceland. Cushman in 1948 recorded this species from North East Greenland, in 1949 from Belgium, and with McCulloch in 1950 from off the coast of Oregon, Mexico, the Galapagos Islands, South America, and Singapore. This form was recorded from the Netherlands Wadden Sea (Voorthuysen 1951), from the Arctic (Loeblich and Tappan 1953), and from the Gulf of San Jorge, Argentina (Boltovskoy 1954). In 1957 this species was recorded from off the West coast of Central America by Bandy and Arnal, from the estuary of the Rio de la Plata by Boltovskoy, and from Cook Strait, New Zealand by Vella. Todd in 1958 noted this species in the Recent portion of a core obtained from the Western Mediterranean, and in the following year Boltovskoy noted it from off Brazil and off Argentina. It was noted from the adjacent seas of Japan by Asano in 1960, common between 90-684 metres, with a temperature range of 0.5°C-19.9°C. In 1961 this species was recorded from the continental platform between Santo Tome and the Rio de la Plata by Boltovskoy, and from the Orange County outfall area, Southern California by Watkins. This species was recorded in 1962 from the North Sea by Haake, from the shore sands of Southern Brazil by Closs and Barberena, and from 487 metres at a temperature of +0.34°C on the Arctic Continental shelf by Wagner. In 1963 this form was noted from the Ivory Coast by Le Calvez, from Hudson Bay, Canada by Leslie, and from Puerto Deseado, Patagonia by Boltovskoy. Hulme in 1964 obtained this species from Manukau Harbour, New Zealand, and in the same year Smith obtained it at a depth of 1,600 metres off El Salvador, South America.

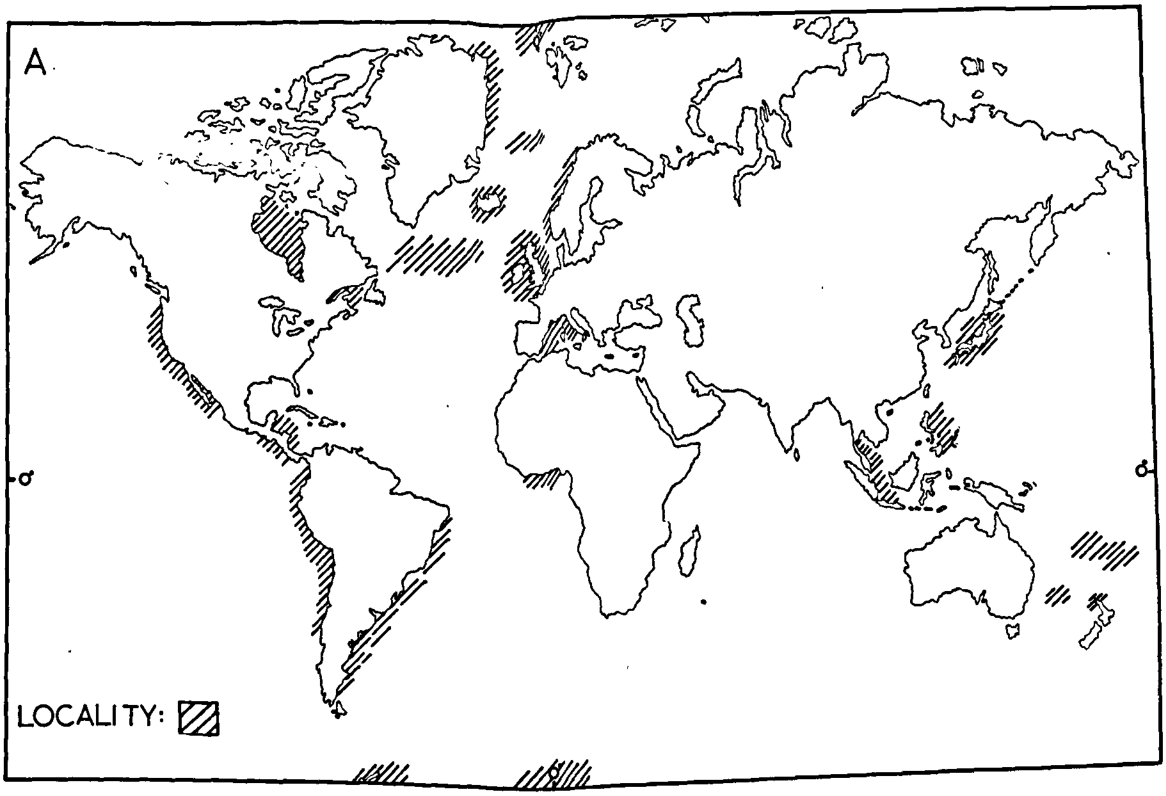
Stratigraphic Occurrence: (Text fig.28B). Holocene occurrences of this species in the British area have been recorded from Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar (Wright 1904), Great Crosby (Wright 1908), English Fenlands (MacFadyen 1933, 1938), Skye and County Antrim (MacFadyen 1937), Swansea Docks, (MacFadyen 1952), and Borth Cardiganshire (Adams and Haynes 1965).

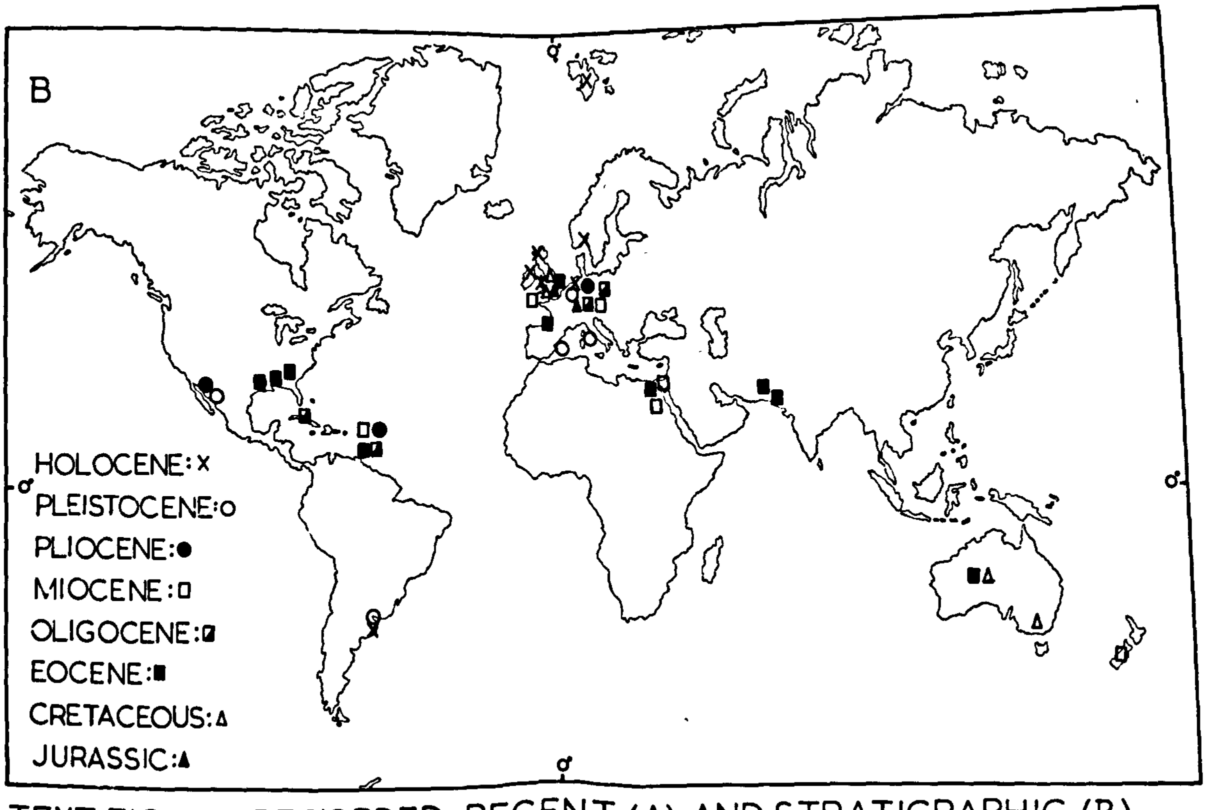
Jones in 1884 noted this species in the Jurassic of Richmond, and Chapman in 1893 from Gault of Folkestone. Other Jurassic occurrences were noted at Hartwell (Chapman 1897), Buckinghamshire (Neaverson 1921), and MacFadyen in 1941 obtained this form from the Lower Lias of Dorset. In 1900 Jones recorded this species from the Cretaceous of Southern England, and Heron-Allen and Earland in 1914 stated that forms obtained from shore sands at Selsey Bill, Sussex were Cretaceous derived. Sherlock in 1914 recorded this form from the Lower Cretaceous of Yorkshire. Burrows and Holland in 1897 noted this species in the Paleogene of Pegwell Bay. Eocene occurrences were noted from London Clay by Sherborn and Burrows in 1891, and Bowen in 1954. Curry, Murray and Whittard in 1965 noted this species occuring in the Miocene and Neogene of the Western approaches to the English Channel. Crosskey and Robertson noted Post Tertiary occurrences of this species from the Isle of Cumbrae (1867), Loch Fyne, Crinan, Duntroon, Renfrew, Paisley (1869). Greenock (1871), Campbeltown, Bute (1873) and the Kyles of Bute in 1874. Robertson also noted this form in the Post Tertiary beds of Kilwinning in 1877, and of Greenock in 1885. Shone in 1874 recorded this species from the Boulder Clay of Cheshire, and other Boulder Clay occurences were noted by Wright from Great Crosby in 1898, Cheshire, 1899, Carrickgergus 1903, County Down 1904, and Lancashire in 1905. An Upper Boulder Clay occurrence was noted from Cheshire and Liverpool by Shone in 1878, and Wright in 1903 obtained it from the High Level Boulder Clay of County Dublin.

Holocene occurrences from other regions of the world have been recorded from Bruges by Reade in 1898, from Porto Quequen, Buenos Aires by Boltovskoy in 1959, from the Dollart-Ems estuary by Voorthuysen in 1960, from the South West Barents Island by Feyling-Hanssen in 1961, and by the same auther from the Holocene of Spitzbergen in 1965.

Pietrzensk in 1961 obtained this form from the Lias of Germany, and Cretaeeous occurrences were noted from Australia by Howchin in 1893, and from the Lower Cretaceous of the Great Artesian Basin of Northern New South Wales by Crespin in 1956. Paleocene occurrences were noted from Arkansas by Cushman and Todd in 1946, and from New Jersey by McLean in 1953. Haque in 1956 recorded this species from the Ranikot (Paleocene) and Laki (Eocene) of the Nammal Gorge, Pakistan. Eocene occurrences of this species were noted from Trinidad by Guppy in 1892, from Australia by Howchin in 1893, from Cook Mountain, Louisiana by Howe in 1939, from Mississippi by Mornhinveg in 1941, from Alabama by Toulmin in 1941, and Cushman and Todd in 1942, from Georgia by Cushman and Herrick in 1945, and from Cape d'Ailly by Bignot,in 1962. Halkyard in 1917 and 1919 obtained this species from the Middle Eocene Blue Marl of Biarritz, and Kaever in 1965 obtained it from the Middle Eocene of Afghanistan. Two Upper Eocene occurrences have been noted, from Egypt by Ansary in 1954, and from the Nullabor Plains, Australia by Crespin in 1956. Bellen, Puyt, Rutgers, and Soest in 1961 noted this species from the Lower Oligocene of Cuba, and it was also recorded from this horizon in Trinidad by Stainforth in 1964. Langer in 1962 stated that this form ranged from the Lower to Middle Oligocene in the North East Rhineland, and Friese in 1951 obtained it from the Middle Oligocene of Bavaria. The occurence of this species in the Miocene was recorded from Egypt and Sinai by MacFadyen in 1930, from Upper Silesia by Smigielska in 1957, and from the Gulf of Suez area by Souaya in 1965. Occurrences in the Upper Miocene of New Zealand have been noted by Kennett in 1962, and Vella in 1963. Chapman in 1898 noted this form ranging through the Miocene and Pliocene of Barbados. Cushman and Gray in 1946 obtained this species from the Pliocene of Timms Point, California, and Voorthuysen in 1953 stated that this form constituted less than .5% of the fauna from the Pliocene of a boring at Oosterhout, Netherlands. Bagg in 1912 noted this species ranging through the Pliocene and Pleistocene of Southern California, as did Voorthuysen in 1950 from the Hague, Netherlands. Australian Tertiary occurrences have been noted by Chapman and Parr in 1926, Crespin, and Rao in 1955, and a Netherlands Tertiary occurrence was recorded in 1944 by Ten Dam. Broeck in 1878 noted this species occuring in the Pleistocene of Ischia, and Voorthuysen in 1949 and 1950 obtained it from the Pleistocene of the Netherlands. Todd in 1958 obtained this form from the Pleistocene portion of a core from the Western Mediterranean. Boltovskoy in 1959 noted a Pleistocene occurrence at Porto Quequen Buenos Aires, and Feyling-Hanssen in 1964 stated that this form occurred in the Late Quaternary deposits of the Oslo Fjord area.

Diagnosis: This species, possibly conspecific with L. clavata has a cosmopolitan distribution in all latitudes and at all depths, although tropical occurrences are not so common. Stratigraphically it ranges from the Jurassic to Recent, being very well represented in the Tertiary and Recent.





TEXT FIG. 28 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- LAGENA LAEVIS

Lagena semistriata Williamson 1848

Pl. 11, figs. 3a, 3b, 3c.

1848 *Lagena striata* (Montagu) *var. semistriata* WILLIAMSON. Ann.Mag. NatlHist.Ser.2,Vol.1,p.14,pl.1,figs. 9,10.

1858 *Lagena vulgaris* Williamson *var. semistriata* Williamson WILLIAMSON. Rec.For.Gt.Brit.Ray.Soc. London. p.6,pl.1,fig.9.

1865 *Lagena sulcata* Walker and Jacob. *var. semistriata* Williamson PARKER and JONES. Phil,Trans.Roy.Soc. Vol.155,p.350,pl.13,fig.23.

1884 *Lagena semistriata* Williamson BRADY. Chall.Rep.Zool.Vol.9,p.465, pl.57,figs.14,16,17.

1894 *Lagena semistriata* Williamson GOES. Kongl.Svensk.Veten.Akad.Handl. N.F. Bd.25,No.9,p.76,Tab.13,fig.737.

1901 *Lagena semistriata* Williamson MILLETT. Journ.Roy.Micro.Soc. p.486, pl.VIII,fig.3.

1912 *Lagena semistriata* Williamson BAGG. U.S.Geol.Survey Bull.no.513, p.50,pl.XIV,figs.1-5.

1926 *Lagena semistriata* Williamson CHAPMAN and PARR. Journ.Linn.Soc. Zool.London. Vol.36,p1374,pl.17,fig.19.

1931 *Lagena semistriata* Williamson CUSHMAN and PARKER. Contr.Cush.Found. Foram.Res. Vol.7,pt.1,p.7,pl.1,fig.23.

1933 *Lagena semistriata* Williamson CUSHMAN. U.S.Nat.Mus.Bull.no.161, pt.2,p.32,pl.8,fig.1.

1943 *Lagena c.f. L.semistriata* Williamson BECK. Journ.Pal.Vol.17,no.6, p.602,pl.107,fig.32.

1946 *Lagena semistriata* Williamson CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res. sp.Pub.no.19,p.18,19, pl.3,fig.34.

1949 *Lagena semistriata* Williamson ASANO. Journ.Pal. Vol.23, no.4, p.424, fig.1,no.28.

1960 *Lagena sulcata* Walker and Jacob *var. semistriata* Williamson. VOORTHUYSEN van. Verh.Kon.Ned.Geol. Mijnb.K.Gen.Geol.Serie. Deel.19, p.246,Taf.10,fig.13.

1961 Lagena semistriata Williamson BRAGA. Pub.Inst.de.Zool.Fac.Ciencias do Porto 77, p.119,120,pl.XII,fig.12.

1963 Lagena semistriata Williamson RAU. Contr.Cush.Found.Foram.Res. Vol.14,pt.4,p.140,pl.12,fig.7.

Test free, unilocular, elongate, twice as long as broad, decanter shaped in outline, circular in cross section. Greatest width in the lowest one fifth of the test, sides nearly straight above this point tapering to the long slender neck, which is circular in cross section. Basal end rapidly rounding to a flattened base. Aperture small, circular, terminal at the end of the neck with a trace of a phialine lip present. Wall calcareous, thin, transluscent, finely perforate, smooth on the upper half of the test, the lower half ornamented with 14 well spaced, short, strong, longitudinal costae. Centre of base finely hispid, non constate. Neck ornamented with two very fine, very faint, slightly spiral longitudinal costae.

Dimensions: Length 0.42 mm. Diameter 0.23 mm.

Occurrence: Dead CB.402.

Morphological remarks: Numerous workers credit this species to Williamson 1858, prior to this however, in 1848 the same auther described and figured Lagena striata (Montagu) var. semistriata which is morphologically identical with his 1858 Lagena vulgaris Williamson var. semistriata and thus should be adopted as the type.

This species exhibits great diversity of form in shape, strength, relative length of neck and main test body, number and extent of costae, and a number of individuals with only weak rudimentary costae at the aboral end could be included into the L.laevis, L.clavata group from which group this species is not far removed.

Distribution: (Text-fig.29A). This species has been recorded from Tenby, Boston and Scarborough, (Williamson 1848), from the Shetland Seas (Waller 1868), South East of Eddystone, (Robertson 1870) and from Breydon Water, Somerton Broad, Montrose Basin, Budle Bay, the River Aln, River Wansbeck, River Blyth, and Westport, Ireland (Brady 1870). Robertson recorded this form from the Firth of Clyde in 1875, and with Brady in 1876 from the coast of Durham and North Yorkshire. Sidall in 1876 noted it as frequent in the River Dee. In 1891 this species was noted from the River Mersey by Burgess, and from Liverpool Bay by Pearcey. In the following year Robertson obtained it from Portree Bay, Isle of Skye, and in 1895 Wright noted it as rare in Dogs Bay. The British Association in 1896 included it in its list of foraminifera from the Irish Sea, and in 1900 it was recorded from Salcombe estuary by Worth, and again from Dogs Bay by Wright. It was recorded from Recent clay in the Valley of the River Lune by Wright in 1902, from the Firth of Forth by Pearcey in 1903, from Plymouth by Worth in 1904, and from Larne Lough and Belfast Lough, Ireland by Gough in 1906. Wright in 1907 noted this form as very rare to rare at Lambay, County Dublin. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909, and 1911, from the North Sea and Clare Island in 1913, from 12 fathoms in Loch Sunart in 1914, from West of Scotland and from the shore sands and shallow water zone of the South Coast of Cornwall in 1916, and from the Plymouth area in 1930. Heron-Allen in 1915 noted this form as being very rare at 20 fathoms off the Isle of Man.

The Marine Biological Association in 1957 obtained this species from five stations in the Plymouth area, and Le Calvez in 1958 noted it occurring in the Mer Celtique, West of France and South of Ireland. Bruce, Colman and Jones in 1963 stated that this form was very rare from the Isle of Man and surrounding areas.

Parker and Jones in 1865 recorded this species from the Arctic, Dawson in 1870 from the Gulf and River St. Lawrence, and Brady in 1878 from Greenland and Norway. The same auther in 1884 stated that the distribution of this species virtually extended from the Arctic to the Antarctic. This species has also been recorded from Scandinavia and the Arctic (Goes 1894), from the Malay Archipelago (Millett 1901), from two stations in the South West Pacific Ocean (Sidebottom 1912), and from three stations in the Antarctic (Pearcey 1914). Cushman recorded this form from the Philippine Islands and adjacent seas in 1921, and from the Caroline Islands in 1933. In the same year Natland obtained this form from the Southern California region. Earland in 1934 noted this species as being very rare to rare in the Falklands sector of the Antarctic, and Rutten and Hotz in 1936 obtained it from the Island of Ceram. It was noted from North East Greenland by Cushman in 1948, from the Antarctic by Parr in 1950, from the coast of Galicia by Colom in 1952, from the Mozambique coast by Braga in 1961, and from the Ivory coast by Le Calvez in 1963. Hulme in 1964 recorded this species from Manukau Harbour, Auckland, New Zealand, and in the following year Albani obtained one specimen from Durban Bay, South Africa.

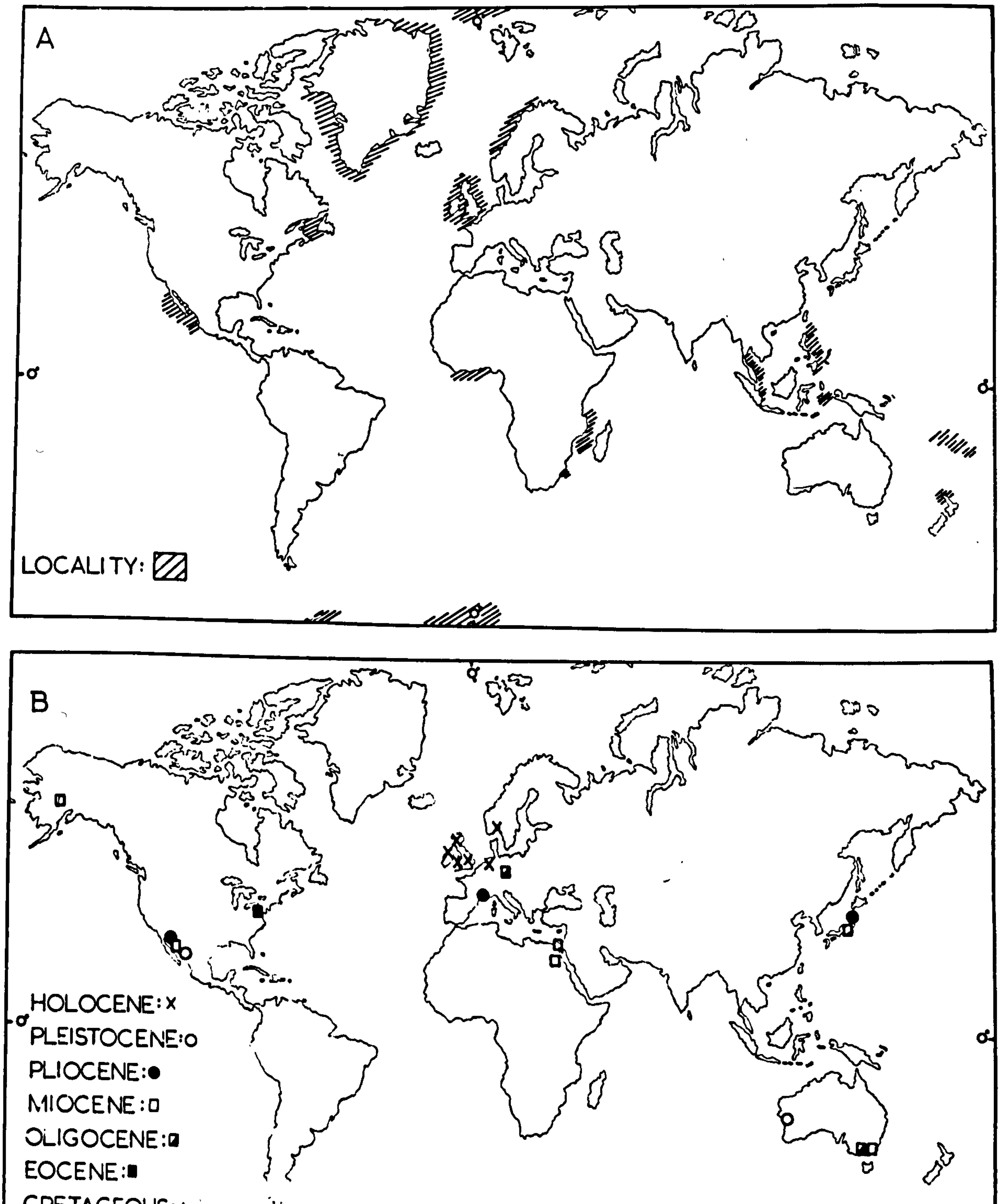
Stratigraphic Occurrence: (Text-fig.29B). Holocene occurrences of this species in the British area have been recorded from Cleongarth (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar (Wright 1904), Great Crosby (Wright 1908), County Antrim (MacFadyen 1937), English Fens (MacFadyen 1938), Swansea Docks (MacFadyen 1942), and Borth, Cardiganshire (Adams and Haynes 1965).

Post Tertiary occurrences have been noted by Crosskey and Robertson from Loch Fyne and Renfrew (1869), Kyles of Bute (1874), and by Robertson from Kilwinning (1877) and Greenock (1885). MacFadyen recorded this species occurring in Pleistocene deposits of East Anglia in 1932, and in deposits of the same age along the Wexford coast in 1940. Wright in 1902 obtained this form from the Drift of County Cork, and recorded it from Boulder Clay of Cheshire (1899), Carrickfergus (1903), and County Down (1904). Crosskey and Robertson noted it in the Boulder Clay of Caithness in 1868. Shone in 1878 recorded this species from the Upper Boulder Clay of West Cheshire and Wright in 1903 recorded it from the High Level Boulder Clay of County Dublin.

In 1960 Voorthuysen recorded this species in the Holocene of the Dollart-Ems estuary. Beck in 1943 retrieved one specimen from the Eocene of Washington. A Middle Oligocene occurrence was noted from Bavaria by Friese in 1951, and Reed in 1965 recorded this form in the Oligo-Miocene of Victoria, Australia. Miocene occurrences have been recorded from Egypt and Sinai (MadFadyen 1930), from the Eastern side of the San Joaquin Valley, California (Cushman and Parker 1931), from Japan (Asano 1949), from Majorca (Colom 1958, from South Eastern Alaska

(Rau 1963), and from the Gulf of Suez area (Souaya 1965). This species occurrence in the Australian Tertiary has been noted by Chapman and Parr in 1926, and Rao in 1955, and an Australian Post Tertiary occurrence was noted in 1893 by Howchin. Cushman andGray in 1946 recorded this species from the Pliocene of Timms Point, California, Asano in 1950 from the Pliocene of Japan, and Zanfra in 1961 from the Upper Pliocene of the Riviera. Bagg in 1912 obtained this form from the Pliocene of Southern California, where it ranged through to the Pleistocene. A similar occurrence at Parma was noted in 1962 by Papani and Pelosio. Collins in 1953 noted this species occurring in the Pleistocene of Port Fairy, Western Australia, and Feyling-Hanssen in 1964 noted it in the Late Quaternary of the Oslo Fjord area.

Diagnosis: This shallow water species appears to prefer a cold water to cool temperate environment, and is only rarely found in warmer waters. It is well represented in Holocene deposits and ranges stratigraphically from the Eocene to Recent.



TEXT FIG. 29 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- <u>LAGENA SEMISTRIATA</u>

Lagena substriata Williamson 1848

Pl. 11, figs. 1a, 1b, 1c.

1848 Lagena substriata — WILLIAMSON. Ann.Mag.Nat.Hist.Ser.27-Vol.1,p.15,pl.II,fig.12.

1858 Lagena vulgaris Williamson var. substriata Williamson. WILLIAMSON. Rec.For.Gt.Brit.Ray.Soc.London. p.7,pl.1,fig.14.

1923 Lagena substriata Williamson — CUSHMAN. U.S.Nat.Mus.Bull.104, p.56,pl.10,fig.11.

1929 Lagena substriata Williamson — CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.5,pt.3,p.68,pl.11,fig.4.

1931 Lagena substriata Williamson — CUSHMAN. State Tenn.Dept.Ed.Div. Geol.Bull.41, p.37,pl.5,fig.7.

1931 Lagena substriata Williamson — CUSHMAN and LAIMING. Journ.Pal. Vol.5,No.2,p.100,pl.11,fig.1.

1938 Lagena substriata Williamson — CUSHMAN and LEROY. Journ.Pal.Vol.12, No.2,p.125k pl.22,fig.12.

1943 Lagena c.f. L.substriata Williamson — BECK. Journ.Pal.Vol.17,no.6, p.602,pl.107,fig.30.

1944 Lagena c.f. substriata Williamson — CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.20,pt.1,p.9,pl.2,fig.14.

1944 Lagena substriata Williamson — CUSHMAN and DEADERICK. Journ.Pal. Vol.18,no.4,p.336,pl.52,fig.15.

1945 Lagena c.f. substriata Williamson — CUSHMAN and TODD. Contr.Cush. Found.Foram.Res. Vol.21,pt1,p.13 pl.3,fig.15.

1948 Lagena substriata Williamson — CUSHMAN and TODD. Contr.Cush.Found. Foram.Res.Vol.24,pt.2,p.27,pl.5, fig.21.

1949 Lagena substriata Williamson — ASANO. Journ.Pal.Vol.23,No.4, p.424,Fig.1,no.49.

1950 Lagena substriata Williamson — VOORTHUYSEN van. Med.Geol.Stichting n.s. no.4,p.55,pl.1,fig.9.

1952 Lagena substriata Williamson TODD and KNIKER. Contr.Cush.Found. Foram.Res.Sp.Pub.no.1,p.17,pl.3, fig.19,

1954 Lagena substriata Williamson FRIZZELL. Bur.Econ.Geol.Univ.Texas Invest.Reps. no.22,p.103,pl.14, fig.13.

1955 Lagena substriata Williamson GRAHAM and CLASSEN. Contr.Cush. Found.Foram.Res.Vol.6,pt.1,p.13, pl.2,fig.22.

1956 Lagena substriata Williamson McLEAN,Jr. Bull.Am.Pal.Vol.36, No.160,p.333,pl.39,figs.10a,b.

1960 Lagena substriata Williamson ASANO. Sci.Rep.Tohoku Univ.Ser.2. (Geol).Spec.p.34,pl.5,fig.31.

1962 Lagena substriata Williamson BIGNOT. Rev.de Micropal.Vol.5, No.3,p.165,pl.2,figs.1-3.

Te Test free, unilocular, ovate to sub quadrate in outline, two and a half times as long as broad, circular in cross section, basal end rounded, apertural end produced into a long thin neck towards the aperture which is a simple circular opening, small, at the ehddof the tube. Test ornamented with about forty fine, longitudinal ribs, the majority of which originate at the base of the test and continue over the whole of the test surface, a few ribs interdalated near the base of the test do not extend beyond the lower quarter of the test. Neck ornamented with about six very fine ribs, running longitudinally to slightly spiral along it. Wall calcareous, thin, transluscent, very finely perforate.

DimensionsP Length 0.25 mm. Diamter 0.12 mm.

Occurrence: Dead CB.362.

Morphological remarks: This species has been credited to Williamson 1858 by a number of workers, but prior to this date, he had described and figured, in 1848, Lagena substriata which is morphologically identical with his 1858 variety Lagena vulgaris Williamson var. substriata and which thus automatically becomes the type.

Distribution: Williamson recorded this species from Swansea and Boston in 1848 and from a number of British localities in 1858. Le Calvez in 1958 noted it occurring in the Mer Celtique, West of France and South of Ireland.

This species has been recorded from the Gulf and River St. Lawrence (Dawson 1870), from the North Atlantic (Cushman 1923), off the West coast of America (Cushman 1927), and from the Bay of Kola, Arctic (Cushman 1948). Parr in 1950 obtained it from deep watersain the Antarctic, and Harrington in 1955 noted it in the Bay of Fundy. This form was recorded from the Japanese seas at depths of 78-620 metres, by Asano in 1960, who also noted a temperature range of 0.5°C - 18.0°C. In 1961 Watkins recorded living specimens at the Orange County outfall area of Southern California, and in 1964 Hulme recorded this form from Manukau Harbour, Auckland, New Zealand.

Stratigraphic Occurrence: This species has been recorded from the Holocene of Skye and County Antrim by MacFadyen in 1937, and from Holocene deposits at Borth, Cardiganshire by Adams and Haynes in 1965. There are no other stratigraphic records for the British Area.

Cushman and Deaderick in 1944 obtained one specimen from the Cretaceous of Arkansas, and Frizzell in 1954 recorded this species from the Cretaceous of Texas. Cushman in 1931 stated that this form occurred in the Upper Cretaceous of Tennessee. Fox and Ross in 1942 recorded this form from the Paleocene of North Dakota and Eocene occurrences were noted from Washington (Beck 1943), Alabama (Cushman and Todd 1945), Mississippi (Cushman and Todd 1948), Southernmost Chile (Todd and Kniker 1952), California (Graham and Classen 1955), and from Cape d'Ailly (Bignot 1962). A Texas Middle Oligocene occurrence was noted by Cushman and Ellison in 1945, and Kleinpell and Weaver in 1963 obtained this species from the Oligocene and Miocene of the Santa Barbara embayment, California. This species was recorded as occurring in the Miocene of Virginia by McLean in 1956, and Sabol in 1960, in the Miocene of California by Cushman and Laiming in 1931, and Cushman and LeRoy in 1938, and in the Miocene of Japan by Asano in 1949. Pliocene occurrences were noted from California by Cushman in 1929, from the Western Netherlands by Voorthuysen in 1950, and from Japan by Asano in 1960.

Diagnosis: This species which occurs in shallow to moderately shallow water appears to prefer a cool to cold climate. Stratigraphically it ranges from the Cretaceous to Recent, although is not well represented at any age.

Lagena sulcata (Walker and Jacob) 1798

Pl.11, figs. 4a, 4b, 4c.

1798 Serpula sulcata WALKER and JACOB. Adams essays on the microscope Ed.2,p.624,pl.14,fig.5.

1858 Lagena vulgaris Williamson var. striata Williamson WILLIAMSON. Rec.For.Gt.Brit.Ray.Soc.London. p.6,pl.1,fig.10.

1865 Lagena sulcata (Walker and Jacob) PARKER and JONES. Phil.Trans. Roy.Soc.Vol.155,p.351,pl.13, figs.24, 28-32,pl.16,figs.6,7, 7a.

1884 Bars Lagena sulcata (Walker and Jabeb) BRADY. Chall.Rep.Zool.Vol.9, p.462,pl.57,figs.26-34.

1893 Lagena sulcata (Walker and Jacob) CHAPMAN. Journ.Roy.Micro.Soc. p.583,pl.VIII,fig.11.

1894 Lagena sulcata Walker and Boys. GOES. Kongl.Svensk.Veten.Akad. Handl.N.F. Bd.25,No.9,p.78, Tab.13,figs.742-744.

1897 Lagena sulcata (Walker and Jacob) FLINT. U.S.Nat.Mus.Ann. Rep.Wash. p.307,pl.53,fig.7.

1900 Lagena sulcata (Walker and Jacob) READE. Geol.Mag.Vol.VII. p.100,pl.V,fig.14.

1902 Lagena sulcata (Walker and Jacob) CHAPMAN. Foraminifera.Longmans. p.187,pl.10,fig.E.

1912 Lagena sulcata (Walker and Jacob) BAGG. U.S.Geol.Survey Bull. 513. p.52,pl.XIV,figs.9-12.

1912 Lagena sulcata (Walker and Jacob) SIDEBOTTOM. Journ.Queckett Micro.Soc. Vol.11,p.389,pl.15, figs.24,25.

1926 Lagena sulcata (Walker and Jacob) CHAPMAN and PARR. Journ.Linn. Soc.Zool.London. Vol.36,p.375, pl.17,fig.6.

1927 Lagena sulcata (Walker and Jacob) CUSHMAN. Contr.Cush.Found. Foram.Res. Vol.3,pt.2,pl.24, fig.2.

1929 Lagena sulcata (Walker and Jacob) CUSHMAN. Contr.Cush.Found. Foram.Res. Vol.5,pt.3,p.70, pl.11,fig.5.

1931 Lagena sulcata (Walker and Jacob) CUSHMAN and PARKER. Contr. Cush.Found.Foram.Res. Vol.7, pt.1,p.6,pl.1,fig.20.

1931 Lagena sulcata (Walker and Jacob) PLUMMER. Univ.Texas.Bull. 3101,p159,160,pl.X,fig.11.

1932 Lagena sulcata (Walker and Jacob) MacFADYEN. Geol.Mag.Vol.69 pl.XXXIV.fig.7.

1933 Lagena sulcata (Walker and Jacob) GALLOWAY. A manual of foraminifera. p.247,pl.22,fig.11.

1938 Lagena sulcata (Walker and Jacob) CUSHMAN and LEROY. Journ.Pal. Vol.12,no.2,p.125,pl.22,fig.13.

1940 Lagena sulcata (Walker and Jacob) TAPPAN. Journ.Pal.Vol.14, No.2,p.112,pl.17,figs.19a-b.

1942 Lagena sulcata (Walker and Jacob) CUSHMAN and McGLAMERY. U.S.Geol.Survey ProflPaper197NB, p.68,pl.4,fig.25.

1943 Lagena sulcata (Walker and Jacob) TAPPAN. Journ.Pal.Vol.17, No.5,p.504,pl.80,figs.33,34.

1946 Lagena sulcata (Walker and Jacob) CUSHMAN and GRAY. Contr.Cush. Found.Foram.Res.Sp.Pub.no.19, p.19,pl.3,fig.46.

1947 Lagena sulcata (Walker and Jacob) PARR. Proc.Roy.Soc.Victoria, Vol.58,pts.I,II,n.s.pl.VI,fig.1.

1948 Lagena sulcata (Walker and Jacob) CUSHMAN. Contr.Cush.Found. Foram.Res.sp.Pub.no.23,p.46, pl.5,fig.12.

1949 Lagena sulcata (Walker and Jacob) BERMUDEZ. Contr.Cush.Found. Foram.Res.Sp.Pub.no.25,p.118, pl.10,fig.48.

1949 Lagena sulcata (Walker and Jacob) CUSHMAN. Inst.Roy.des Sci. Nat.de Belgique Mem.III,p.23 pl.IV,fig.13.

1952 Lagena sp.c.f. L.sulcata (Walker and Jacob) MARTIN. Contr.Cush. Found.Foram.Res.Vol.3,pt.3, p.122,pl.18,figs.7a,b.

1954 Lagena sulcata (Walker and Jacob) BOLTOVSKOY. Mus.Argentine de Cienc.Nat.Geol.Tome III, no.3,p.148,149,pl.VI,fig.10.

1954 Lagena sulcata (Walker and Jacob) FRIZZELL. Bur.Econ.Geol. Univ.Texas Invest.Reps. no.22, p.103,pl.14,fig.14.

1955 Lagena sulcata (Walker and Jacob) BHATIA. Journ.Pal.Vol.29, no.4,p.675,pl.66,fig.17.

1957 Lagena sulcata (Walker and Jacob) BHATIA and MANDWAL. Journ. Pal.Soc.India. p.167,text-fig.A8.

1959 Lagena sulcata (Walker and Jacob) forma typica. BOLTOVSKOY. Sec.de Marina Pub.H1005, Buenos Aires, p.66,pl.IX, figs. 3,4.

1960 Lagena sulcata (Walker and Jacob) BARKER. Soc.Econ.Pal and Min. Sp.Pub.no.9,p.118,pl.57,figs. 33,34.

1960 Lagena sulcata (Walker and Jacob) BELFORD. Aust.Bur. of Min. Res.Geol. and Geophys. Bull.no. 57,p.55,pl.14,figs.12-13.

1960 Lagena sulcata (Walker and Jacob) TOLLMANN,von. Jb.Geol.B.A. Wien.Bd.103,p.178,Taf.XVII, fig.4.

1960 Lagena sulcata (Walker and Jacob) VOORTHUYSEN,van. Verh.Kon. Ned.Geol.Mijnb.K.Gen.Geol.Serie. Deel 19,p.246,Taf.10,figs.11,12.

1962 Lagena sulcata (Walker and Jacob) HAAKE. Geol.Inst.Univ.Kiel. Meyniana. Band 12,p.32,33, Taf.1,figs18-20.

1963 Lagena sulcata (Walker and Jacob) KUMMERLE. Abhand.Hess.Landes. Boden.Heft.45, p.34,Taf.4,fig.3.

Test free, unilocular, globular to ovate in outline, circular in cross section. Basal end bluntly rounded, apertural end produced into a strong elongate, tapering neck which is ornamented with four to six marked straight longitudinal costae, continuous with costae on the body chamber. Rounded base has a small, circular, central, non costae area. Body chamber ornamented by twenty strong, straight, longitudinal costae extending from the basal end and terminating at the apertural end. There are a few additional costae arising at the base and terminating about one third of the way beyond this point. Aperture small, circular, terminal, at the end of the neck. Wall calcareous, transluscent, densely and finely perforate.

Dimensions: Length 0.38 mm. Diameter 0.20 mm.

Occurrence: Dead DB.323, DB.327, CB.337, CB.374, CB.380, CB.385,
CB.398, CB.403.

Dead, variation sample DB.696.

Morphological remarks: This species is very variable in size, and in prominence and regularity of markings. Earland 1934 noted specimens running from the type into L. gracilis and L. auticosta. Boltovskoy in 1959 stated that individuals without any spines should be designated Lagena sulcata s.s.

Distribution: (Text-fig.30A). This species has been recorded from the Shetland seas (Waller 1868), from the Firth of Forth, River Exe, River Ribble, Somerton Broad, Montrose Basin, Budle Bay, River Aln, River Wansbeck, Outon Broad, Yarmouth, Breydon Water, Westport, Ireland (Brady 1870), and from the Firth of Clyde (Robertson 1875).

In 1876 it was recorded from the River Dee by Sidall, 40 miles South of the Scilly Isles by Jones and Parker, and off the coast of Durham and North Yorkshire by Robertson and Brady. Robertson in 1883 recorded this form from the Atlantic Docks, Liverpool, and Wright in 1889 noted it as very rare at 1,000 fathoms off the South West coast of Ireland. Pearcey recorded this species from the Faroe Channel in 1890, and from Port Dinorwic, Caernarvon Bay, off Penrhos, and Liverpool Bay in 1890, Burgess in the same year noting this form as being frequent in the River Mersey. This form has been noted at Port Erin (Chaffer 1894), Dogs Bay (Wright 1895), in the Irish Sea (British Association 1896), Salcombe estuary (Worth 1900), Dogs Bay (Wright 1900), the Firth of Forth (Pearcey 1902), and from Recent clay in the valley of the River Lune (Wright 1902). It was recorded from the Plymouth area by Worth in 1904, from Belfast Lough and Larne Lough by Goughin in 1906, and from Lambay, County Dublin by Wright in 1907. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from the North Sea and Clare Island in 1913, from 5 fathoms off Jura, 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart, and 20 fathoms off Ardnamuchan in 1914, from West of Scotland and from shore sands and the shallow water zone of the South coast of Cornwall in 1916, and from Plymouth in 1930. Heron-Allen obtained this form from 20 fathoms off the Isle of Man in 1915.

In 1957 the Marine Biological Association recorded this species from five stations in the Plymouth area, in 1958 Le Calvez obtained it from the Mer Celtique and in 1963 Bruce, Colman and Jones noted it as being very rare from the Isle of Man and surrounding areas.

It has been recorded from Crete, Syra, and North West of Crete (Jones and Parker 1860), from the North Atlantic and Arctic (Parker and Jones 1865), from the Gulf and River St. Lawrence (Dawson 1870), from the Arctic (Brady 1878), and was stated to be one of the most abundant and most generally diffused of all the members of the genus, at home in every latitude from Baffin Bay and Smith Sound or the shores of Nouaya Zemlya to the equator, and from the equator to Heard Island far South in the Southern Ocean with a bathymetric range from the littoral zone to 2,750 fathoms (Brady 1884). Goes in 1894 recorded Arctic and Scandinavian occurrences, Flint in 1897 noted it on the Atlantic coast of the United States, Millett in 1901 obtained it from the Malay Archipelago, and Sidebottom in 1912 obtained it from a number of stations in the South West Pacific Ocean. Pearcey in 1914 recorded this form from the Antarctic, and Cushman in 1921 noted it occurring from the Philippine Islands and adjacent seas. The same auther noted it occurring off the West coast of America in 1927, and Heron-Allen and Earland in 1932 noted its general distribution in the ice free area of the Falkland Islands, as did Earland in 1934. Earland in 1936 recorded the species from the Weddell Sea, and Chapman and Parr in 1937 obtained it from three stations in the Antarctic. Norvang in 1945 recorded this species from Iceland, Rutten and Hotz in 1946 from the Island of Ceram, and Cushman obtained it from North East Greenland in 1948, and from Belgium in 1949. Parr in 1950 obtained one specimen from Tasmania, and Boltovskoy recorded this species from the Gulf of San Jorge, Argentina in 1954. In 1957 Vella recorded this species as sporadic in Cook Strait, New Zealand, and Boltovskoy noted this form off Brazil in 1959, and from the continental platform between Santo Tome and Rio de la Plata, Argentina in 1961. In 1962 Haake obtained this form from the North Sea, and in the following year this species was recorded from the Ivory Coast by Le Calvez, and from Juan de Fuca and Georgia Straits, British Columbia by Cockbain. In 1964 this species was recorded from Manukau Harbour, Aukland, New Zealand by Hulme, and off El Salvador, South America with a depth range of 37 to 885 metres by Smith.

Stratigraphic Occurrence: (Text-fig.30B). British Holocene occurrences of this species have been recorded from Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Formby and Leasow (Reade 1900), Altcar (Wright 1904), Great Crosby (Wright 1908), County Antrim (MadFadyen 1837), English Fenlands (MadFadyen 1933, 1938), Swansea Docks (MacFadyen 1942), and Dorth , Cardiganshire (Adams and Haynes 1965).

Jurassic occurrences have been noted from Yorkshire (Blake 1872), Folkestone (Chapman 1893), Buckinghamshire (Neaverson 1921), South East England and Kent (Khan 1950, 1952). Wright in 1886 noted the occurrence of this species in the Cretaceous of County Derry, and Chapman recorded other Cretaceous occurrences from Taplow in 1892, and Swanscombe in 1894. Jones in 1900 also obtained this form from the Cretaceous of Southern England, and Heron-Allen and Earland in 1910 noted Cretaceous derived specimens in shore sands at Selsey Bill, Sussex. Bhatia recorded this species from the Paleogene sediments of the Isle of Wight in 1955 and 1957. Eocene occurrences in London Clay were noted by Sherborn and Burrows in 1891, and by Bowen in 1954. Crosskey and Robertson noted Post Tertiary occurrences at Loch Gilp, Isle of Cumbrae (1868), Loch Fyne, Duntroon (1869), Greenock (1871), Campbeltown (1873), Kyles of Bute (1874), and Robertson noted Post Tertiary occurrences at Garnock, Kilwinning, Paisley (1877) and Greenock (1885). In 1900 Wright obtained this species from the Pleistocene of Moel Tryfaen, and in 1906 Reade and Wright obtained one specimen from the Pleistocene of the Isle of Man. MacFadyen in 1932 recorded an East Anglian Pleistocene occurrence. Wright in 1902 obtained one specimen from the Drift of County Cork. Boulder Clay occurrences have been noted from Caithness (Crosskey and Robertson 1868), Cheshire (Shone 1874), Bridlington Quay (Crosskey 1884, Vale of Clwyd (Reade 1897), Cheshire (Wright 1899), Carrickfergus (Wright 1903), and County Down (Wright 1904). A Lower Boulder Clay occurrence of this species was noted from Lancashire and Cheshire by Reade in 1874, and Upper Boulder Clay occurrences have been recorded from West Cheshire and Liverpool by Shone in 1878, and from County Dublin by Wright in 1903.

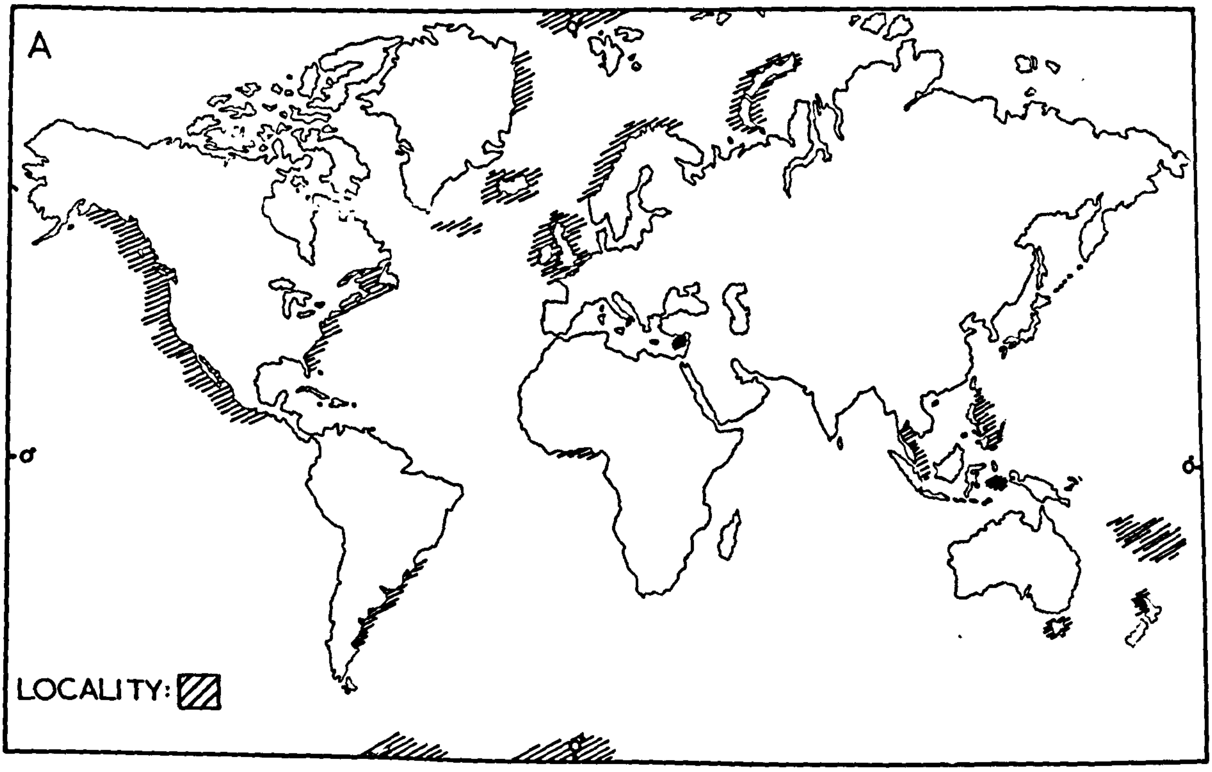
World Holocene occurrences have only been recorded from two localities, at Bruges by Reade in 1898, and in the Dollart-Ems estuary by Voorthuysen in 1960.

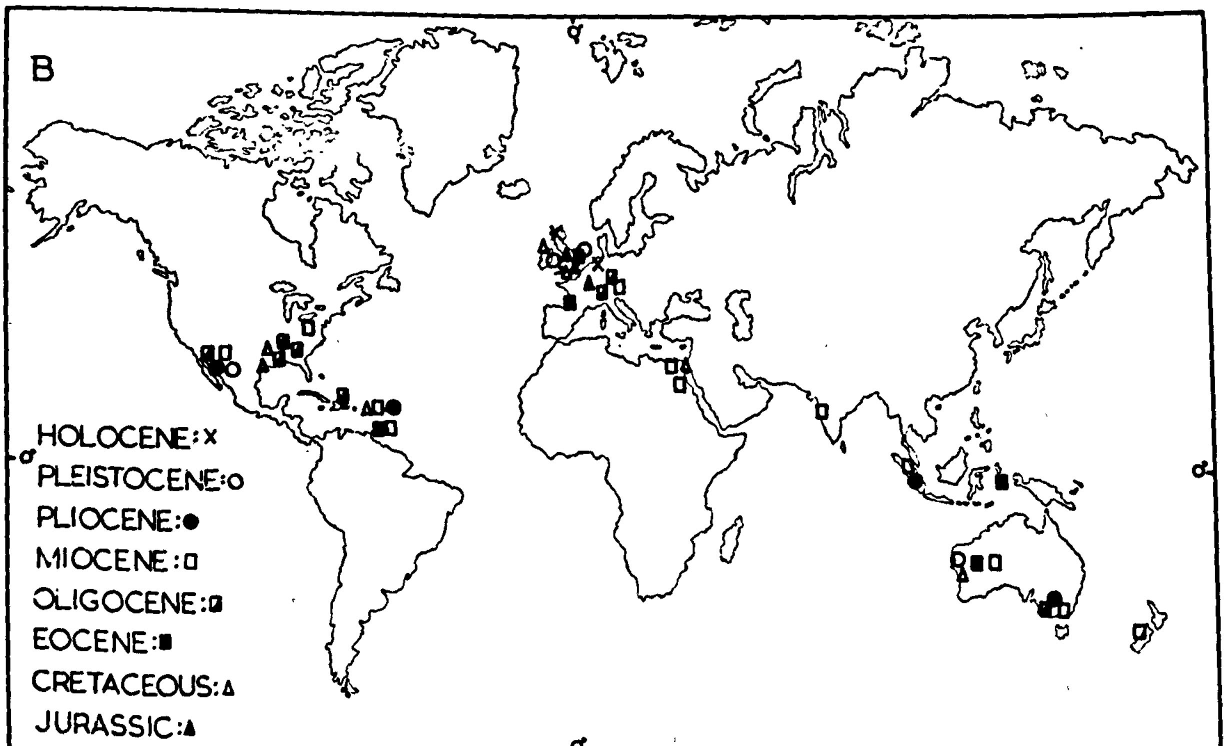
Tellmann in 1960 recorded a Jurassic occurrence in the Gosau Basin of the Austrian Alps. In 1892 Jukes, Browne, and Harrison recorded this form from the Cretaceous of Barbados, and other Cretaceous occurrences were noted from Texas by Plummer in 1931, and Frizzell in 1954.

Tappan noted this form from the Lower Cretaceous of Northern Texas in 1940, and of Oklahoma and Texas in 1943. Upper Cretaceous occurrences were recorded from Western Australia by Crespin in 1938, from Northern Sinai and Egypt by Said and Kenawy in 1956, and from Australia by Belford in 1960. Eocene occurrences have been noted from Trinidad (Guppy 1892), Australia (Howchin 1893), Alabama (Garrett 1936), Mississippi (Mornhinveg 1941) and the Island of Ceram (Rutten and Horz 1946). Halkyard in 1917 and 1919 obtained this species from the Middle Eocene Blue Marl of Biarritz. Upper Eocene occurrences have been recorded from Trinidad by Nuttall in 1928 who noted the form ranging into the Miocene, from Egypt by Ansary in 1954, and from Nullabor Plains, Australia, by Crespin in 1956. Oligocene occurrences have been noted from Mississippi by Howe in 1928, from Hungary by Majzon in 1940, from Alabama by Howe in 1942, and by Cushman and McGlamery in 1942. Bermudez in 1949 obtained this form from the Middle Oligocene of the Dominician Republic, and Cushman and Ellison in 1945 recorded it from the same age in Texas. Kummerle recorded this species from the Upper Oligocene of Germany in 1963. Kleinpell and Weaver in 1963 noted this species from the Santa Barbara embayment, California where it ranged through to the Miocene, and a similar range was noted by Reed in 1965 from Victoria, Australia. This species has been recorded from the Miocene of Australia (Howchin 1893), Egypt and Sinai (MadFadyen 1930), East side of San Joaquin Valley, California (Cushman and Parker 1931), Netherlands Antilles (Drooger 1953), Gulf of Suez (Souaya 1955), Western India (Bhatia and Mandwal 1957), Carpathian foreland (Luczkowski 1957), and Virginia

(Sabol 1960). Cushman and LeRoy in 1938 noted this species in the Lower Miocene of California. In 1962 Kennett noted this form in the Upper Miocene of Çape Foulwind on the West coast of New Zealand, and Vella in the following year also recorded a New Zealdnd Upper Miocene occurrence. Chapman in 1898 recorded this species from Barbados where it ranged from the Miocene to Pliocene, and LeRoy in 1952 stated that this form ranged from the Middle Miocene to Pliocene in Central Sumatra. Pliocene occurrences have been recorded from California by Cushman in 1929, from South East Australia by Parr in 1939, from Timms Point, California by Cushman and Gray in 1946, and from the Los Angeles Basin, California by Martin in 1952. In 1912 Bagg noted this form ranging from the Pliocene to Pleistocene of Southern California, and a similar range was noted in 1962 at Parma by Papani and Pelosio. Lys and Vatan in 1952 stated that this species occurred in the Neogene of the Rhone Vally. LeRoy in 1953 obtained this species from the Maqfi section (Lower Tertiary), Egypt and other Tertiary occurrences have been noted from Malaya by Jones and Parker in 1859 and 1860, from Port Phillip, Victoria, Australia by Chapman and Parr in 1926, from the Netherlands by Ten Dam in 1944, from Cape Range, Western Australia by Crespin in 1955, from the Rhine area by Ellermann in 1963, and from West Emsland, Germany by Ellermann in 1963. Collins in 1953 noted a Dleistocene occurrence of this species at Port Fairy, Western Victoria.

Diagnosis: This species does not appear to be restricted by depth although it does indicate a preference for shallow water environments irrespective of temperature. This weâl distributed form ranges from the Jurassic to Recent being well represented at all ages.





TEXT FIG. 30 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- LAGENA SULCATA

Lagena sulcata (Walker and Jacob) var. interrupta Williamson 1848

Pl.11, figs. 5a,5b,5c.

1848 Lagena striata (Montagu) var. interrupta WILLIAMSON. Ann.Mag. Nat.Hist.Ser.2,Vol.1,p.14, pl.1,fig.7.

1858 Lagena vulgaris Williamson var. interrupta Williamson. WILLIAMSON. Rec.For.Gt.Brit.Ray.Soc.London. p.6,pl.1,fig.11.

1884 Lagena sulcata (Walker and Jacob) var. interrupta Williamson. BRADY. Chall.Rep.Zool.Vol.9, p.463,pl.57,figs.25,27.

1926 Lagena sulcata (Walker and Jacob) var. interrupta Williamson. CHAPMAN and PARR. Journ.Linn. Soc.Zool.London.Vol.36,p.375, pl.17,fig.7.

1949 Lagena sulcata interrupta Williamson ASANO. Journ.Pal. Vol123, No.4,p.424,Fig.1,nos.27,36.

1954 Lagena interrupta Williamson BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tome III. no.3, p.152,pl.6,figs.5,6.

1959 Lagena interrupta Williamson BOLTOVSKOY. Sec.de Marina Pub. H.1005,Buenos Aires.p.68,pl.9, fig.21.

Test free, unilocular, globular to ovate in outline, circular in cross section, the basal end bluntly rounded with a small circular, central, non costate, area. Apertural end produced into a strong elongate tapering neck which is ornamented with six marked straight longitudinal costae that are continued with similar ribs on the test body. Test ornamented by twenty six to thirty strong straight longitudinal costae. Some of the costae run to the apertural end while others originate about a third or two thirds of the way up the test and then terminate at the apertural end. Aperture small, circular, terminal, at the end of the neck.

Wall calcareous, tmansluscent, finely and densely perforate.

Dimensions: Length 0.45 mm. Diameter 0.25 mm.

Occurrence: Dead. DB.345,CB.404, CB.361.

Morphological remarks: This variety has often been incorrectly assigned to Williamson 1858, with the type being Lagena vulgaris Williamson var.interrupta which is morphologically identical to his earlier described and figured Lagena striata (Montagu) var. interrupta in 1848. This variety should, be reason of priority be accredited to Williamson 1848, with the type variety being Lagena striata (Montagu) var. interrupta Williamson. Boltovskoy in 1954 and 1959 raises this variety to specific level with his Lagena interrupta Williamson, but the differences between L.sulcata and L.sulcata var. interrupta are only of a varietal importance and do not justify the erection of a species. The morphological variation exhibited by this variety is similar to that shown by the parent species.

Distribution: Williamson in 1848 recorded this variety from Swansea, Rhossily, Tenby, Manobeer, Oxwich, Caswell, Sandwich, Oban, Roundstone, Connemara, Kyleakin, Scarborough and Boston March. It has also been recorded from off the coast of Durham and North Yorkshire by Robertson and Brady in 1876, from Liverpool Bay by Pearcey in 1891, from Dogs Bay by Wright in 1900, and from Plymouth by Worth in 1904. Heron-Allen and Earland recorded this form from Selsey Bill, Sussex in 1911, from Clare Island material in 1913, from West of Scotland and the South coast of Cornwall in 1916, and from the Plymouth district in 1930. The Marine Biological Association also obtained this variety from the Plymouth area in 1957, and Bruce, Colman and Jones in 1963 obtained it from the Isle of Man and surrounding area.

Brady in 1884 stated that this variety had a distribution virtually extending from the Arctic to Antarctic. It has been recorded from the Malay Archipelago by Millett in 1901, from the Falklands sector of the Antarctic by Earland in 1934, and from one station in the Antarctic by Chapman and Parr in 1937. Boltovskoy recorded this variety from the Gulf of San Jorge, Argentina in 1954, and from off Southern Brazil in 1959.

Stratigraphic Occurrence: The only record of this variety occuring in Holocene deposits of the British area, was that made from Borth, Cardiganshire by Adams and Haynes in 1965.

Robertson in 1882 obtained this variety from the Post-Tertiary beds of Lewis. In 1954 Ansary recorded this variety from the Upper Eocene of Egypt, and Miocene occurrences have been noted from Japan by Asano in 1949, and from the Carpathian foreland by Luczkowski in 1957. Chapman and Parr in 1926 noted this form in the Tertiary of Port Phillip, Victoria, Australia.

Diagnosis: This variety has a similar distribution to C. sulcata and is often found in association with the type. It does not have a similar stratigraphic range as the type, but first appears in the Eocene and ranges through to the Recent.

Lagena sulcata (Walker and Jacob) *var. spirata* Bandy 1949

Pl.11. figs.6a,6b.6c.

1884 Pars. *Lagena sulcata* (Walker and Jacob) BRADY. Chall.Rep.Zool. Vol19,p.462,pl.57,figs.23,27.

1949 *Lagena sulcata* (Walker and Jacob) *var. spirata* BANDY. Bull.Am. Pal.Vol.32,No.131,p.57,pl.7, fig.18.

1964 *Lagena sulcata spirata* Bandy COPELAND. Bull.Am.Pal.Vol.47, No.215,p.246,pl.25,figs.7a,b.

1964 *Lagena sulcata* (Walker and Jacob) *var. spirata* Bandy. LEROY. U.S.Geol.Survey.Prof.Paper 454-F.p.F25,pl.13,figs.32,38.

Test free, unilocular, globular to elongate ovate, circular in cross section. Basal end bluntly rounded with a small, circular, non costate area, apertural end produced into a neck which is strong, tapering and about one third of the total test length, ornamented with four to six sinistral spiral costae which are continuous with the costae on the main test body. Test ornamented with twenty to twenty two longitudinal ribs, the majority of which run over the whole length of the test, the rest originating at the base and being discontinuous.

Aperture a simple, circular, terminal opening at the end of the neck.

Wall calcareous, transluscent, finely and densely perforate.

Dimensions: Length 0.50 mm. Diameter 0.27 mm.

Occurrence: Dead CB.346, CB.371, CB.380, CB.385, CB.403, CB.404, CB.661.

Dead, variation sample CB.696.

Morphological remarks: This variety differs from the type in the nature of neck ornamentation, and exhibits a similar range of variation as shown by the type.

Distribution: This species has not been recorded from the British Area to the present day, and Brady in 1884 has recorded the only world occurrence, from the South Pacific.

Stratigraphic Occurrence: Adams and Haynes in 1965 obtained this variety from the Holocene deposits of Borth, Cardiganshire.

Eocene occurrences have been noted from Alabama by Bandy in 1949, and from North Carolina, where it also occurs in the Miocene by Copeland in 1964. LeRoy in 1964 noted this variety as being rare in the Pliocene of Southern Okinawa.

Diagnosis: This variety appears to be a very rare type stratigraphically, and also at the present day, although it does seem to occur in temperate, shallow water coastal zones.

Genus: Lenticulina Lamarck 1804

Lenticulina suborbicularis Parr 1950

Pl.13, figs.4a,4b.

1950 Lenticulina (Robulus) suborbicularis PARR. B.A.N.Z.Antarctic Res. Exped.Repts.Foraminifera Adelaide. Ser.B,Vol.5,pt.6, p.321,pl.11,figs.5-6.

Test free, fairly large, planispiral, bi-laterally symmetrical, close coiled, involute, bi-umbonate, faces convex, peripheral edge acute with a well developed keel of variable width. Chambers fairly distinct, seven in the last whorl, the later part damaged, not inflated, elongate, flexuose, triangular in outline, increasing gradually and evenly in width as they approach the periphery, increasing fairly rapidly in size as added. Sutures distinct, flush, thickened. Last one or two chanbers broken so apertural face suggested to be from previous apertural faces, sagitatte, with a large radiate aperture, at the peripheral angle. Wall calcareous, thick, opaque.

Dimensions: Diameter 0.61 mm. Thickness 0.35 mm.

Occurrence: Dead CB.317.

Morphological remarks: Parr in 1950 stated that this species has probably been previously identified as (R).orbicularis (d'Orbigny), but is quite different. In d'Orbigny's species, each chamber is of almost equal width for the greater part of its length, whereas those of the above species increase gradually and evenly in width as they approach the periphery and are not as much reflexed as in L.(R).orbicularis

Distribution: Parr 1950 obtained the type species from Tasmania, where this form was common on the East coast of Tasmania, and off North East Tasmania.

Stratigraphic Occurrence: No stratigraphic records are available for this species.

Diagnosis: Incorrect identification as suggested by Parr, is probably due to the scarcity of records. It does appear to live in temperate latitudes, generally in shallow water, and could possibly be restricted to the Recent although this cannot be stated with certainty for the above reason.

Lenticulina varians (Bornemann) 1854

Pl.13, figs.3a,3b.

1854 *Cristellaria varians* BORNEMANN Ueber die Lias-formation in der Umgegend von Göttingen und ihre organischen Einschlüsse Berlin, Deutschland.A.W.Schada.p.41, pl.4,figs.32-34.

1941 *Cristellaria varians* Bornemann MacFADYEN. Phil.Trans.Roy.Soc. Ser.B,no.576,Vol.231,p.35,36. pl.2,fig.28.

1950 *Lenticulina varians* (Bornemann) BARNARD. Quart.Journ.Geol.Soc. Vol.106,pt.1,p.8,pl.II,fig.4. text-fig.2.

1952 *Lenticulina aff.varians* (Bornemann) USBECK. Neves.Jarhb.Geol.Palaont. Abhandl.Bd.95,p.395,fig.5,Taf.17. fig.52.

1955 *Lenticulina varians* (Bornemann) TAPPAN. U.S.Geol.Survey Prof. Paper 236-B,p.53,54,pl.18,fig.1.

1958 *Lenticulina varians* (Bornemann) SAID and BARRAKAT. Micropalaeontology Vol.4,No.3,p.250,pl.1,fig.9,pl.2, fig.10,pl.3,fig.33,pl.5,fig.33.

1959 *Lenticulina varians* (Bornemann) CIFELLI. Bull.Mus.Comp.Zool.Camb. Vol.121,No.7,p.297,298,pl.2, figs.11-13.

1961 *Lenticulina (Lenticulina) varians* (Bornemann) PIETRZENUK. Frieb. Forsch.C.113,Palaont.Akad.Verlang. Berlin.p.66,Taf.5,figs 2,8a,b.

Test free, small, planispiral initially, later tendency to uncoiling, compressed, bi-laterally symmetrical, biumbonate, periphery sub-acute, slightly carinate. Chambers moderately distinct, ten visible in the last whorl, slightly higher than wide at first, later markedly so, with the last few chambers giving an indication of flaring, increasing gradually at first and then rapidly in size as added. Sutures moderately distinct, slightly deppessed, curved, thickened. Apertural face higher than wide, oval, convex, with the aperture circular, radiate, situated at the top of the apertural face at the peripheral angle. Test glassy, black, re-crystallised(?).

Dimensions: Diameter 0.46 mm. Thickness 0.12 mm.

Occurrence: Dead CB.412.

Morphological remarks: The dark, recrystallised appearance of this species in Tremadoc Bay indicates that this is a reworked form; this question of reworking will be discussed later. Great variation in shape is exhibited by this species (Barnard 1960).

Distribution: There are no Recent living occurrences noted, where this form having occurred in Recent sediments it has been assumed that it is a reworked type.

Stratigraphic Occurrence: (Text-fig.25B). All stratigraphic records of this species are from the Jurassic, or Jurassic derived.

MacFadyen in 1933 recorded this species from Fenland Clays at Kings Lynn, and stated that it was derived from the Kimmeridge Clay. The same auther in 1941 obtained this form from the Lower Lias of Dorset. It has been recorded from the Upper Lias of Northamptonshire by Barnard in 1950, from the Bathonian of England by Cifell in 1959, and from the Upper Lias of England by Barnard in 1960.

Bornemann recorded the type species from the Lias of Gottingen in 1854. In 1952 Usbeck obtained this form from the Lias of the Stuttgart area, and in the following year Seibold and Seibold recorded it from the German Jurassic. Tappan in 1955 obtained this species from the Arctic slope of Alaska and stated it was a Jurassic foraminifer. It was recorded from the Lower Malm in the vicity of Trzebinia, Upper Silesia by Bielecka in 1956. Said and Barakat recorded this species from the Jurassic of Sinai and Egypt in 1958, and in the following year it was recorded from the Jurassic of the Ardennes by Garrot, Lacassagne, and Nouet. Pietrzenuk in 1961 recorded this species from the German Lias.

Diagnosis: This species appears to be a chatacteristic form of the Jurassic throughout the world, especially indicative of the Lias, and any post Jurassic occurrences are regarded as the result of reworking.

Family: Polymorphinidae d'Orbigny 1839

SubFamily: Polymorphininae d'Orbigny 1837

Genus: *Globulina* d'Orbigny in de la Sagra 1839

***Globulina gibba* (d'Orbigny) 1826**

Pl.13, figs.2a,2b.2c.

1826 *Polymorphina gibba* d'ORBIGNY Ann.Sci.Nat.Paris.France.Vol.7, p.266,no.26,Modeles no.63.

1846 *Globulina gibba* (d'Orbigny)d'ORBIGNY. For.Foss.Vienne.p.227, pl.XIII,figs.13.14.

1882 *Globulina gibba* (d'Orbigny)TERQUEM. Mem.Geol.Soc.France. Ser.3, Vol.2,Mem.3,p.130,pl.XIII, figs.22-27.

1884 *Polymorphina gibba* d'Orbigny BRADY. Chall.Rep.Zool.Vol.9,p.561, pl.71,fig.12.

1894 *Polymorphina gibba* d(Orbigny GOES. Kongl.Svensk.Veten.Akad. Handl.N.F. Bd.25,No.9,p.55,Tab.IX, figs.520-526.

1896 *Polymorphina gibba* d'Orbigny CHAPMAN. Journ.Roy.Micro.Soc. p.9,10,pl.II,fig.5.

1902 *Polymorphina gibba* d'Orbigny CHAPMAN. Foraminifera, Longmans. p.199,pl.11,fig.A.

1913 *Polymorphina gibba* d'Orbigny CUSHMAN. U.S.Nat.Mus.Bull.71.pt.3, p.85,pl.41,fig.4.

1922 *Polymorphina gibba* d'Orbigny CUSHMAN. Dept.Marine Biol.Carnegie Inst.Wash. Vol.17,p.34,pl.4,fig.9.

1926 *Polymorphina gibba* d'Orbigny CHAPMAN and PARR. Journ.Linn.Soc. Zool.London. Vol.36,p.391,pl.21, fig.71.

1927 *Globulina gibba* (d'Orbigny)CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.3,pt.1,pl.9,fig.15.

1927 *Polymorphina gibba* d'Orbigny STADNICHENKO. Journ.Pal. Vol.1. No.3,p.230,pl.38,figs.20-22.

1928 _Guttulina (Globulina) gibba_ (d'Orbigny) CUSHMAN and OZAWA. Contr.Cush.Found.Foram.Res.Vol.4, pt.1,pl.2,fig.4.

1928 _Polymorphina gibba_ (d'Orbigny) FRANKE. Her. Preub.Geol.Land.p.115, 116. Taf.X,figs.15,16.

1929 _Globulina gibba_ (d'Orbigny) CUSHMAN and OZAWA. Jap.Journ.Geol. Geog. Vol.VI,nos.3-4,11.pl.XVII, fig.3.

1930 _Glabulina gibba_ (d'Orbigny) CUSHMAN and OZAWA. Proc.U.S.Nat.Mus. Vol.77,Art.6,p.60,pl.16,figs.1-4.

1935 _Globulina gibba_ (d'Orbigny) CUSHMAN. U.S.Geol.Survey Prof.paper 181.p.25,pl.9,fig.18.

1939 _Globulina gibba_ (d'Orbigny) HOWE. Louisiana Geol.Survey Bull. no.14,p.53,pl.6,figs.25,26.

1940 _Globulina gibba_ (d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.16,pt.3,p.63,54,pl.11,fig.6.

1941 _Globulina gibba_ (d'Orbigny) TOULMIN. Journ.Pal.Vol.15,No.6, p.594,pl.80,fig.9.

1942 _Globulina gibba_ (d'Orbigny) CUSHMAN and McGLAMERY. U.S.Geol. Survey Prof.Paper 197-B.p.68,pl.4, fig.32.

1942 _Globulina gibba_ (d'Orbigny) CUSHMAN and RENZ. Contr.Cush.Found. Foram.Res. Vol.18,pt11,p.7,pl.2,fig.4.

1942 _Globulina gibba_ (d'Orbigny) CUSHMAN and SIEGFUS. Trans.San.Diego Soc.Nat.Hist.Vol.IX,no.34,p.409, pl.16,fig.26.

1942 _Globulina gibba_ (d'Orbigny) CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.18,pt.2,p.34,35,pl.6, figs.13.14.

1943 _Globulina gibba_ (d'Orbigny) CUSHMAN and APPLIN. Contr.Cush. Found. Foram.Res. Vol.19,pt.2,p.35,pl.7, fig.19.

1943 _Globulina gibba_ (d'Orbigny) CUSHMAN and FRIZZELL. Contr.Cush. Found.Foram.Res. Vol.19,pt.4,p.85 pl.14,fig.12.

1944 Globulina gibba (d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram.Res. Sp.Pub.no.12,p.22,pl.3,figs.18,19.

1944 Globulina gibba (d(Orbigny) CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.20,pt.1,p.23,pl.4,figs.17,18.

1944 Globulina gibba (d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.20,pt.2,p.39,40,pl.6,fig.19.

1945 Globulina gibba 4d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram.Res. Sp.Pub.no.13,p.14,pl.2,fig.5.

1945 Globulina gibba (d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.21,pt.1,p.4,pl.1,fig.9.

1945 Globulina gibba (d'Orbigny) CUSHMAN and ELLISOR. Journ.Pal.Vol.19, No.6,p.558,pl.74,fig.17.

1945 Globulina gibba (d(Orbigny) CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.21,pt.1,p.14,pl.3, fig.22.

1945 Globulina gibba (d'Orbigny) CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.21,pt.4,p.88,pl.14, fig.13.

1946 Globulina gibba (d'Orbigny) BELLEN van. Neded.Geologische Stichting.Ser.C.V.no.4,p.37,pl.3, fig.4.

1946 Globulina gibba (d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram.Res. Sp.Pub.no.16,p.18,19,pl.4,fig.16.

1946 Globuaina gibba (d'Orbigny) CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res. Sp.Pub.no.19,p.23,pl.4, fig.22.

1946 Globulina gibba (d'Orbigny) CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.22,pt.2,p.56,pl.10, fig.3.

1948 Globulina gibba (d'Orbigny) CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.24,pt.2,p.31,pl.5, fig.28.

1948 Polymorphina (Globuaina) gibba d'Orbigny DORREEN. Journ.Pal.Vol.22, No.3,p.289,pl.37,fig.7.

1949 Globulina gibba (d'Orbigny) BERMUDEZ. Contr.Cush.Found.Foram. Res.Sp.Pub.no.25,p.164,pl.11,figs.6,7.

1949 Globulina gibba (d'Orbigny) CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique Mem.III,p.23,pl.4,fig.16.

1951 Globulina gibba (d'Orbigny) CUSHMAN. U.S.Geol.Survey Prof.Paper 232,p.33,pl.9,figs.26-28.

1953 Globulina sp.cf. G.gibba (d'Orbigny) MILLER,Jr. Contr.Cush.Found. Foram.Res.Vol.4,pt.2,p.54,pl.8, fig.6.

1955 Globulina gibba (d'Orbigny) BHATIA. Journ.Pal.Vol.29,No.4,p.676, pl.67,fig.19.

1955 Globulina gibba (d'Orbigny) KAASSCHIETER in Drooger, Kaasschieter, and Key, Verhandl.Konin.Ned.Akad. Weten.Afd.Nat.DeelXXI,No.2,p.67 pl.5,fig.12.

1956 Globulina gibba (d'Orbigny) HAQUE. Geol.Survey Pakistan Vol.1, p.107,108,pl.30,fig.4.

1957 Globulina gibba (d'Orbigny) BOWEN. Micropaleontology. Vol.3, No.1,p.57,pl.1,fig.13.

1957 Globulina gibba (d'Orbigny) FORAMINIFERI PADANI. Agip Mineraria, pl.20,fig.1.

1958 Globulina gibba (d'Orbigny) HAYNES. Contr.Cush.Found.Foram.Res. Vol.9,pt.1,p.8,9,pl.3,figs.10,10a.

1959 Globulina gibba (d'Orbigny) BHATIA and MOHAN. Journ.Pal.Vol.33, No.4,p.653,Text-fig.3,fig.10.

1960 Globulina gibba (d'Orbigny) BARKER. Soc.Econ.Pal. and Min.Sp.Pub. no.9,p.148,pl.71,figs.11,12.

1960 Globulina gibba (d'Orbigny) HOFKER. Palaontologische Zeitschrift. Stuttgart W.Band 34,Nr.3/4,p.247, pl.C,figs.79,81.

1960 Globulina gibba (d'Orbigny) OLSSON. Journ.Pal. Vol.34,No.1, p.25,pl.3,fig.25.

1960 Globulina gibba (d'Orbigny) VOORTHUYSEN van. Verh.Kon.Ned.Geol. Mijnb.K.Gen.Geol.Serie.Deel 19,p.249, Taf.11,fig.4.

1961 Globulina gibba (d'Orbigny) KAASSCHEITER. Inst.Roy.des Sci.Nat. de Belgique Mem.147,p.183,pl.8,figs.6&7.

1962 Globálána gibba (d'Orbigny) McKNIGHT,Jr. Bull.Am.Pal.Vol.44, No.201,p.117,pl.16,fig.91.

1963 Globulina gibba (d'Orbigny) BROWNE and HERRICK. Bull.Am.Pal. Vol.46,no.210,p.260,pl.34,figs.19,20.

1963 Globulina gibba (d'Orbigny) KLEINPELL and WEAVER. Univ.Calif. Pubs.Geo.Sci.Vol.43,p.172,pl.7, fig.13.

1963 Globulina gibba gibba (d'Orbigny) KUMMERLE. Abhand.Hess.Landes. Boden.Heft.45,p.38,Taf.3,figs.8a-c.

Test free, globular to ovate in outline, sub-circular in transverse section, greatest width at or near the median line, tapering to the apertural and posterior ends. Chambers moderately distinct, increasing rapidly in size as added, few,four to six visible, inflated, rounded to ovate, arranged in a strongly overlapping sinistral quinqueloculine series, each chamber little removed from the test base, added in planes approximately 120° apart. Sutures distinct, flush, with a pronounced geniculation in the suture between the ultimate and penultimate chamber. Aperture terminal, slightly produced, radiate, circular to ovate. Wall calcareous, smooth, semi-transparent, densely and finely perforate.

Dimensions: Length 0.38 mm. Diameter 0.27mm.

Occurrence: Dead CB.316, CB.330, CB.387.

Morphological remarks: This species exhibits considerable range in size, amount of chamber overlap, and in the degree of chamber inflation. Fistulose specimens are not uncommon, although none were obtained from the study area.

Distribution: (Text-fig.31A). This species has been recorded from Bundoran, Ireland (Thompson 1847), from the Firth of Clyde (Robertson 1875), from the River Dee (Sidall 1876), from off the coast of Durham andnNorth Yorkshire (Robertson and Brady 1876), and from Dogs Bay, Connemara, Ireland (Brady 1884). In 1891 Pearcey obtained this form from Port Dinorwic and Liverpool Bay, and Robertson in the following year obtained it from Portree Bay, Isle of Skye. The British Association in 1896 published a list of foraminifera obtained from the Irish Sea and included this species in that list. It was recorded from Rathlin Island by Wright in 1902, from Plymouth by Worth in 1904, from the Gobbins, Ireland by Gough in 1906, and from Lambay, County Dublin by Wright in 1907. Heron-Allen obtained this species from 20 fathoms off the Isle of Man in 1915, and with Earland recorded it from Selsey Bill, Sussex in 1909 and 1911, from Clare Island in 1913, from 5 fathoms off Jura and from 20 fathoms off Ardnamuchan in 1914, from the South coast of Cornwall and West of Scotland in 1916, and from the Plymouth district in 1930. It was retrieved from four stations in the Plymouth area by the Marine Biological Association in 1957, and Bruce, Colman and Jones in 1963 noted it as being very rare from the Isle of Man and surrounding areas.

In 1884 Brady stated that this species was most abundant and best developed in shallow water and temperate zones and that it occured as far North as Novaya Zemlya and as far South as the Cape of Good Hope. Goes in 1894 noted it occuring in Arctic and Scandinavian waters. It was recorded from off Japan in 1910 by Cushman, and noted as being rare at one station in the Antarctic in 1914 by Pearcey. Cushman recorded this form from the Philippines area in 1921, from the Tortugas region in 1922, and with Ozawa in 1929 recorded it from Japan. It was noted from the ice free Falklands sector of the Antarctic by Heron-Allen and Earland in 1932, and by Earland in 1934. Cushman obtained this form from Vineyard Sound on the New England coast in 1944, and from Belgium material in 1949. In 1950 Parr recorded this species from Tasmania, and it was noted from Mason Inlet, North Carolina by Miller in 1953. It has been recorded from the Egyptian Mediterranean coast by Said and Kamel in 1957, from 35 metres in the Gulf of Gascogne by Berthois and Le Calvez in 1959, from the Gulf of Neapel by Hofker in 1960, and from the Mediterranean coast of Israel by Reiss, Klug and Merling in 1961. In 1962 McKnight obtained one specimen from 2,620 metres off Queen Maud Land, Antarctic, and Segura in 1963 obtained it from the littoral zone at Matamoros in the Gulf of Mexico.

Stratigraphic Occurrence: (Text-fig.31B). Recorded Holocene occurrences of this species in the British area have been made from Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Altcar, Great Crosby, (Wright 1904,1908), and Borth, Cardiganshire (Adams and Haynes 1965).

Chapman in 1896 recorded this species from the Gault of Folkestone, and occurrences in the Cretaceous were noted by Wright in 1886 at County Derry, Chapman at Taplow in 1892, and by Jones in 1900 from Southern England. It was obtained from the Reculver Silts (Paleocene) of Eastern Kent by Haynes in 1958, and London Clay occurrences (Eocene) were noted by Sherborn and Burrows in 1891, Chapman and Sherborn in 1899, and by

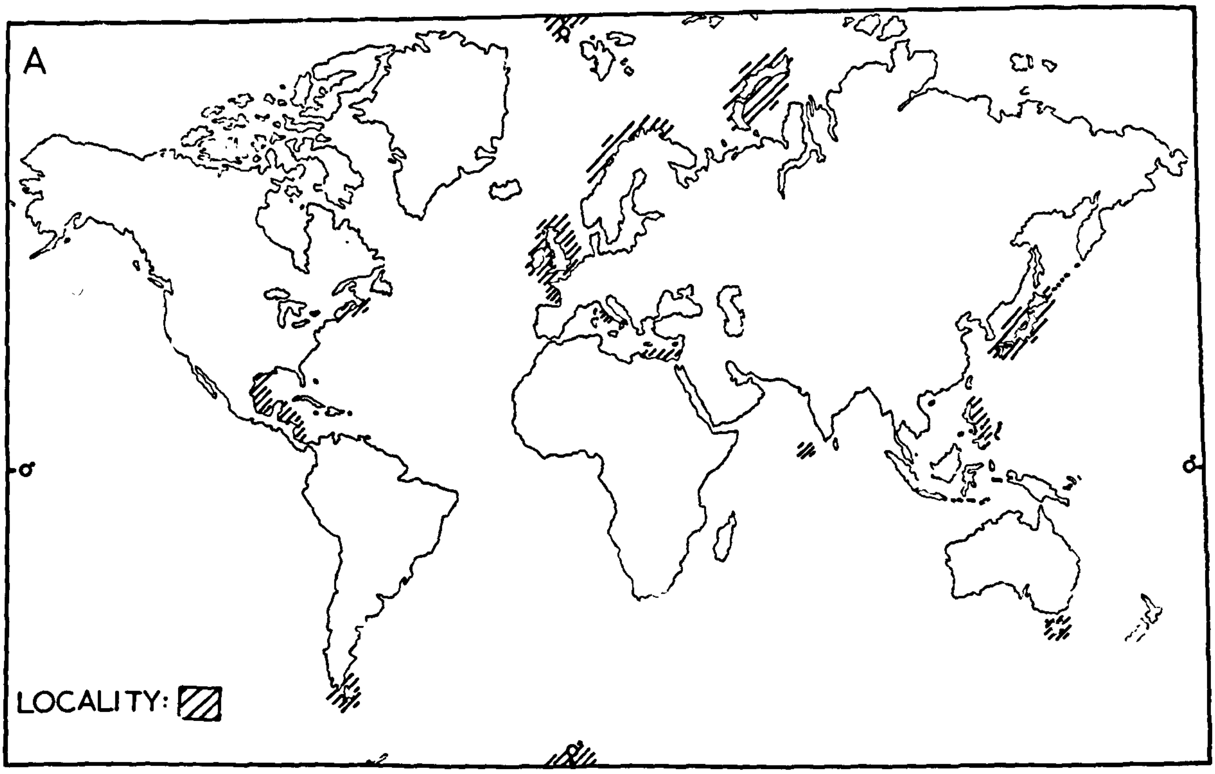
Bowen in 1954. The same author in 1957 recorded this form from the Upper Eocene of Hampshire. Bhatia in 1955 and 1957 noted this species occurring in Late Paleogene sediments on the Isle of Wight. Funnell in 1961 noted a Paleogene occurrence in Norfolk and stated that the species ranged through to the Early Pleistocene. Curry, Murray and Whittard in 1965 stated that this species occurred in the Paleogene of the Western approaches to the English Channel. Post Tertiary occurrences have been recorded by Robertson from Kilwinning in 1877, and from Greenock in 1885, and by Crosskey and Robertson from Loch Fyne in 1869, and from the Kyles of Bute in 1874. Wright in 1902 recorded this species from the Drift of County Cork, from the Boulder Clay of Carrickfergus in 1903, and from the Boulder Clay of County Down in 1904.

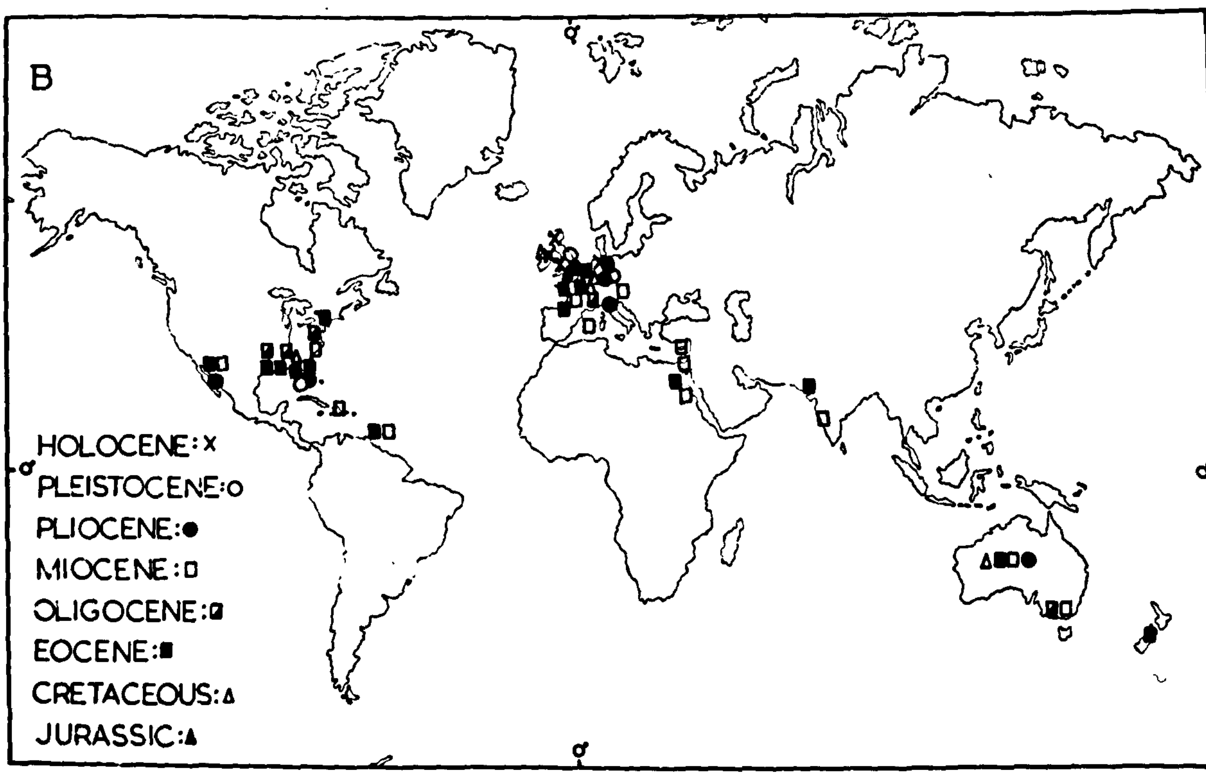
Reade in 1898 noted this species occurring in the Holocene at Bruges, and Voorthuysen in 1960 noted it in the Holocene of the Dollart-Ems estuary.

In 1928 Franke obtained this form from the Upper Cretaceous of North and Middle Germany. Howchin in 1893 stated that the species ranged through the Cretaceous, Eocene and Miocene of Australia, and Cushman in 1945 noted the species in the Cretaceous of Gergia and stated that it ranged through to the Tertiary, Paleocene occurrences have been recorded from North Dakota by Fox and Ross in 1942, from Alabama by Cushman in 1944, from Arkansas by Cushman and Todd in 1946, from localities in the United States by Cushman in 1951, from New Jersey by Hofker in 1955, and from Kentucky by Browne and Herrick in 1963. Brotzen and Pozaryska in 1957 obtained this species from a boring in Central Polamd where it constituted 1% of the Paleocene fauna. Haque in 1956 recorded the form from the Paleocene and Eocene of the Nammal Gorge, Pakistan, and Nogan in 1964 stated that this species ranged from the Upper Paleocene to Eocene in Maryland and Virginia. Eocene occurrences have been recorded from the Paris area (Terquem 1882), Trinidad (Guppy 1874; 1892; Cushman and Renz 1942), Alabama (Garrett 1936; Cushman 1940; Toulmin 1941; Cushman and Todd 1942; 1945), the State of Mississippi (Mornhinveg 1941; Cushman and Todd 1945; 1948), Louisiana (Howe 1939; Hussy 1949), Finistere and Brittany (Le Calvez and Boillot 1961), Belgium (Kaasscheiter 1961), Georgia (Cushman and Herrick 1945), Virginia (Cushman 1944), Eastern Texas and the Texas Gulf area (Stadnichenko 1927; Wienzierl and Applin 1929). A Lower to Middle Eocene record was made in 1946 by Bellen who noted the species in Belgium, the Paris area, and in the Northern Netherlands. Halkyard in 1917 and 1919 obtained the species from the Middle Eocene Blue Marl of Biarritz, and Applin in 1964 obtained it from the Middle Eocene of West Florida. Upper Eocene occurrences have been recorded from Alabama by Cushman in 1946, from New Zealand by Dorreen in 1948, and from Egypt by Ansary in 1954. Nuttall in 1928 stated that this species ranged through the Eocene to Miocene of Trinidad, and a similar range was noted in the Santa Barbara embayment, California by Kleinpell and Weaver in 1963. Cushman in 1935 noted that this species ranged through the Eocene to the Lower Oligocene on the Coastal Plain of the United States, and at Perugia the range was Eocene to Oligocene according to Nocchi in 1961. Oligocene occurrences were recorded from Alabama (Cushman and McGlamery 1942; Howe 1942), from the State of Mississippi (Howe 1928; Cushman and Todd 1946), from Washington State (Cushman dnd Frizzell 1943), from Texas (Garrett 1938), and from a bore in Hungary (Majzon 1940). Cushman and Todd in 1948 obtained the species from the Lower Oligocene of Red Bluff, Mississippi, and Langer in 1962 noted this form in the lower and Middle Oligocene of the North East Rhineland. Another Middle Oligocene occurrence was recorded in 1945 by Cushman and Ellisor from Texas. In 196[illegible] Kummerle obtained this form from the Upper Oligocene of Germany, and in 1965 Reed stated that this species occurred in the Oligo-Miocene of Victoria, Australia. In 1946 Schijfsma obtained this species from the Paleogene of South Limberg. Miocene occurrences were noted from Egypt and Sinai (MacFadyen 1930), the Carpathian foreland (Lucskovski 1957), South West France (Kaasschieter 1955), the Vienna Basin (Marks 1951), Western India (Bhatia and Mohan 1959), Cagliari (Caria 1959), and from New Jersey, Maryland and Virginia (Malkin 1953). Lower Miocene occurrences have been recorded from Trinidad by Guppy in 1873, from the Dominician Republic by Bermudez in 1949, from Cyprus by Henson, Browne and McGinty in 1949, and from Majorca by Colom in 1958. A range from the Miocene to the Pliocene by this species was noted in 1937 by Parr and Collins in Australia, and in 1950 by Voorthuysen in the Western Netherlands. Cushman in 1945 noted the species in the Pliocene of Castel Arquato, Italy, and in 1946 with Gray noted it in the Pliocene of Timms Point, California. Cole in 1931 noted this species ranging from the Pliocene to Pleistocene in Florida, and Voorthuysen in 1953 noted a similar range in a boring at Oosterhaut, Netherlands, where this species constituted

1.2% of the Pliocene fauna and less than .5% of the Pleistocene fauna. Lys and Vatan in 1952 obtained this form from the Neogene of the Rhone vally. Occurrences in the Australian Tertiary deposits have been noted by Chapman and Parr in 1926 from Victoria, by Crespin in 1954 from South Australia, by the same auther in 1955 from West Australia, and by Rao in 1955. Other Tertiary occurrences have been noted from the Netherlands (Ten Dam 1942), the Rhine area (Ellermann 1960), the Paris Basin (Rouvillois 1960), Oomaru, New Zealand (Hornibrook 1961), California (Cushman and Siegfus 1942), South Carolina (Cooke and MacNeil 1952), and from the New Jersey Coastal Pàain (Olssen 1960). A Quaternary occurrence of this species was noted from the Alps in 1963 by Bourcart, Damíani, Vernet, and Le Calvez.

Diagnosis: Although this species has a world wide distribution at all depths, it appears to prefer the more temperate latitudes and shallow waters with a sandy substrate. Stratigraphically it ranges from the Jurassic to Recent, being very well represented in the Paleogene.





TEXT FIG. 31 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- GLOBULINA GIBBA

Genus: Guttulina d'Orbigny in de la Sagra 1839

Guttulina lactea (Walker and Jacob) 1798

Pl.13. figs.1a,1b,1c,1d.

1798 Serpula lactea WALKER and JACOB. Adams Essays on the microscope p.634,pl.14,fig.4.

1858 Pars. Polymorphina lactea (Walker and Jacob) WILLIAMSON. Rec.For. Gt.Brit.Ray.Soc.London.p.79, pl.6,figs.145-152.

1865 Polymorphina lactea (Walker and Jacob) PARKER and JONES. Phil.Trans. Roy.Soc.Vol.155,p.359,pl.13, figs.45, 46.

1884 Polymorphina lactea (Walker and Jacob) BRADY. Chall.Rep.Zool.Vol.9, p.559,pl.71,fig.11.

1890 Polymorphina lactea (Walker and Jacob) BURROWS, SHERBORN, and BAILEY. Journ.Roy.Micro.Soc.pt.VIII, p.13,pl.XI,figs.9,10.

1896 Polymorphina lactea (Walker and Jacob) CHAPMAN. Journ.Roy.Micro.Soc. p.9,pl.II,fig.3.

1912 Polymorphina lactea (Walker and Jacob) BAGG. U.S.Geol.Survey Bull. no.513,p.71,pl.XXI,fig.12.

1913 Polymorphina lactea (Walker and Jacob) CUSHMAN. U.S.Nat.Mus.Bull. no.71,pt.3,p.84,pl.34,fig.8.

1926 Polymorphina lactea (Walker and Jacob) PLUMMER. Univ.Texas Bull. no.2644,p.121,122, pl.VI,fig.7.

1929 Polymorphina lactea (Walker and Jacob) BERRY and KELLEY. Proc. U.S. Nat.Mus.Vol.76,Art.19,p.9, pl.1,fig.12.

1929 Guttulina aff. lactea (Walker and Jacob) CUSHMAN and OZAWA. Jap.Journ. Geol.Geog. Vol.VI, nos.3-4,10. p.67,pl.XIV,figs.4,5.

1929 Guttulina lactea (Walker and Jacob) OZAWA. Contr.Cush.Found.Foram. Res. Vol.5, pt12,p.36,37, pl.6,figs.6-10.

1930 Guttulina lactea (Walker and Jacob) CUSHMAN and OZAWA. Proc. U.S.Nat.Mus.Vol.77,Art.6, p.43,pl.10,fig.14.

1944 Guttulina lactea (Walker and Jacob) CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.12,p.22, pl.3,figs.10,11.

1948 Guttulina lactea (Walker and Jacob) PARKER. Bull.Mus.Comp.Zool. Vol.100,no.2,pl.5,fig.3.

1949 Guttulina lactea (Walker and Jacob) VOORTHUYSEN van. Verh.Ned. Konin.Mijnb.Gen.Geol.Deel 15, p.66,pl.1,figs.6a,b.

1956 Guttulina lactea (Walker and Jacob) HAQUE. Geol.Survey Pakistan Vol.1,p.106,107,pl.28,fig.6.

1958 Guttulina lactea (Walker and Jacob) HAYNES. Contr.Cush.Found. Foram.Res.Vol.9,pt.1,p.4,pl.3, fig.1.

1959 Guttulina lactea (Walker and Jacob) BOLTOVSKOY. Sec.de Marina Marina Pub.H1005,Buenos Aires, p.73,plX,fig.1.

1960 Guttulina lactea (Walker and Jacob) HOFKER. Palaontologische Zeitschriff, Stuttgart W.Band 34,Nr.3/4,p.247,pl.C,fig.77.

1961 Guttulina cf. lactea (Walker and Jacob) FEYLING-HANSSEN.Vort. Fridt.Nansen.Geol.Symp.Spitzbergen.Vol.3,Bis.11,p.49, pl.1,fig.8.

1961 Guttulina lactea (Walker and Jacob) KAASSCHIETER. Inst.Roy. des Sci.Nat. de Belgique Mem.147, p.182,pl.VIII,fig.5.

1962 Guttulina cf. lactea (Walker and Jacob) McKENZIE. Journ.Roy.Soc. Western Australia. Vol.45,pt.4, p.124,pl.III,fig.2.

1964 Guttulina lactea (Walker and Jacob) FEYLING-HANSSEN. Nordes Geol. Undersokelse. Nr.225,p.297,298, pl.12,figs.12-14.

1965 Guttulina cf. lactea (Walker and Jacob) FEYLING-HANSSEN.Norsk.Polarinstitutt Meddel.Nr.93,p.25 pl.1,fig.8.

Free Form;

Test free, elongate ovate, greatest width at or near the median line, tapering to the acuminate apertural end and to the bluntly rounded basal end, sub circular to oval in transverse section. Chambers moderately distinct, elongate, gently inflated, few, four to six, added in a quinqueloculine series at planes 144° apart, each chamber extending further from the base but strongly overlapping, increasing rapidly in size as added. Sutures distinct, flush to slightly impressed. Aperture terminal, slightly produced, radiate, circulate to oval. Wall calcareous, semi-transparant, densely and finely perforate.

Fistulose Form;

Identical to the above except for the following features :-

Test attached, much more compressed, elliptical in transverse section. Aperture larger and slightly more spreading in type, and around the periphery of the test there has been a flange or plate of calcareous material develpped for attachment.

Dimensions: Free form; Length 0.34 mm. Diameter 0.20 mm.

Fistulose Form; Length 0.35 mm. Width (without flange) 0.22 mm.

Occurrence : Dead CB.307, CB.346, CB.356, CB.389, CB.393, CB.394 CB.633

Dead variation samples, CB.633, CB.693.

Morphological remarks: Variation is exhibited by this species in chamber length and degree of inflation, amount of chamber overlap, and degree of test compression. Fistulose forms are often found in association with the free types.

Distribution: (Text fig.32A). This species has been recorded from Belfast Bay (Williamson 1858), the Shetland Seas (Waller 1868), Budle Bay (Brady 1870), South East of Eddystone (Robertson 1970), and from the Firth of Clyde (Robertson 1875). In 1896 this form was noted from 50 miles South West of Ushant by Jones and Parker, from the River Dee by Sidall, and from off the coast of Durham and North Yorkshire by Roberson and Brady. Pearcey recorded this form from the Faroe Channel in 1890, and from Liverpool Bay in 1891. In the same year Burgess obtained this species from the River Mersey. In 1895 Wright obtained this form from Dogs Bay, and in the following year it was recorded from Barry Dock by Chapman and Jones, and from the Irish Sea by the British Association. It has been recorded from the Salcombe estuary (Worth 1900), Dogs Bay (Wright 1900), the Firth of Forth (Pearcey 1902), Plymouth, (Worth 1904), Red Bay, Ireland (Gouch 1906), and from Lambay, County Dublin (Wright 1907). Heron-Allen and Earland have recorded this species from shore sands at Selsey Bill, Sussex in 1909, and 1911, from the North Sea and Clare Island in 1913, from 12 fathoms in Loch Sunart and 20 fathoms off Ardnamuchan in 1914, from West of Scotland and off the South coast of Cornwall in 1916, and from the Plymouth region in 1930. Heron-Allen in 1915 noted this species as being frequent in 20 fathoms off the Isle of Man. Voorthuysen in 1949 stated that this was a mosttcommon species found in the shallow sea of England and Ireland. The Marine Biological Association in 1957 obtained this form from the Plymouth area, and Le Calvez in 1958 obtained two specimens South West of the

Cornish peninsula. Bruce, Colman and Jones in 1963 recorded this species as being frequent around the Isle of Man.

This species has been recorded from the Arctic, (Parker and Jones 1865) the Gulf and River St. Lawrence (Dawson 1870), the Arctic (Brady 1878) as far North as Novaya Zemlya and as far South as the Cape of Good Hope (Brady 1884), and from Scandinavia and the Arctic (Goes 1894). Millet in 1903 obtained this form from the Malay Archipelago. Cushman recorded this species from the North Pacific in 1913, from the China Sea in the vicinity of Hong Kong in 1921, and with Ozawa in 1929 from Japan. Heron-Allen and Earland in 1932 recorded this form from the Falklands Islands ice free area, and Earland in 1934 obtained two small specimens from this area. In 1937 Parr and Collins recorded this species off Victoria, Australia, and in 1944 Cushman recorded it from the New England coast. Norvang in 1945 recorded this species from Iceland, Cushman in 1948 from North East Greenland, and Parker in 1948 from the continental shelf between the Gulf of Maine and Maryland. This species was recorded from Narrangansett Bay by Said in 1951, from the Bay of Fundy by Harrington in 1955, and Boltovskoy has recorded it from off Brazil in 1959, and from the continental platform between Santo Tome and the Rio de la Plata, Argentina in 1961. Hofker in 1960 noted this form from the Gulf of Neapel, and McKenzie in 1962 obtained one specimen from Oyster Harbour, Albany, Western Australia. In 1963 it was recorded from the Bering Sea by Anderson, and from off the Ivory Coast by Le Calvez.

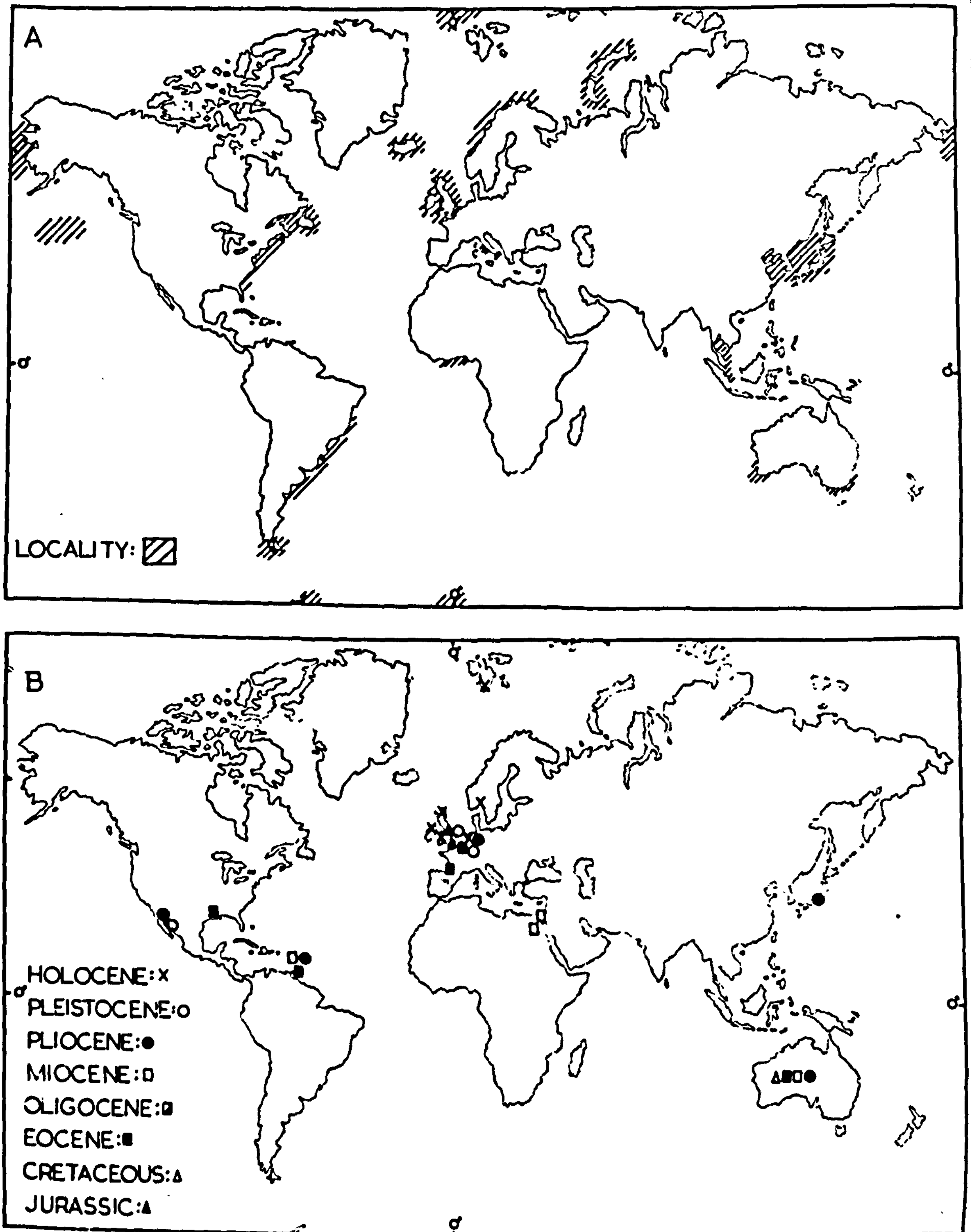
Stratigraphic Occurrence: (Text-fig.32B). British Holocene occurrences have been recorded from Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar (Wright 1904), Great Crosby (Wright 1908), Skye, County Antrim, English Fens, Swansea Docks (MacFadyen 1937;1938;1942), and from Borth, Cardiganshire, (Adams and Haynes 1965).

Jurassic records have been made from Yorkshire by Blake in 1872, from Folkestone by Chapman in 1896, and from Buckinghamshire by Hollis and Neaverson in 1921. Heron-Allen and Earland obtained this species from the shore sands of Selsey Bill, Sussex in 1910 and stated that it was derived from the Cretaceous. In 1958 Haynes noted this form occuring in the Reculver Silts (Paleocene) of East Kent. Funnell in 1961 stated that in Norfolk this species ranged from the Paleogene to Early Pleistocene, and with West in 1962 obtained it from the Early Pleistocene of Suffolk. Post-Tertiary occurrences were noted by Crosskey and Robertson from Dumbartonshire in 1867, from Loch Gilp in 1868, from Bute and Campbeltown in 1873, and from the Kyles of Bute in 1874. Robertson also noted this species in Post Tertiary deposits at Garnock and Paisley in 1877, and at Greenock in 1885. The same author in 1883 obtained this form from the Drift of Inverneshire, and Gough in 1904 obtained it from glacial sands at Belfast. Shone in 1878 recorded the species from the Upper Boulder Clay of West Cheshire and Liverpool, and other Boulder Clay occurrences have been noted from Caithness (Brady 1867; Crosskey and Robertson 1868), from Cheshire (Shone 1874), from Bridlington Quay (Crosskey 1884), from the Vale of Clwyd (Reade 1897), and from Carrickfergus (Wright 1903).

Reade in 1898 recorded this species from the Holocene of Bruges, and other Holocene occurrences have been noted by Feyling-Hanssen from South West Barents Island in 1961, from the Oslo Fjord area in 1964, and from Spitzbergen in 1965.

Howchin in 1893 noted this form in the Australian Cretaceous, where he stated that it also occurred in the Eocene, Miocene and Post Tertiary deposits of this country. A Paleocene occurrenceswas noted from the Nammal Gorge, Pakistan, where it was found occurring in the Ranikot by Haque in 1956. Halkyard in 1917, and 1919 retrieved this form from the Middle Eocene Blue Marl of Biarritz, and other Eocene occurrences have been noted from Trinidad by Guppy in 1892, from Texas by Plummer in 1926, and from Belgium by Kaasschieter in 1961. In 1930 MacFadyen noted this species in the Miocene of Egypt and Sinai, and Chapman in 1898 noted this form ranging from the Miocene to Pliocene in Barbados. Parr and Collins in 1937 noted the occurrence of this species in the Lower Pliocene of Australia. In 1957 Asano noted this form in the Pliocene of Hapan, and Voorthuysen in 1953 stated that this species constituted less than .5% of the fauna of the Pliocene section of a boring at Oosterhaut in the Netherlands. Bagg in 1912 noted the form in the Pliocene of Southern California where it ranged through to the Pleistocene. Tertiary occurrences have been recorded from Malaga, Turin, Palermo, and Malta (Jones and Parker 1860), from South Australia (Parker and Jones 1860), from South Australia and from Cape Range, Western Australia (Crespin 1954, 1955). Voorthuysen in 1949 noted a Pleistocene occurrence of this species in the Netherlands.

Diagnosis: Although this species can be found at almost every latitude at every depth it appears to prefer a temperate latitude, shallow water environment. It is often found in association with *Globulina gibba* and has a similar stratigraphic occurrence.



TEXT FIG. 32 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF:- GUTTULINA LACTEA

Family: Glandulinidae Reuss 1860

SubFamily: Oolininae Loeblich and Tappan 1961

Genus: Oolina d'Orbigny 1839

Oolina hexagona (Williamson) 1848

Pl.12, figs.1a,1b.

1848 Entosolenia squamosa (Montagu) var.y.hexagona WILLIAMSON. Ann.Mag.Nat.Hist.London,Ser.2, Vol.1,p.20,pl.2,fig.23.

1884 Lagena hexagona (Williamson) BRADY. Chall.Rep.Zool.Vol.9, p.472,pl.LVIII, figs.32,33.

1894 Lagena hexagona (Williamson) GOES. Kongl.Svensk.Veten.Akad. Handl.N.F.Bd.25,No.9,p.80, Tab.13,fig.746.

1900 Lagena hexagona (Williamson) READE. Geol.Mag.Vol.VII,p.100, pl.V,fig.15.

1913 Lagena hexagona (Williamson) CUSHMAN. U.S.Nat.Mus.Bull.no.71, pt.3,p.17,pl.6,figs.2,3.

1929 Lagena hexagona (Williamson) CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.5,pt.3,p.72,pl.11,fig.18.

1931 Lagena hexagona (Williamson) COLE. Florida State Geol. Survey Bull.no.6,p.28,pl.6,fig.7.

1931 Lagena hexagona (Williamson) CUSHMAN. State.Tenn.Dept.Ed.Div. Geol.Bull.no.41,p.38,pl.5, fig.12.

1931 Lagena (Entosolenia) Hexagona (Williamson) WIESNER. Deutsche. SudPolar Exped.Bd.XX,Bd.XII, p.119,Taf.XVIII,fig.217.

1935 Lagena hexagona (Williamson) CUSHMAN. U.S.Geol.Survey Prof. Paper 181,p.23,pl.9,fig.10.

1939 Lagena hexagona (Williamson) HOWE. Louisiana Geol.Survey Bull. no.14,p.50,pl.6,fig.16.

1940 Lagena hexagona (Williamson) BUCHNER. Acta.Nova Leopoldina, N.F.Bd.9,No.62,p.432,Taf.V, figs.73-77.

1943 Lagena hexagona (Williamson) BECK. Journ.Pal.Vol.17,No.6, p.602,pl.107,fig.23.

1943 Lagena hexagona (Williamson) FRIZZELL. Journ.Pal.Vo.17,No.4, p.348,pl.56,fig.26.

1944 Entosolenia hexagona Williamson CUSHMAN and SIMONSON. Journ.Pal. Vol.18,No.2,p.198,pl.32,fig.8.

1944 Lagena hexagona (Williamson) TEN DAM. Meded.Geol.Stichting. Serie C-V,no.3,p.103,Taf.2,fig.18.

1945 Lagena hexagona (Williamson) CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.21,pt.1,p.3,pl.1,fig.7.

1948 Lagena hexagona (Williamson) PARKER. Bull.Mus.Comp.Zool. Vol. 100,no.2,pl.4,fig.19.

1949 Lagena hexagona (Williamson) CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique. Mem.111,p.22,pl.IV, fig.7.

1950 Oolina hexagona (Williamson) VOORTHUYSEN van. Geol.Meded. Stichting.n.s.No.4,p.56,pl.1, fig.12.

1952 Lagena hexagona (Williamson) MARTIN. Contr.Cush.Found.Foram. Res.Vol.3,pt.3,p.121,pl,18,fig.3.

1953 Lagena hexagona (Williamson) LEROY. Geol.Soc.Am.Mem.54,p.36, 37,pl.8,fig.16.

1953 Oolina hexagona (Williamson) LOEBLICH and TAPPAN. Smith Miscell. Coll.Pub.4105,vol.121,No.7,p.69, pl.14,figs.1,2.

1954 Oolina hexagona (Williamson) BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tome III, no.3, p.156,pl.6,fig.11.

1955 Lagena cf. L.hexagona (Williamson) WEISS. Journ.Pal.Vol.29,No.1,p. 12,pl.3,fig.12.

1956 Lagena hexagona (Williamson) HAQUE. Geol.Survey Pakistan.Vol.1, p.92,93,pl.10,figs.7,9,10.

1957 Lagena hexagona (Williamson) FORAMINIFERI PADANI. Agip Mineraria pl.17,fig.9.

1957 <u>Oolina</u> <u>hexagona</u> (Williamson) VOORTHUYSEN van. Med.Geol. Stichting.N.S.No.11,p.36,Taf.26, fig.39.

1958 <u>Lagena</u> <u>hexagona</u> (Williamson) HAYNES. Contr.Cush.Found.Foram. Res.Vol.9,pt.3,p.72,pl.17, figs.8-8b.

1959 <u>Oolina</u> <u>hexagona</u> (Williamson) BOLTOVSKOY. Sec.de Marina Pub. H1005, Buenos Aires, p.69,pl.9, fig.20.

1960 <u>Oolina</u> <u>hexagona</u> (Williamson) BARKER. Soc.Econ.Pal.and Min. Sp.Pub.no.9,p.120,pl.58,figs.32.33.

1960 <u>Lagena</u> <u>hexagona</u> (Williamson) BELFORD. Aust.Bur.Min.Res.Geol and Geophys. Bull.no.57,p.55,pl.14, figs.14-15.

1960 <u>Oolina</u> <u>hexagona</u> (Williamson) VOORTHUYSEN.van. Verh.Kon.Ned. Geol.Mijnb.K.Gen.Geol.Serie. Deel 19,p.246,Taf.10,fig.14.

1961 <u>Oolina</u> <u>hexagona</u> (Williamson) BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Zool.Tome VI,no.6,p.290, pl.V,fig.25.

1962 <u>Oolina</u> <u>hexagona</u> (Williamson) HAAKE. Geol.Inst.Univ.Kiel.Meynlana Band.12,p.35,36,Taf.2,fig.5.

1963 <u>Lagena</u> <u>sp.cf.</u> <u>L.hexagona</u> (Williamson) KAVARY and FRIZZELL. Bull. Univ.Miss.Sch.Mines.Met.Tech. Ser.No.102,p.23,pl.3,fig.10.

1963 <u>Lagena</u> <u>hexagona</u> (Williamson) KUMMERLE. Abhand.Hess.Londes. Boden.Heft.45,p.34,Taf.4,fig.2.

1964 <u>Oolina</u> <u>hexagona</u> (Williamson) FEYLING-HANSSEN. Nordes.Geol. Undersokelse,Nr.225,p.311, pl.15,fig.4.

Test free, monothalmous, small globular, greatest width of the test at the base which is bluntly rounded, tapering to the apertural end which has a very small prolongation or neck. Aperture terminal, at the end of the neck very small, simple circular, central.

Entosolenian tube present, extending into the test body for about one eighth of the distance. Test body covered with hexagonal concave aureolae, not arranged in well designated perpendicular rows, but successive rows of aureolae appear to alternate over the test surface with each other. Edges of successive aureolae appear as definite ridges and this gives the test a honeycombed appearance. Well calcareous, thin transluscent, densely and finely perforate.

Dimensions: Length 0.25 mm. Diameter 0.16 mm.

Occurrence: Dead CB.345, CB.412.

Dead, variation sample CB.696.

Morphological remarks: There is considerable variation in the external appearance of this species, due primarily to the degree of elevation of the hexagonal reticulations and the regularity of their angular outlines. Haynes 1958 stated that it is uncertain whether differences in size of the hexagons are of infraspecific value. Specimens can be found at every state of development that are intermediate between L.squamosa, L.reticulata, and L.hexagona (Heron-Allen and Earland 1913).

Distribution: (Text-fig.33A). This species has been recorded from stations around the British Isles (Williamson 1848), from the Firth of Clyde (Robertson 1875), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), from the Atlantic Docks, Liverpool (Robertson 1883), at 1,000 fathoms off the South West coast of Ireland (Wright 1889), and from the warm and cold areas of the Faroe Channel (Pearcey 1890). In 1891 this form was noted from the River Mersey by

Burgess, and from Caernarvon Bay and Liverpool Bay by Pearcey. It was recorded from Portree Bay, Isle of Skye by Robertson in 1892, and from Port Erin by Chaffer in 1894, from Dogs Bay by Wright in 1895, and from the Irish Sea by the British Association in 1896. In 1900 Wright noted this species in Dogs Bay, and Worth noted it in Salcombe estuary. Worth in 1902 recorded it from the Exe estuary, and Wright in the same year obtained it from Recent clay in the Valley of the River Lune. This form has been recorded from Plymouth by Worth in 1904, from Larne Lough, Ireland by Gough in 1906, and from Lambay, County Dublin, by Wright in 1907. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1911, from the North Sea and Clare Island in 1913, from 12 fathoms in Loch Sunart, 20 fathoms in the Sound of Mull, and 5 fathoms off Jura in 1914, from the South coast of Cornwall and West of Scotland in 1916, and from the Plymouth area in 1930. Heron-Allen obtained this form from 20 fathoms off the Isle of Man in 1915. In 1957 the Marine Biological Association noted this species in the Plymouth district, and in the following year Le Calvez recorded it from the Mer Celtique, West of France and South of Ireland. This species was recorded as frequent from the Isle of Man and surrounding area in 1963 by Bruce, Colman and Jones.

This species has been recorded from off Honolulu Reefs, South Pacific (Brady 1884), from Scandinavia and the Arctic (Goes 1894), from the Malay Archipelago (Millett 1901), from the South West Pacific Ocean (Sidebottom 1912), and from the North Pacific (Cushman 1913).

In 1913 this form was noted from the Cabot Strait by Kindle, and from one station from the South Pole at depths of 380 metres and 385 metres by Wiesner. Heron-Allen and Earland obtained it from the ice free area of the Falkland Islands in 1932, Natland in 1933 from the Southern California region, and Earland in 1934 from the Falklands sector of the Antarctic. It was recorded from one station in the Weddell Sea by Earland in 1936, from three stations in the Antarctic by Chapman and Parr in 1937, and from the Gulf of Naples by Buchner in 1940. Norvang recorded this species from off Bergen in 1941, and from Iceland in 1945. Parker in 1948 obtained the form from the continental shelf between the Gulf of Maine and Maryland, Ruscelli in 1949 from the Ligurian Sea, Italy, Cushman in 1949 from Belgium, and Parr in 1950 from Tasmania and the Antarctic. An Arctic occurrence was notedd by Loeblich and Tappan in 1953, and Boltovskoy in 1954 recorded it from the Gulf of San Jorge, Argentina. In 1957 Vella recorded this form from Cook Strait, New Zealand, and in the following year it was recorded from the Central Tyrrhenian Sea by Norin, and by Todd from the Recent portion of a core taken in the Western Mediterranean. One individual was obtained by Boltovskoy in 1959 from off Southern Brazil. In 1960 Green recorded it from the Arctic Basin, and Asano recorded itfrom the Japanses seas at depths of 90-402 metres with a temperature range of 1.1°C - 21.1°C. In the following year Boltovskoy obtained this form from the continental platform between Santo Tome and the Rio de la Plata, Argentina. In 1962 this species was recorded from the Adriatic Sea by Cita and Chierici, from the North Sea by Haake, and from the Arctic continental shelf at a depth of 472 metres, at a temperature of +0.28°C by Wagner. Le Calvez in 1963 recorded this species off the Ivory coast, and in 1964 Hulme obtained it from Manukau Harbour, Auckland, New Zealand.

Stratigraphic Occurrence (Text-fig.33B). Recorded British Holocene occurrences have been made from Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Great Crosby (Wright 1908), County Antrim (MacFadyen 1937), and Borth Cardiganshire (Adams and Haynes 1965).

Heron-Allen and Earland in 1910 obtained Cretaceous derived individuals from shore sands at Selsey Bill, Sussex. Haynes in 1958 recorded this species in the Pegwell Marls (Paleocene) of East Kent, and Bowen in 1954 recorded an Eocene occurrence in the London Clay. It was recorded from the Pleistocene of the Isle of Man in 1906, by Reade and Wright. Wright in 1902 obtained this form from the Drift of County Cork, and Boulder Clay occurrences have been noted from the Vale of Clwyd (Reade 1897), Great Crosby and Carrickfergus (Wright 1898;1903).

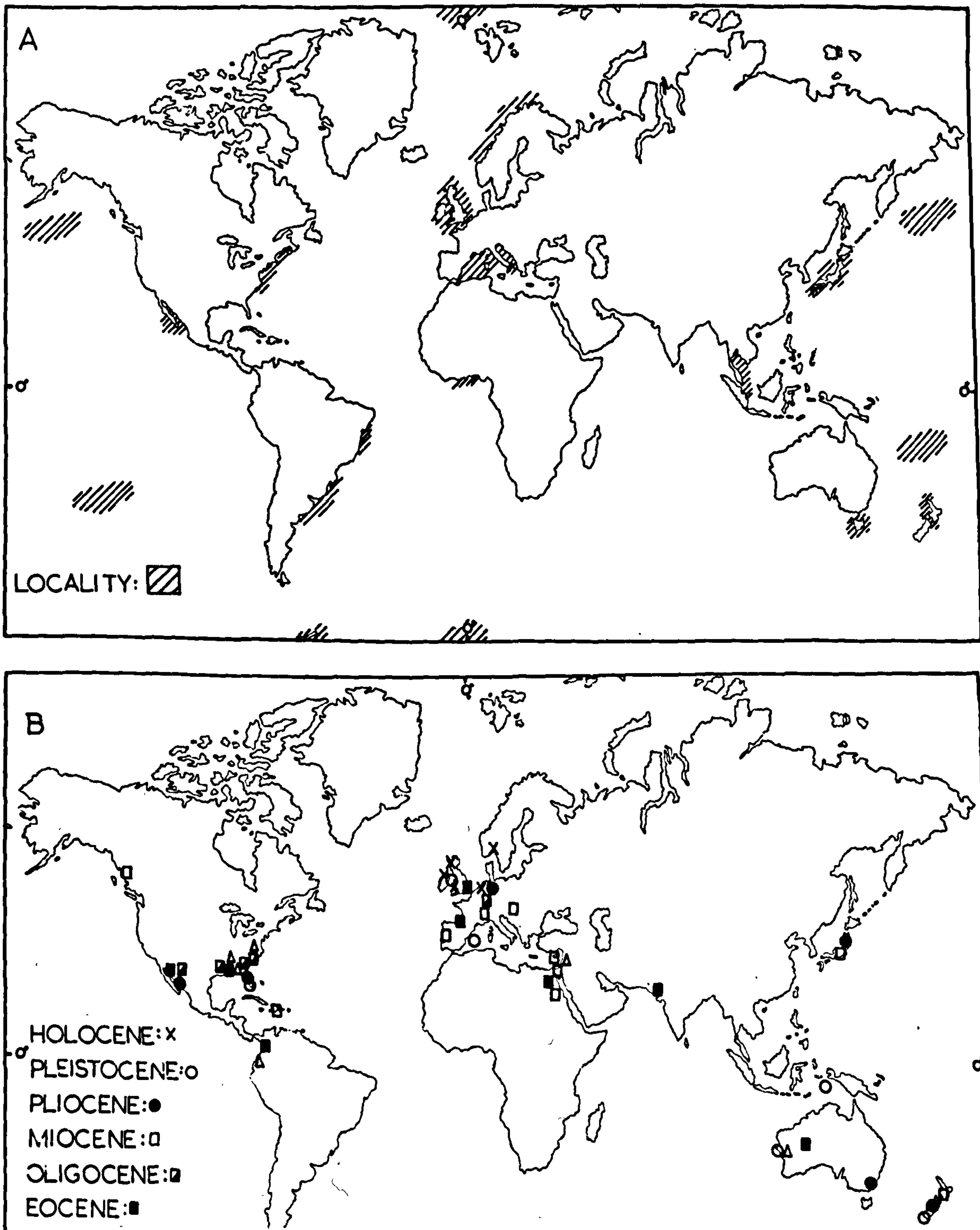
Holocene occurrences have been recorded from Bruges (Reade 1898), from the Dollart-Ems estuary (Voorthuysen 1960), and from the Oslo Fjord area (Feyling-Hanssen 1964).

All Cretaceous occurrences recorded appear to be from the Upper portion and these have been noted from Tennessee (Cushman 1931), Western Australia (Crespin 1938), North West Peru (Frizzell 1943), Australia (Belford 1960), and West Central Iran (Kavary and Frizzell 1963). Cushman in 1945 obtained this species from the Cretaceous of

Georgia and stated that it ranged through into the Tertiary, and Olssen in 1960 noted it ranging from the Upper Cretaceous to Early Tertiary on the New Jersey coastal plain. Weiss recorded this species from the Paleocene of Peru in 1955, and Nogan in 1964 noted it ranging from the Upper Paleocene to Eocene in Maryland and Virginia. Eocene occurrences have been noted from Australia (Howchin 1893), Louisiana Cook Mountain (Howe 1939), Mississippi (Mornhinveg 1941), Washington, (Beck 1943), Coastal Ecuador (Cushman and Stainforth 1951), and from the Laki of the Nammal Gorge, Pakistan (Haque 1956). Halkyard in 1917 and 1919 obtained this form from the Middle Eocene Blue Marl of Biarritz. Cushman in 1935 recorded this species from the Upper Eocene of the South East United States, and Ansary in 1954 noted it from the Upper Eocene of Egypt. A range of this species from the Upper Eocene to Oligocene was noted in California by Cushman and Simonson in 1944. Occurrences in the Oligocene of the State of Mississippi were noted by Howe in 1928, and by Cushman and Todd in 1946. Middle Oligocene occurrences have been noted from Texas by Cushman and Ellisor in 1945, and from the North East Rhineland by Langer in 1962. Kummerle in 1963 obtained the species from the Upper Oligocene of Germany. Miocene occurrences have been recorded from Egypt and Sinai (MadFadyen 1930), from Japan (Asano (1949), from the Dominician Republic (Bermudez 1949), from the Vienna Basin (Marks 1951), from Northern Columbia (Redmond 1953), from the Carpathian foreland (Luczkowski 1957), from Spain (Delga and Magne 1958), and from the Gulf of Suez region (Souaya 1965). Henson, Browne and McGinty in 1949 obtained this species from the Lower Miocene of

Cyprus. In 1962 Kennett noted the form in the Upper Miocene of Cape Foulwind, West coast of New Zealand, and Vella recorded this species from the New Zealand Upper Miocene in 1963 and 1964. In 1962 Vella stated that in New Zealand this species ranges from the Upper Miocene to Lower Pleistocene. Pliocene occurrences have been noted from California (Cushman 1929), South East Australia (Parr 1939), Western Netherlands (Voorthuysen 1950), Japan (Asano 1950), and from the Los Angeles Basin, California (Martin 1952). Cole in 1931 obtained this species from the Pliocene and Pleistocene of Florida, and Papani and Pelosio in 1962 noted it ranging from the Pliocene to Pleistocene near Parma. A Neogene occurrence was noted from the Rhone Valley by Lys and Vatan in 1952, and Tertiary occurrences have been recorded from the Netherlands by Ten Dam in 1944, from Egypt by LeRoy in 1953, from South Australia by Crespin in 1954, and from the Rhine area, Germany by Ellerman in 1960. An occurrence in the Pleistocene of Port Fairy, Western Victoria was noted by Collins in 1953, and Todd in 1958 obtained this species from the Pleistocene portion of a core from the Western Mediterranean. In 1959 Reyment obtained this species from Pleistocene deposits in the Mindano Trough, West Pacific.

Diagnosis: This species has a world wide distribution at every depth, but prefers comparatively shallow waters. Stratigraphically it ranges from the Cretaceous to Recent being well represented in the Tertiary.



TEXT FIG. 33 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- <u>OOLINA HEXAGONA</u>

Oolina laevigata d'Orbigny 1839

Pl.12, figs.2a,2b.

1839	Oolina laevigata	d'ORBIGNY	Voy.L'Am.Merid.Foram.France.Tome. 5,pt.5,p.19,pl.5,fig.3.
1927	Oolina laevigata	d'Orbigny	GALLOWAY and WISSLER. Journ.Pal. Vol.1,No.1,p.50,pl.8,fig.10.
1932	Lagena laevigata	(d'Orbigny)	HERON-ALLEN and EARLAND. Discovery Repts.Vol.4,pt.1,p.361,pl.X,fig.4.
1933	Oolina laevigata	d'Orbigny	GALLOWAY. A manual of foramihifera. p.245,pl.22,fig.3.
1947	Oolina laevigata	d'Orbigny	PARR. Proc.Roy.Soc.Victoria,Vol.58, pts. I and II. n.s.pl.VI,fig.5.
1957	Oolina laevigata	d'Orbigny	TODD. U.S.Geol.Survey Prof.Paper 294-F.p.224,pl.29,figs.5,8.

Test free, monothalmous, small, flask shaped, oval in outline, circular in cross section, greatest width just above the base of the test which is broadly rounded and tapers gradually to a short, stout, unornamented neck. Aperture terminal, at end of neck, circular, ratiate. Faint indication of an entosolenian tube present. Wall calcareous, thin, transluscent, very finely and densely perforate.

Dimensions: Diameter 0.17 mm. Length 0.20 mm.

Occurrence: Dead CB.326.

Morphological remarks: This variable species should not be confused with the morpholégécally disimilar O.laevigata Reuss.

Distribution: This species has not been recorded from the British Area to the present day.

d'Orbigny in 1838 obtained the type species from the Falkland Islands, Heron-Allen and Earland obtained a single specimen from the ice free area of the Falkland Islands in 1932, and in 1934 Earland also recorded this species from the Falklands sector of the Antarctic.

Stratigraphic Occurrence: There are no recorded stratigraphic occurrences of this form in the British area to date.

Todd in 1957 recorded it from the Tertiary of North Eastern Alaska, and Galloway and Wissler in 1927 noted this form as being rare to very rare in the Pleistocene of California.

Diagnosis: This form appears to be a typical boreal species, although even in cold latitudes it is not common. Stratigraphic records are scarce but it would appear to range from the Tertiary to Recent.

Oolina _lineato-punctata_ (Heron-Allen and Earland) 1922

Pl.12, figs.7a,7b,7c.

1922 _Lagena globosa_ (Montagu) _var._ _lineato-punctata_ HERON-ALLEN and EARLAND. Brit.Antarctic Exped.Nat. Hist.Rept.Protozoa, Pt.II, Foraminifera, Zool.Vol.6,no.2, p.142,pl.5,figs.12-14.

1953 _Oolina lineato-punctata_ (Heron-Allen and Earland) LOEBLICH and TAPPAN. Smith Miscell. Coll.Pub.4105,Vol.121, No.7,p.70,pl.13,fig.8.

Test free, small unilocular, globular, circular in cross section, broadly rounded base with a clear spot of shell substance in the centre of the base, greatest width at the centre of the test, tapering to the apertural end. Aperture terminal, circular, at end of the fairly long neck. Entosolenian tube present extending about one quarter of the distance into the test. Test surface "frosted" with very small circular depressions set close together in lines extending from the base to the neck.

Dimensions: Length 0.35 mm. Diameter 0.25 mm.

Occurrence: Dead CB.316.

Morphological remarks: Variation in the nature of the circular punctations is shown by this species, but it is doubtful whether this is of infraspecific value.

Distribution: This species has not been recorded from British waters to the present day.

Heron-Allen and Earland in 1922 obtained this form from off New Zealand and Loeblich and Tappan ih 1953 recorded it from the Arctic.

Stratigraphic Occurrence: No stratigraphic occurrences of this species have been recorded to the present day.

Oolina patannae sp.nov.

Pl.12, figs.6a,6b,6c.
Pl.13, figs.5a,5b,5c.

Test free, small unilocular, circular in outline, round in cross section. Test has a small, flat, unormamented base, and a short, stout, cylindrical neck, with a low transverse rib at the base of the neck. Body ornamented with twenty two longitudinal wide ribs, originating adjacent to the clear basal area and extending from the base into the top one third of the test where they coalesce to form a smooth, thick, upper portion of the test. Ribs are flat topped, wide and separated by grooves of a similar width. Aperture, small, circular, terminal, central, at the end of the neck. Faint indication of a short, stout, entosolenian tube present, extending only a very short distance into the test. Wall calcareous, transluscent, perforate.

Dimensions: Length 0.36 mm. Diameter).30 mm.

Occurrence: Dead CB.316, CB.346,CB.358, CB.384, CB.639.

Morphological remarks: This species differs markedly from the related species *Oolina borealis* Loeblich and Tappan in general shape, nature of the costae, and also in the nature of the distinct apertural collar and neck.

Diagnosis: This species appears to be a cool temperate, shallow water form related to the cold water type *O.borealis*

Oolina williamsoni (Alcock) 1865

Pl.12, figs.3a,3b.

1865	Entosolenia williamsoni		ALCOCK. Proc.Lit.Phil.Soc.Manchester Vol.4,p.195.
1923	Lagena williamsoni	(Alcock)	CUSHMAN. U.S.Nat.Mus.Bull.104,pt.4, p.61,pl.11,figs.8,9.
1929	Lagena williamsoni	(Alcock)	CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.5,pt.3,p.70,pl.11,figs.7,8.
1933	Lagena williamsoni	(Alcock)	CUSHMAN. U.S.Nat.Mus.Bull.161,pt.2, p.34,pl.8,fig.8.
1940	Lagena williamsoni	(Alcock)	BUCHNER. Nova Acta Leopoldina, N.F. Bd.9,no.62,p.431,Taf.V,figs.71,72.
1944	Lagena williamsoni	(Alcock)	BANDY. Journ.Pal.Vol.18,No.4,p.369, pl.60,fig.13.
1947	Lagena williamsoni	(Alcock)	CUSHMAN and TODD. Contr.Cush.Found. Foram.Res. Vol.23,pt.3,p.63,pl.15, fig.9.
1949	Lagena williamsoni	(Alcock)	CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique. Mem.111,p.22,pl.4,fig.11.
1950	Lagena williamsoni	(Alcock)	CUSHMAN and McCULLOCH. Al.Han.Pac. Exped.Vol.6,no.6,p.362,pl.48,figs. 14,15.
1951	Oolina williamsoni	(Alcock)	VOORTHUYSEN,van. Med.Geol.Stichting. n.s.No.5,p.24,25,pl.1,fig.14.
1952	Lagena williamsoni	(Alcock)	MARTIN. Contr.Cush.Found.Foram.Res. Vol.3,pt.3,p.122,pl.18,figs.10a,b.
1957	Oolina williamsoni	(Alcock)	SMIGIELSKA. Rocz.Polski.Tow.Geol. Tome XXV,Zes 3,p.269,pl.XVII,fig.13.
1957	Oolina williamsoni	(Alcock)	VOORTHUYSEN,van. Med.Geol.Stichting N.S. No.11,p.37,Taf.26,fig.41.
1960	Lagena williamsoni	(Alcock)	HOFKER. Palaeontologische Zeitschriff, Stuttgart W, Band 34,Nr.3/4,p.245, pl.C, fig.68.

1960 Oolina williamsoni (Alcock) VOORTHUYSEN, van. Verh.Kon.Ned.Geol. Mijnb.K.Gen.Geol.Serie Deel 19, p.247, Taf.10, fig.18.

1962 Oolina williamsoni (Alcock) HAAKE. Geol.Inst.Univ.Kiel.Meyniana Band 12, p.37, Taf.2, fig.8.

1964 Oolina williamsoni (Alcock) FEYLING-HANSSEN. Nordes Geol.Undersokelse.Nr.225, p.312, 313, pl.15, fig.8.

1964 Lagena williamsoni (Alcock) LEROY. U.S.Geol.Survey Prof.Paper 454-F, p.F26, pl.13, fig.40.

Test free, unilocular, small, elongate - globular in outline, circular in cross section, greatest width in the lower one third of the test, tapering to the broadly rounded basal end and also the apertural end which is extended into a short neck with a marked collar. Test ornamented with eighteen strong, longitudinal costae originating at the base, remaining separate on the body chamber but which coalesce at the collar to give a distinct reticulate ornament. Aperture terminal, simple, circular, at the end of the neck, with a faint trace of an entosolenian tube present. Wall calcareous, thin, transluscent, finely and densely perforate.

Dimensions: Length 0.42 mm. Diameter 0.30 mm.

Occurrence: Dead CB.316, CB.326, CB.343, CB.362, CB.368, CB.381, CB.387, CB.398. CB.403, CB.628, CB.641.

Morphological remarks: Variation is exhibited by this species in the size and development of the costae, and in the relative extent of development of the reticulate markings around the neck.

Distribution: (Text-fig.34A). This species has been recorded from Liverpool Bay (Pearcey 1891), from the River Mersey (Burgess 1891), from Portree Bay, Isle of Skye (Robertson 1892), from Dogs Bay (Wright 1895), and from the Irish Sea (British Association 1896). Wright noted this form at Dogs Bay in 1900, and in Recent Clay in the River Lune valley in 1902. It was recorded from the Firth of Forth in 1903 by Pearcey, from Larne Lough, Belfast Lough and Red Bay, Ireland in 1906 by Gough, and from Lambay, County Dublin in 1907 by Wright. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from the North Sea and Clare Island in 1913, from 5 fathoms off Jura, from 20 fathoms off Ardnamuchan, from 12 fathoms in Loch Sunart and from 20 fathoms in the Sound of Mull in 1914, from West of Scotland and from the shallow water zone and shore sands of the South coast of Cornwall in 1916, and from Plymouth in 1930. Heron-Allen in 1915 noted this form as being common at 20 fathoms off the Isle of Man. in 1957 the Marine Biological Association obtained this form from seven stations in the Plymouth area. Le Calvez noted this species as being common in the Mer Celtique in 1958, West of France and South of Ireland, and in 1963 Bruce, Colman and Jones also noted this form as common from the Isle of Man and surrounding areas.

This species has been recorded from Scandinavia and the Arctic (Goes 1894), off the West coast of America (Cushman 1927), from fourteen stations in the ice free area of the Falkland Islands (Heron-Allen and Earland 1932), from Apaiang Atoll (Cushman 1933), and from the Southern Californian region (Natland 1933). In 1940 Buchner retrieved this species from the Gulf of Naples, and in 1947 Cushman and Todd obtained numerous specimens from Amchitka Island, Alaska. Cushman in 1949 noted this species as common from Belgium, and with McCulloch in 1950 noted it in the Pacific. It was obtained from the Netherlands Wadden Sea by Voorthuysen in 1951, and Hofker in 1960 noted it in the Gulf of Neapel. It was recorded from the North Sea by Haake in 1962.

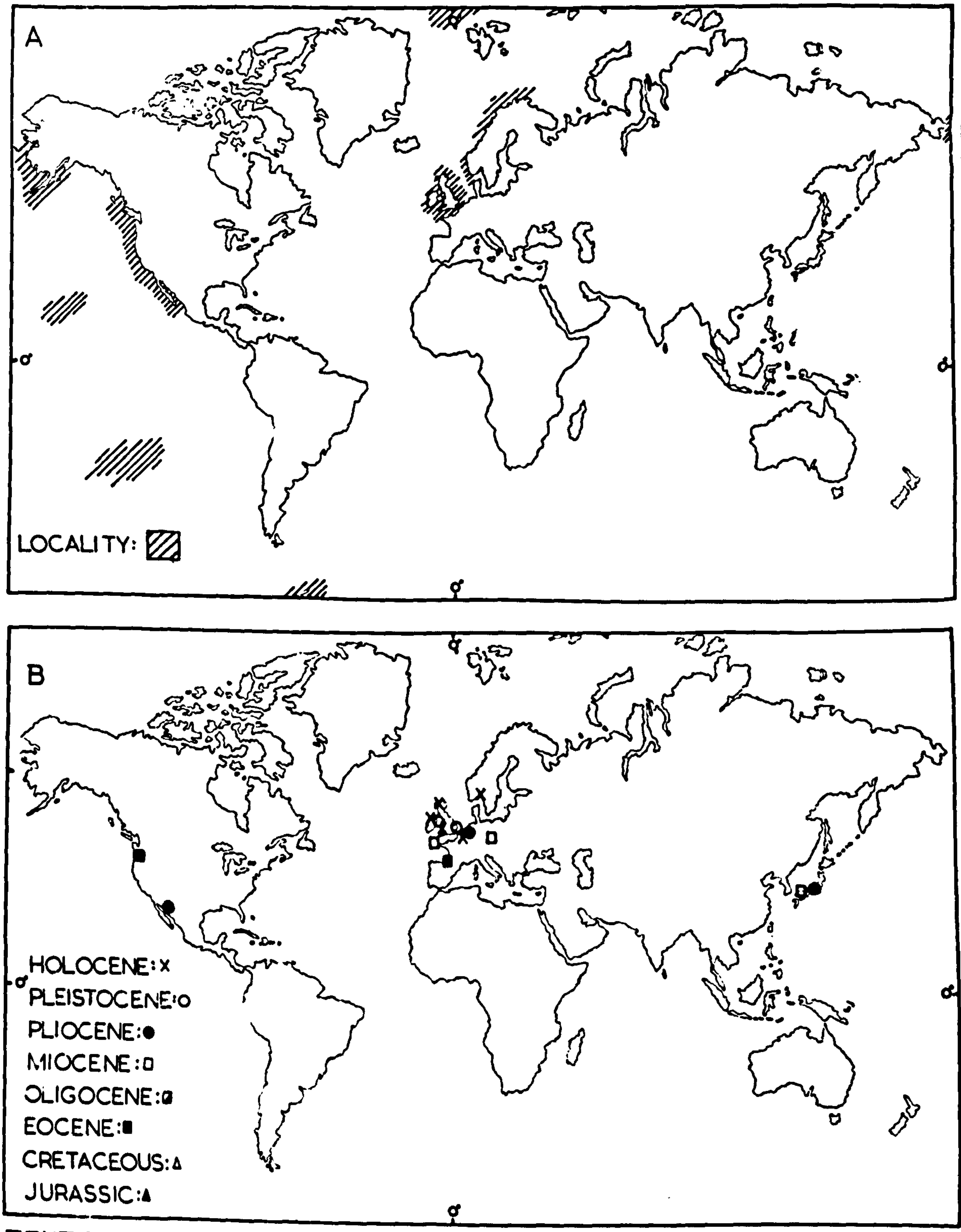
Stratigraphic Occurrence: (Text-fig.34B). Holocene occurrences of this species in the British Holocene have been recorded from Altcar and from Great Crosby (Wright 1904; 1908), from Skye and County Antrim (MacFadyen 1937), from the English Fens and Swansea Docks (MacFadyen 1938; 1942), and from Borth, Cardiganshire (Adams and Haynes 1965).

Funnell in 1961 obtained this form from the Paleogene and Early Pleistocene of Norfolk. In 1965, Curry, Murray and Whittard obtained it from the Miocene and Neogene of the Western approaches to the English Channel. Funnell and West in 1962 noted this species in the Early Pleistocene of Suffolk, and other Pleistocene occurrences were noted by Wright from Moel y Tryfaen in 1900, and with Reade in 1906 from the Isle of Man. Robertson obtained this form from the Post Tertiary deposits of Lewis in 1882, and of Greenock in 1885. Gough in 1904 noted this form in glacial sands at Belfast, and Wright obtained it from the Drift of County Cork in 1902, and from the Drift of Herefordshire in 1923. Boulder Clay occurrences have been recorded from the Vale of Clwyd (Reade 1897), from Great Crosby, from Cheshire, from Carrickfergus, and from County Down (Wright 1898; 1899; 1903; 1904).

Reade in 1898 recorded this species from the Holocene of Bruges, and in 1960 Voorthuysen obtained it from the Holocene of the Dollart-Ems estuary. Bandy in 1944 noted this form in the Eocene of Oregon, and Halkyard in 1917 and 1919 obtained it from the Middle Eocene Blue Marls of Biarritz. In 1957 Smigielska recorded the species from the Miocene of Upper Silesia, and LeRoy in 1964 obtained it from the Miocene and Pliocene of Southern Okinawa. Pliocene occurrences have been noted from California (Cushman 1929), the Western Netherlands (Voorthuysen) 1950), and from the Los Angeles Basin (Martin 1952), and from a boring at Oosterhaut, Netherlands where this form constituted less than .5% of the Pliocene fauna (Voorthuysen 1953).

In 1964 Feyling-Hanssen recorded this species from the Late Quaternary of the Oslo Fjord area.

Diagnosis: This species appears to prefer an environment in cold and cool waters in shallow water. Stratigraphically this species ranges from the Paleogene to Recent.



TEXT FIG. 34 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- OOLINA WILLIAMSONI

Gemus: Fissurina Reuss 1850

Fissurina lucida (Williamson) 1848

Pl.12, figs.4a,4b,4c.

1848	*Entosalenia marginata* (Montagu) *var. lucida*		WILLIAMSON. Ann.Mag.Nat. Hist.Ser.2,Vol.1,p.17,pl.2,fig.17.
1858	*Entosalenia marginata* (Montagu) *var. lucida*	Williamson.	WILLIAMSON. Rec.For.Gt.Brit.Ray.Soc.London. p.10,pl.1,figs.20-23.
1912	*Lagena lucida*	(Williamson)	SIDEBOTTOM. Journ.Queckett Micro. Soc.Vol.11,pl.17,figs.12-14.
1923	*Lagena lucida*	(Williamson)	CUSHMAN. U.S.Nat.Mus.Bull.104. p.33,pl.6,figs.1,2.
1930	*Entosolenia lucida*	(Williamson	CUSHMAN and COLE. Contr.Cush.Found. Foram.Res.Vol.6,pt.4,p.98,pl.13, figs.11,12.
1931	*Entosolenia lucida*	Williamson	COLE. Florida State Geol.Survey Bull.no.6,p.40,pl.7,figs.5,6.
1940	*Lagena lucida*	(Williamson)	BUCHNER. Acta Nova Leopoldina N.F. Bd.9,No.62,p.477,Taf.XIV, figs.259-261.
1941	*Entosolenia cf. lucida*	Williamson	CUSHMAN. Contr.Cush.Found.Foram. Res. Vol.17,pt.2,p.36,pl.9,fig.12.
1946	*Entosolenia lucida*	Williamson	CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res.Sp.Pub.no.19,p.30,pl.5, figs.16-18.
1947	*Entosolenia lucida*	Williamson	CUSHMAN and TODD. Contr.Cush.Found. Foram.Res.Vol.23,pt.3,p.65,pl.15 fig.22.
1947	*Entosolenia lucida*	Williamson	CUSHMAN and TODD. Contr.Cush. Found.Foram.Res.Sp.Pub.no.21,p.20, pl.3,fig.11.
1948	*Entosolenia lucida*	Williamson	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.23,p.63,pl.7,fig.2.

1949 Entoselenia lucida Williamson — CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique Mem.111,p.35,pl.VII,fig.2.

1950 Fissurina lucida (Williamson) — BANDY. Journ.Pal.Vol.24,No.3,p.274, pl.41,figs.12a,b.

1951 Entosolenia cf. lucida Williamson — CUSHMAN and STAINFORTH. Journ.Pal. Vol.25,no.2,p.154,pl.26,fig.52

1953 Fissurina lucida (Williamson) — LOEBLICH and TAPPAN. Smith Miscell. Coll.Pub.4105, Vol.121,No.7,p.76, pl.14,fig.4.

1958 Fissurina lucida (Williamson) — DETLING. Contr.Cush.Found.Foram. Res.Vol.9,pt.2,p.27,pl.7,fig.15.

1961 Fissurina lucida (Williamson) — BOLTOVSKOY. Mus.Argentina de Cienc. Nat.Zool.Tome VI,no.6,p.272,pl.III, fig.7.

1962 Fissurina lucida (Williamson) — HAAKE. Geol.Inst.Univ.Kiel.Meyniana. Band 12,p.38,Taf.2,figs.11-12.

1964 Fissurina lucida (Williamson) — FEYLING-HANSSEN. Nordes.Geol. Undersokelse Nr.225,p.315,pl.15, fig.21.

Test free, monothalmous, very small, globular to slightly elongate, compressed, oval in transverse section. Aperture a narrow fissurine slit, no neck present. Entosolenian tube present, long thin, running into the interior of the test for about one quarter of the way. Tube visible through test wall. Wall smooth, transparent, shining with a slightly thickened area around the edge of the test. Wall finely and densely perforate.

Dimensions: Length 0.25 mm, Width 0.17 mm, Thickness 0.10 mm.

Occurrence: Dead CB.359, CB.360, CB.366.

Morphological remarks: Considerable variation is exhibited by this species in both the relative breadth of the test, and in the amount of test thickening.

Distribution: (Text-fig.35A). Williamson recorded this species from Swansea, Rhossily, Manorbeer, Portsmouth, Sandwich, Kyleakin, Scarborough, Lamlash Bay, and Boston March in 1848, and from other British stations in 1858. The species has been recorded from the River Dee (Sidall 1876), from the River Mersey (Burgess 1891), from Portree Bay, Isle of Skye (Robertson 1892), from Port Erin (Chaffer 1894), and from the Irish Sea (British Association 1896). Wright noted the species from Dogs Bay in 1900, and from Recent clay in the valldy of the River Lune in 1902. Gough in 1906 obtained this species from Belfast Lough, Ireland and Wright in the following year from Lambay, County Dublin. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from Clare Island and from the North Sea in 1913, from 5 fathoms off Jura, 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart, 20 fathoms off Ardnamuchan in 1914, from the shallow water zone of the South coast of Cornwall, and West of Scotland in 1916, and from the Plymouth area in 1930. Heron-Allen obtained this form from 20 fathoms off the Isle of Man in 1915, and Cushman in 1923 obtained it from Dogs Bay, South West Ireland. The Marine Biological Association noted the occurrence of this species at seven stations in the Plymouth region in 1957, and in the following year Le Calvez noted it in the Mer Celtique, West of France. Bruce, Colman and Jones recorded this form as frequent in 1963 from the Isle of Man and surrounding areas.

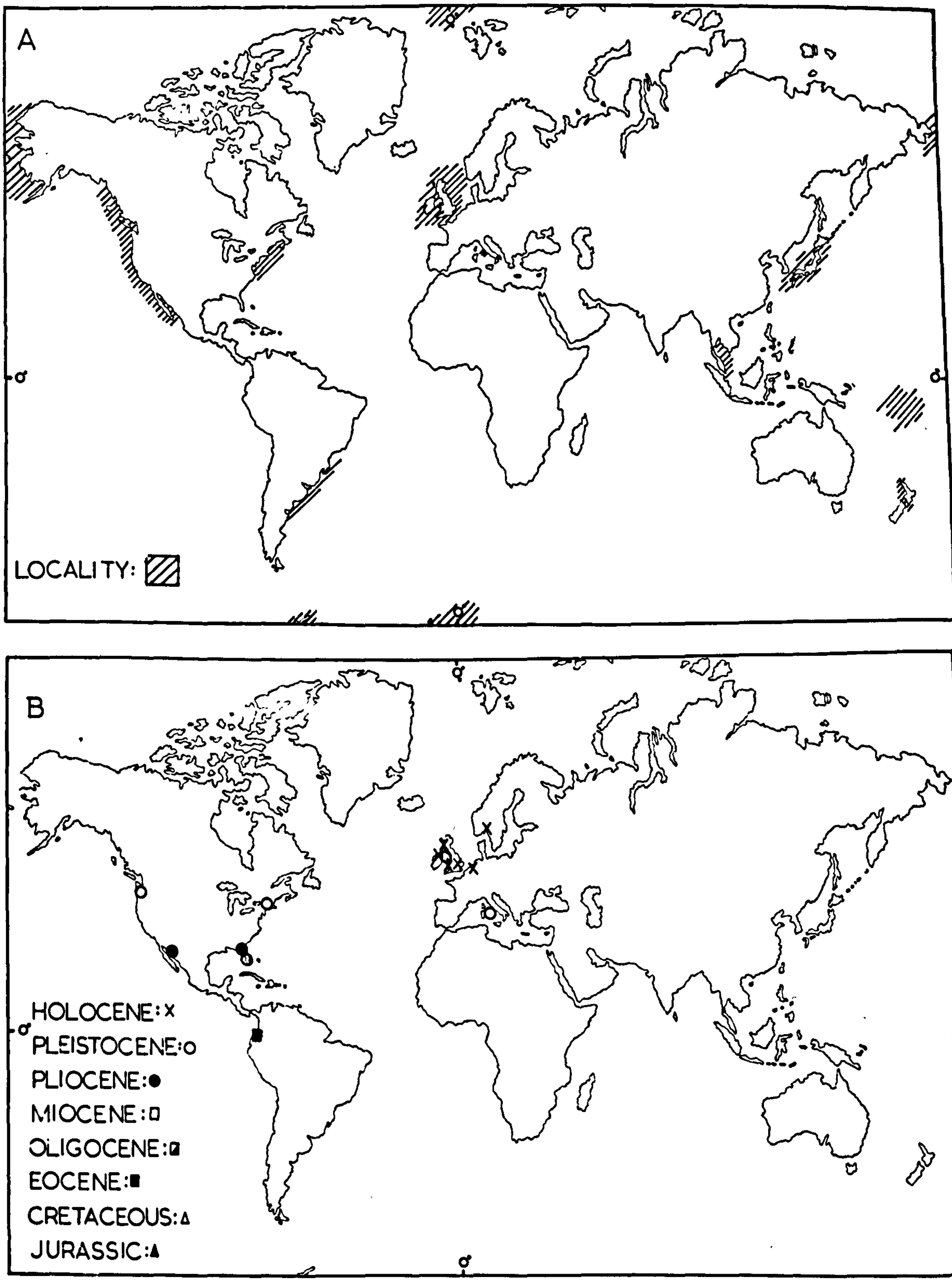
This species has been recorded from the Malay Archipelago (Millett 1901), from the South West Pacific (Sidebottom 1912), off Guam, and off Japan (Cushman 1913), and from the Antarctic (Pearcey 1914). In 1931 Wiesner obtained this form from a depth of 385 metres at one station in the Antarctic region, in 1932 Heron-Allen and Earland obtained it from the ice free area of the Falkland Islands and adjacent seas, and Earland in 1934 obtained it from the Falklands sector of the Antarctic as did Chapman and Parr in 1937. Buchner recorded the species from the Gulf of Naples in 1940, Cushman noted it from Alaska in 1941, and Cushman and Todd in 1947 recorded it from off the Washington coast, and from Amchitka Island, Alaska. Cushman noted the form from the Arctic in 1948, and from a number of localities in Belgium in 1949. It had been recorded from the Arctic (Loeblich and Tappan 1953), from the shore sands at Quequen, Buenos Aires (Boltovskoy 1955), from the Bay of Fundy (Harrington 1955), from Cook Strait, New Zealand (Vella 1957), and from the estuary of the Rio de la Plata (Boltovskoy 1957). In 1958 Detling noted this form as being rare in tide pools at Sunset Bay, Oregon, and in the following year Zalesney noted it from Santa Monica Bay, California. In 1961 the species was recorded from the continental platform between Santo Tome and the Rio de la Plata, Argentina by Boltovskoy, from the intertidal zone of the California and Oregon coast by Cooper, and from the Orange County outfall area, Southern California by Watkins. Haake in 1962 obtained it from the North Sea, and Cockbain in 1963 obtained it from Juan de Fuca and Georgia Straits, British Colombia. In 1964 Harman recorded the form from Santa Barbara Basin, California, Hulme from Manukau Harbour, Auckland, and Smith from between 1,600 to 1,700 metres off El Salvador, South America.

Stratigraphic Occurrence: (Text-fig.35B). The occurrence of this species in British Holocene deposits has been recorded from Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar (Wright 1904), Great Crosby (Wright 1908), County Antrim and Skye (MacFadyen 1937), the English Fens (MacFadyen 1938), Swansea Docks (MacFadyen 1942), and from Borth, Cardiganshire (Adams and Haynes 1965).

Heron-Allen and Earland in 1910 obtained what they stated to be Cretaceous derived forms from the shore sands at Selsey Bill, Sussex. Reade and Wright in 1906 recorded the species from the Pleistocene of the Isle of Man. Wright noted the occurrence of this species in the Boulder Clay deposits of Great Crosby in 1898, Cheshire in 1899, Carrickfergus in 1903, County Down in 1904, and Lancashire in 1905. Upper Boulder Clay occurrences have been noted from West Cheshire and Liverpool (Shone 1878), Ayrshire and County Dublin (Wright 1903).

In 1898 Reade obtained this species from the Holocene deposits of Bruges. An Eocene occurrence was recorded by Cushman and Stainforth in 1951 from coastal Ecuador. Cushman and Gray in 1946 noted this form occurring in the Pliocene of Timms Point, California, and Cole in 1931 obtained it from the Pliocene and Pleistocene of Florida. A range from the Pliocene to Pleistocene by this species was recorded near Parma in 1962 by Papani and Pelosio. Pleistocene occurrences have been recorded from Ischia (Broeck 1878), from Maryland (Cushman and Cole 1930), and from Cape Blanco, Oregon (Bandy 1950). In 1964 Feyling-Hanssen noted this species occurring in the Late Quaternary deposits of the Oslo Fjord area.

Diagnosis: This species has a moderate distribution throughout the world, but is more common in cold and cool temperate shallow water areas. Stratigraphically it ranges from the Eocene to Recent, and possibly from the Cretaceous to Recent.



TEXT FIG. 35 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- FISSURINA LUCIDA

Fissurina marginata Sequenza 1862

Pl.12, figs.5a,5b,5c.

1862	*Fissurina marginata*		SEGUENZA. Dei terreri Terziarii del distretto di Messina, Italia, Pt.2, p.66, pl.2, figs.27, 28.
1865	*Lagena sulcata*	Walker and Jones *var.* (*Entosolenia*) *marginata*	Montagu. PARKER and JONES. Phil.Trans.Roy.Soc.Vol.155, p.355, pl.13, figs.42-44, pl.16, figs.12a, 12b.
1882	*Fissurina marginata*	(Williamson)	TERQUEM. Mem.Geol.Soc.France Ser.3, Vol.2, Mem.3, p.30, pl.1, figs.20-22.
1884	*Lagena marginata*	(Seguenza)	BRADY. Chall.Rep.ZoolVol.9, p.476, pl.59, figs.21-23.
1893	La		
1893	*Lagena marginata*	(Walker and Boys)	CHAPMAN. Journ.Roy.Micro. Soc.p.584, pl.VIII, fig.16.
1894	*Lagena marginata*	(Walker and Boys)	GOES. Kongl.Svensk.Veten.Akad. Handl.N.F.Bd.25, No.9, p.81, Tab.13, fig.748-751.
1897	*Lagena marginata*	(Walker and Boys)	FLINT. U.S.Nat.Mus.Ann.Rep. p1307, pl.54, fig.2.
1900	*Lagena marginata*	(Walker and Boys)	READE. Geol.Mag.Vol.VII, p.100, pl.V, fig.17.
1902	*Lagena marginata*	(Walker and Boys)	CHAPMAN. Foraminifera Longmans p.188, pl.10, fig.F.
1912	*Lagena marginata*	(Walker and Boys)	SIDEBOTTOM. Journ.Queckett Micro.Soc.Vol.11, p.405, 407, pl.17, figs.29-31, pl.18, figs. 1-5.
1913	*Lagena marginata*	(Walker and Boys)	CUSHMAN, U.S.Nat.Mus.Bull, 71, pt.3, p.37, 38, pl.22, figs.1-7.

1916	*Lagena marginata*	(Walker and Boys)	HERON-ALLEN and EARLAND. Trans.Linn.Soc.Zool.Ser.2, Vol.XI,pt.13,p.251,pl.41, fig.26.
1923	*Lagena marginata*	(Seguenza)	CUSHMAN. U.S.Nat.Mus.Bull.104, p.35,pl.6,fig.9.
1926	*Lagena marginata*	(Walker and Boys)	CHAPMAN and PARR. Journ.Linn. Soc.Zool.Vol.36,p.376,pl.17, fig.12.
1928	*Lagena marginata*	(Walker and Boys)	NUTTALL. Quart.Journ.Geol. Soc.Vol.84,ptll,p.79,pl.IV, fig.4.
1928	*Fissurina marginata*	(Walker and Boys)	WHITE. Journ.Pal.Vol.2,No.3, p.211,pl.29,figs.11,12.
1929	*Lagena marginata*	(Walker and Jacob)	CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.5,pt.3,p.71, pl.11,fig.15.
1933	*Lagena marginata*	(Montagu)	CUSHMAN. U.S.Nat.Mus.Bull. no.161,pt.2,p.17,18,pl.4, figs.9,11,12,14-16. pl.5, figs.2,4,6,8,9.
1939	*Entosolenia marginata*	(Walker and Jacob)	CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.15,pt.3,p.66, pl.11,figs.1,3.
1940	*Lagena marginata*	(Walker and Jacob)	BUCHER. Acta Nova Leopoldina N.F. Bd.9,No.62,p.509,Taf.XXI, figs.426,427.
1941	*Entosolenia cf. marginata*	(Walker and Boys)	CUSHMAN. Contr.Cush. Found.Foram.Res.Vol.17,pt.2, p.36,pl.9,fig.11.
1945	*Entosolenia cf. marginata*	(Walker and Boys)	CUSHMAN and STAINFORTH. Contr.Cush.Found.Foram.Res. Sp.Pub,no.14,p.42,pl.6, figs.8-10.
1946	*Entosolenia marginata*	(Walker and Jacob)	CUSHMAN and RENZ. Contr. Cush.Found.Foram.Res.Sp.Pub. no.18,p.38,pl.6,fig.16.

1948	<u>Entosolenia</u> <u>marginata</u> (Montagu)	CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.23, p.65,pl.7,fig.7.
1948	<u>Entosolenia</u> <u>cf.</u> <u>marginata</u> (Walker and Boys)	CUSHMAN and RENZ. Contr. Cush.Found.Foram.Res.Sp.Pub. no.24,p.26,pl.5,fig.17.
1948	<u>Lagena</u> <u>marginata</u> (Walker and Boys)	RENZ. Geol.Soc.Am.Mem.32, p.142,pl.V.fig.30.
1949	<u>Lagena</u> <u>marginata</u> (Walker and Boys)	BERMUDEZ. Contr.Cush.Found. Foram.Res.Sp.Pub.no.25,p.117, pl.10,figs.56-58.
1949	<u>Fissurina</u> <u>marginata</u> (Montagu)	SAID. Contr.Cush.Found.Foram. Res.Sp.Pub.no.26,p.27,pl.3, fig.13.
1951	<u>Entosolenia</u> <u>cf.</u> <u>marginata</u> (Walker and Boys)	CUSHMAN and STAINFORTH. Journ.Pal.Vol.25,No.2,p.154, pl.26,fig.51.
1951	<u>Fissurina</u> <u>marginata</u> (Walker and Boys)	VOORTHUYSEN,van. Med.Geol. Stichting, n.s.No.5,p.24,25, pl.1,fig.15.
1952	<u>Fissurina</u> <u>marginata</u> (Walker and Boys)	MARTIN.Contr.Cush.Found.Foram. Res.Vol.3,pt.3,p.123,pl.18, figs.12a,b.
1952	<u>Fissurina</u> <u>cf.</u> <u>F.marginata</u> (Walker and Boys)	TODD and KNIKER. Contr. Cush.Found.Foram.Res.Sp.Pub. no.1,p.22,pl.4,fig.13.
1953	<u>Lagena</u> <u>marginata</u> (Walker and Boys)	BECKMANN. Eclog.Geol.Helvet. Vol.46,No.1,p.358,Taf.XX, fig.5.
1953	<u>Fissurina</u> <u>marginata</u> (Montagu)	LOEBLICH and TAPPAN. Smith Miscell.Coll.Pub.4105,Vol. 121,No.7,p.77,pl.14,figs. 6-9.
1954	<u>Fissurina</u> <u>marginata</u> (Walker and Boys)	WEISS. U.S.Geol.Survey Prof. Paper 254-G, p.161,pl.33, fig.9.

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1955 *Fissurina marginata* (Walker and Boys) GRAHAM and CLASSEN. Contr. Cush.Found.Foram.Res. Vol. 6,pt.1,p.20,pl.3,fig.24.

1955 *Entosolenia marginata* (Walker and Boys) KAASSCHIETER in Drooger, Kaasschieter, and Key,Verhandl, Konin.Ned.Akad.Weten.Afd.Nat. Deel XXI,No.2,p.64,pl.5, fig.4.

1957 *Lagena marginata* (Walker and Jacob) FORAMINIFERI PADANI. Agip Mineraria pl.18,fig.3bis.

1957 *Fissurina marginata* (Walker and Boys) POZARYSKA. Palaeontol.Polonica No.8,p.61,pl.V,fig.5.

1959 *Fissurina marginata* (Walker and Boys) BOLTOVSKOY, Sec.de marina Pub. H1005,Buenos Aires,p.69,70, pl.IX,fig.18.

1959 *Fissurina cf. F.marginata* (Walker and Boys) GARRISON. Journ.Pal.Vol. 33,No.4,p.667,pl.85,figs.6a,6b.

1960 *Fissurina Marginata* (Montagu) ASANO. Sci.Rep.Tohoku Univ. Ser.2(Geol),Spec.p.53,pl.5, figs.58-61.

1960 *Fissurina marginata* (Montagu) VOORTHUYSEN van. Verh.Kon.Ned. Geol.Mijnb.K.Gen.Geol.Serie. Deel 19,p.248,Taf.10,fig.19.

1961 *Fissurina marginata* (Walker and Boys) FEYLING-HANSSEN. Vort.Fridt. Nansen Geol.Symp.Spitzbergen Vol.3,Bis.11,p.49.pl.2,fig.11.

1961 *Entosolenia marginata* (Walker and Boys) KAASSCHIETER. Inst.Roy.des. Sci.Nat.de Belgique.Mem.147, p.180,pl.VII,fig.28.

1961 *Fissurina marginata* Seguenza TODD and LOW. Contr.Cush. Found.Foram.Res.Vol.12,pt.1, p.16,17,text-fig.2,fig.1.

1963 *Lagena marginata* (Walker and Boys) KLEINPELL and WEAVER. Univ.Calif. Pubs.Geol.Sci. Vol.43,p.172, pl.7,fig.12.

1964 Fissurina marginata (Montagu) COOPER. Contr.Cush.Found. Foram.Res. Vol.15,pt.3,p. 94,pl.5,fig.17.

1964 Fissurina marginata (Walker and Boys) FEYLING- HANSSEN. Nordes.Geol. Undersokelse,Nr.225,p.315, 316,pl.15,fig.22.

1964 Fissurina marginata (Montagu) PARKER. Journ.Pal.Vol.38, no.4,pl.98,fig.11.

1965 Fissurina marginata (Walker and Boys) FEYLING-HANSSEN. Norsk. Polarinstitutt Meddel.Nr.93, p.25,pl.2,fig.11.

Test free, monothalmous, globular to slightly elongate, compressed, oval in transverse section, with a fairly distinct obtuse marginal ridge which completely encircles the test apart from the aperture where the ridge bifurcates and encloses the aperture. At the posterior end there appears to be a slight projection of this marginal ridge into a truncate, extremely small spine. Aperture an elliptical slit at the end of a very small tubular projection of the test. Entosolenian tube visible through the test wall, extending into the test for about one quarter of the length. Wall calcareous, transparant, densely and finely perforate.

Dimensions: Length 0.20 mm. Width 0.13 mm. Thickness 0.08 mm.

Occurrence: Dead CB.318, CB.373.

Morphological remarks: This species exhibits great variation both in size and shape, and also in the development of the carina, which may completely encircle the body of the test, or be restricted to the base, this keel development also showing considerable variation from the narrow type to the broad "flange" type. It is as a result of this extreme variation that this species has such a complex and confusing synonemy, as it appears that any specimen with a fissurine aperture and with a marginal ridge has been designated F.marginata. The problem of validity of authorship is also very problematical as this species has been assigned to Williamson, Seguenza, Walker and Boys, Walker and Jacob, and Montagu. Each of these authors described their F.marginata but due to the extreme variation in this species noted above, correlation between these description is very tentative. Seguenza in 1862 described F.marginata but in 1848 Williamson described and figured Entosolenia marginata (Ann.Mag.Nat.Hist.Ser.2,Vol.1,p.17,pl.11,figs.15,16), and followed this in 1858 with another description of Entosalenia marginata (Rec.For.Gt.Brit.Ray.Soc.London p.10,pl.1,figs.10-21), and thus should be accreddited with this species on the grounds of priority. However the species has been assigned to Seguenza in this work, but it should be realised that work should be carried out on this species to ascertain the true authorship.

Distribution: (Text-fig.36A). This species has been recorded from the Shetland Seas (Waller 1868), from Montrose Basin, Budle Bay, River Aln, River Wansbeck, River Blyth and the Firth of Forth (Brady 1870), and the Firth of Clyde (Robertson 1875). In 1876 this form was noted from off the coast of Durham and North Yorkshire by Robertson and Brady, from the River Dee by Sidall, from 40 miles South of the Scilly Islands and 50 miles South West of Ushant by Jones and Parker. It has been recorded from the Atlantic Docks, Liverpool by Robertson in 1883, from 1,000 fathoms off the South West coast of Ireland by Wright in 1889, from the Faroe Channel by Pearcey in 1890, and off the South West coast of Ireland by Wright in 1890. In 1891 it was recorded from the River Mersey by Burgess, in 1894 from Port Erin by Chaffer, and in 1896 from the Irish Sea by the British Association. It was recorded from Dogs Bay (Wright 1900), from the Firth of Forth (Pearcey 1902), and from Recent clay in the valley of the River Lune (Wright 1902). Worth in 1904 stated that this form was generally distributed in the Plymouth area, and Gough in 1906 noted it as being common in Larne Lough, Ireland. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909, and 1911, from the North Sea and Clare Island in 1913, from 5 fathoms off Jura, 20 fathoms in the Sound of Mull, 12 fathoms in Loch Sunart, and 20 fathoms off Ardnamuchan in 1914, from the South coast of Cornwall and West of Scotland in 1916. Heron-Allen noted this form at 20 fathoms in 1915, off the Isle of Man, and with Earland in 1930 noted it in the Plymouth area. The Marine Biological Association obtained the species from six stations at Plymouth in 1957, and in the following year Le Calvez noted it West of France in the Mer Celtique. Bruce, Colman and Jones in 1963 recorded the form from around the Isle of Man.

This species has been recorded from the Arctic and North Atlantic (Parker and Jones 1865), from the Gulf and River St. Lawrence (Dawson 1870), from the Arctic (Brady 1878), and Brady in 1884 stated that this species occurs from the Arctic to Antarctic, from the littoral zone to 3,125 fathoms. Goes in 1894 noted this form from Scandinavia and the

Arctic, Flint in 1897 from the Caribbean , the Gulf of Mexico, and the South Atlantic, and Millet in 1901 from the Malay Archipelago. Sidebottom in 1912 stated that this species was well represented in the South West Pacific Ocean, and Cushman in 1913 noted it as common in the North Pacific. It was recorded from the Antarctic (Pearcey 1914), from Lord Howe Island (Heron-Allen and Earland 1923), from one Antarctic station at a depth of 2,320 metres (Wiesner 1931), from twenty three stations in the ice free area of the Falkland Islands (Heron-Allen and Earland 1932), and Cushman in 1933 noted it as rare in the Tropical Pacific. Earland in 1934 obtained this form from the Falklands sector of the Antarctic, and in 1936 obtained it from three stations in the Weddel Sea. Chapman and Parr noted this form at thirteen Antarctic stations in 1937, and Stubbings in 1939 from 1,046 metres off the South Arabian coast and from 1,105 metres in the Gulf of Aden. This species has been noted from the Gulf of Naples (Bucher 1940), from Alaska (Cushman 1941), off Bergen and from Iceland (Norvang 1941;1945). In 1946 Rutten and Hotz noted this form off the Island of Ceram, and Cushman recorded it from North East Greenland in 1948, and from Belgium in 1949. In the same year Said obtained this species from a depth of 59-62 metres in the Gulf of Suez and in 1950 Parr obtained it from Tasmania. It was recorded from the Netherlands Wadden Sea by Voorthuysen in 1951, from the Arctic by Loeblich and Tappan in 1953, and in 1958 it was noted from West of Tobago on the Orinoco-Trinidad-Paria shelf by Drooger and Kaasschieter, from the Recent portion of a Western

Mediterranean core by Todd, and from the Central Tyrrhenian Sea by Norin. Boltovskoy recorded this species off Brazil in 1959, and from the continental platform between Santo Tome and the Rio de la Plata, Argentina in 1961. In the same year Todd and Low noted this species from Nantucket Sound. Waller in 1960 recorded this species off the South China coast at a depth of 401-656 feet with a temperature range of 10-15°C, and a salinity of 34‰. Wagner in 1962 obtained this form from the Arctic continental shelf at a depth of 472 metres at +0.28°C and ataa depth of 487 metres at +0.34°C. Asano in 1962 noted this species in the seas around Japan at depths of 126-669 metres with a temperature range of 0.5°C - 18.8°C. It was recorded from Hudson Bay, Canada by Leslie in 1963 and Wilcoxin in the following year noted it off the Southern Atlantic coast of the United States. Cooper in 1964 obtained this species from the Chukchi Sea, North Bering Sea, in small percentages associated with depths greater than 95 feet, with salinities greater than 32.5‰, and temperatues less than 4.0°C. In the same year Hulme recorded the species from Manukau Harbour, Auckland, New Zealand.

Stratigraphic Occurrence: (Text-fig.36B). Occurrences in the British Holocene have been recorded from Cleongart (Munthe 1897). Formby and Leasowe (Reade 1900), Altcar (Wright 1904), Great Crosby (Wright 1908), County Antrim, English Fens, Swansea Docks (MacFadyen 1937; 1938; 1942), and from Borth, Cardiganshire (Adams and Haynes 1965).

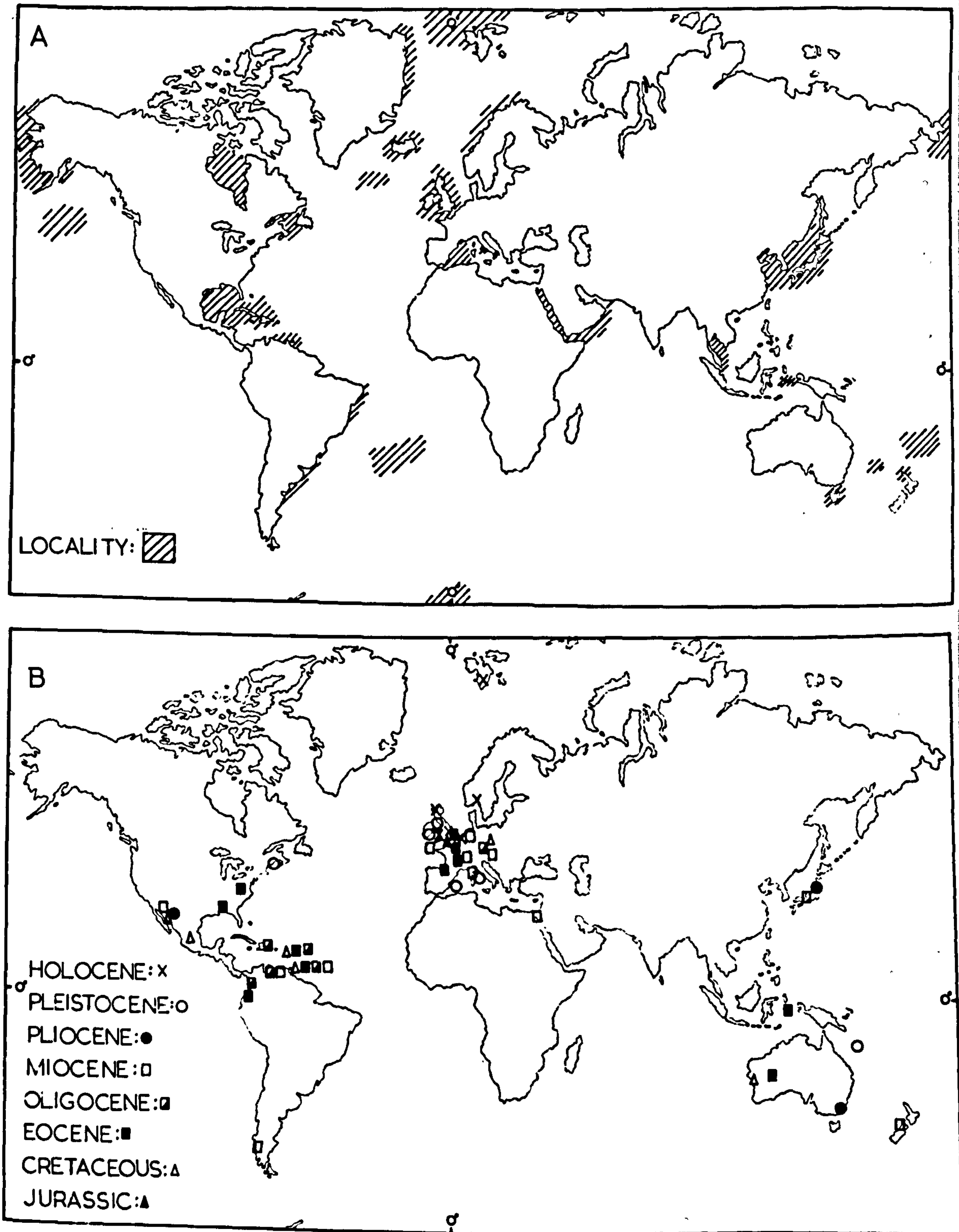
Chapman in 1893 obtained this form from the Gault of Folkestone, and with Sherborn in 1899 obtained it from the London Clay (Eocene) of

Sheppey. Curry, Murray and Whittard in 1965 stated that this species occurred in the Miocene and Neogene of the Western approaches to the English Channel. Post Tertiary occurrences have been recorded by Crosskey and Robertson from the Isle of Cumbrae in 1868, from Duntroon, Renfrew and Paisley in 1869, and from Bute and Campbeltown in 1873. Robertson also noted Post-Tertiary occurrences from Garnock and Kilwinning in 1877, and from Greenock and Lewis in 1882. Påeistocene occurrences have been noted from Moel y Tryfaen (Wright 1900), from the Isle of Man (Reade and Wright 1906), and from the Wexford coast (HadFadyen 1940). Wright in 1902 obtained this species from the Drift of County Cork and Boulder Clay occurrences have been noted from Caithness (Crosskey and Robertson 1868), from Cheshire (Shone 1874), from Great Crosby, Cheshire, Carrickfergus, and County Down (Wright 1898; 1899, 1903; 1904). Reade in 1874 noted this form from the Lower Boulder Clay of Lancashire and Cheshire, and Upper Boulder Clay occurrences were noted from West Cheshire and Liverpool (Shone 1878), from County Dublin and Ayrshire (Wright 1903).

Reade in 1898 obtained this species from the Holocene deposits of Bruges, and other Holocene occurrences were recorded from the Dollart-Ems estuaryy (Voorthuysen 1960), South West Barents Island, the Oslo Fjord area and Spitsbergen (Feyling-Hanssen 1961;1964;1965).

This form was noted occurring in the Cretaceous of Barbados by Jukes, Browne and Harrison in 1892, and of Trinidad by Cushman and Renz in 1947. White in 1928 obtained this species from the Upper Cretaceous of Mexico, and other Upper Cretaceous occurrences were noted from Western Australia by Crespin in 1938, and from Poland by Pozaryska in 1957. In 1892 Guppy noted this form ranging from the Cretaceous to Eocene in Trinidad. Eocene occurrences have been recorded from the Paris area (Terquem 1882), from Australia (Howchin 1893), from the Eastern coast of the United States (Cushman 1939), from Trinidad (Cushman and Renz 1948), from Mississippi (Cushman and Todd 1948), from coastal Ecuador (Cushman and Stainforth 1951), from Southernmost Chile (Todd and Kniker 1952), and from Belgium (Kaasschieter 1961). Graham and Classen in 1955 obtained this form from the Lower Cretaceous of California and in 1917 and 1919 stated that this species ranged from the Eocene to Oligocene in Barbados, and a range from the Upper Eocene to Miocene was noted in Trinidad by Nuttall in 1928. In 1946 Rutten and Hotz noted this species ranging from the Eocene to Recent in the Island of Ceram. Olégocene occurrences have been noted from a borehole in Hungary (Majzen 1940), from Trinidad (Cushman and Stainforth 1945), and from the Dominician Republic (Bermudez 1949). Petters and Sarmiento in 1956 obtained this species from the Lower and Middle Oligocene of Colombia. A range from the Oligocene to Miocene by this species was noted from the Maltese Islands in 1893 by Cooke, from Venezuela by Renz in 1948, and from Trinidad by Cushman and Renz in 1946. Miocene occurrences of this form have been recorded from the Vienna Basin (Marks 1951), the Carpathian foreland (Luczkowski 1957) from Sicily (Cita 1958), from Venezuela (Blow 1959), from the Santa Barbara embayment, California (Kleinpell and Weaver 1963), and from the Gulf of Suez area (Souaya 1965). Drooger noted this form in 1953 occurring in the Lower Miocene of the Netherlands Antilles, and Upper Miocene occurrences have been noted by Garrison in 1959 from California, and by Kennett in 1962 from Cape Foulwind on the West coast of New Zealand. Asano in 1940 recorded this species ranging from the Miocene to Pliocene in Japan. This species has been recorded from the Pliocene of California (Cushman 1929), of South East Australia (Parr 1939), and of the Los Angeles Basin, California (Martin 1952). Seguenza in 1962 obtained the type species from the Italian Tertiary, and Chapman and Parr in 1926 obtained this form from the Tertiary of Port Phillip, Victoria, Australia. In 1955 Rao noted this species in the Upper Tertiary of Australia and Brady noted a Post Tertiary occurrence from Fiji in 1888. This species has been recorded as occurring in the Pleistocene of Ischia (Broeck 1878), of Eastern Long Island, New York (Weiss 1954), of a core taken from the Western Mediterranean (Todd 1958), and of the Mindano Trough, West Pacific (Reyment 1959).

Diagnosis: This species can be found at all latitudes and at every depth. It can withstand a temperature range of $+0.28^{\circ}C - 18.8^{\circ}C$, and salinities in excess of 34‰. Stratigraphically it possibly ranges from the Jurassic to Recent and certainly from the Cretaceous to Recent.



TEXT FIG. 36 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF:- FISSURINA MARGINATA

C H A P T E R 7

The BULIMINACEA, DISCORBACEA, and SPIRILLINACEA

These Super Families all belong to the Sub Order Rotaliina Delage and Herouard 1896. The first Super Family, the Buliminacea is characterised by forms having a high trochospiral test, sometimes modified biserial and uniserial, the aperture being variable, primary, a basal slit, or in apertural face, or terminal, or on a neck with internal tooth plate or tube development, the test wall being radial, finely or coarsely perforate. The Discorbacea is charadterised by forms with trochospiral tests, with an interiomarginal or areal aperture, occasionally modified, wall radial, perforate. The third Super Family, the Spirillinacea has forms with typical planispiral to conical tests, nonseptate to late septa to septae throughout, may become annular in the more advanced forms.

Super Family: Buliminacea Jones 1875

Family: Turrilinidae Cushman 1927

Sub Family: Turrilininae Cushman 1927

Genus: Buliminella Cushman 1911

Buliminella elegantissima (d'Orbigny) 1839

pl.14, figs.2a,2b.

1839	Bulimina elegantissima	d'ORBIGNY ?	Voy.dans l'Am.Merid.Foram. France Levrault,Tome 5,pt.5, p.51,pl.7,figs.13-14.
1858	Bulimina elegantissima	d'Orbigny	WILLIAMSON. Rec.For.Gt.Brit. Ray.Soc.London.p.64,pl.5,figs. 134,135.
1884	Bulimina elegantissima	d'Orbigny	BRADY. Chall.Rep.Zool.Vol.9, p.402,pl.50,figs.20.22.
1900	Bulimina elegantissima	d(Orbigny	MILLETT. Journ.Roy.Micro.Soc. p.276,pl.II,fig.4.
1900	Buliminella elegantissima	(d(Orbigny)	READE. Geol.Mag.Vol.VII,p.100, pl.V,fig.6.
1910	Bulimina elegantissima	d'Orbigny	HERON-ALLEN and EARLAND.Journ. Roy.Micro.Soc.p.409,pl.VI, fig.12.
1912	Bulimina elegantissima	d'Orbigny	BAGG. U.S.Geol.Survey.Bull.513, p.38,pl.IX,fig.8.
1922	Bulimina elegantissima	d'Orbigny	HOFKER. Flora en Fauna der Zuidersee,Protozoa. p.142,143, fig.33.
1923	Bulimina elegantissima	d'Orbigny	HERON-ALLEN and EARLAND.Journ. Linn.Soc.Vol.35,p.620,621, pl.35,figs.23,24.
1925	Buliminella elegantissima	(d'Orbigny)	CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.1,pt.2,p.40,pl.6, figs.5a,b.

1927 Buliminella elegantissima (d'Orbigny) CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.3,pt1,pl.14, fig.3.

1931 Buliminella elegantissima (d'Orbigny) COLE. Florida State Geol.Survey Bull.no.6,p.39,pl.2,fig.8.

1931 Buliminella elegantissima (d'Orbigny) WIESNER. Deutsche SudPolar Exped.Bd.XX,Bd.XII,p.124, Taf.XIX,figs.235,236.

1932 Buliminella cf. elegantissima (d'Orbigny) CUSHMAN and PONTON. Contr.Cush.Found.Foram.Res. Vol.8,pt.3,p.67,pl.8,figs. 20,21.

1933 Buliminella elegantissima (d'Orbigny) GALLOWAY. A manual of foraminifera p.364,pl.33,fig.15.

1934 Buliminella elegantissima (d'Orbigny) BARBAT and JOHNSON. Journ.Pal. Vol.8,No.1,p.72,pl.1,figs.12, 13.

1944 Buliminella elegantissima (d'Orbigny) CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.12,p.27,pl.3, figs.43,44.

1945 Buliminella elegantissima (d'Orbigny) CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.21,pt.1,p.7,8,pl.2, fig.6.

1947 Buliminella elegantissima (d'Orbigny) CUSHMAN and TODD. Contr.Cush. Found.Foram.Res.Sp.Pub.no.21, p.15,16,pl.3,fig.1.

1947 Buliminella elegantissima (d'Orbigny) HOGLUND. Zool.Bidrag.Fran. Uppsala.Band 26,p.215,216, pl.18,fig.1,text-figs.196,197.

1948 Buliminella elegantissima (d'Orbigny) CUSHMAN and McCULLOCH. Allan. Pac.Exped.Rep.Vol.6,no.5, p.236-238,pl.29,fig.4.

1949 Buliminella elegantissima (d'Orbigny) BERMUDEZ. Contr.Cush.Found. Foram.Res.Sp.Pub.no.25,p.185, pl.12,fig.13.

1949 *Buliminella elegantissima* (d'Orbigny) CUSHMAN. Inst.Roy.des Sci. Nat.de Belgique.Mem.111,p.30, pl.VI,figs.4,5.

1950 *Buliminella elegantissima* (d'Orbigny) BANDY. Journ.Pal.Vol.24,No.3, p.279,pl.42,fig.10.

1951 *Buliminella elegantissima* (d'Orbigny) CUSHMAN. U.S.Geol.Survey Prof.Paper 232,p.39,pl.11,fig.20.

1951 *Bulimihella elegantissima* (d'Orbigny) HOFKER. Rep.Siboga Exped. Monog.IVa,Pt.III,p.131,fig.80.

1951 *Buliminella elegantissima* (d'Orbigny) PHLEGER and PARKER. Geol.Soc. Am.Mem.46,pt.2,p.17,pl.8, figs.3,4.

1951 *Buliminella elegantissima* (d'Orbigny) VOORTHUYSEN,van. Geol.Med. Stichting,n.s. no.5,p.24,25, pl.1,fig.23.

1952 *Buliminella elegantissima* (d'Orbigny) PARKER. Bull.Mus.Comp.Zool. Vol.106,no.9,p.416,pl.5, figs.27,28.

1953 *Buliminella elegantissima* (d'Orbigny) BANDY. Journ.Pal.Vol.27,no.2, pt.1,p.176,pl.24,fig.14.

1953 *Buliminella elegantissima* (d'Orbigny) MILLER,Jr. Contr.Cush.Found. Foram.Res.Vol.4,pt.2,p.57, 58,pl.8,fig.11.

1953 *Buliminella elegantissima* (d'Orbigny) PARKER, PHLEGER and PEIRSON. Contr.Cush.Found.Foram.Res. Sp.Pub.no.2,p.6,7,pl.4, figs.8,9.

1953 *Buliminella elegantissima* (d'Orbigny) REDMOND. Journ.Pal.Vo.27,No.5, p.719,pl.75,fig.2.

1954 *Bulimihella elegantissima* (d'Orbigny) BOL[illegible]VSKOY.Mus.Argentina de CiencìNat.Geol. Tome III, no.3,p.173,174,pl.8,figs.9.10.

1954 *Buliminella elegantissima* (d'Orbigny) BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol. Tome III,no.4, p.278,pl.25,fig.6.

1954 Buliminella elegantissima (d'Orbigny) PHLEGER. Bull.Am.Associ.Pet.
Geol.Vol.38,no.4,p.637,pl.1,
figs.24,25.

1954 Buliminella elegantissima (d'Orbigny) WEISS. U.S.Geol.Survey Prof.
Paper 254-G,p.161,pl.33,fig.7.

1955 Buliminella elegantissima (d'Orbigny) WALTON. Journ.Pal.Vol.29,no.
6,p.1004,pl.102,fig.7.

1956 Buliminella cf. elegantissima (d'Orbigny) McLEAN,Jr. Bull.Am.Pal.
Vol.36,No.160,p.344,pl.44,
figs.11a-b.

1957 Buliminella elegantissima (d'Orbigny) BOWEN. Micropaleontology.
Vol.3,No.1,p.54,55,pl.1,fig.17.

1957 Buliminella elegantissima (d'Orbigny) TODD and BRONNIMANN. Contr.Cush.
Found.Foram.Res.Sp.Pub.no.3,
p.32,pl.8,figs.1,2.

1958 Buliminella elegantissima (d'Orbigny) ARNAL. Contr.Cush.Found.Foram.
Res.Vol.9,pt.2,p.37,pl.11,
figs.7,8,9.

1958 Buliminella elegantissima (d'Orbigny) DETLING.Contr.Cush.Found.Foram.
Res.Vol.9,pt.2,p.29,pl.8,fig.5.

1958 Buliminella elegantissima (d'Orbigny) DROOGER and KAASSCHIETER.
Verhandl.Kon.Ned.Akad.Weten.Nat.
Deel XXII,Vol.IV,p.34,pl.1,
fig.9.

1959 Buliminella elegantissima (d'Orbigny) BOLTOVSKOY. Sec.de Marina Pub.
H1005, Buenos Aires, p.76,77,
pl.XI,figs.1,2.

1959 Buliminella elegantissima (d'Orbigny) GARRISON. Journ.Pal.Vol.33,
No.4,p.556,pl.85,figs.2a,b.

1959 Buliminella elegantissima (d'Orbigny) LANKFORD. Bull.Am.Assoc.Pet.
Geol.Vol.43,no.9,pl.II,fig.16.

1960 Buliminella elegantissima (d'Orbigny) BARKER. Soc.Econ.Pal. and Min.
Sp.Pub.no.9,p.104,pl.50,figs.
20-22.

1960 Buliminella elegantissima (d'Orbigny) HOFKER. Palaontologische Zeitschriff, Stuttgart.W.Band 34,Nr.3/4,p.248,pl.C,fig.83.

1960 Buliminella elegantissima (d'Orbigny) UCHIO. Contr.Cush.Found.Foram. Res.Sp.Pub.no.5,pl.6,fig.2.

1960 Buliminella elegantissima (d'Orbigny) VOORTHUYSEN,van. Verh.Kon.Ned. Geol.Mijnb,K.Gen.Geol.Serie Deel.19,p.250,Taf.11,fig.10.

1961 Buliminella elegantissima (d'Orbigny) BANDY. Micropaleontology. Vol.7,No.1,p.14,pl.2,fig.8.

1962 Buliminella elegantissima (d'Orbigny) HAAKE. Geol.Inst.Univ.Kiel. Meyniana,Band.12,p.34,Taf.2. fig.1.

1963 Buliminella elegantissima (d'Orbigny) AYALA-CASTANARES.Uni.Nac. Autonoma de Mexico Inst.Geol. Bol.no.67,pt.3,p.71,pl.5, figs.2a,b, 3a,b.

1963 Buliminella elegantissima (d'Orbigny) BOLTOVSKOY. Contr.Cush.Found. Foram.Res.Vol.14,pt.2,p.61, pl.6,fig.8.

1964 Buliminella elegantissima (d'Orbigny) COOPER. Contr.Cush.Found.Foram. Res.Vol.15,pt.3,p.95,pl.6, fig.11.

1964 Buliminella elegantissima (d'Orbigny) COPELAND. Bull.Am.Pal.Vol. 47,No.215,p.289,pl.43,figs.5a,b.

1964 Buliminella elegantissima (d'Orbigny) FEYLING-HANSSEN. Nordes Geol. Undersokelse,Nr.225,p.302,303, pl.14,fig.1.

1964 Buliminella elegantissima (d'Orbigny) BARKER. Journ.Pal.Vol.38,No.4, pl.98,fig.20.

Test free, elongate, slender, a high close spire, three times as long as broad, greatest width near the apertural end, tapering to the initial end which is broadly rounded. Chambers distinct, very high, narrow, about ten visible externally, increasing rapidly in size as added, coiled sinistrally in one and a half to two whorls. Sutures fairly distinct, impressed, slight indication of thickening. Apertural end sub rounded to sub ovate. Apertural face large with a large loop shaped aperture extending from the base well up into the face, surroundedg by a well defined apertural ridge. Test wall smooth, transluscent, finely perforate.

Dimensions: Length 0.30 mm. Diameter 0.10 mm.

Occurrence: Living, CB.370.

Dead; CB.352, CB.360, CB.373, CB.383.

Dead, variation sample CB.634.

Morphological remarks: This species exhibits variation in general shape, relative length, tightness and direction of coiling and in apertural characteristics. The inner construction of the aperture has been the centre of controversey between Hoglund and Hofker, as well as other authors. Hoglund in 1947 stated, "The aperture is situated in the uppermost part of the apertural face, which is here somewhat sunk like a crater near the boundary of the preceeding convolution. The constructional details of the aperture are particularly difficult to discover, owing to the minute size, and almost complete transparency of the test.......It seems however as though the aperture were constructed in principle as in <u>Bulimina marginata</u> and as though an 'internal trough' were present". Hofker repudiated this statement and in 1951 stated himself that, "The toothplate has nothing whatever to do with that of <u>Bulimina marginata</u>.........the plate is of a much more simple type;

as is found in all the Buliminellae. It consists of a cornet, running from the border of the former loop shaped aperture towards the border of the next one. Its attached part runs along the inner wall of the chamber, forming the lower border of the next aperture which is smooth and distinct, its free part runs along the upper border of the loop shaped opening, and with its sawed free end forms a sawed somewhat protruding border of the aperture too". Loeblich and Tappan 1964 agree with Hofker, and the Tremadoc Bay specimens appear to show the type of structure he described.

Distribution: (Text-fig.37A). This species has been recorded from the Isle of Man, Skye, Exmouth, and from the Shetlands (Williamson 1858), from the Shetland Seas (Waller 1868), from Montrose Basin and the Firth of Forth (Brady 1870), from the River Dee (Sidall 1876), and from stations around the British Isles (Brady 1884). In 1891 Burgess noted this species in the River Mersey, in 1896 the British Association noted it in the Irish Sea, and in 1902 Wright obtained it from Recent Clay in the River Lune valley. It was recorded from the Firth of Forth (Pearcey 1903), Plymouth (Worth 1904), Belfast Lough (Gough 1906), and from Lambay, County Dublin (Wright 1907). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1911, from the North Sea and Clare Island in 1913, from 12 fathoms in Loch Sunart and from 5 fathoms off Jura in 1914, from West of Scotland and the South coast of Cornwall in 1916, and from the Plymouth area in 1930. Heron-Allen in 1915 obtained this form from 20 fathoms off the Isle of Man in 1915. In 1957 the Marine Biological Association noted this species in the Plymouth region and in 1963 Bruce, Colman and Jones recorded it off the Isle of Man.

This species has been recorded from off Peru, Chile and Cape Horn (d'Orbigny 1839), from Crete and Syra (Jones and Parker 1860), from the Gulf and River St. Lawrence (Dawson 1870), and Brady in 1884 stated that this species occurred as far North as Novaya Zemlya, on the shores of Belgium andFrance, from 6 fathoms off the Falkland Islands, from the East coast of America, and from the South Pacific. In 1899 Chapman noted the form at Funafuti Atoll, in 1900 Millett obtained it from the Malay Archipelago, in 1914 Pearcey noted it from the Antarctic, and in 1918 Sidebottom obtained a single specimen off the East coast of Australia. It has been recorded from the Philippines (Cushman 1921), from the Zuidersee (Hofker 1922), from Lord Howe Island (Heron-Allen and Earland 1923) from British Columbia (Cushman 1925), from the Antarctic (Wiesner 1931; Heron-Allen and Earland 1932). Natland in 1933 obtained the form from the Southern California area where there was a bottom temperature range of 21.43°C - 13.20°C, and a depth range of 14-125 feet. Cushman in 1936 recorded it from Georges Bank Canyons, Chapman and Parr in 1937 from five Antarctic stations, and Stubbings in 1939 from 805 metres in the Zanzibar area. In 1944 Cushman recorded this form from 6 fathoms off the New England Coast and in 1947 it was recorded from the Washington coast by Cushman and Todd, and from the Gullmar Fjord and the Skagerak by Hoglund. It was recorded from Alaska south to Peru (Cushman and McCulloch 1948), and from the Gulf of Maine to Maryland (Parker 1948), from Belgium (Cushman 1949). In 1951 the species was recorded from the North West Gulf of Mexico by Phleger and by Phleger and Parker, from

Netherlands Wadden Sea by Voorthuysen and from Narragansett Bay by Said. In 1952 it was noted from the Portsmouth (N.H.) area by Parker and by Phleger, and in 1953 from the middle neritic zone, 0-150 feet off California by Bandy, from Mason Inlet, North Carolina by Miller, and from San Antonio Bay, South West Texas by Parker, Phleger and Peirson. In 1954 it was recorded from the Gulf of San Jorge, and San Blas Bay, Argentina by Boltovskoy, from the Mississippi Sound area by Phleger, from the North Eastern Gulf of Mexico by Parker, and from the San Pedro Shelf and vicinity by Crouch. Walton in 1955 stated that living specimens of this species range from 5-165 fathoms in Todos Santos Bay, California, occurring more abundantly between 10 and 20 fathoms and the deeper occurrences appear to be displacements from the shoaler waters. In the same year Boltovskoy recorded this form from Quequen, Buenos Aires, by Harrington from the Bay of Fundy, and by Phleger from the South Eastern Mississippi area. In 1956 this species was recorded from the North East Gulf of Mexico by Bandy, from 7-23 metres along the Central Texas coast by Phleger, and in 1957 from the West coast of Central America by Bandy and Arnal, from the estuary of the Rio de la Plata by Boltovskoy, from the Eastern Gulf of Paria by Todd and Bronnimann, and from the Central Texas Bays by Phleger and Lankford. It was recorded in 1958 from the Orinoco-Trinidad-Paria shelf by Drooger and Kaasschieter, from the Santa Cruz Basin, California by Resig, from the Western Mediterranean by Todd, from Sunset Bay, Oregon by Detling, and from Salton Sea, California by Arnal who noted large populations occurring where there is an abundance of nutrients, in shallow water. In 1959 the form was noted at the Bay of Flamengo, Brazil and off Argentina by Boltovskoy, from the East Mississippi delta margins by Lankford, from Santa Monica Basin by Zalesney, around Santa Catalina Island, California by McGlassen, and from the intertidal zone of the Santa Monica Bay, California by Reiter. It was recorded in 1960 from San Diego, California by Uchio, from Laguna Madre, Texas by Phleger, and from the Arctic Basis by Green. Boltovskoy in 1961 obtained the species from the continental platform between Santo Tome and the Rio de la Plata, Argentina, and in the same year it was noted from the Red Sea and Mediterranean coast of Israel by Reiss, Klug and Merling, from the Gulf of California by Bandy, from the Orange County Outfall area, Southern California where this species occurred with a frequency of 11.4% to 46% by Watkins, and from the intertidal zone of the California and Oregon coasts by Cooper. Haake obtained this form from the North Sea in 1962, and in the same year it was noted from Upper Florida Bay by Lynts, and from the Gulf of Mexico by Kane. In 1963 Cockbain recorded the species from Juan de Fuca and Georgia Straits, British Columbia, Segura from the Gulf of Mexico, Anderson from the Bering Sea, Ayala-Castanares from the Laguna de Terminos, Mexico, Bandy from Southern California and the Gulf of California, and Boltovskoy from Patagonia, Argentina. In 1964 the species was recorded from Manukau Harbour, Auckland, New Zealand by Hulme, from the North Bering Sea by Cooper, from off Japan by Uchio, from Tampa-Sarasota Bay, Florida by Walton, from Laguna Beach Outfall area, and Los Angeles Outfall area, California by Bandy, Ingle and Resig, from San Pedro and Santa Monica Basins, California by Bandy, from the Santa Barbara Basin, California by Harman, and off El Salvador, South America by Smith. In the same year Boltovskoy obtained living specimens from Puerto Deseado, Patagonia, but the author was unable to note any seasonable reproductive cycle. Phleger in 1865 obtained living specimens from Guerrero Negro Lagoon, Baja, California.

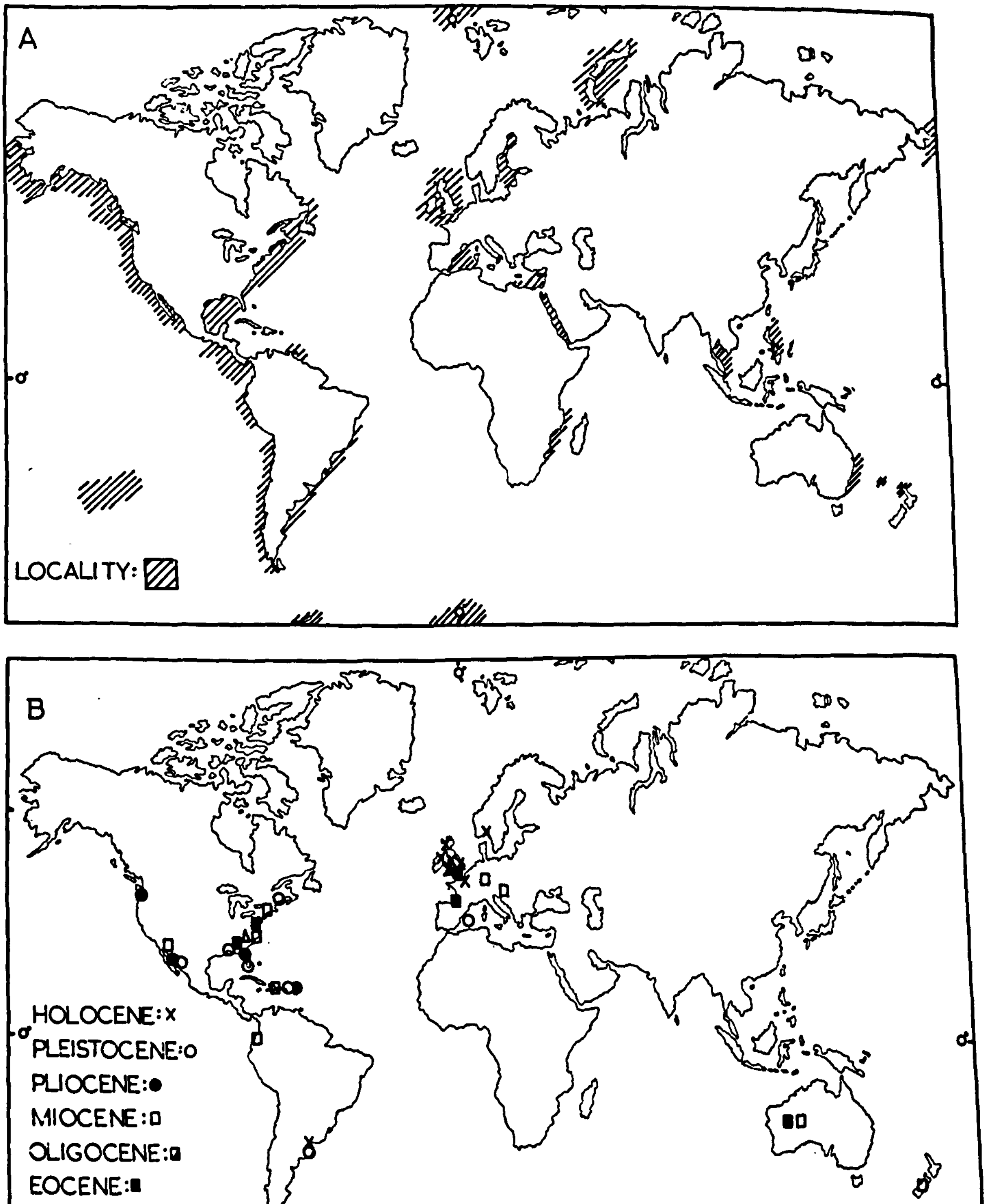
Stratigraphic Occurrence: (Text-fig.37B). Occurrences of this species in the British Holocene have been recorded from Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar and Great Crosby (Wright 1904; 1908), Kings Lynn, Skye, County Antrim, English Fens and Swansea Docks (MacFadyen 1933;1937;1938;1942), and from Borth Cardiganshire (Adams and Haynes 1965).

Heron Allen and Earland in 1910 obtained specimens from Selsey Bill, Sussex that were possibly derived from the Cretaceous. Bowen in 1957 noted this form in the Upper Eocene of Hampshire, and Bhatia in 1955 and 1957 obtained it from the Late Paleogene sediments of the Isle of Wight. A Neogene occurrence was noted in 1965 from the Western approaches to the English Channel by Curry, Murray and Whittard. Robertson noted Post Tertiary occurrences from Lewis in 1882, and from Greenock in 1885. Pleistocene occurrences of this species have been recorded from the Isle of Man by Reade and Wright in 1906, and from the Wexford coast by MacFadyen in 1940. In 1902 Wright obtained this form from the Drift of County Cork, and Boulder Clay occurrences have been noted from Cheshire (Shone 1874; Wright 1899), Great Crosby, Carrickfergus, County Down, and Lancashire (Wright 1898; 1903; 1904; 1905). Shone in 1878 obtained this species from the Upper Boulder Clay of West Cheshire and Liverpool as did Wright in 1903 from County Dublin.

Holocene occurrences from the rest of the world have been recorded from Bruges (Reade 1898), from the Georges Banks Canyons (Cushman 1936), and from the Dollart-Ems estuary (Voorthuysen 1960).

Cushman in 1945 stated that this form ranged from the Cretaceous to Tertiary in Georgia, and in 1951 stated that it occurred in the United States Paleocene. In 1932 Cushman and Ponton obtained this species from the Eocene of Alabama, and Halkyard in 1917 and 1919 obtained it from the Middle Eocene Blue Marls of Biarritz. A range from the Eocene to Miocene by this species was noted in 1893 by Howchin from Australia, and in 1964 by Copeland from North Carolina. Miocene occurrences have been noted from Northern Colombia (Redmond 1953), from New Jersey, Maryland and Virginia (Malkin 1953), from Virginia (McLean 1956), from the Carpathian foreland (Luczkowski 1958), and from the Santa Ana Mountains, California (Smith 1960). Langer in 1963 obtained this form from the Middle and Upper Miocene of North and North West Germany and Upper Miocene occurrences were noted from New Zealand (Vella 1963), and from California (Garrison 1959; Barbat and Johnson 1934). A range by this species from the Miocene to Pleistocene was noted from the Dominician Republic by Bermudez in 1949, and from the San Pedro Shelf and vicinity by Crouch in 1954. Pliocene occurrences have been recorded from Timms Point, California (Cushman and Gray 1946), from Cape Blanco, Oregon (Bandy 1950), and from California (Goodwin and Thomson 1954). Bagg in 1912 stated that this species ranges from the Pliocene to Pleistocene in Southern California, and Cole in 1931 noted a similar range in Florida. Australian Tertiary occurrences were noted in 1955 by Crespin and by Rao, and a Middle Tertiary occurrence was noted in 1963 by Bandy and Kolpack in the Tecolote Tunnel, California. Pleistocene occurrences were noted from Louisiana (Anderson and Murray 1953), from Eastern Long Island Sound (Weiss 1954), and from a Western Mediterranean core (Todd 1958). Boltovskoy in 1959 recorded this species in the Pleistocene and Holocene of Quequen, Buenos Aires, and Feyling-Hanssen in 1964 obtained it from the Late Quaternary of the Oslo Fjord area.

Diagnosis: This species has a world wide distribution but appears to prefer shallow water temperate latitudes, generally found in the finer sediments. The stratigraphic range is possibly Cretaceous to Recent, and certainly Tertiary to Recent.



TEXT FIG. 37 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- BULIMINELLA ELEGANTISSIMA

Family: Bolivinitidae Cushman 1927

Genus: Bolivina d'Orbigny 1839

Bolivina spathulata (Williamson) 1858

Pl.14, figs.1a,1b.

1858	Textularia variablis var. spathulata	WILLIAMSON. Rec.For.Gt.Brit.Ray Soc. p.76,pl.6,figs.164-165.
1884	Bolivina dilitata (Reuss)	BRADY. Chall.Rep.Zool.Vol.9, p.418,pl.52,figs.20,21.
1912	Bolivina dilitata (Reuss)	BAGG. U.S.Geol.Survey Bull.513, p.40,pl.XI,figs.7,8,9.
1930	Bolivina spathulata (Williamson)	MacFADYEN.Geol.Survey Egypt. p.57,pl.IV,fig.20.
1937	Bolivina spathulata (Williamson)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.9,p.162,pl.15,figs. 20-24.
1947	Bolivina spathulata (Williamson)	HOGLUND. Zool.Bidrag.Fran.Uppsala, Band.26,p.271,272,pl.24,fig.7, pl.32,figs.21,22,text-figs.286,287.
1950	Bolivina spathulata (Williamson)	VOORTHUYSEN,van. Meded.Geol. Stichting,n.s.No.4,p.61,pl.2,figs. 16,17,20,21.
1952	Bolivina spathulata (Williamson)	COLOM. Bull.Inst.Espanol Ocean. No.51,p.31,Lam.11,figs.8-9.
1954	Bolivina spathulata (Williamson)	BOLTOVSKOY.Mus.Argentino de Cienc. Nat.Geol.Tome III, no.4,p.280, 281,pl.XXV,fig.17.
1957	Bolivina spathulata (Williamson)	FORAMINIFERI PADANI. Agip Mineraria, pl.31,fig.3.
1957	Bolivina spathulata (Williamson)	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3, p.34,pl.8,figs.22,23.
1960	Bolivina spathulata (Williamson)	BARKER.Soc.Econ.Pal. and Min.Sp. Pub.no.9,pl.52,figs.20.21,

1962 Bolivina spathulata (Williamson) CHIERICI, BUSI, and CITA. Rev.de Micropalaeo.Vol.5,no.2,p.133,pl.1,(2),fig.3.

1964 Bolivina spathulata (Williamson) FEYLING-HANSSEN. Nordes Geol. Undersokelse, Nr.225,p.321,322, pl.16,fig.10.

Test free, small compressed, tapering regularly throughout to a sub rounded initial end, ovate at the apertural end. Periphery regularly acute becoming slightly less so at the apertural end. Chambers distinct, broad, and low except at the initial end. Adult chambers biserial, alternating regularly, nine pairs present, increasing gradually in size as added. Sutures distinct, impressed, straight to slightly limbate. Aperture narrow, elongate, slightly comma shaped in the median line of the last chamber extending from the base of this chamber half way up into the apertural face. Wall smooth, transparent, perforate.

Dimensions: Length 0.35 mm. Width 0120 mm. Thickness 0.10 mm.

Occurrence: Dead CB.323, CB.352, CB.362, CB.402.

Morphological remarks: B.catanensis, Seguenza, B.ordinaria Phleger and Parker, and B.minima Phleger and Parker are all similar to the above species, with only minor differences serving to differentiate them. Both the microspheric and megalospheric generations are present. Variation is exhibited in the amount of suture limbation.

Distribution: This species has been recorded from a number of British Stations (Williamson 1858), from West of Ireland (Brady 1884), and from West of France, South of Ireland and from the Western English Channel (Le Calvez 1958).

This form has been recorded from the Gullmar Fjord and the Skagerak (Hoglund 1947), from Belgium (Cushman 1949), from the coast of Galicea (Colom 1952), from San Blas Bay, Argentina (Boltovskoy 1954), from the offshore zone of the Eastern Gulf of Paria (Todd and Bronnimann 1957), and from depths of 171-875 metres in the Gulf of Gascogne (Berthois and Le Calvez 1959). Also in 1959 Polski obtained this form from the Inner Shelf (49-150 feet) of the South Korean Sea, from the Central Shelf (150-285 fee6) and the Middle Bathyal zone (2000-4454 feet) of the East China Sea, and from the Outer Shelf (285-400 feet) of the Taiwan Strait. In 1960 Waller noted this species off the South China coast in the Upper Bathyal zone at depths of 401-656 feet, at temperatures of 10-15°C, and at a salinity of 34‰.
In 1962 it was recorded from the Adriatic Sea (Chierici, Busi, Cita; Cita and Chierici). Le Calvez in 1963 recorded it from the Ivory coast, and in the following year Hulme obtained it from Manukau Harbour, Auckland, New Zealand.
Stratigraphic Occurrence: Holocene occurrences in the British Area have been recorded from the Fens (MadFadyen 1938), and from Borth, Cardiganshire (Adams and Haynes)1965).

MacFadyen in 1940 obtained this species from the Pleistocene Lower and Upper Clay of the Wexford coast.

Feyling-Hanssen in 1964 noted a few specimens in the Holocene deposits of the Oslo Fjord area.

In 1955 Rao recorded this form from the Australian Tertiary deposits. Miocene occurrences were noted from Egypt and Sinai by

MacFadyen in 1930, and from the Vienna Basin by Marks in 1951. Voorthuysen in 1950 recorded the species from the Pliocene of the Western Netherlands, and two Upper Pliocene occurrences have been noted, one from a core at Foggia by Borsetti in 1962, and the other from the Riviera by Zanfra in 1961. A range by this species from the Pliocene to Pleistocene was noted from Southern California (Bagg 1912), and from Parma (Papani and Pelosio 1962). Bourcart, Damiani, Le Calvez and Vernet in 1963 recorded this species in the Quaternary of the Alps.

Diagnosis: This species is not particularly well distributed throughout the world, and has not been recorded from Polar or Equatorial regions. It appears to prefer the more temperate environments at differing depths. Stratigraphically it ranges from the Miocene to Recent but is not abundant at any time.

Bolivina variablis (Williamson) 1858

Pl.14, figs.3a,3b.

1858	*Textularia variablis*	WILLIAMSON	Rec.For.Gt.Brit.Ray.Soc.London. p.76,pl.6,figs.162,163.
1922	*Bolivina variablis*	(Williamson)	CUSHMAN. U.S.Nat.Mus.Bull.104, pt.3,p140,pl.4,fig.3.
1937	*Bolivina variablis*	(Williamson)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.9,p.158,pl.16, figs.6,12-14.
1944	*Bolivina variablis*	(Williamson)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.29,pl.4,figs. 2,3.
1949	*Bolivina variablis*	(Williamson)	CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique,Mem.III,p.32,pl.6,figs. 13-15.
1952	*Bolivina variablis*	(Williamson)	PARKER. Bull.Mus.Comp.Zool. Vol.106,No.10,p.445,pl.4,fig.12.
1956	*Bolivina variablis*	(Williamson)	BHATIA. Contr.Cush.Found.Foram. Res.Vol.7,p.21,pl.1,fig.8.
1957	*Bolivina variablis*	(Williamson)	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3, p.35,pl.8,fig.31.
1957	*Bolivina variablis*	(Williamson)	VOORTHUYSEN,van. Med.Geol. Stichting n.s. No.11,p.36,Taf.25, fig.37.
1960	*Bolivina variablis*	(Williamson)	VOORTHUYSEN,van. Verh.Kon.Ned. Geol.Mijnb.K.Gen.Geol.Serie. Deel 19,p.249,Taf.11,fig.8.

Test free, small, elongate, oval, tapering regularly throughout to a subacute initial end, slightly ovate at the apertural end. Periphery regularly acute except for the last formed chambers where it is somewhat rounded. Chambers broad and low, increasing gradually in size as added, nine pairs present. Sutures broad with a concentration of coarse perforations along the length of the sutures giving them an opaque appearance, slightly limbate at the inner end, oblique. Aperture elongate comma shaped on the base of the last chamber in the median line extending from the base of this chamber half way up into the apertural face. Wall smooth, perforate, densely so along the sutures, transluscent except for the opaque sutures.

Dimensions: Length 0.25 mm. Width 0.10 mm. Thickness 0.09 mm.

Occurrence: Dead CB.360, CB.380, CB.382.

Morphological remarks: This species is very variable and may be confused with the similar forms B.pseudopunctata Hogland and B.simplex Phleger and Parker. An extreme example of variation shown by this species is when the test becomes twisted, giving it an arcuate appearance.

Distribution: This species has been recorded from the Shetland Seas (Waller 1868), the River Dee (Sidall 1876), Liverpool Bay (Pearcey 1891), the Irish Sea (British Association 1896), Selsey Bill, Sussex and from 12 fathoms in Loch Sunart (Heron-Allen and Earland 1909; 1914). Heron-Allen in 1915 obtained this form from 20 fathoms off the Isle of Man, and with Earland recorded it from the South coast of Cornwall in 1916, and from the Plymouth area in 1930. It was obtained from six stations in the Plymouth area in 1957 by the Marine Biological Association.

In 1964 Hulme obtained the species from Manukau Harbour, Auckland, New Zealand.

Stratigraphic Occurrence: British Holocene occurrences have been recorded from Great Crosby (Wright 1908), Skye and County Antrim (MacFadyen 1937), English Fens and Swansea Docks (MacFadyen 1938; 1942), and from Borth, Cardiganshire (Adams and Haynes 1965).

MacFadyen in 1940 obtained the species from the Pleistocene Lower Clay of the Wexford coast.

Voorthuysen in 1960 recorded the species from the Holocene of the Dollart-Ems estuary.

Diagnosis: This species is essentially a shallow water temperate form only occurring from the Pleistocene to Recent.

Family: Islandiellidae Loeblich and Tappan 1964

Genus: <u>Cassidulinoides</u> Cushman 1927

<u>Cassidulinoides tenuis</u>. Phleger and Parker 1951

Pl.14, figs.5a,5b.

1951	<u>Cassidulinoides tenuis</u>	PHLEGER and PARKER	Geol.Soc.Am.Mem.46,pt.2, p.27,pl.14,figs.14a,b, 15-17.
1954	<u>Cassidulinoides tenuis</u>	Phleger and Parker	PARKER. Bull.Mus.Comp. Zool.Vol.111,No.10,p.537, pl.11,fig.14.
1958	<u>Cassidulinoides tenuis</u>	Phleger and Parker	PARKER. Rep.Swed.Deep Sea Exped.Vol.VIII,fasc.II No.4,p.272,pl.4,figs.18,19.
1961	<u>Cassidulinoides tenuis</u>	Phleger and Parker	BANDY. Micropaleontology. Vol.7,No.1,p.15,pl.4,fig.7.
1964	<u>Cassidulinoides tenuis</u>	Phleger and Parker	PARKER. Journ.Pal.Vol.38, No.4,pl.99,fig.31.

Test free, elongate, fairly small, slender, greatest width at the apertural end tapering gently to the initial end which is rounded, circular to sub-circular in transverse section. Initial portion sub globular with chambers biserially arranged and enrolled, later becoming uncoiled in a series of biserial alternating chambers, three to five alternating sets present. Chambers distinct, ten to thirteen visible, long and slender in the uncoiled portion, very slightly inflated. Sutures distinct, depressed, flexuose. Aperture loop shaped, broad, extending from the base of the last chamber well up into the apertural face. Test wall calcareous, thin, transparent, very finely perforate.

Dimensions: Length 0.55 mm. Diameter 0.16 mm.

Occurrence: Dead CB.360.

Morphological remarks: This form differs from Cassidulinoides bradyi (Norman) in being more elongate, and in having a less definitely coiled initial end, and from Cassidulinoides mexicana (Cushman) in being more slender and with a less tightly coiled initial end.

Distribution: This species has not been recorded from the British area to the present date.

In 1951 Phleger and Parker recorded the type species from the North West Gulf of Mexico. Parker in 1954 obtained it from three traverses deeper than 255 metres in the North Eastern Gulf of Mexico and noted that it occurred with frequencies of less than 1%, and also noted that occurrences deeper than 1,100 metres were very scattered. Bandy and Arnal in 1957 recorded the form off the West coast of Central America and in 1958 it was recorded in the Recent portion of a core from the Western Mediterranean by Todd, and was recorded as rare in the Eastern Mediterranean by Parker. It was obtained from the East Mississippi delta margin by Lankford in 1959, from the Gulf of California by Bandy in 1961, and from a depth of 450 metres off El Salvador, South America by Smith in 1964.

Stratigraphic Occurrence : The only stratigraphic occurrence of this species in the British area was noted in 1965 by Adams and Haynes from the Holocene deposits of Borth, Cardiganshire.

Phleger and Parker in 1951 stated that apart from Recent occurrences this species also occurred in the Late Pleistocene of the North West Gulf of Mexico and that it appeared to be a transition fauna. Todd in 1958 obtained the form from the Pleistocene portion of a core from the Western Mediterranean.

Diagnosis: This species appears to only occur off America, and in the Mediterranean, this may be due to few records however. Stratigraphically it is restricted to the Pleistocene and Recent.

Family: Buliminidae Jones 1875

SubFamily: Bulimininae Jones 1875

Genus: *Bulimina* d'Orbigny 1826

Bulimina elongata d'Orbigny 1826

Pl.14, figs.4a, 4b.

1826	*Bulimina elongata*	d'ORBIGNY	Ann.Sci.Nat.Paris.Vol.7,p.269,no.9,
1846	*Bulimina elongata*	d'Orbigny	d'ORBIGNY.For.Foss.Vienne,p.187, pl.XI,figs.19,20.
1882	*Bulimina elongata*	d'Orbigny	TERQUEM. Mem.Geol.Soc.France,Ser. 3,Vol.2,Mem.3,p.109,pl.XI,figs. 21a,b,22.
1884	*Bulimina elongata*	d'Orbigny	BRADY. Chall.Rep.Zool.Vol.9,p.401, 402,pl.21,figs.1,2.
1901	*Bulimina elongata*	d'Orbigny	FORNASINI. Mem.Real.Accad.Sci.Inst. Bologna Ser.5,Vol.9,p.373,fig.5, p.376,Tav.0,figs.10,20,Tav.0,figs. 12,37.
1911	*Bulimina elongata*	d'Orbigny	CUSHMAN. U.S.Nat.Mus.Bull.71,pt.2, p.79,80,fig.131.
1932	*Bulimina elongata*	d'Orbigny	SANDIDGE. Journ.Pal.Vol.6,No.3, p.281,pl.43,fig.3.
1937	*Bulimina elongata*	d'Orbigny	CUSHMAN and PARKER. Contr.Cush. Found.Foram.Res.Vol.13,pt.2,p.49, pl.7,figs.1-3.
1938	*Bulimina elongata*	d'Orbigny	CUSHMAN and PARKER. Contr.Cush. Found.Foram.Res.Vol.14,pt.4,p.93, pl.16,fig.12.
1949	*Bulimina elongata*	d'Orbigny	BANDY. Bull.Am.Pal.Vol.32,No.131, p.163,pl.25,fig.15.
1949	*Bulimina elongata*	d'Orbigny	CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique.Mem.III,p.31,pl.VI,figs.7,8.
1950	*Bulimina elongata*	d'Orbigny	VOORTHUYSEN,van. Med.Geol.Stichting n.s, No.4,p.59,pl.2,fig.6.

1951 Bulimina elongata d'Orbigny MARKS, Jr. Contr.Cush.Found.Foram.Res. Vol.2, pt.2, p.57, pl.7, fig.12.

1952 Bulimina elongata d'Orbigny COLOM. Bull.Inst.Espanol Ocean, No.51, p.25, Lam.1, fig.19.

1954 Bulimina elongata d'Orbigny BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III, no.3, p.178, 179, pl.X, figs.10, 12.

1955 Bulimina elongata d'Orbigny BHATIA. Journ.Pal.Vol.29, no.4, p.680, pl.66, fig.23.

1955 Bulimina elongata d'Orbigny KAASSCHIETER in Drooger.Kaasschieter, and Key, Verhandle.Konin.Ned.Akad.Weten. Nat.Deel.XXI, no.2, p.76, pl.12, fig.12.

1957 Bulimina elongata d'Orbigny FORAMINIFERI PADANI. Agip Mineraria pl.26, fig.9.

1962 Bulimina elongata d'Orbigny CITA and CHIERICI. Est.Arch.Ocean. Limnol.Vol.XII, fasc.3, p1344, pl.VI, fig.3.

1963 Bulimina elongata d'Orbigny BOLTOVSKOY. Contr.Cush.Found.Foram. Res.Vol.14, pt.2, p.61, pl.6, fig.6.

1963 Bulimina elongata d'Orbigny KUMMERLE. Abhand.Hess.Landes.Boden Heft.45, p.40, Taf.5, figs.8a-b.

1965 Bulimina elongata elongata d'Orbigny SOUAYA. Micropaleo.Vol.11, No.3, p.315, pl.2, fig.16.

Test free, triserial, elongate, slightly curved at the initial end, three times as long as broad, circular in cross section. Greatest width at the apertural end, tapering gently to the initial end which is somewhat indistinct but which appears to have one or two very small spines present. Chambers at first indistinct, later distinct, numerous, fifteen to eighteen present, gently inflated, rapidly increasing in size as added, the last chambers comprising 30% of the length of the test. Sutures distinct, impressed. Apertural face large, semi-circular.

Aperture large, extending from the base of the apertural face well up into the face, broad, rounded with a slight lip present. Faint trace at apertural end of the tooth plate present. Wall thin, transluscent, finely and densely perforate.

Dimensions: Length 0.34 mm. Diameter 0.15 mm.

Occurrence: Living CB.398.

Dead, CB.327, CB.337, CB.348, CB.360, CB.361, CB.363, CB.364, CB.370, CB.373, CB.374, CB.380, CB.381, CB.382, CB.384, CB.398.

Morphological Remarks: This species is variable in the length of the test, inflation of test, inflation of chambers, and presence of absence of the small basal spines. Specimens are available from the study area showing a gradation from B.elongata to B.gibba.

Distribution: This species has been recorded from Liverpool Bay (Pearcey 1891), the Irish Sea (British Association 1896), the Firth of Forth (Pearcey 1902), the Larne district, Ireland (Gough 1904), Belfast Lough and Larne Lough, Ireland (Gough 1906), and from Lambay County Dublin (Wright 1907). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909, and 1911, from the Clare Island area in 1913, from 12 fathoms in Loch Sunart in 1914, from West of Scotland and the South coast of Cornwall in 1916, and from the Plymouth area in 1930. It was obtained from six stations in the Plymouth area in 1957 by the Marine Biological Association, and in the following year from the Mer Celtique, West of France, the Western English Channel, and South of Ireland by Le Calvez.

It was recorded from Rimini (d'Orbigny 1826), from 630 fathoms in the North Atlantic and 1,425 fathoms in the South Atlantic (Brady 1884), from the Western North Pacific, South of Japan, from the Philippines and adjacent areas (Cushman 1911, 1921), and from the Falklands sector of the Antarctic (Earland 1934). Stubbings in 1939 obtained this form from 186 and 528 metres in the Gulf of Aden, 274 metres in the Northern Arabian Sea, and from 797 metres in the Maldive area. Cushman in 1949 noted this form in Belgian material and Colom in 1952 noted it on the coast of Galicia. Boltovskoy recorded this species from the Gulf of San Jorge, Argentina in 1954, from Quequen, Buenos Aires in 1955, and from the estuary of the Rio de la Plata in 1957. In 1959 it was noted at 35 metres in the Gulf of Gascogne by Berthois and Le Calvez, in 1961 Watkins obtained it from the Orange County outfall area, Southern California, and in 1962 Cita and Chierici noted it in the Adriatic Sea. Boltovskoy also recorded this species from Puerto Deseado, Patagonia in 1963.

Stratigraphic Occurrence: This species has occurred in the British Holocene at Cleongart (Munthe 1897), and Great Crosby (Wright 1908). Heron Allen and Earland in 1916 noted this form in the shore sands of the South coast of Cornwall and stated that it was Eocene derived. It was obtained from the Late Paleogene of the Isle of Wight by Bhatia in 1955, and Curry, Murray and Whittard noted it in 1965 in the Miocene of the Western approaches to the English Channel.

An occurrence in the Upper Cretaceous of Western Alabama was noted by Sandidge in 1932, and Ellermann recorded Tertiary occurrences of this species from the Rhine area in 1960, and from West Emsland in 1963.

Eocene occurrences have been noted from the Paris area (Terquem 1882), Germany and the Vienna Basin (Cushman and Parker 1937), Alabama (Bandy 1949), and a Middle Eocene occurrence was noted in the Blue Marlsof Biarritz (Halkyard 1917,1919). In 1940 Majzon noted this species occurring in the Oligocene portion of a core in Hungary, and Ellermann in 1958 also noted an Oligocene occurrence in the Rhine area. In 1963 Kummerle obtained the form from the German Upper Oligocene. Miocene occurrences have been recorded from Egypt and Sinai (MacFadyen 1930), Vienna Basin (Marks 1951), South West France (Kaasschieter 1955), the Carpathian foreland (Luczkowska 1957), Cagliari (Caria 1959), and from the Gulf of Suez region (Souaya 1965). In 1950 Voorthuysen obtained this form from the Middle Miocene of the Western Netherlands, and in 1954 Schroeder and Bishop stated that this species ranged from the Lower to Upper Miocene in Southern Florida. Borsetti noted the species in the Middle and Upper Pliocene at Foggia in 1962, and Voorthuysen noted the form ranging from the Pliocene to Pleistocene in a boring at the Hague, Netherlands in 1950. An Alpine Quaternary occurrence was recorded in 1963 by Bourcart, Damiani, Vernet, and Le Calvez.

Diagnosis: This species appears to occur fairly commonly in the warm temperate latitudes, in shallow to deep water. It ranges from the Upper Cretaceous to Recent.

<u>Bulimina gibba</u> Fornasini 1901

Pl.14, figs.6a, 6b.

1884	<u>Bulimina elegans</u>	(d'Orbigny)	BRADY. Chall.Rep.ZoolVol.9,pl.50, figs.1-4.
1901	<u>Bulimina gibba</u>	FORNASINI	Roy.Accad.Sci.Inst.Bologna. Mem.Sci.Nat.Ser.5,Vol.9,p.378,pl.10, fig.32-34.
1954	<u>Bulimina gibba</u>	Fornasini	BOLTOVSKOY. Mus.Argentino de Cienc.Nat. Geol.Tome III,no.3,p.182,pl.10,fig.19.
1954	<u>Bulimina gibba</u>	Fornasini	BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III,no.4,p.279,pl.25, fig.13.
1958	<u>Bulimina gibba</u>	Fornasini	PARKER. Rep.Swed.Deep Sea Exped.Vol. VIII,fasc.II,No.4,p.261,pl.2,fig.21,22.
1960	<u>Bulimina gibba</u>	Fornasini	BARKER. Soc.Econ.Pal. and Min.Sp.Pub. no.9,no.102,pl.50,figs.1-4.
1960	<u>Bulimina gibba</u>	Fornasini	HOFKER. Palaontologische Zietschriff Stuttgart W,Band 34,Nr.3/4,p.248, 249,pl.D,figs.91-95.
1962	<u>Bulimina gibba</u>	Fornasini	McKNIGHT Jr. Bull.Am.Pal.Vol.44, No.201,p.110,pl.18,fig.105.

Test free, one and a half times as long as broad, widest at the apertural end with the last formed whorl which constitutes the greater part of the test, tapering to the initial end which is somewhat rounded. Apertural end sub rounded, sub triangular to sub rounded in transverse section. Chambers distinctly, gently inflated at first, later markedly so, increasing rapidly in size as added, numerous, about twelve to fourteen present, all visible externally, arranged in a regular, triserial, sinistral spire. Sutres distinct, impressed. Aperture large, elongate, comma shaped, extending from the basal suture well into the apertural face. Test wall smooth, semi-transparent, finely perforate.

Dimensions: Length 0.31 mm. Diameter 0.25 mm.

Occurrence: Living CB.374, CB.401.

Dead: CB.309, CB.311, CB.316, CB.317, CB.321, CB.323, CB.324, CB.326, CB.327, CB.331, CB.334, CB.337, CB.343, CB.346, CB.347, CB.348, CB.349, CB.350, CB.351, CB.352, CB.358, CB.359, CB.360. CB.361, CB.363, CB.368, CB.371, CB.373, CB.374, CB.379, CB.380, CB.382, CB.384, CB.385, CB.386, CB.387, CB.396, CB.398, CB.402, CB.403, CB.408, CB.412, CB.612, CB.629, CB,631, CB.638, CB.640, CB.641, CB.642.

Dead, variation samples, CB.690, CB.696, CB.700, CB.717, CB.746.

Morphological remarks: This species exhibits considerable variation in relative test length and in the degree of inflation.

Distribution: Brady in 1884 recorded this species from West of Ireland.

Boltovskoy recorded this species from the Gulf of San Jorge, Argentina, San Blas Bay, Argentina, and off Argentina in 1954, from the Rio de la Plata estuary in 1957, again off Argentina in 1959, and from the continental platform between Santo Tome and the Rio de la Plata in 1961. Parker noted this form occurring with frequencies up to 11%, at depths of 71-685 metres in the Eastern Mediterranean, in 1958, and Todd in the same year noted it in the Western Mediterranean. Hofker in 1960 obtained the form the Gulf of Naples, and in 1962 McKnight obtained one specimen at 1,670 metres off Queen Maud Land, Antarctic. It was recorded off the Southern Atlantic coast of the United States in 1964 by Wilcoxin.

Stratigraphic Occurrence: The only stratigraphic occurrence in the British area recorded to the present day was made by Adams and Haynes in 1965 who obtained this species from the Holocene deposits of Borth, Cardiganshire.

Todd in 1958 recorded this form in the Pleistocene portion of a core taken from the Western Mediterranean.

Diagnosis: This species occurs in warm to temperate latitudes at varying depths. Stratigraphically it is restricted from the Pleistocene to Recent.

Bulimina marginata d'Orbigny 1826

Pl.14, figs.7a,7b.

1826	Bulimina marginata	d'ORBIGNY	Ann.Sci.Nat.Paris.Ser.1,Tome 7, p.269,pl.12,figs.10-12.
1958	Bulimina pupoides	(d'Orbigny)	var. marginata WILLIAMSON. Rec.For. Gt.Brit.Ray.Soc.London,p.62,pl.5, figs.126,127.
1884	Bulimina marginata	d'Orbigny	BRADY. Chall.Rep.Zool.Vol.9,p.405, pl.51,figs.3-5.
1894	Bulimina marginata	d'Orbigny	GOES. Kongl.Svensk.Veten.Akad.Handl. N.F.Bd.25,No.9,p.46,Tab.IX,figs.439,444
1900	Bulimina marginata	d'Orbigny	READE. Geol.Mag.Vol.XII,p.100, pl.V,fig.4.
1911	Bulimina marginata	d'Orbigny	CUSHMAN. U.S.Nat.Mus.Bull.71,pt.2, p.83,fig.136.
1922	Bulimina marginata	d'Orbigny	CUSHMAN. U.S.Nat.Mus.Bull.104, pt.3,p.91,pl.21,figs.4,5.
1927	Bulimina marginata	d'Orbigny	GALLOWAY and WISSLER. Journ.Pal. Vol.1,No.1,p.73,pl.11,fig.17.
1932	Bulimina marginata	d'Orbigny	MacFADYEN.Geol.Mag.Vol.69,p.496, pl.34,fig.5.
1933	Bulimina marginata	d'Orbigny	GALLOWAY. A manual of foraminifera, p.362,pl.33,fig.10.
1938	Bulimina marginata	d'Orbigny	CUSHMAN and PARKER. Contr.Cush.Found. Foram.Res.Vol.14,pt.4,p.91,92,pl.16, figs.5,6.
1939	Bulimina marginata	d'Orbigny	PHLEGER. Geol.Soc.Am.Bull.Vol.50, no.9,pl.3,fig.23.
1940	Bulimina marginata	d'Orbigny	CUSHMAN and PARKER. Contr.Cush. Found.Foram.Res.Vol.16,pt.1,p.9, pl.2,figs.8,9.
1944	Bulimina marginata	d'Orbigny	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.27,28,pl.3, figs.45,46.

1947	<u>Bulimina marginata</u>	d'Orbigny	HOGLUND. Zool.Bidrag..Fran.Uppsala, Band 26,p.227,228,pl.20,figs.1,2, pl.22,fig.1,text-figs.205-218.
1948	<u>Bulimina marginata</u>	d'Orbigny	CUSHMAN and McCULLOCH. Al.Han.Pac. Exped.Reps.Vol.6,no.5,p.246,247, pl.30,fig.8.
1948	<u>Bulimina marginata</u>	d'Orbigny	PARKER. Bull.Mus.Comp.Zool.Vol.100, no.2,pl.5,fig.11.
1949	<u>Bulimina marginata</u>	d'Orbigny	BERMUDEZ. Contr.Cush.Found.Foram.Res. Sp.Pub.no.25,p.182,pl.12,fig.11.
1949	<u>Bulimina marginata</u>	d'Orbigny	CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique. Mem.III,p.30,pl.VI,fig.6.
1949	<u>Bulimina marginata</u>	d'Orbigny	RUSCELLI. Inst.Geol.Pal.Geog.Fis. Univ.Milano,Ser.p,no.62,Vol.VI, fasc.1,p.13,Tav.1,fig.10.
1949	<u>Bulimina marginata</u>	d'Orbigny	SAID. Contr.Cush.Found.Foram.Res. Sp.Pub.no.26,p.26,27,pl.3,fig.4.
1949	<u>Bulimina marginata</u>	d'Orbigny	VOORTHUYSEN,van. Verh.Ned.Konin. Mijnb.Gen.Geol.Deel 15,p.66,pl.1, fig.8.
1951	<u>Bulimina marginata</u>	d'Orbigny	HOFKER. Siboga Exped.Monog.IV,a, Pt.III,p.154-6,figs.95,96.
1951	<u>Bulimina marginata</u>	d'Orbigny	PHLEGER and PARKER. Geol.Soc.Am. Mem.46,pt.2,p.16,pl.7,figs.27,28.
1952	<u>Bulimina marginata</u>	d'Orbigny	COLOM. Bull.Inst.Espanol Ocean, No.51,p.24,Lam.1,figs.1-6.
1952	<u>Bulimina marginata</u>	d'Orbigny	PARKER. Bull.Mus.Comp.Zool.Vol.106, no.9,p.415,pl.5,fig.26.
1953	<u>Bulimina marginata</u>	d'Orbigny	DROOGER. Contr.Cush.Found.Foram.Res. Vol.4,pt.14,p.129,pl.20,fig.21-24.
1954	<u>Bulimina marginata</u>	d'Orbigny	ANDEL,van, and POSTMA. Verh.Konin. Ned.Akad.Weten.Afd.Nat.Deel XX, No.5,Vol.1,p.211,pl.II,fig.2.

1954	Bulimina marginata	d'Orbigny	BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol. Tome III,no.3,p.175,pl.X, figs.1-4,5,6-8.
1954	Bulimina marginata	d'Orbigny	BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III,no.4,p.278,279, pl.XXV,fig.10.
1954	Bulimina marginata	d'Orbigny	PARKER. Bull.Mus.Comp.Zool.Vol.111, No.10,p.510,pl.6,fig.20.
1956	Bulimina marginata	d'Orbigny	BHATIA. Contr.Cush.Found.Foram.Res. Vol.7,pt.1,p.20,pl.1,fig.4.
1957	Bulimina marginata	d'Orbigny	FORAMINIFERI PADANI. Agip Mineraria pl.27,fig.8.
1957	Bulimina marginata	d'Orbigny	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.32 pl.8,figs.4,5.
1958	Bulimina marginata	d'Orbigny	DROOGER and KAASSCHIETER. Verhandl. Kon.Ned.Akad.Weten.Nat.Deel XXII, Vol.IV,p.33,pl.1,fig.8.
1958	Bulimina marginata	d'Orbigny	PARKER. Rep.Swed.Deep Sea Exped. Vol.VIII,fasc.II,no.4,p.262,pl.2, fig.23.
1959	Bulimina marginata	d'Orbigny *forma typica*	BOLTOVSKOY. Sec. de Marina Pub.H.1005,Buenos Aires, p.77-79,pl.X,figs.3,4.
1959	Bulimina marginata	d'Orbigny	d'ONOFRIO. Giorn.Geol.Bologna,Ser. 2a,Vol.XXVII,1956-57, p.169,Tav.II, fig.6.
1960	Bulimina marginata	d'Orbigny	ASANO. Sci.Rep.Tohoku Univ.Ser.2, (Geol).Spec.p.4,pl.1,figs.5,9.10,11.
1960	Bulimina marginata	d'Orbigny	BARKER. Soc.Econ.Pal. and Min.Sp. Publno.9,p.104,pl.51,figs.3-5.
1962	Bulimina marginata	d'Orbigny	CHIERICI, BUSI, and CITA. Rev.de Micropalaeo. Vol.5,No.2,pl.2(2), fig.2.

1962 Bulimina marginata d'Orbigny CITA and CHIERICI. Est.Arch.Ocean. Limnol.Vol.XII,fasc.3,p.344,pl.VI, fig.4,pl.VII,fig.4,pl.VIII,fig.2.

1962 Bulimina marginata d'Orbigny forma typica CLOSS and BARBERENA. Inst.Rio Grande do Sul, Inst.Cienc. Nat. No.16,p.32,Est.3,figs.1-3, Est.6,figs.2-5.

1963 Bulimina marginata d'Orbigny AYALA-CASTANARES. Univ.Nac.Autonoma de Mexico Inst.Geol.Bol.no.67,pt.3, p.77,pl.5,figs.10a,b.

1963 Bulimina marginata d'Orbigny BOLTOVSKOY. Contr.Cush.Found.Foram. Res.Vol.14,pt.2,p.61,pl.6,fig.7.

1964 Bulimina marginata d'Orbigny FEYLING-HANSSEN. Nordes. Geol. Undersokelse, Nr.225,p.303,304, pl.14,figs.2-5.

1964 Bulimina marginata d'Orbigny LEROY. U.S.Geol.Survey Prof.Paper 454-F,p.F30,pl.11,fig.2.

Test free, triserial throughout, ovate, greatest width at the apertural end tapering to the sub rounded initial end which has a number of small spines present. Chambers indistinct at first, later distinct, nine to ten visible externally, increasing rapidly in size as added, the last three chambers becoming globular and inflated. Chamber edges geniculated and the edges are rim like, covered with very small spines and crenulations, the remainder of the chamber being smooth, apart from the occasional random spine. Sutures distinct, impressed. Apertural face sub rounded. Aperture large, a loop shaped opening set in a depression in the apertural face and extending well up into the face. Aperture has a raised border or lip present. Wall calcareous, thin, transluscent, except for the initial end which is opaque, very finely perforate.

Dimensions: Length 0.26 mm. Diameter 0.16 mm.

Occurrence: Living CB.382.

Dead, CB.308, CB.362, CB.371, CB.373, CB.379, CB.382.

Morphological remarks: This species exhibits considerable variation in the shape of the test and degree of ornamentation. Hoglund (1947) noted this form as a variable species belong to a series leading from B.aculeata d'Orbigny and B.pupoides var.spinulosa Williamson, through specimens with only slightly crenulated chamber edges to specimens with only an apical spine. Hofker (1951) stated that the aperture is "loop shaped with one higher border with collar, while along the more sunken border runs the free tooth of the plate which shows a typical serrated tooth........but at the lower end of this tooth the plate is once more folded up, and forms underneath the obliquely running upper border of the aperture, a distinct second foramen. This second foramen runs as a sipho along the free folded border of the plate and opens at the base of the toothplate near its adjustment at the base of the former aperture". Hay, Towe and Wright in 1963 examined this form and noted the following :- "In reflected light the specimens are sub-hyaline. In transmitted light thin sections show many tiny pores perpendicular to the surface. In polarised light a negative uniaxial pseudofigure can be observed, on each chamber, indicating radial crystal structure. On an electron micrograph of the surface of the test the pores are present but are almost all obscured by black spots which represent the organic lining. Many traces of the organic membrane covering the shell surface are also visible. The surface is smooth. The pores are $\frac{1}{2}$ to $\frac{1}{4}\mu$ in diameter. The pore index is 176-$\frac{1}{4}$ about 8% of the surface being pore space".

Distribution: (Text-fig.38A). This species has been recorded from the Shetland Seas (Waller 1868), from the Firth of Forth, Montrose Basin and the River Blyth (Brady 1870), the Firth of Clyde (Robertson 1875), the River Dee (Sidall 1876), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), from the Faeroe channel (Pearcey 1890), and from the River Mersey (Burgess 1892). In 1892 this form was notedfrom Portree Bay, Isle of Skye by Robertson, in 1895 from Dogs Bay by Wright, and in 1896 from the Irish Sea by the British Association. It was noted from Dogs Bay (Wright 1900), from Plymouth (Worth 1902) and from Recent clay in the River Lune Valley (Worth 1902). Pearcey obtained this species from the Firth of Forth in 1903, and Gough from Red Bay, Larne Lough and Belfast Lough in 1906. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1911, from the North Sea and Clare Island in 1913, from 20 fathoms in the Sound of Mull, 5 fathoms off Jura, 12 fathoms in Loch Sunart and 20 fathoms off Ardnamuchan in 1914, from the South coast of Cornwall and West of Scotland in 1916, and from the Plymouth area in 1930. Heron-Allen noted this form as being common at 20 fathoms off the Isle of Man in 1915. In 1957 the Marine Biological Association retrieved this species from seven stations in the Plymouth region, and in the following year Le Calvez recorded it West of France, South of Ireland, and from the Western English Channel. It was recorded as common from the Isle of Man and surrounding areas by Bruce, Colman and Jones in 1963.

This species has been recorded from Rimini (d'Orbigny)1826), Crete and Rimini (Jones and Parker 1960), the Gulf and River St. Lawrence (Dawson 1870), from the Arctic and Scandinavia (Goes 1894), and it was stated to be a common constituent of the littoral fauna of the Atlantic shores of Europe and is by no means confined to shallow water but extends in mid-ocean to a depth of 1,630 fathoms being equally abundant in the South Pacific, but less frequent in the South Atlantic and North Pacific and occurring also in the Southern Ocean, Adriatic, and Mediterranean (Brady 1884). Millett in 1900 noted this form in the Malay Archipelago, Cushman in 1911 obtained it from off Japan, and Sidebottom in 1918 recorded it off the East coast of Australia. Cushman recorded this species from the Philippine Islands and adjacent seas in 1921, and from the Gulf of Mexico, Florida, South of Cape Cod and New Zealand in 1922l It was recorded from the Antarctic area by Heron-Allen and Earland in 1932, and by Earland in 1934. It has been recorded from off Bergen (Norvang 1941), off the New England coast (Cushman 1944), from Iceland (Norvang 1945), and from the Gullmar Fjord and Skagerak (Hoglund 1947). In 1948 this species was noted from the Arctic by Cushman, from Southern California, South to Ecuador by Cushman and McCulloch, and from the continental shelf from the Gulf of Maine to Maryland by Parker. In 1949 it was recorded from Belgium by Cushman, from the Ligurian Sea, Italy by Ruscelli, and from 59-64 metres in the Gulf of Suez by Said. Colom in 1950 obtained this form from off the West African coast and in 1951 it was recorded from the North West Gulf of Mexico by Phleger and Parker, and Phleger alone where he stated that this species constituted 1%-5% of the fauna and that it was characteristic of the fauna down to about 200 metres, from the Gulf of California by Ly Bandy, and off Japan by Nagahama. In the following year Parker obtained it from off Portsmouth (N.H.), and Colom from the coast of Galicia. In 1953 it was recorded from off California (Bandy), in 1954 from the Gulf of Paria (Andeland Postma), the Gulf of San Jorge and San Blas Bay, Argentina (Boltovskoy), from 75-530 metres with a maximum frequency of 33% in the North Eastern Gulf of Mexico (Parker), from San Pedro Shelf and Vicinity (Crouch), and in 1955 from Quequen, Buenos Aires (Boltovskoy). In 1956 it was obtained from shore sands by Western India by Bhatia, from the North East Gulf of Mexico by Bandy, from 15-110 metres with frequencies of less than 1% along the Central Texas coast by Phleger, and from the Argentinian shelf by Boltovskoy. It was recorded in 1957 by Boltovskoy from the Rio de la Plata estuary, by Todd and Bronniman from the offshore zone of the Eastern Gulf of Paria, by Warren from South East Louisiana, in 1958 by Drooger and Kaasschieter from the Orinoco-Trinidad-Paria shelf, at all depths, by Norin from the Central Tyrrhenian sea, by Parker from 82-1,016 metres with frequencies up to 13% from the Eastern Mediterranean, and in 1959 by Boltovskoy off Brazil and off Argentina, by Lankford from the East Mississippi delta margin, by Berthois and Le Calvez from 171 and 875 metres in the Gulf of Gascogne, and by Polski from the Inner Shelf (49-150 feet) of the Yellow Sea, South Korean Sea, East China Sea, from the Central Shelf (150-285′) of the same regions, from the Outer Shelf (285-400′), of the South Korean Sea, East China Sea, and the

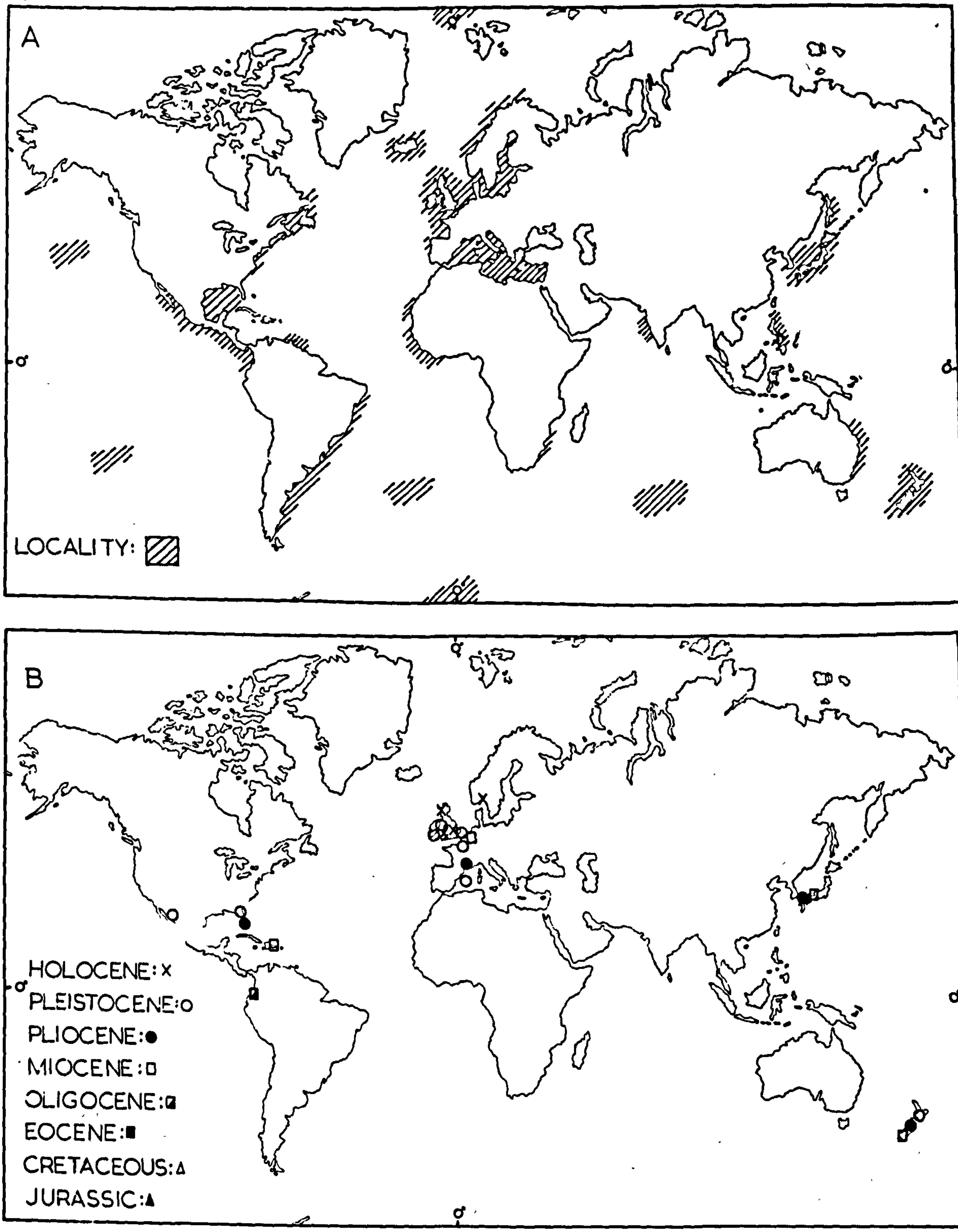
Taiwan Strait, from the Upper Bathyal zone (400-2,000)feet) of the South Korean Sea and East China Sea, and from the Middle Bathyal zone (2,000-4454 feet) of the East China Sea. In 1960 this species was recorded from the Upper Continental Shelf of the Northern Gulf of Mexico by Phleger, off the South China coast by Waller, and from the adjacent seas of Japan by Asano at depths of 68-684 metres and temperatures of 1.5°C-21.1°C. Boltovskoy in 1961 recorded the species from the continental platform between Santo Tome and the Rio de la Plata, Argentina, and other records during this year were made from the Red Sea and the Mediterranean coast of Israel by Reiss, Klug and Merling, and from the Gulf of California by Bandy. In 1962 the form was noted from the Adriatic Sea (Chierici, Busi,Cita; Cita and Chierici), from the shore sands of Southern Brazil (Closs and Barberena), and in 1963 from the Laguna de Terminos, Campeche, Mexico (Ayala-Castanares), Puerto Deseado, Patagonia (Boltovskoy), from off the Ivory Coast (Le Calvez), and from the littoral zone of the Gulf of Mexico (Segura). This species was recorded in 1964 from Manukau Harbour, New Zealand by Hulme, and in 1965 from Guerrero Negro Lagoon, Baja, California, by Phleger, and from the Recent portion of a core taken in Hardangerfjord, Norway by Holtedahl, and from Durban Bay, South Africa by Albani.

Stratigraphic Occurrence: (Text-fig.38B). The occurrence of this species in British Holocene deposits have been recorddd from Cleongart (Munthe 1897), Leasowe and Formby (Reade 1900), Altcar and Great Crosby (Wright 1904;1908), Skye and County Antrim, English Fens, Swansea Docks (MacFadyen 1937,1938,1942), and Borth, Cardiganshire (Adams and Haynes 1965).

Heron-Allen and Earland in 1910 obtained Cretaceous derived specimens from Selsey Bill, Sussex. Occurrences in Post Tertiary deposits have been noted by Crosskey and Robertson from the Isle of Cumbrae and Loch Gilp in 1868, from Loch Fyne, Crinan, and Duntroon in 1869, from Greenock in 1871, and from the Kyles of Bute in 1874. Robertson obtained this form from the Post Tertiary of Kilwinning in 1877, Lewis in 1882 , and Greenock in 1885. Pâeistocene occurrences of this species have been noted from the Isle of Man by Reade and Wright in 1906, from East Anglia and the Wexford coast by MacFadyen in 1932 and 1940, and from the Early Pleistocene of Suffolk by Funnell and West in 1962. In 1902 Wright noted this form from the Drift of County Cork. Boulder Clay occurrences were noted from Caithness (Crosskey and Robertson 1868), Cheshire (Shone 1874), the Vale of Clwyd (Reade 1897), Carrickfergus and County Down (Wright 1903,1904). Upper Boulder Clay occurrences were noted from West Cheshire by Shone in 1878, and from County Dublin by Wright in 1903.

Feyling-Hanssen in 1964 recorded this species from the Holocene deposits of the Oslo-Fjord area, where it characterised and predominated the deposits. Jones and Parker in 1860 noted it in the Tertiary of Palermo, and Rutten and Hotz in 1946 noted it ranging from the Neogene to Recent on the Island of Ceram. Petters and Sarmiento obtained the form from the Upper Oligocene of Colombia in 1956. Miocene occurrences were noted from Haiti by Rivero in 1940, and from the Dominician Republic by Bermudez in 1949. Drooger in 1953 noted the form in the Lower and Upper Miocene of the Netherlands Antilles. LeRoy noted it in the Miocene and Pliocene of Southern Okinawa in 1964, and a range of this species from the Miocene to Lower Pleistocene was noted in New Zealand by Vella in 1962, and from the San Pedro Shelf and vicinity by Crouch in 1954. An Upper Pliocene occurrence was noted from the Riviera by Zanfra in 1961. A range from the Pliocene to Pleistocene by this form was recorded from Florida by Cole in 1931, from New Zealand by Hornibrook in 1958, and from Parma by Papani and Pelosio in 1962. Dando in 1962 stated that the species ranges from the Middle Pliocene to Quaternary in the Southern Appennines, and Borsetti noted it ranging from the Upper Pliocene to Quaternary in a core at Foggia in 1962. Pleistocene occurrences by this species have been recorded from California by Galloway and Wissler in 1927, from the Netherlands by Voorthuysen in 1949, and from Port Fairy, Western Victoria by Collins in 1953, and from a Western Mediterranean core by Todd in 1958. It was recorded from the Upper Pleistocene portion of a core taken at the Hague, Netherlands in 1950 by Voorthuysen.

Diagnosis: This species has a world wide distribution irrespective of depth. Stratigraphically it ranges from the Cretaceous (?) Tertiary to Recent.



TEXT FIG. 38 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- <u>BULIMINA MARGINATA</u>

Super Family: Discorbacea Ehrenberg 1838

Family: Discorbidae Ehrenberg 1838

Sub FamilyP Discorbinae Ehrenberg 1838

Genus: Discorbis Lamarck 1804

Discorbis bradyi Cushman 1915.

Pl.15, figs.1a,1b.1c.

1884 Pars Discorbina globularis (d'Orbigny) BRADY. Chall.Rep.Zool.Vol.9, pl.86,fig.8.

1915 Discorbis globularis (d'Orbigny) var. bradyi CUSHMAN. U.S.Nat.Mus. Bull.71,pt.5,p.12,pl.8,fig.1, Text-fig.12.

1951 Discopulvinulina bradyi (Cushman) HOFKER. Siboga.Exped.Monog.IVa, p.458,fig.310.

1955 Discorbis globularis (d'Orbigny) var. bradyi. Cushman. KAASSCHIETER, in Drooger,Kaasschieter, and Key. Verhandl.Konin.Ned.Akad.Weten.Nat. Deel XXI,No.2,p.83,pl.7,figs.7a-c.

1955 Discorbis globularis (dIOrbigny) var. bradyi Cushman. KRUIT. Kon.Med. Geol.Minjb.Gen.Verh.Deel 15,p.472, pl.2,figs.13a,b.

1957 Discorbis globularis (d'Orbigny) var. bmadyi. Cushman. FORAMINIFERI PADANI. Agip Mineraria,pl.38,fig.9.

1958 Rosalina globularis bradyi (Cushman) PARKER. Rep.Swed.Deep Sea Exped. Vol.VIII,fasc.II,no.4,p.268, pl.3,figs.37,38.

1959 Discorbis globularis (d'Orbigny) var. brady. Cushman. BHATIA and MOHAN. Journ.Pal.Vol.33,No.4,p.655,Text-fig.4,fig.11a-c.

1960 Rosalina bradyi (Cushman) BARKER. Soc.Econ.Pal. and Min.Sp. Pub.no.9,p.178,pl.86,fig.8.

Test free, concavo-convex, medium to high trochospiral, circular in outline, periphery rounded and thickened. Dorsal convex- evolute, twelve chambers visible arranged in 2+ whorls sinistrally coiled. Chambers distinct, wider than high, increasing gradually in size as added. Dorsal sutures distinct, flush, curved, spiral suture distinct, flush. Ventral involute, only the chambers of the last whorl visible, six present, sub triangular in outline. Ventral sutures distinct, impressed, with pronounced re-entrants along the basal sutures midway between the umbilicus and periphery. Ventral surface partially covered by a secondary pustular shell material. Umbilicus ventral, deeply incised. Aperture ventral, an interiomarginal extraumbilical slit at the base of the ultimate chamber near the umbilicus with a triangular flap covering it. Wall calcareous, densely perforate, ventral pores slightly larger than the dorsal.

Dimensions: Diameter 0.25 mm. Height 0.25 mm.

Occurrence: Dead, CB.316, CB.318, CB.323, CB.328, CB.330, CB.337, CB.339, CB.358, CB.359, CB.373, CB.374, CB.379, CB.380, CB.384, CB.385, CB.398, CB.404, CB.412, CB.414, CB.639.

Dead, variation sample CB.700.

Morphological remarks: This species is similar to D.globularis (d'Orbigny) but can be differentiated on: Size, D.bradyi; being generally smaller; Perforation; D.bradyi; has smaller dorsal and larger ventral pores; Periphery, which is thickened and distinctly perforate; by the secondary pustular shell material in the umbilical region; by the strong re-entrant on the basal suture of each chamber between the umbilicus and periphery. Within the group Rosalina-Discorbis a great amount of taxonomic confusion is evident and until the position has been clarified the generic name Discorbis has been adopted in this work.

Distribution: This species has not been previously recorded from British waters to the present day.

It was recorded off Hong Kong in 7 fathoms (Brady 1884), from the North Pacific (Cushman 1915), from the Rhone delta where the optimum environment was found to be situated at about 10 metres (Kruit 1855), and from seven Eastern Mediterranean stations, ranging from the bay to 143 metres, with frequencies up to 1% (Parker 1958).

Stratigraphic Occurrence: Adams and Haynes in 1965 obtained the species from the Holocene deposits of Borth, Cardiganshire, this being the only recorded stratigraphic occurrence to date.

The occurrence of this form in the Miocene was noted by Kaasschieter in 1955 from South West France, and by Bhatia and Mohan in 1959 from Western India.

Diagnosis: This poorly recorded species appears to prefer a shallow water habitat in temperate latitues. The stratigraphic range is Miocene to Recent, but the species is not well represented at any time.

Discorbis malovensis Heron-Allen and Earland *var. nudiformis* var.nov.

Pl.15, figs.2a,2b,2c.

1932 Pars *Discorbis malovensis* HERON-ALLEN and EARLAND. Disc.Repts. Vol.4,p.415,pl.14,figs.22-24.

Test free, concavo-convex, low trochospire, periphery sub acute, circular. Dorsal, low, convex, evolute, coiled sinistrally, chambers indistinct, about six to eight in number arranged in 3½ whorls, initially higher than long, later increasing in size and becoming longer than high, so that chambers are at least half a whorl in length. Dorsal sutures distinct, limbate, slightly raised, thickened, strongly curved. Initial sutures covered by a small low umbo of secondary shell material.

Ventral involute, six chambers visible, sutures distinct, curved, strongly impressed. Umbilicus deep, open, (pseudo-umbilicus). Aperture interiomarginal, a low arch extending from the periphery to the umbilicus along the basal suture of the last chamber. Wall calcareous, opaque, thick, densely perforate with medium size pores and with slightly coarser perforations towards the periphery.

Dimensions: Diameter 0.43 mm. Height 0.23 mm.

Occurrence: Dead CB.316, CB.326, CB.386, CB.390.

Morphological remarks: This variety is very similar to Heron-Allen and Earlands but differs in that in side view there is a loss of smoothness in test appearance. The main difference is that the ventral surface of the type species is characteristically covered with an ornamentation of small circular "beads" in the umbilical region, whereas in this variety this area is completely without the "beads".

Distribution: Heron-Allen and Earland in 1932 obtained the type species from the Sub-Antarctic region.

Diagnosis: This variety appears to be typically found in shallow water areas in temperate latitudes.

Discorbis williamsoni Chapman and Parr 1932

Pl.15, figs.3a,3b,3c.

1858 Rotalina nitida — WILLIAMSON. Rec. For.Gt.Brit. Ray.Soc.London.p.541,pl.5, figs.106-108.

1916 Discorbina nitida (Williamson) HERON-ALLEN and EARLAND. Trans. Linn.Socl.Zool.London,2nd.Ser, Vol.XI,pt.13,p.269,pl.42,figs. 26-30.

1932 Discorbis williamsoni — CHAPMAN and PARR in Parr, Roy. Soc.Victoria Proc.Vol.44,n.s., pt.2,p.226,pl.21,fig.25.

1937 Discorbis williamsoni Chapman and Parr. CHAPMAN and PARR. Aust. Ant.Exped.Sci.Rep.Ser.C.V.I. pt.2,p.105,pl.8,fig.23.

1949 Discorbis nitida (Williamson) CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique, Mem.III,p.41,42, pl.18,fig.1.

1951 Discorbis williamsoni Chapman and Parr. VOORTHUYSEN,van. Med.Geol. Stichting n.s. No.5,p.24,25, pl.2,fig.2.

1953 Discorbis williamsoni Chapman and Parr. PHLEGER, PARKER and PEIRSON. Rep.Swed.Deep Sea Exped. Vol. VII, fasc.I,p.40,pl.8,figs. 19-22.

1953 Discorbis williamsoni Chapman and Parr. VOORTHUYSEN,van. Med.Geol. Stichting,n.s. No.7,p.38,pl.2, fig.3.

1957 Rosalina williamsoni (Chapman and Parr) VOORTHUYSEN,van. Med.Geol. Stichting,n.s. No.11,p.34, pl.24,fig.19a,b.c.

1958 Neoconorbina williamsoni (Chapman and Parr), PARKER. Rep.Swed. Deep Sea Exped. Vol.VIII,fasc.II, no.4,p.267,pl.3,figs.28,29.

1960 Rosalina williamsoni (Chapman and Parr).VOORTHUYSEN,van. Ver.Kon. Ned.Geol.Mijnb.K.Gen.Geol.Serie. Deel 19,p.252,Taf.11,figs.19a,b.

1962 Discorbis williamsoni Chapman and Parr. CLOSS and BARBERENA. Inst.Rio Grande do Sul Inst.Cienc. Nat.No.16,p.37,Est.4,figs.14-16.

1962 Rosalina williamsoni (Chapman and Parr). HAAKE. Geol.Inst.Univ.Kiel. Meyniana,Band 12,p.43,44,Taf.4, figs.1-2.

Test free, concavo-convex, low trochospire, circular in outline, periphery acute with a very small keel. Dorsal very low convex, evolute, eleven chambers arranged in 2+ whorls coiled sinistrally. Chambers distinct, longer than high, increasing gradually in size as added, the ultimate chamber being slightly inflated. Dorsal sutures flush, swept back, curved. Ventral involute, only the chambers of the last whorl visible, six present, sub triangular, with a lobe which slightly enters into the umbilicus, which is deep and incised with a number of circular bosses present. Sutures distinct, sub-radial, except at the peripheral edge where they are slightly backward curved. Aperture ventral, interiomarginal, extraumbilical, a semi-circular opening at the base of the ultimate chamber near the umbilicus with the triangular flap covering it. Wall calcareous, transluscent, finely and densely perforate except for the small keel.

Dimensions: Diameter 0.40 mm. Height 0.09 mm.

Occurrence: Dead, CB.308, CB.316, CB.346, CB.358, CB.359, CB.360, CB.374, CB.379, CB.380. CB.385, CB.387, CB.388, CB.391, CB.399, CB.403.

Dead, variation samples CB.690, CB.700, CB.714.

Morphological remarks: This species exhibits variation in size, in the height of the spire, and in the development of the marginal edge.

Distribution: This species has been recorded from Plymouth Sound, the Shetlands, Arran, Skye, and Torquay (Williamson 1858), from the Shetland Seas (Waller 1868), from the Firth of Clyde (Robertson 1875), from the River Dee (Sidall 1876), from off the coasts of Durham and North Yorkshire (Robertson and Brady 1876), from off the South West coast of Ireland (Wright 1889), from Liverpool Bay (Pearcey 1891), and from the River Mersey (Burgess 1891). In 1892 Robertson noted the form at Portree Bay, Isle of Skye, in 1895 Wright obtained it from Dogs Bay, and in 1896 it was recorded from the Irish Sea by the British Association. It was recorded from Dogs Bay (Wright 1900), from Recent clay in the River Lune valley (Wright 1902), from the Firth of Forth (Pearcey 1903), from Plymouth (Worth 1904), from Red Bay, Ireland (Gouch 1906), and from Lambay, County Dublin (Wright 1907). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1911, from the North Sea and Clare Island in 1913, from 20 fathoms off Ardnamuchan and from 12 fathoms in Loch Sunart in 1914, from West of Scotland and from the South coast of Cornwall in 1916. Heron-Allen obtained the form from 20 fathoms off the Isle of Man in 1915. This species was noted in the Plymouth area by Heron-Allen and Earland in 1930, and by the Marine Biological Association in 1957. Le Calvez in 1958 noted this form West of France, South of Ireland and from the Western English Channel, and in 1963, Bruce, Colman and Jones obtained it from the Isle of Man area.

This species was recorded from Lord Howe Island (Heron-Allen and Earland 1923), from Victoria and South Australian shallow water (Parr 1932), from the Antarctic (Chapman and Parr 1937), off Iceland

(Norvang 1945), from Belgium (Cushman 1949), and from the Netherlands Wadden Sea (Voorthuysen 1951). In 1952 Colom noted tye form off the coast of Galicia, in 1953 Phleger, Parker and Peirson noted it in the North Atlantic, and in 1957 Said and Kamel obtained it from the Egyptian Mediterranean coastl In 1958 it was recorded from the Orinoco-Trinidad-Shelf by Drooger and Kaasschieter, from two Eastern Mediterranean stations at depths of 117-179 metres where it constituted less than 1% of the fauna by Parker, and from the Marseille coast by Blanc-Vernet. Bolt@vskoy in 1959 noted the species off Argentina, and Shifflet in 1961 obtained it from Heald Bank in the Gulf of Mexico. In 1962 the species was recorded from the North Sea by Haake, from the shore sands and littoral zone of Southern Brazil by Closs and Barberena, and from Upper Florida Bay and associated sounds by Lynts.

Stratigraphic Occurrence: Occurrences in the British Holocene have been recorded from County Antrim, the English Fens, Swansea Docks (MacFadyen 1937; 1938; 1942), from Anglesey (Ovey for McMillan 1949), and from Borth, Cardiganshire (Adams and Haynes 1965).

Post Tertiary occurrences were noted by Robertson from Lewis in 1882, and from Greenock in 1885. Wright in 1902 obtained this form from the Drift of County Cork.

Voorthuysen obtained this species from the Holocene deposits of the N.O.Polder Netherlands in 1951, and of the Dollart-Ems estuary in 1960.

Kleinpell in 1954 recorded the species from the Neogene of Lau, Fiji, and Caria in 1959 from the Miocene of Cagliari. Voorthuysen in 1953 noted the species occurring in the Pliocene portion of a boring at Oosterhaut, Netherlands where it constituted .5-1% of the fauna.

Diagnosis: This species has the perfect test shape for gliding over the bottom surface of fine sediment size, and appears to prefer a shallow water, temperate environment. Stratigraphically it ranges from the Miocene to Recent.

Genus: Eoeponidella Wickenden 1949

Eoeponidella mamilla (Williamson)1858.

Pl.15, figs.4a,4b,4c.

1858	Rotalina mamilla	WILLIAMSON	Rec.For.Gt.Brit.Ray.Soc. London,p.54,pl.4,figs.109-111.
1951	Asterigerinata mamilla	(Williamson)	HOFKER. Siboga Exped.Moneg. IVa,pt.III,p.472-477,figs.323-326.
1953	Discorbis mamilla	(Williamson)	PHLEGER, PARKER and PEIRSON. Rep.Swed.Deep Sea Exped Vol. VII,fasc.I,p.39-40,pl.8,figs. 18,23,24.
1958	Asterigerinata mamilla	(Williamson)	BOLTOVSKOY. Contr.Cush.Found. Foram.Res.Vol.9,pt.1,p.18,pl.6, fig.7.
1958	Asterigerinata mamilla	(Williamson)	PARKER. Rep.Swed.Deep Sea Exped.Vol.VIII,fasc.II.no.4, p.264,pl.3,figs.5,6.
1960	Asterigerinata mamilla	(Williamson)	HOFKER. Palaeontologische Zeitschriffe, Stuttgart W.Band 34, Nr.3/4,p.252,pl.D,figs.111.
1960	Rosalina mamilla	(Williamson)	VOORTHUYSEN,van. Verh.Kon.Ned, Geol.Minjb.K.Gen.Geol.Serie. Deel 19,p.251,Taf.11,figs.17a,b.c.

Test free, concavo-convex, to plano-convex, fairly high trochospire, circular in outline. Periphery sub acute, slightly lobate with a marked keel with coarse tubuli. Dorsal fairly high convex, evolute, eleven chambers visible, arranged in three whorls sinistrally coiled, longer than high, increasing rapidly in size as added, slightly overlapping. Dorsal sutures distinct, limbate, curved, perforated with coarse tubulae. Ventral involute, only the chambers of the last whorl visible, six present, sub triangular, alternating at the umbilicus with small sub triangular supplementary chambers which give the umbilical region a stellate appearance. Ventral sutures sub radial, impressed. Umbilicus deep and incised. Aperture ventral, a large semi-circular opening at the umbilical margin of the basal suture of the last chamber. Wall calcareous, smooth, semi-transparent, distinctly and rather coarsely perforate on both sides.

Dimensions: Diameter 0.22 mm. Height 0.15 mm.

Occurrence: Dead CB.307, CB.309, CB.312, CB.316, CB.317, CB.320, CB.322, CB.323, CB.326, CB.334, CB.337, CB.347, CB.358, CB.359, CB.367, CB.374, CB.380, CB.387, CB.398, CB.402, CB.404, CB.631,

Morphological remarks: The height of the spire varies considerably in this species from a low type to a very high pronounced type.

Distribution: This species has been recorded from the River Mersey (Burgess 1891), from Clare Island, from 5 fathoms off Jura, 20 fathoms off Ardnamuchan and in Loch Sunart, West of Scotland (Heron-Allen and Earland 1913, 1916), from 20 fathoms off the Isle of Man (Heron-Allen 1915), from Plymouth (Heron-Allen and Earland 1930; Marine Biological Association 1957), from West of France and South West of Lands End (Le Calvez 1958), and from the Isle of Man and surrounding areas (Bruce, Colman and Jones 1963).

This form has been recorded from the Gulf of Naples (Hofker 1951; 1960). In 1958 it was recorded from the Western Mediterranean by Todd, from the estuary of the Rio de la Hata by Boltovskoy, from the Central Tyrrhenian Sea by Norin, with frequencies up to 3% from twelve Eastern Mediterranean stations at depths ranging from the bay to 179 metres by Parker, and from the Marseilles coast by Blanc-Vernet. Dupeuble in 1963 obtained this form from Finistere.

Stratigraphic Occurrence: Adams and Haynes 1965 recorded this species from the Holocene deposits of Borth, Cardiganshire.

It was recorded from the Miocene and Neogene of the Western approaches to the English Channel in 1965 by Curry, Murray, and Whittard.

Voorthuysen obtained this form from the Holocene of the Dollart-Ems estuary in 1960.

Dandi in 1962 stated that in the Southern Appenines this species ranged from the Middle Pliocene to Quaternary, and Todd in 1958 obtained it from the Pleistocene portion of a core taken in the Western Mediterranean.

Diagnosis: This species is not well represented throughout the world but is more commonly fouhd in temperate to warm shallow water areas. The stratigraphic range is Pliocene to Recent.

Super Family: Spirillinacea Reuss 1862

Family: Spirillinidae Reuss 1862

Sub Family : Spirillininae Reuss 1862

Genus : Spirillina Ehrenberg 1843

Spirillina vivipara Ehrenberg 1843

Pl.15, figs.6a,6b.

1843	Spirillina vivipara		EHRENBERG. Abhandl.Akad.Wiss. Berlin, p.422,pl.13,fig.41.
1858	Spirillina vivipara	Schultze	WILLIAMSON. Rec.For.Gt.Brit. Ray Soc.London,p.92,pl.7,fig.202.
1865	Spirillina vivipara	Ehrenberg	PARKER and JONES. Phil.Trans. Roy.Soc.Vol.155,p.397,pl.15, fig.28.
1884	Spirillina vivipara	Ehrenberg	BRADY. Chall.Rep.Zool.Vol.9, p.630,pl.85,figs.1-5.
1897	Spirillina vivipara	Ehrenberg	FLINT. U.S.Nat.Mus.Ann.ReplWash. p.326,pl.71,fig.4.
1902	Spirillina vivipara	Ehrenberg	CHAPMAN. Foraminifera. Longmans. p.215,pl.12,fig.A.
1913	Arspirillinum vu-viviparum	(Ehrenberg)	RHUMBLER. Erg.Plankton Exped.Humboldt Stift.Bd.111,L.c. Tiel.2,p.428,Taf.V,fig.9,Taf.VI, figs.4-6
1915	Spirillina vivipara	Ehrenberg	CUSHMAN. U.S.Nat.Mus.Bull.71,pt.5, p.3,pl.1,figs.1-2,text-fig.1.
1916	Spirillina vivipara	Ehrenberg	HERON-ALLEN and EARLAND. Trans.Linn. Soc.Zool.London, Ser.3,Vol.XI, pt.13,p.268,269,pl.42,figs.21-25.
1922	Spirillina vivipara	Ehrenberg	CUSHMAN. Dept.Marine Biol.Carnegie Inst.Wash. Vol.XVII,p.37,pl.5,fig.7.
1928	Spirillina vivipara	Ehrenberg	WHITE. Journ.Pal. Vol.2,No.3, p.185,pl.27,fig.4.

1930 Spirillina vivipara Ehrenberg CUSHMAN and VALENTINE. Contr. Dept.Geol.Stanford Univ. Vol.1, no.1,p.22,23,pl.6,fig.4.

1931 Spirillina vivipara Ehrenberg GALLOWAY and MORREY. Journ.Pal. Vol.5,No.4,p.331,pl.37,fig.3.

1931 Spirillina vivipara Ehrenberg WIESNER. Duetsche Sud Polar Exped. Bd.XX, Bd.XII,p.127,Taf.XX,fig.248.

1933 Spirillina vivipara Ehrenberg GALLOWAY. A manual of foraminifera. p.85,pl.6,figs.9,10.

1934 Spirillina vivipara Ehrenberg CHAPMAN, PARR, and COLLINS. Journ. Linn.Soc.Zool.London, Vol.38, p.558,pl.8,fig.2.

1935 Spirillina vivipara Ehrenberg CHAPMAN. U.S.Geol.Survey Prof.Paper 181,p.42,43,pl.16,fig.12.

1942 Spirillina cf. vivipara Ehrenberg CUSHMAN and TODD. Contr.Cush. Found.Foram.Res.Vol.18,pt.2, p.38,pl.7,fig.1.

1944 Spirillina cf. vivipara Ehrenberg CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.20,pt.2,p.44,45,pl.7,fig.21.

1945 Spirillina cf. S.vivipara Ehrenberg CUSHMAN and ELLISOR. Journ. Pal.Vol.19,No.6,p.567,pl.77,fig.1.

1946 Spirillina vivipara Ehrenberg CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res.Sp.Pub.no.19,p.37,pl.6, fig.20.

1949 Spirillina vivipara Ehrenberg CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique.Mem.111,p.38,pl.7,fig.12.

1949 Spirillina vivipara Ehrenberg SAID. Contr.Cush.Found.Foram.Res. Sp.Pub.no.26,p.34,35,pl.3,fig.31.

1951 Spirillina cf. vivipara Ehrenberg CUSHMAN. U.S.Geol.Survey Prof. Paper 232,p.48,pl.13,fig.15.

1951 Spirillina vivipara Ehrenberg PHLEGER and PARKER. Geol.Soc.Am. Mem.46,pt.2,p.25,pl.13,figs.3a,b, 4a,b.

1952	<u>Spirillina vivipara</u>	Ehrenberg	BURMUDEZ. Bol.de Geol.Caracas.Vol.II, no.4,p.25,pl.1,fig.1.
1953	<u>Spirillina vivipara</u>	Ehrenberg	LOEBLICH and TAPPAN. Smith Miscell. Coll.Pub.4105,Vol.121,No.7,p1112, pl.21,figs.2,3.
1954	<u>Spirillina vivipara</u>	Ehrenberg	BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III,no.3,p.199, pl.XIV,fig.8.
1954	<u>Spirillina vivipara</u>	Ehrenberg	BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol. Tomo III,no.4,p.283, pl.XXVI,fig.11.
1954	<u>Spirillina vivipara</u>	Ehrenberg	PARKER.Bull.Mus.Comp.Zool.Vol.111, no.10,p.522,pl.8,figs.15,16.
1955	<u>Spirillina vivipara</u>	Ehrenberg	KAASSCHIETER.in Drooger.Kaasschieter and Key.Verhandl,Konin.Ned.Akad..Weten. Nat.DeelXXI,no.2,p.82,pl.7,fig.5.
1958	<u>Spirillina vivipara</u>	Ehrenberg	CARTER. Geol.Survey Vict.Aust. Bull.no.55,p.39,40,pl.4,figs.32,33.
1958	<u>Spirillina vivipara</u>	Ehrenberg	PARKER. Rep.Sewd.Deep Sea Exped. Vol.VIII,fasc.II,no.4,p.264,pl.3, fig.4.
1960	<u>Spirillina vivipara</u>	Ehrenberg	BARKER. Soc.Econ.Pal. and Min. Sp.Pub.no.9,p.176,pt.85,figs.1-4.
1960	<u>Spirillina vivipara</u>	Ehrenberg	HOFKER. Palaontologische Zietschriff. Stuttgart.W.,Band 34,Nr.3/4,p.252, pl.D,fig.109.
1961	<u>Spirillina vivipara vivipara</u>	Ehrenberg	BOLTOVSKOY.Mus. Argentino de Cienc.Nat.Zool.Tome VI,no.6, p.314,pl.IX,fig.11.
1962	<u>Spirillina vivipara</u>	Ehrenberg	HAAKE. Geol.Inst.Univ.Kiel.Meyniana, Band 12,p.42,Taf13,fig.8.
1963	<u>Spirillina vivipara</u>	Ehrenberg	AYALA-CASTANARES. Uni.Nac.Autonoma de Mexico Inst.Geol.Bol.no.67, pt.3,p.85,pl.7,figs.2,3.

Test free, small, planispiral, bi-laterally symmetrical, discoidal, megalospheric, circular in outline, elliptical in transverse section, bi-umbilicate, periphery rounded. Proloculum sub-globular, followed by a closely adpressed, long undivided, spirally coiled tubular second chamber, which increases in diameter, gradually and evenly as added, coiled for four whorls. Spiral suture distinct, slightly impressed. Aperture terminal, peripheral, at the end of the tubular second chamber, semi-circular. Wall calcareous, hyaline, smooth, transluscent, coarsely perforate, composed of a single crystal of calcite.

Dimensions: Diameter 0.20 mm. Thickness 0.12 mm.

Occurrence: Dead CB.337, CB.354, CB.366, CB.387.

Morphological remarks: This species is similar to S.wrighti Heron-Allen and Earland but is differentiated by the rounded rather than truncate peripheral edge, and by the unornamented character of the test. Both microspheric and megalospheric generations occur in the study area, variation in the diameter of the tube and number of whorls being exhibited by both types.

Distribution: (Text-fig.39A). This species has been recorded from the Shetland Seas (Waller 1868), South East of Eddystone (Robertson 1870), 40 miles South of the Scilly Isles, 50 miles South West of Ushant (Jones and Parker 1876), from the River Dee (Sidall 1876), from the Faeroe Channel (Pearcey 1890), from the River Mersey (Burgess 1891), and from the Irish Sea (British Association 1896). In 1900 it was recorded from Salcombe estuary by Worth, and from Dogs Bay by Wright.

Wright in 1902 noted the form in Recent clay in the valley of the River Lune, in 1904 Worth obtained it from the Plymouth area, and in 1906 Gough noted it from Larne Lough and Red Bay, Ireland. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from the North Sea and Clare Island area in 1913, from 20 fathoms off Ardnamuchan in 1914, from West of Scotland and from the South coast of Cornwall in 1916. Heron-Allen obtained the species from 20 fathoms off the Isle of Man in 1915. It was recorded from the Plymouth area by Heron-Allen and Earland in 1930 and by the Marine Biological Association in 1957. Le Calvez noted this species occurring South West of Lands End in 1958, and in 1963 Bruce, Colman and Jones recorded it from the Isle of Man region.

The form has been recorded from Crete (Jones and Parker 1960), from the Arctic (Parker and Jones 1865; Brady 1878), and Brady in 1884 stated that this species couàd be found in almost every part of the world, generally on muddy bottoms of less than 150 fathoms although it can occur at greater depths. In 1899 Chapman noted it at Funafuti Atoll, in 1903 Milleèt obtained it from the Malay Archipelago and Cushman recorded it from Guam, North Pacific in 1915, and from the Tortugas region and Porto Rico in 1922. It has been noted from Lord Howe Island (Heron-Allen and Earland 1923), off the West Coast of America (Cushman 1927), from the channel islands of Southern California (Cushman and Valentine 1930), and from the Florida area (Norton 1930). This form was obtained from the Antarctic area in 1931 by Wiesner, in 1932 by

Heron-Allen and Earland and in 1934 by Earland. Natland in 1933 noted the form from the Southern California area. Myers in 1936 worked on laboratory cultures of this species at La Jolla, California and noted the following:- optimum temperature for these cultures was 21°C. At 18°C, the rate of reproduction is considerably reduced, whilst at temperatures above 26°C reproduction becomes abnormal. He went on to say that the living organisms are found on sea weed, eel grass, or almost any substratum covered with a thim film of organic debris including diatoms, bacteria, and other Protista which constitute the food of Spirillina and other benthonic foraminifera of the littoral zone.

In 1937 Chapman and Parr recorded the species from two Antarctic stations, and in the following year Marie obtained it from the estuary of the Rance. In 1949 it was noted from Belgium by Cushman and from 80-400 metres in the Red Sea by Said. It has been recorded from Tasmania (Parr 1950), from calcareous areas in the North West Gulf of Mexico (Phleger and Parker 1951), from the Arctic (Loeblich and Tappan 1953), and in 1954 it was recorded from the Gulf of San Jorge and San Blas Bay, Argentina by Boltovskoy, and from the North Eastern Gulf of Mexico to a depth of 285 metres by Parker. Lehmann in 1957 obtained the form from the Texas Gulf coast, and in 1958 it was recorded from the Orinoco-Trinidad-Paria shelf by Drooger and Kaasschieter, from the Western Mediterranean by Todd, from the Central Tyrrhenian Sea by Norin, and from thirteen Eastern Mediterranean stations at depths of 71-996 metres with a freqnency of up to 3% by Parker. Green in 1960 obtained the form from the Arctic Basin and Hofker in the same year noted it in the Gulf of Naples.

The species was recorded in 1961 from the continental platform between Santo Tome and the Rio de la Plata by Boltovskoy, from the Red Sea and Mediterranean coast of Israel by Reiss, Klug and Merling, and from the intertidal zone of the California and Oregon coasts by Cooper. Haake in 1962 noted this species in the North Sea, and in the same year Lynts obtained it from Upper Florida Bay and Associated sounds. In 1963 this form was noted in the Baring Sea (Anderson), from Laguna de Terminos, Campeche, Mexico (Ayala-Castanares), and from Hudson Bay, Canada (Leslie). The species was recorded in 1964 from Manukau Harbour, Auckland by Hulme, from Tampa-Sarasota Bay, Florida by Walton, and from Campeche Bank, Mexico by Davis. Phleger in 1965 obtained this speeies from Guerrero Negro Lagoon, Baja, California.

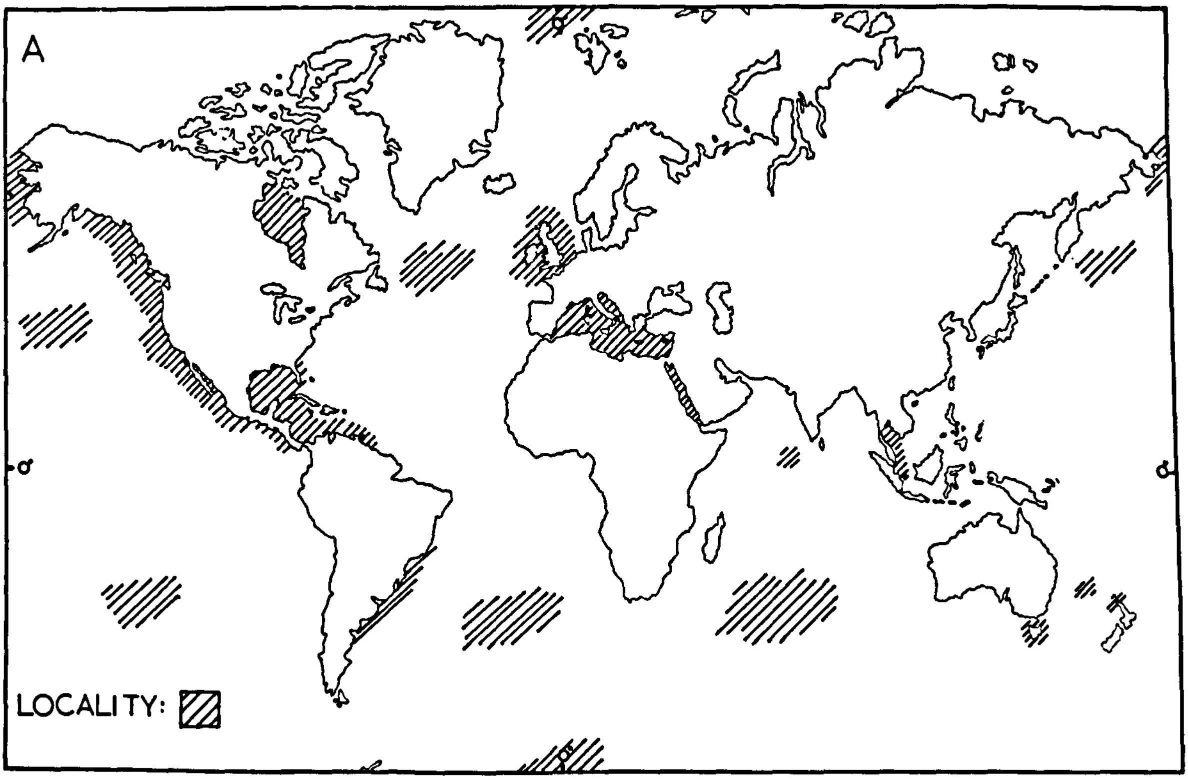
Stratigraphic Occurrence: (Text-fig.39B). British Holocene occurrences of this species have been noted from Formby and Leasowe (Reade 1900), and from Swansea Docks (MacFadyen 1942).

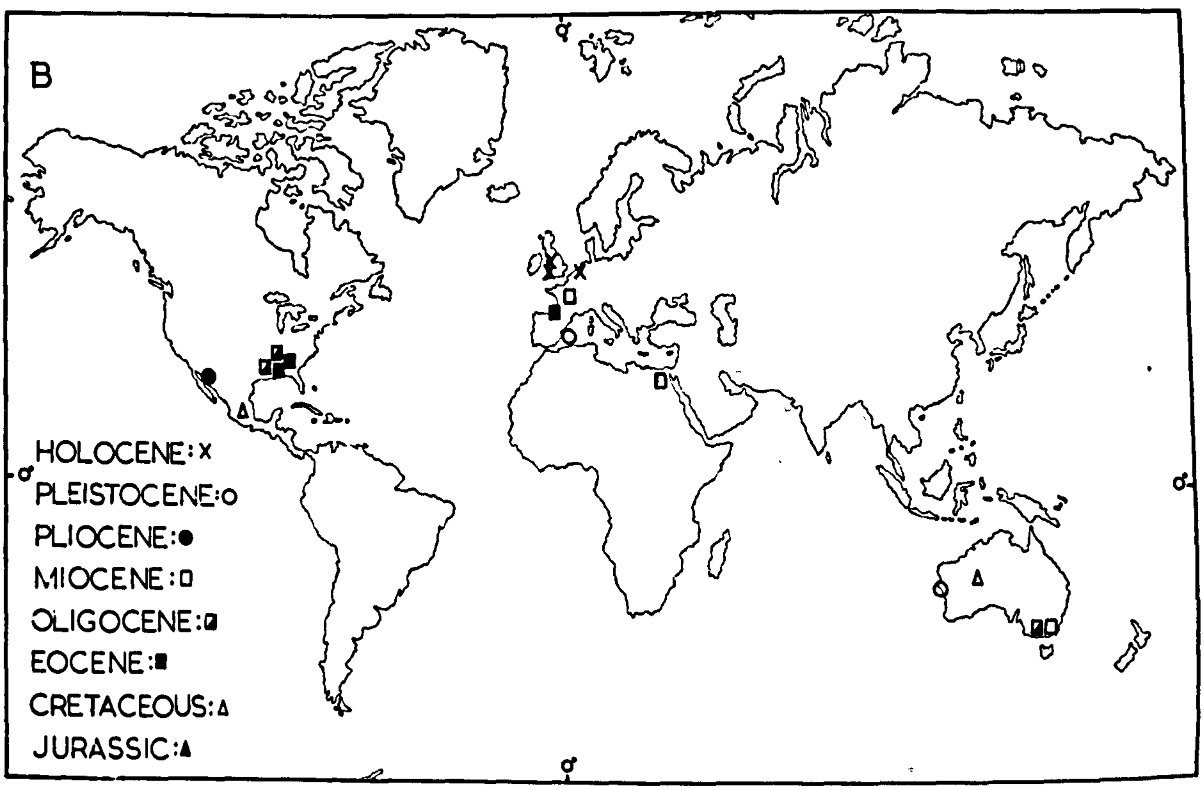
Heron-Allen and Earland in 1910 obtained Cretaceous derived specimens from the shore sands at Selsey Bill. A Post Tertiary occurrence was noted at Greenock in 1885 by Robertson. Reade in 1897 obtained this form from the Boulder Clay of the Vale of Clwyd, and other Boulder Clay occurrences were noted by Wright from Carrickfergus in 1903, and from County Down in 1904.

Voorthuysen in 1951 obtained the species from the Holocene deposits of the N.O.Polder, Netherlands.

Galloway and Morrey in 1931 noted the form from the Lower Cretaceous of Mexico, White in 1928 from the Upper Cretaceous of Mexico, and Howchin in 1893 from the Cretaceous of Australia. Cushman obtained the species from the Paleocene of Alabama in 1944, and of the United States in 1951. Eocene occurrences were noted from Alabama by Cushman and Todd in 1942, and from Georgia by Cushman and Herrick in 1945. Halkyard in 1917 and 1919 noted the species in the Middle Eocene Blue Marls of Biarritz, and Cushman in 1935 stated that this form occurred in the Upper Eocene of the South Eastern United States. Howe in 1942 recorded the species from the Oligocene of Alabama, Cushman and Ellisor in 1945 from the Middle Oligocene of Texas, and Reed in 1965 noted the species occurring in the Oligo-Miocene of Victoria, Australia. Miocene occurrences were recorded from South West France (Kaasschieter 1955), and from Northern Egypt (Souaya 1965). Cushman and Gray noted a Pliocene occurrence in 1946 from Timms Point, California. Occurrences in the Tertiary of Victoria, Australia, were noted by Chapman, Parr, and Collins in 1934 and by Carter in 1958. In 1953 Collins recorded the species from the Pleistocene of Port Fairy, West Australia, and in 1958 Todd noted it in the Pleistocene portion of a core from the Western Mediterranean.

Diagnosis: This species has a world wide distribution but temperature appears to be the main factor controlling its distribution, the optimum environment being in temperate to warm latitudes. The stratigraphic rance is Cretaceous to Recent.





TEXT FIG. 39 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- SPIRILLINA VIVIPARA

Sub Family: Patellininae Rhumbler 1906

Genus: *Patellina* Williamson 1858

Patellina corrugata Williamson 1858

Pl.15, figs.5a,5b,5c.

1858 *Patellina corrugata* WILLIAMSON. Rec.For.Gt.Brit. Ray.Soc.London,p.46,pl.3,figs. 86-89.

1865 *Patellina corrugata* Williamson PARKER and JONES. Phil.Trans. Roy.Soc.Vol.155,p.398,pl.15, figs.29a,b.c.

1884 *Patellina corrugata* Williamson BRADY. Chall.Rep.Zool.Vol.9, p.634,pl.86,figs.1-7.

1900 *Patellina corrugata* Williamson READE. Geol.Mag.Vol.VII,p.100, pl.V,fig.20.

1902 *Patellina corrugata* Williamson CHAPMAN. Foraminifera. Longmans. p.216,pl.12,fig.8,b.

1913 *Patellina corrugata* Williamson HERON-ALLEN and EARLAND. Proc. Roy.Irish Acad.Vol.31,pt.64,p.109, 110,pl.IX,fig.11.

1913 *Arpatellum dunst-corrugatum* (Williamson) RHUMBLER. Erg.Plankton. Exped.Humboldt Stift. Bd.III, Tiel 2,p.437,fig.CXXXIV a-c, fig.CXXXVI,Taf.V,figs.5-7,Taf.VII, figs.11-15.

1915 *Patellina corrugata* Williamson CUSHMAN. U.S.Nat.Mus.Bull.71,pt.5, p.9,pl.7,fig.1,text-fig.8.

1922 *Patellina corrugata* Williamson HOFKER. Flora en Fauna der Zuidersee. Protozoa,p.134,fig.13.

1925 *Patellina corrugata* Williamson CUSHMAN. Smith Miscell.Coll.Vol. 77,No.4,p.70,pl.9,fig.4.

1927 *Patellina corrugata* Williamson CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.3,pt.1,pl.16,fig.3.

1930 _Patellina corrugata_ Williamson CUSHMAN. Contr.Cush.Found.Foram. Res.Vol.6,pt.1,p.15,16,pl.3,figs. 5a-c.

1932 _Patellina corrugata_ Williamson HERON-ALLEN and Earland. Disc. Repts.Vol.4,pt.1,p.406,pl.XIII, figs.19-22.

1933 _Patellina corrugata_ Williamson GALLOWAY. A manual of foraminifera. p.92,pl.7,fig.14.

1934 _Patellina corrugata_ Williamson CHAPMAN, PARR, and COLLINS. Journ. Linn.Soc.Zool.London,Vol.38,p.560, pl.8,fig.6.

1944 _Patellina corrugata_ Williamson CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.30,pl.4,fig.14.

1946 _Patellina corrugata_ Williamson CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res.Sp.Pub.no.19,p.37,38, pl.6,figs.22-24.

1946 _Patellina_ cf. _corrugata_ Williamson SCHIJFSMA. Meded.Geol.Stichting. Serie C,V,No.7,p.88,89,pl.5,figs.5a-c.

1947 _Patellina corrugata_ Williamson CUSHMAN and TODD. Contr.Cush. Found. Foram.Res.Sp.Pub.no.21,p.20,pl.3, fig.13.

1947 _Patellina corrugata_ Williamson CUSHMAN and TODD. Contr.Cush.Found. Foram.Res.Vol.23,pt.3,p.67,pl.16, fig.9.

1948 _Patellina corrugata_ Williamson CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.23,p.67,pl.7,fig.11.

1949 _Patellina corrugata_ Williamson CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique.Mem.111,p.41,pl.7,figs. 17,18.

1949 _Patellina corrugata_ Williamson SAID.Contr.Cush.Found.Foram.Res.Sp. Pub.no.26,p.35,pl.3,fig.32.

1951 _Patellina corrugata_ Williamson PHLEGER and PARKER. Geol.Soc.Am. Mem.46,pt.2,p.23,pl.12,fig.4.

1951 _Patellina corrugata_ Williamson VOORTHUYSEN,van. Med.Geol.Stichting, n.s.No.5,p.24,25,pl.2,fig.6.

1952 <u>Patellina</u> <u>corrugata</u> Williamson BERMUDEZ. Bol.de Geol.Caracas. Vol.II,no.4,p.30,pl.2,fig.1.

1952 <u>Patellina</u> <u>corrugata</u> Williamson PARKER.Bull.Mus.Comp.Zool.Vol. 106,No.9,p.420,pl.6,figs.16,17.

1953 <u>Patellina</u> <u>corrugata</u> Williamson LOEBLICH and TAPPAN. Smith.Miscell. Coll.Pub.4105,Vol.121,No.7,p.114, pl.21,figs.4,5.

1953 <u>Patellina</u> <u>corrugata</u> Williamson PHLEGER, PARKER and PEIRSON.Rep. Swed.Deep Sea Exped.Vol.VII, fasc.I,p139,pl.8,fig.14.

1954 <u>Patellina</u> <u>corrugata</u> Williamson BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol. Tome III,no.3, p.199,200,pl.XIV,fig.4.

1954 <u>Patellina</u> <u>corrugata</u> Williamson BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol. Tome III,no.4,p. 284,pl.XXVI,fig.10.

1954 <u>Patellina</u> <u>corrugata</u> Williamson WEISS. U.S.Geol.Survey Prof.Paper 254-G,p.160,pl.33,fig.4.

1955 <u>Patellina</u> <u>corrugata</u> Williamson KAASSCHIETER,in Drooger.Kaasschieter and Key. Verhandl.Konin.Ned.AMaM. Weten.Nat.Deel XXI,No.2,p.82,pl.12, figs.8a,b.

1957 <u>Patellina</u> <u>corrugata</u> Williamson FORAMINIFERI PADANI. Agip Mineraria. pl.38,fig.6.

1957 <u>Patellina</u> <u>corrugata</u> Williamson SMIGIELSKA. Rocz.Polski.Tow.Geol. Tome XXV,Zes 3,p.279,fig.1,pl.19, fig.10.

1957 <u>Patellina</u> <u>corrugata</u> Williamson VOORTHUYSEN,van. Med.Geol.Stichting, n.s.No.11,p.36,Taf.25,figs.34a,b.c.

1960 <u>Patellina</u> <u>corrugata</u> Williamson BARKER.Soc.Econ.Pal. and Min.Sp. Pub.no.9,p.178,pl.86,figs.1-7.

1961 <u>Patellina</u> <u>corrugata</u> Williamson BOLTOVSKOY.Mus.Argentino de Cienc. Nat.Zool.Tome VI,no.6,p.292,pl.V, fig.30.

1961 Patellina corrugata Williamson HORNIBROOK. New Zealand Geol.Survey Pal.Bull.34(1),p.97,pl.13,fig.250.

1962 Patellina corrugata Williamson HAAKE.Geol.Inst.Univ.Kiel.Meyniana, Band 12,p.43,Taf.3,fig.9.

1962 Patellina corrugata Williamson McKNIGHT,Jr. Bull.Am.Pal.Vol.44, No.201,p.124,pl.20,figs.131a,b.

1963 Patellina corrugata Williamson KUMMERLE. Abhand.Hess.Landes.Boden. Heft.45,p.47,Taf.7,figs.3a,b.

1964 Patellina corrugata Williamson FEYLING-HANSSEN. Nordes Geol. Undersokelse.Nr.225,p1335,pl.18, fig.9.

Test free, small, low trochospire, plano-convex to concavo-convex, circular in outline, periphery acute. Spiral side low, convex, evolute, with a globular to elliptical proloculum followed by a long undivided chamber of about two to three whorls spirally arranged which follow the proloculum, in turn followed by biserially arranged crescentric chambers each covering over half the circumference of the preceeding whorl, final chambers becoming annular. Chambers about ten in number, much longer than high, increasing gradually in size as added. Chambers divided by numerous incomplete secondary transverse septa, these transverse septa giving a typical cancellated appearance to the test. Spiral suture indistinct, flush. Ventral involute, umbilicate, very indistinct. Aperture ventral, an elongate slit at the base of the ultimate chamber, indistinct. Wall calcareous, transluscent, thin imperforate, frosted ventrally.

Dimensions: Diameter 0.41 mm. Height 0.15 mm.

Occurrence: Living CB.363.

Dead: CB.316, CB.322, CB.323, CB.326, CB.348, CB.381.

Dead, variation sample CB.700.

Morphological remarks: This species shows variation in size, height of spire, and density of transverse septa.

Distribution: (Text-fig.40A). This species has been recorded from the Shetland seas (Waller 1868), Montrose Basin and the River Blyth (Brady 1870), South East of Eddystone (Robertson 1870), the Firth of Clyde (Robertson 1875), the River Dee (Sidall 1876), 40 miles South of the Scilly Isles (Jones and Parker 1876), the Faeroe channel (Pearcey 1890), the River Mersey (Burgess 1891), Portree Bay, Isle of Skye (Robertson 1892), and the Irish Sea (British Association 1896). Wright obtained this form from Dogs Bay in 1900, and from the Recent clay in the River Lune valley in 1902. Pearcey in 1903 noted it in Firth of Forth, Worth in 1904 from Plymouth, Gough in 1906 from Larne Lough, the Gobbins, and Belfast Lough, Ireland, and Wright in 1907 from Lambay County Dublin. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from Clare Island and the North Sea in 1913, from 20 fathoms off Ardnamuchan, 12 fathoms in Loch Sunart, and 20 fathoms in the Sound of Mull in 1914, from the South coast of Cornwall and West of Scotland in 1916. In 1915 Heron-Allen obtained the form from 20 fathoms off the Isle of Man. It was noted from the Plymouth area by Heron-Allen and Earland in 1930, and by the Marine Biological Association in 1957. In 1958 Le Calvez recorded the species South West of Lands End, and in 1963 Bruce, Colman and Jones noted it from the Isle of Man area.

The form has been recorded from the Arctic (Parker and Jones 1865; Brady 1878), from the Gulf and River St. Lawrence (Dawson 1870), and

Brady in 1884 noted a world wide distribution of this form at all depths. In 1894 Goes recorded Scandinavian and Arctic occurrences, and in 1899 Chapman noted it at Funafuti Atoll. It was recorded from the Malay Archipelago by Millett in 1903, from the Antarctic by Pearcey in 1914, from the North Pacific by Cushman in 1915, from the Philippine Islands area by Cushman in 1921, from the Gulf of Naples by Hofker in 1922, and from Lord Howe Island (Heron-Allen and Earland 1923). This form has been recorded from off San Juan Island Washington (Palmer 1929), from Cabot Strait (Kindle 1931), from the Antarctic area (Wiesner 1931; Heron-Allen and Earland 1932; Earland 1934), and from the Southern California region (Natland 1933). Myers in 1935 stated that although Patellina corrugata is found in all oceans and in the Mediterranean Sea, its distribution is restricted to the warm shallow waters of the littoral zone. He stated that the depressed conical tests are found attached to calcareous algae, eel grass, succulent seaweed, or any firm substrate that supports a sparse population of diatoms and other unicellular organisms which may serve as food. Under laboratory conditions the maximum-rate of reproduction occurred at 21°C below 18°C the rate of reproduction was greatly retarded. When a temperature of 25°C was maintained for more than one day, reproduction became abnormal, and many of the larger individuals died. He concluded that reproduction in the sea is limited almost exclusively to the warm summer months, and supported this conclusion by noting the fact that in the winter months few early developmental stages are to be found, and the population of foraminifera of the littoral zone is greatly diminished, also noting that the relative scarcity may be accounted for in part by the heavy wave action that prevails in this season of the year. In 1937 Chapman and Parr noted the occurrence of this form in the Antarctic, in 1938 Marie obtained it from the Rance estuary, and in 1944 Cushman noted it on the coast of New England. Norvang noted this form off Bergenián 1941, and from Iceland in 1945. In 1947 Cushman and Todd noted this form off the Washington coast, and from Amchitka Island, Alaska. Cushman recorded the species from Fox Basin and off the Greenland and Labrador coasts in 1948, and from Belgium in 1949. In the same year Said obtained the forms from depths of 90-400 metres in the Red Sea. It was recorded from the Tasmanian area (Parr 1950), the Netherlands Wadden Sea (Voorthuysen 1951), from calcareous areas in the North West Gulf of Mexico (Phleger and Parker 1951), from the Portsmouth, (N.H.) area (Parker 1952; Phleger 1952), from Hachijo Island, Tokyo (Uchio 1951), and from the Arctic (Loeblich and Tappan 1953).

In 1954 this species was noted off the Gulf of San Jorge, and San Blas Bay, Argentina by Boltovskoy, from the North Eastern Gulf of Mexico by Parker, and in 1955 from the Bay of Fundy by Harrington. In 1957 Boltovskoy noted the form from the estuary of the Rio de la Plata, Vella from Cook Strait, New Zealand, and in 1958 Drooger and Kaasschieter noted a few specimens on the Orinoco-Trinidad-Paria Shelf. Norin noted it from the Central Tyrrhenian Sea, and Parker from the Eastern Mediterranean. The species was recorded in 1959 off

Brazil and off Argentina by Boltovskoy, and from around Santa Catalina Island, California by McGlasson. In 1960 Uchio obtained this species from San Diego, California, Green from the Arctic Basin, and in 1961 it was noted from the continental platform between Santo Tome and the Rio de la Plata, Argentina by Boltovskoy, from Marthas Vineyard, Massachussetts, by Todd and Low, from the Gulf of California by Bandy, and from the California and Oregon intertidal zone by Cooper. In 1962 Haake obtained this form from the North Sea region, Wagner obtained it from 472 metres at +0.28°C on the Arctic continental shelf, and McKnight obtained it off the Antarctic coast. In 1963 it was recorded from the Ivory coast by Le Calvez, from Hudson Bay, Canada by Leslie, from Juan de Fuca and Georgia Straits, British Columbia by Cockbain, and in 1964 it was noted by Smith at 50 metres off El Salvador, South America, and by Hulme from Manukau Harbour, Auckland, New Zealand.

Stratigraphic Occurrence: (Text-fig.40B). British records for occurrences in the Holocene have been made from Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar and Great Crosby (Wright 1904;1908), County Antrim and Skye, the English Fens and Swansea Docks (MacFadyen 1937;1938;1942), and from Borth,Cardiganshire (Adams and Haynes 1965).

Cretaceous occurrences have been noted from Surrey by Chapman in 1894, and from Farringdon by Wright in 1905. Crosskey and Robertson noted Post-Tertiary occurrences from Paisley in 1869, and Greenock in 1871. Robertson also noted this species in the Post Tertiary at Greenock in 1885. In 1906 Reade and Wright noted the form in the Pleistocene of the Isle of Man. Wright in 1902 noted the species in the Drift of County

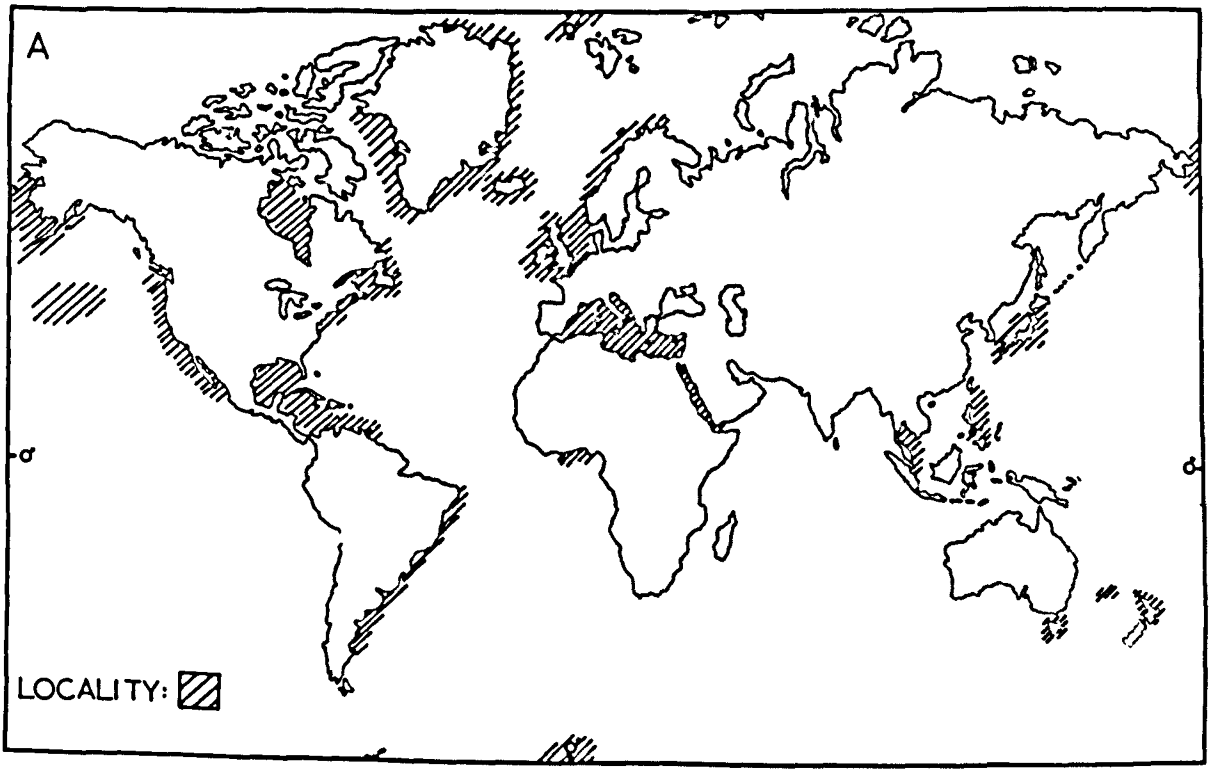
Cork, and Boulder Clay occurrences were noted from the Vale of Clwyd (Reade 1897), Great Crosby, Carrickfergus, and County Down (Wright 1898; 1903; 1904;). Upper Boulder Clay occurrences were noted from Cheshire by Shone in 1878, and from County Dublin by Wright in 1903.

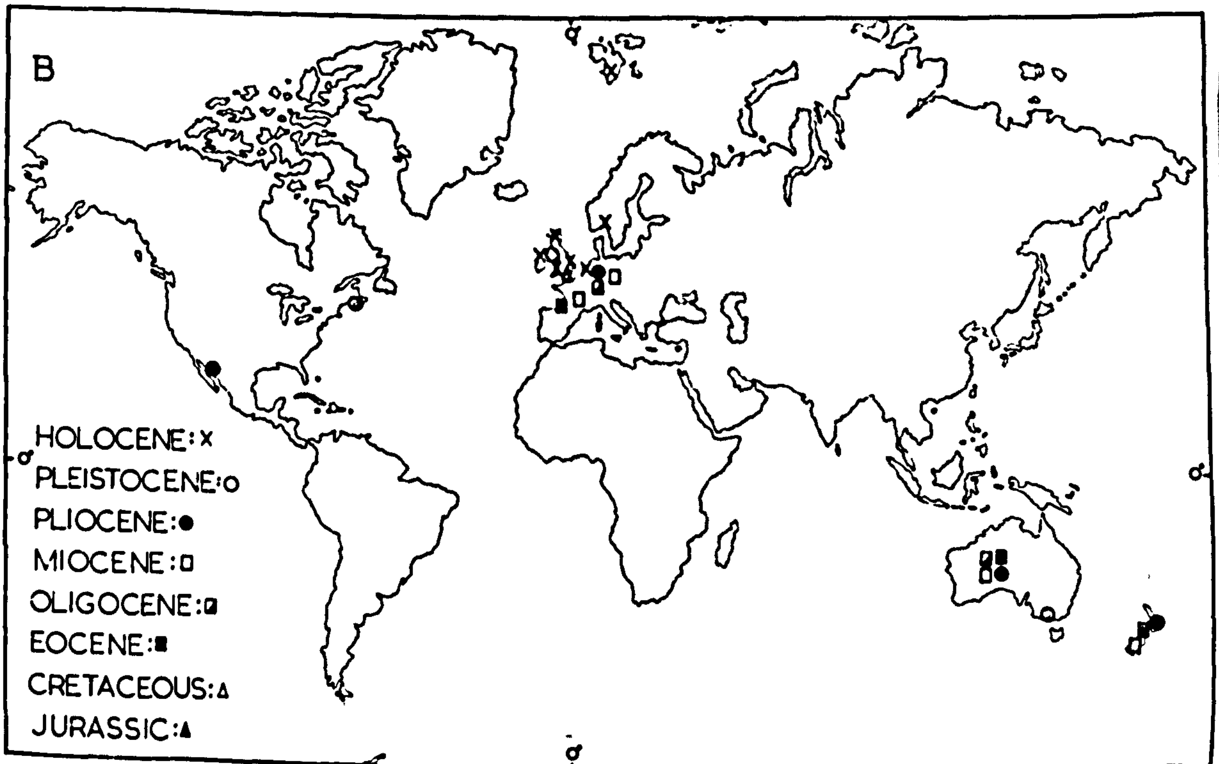
Other Holocene occurrences have been noted from Bruges (Reade 1898), the Dollart-Ems estuary (Voorthuysen 1960), South West Barents Island, the Oslo Fjord area, and Spitzbergen (Feyling-Hanssen 1961;1964; 1965).

Halkyard in 1917 and 1919 obtained this species from the Middle Eocene Blue Marls of Biarritz, and Crespin in 1956 noted it in the Upper Eocene of the Nullabor Plains, Australia. An Upper Oligocene occurrence in Germany was recorded by Kummerle in 1963, and Parr in 1930 stated that this form ranged from the Oligocene to Lower Pliocene of New Zealand and Australia. Schijfsma in 1946 noted the species in the Paleogene of South Limburg. Miocene occurrences have been recorded from South West France (Kaasschieter 1955), Upper Silesia (Smigielska 1957), and France (Rey 1958). Cushman and Grey in 1946 noted it in the Pliocene of Timms Point, California, and Voorthuysen in 1953 recorded it as constituting .5-1% of the Pliocene fauna in a boring at Oosterhaut, Netherlands. In 1936 Cushman recorded the species from the Lower Tertiary of the Georges Bank Canyons, and other Tertiary occurrences have been noted from Port Phillip, Victoria (Chapman, Parr and Collins 1934), Cape Range, Western Australia and Cebu, Philipinnes (Crespin 1955;1956) and from Oomaru, New Zealand (Hornibrook 1961). Collins in 1953 obtained the species from the Pleistocene of Port Fairy, Western Victoria, and

Weiss in 1954 noted it from the Pleistocene of Eastern Long Island, New York.

Diagnosis: This species is common nearly everywhere in the World, the main restricting factors appearing to be temperature, and food availability. Stratigraphically it ranges from the Cretaceous to Recent.





TEXT FIG.40 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF:- PATELLINA CORRUGATA

CHAPTER 8

The ROTALIACEA and GLOBIGERINACEA

The first Super Family includes trochospiral or planispiral forms with double walls and septa of radial laminated calcite, with apertural modifications or retral processes projecting across sutures. The second Super Family have forms with trochospiral tests, globular chambers with distinctly perforate double walls of lamellar radial hyaline calcite, aperture variable, with occasional modifications. The Sub Order ROTALIINA Delage and Herouard includes both these Super Families.

Super Family: Rotaliacea Ehrenberg 1839

Family: Rotaliidae Ehrenberg 1839

Sub Family: Rotaliinae Ehrenberg 1839

Genus: Ammonia Brunnich 1772

Ammonia beccarii (Linne) 1758

Pl.16, figs.1a,1b,1c.

1758	Nautilus beccarii	LINNAEUS	Syst.Nat.Ed.10.Holmia,Suecia,Sweden impensis.L.Salvii,Tome 1,p.710,type fig.Plancus op.cit.pl.1,figs.1a-c, also Gualtieri op.cit.pl.19,figs.h-h, i-i.
1858	Rotalina beccarii	(Linne)	WILLIAMSON. Rec.Foram.Gt.Brit.Ray Soc.London.p.48,pl.4,figs.90-92.
1870	Rotalia beccarii	(Linne)	BRADY. Ann.Mag.Nat.Hist.Ser.4,Vol.6, p.303,pl.12,fig.8.
1884	Rotalia beccarii	(Linne)	BRADY. Chall.Rep.Zool.Vol.9,p.704, 705,pl.CVII,figs.2,3.
1894	Rotalina beccarii	(Linne)	GOES. Kongl.Svensk.Veten.Akad.Handl. N.F.Bd.25,No.9,p.99,Tab.16,fig,811.
1897	Rotalia beccarii	(Linne)	FLINT. U.S.Nat.Mus.Ann.Rept.p.331, pl.75,fig.2.
1900	Rotalia beccarii	(Linne)	READE. Geol.Mag.Vol.VII,p.100,pl.V, fig.22.
1906	Rotalia beccarii	(Linne)	BULLEN. Geol.Mag.Vol.III,p.357, pl.XIX,fig.1.
1915	Rotalia beccarii	(Linne)	CUSHMAN. U.S.Nat.Mus.Bull.71,pt.5, p.67,pl.30,fig.3.
1931	Rotalia beccarii	(Linne)	CUSHMAN. U.S.Nat.Mus.Bull.100,Vol.4, p.345,pl.70,figs.3a-c.
1022	Rotalia beccarii	(Linne)	CUSHMAN. Dept.Marine Biol.Carnegie Inst.Wash.Vol.XVII,p.52,pl.8,figs.7,8,9.
1922	Rotalia beccarii	(Linne)	HOFKER. Flora en Fauna der Zuidersee, Protozoa.p.149,150,fig.46.

1925	Rotalia becarii	(Linne)	CUSHMAN. Smith.Miscell.Coll.Vol.77, No.4,p.73,pl.12,fig.2.
1928	Rotalia beccarii	(Linne)	CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.4,pt.4,p.103,pl.15,figs.1-7.
1932	Rotalia beccarii	(Linne)	MacFADYEN. Geol.Mag.Vol.69,pl.XXXIV, figs.11a-c.
1933	Rotalia beccarii	(Linne)	GALLOWAY. A manual of foraminifera.p.281. pl.25,fig.1.
1934	Rotalia beccarii	(Linne)	CHAPMAN, PARR and COLLINS. Journ.Linn. Soc.Zool.London, Vol.38,p.567,pl.9, fig.21.
1941	Rotalia beccarii	(Linne)	CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.17,pt.2,p.36,37,pl.9,fig.20.
1944	Rotalia beccarii	(Linne)	CUSHMAN. Contr.Cush.Found.Foram.Res. Sp.Pub.no.12,p.35,pl.4,fig.22.
1945	Rotalia beccarii	(Linne)	CUSHMAN. Contr.Cush.Found.Foram.Res. Sp.Pub.no.13,p.21,pl.5,fig.9.
1948	Streblus beccarii	(Linne)	RENZ. Geol.Soc.Am.Mem.32,p.167,pl.IX, fig.2.
1949	Rotalia beccarii	(Linne)	CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique.Mem.111,p.47,pl.IX,fig.4.
1949	Rotalia beccarii	(Linne)	SAID. Contr.Cush.Found.Foram.Res. Sp.Pub.no.26,p.37,38,pl.4,fig.5.
1950	Rotalia beccarii	(Linne)	COLOM. Bull.Inst.Espanol Ocean. No.28, p.36,Lam.IX,figs.6-7,16.
1950	Rotalia beccarii	(Linne)	LLARENIA de. Bull.Inst.Espanol.Ocean. No.29,Lam.VIII,figs.18,19.
1951	Rotalia beccarii	(Linne)	Le CALVEZ and Le CALVEZ, Vie et Milieu, Paris Univ.Lab.Arago.Bull.Tome 2, No.2,p.242,fig.5,c.d.e.
1951	Streblus batavus n.sp.		HOFKER. Siboga Exped.Monog.Pt.III, Foraminifera.No.IVb,p.493,text-fig.335, p.497,text-fig.340,p.498,text-figs. 341,345,pp.500-502.

1952 Streblus beccarii (Linne) BERMUDEZ. Boletin de Geologia, Caracas, Vol.II,no.4,p.71,pl.XII,fig.2.

1952 Rotalia beccarii (Linne) PARKER. Bull.Mus.Comp.Zool.Mass.Vol.106, no.10,p.457,pl.5,figs.5,7,8.

1953 Rotalia beccarii (Linne) BANDY. Journ.Pal. Vol.27,No.2,p.177, pl.22,fig.8.

1953 'Rotalia' sp.cf. 'R' beccarii (Linne) MILLER Jr. Contr.Cush.Found. Foram.Res.Vol.4,pt.2,p.59,60,pl.10, fig.2.

1953 'Rotalia beccarii' (Linne) PARKER, PHLEGER, and PEIRSON. Contr. Cush.Found.Foram.Res.Sp.Pub.no.2,p.13, pl.4,figs.20-22,25-30.

1953 Rotalia beccarii (Linne) PHLEGER, PARKER, and PEIRSON. Rep. Swed.Deep Sea Exped. Vol.VII,fasc.1, p.42,pl.9,figs.12,14,17,18.

1953 Rotalia beccarii (Linne) REDMOND. Journ.Pal.Vol.27,No.5,p.726, pl.76,figs.10a-c.

1954 Rotalia beccarii (Linne) beccarii BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III,no.4,p.287,pl.28, fig.2.

1954 Rotalia beccarii (Linne) PHLEGER. Bull.Am.Assoc.Pet.Geol.Vol.38, no.4,p.645,pl.3,figs.4-10.

1955 Streblus beccarii (Linne) KAASSCHIETER in Drooger. Kaasschieter, and Key. Verhandl.Konin.Ned.Akad.Weten. Nat.Deel XXI,No.2,p.87,pl.8,figs.5a-c, 6a-c.

1955 Rotalia beccarii (Linne) KRUIT. Kon.Med.Geol.Mijnb.Gen.Verh. Deel.15,p.473,pl.2,figs.15a,b.

1955 Rotalia cf. R. Beccarii (Linne) WALTON. Journ.Pal.Vol.29,No.6,p.1014, pl.103,figs.12,13.

1957 Rotalia beccarii (Linne) FORAMINIFERI PADANI. Agip Mineraria, pl.41,figs.3v,3p,3d.

1957 Streblus beccarii (Linne) LEHMANN. Micropaleontology. Vol.3, No.4,p.349,pl.3,figs.29-31.

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1957 Streblus beccarii (Linne) VOORTHUYSEN, van. Med.Geol.Stichting. N.S.No.11, p.27, Taf.23, figs.1a, 1b.

1959 Streblus beccarii (Linne) variants LANKFORD. Bull.Am.Assoc.Pet. Geol.Vol.43, no.9, pl.III, figs.10, 13.

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1960 Streblus beccarii (Linne) HOFKER. Palaentologische Zeitschriffe, Stuttgart W., Band 34, Nr.3/4, p.255, pl.E, fig.134.

1960 Streblus beccarii (Linne) PHLEGER. Am.Assoc.Pet.Geol.pl.3, figs. 7-10, 25, 26, pl.4, figs.7, 17, 18.

1961 Rotalia beccarii (Linne) BRAGA. Pub.Inst. de Zool.Fac.Ciencias do Porto, 77, p.160, 161, pl.XVII, fig.7.

1961 Rotalia beccarii (Linne) MAGNE and ESPITALIE. Rev.de Micropaleo. Vol.3, No.4, pl.2, figs.5a, b.

1961 Streblus beccarii (Linne) TODD and LOW. Contr.Cush.Found.Foram. Res.Vol.12, pt.1, p.18, pl.2, figs.18, 19.

1962 Ammonia beccarii (Linne) CHIERICI, BUSI, and CITA. Rev.de. Micropaleo.Vol.5, No.2, p.133, 137, pl.1(1), fig.1.

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1962 Streblus batavus Hofker HAAKE. Geol.Inst.Univ.Kiel Meyniana, Band 12, p.52, 53, Taf.6, figs.6-12.

1962 Streblus beccarii (Linne) McKENZIE. Journ.Roy.Soc.Western Aust. Vol.45, pt.4, p.125, pl.III, figs.18, 19.

1963 Ammonia beccarii (Linne) AYALA-CASTANARES. Uni.Nac.Autonoma de Mexico, Inst.Geol. Bol.no.67, pt.3, p.87, pl.7, figs.4a-c, 5a-c.

1963	_Rotalia beccarii_	(Linne)	BOLTOVSKOY. Contr.Cush.Found.Foram. Res.Vol.14,pt.2,p.64,pl.7,figs.10,11.
1963	_"Rotalia" beccarii_	(Linne)	SOUAYA. Journ.Pal.Vol.37,No.2,p.449, pl.57,fig.1,pl.58,fig.12.
1964	_Ammonia batavus_	(Hofker)	FEYLING-HANSSEN, Nordes Geol.Undersokelse, Nr.225,p.349,350,pl.21,figs.4-13.
1964	_Ammonia beccarii_	(Linne)	HUANG. Micropaleontology. Vol.10, No.1,p.52,pl.2,fig.6.

Test free, trochoid, bi-convex, dorsally gently convex, ventrally more strongly convex, periphery lobate. Dorsal evolute, composed of 21 chambers arranged in a sinistral coil of three whorls, chambers arranged 5:7:9. Chambers higher than long, gently inflated, increasing gradually in size as added. Dorsal sutures distinct, limbate, slightly curved, impressed, thickened. Spiral suture distinct, impressed, thickened. Ventral involute, only the chambers of the last whorl visible, nine in number, sub-tråangular in shape, with a development of umbilical flaps, increasing with size as the chambers do so, chambers gently inflated. Ventral sutures distinct, sub-radial, moderately impressed at the periphery, deeply incised at the umbilical area. Umbilicus deeply incised in the central area, occupied by a large umbilical plug surrounded by smaller bosses with granular material transgressing onto the suture areas. Apertural face sub rounded to oval, convex. Aperture interiomarginal, an elongate slit above the base of the apertural face on the umbilical margin, extending ventrally to the umbilicus, partially covered by a chamber flap. Wall calcareous, smooth, semi-tragsparent.

Dimensions: Diameter 0.50 mm. Height 0.26 mm.

Occurrence: Living, CB.304, CB.307, CB.309, CB.316, CB.323, CB.327, CB.334, CB.336, CB.356, CB.348, CB.349, CB.352, CB.353, CB.358, CB.364, CB.367, CB.373, CB.374, CB.380, CB.382, CB.385, CB.393, CB.404, CB.409, CB.413, CB.627.

Dead, CB.298, CB.299, CB.301, CB.302, CB.303, CB.304, CB.305, CB.306, CB.307, CB.308, CB.309, CB.310, CB.311, CB.312, CB.313, CB.314, CB.315, CB.316, CB.317, CB.318, CB.319, CB.320, CB.321, CB.322, CB.323, CB.324, CB.325, CB.326, CB.327, CB.328, CB.329, CB.330. CB.331, CB.332, CB.333, CB.334, CB.335, CB.336, CB.337, CB.338, CB.339, CB.340, CB.341, CB.342, CB.343, CB.344, CB.345, CB.346, CB.347, CB.348, CB.349, CB.350, CB.351, CB.352, CB.353, CB.354, CB.356, CB.358, CB.359, CB.360, CB.361, CB.362, CB.363, CB.364, CB.365, CB.366, CB.367, CB.368, CB.369, CB.370, CB.371, CB.372, CB.373, CB.374, CB.375, CB.376, CB.377, CB.378, CB.379, CB.380, CB.381, CB.382, CB.383, CB.384, CB.385, CB.386, CB.387, CB.388, CB.389, CB.390, CB.391, CB.392, CB.393, CB.394, CB.395, CB.396, CB.397, CB.398, CB.399, CB.400, CB.401, CB.402, CB.403, CB.404, CB.405, CB.406, CB.407, CB.408, CB.409, CB.410, CB.411, CB.412, CB.413, CB.414, CB.415, CB.611, CB.612, CB.613, CB.614, CB.615, CB.618, CB.623, CB.624, CB.626, CB.627, CB.628, CB.629, CB.630, CB.631, CB.632, CB.633, CB.634,

CB.635, CB.636, CB.637, CB.638, CB.639, CB.640, CB.641, CB.642.

Dead, variation samples,, CB.176, CB.177, CB.633, CB.634, CB.689, CB.690, CB.693, CB.694,, CB.695, CB.696, CB.699, CB.700, CB.705, CB.706, CB.710, CB.711, CB.712, CB.713, CB.714, CB.715, CB.716, CB.717, CB.734, CB.735, CB.743, CB.744, CB.745, CB.746.

Morphological remarks: Tremendous taxonomic confusion is evident with regard to this form especially with regard to the generic name, whether it should be Rotalia, Ammonia, or Streblus. On the definition of Loeblich and Tappan 1964 the generic name Ammonia has been utilised in this work. Another problem with regard to this form is what should or should not be included in the "beccarii" group, and in the "batavus" group. Within the Tremadoc Bay specimens variation is exhibited to a tremendous degree and it is virtually impossible to differentiate every subspecies or variety and so for convenience all the forms have been included in the "beccarii" group, realising at the same time that there are a large number of variants present. Variation in this species are variants takes the form of :-

i) variation in general appearance of test with regard to degree of convexity and corresponding height of test.

ii) strong variation in the umbilical region, from a complex umbilical plug, standing out strongly in this areak to the more flattened type, or the plug being absent.

iii) variation in the amount of transgression of the granular material from the umbilicus along the sutures.

iv) variation in the amount of umbilical excavation.

v) variation from an entire to strongly lobate periphery.

vi) variation of the dorsal sutures from subradial to markedly curved, from moderately impressed, flush, to markedly raised and in the amount of thickening evident.

vii) variation of the spiral suture from moderatбly impressed to flush or raised, and in the amount of thickening.

viii) variation of the ventral sutures from subradial to strongly curved, impressed to incised.

ix) variation in directŝon of coiling.

x) variation in number of chambers present, and in number of chambers to each whorl.

xi) variation in proloculus size.

xii) variation in general text size.

xiii) variation of the peripheral border from gehtly rounded to angled.

xiv) variation in degree of development of the umbilical flaps.

xv) variation in chamber f~~orm~~ from long narrow chambers to inflated, more globose types.

xvi) variation in the degree of inflation of the ultimate chamber.

Distribution: (Text-fig.41A). This species has been recorded from Belfast Bay (Williamson 1858), the Shetland Seas (Waller 1868), from Montrose Basin, Budle Bay, River Aln, River Wansbeck, River Blyth, the Firth of Forth, Seaton Sluice, River Tyne, Hartlepool Slake, the River Tees, River Exe, River Ribble, River Cam, Oulton, Broad, Yarmouth, Breydon Water, and Westport, Ireland (Brady 1870), South East of Eddystone (Robertson 1870), the Firth of Clyde (Robertson 1875), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), from the River Dee (Sidall 1876), from South of the Scilly Isles (Jones and Parker 1876), and West of Ireland (Brady 1884). In 1891 this form was noted in the River Mersey by Burgess, and in the Menai Straits, Port Dinorwic, Caernarvon Bay, off Penrhos, and Liverpool Bay by Pearcey, and in the following year was noted from Portree Bay, Isle of Skye by Robertson. In 1896 it was recorded from Barry Dock by Chapman and Jones, and from the Irish Sea by the British Association, and in 1900 it was noted from Dogs Bay by Wright, and from Salcombe estuary by Worth. It was recorded from the Exe estuary (Worth 1902), from Recent clay in the River Lune valley (Wright 1902), from Rathlin Island (Wright 1902), from the Firth of Forth (Pearcey 1903), from Plymouth (Worth 1904), from Larne Lough, Red Bay, Gobbins, Belfast Lough (Gouch 1906), and from Lamay, County Dublin (Wright 1907). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1919 and 1911, from the North Sea and Clare Island in 1913, from 5 fathoms off Jura, 20 fathoms off Ardnamuchan, 12 fathoms in Loch Sunart and 20 fathoms in the Sound of Mull in 1914, from West of Scotland and the South Coast of Cornwall in 1916, and from the Plymouth area in 1930. Heron-Allen in 1915 obtained this form from 20 fathoms off the Isle of Man. Other occurrences in the Plymouth area were noted by Myers in 1943 who stated that this form comprised 22% of the fauna, and by the Marine Biological Association in 1957, when this species was obtained from eight stations. Le Calvez in 1958 noted this form as being abundant South of Ireland, West of France, and in the Western English Channel, and Bruce, Colman and Jones in 1963 noted it from the Isle of Man and surrounding areas.

This species with variants has been recorded from New Zealand (Mantell 1850), from Crete and Serpho (Jones and Parker 1860), from the Gulf and River St. Lawrence (Dawson 1870), the River Scheldt (Brady 1870), and from the margins of all the great oceans except the Arctic and Antarctic at depths of generally less than 50 fathoms (Brady 1884), from Scandinavia and the Arctic (Goes 1894), from Funafuti lagoon (Chapman 1900), from Cocos Keeling Atoll (Chapman 1902), from the Malay Archipelago (Millett 1904), from the North Pacific Ocean, from the Philippine Islands area, and from the Tortugas region (Cushman 1915; 1921; 1922;). Hofker 1922 obtained this form from the Zuidersee. It has been noted from Lord Howe Island (Heron-Allen and Earland 1923), down to 16 fathoms in the Florida area (Norton 1930), from the ice free area of the Falkland Islands (Heron-Allen and Earland 1932), from the Southern California region (Natland 1933), from the Falkland sector of the Antarctic (Earland 1934), from off Venezuela (Hedberg 1934), from the Rance estuary (Marie 1938), and from 1932 and 2312 metres in the Gulf of Aden (Stubbings 1939). Cushman noted this form from Alaska in 1941, and South of Cape Cod in 1944. This form was obtained from Iceland (Norvang 1945), from the littoral and sub-littoral zone (0-15 metres) of the Gulf of Maine and Maryland (Parker 1948), from Belgium (Cushman 1949), from the Red Sea and the Gulf of Suez (Said 1949), from off the West African coast (Colom 1950, Llarenia 1950), and in 1951 it was recorded from St. Nazaire by Le Calvez and Le Calvez, from off Japan by Nagahama, from Narranganset Bay by Said, and from the Netherlands Wadden Sea by Voorthuysen. Parker in 1952 noted this species occurring with variable frequency in the Long Island Sound, Buzzards Bay area, where there was a temperature range of 1-21°C, and 3-15°C, and a salinity range of 28-30‰. In the following year Phleger, Parker and Peirson obtained this species from San Antonio Bay and Marsh, Texas, Ayala-Castanares from Campeche, Mexico, Said from Great Pond, East Falmouth, Massachussetts, and Miller from Mason Inlet, North Carolina. In 1954 it was noted from Mississippi Sound and environs (Phleger), from San Blas Bay(Boltovskoy), and from the Eastern shore of the Arabian Sea (Chaudhuri and Biswan), and in 1955 from Todos Santos Bay, California (Walton), from shore sands at Cuequen, Buenus Aires (Boltovskoy), and from the Rhone delta where it was abundant in terrestrial deltaic basins with salinity conditions varying between mesohaline and strongly saline, and in the marine environment a distinct optimum occurrence was noted at depths of less than 35 metres (Kruit). Boltovskoy in 1957 recorded this species from the coastal zone of Argentina and from the estuary of the Rio de la Plata, and in the same year Todd obtained it from the Mariana Islands, Said and Kamel from the Egyptian Mediterranean coast, Moor from depths of 0-10 feet in Florida Bay, and Lehmann from the Texas Gulf coast where this form occured with frequencies of 17.7%-80.1%. In 1958 Blanc-Vernet obtained this species from the Marseille coast, Norin from the Central Tyrrhenian Sea, and Parker obtained it with frequencies of up to 7% from seven Eastern Mediterranean stations ranging from the bay to 179 metres, andiin 1959 it was recorded from off Argentina by Boltovskoy, from the East Mississippi delta margins by Lankford, from 35,171 and 875 metres in the Gulf of Gascogne by Berthois and Le Calvez, and from Poponesset Bay, Massachusetts by Parker and Athearn who noted that the largest living population occurred in August. Phleger in 1960 recorded this species from the Northern Gulf of Mexico and Laguna Madre, Texas, and Hofker in the same year obtained it from the Gulf of Naples. In 1961 this form was noted from off the Mozambique coast by Braga, from the Red Sea and Mediterranean coasts of Israel by Reiss, Klug, and Merling, from the Nantucket Sound area by Todd and Low, and from the shore sands of Gibralter by Magne and Espitalie. This species has been recorded from the Adriatic Sea by Cita and Chierici in 1962, and by Chierici, Cita, and Busi in 1962. Also in 1962 it was recorded from the North Sea by Haake, from Upper Florida Bay and associated sounds by Lynts, and from Oyster Harbour, Albany, Western Australia by McKenzie. In 1963 Bandy obtained this species from the Gulf of California, Boltovskoy from Puerto Deseado, Patagonia, Le Calvez from off the Ivory coast, Segura from the littoral zone of the Gulf of Mexico, Dupeuble from Finistere, and Shokhina (quoted by Zenkevitch) from the Caspian Sea. In 1964 Smith obtained this species at depths of 20-140 metres off El Salvador, South America, Walton obtained it from 1-30 feet in Tampa-Sarasota Bay, Florida and Boltovskoy from Puerto Deseado, Patagonia, where he found the highest living populations in January and February, although living individuals were found each month. Albani in 1965 noted this form as being common in Durban Bay, South Afrida.

Stratigraphic Occurrence: (Text-fig.41B). The occurrence of this species in British Holocene deposits have been recorded from Norfolk (Jones 1865), Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar, Great Crosby (Wright 1904; 1908), County Antrim, Skye, English Fens, Swansea Docks (MacFadyen 1937; 1938; 1942), Anglesey (Earland for McMillan 1949), and from Borth, Cardiganshire (Adams and Haynes 1965).

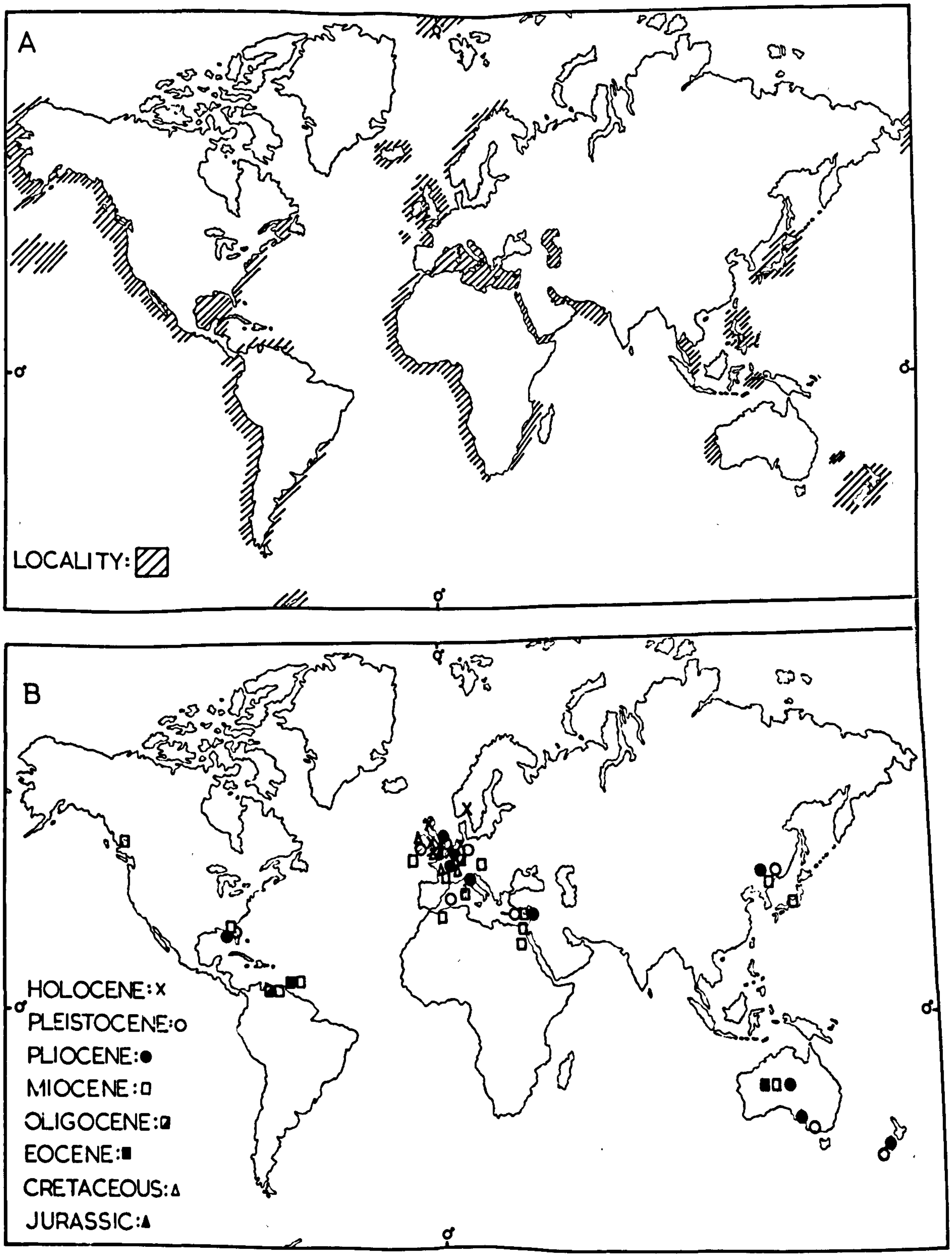
Jones and Parker in 1872 obtained this form from the Gault of Kent, and Cretaceous occurrences have been noted from County Derry (Wright 1886), Southern England (Jones 1900), and Taplow (Strahan 1891; Chapman 1892). Burrows and Holland in 1897 noted this form in the Paleocene of Pegwell Bay, and Bowen in 1954 noted it in the London Clay of the Isle of Wight. Funnell in 1961 stated that the species occurred in the Paleogene and Early Pleistocene of Norfolk. In 1965 Curry, Murray and Whittard obtained this species from the Miocene and Neogene in the Western approaches to the English Channel. A Pliocene occurrence was noted from Suffolk by Prestwich in 1871, and MacFadyen in 1932 obtained it from the Pliocene and Pleistocene of East Anglia. Post Tertiary occurrences were noted by Crosskey and Robertson from Paisley in 1869, Bute and Campbeltown in 1873, and from the Kyles of Bute in 1874. Robertson also noted Post

Tertiary occurrences from the Isle of Bute in 1876, Garnock and Kilwinning in 1877, and from Greenock in 1885. MacFadyen in 1940 noted the species occurring in the Pleistocene of the Wexford coast, and Funnell and West in 1962 noted it from the Early Pleistocene of Suffolk. Boulder Clay occurrences have been recorded from Caithness (Crosskey and Robertson 1868), Cheshire (Shone 1874), the Vale of Clwyd (Reade 1897), Great Crosby, Carrickfergus and County Down (Wright 1898;1903; 1904). Reade in 1874 noted this form in the Lower Boulder Clay of Lancashire and Cheshire, Shone in 1878 noted it from the Upper Boulder Clay of West Cheshire and Liverpool, and Wright in 1903 noted from similar deposits of County Dublin. Occurrences in Drift deposits have been recorded from County Cork and Herefordshire (Wright 1902; 1923).

Holocene occurrences have been noted at Bruges (Reade 1898). N.O.Polder, Netherlands (Voorthuysen 1951), and in the Oslo Fjord area (Feyling-Hanssen 1964). Jones and Parker in 1872 obtained this form from the Cretaceous of the Eastern Alps, Austria, France and Westphalia. In 1893 Howchin stated that this form occurred in the Eocene, Miocene and Pliocene of Australia, and Nuttall in 1928 noted it in the Upper Eocene and Miocene of Trinidad. It was noted from the Oligocene and Miocene of Venezuela by Renz in 1948, and from the Oligocene of the Rhine area by Ellermann in 1958.Miocene occurrences have been recorded from Haiti (Guppy1874), Egypt and Sinai (MacFadyen 1930), Japan (Asano 1949), from the Netherlands Antilles (Drooger 1953), Northern Columbia (Redmond 1953), South West France (Kaasschieter 1955), Algeria (Dame and Magne 1956), the Carpathian foreland (Luczkowska 1957), Sicily (Cita 1958), Venezuela (Blow 1959), Cagliari (Caria 1959), and Northern Egypt (Souaya 1963). Hilly and Magne in 1953 obtained this form from the Lower Miocene of Northern Algeria, and Colom in 1958 obtained it from the Lower Miocene of Majorca. Henson, Browne, and McGinty noted this species ranging from the Miocene to Pliocene in Cyprus in 1949, and Huang in 1963 noted this range in Taiwan, China. A range by this form from the Miocene through to the Pleistocene was noted inSouthern Florida by Schroeder and Bishop in 1954, and in Western Taiwan by Huang in 1964. In a core at Foggia Borsetti in 1962 noted this species ranging from the Miocene to Quaternary. Pliocene occurrences have been recorded from Castel Arquato, Italy (Cushman 1945), Australia (Rao 1955), and from France (Sourdillon 1960). Upper Pliocene occurrences have been noted from Adelaide by Howchin and Parr in 1938, and from the Riviera by Zanfra in 1961. Voorthuysen noted this species ranging from the Pliocene to Recent in a bore at the Hague, Netherlands in 1950, and from the Pliocene to Pleistocene in a bore at Oosterhaut, Netherlands in 1953. Hornibrook in 1958 obtained the form from the Pliocene and Pleistocene of New Zealand, and in 1962 Papani and Pelosio noted it in the Pliocene and Pleistocene near Parma. Rutten and Hotz in 1946 noted the species ranging from the Neogene to Recent in the Island of Ceram, Lys and Vatan in 1952 noted it in the Neogene of the Rhone Valley, and it was recorded from the Neogene of Israel by Avnimelech in 1953, and by Avnimelech and Reiss in 1953. Occurrences in Tertiary deposits have been recorded from Malaga, Turin, Palermo and Bulgaria

(Jones and Parker 1860), Java (Caudri 1932), Port Phillip, Victoria, Australia (Chapman, Parr and Collins 1934), Venezuela (Hedberg 1934), South Australia (Crespin 1954), from the Low Countries (Voorthuysen and Pannekeok 1950), and from West Emsland, Germany (Ellermann 1963). The Species has been recorded from the Pleistocene of Ischia (Broeck 1878), East Crete (Bullen 1906), the Netherlands (Voorthuysen 1948; 1949;1950), and from Port Fairy, Western Victoria, Australia (Collins 1953). In 1958 Todd noted the species in the Pleistocene and Recent portions of a core taken from the Western Mediterranean. Bourcart, Damiani, Vernet, and Le Calves in 1963 obtained the species from the Quaternary of the Alps.

Diagnosis: This highly variable species is characteristic of shallow water zones throughout the world, found typically and abundantly in brackish and more saline waters. Stratigraphically the form ranges from the Jurassic to Recent being most abundant from the Neogene to Recent.



TEXT FIG. 41 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- AMMONIA BECCARII

Family: Elphidiidae Galloway 1933

Sub Family: Elphidiinae Galloway 1933

Genus: Elphidium de Montford 1808

Elphidium bartletti Cushman 1933

Pl.16, figs.2a, 2b.

1933 Elphidium bartletti CUSHMAN. Smith.Miscell.Coll.Vol.89, no.9,p.4,pl.1,figs.9a,b.

1939 Elphidium bartletti Cushman CUSHMAN. U.S.Geol.Survey Prof.Paper 191,p.64,pl.18,fig.10.

1941 Elphidium bartletti Cushman CUSHMAN. Contr.Cush.Found.Foram.Res. Vol.17,pt.2,p.34,pl.9,figs.2,3.

1948 Elphidium bartletti Cushman CUSHMAN. Contr.Cush.Found.Foram.Res. Sp.Pub.no.23,p.59,pl.6,fig.13.

1952 Elphidium articulatum (d'Orbigny) PARKER. Bull.Mus.Comp.Zool.Vol. 106,no.9,p.411,pl.5,figs.5-7.

1953 Elphidium bartletti Cushman LOEBLICH and TAPPAN. Smith Miscell. Coll.Vol.121,no.7,p.97,pl.18,figs. 10-14.

1955 Elphidium bartletti Cushman RONAI. Contr.Cush.Found.Foram.Res. Vol.6,pt.4,p.145,146,pl.21,fig.6.

1961 Elphidium-bartletti Cushman FEYLING-HANSSEN. Vort.Fridt.Nansen Geol.Symp.Spitzbergen.Vol.3,Bis.11, p.48,pl.3,figs.8,9.

1964 Elphidium bartletti Cushman COOPER. Contr.Cush.Found.Foram.Res. Vol.15,pt.3,p.95,pl.6,figs.1,2.

1964 Elphidium bartletti Cushman FEYLING-HANSSEN. Nordes Geol. Undersokelse,Nr.225,p.343,344,pl.21, figs.1,2.

1965 Elphidium bartletti Cushman FEYLING-HANSSEN. Norsk.Polarinstitutt Meddel.Nr.93,p.24,pl.3,figs.8,9.

Test free, planispiral, bi-laterally symmetrical, involute, biconvex, sides slightly flattened, bi-umbilicate with a small central umbilical boss, periphery rounded, very slightly lobate. Chambers distinct, eight visible externally,, twice as high as long, increasing gradually in size as added. Sutures moderately distinct, curved posteriorly, almost flush in the early visible chambers, later impressed. Sutural pores indistinct except in the last few chambers in which they are set in short broad, triangular, depressions which extend across the impressed sutural regions, six to eight on each suture. Septal bridges indistinct. Apertural face smooth, high, oval, convex. Aperture a row of slit like pores along the basal suture of the ultimate chamber. Wall calcareous, smooth, opaque, finely perforate.

Dimensions: Diameter 0.26 mm. Thickness 0.13 mm.

Occurrence: Dead CB.346, CB.353, CB.359, CB.380, CB.398, CB.403, CB.404, CB.627, CB.628, CB.629, CB.638, CB.639, CB.641, CB.642.

Dead, variation samples CB.696, CB.700, CB.714, CB.746.

Morphological remarks: Cushman 1933 stated that this form resembled the young stages of E.articum but seems to be distinct from that species. Parker 1952 stated that "it is possible that E.bartletti represents the Arctic development of E.articulatum which is not reported from that area". Loeblich and Tappan 1953 disagreed with the above statement and noted that Eastern Seaboard specimens could not be designated E.articulatum on morphological grounds. As a result these two forms appear to be conspecific. Hooper in 1964 carried out a qualitative analysis on this form as noted the following elements being present :- Si, Mg, Ca, Sr, Al, Fe, Cu, Ba.

Distribution: This species has not been recorded from the British area to the present day.

Cushman in 1933 obtained this species from off North East Greenland and in Fox Basin, in 1941 off Alaska, with Todd in 1947 from Amchitka Island, Alaska, and in 1948 he obtained well developed individuals from off Labrador. It was recorded from the Eastern seaboard (Parker 1952), from the Arctic (Loeblich and Tappan 1953), and from brackish water in New York Bight (Ronai 1955). In 1960 Green recorded the species from the Arctic Basin, from the Shelf, 433-510 metres, +.03 to +.05°C where it constituted 3% of the fauna; from the Slope, 619-1,142 metres, +.03 to +.02°C, where it constitutes 2% of the fauna; and from the Apron 1,532-2,000 metres -.39 to -.42°C, where it constitutes 1% of the fauna. Leslie in 1963 recorded the form from Hudson Bay, Canada. Feyling-Hanssen in 1964 from the Spitzbergen area, and Cooper in 1964 from the North Bering Sea.

Stratigraphic Occurrence: The only recorded stratigraphic occurrence of this species in the British area is that made by Adams and Haynes in 1965 from the Holocene deposits of Borth, Cardiganshire, and that made by Funnell in 1961 from the Paleogene and Early Pleistocene of Norfolk.

Feyling-Hanssen obtained this species from the Holocene deposits of South West Barents Island in 1961, and of Spitsbergen in 1965. The same author in 1964 obtained two specimens from the Pleistocene of the Oslo

Fjord area.

Diagnosis: This species is characteristic of Northern cold and cool temperate waters at variable depth and occurs from the Pleistocene to Recent.

Elphidium crispum (Linne) 1758

Pl.16, figs.3a, 3b.

1758	*Nautilus crispus*	LINNAEUS	Syst.Nat.Ed.10,Holmia Suecia (Sweden). impensis L.Salvii.tome 1,p.709, Plancus op.cit.pl.1,figs.2d,2e,2f. also Gaultieri op.cit.pl.19,figs.a-a, d-d.
1846	*Polystomella crispa*	(Linne)	d'Orbigny. Foram.Ross.Vienn.Bas. p.125,pl.VI,figs.9-14.
1849	*Polystomella crispa*	(Linne)	WILLIAMSON. Trans.Micro.Soc.Vol.2, 159,pl.28,figs.1,2,6.
1858	*Polystomella crispa*	(Linne)	WILLIAMSON. Rec.For.Gt.Brit.Ray Soc.London, p.41,pl.3,fig.80.
1865	*Polystomella crispa*	(Linne)	PARKER and JONES. Phil.Trans.Roy. Soc.Vol.155,p.399,pl.14,fig.24, pl.17,fig.61a,61b.
1884	*Polystomella crispa*	(Linne)	BRADY. Chall.Rep.Zool.Vol.9,p.736, 737,pl.CX,figs.6-8,11.
1894	*Polystomella crispa*	(Linne)	GOES. Kongl.Svensk.Veten.Akad.Handl. N.F.Bd.25,No.9,p.102,Tab.17,figs.820-821,822.
1897	*Polystomella crispa*	(Linne)	FLINT. U.S.Nat.Mus.Ann.Rep.Wash. p.338,pl.80,fig.3.
1912	*Polystomella crispa*	(Linne)	BAGG. U.S.Geol.Survey Bull.513, p.90,91,pl.27,figs.13-20,pl.28,figs. 1-6.
1913	*Polystomella crispa*	(Linne)	HERON-ALLEN and EARLAND. Proc.Roy. Irish Acad.Vol.31,pt.64,p.146,147, pl.XIII,fig.14.
1929	*Elphidium crispum*	(Linne)	CUSHMAN and LEAVITT. Contr.Cush. Found.Foram.Res.Vol.5,pt.1,p.20,21, pl.4,figs.3,4.
1930	*Elphidium crispum*	(Linne)	CUSHMAN and VALENTINE. Contr.Dept. Geol.Stanford Univ. Vol.1,no.1, p.21,pl.5,fig.12.

1932	Elphidium aff. crispum	(Linne)	MacFADYEN. Geol.Mag.Vol.69,pl.XXXV, figs.18a,b.
1933	Elphidium crispum	(Linne)	CUSHMAN. U.S.Nat.Mus.Bull.161,pt.2, p.47,pl.11,fig.4.
1933	Elphidium crispus	(Linne)	GALLOWAY. A manual of foraminifera, p.269,pl.24,fig.3.
1939	Elphidium crispum	(Linne)	CUSHMAN. U.S.Geol.Survey Prof.Paper 191,p.50,pl.13,figs.17-21.
1940	Elphidium crispum	(Linne)	CUSHMAN and McCULLOCH. Al.Han.Pac. Exped.Rep.Vol.6,no.3,p.174,176, pl.20,fig.5.
1943	Elphidium crispum	(Linne)	MYERS. Proc.Am.Phil.Soc.Vol.86, No.3,p.439,fig.4,A+E.
1946	Elphidium crispum	(Linne)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.17,p.7,pl.1,figs.11,12.
1949	Elphidium crispum	(Linne)	SAID. Contr.Cush.Found.Foram.Res. Sp.Pub.no.26,p.23,24,pl.2,fig.36.
1950	Elphidium crispum	(Linne)	LLARENA,de. Bol.Inst.Espanol Ocean. No.29,Lam.VIII,fig.15.
1951	Elphidium crispum	(Linne)	FRIESE. Abhand.Geol.Dien.Berlin. Heft1227,p.29,30,Taf.13,figs.1-47.
1952	Elphidium crispum	(Linne)	COLOM. Bol.Inst.Espanol Ocean. No.51,p.34,Lam.III,figs.32-35.
1953	Elphidium crispum	(Linne)	PHLEGER, PARKER and PEIRSON. Rep. Swed.Deep Sea Exped.Vol.VII,fasc.1, p.31,pl.6,fig.17.
1955	Elphidium crispum	(Linne)	KAASSCHIETER in Drooger, Kaasschieter and Key. Verhandl.Konin.Ned.Akad.Weten. Nat.Deel.XXI,No.2,p.74,pl.13,figs.8a,b.
1955	Elphidium crispum	(Linne)	and Elphidium crispum (Linne) var. (A).KRUIT.Kon.Med.Geol.Mijnb.Gen.Verh. Deel.15,p.472,pl.2,fig.10,pl.2,figs. 11a,b.
1955	Elphidium cf. E.crispum	(Linne)	SMOUT. Journ.Wash.Acad.Sci.Vol.45, no.7,p.207,figs.10a,b.

1955	Elphidium crispum	(Linne)	WALTON. Journ.Pal.Vol.29,No.6,p.1007, pl.101,fig.11.
1956	Elphidium crispum	(Linne)	BHATIA. Contr.Cush.Found.Foram.Res. Vol.7,pt.1,p.20,pl.5,fig.11.
1956	Polystomella crispa	(Linne)	JEPPS. The Protozoa Sarcodina, Oliver and Boyd. p.73,text-fig.34.
1957	Elphidium crispum	(Linne)	FORAMINIFERI PADANI. Agip Mineraria, pl.22,figs.1,1a.
1957	Elphidium crispum	(Linne)	TODD. U.S.Geol.Survey Prof.Paper 280-G,pl.88,fig.18.
1959	Elphidium crispum	(Linne)	CARIA. Boll.Soc.Geol.Italia,Vol.78, fasc.1,p.48,Tav.1,fig.7.
1960	Elphidium crispum	(Linne)	ASANO. Sci.Rep.Tohoku Univ.Ser.2, (Geol.),Spec.Vol.no.4,p.197,198, pl.22,fig.6.
1960	Elphidium crispum	(Linne)	BARKER. Soc.Econ.Pal. and Min.Sp. Pub.no.9,p.226,pl.110,figs.6,7.
1960	Elphidium crispum	(Linne)	HOFKER. Palaontologische Zietschriff, Stuttgart W.Band 34,Nr.3/4,p.262, pl.F,fig.184.
1961	Elphidium crispum	(Linne)	BANDY. Micropaleontology, Vol.7,No.1, p.15,pl.1,fig.8.
1961	Elphidium crispum	(Linne)	BRAGA. Pub.Inst.de Zool.Fac.Ciencias do Porto 77,p.125,126,pl.XIII,figs.6,7.
1962	Elphidium crispum	(Linne)	CHIERICI, BUSI, and CITA. Rev.de Micropaleo.Vol.5,No.2,p.133,137, pl.1(1),fig.2,pl.1(2),fig.61
1962	Elphidium crispum	(Linne)	CITA and CHIERICI. Est.Arch.Ocean. Limnol.Vol.XII,fasc.3,p.350,pl.II, fig.5.
1962	Elphidium crispum	(Linne)	McKENZIE. Journ.Roy.Soc.Western Australia,Vol.45,pt.4,p.127,pl.III, fig.21.
1963	Elphidium crispum	(Linne)	SOUAYA. Journ.Pal.Vol.37,No.2,p.443, pl.56,fig.2.

Test free, planispiral, bi-laterally symmetrical, involute, biconvex, compressed, circular in outline, sides slightly flattened, biumbilicate, biumbonate, umbilical region infilled with a round composite pustural boss, periphery acute, maximum diameter three times the thickness. Chambers distinct, 18 visible in the last whorl, twice as high as long, increasing gradually in size as added. Sutures distinct, curved, with a raised ridge of clear shell material on the anterior border of each chamber, the ridge being highest near the umbilicus and almost flush near the periphery. Sutural pores distinct with attendant deep elongate depressions up to 17 seen on the side of each chamber. Septal bridges distinct. Apertural face sagittate, convex, smooth, perforate. Aperture a series of pores along the basal suture of the ultimate chamber. Wall calcareous, transluscent, finely perforate, often greenish in colour.

Dimensions: Diameter 0.75 mm. Thickness 0.30 mm.

Occurrence: Living CB.331, CB.334, CB.359, CB.623.

Dead CB.299, CB.301, CB.302, CB.303, CB.304, CB.305, CB.306, CB.307, CB.308, CB.309, CB.311, CB.312, CB.313, CB.315, CB.316, CB.317, CB.318, CB.319, CB.320, CB.321, CB.322, CB.323, CB.324, CB.327, CB.328, CB.330, CB.331, CB.332, CB.334, CB.335, CB.336, CB.337, CB.338, CB.339, CB.340, CB.342, CB.343, CB.344, CB.345, CB.346, CB.347, CB.348, CB.351, CB.352, CB.354, CB.355, CB.356, CB.358,

CB.359, CB.361, CB.362, CB.363, CB.364, CB.366, CB.367, CB.368, CB.369, CB.370, CB.371, CB.373, CB.374, CB.376, CB.377, CB.378. CB.379, CB.380, CB.381, CB.384, CB.386, CB.387, CB.388, CB.389, CB.390, CB.391, CB.392, CB.393, CB.394, CB.395, CB.397, CB.398, CB.399, CB.400, CB.402, CB.403, CB.404, CB.405, CB.407, CB.409, CB.410, CB.412, CB.414, CB.415, CB.612, CB.613, CB.614, CB.615, CB.617, CB.618, CB.619, CB.620, CB.621, CB.623, CB.624, CB.627, CB.628, CB.629, CB.630, CB.631, CB.632, CB.634, CB.636, CB.637, CB.638, CB.639, CB.641, CB.642.

Dead, variation samples CB.176, CB.634, CB.689, CB.693, CB.694, CB.695, CB.699, CB.700, CB.705, CB.706, CB.710, CB.714, CB.734. CB.743, CB.746.

Morphological remarks: This species exhibits variation in the shape of the chambers, umbilicus and retral processes and is very difficult to differentiate between this species and E.macellum as there appears to be a gradation between the two forms. Lister in 1894 worked on this species and noted that the central chamber of the megalospheric form was about 80μ in diameter, while that of the microspheric form is about 10μ. Associated with this difference in central chamber size he noted a marked difference in the nuclei of the two forms, in the microspheric form numbers of small nuclei were present scattered through the protoplasm but not extending into the terminal chambers, whereas in the megalospheric type there is a single large nucleus

which grows in size with the growth of the protoplasm and passes on from chamber to chamber, moving towards the centre of the protoplasm contained in the series of chambers though lagging some distance short of it. Murray in 1963 suggested that this species selects its food on the basis of size and stated that the colour of the protoplasm is closely related to the food pigments. He also stated that movement in the horizontal plane is normally random, but that this species prefers a clean hard substratum to one of clay, and therefore movement associated with the substrate must be directed and not random.
The same author conducted a number of experiments on this form and found that the rate of feeding is closely related to the salinity, the feeding rate decreasing with the salinity, the amount of calcium being present being unimportant. He noted that lowered temperatures helped the species to survive for longer periods in subsaline waters. At temperatures of 8°C and 16°C cultures survived subsaline water of 20‰ for 38 days, but at a salinity of 15‰ only the culture kept at 8°C survived for 15 days. He considered that food shortage was the cause of the formation of small chambers which produced notches in the test outline. Myers in 1942 stated that reproduction is largely limited to a few weeks beginning in March. He noted that the larger tests are especially resistant to erosion and even after passing through the digestive tracts of bottom feeding invertebrates were not noticably affected. <u>E.crispum</u> (Linne) <u>var.(A)</u> of Kruit 1955 is not considered to be a valid variety here as the lobate

periphery of the test is quite a common feature, often found in association with specimens with an entire periphery.

Distribution: (Text-fig.42A). This species has been recorded from off Falmouth (Williamson 1849), Belfast Bay (Williamson 1858), the Shetland Seas (Waller 1868), the Firth of Clyde (Robertson 1875), the River Dee (Sidall 1876), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), in the Faeroe Channel and on the British coasts (Brady 1884), from the River Mersey (Burgess 1891), from Caernarvon Bay, Liverpool Bay, and Port Dinorwic (Pearcey 1891), Portree Bay, Isle of Skye (Robertson 1892), Dogs Bay (Wright 1895), and from the Irish Sea (British Association 1896). In 1900 Wright noted the species in Dogs Bay, and Worth noted it in Salcombe estuary. The form was noted from Rathlin Island (Wright 1902), from the Exe estuary (Worth 1902), from 0-15 fathoms in the Plymouth area (Worth 1904), from Larne Lough, Red Bay, Gobbins, and Belfast Lough (Gough 1906), and from Lambay, County Dublin (Wright 1907). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from Clare Island and the North Sea in 1913, from 20 fathoms in the Sound of Mull, 5 fathoms off Jura, 20 fathoms off Ardnamuchan and in 12 fathoms in Loch Sunart in 1914, from West of Scotland and the South coast of Cornwall in 1916, and from the Plymouth area in 1930. Heron-Allen obtained this form from 20 fathoms off the Isle of Man in 1915. This species was reported in the Plymouth area by Myers (1942,1943), and by the Marine Biological Association (1957).

Bruce, Colman and Jones noted this form, in 1963, from the Isle of Man and surrounding areas.

This species has been recorded from Crete, Rimini, Syra and Serpho (Jones and Parker 1960), the North Atlantic and Arctic (Parker and Jones 1865), Greenland and Norway (Brady 1878), from the littoral zone to 355 fathoms in most of the oceans of the world (Brady 1884), Scandinavia and the Arctic (Goes 1894), Funafuti Atoll (Chapman 1899; 1900), Cocos Keeling Atoll (Chapman 1902), and from the Malay Archipelago (Millett 1904). In 1921 this form was recorded from the Philippine Island area by Cushman, in 1923 from Lord Howe Island by Heron-Allen and Earland, in 1930 from the Atlantic Ocean by Cushman, and from the channel islands of Southern California by Cushman and Valentine. It has been recorded from the Antarctic area (Wiesner 1931), from the Southern California area (Natland 1933), from the Tropical Pacific (Cushman 1933), from the Antarctic (Chapman and Parr 1937), from the Rance estuary (Marie 1938), from Japan (Asano 1938), from 37, 91, and 275 metres in the Gulf of Aden, 13.5 and 48 metres off the South Arabia coast, 73-165, 209 and 805 metres from the Zanzibar area, 46,366 and 878 metres in the Maldive area (Stubbings 1939), and from the East Pacific, off Ecuador, and the Gulf of California (Cushman and McCulloch 1940). Norvang noted this species from off Bergen in 1941, and from Iceland in 1945. In 1946 the species was noted from the Mediterranean by Cushman and from the Island of Ceram by Rutten and Hotz. Said in 1949 obtained the form from the shallow areas of the Red Sea and Gulf of Suez, and in the following year it was noted from off the West African coast in 1950 by Colom and by Llarena. The species has been recorded from Coronado Bank, California (Dutcher 1951), the coast of Galicia (Colom 1952), the North Atlantic (Parker, Phleger and Peirson 1953), Todos Santos Bay, California (Walton 1955), the Rhone delta (Kruit 1955), shore sands of Western India (Bhatia 1956), the Mariana Islands (Todd 1957), and from the Egyptian Mediterranean coast (Said and Kamel 1957). In 1958 Blanc-Vernet noted the form on the Marsille coast, and Parker noted it with frequencies up to 7% at 14 Eastern Mediterranean stations ranging down to a depth of 538 metres. In 1959 Berthois and Le Calvez noted the form at 171 metres in the Gulf of Gascogne, and in the following year it was noted from Laguna Madre, Texas by Phleger, from the Gulf of Naples by Hofker, and from the Indo-Pacific region at depths of 68-539 metres, and temperatures of 1.6-23.3°C by Asano. In 1961 Braga noted the form off the Mosambique coast, Bandy from the Gulf of California, and Reiss, Klug and Merling from the Red Sea and Mediterranean coasts of Israel. Occurrences by this species in the Adriatic Sea were noted in 1962 by Chierici, Busi, and Cita, and by Cita and Chierici. McKensie in the same year stated that this form cannot tolerate brackish water conditions in Oyster Harbour, Albany, Western Australia. The species was recorded in 1963 from the Gulf of California by Bandy, from Upper Florida Bay and associated sounds by Lynts, from Juan de Fuca, and Georgia Straits, British Columbia by Cockbain, and from Finistere by Dupeuble. Albani in 1965 obtained a few specimens from Durban Bay, South Africa, and in the same year Phleger obtained living forms from Guerrero Negro Lagoon, Baja, California.

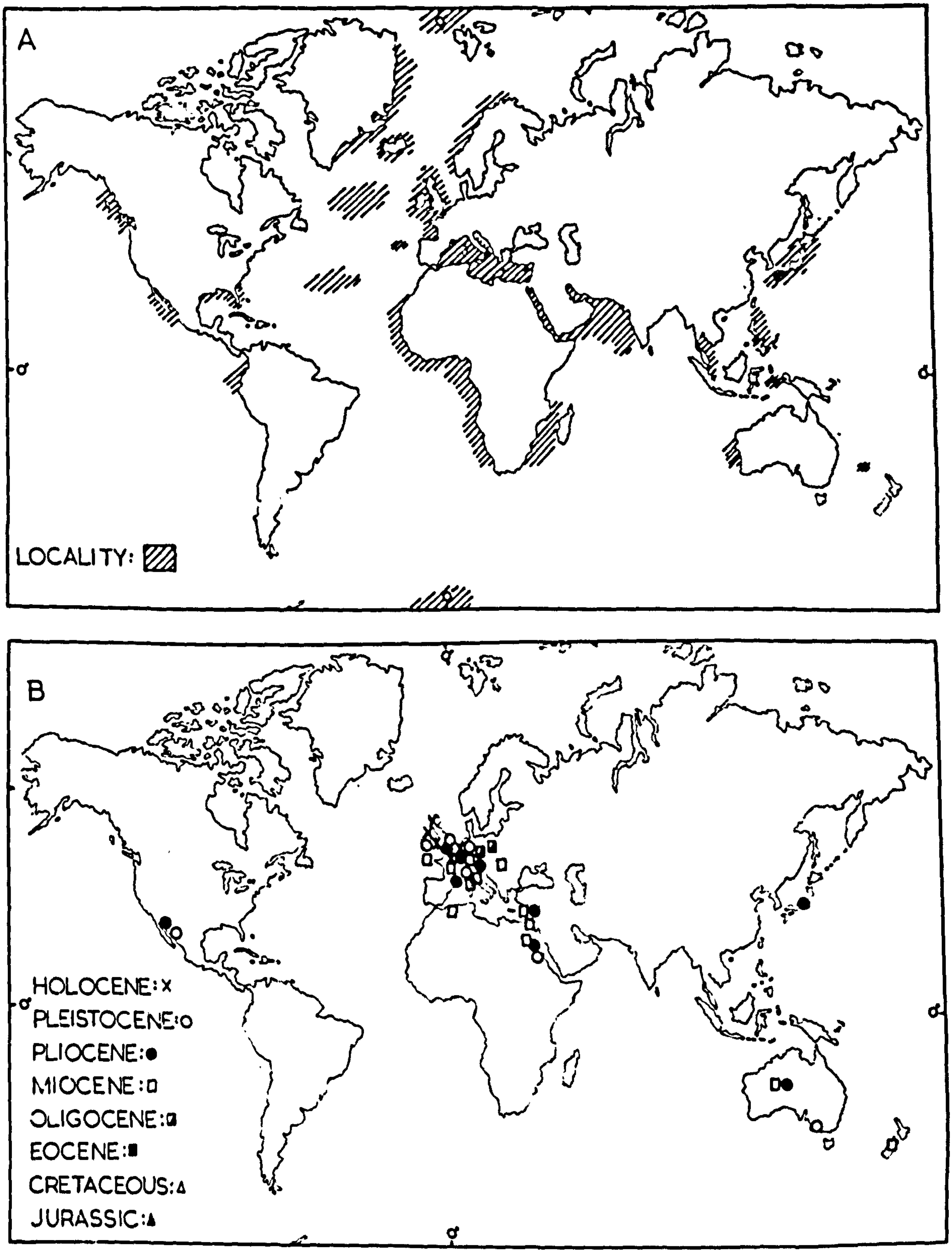
Stratigraphic Occurrence: (Text-fig.42B). Occurrences in British Holocene deposits have been recorded from Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Skye and County Antrim (MacFadyen 1937), Anglesey (Earland for McMillan 1949), and Borth, Cardiganshire (Adams and Haynes 1965).

In 1961 Funnel noted this species ranging from the Paleogene to Early Pleistocene in Norfolk and in 1965 Curry, Murray and Whittard obtained this species from the Neogene and Miocene of the Western approaches to the English Channel. Prestwich in 1871 noted it in the Pliocene of Suffolk, and MacFadyen in 1932 noted it in the Pliocene and Pleistocene of East Anglia. Crosskey and Robertson recorded Post Tertiary occurrences at Loch Gilp in 1868, Loch Fyne and Duntroon in 1869, and Campbeltown in 1873. Robertson also noted Post Tertiary occurrences from the Isle of Bute in 1876, and from Lewis in 1882. MacFadyen in 1940 noted a Pleistocene occurrence on the Wexford coast. Boulder Clay occurrences have been recorded from Cheshire (Shone 1874), and Carrickfergus (Wright 1903). Reade in 1874 noted an occurrence in the Lower Boulder Clay of Lancashire and Cheshire, and Shone in 1878 noted an Upper Boulder Clay occurrence in West Cheshire and Liverpool. An occurrence in the Drift of County Cork was recorded by Wright in 1902.

In 1898 Reade obtained this species from the Holocene at Bruges and in 1960 Voorthuysen obtained it from the Holocene of the Dollart-Ems estuary.

In 1940 Majzon noted the species in the Oligocene portion of a borehold in Hungary, and in 1951 Friese noted the species in the Middle Oligocene of Bavaria. In 1893 Cooke noted this form ranging from the Oligocene to the Miocene in the Maltese Islands. Miocene occurrences have been recorded from Egypt and Sinai (MacFadyen 1930), the Vienna Basin (Marks 1951), Northern Algeria (Hilly and Magne 1953), South West France (Kaasschieter 1955), the Carpathian foreland (Luczkowska 1957), Egypt (Nakaddy 1958), Sicily (Cita 1958), Cagliari (Caria 1959), Northern Italy (Drooger and Socin 1959), and from Northern Egypt (Souaya 1963). In 1893 Howchin noted the species occurring in the Miocene and Pliocene of Australia, and in 1949 Henson, Browne and McGinty recorded the species ranging from the Lower Miocene to Upper Pliocene in Cyprus. A range by this species from the Miocene to Quaternary in the South Appennines was noted by Dandi in 1962, and a range from the Upper Miocene to Upper Pliocene at Foggia noted by Borsetti in 1962. A Lower Miocene occurrence was noted by Colom in 1958 at Majorca, a Middle Miocene occurrence noted by Raffi and Forti in 1958 in Italy, and an Upper Miocene occurrence noted by Vella in 1963 in New Zealand. Pliocene occurrences have been noted from Japan (Asano 1950), the Riviera (Zanfra 1963), and from Levant (Smout 1955). A range by this species from the Pliocene to Pleistocene has been recorded from California (Bagg 1912), from the San Pedro Shelf (Crouch 1954), from the Red Sea coast of Egypt (Souaya 1963), from Parma (Papani and Pelosio 1962), and from a boring at Oosterhaut, Netherlands (Voorthuysen 1960). Rutten and Hotz in 1946 retrieved the species from the Neogene of the Island of Ceram, and Lys and Vatan in 1952 from the Neogene of the Rhone valley. The occurrence of this species in the Neogene of Israel was noted in 1953 by Avnimelech, and by Avnimelech and Reiss. Tertiary occurrences have been recorded from Malaga (Jones and Parker 1859), Australia (Rao 1955), South Australia and West Australia (Crespin 1954,1955), and from California (Bandy and Kélpack 1963). Pleistocene occurrences have been noted from Ischia by Broeck in 1878, and from Port Fairy, Western Victoria, by Collins in 1953.

Diagnosis: This species is common throughout all the shallow water regions of the world, salinity being the main ecological controlling factor, although low salinities can be endured if temperatures are also low. Stratigraphically the form ranges from the Oligocene to Recent.



TEXT FIG. 42 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- ELPHIDIUM CRISPUM

Elphidium crispum (Linne) var. *spinosum* var.nov.

Pl.16, figs.4a,4b.

Test free, planispiral, bi-laterally symmetrical, involute, biconvex compressed, circular in outline, maximum diameter three times the thickness, biumbonate, umbilical region filled with a found composite pustular boss, periphery acute, carinate with eight short peripheral spines. Chambers distinct, 17 visible in the last whorl, twice as high as long, gradually increasing in size as added. Sutures distinct, curved, with a raised ridge of clear shell material on the anterior border of each chamber, the ridge being highest near the umbilicus and almost flush near the periphery. Sutural pores distinct with attendant deep elongate depressions, up to 18 seen on the side of each chamber, septal bridges distinct. Apertural face sagittate, convex, smooth, perforate. Aperture a series of pores at the base of the ultimate chamber. Wall calcareous, translucent, finely perforate, often greenish in colour.

Dimensions: Diameter 0.60 mm. Thickness o.25 mm.

Occurrence: Living CB.325, CB.331, CB.334, CB.353, CB.354, CB.359, CB.365,CB.367,

Dead CB.299, CB.302, CB.304, CB.305, CB.307, CB.308, CB.309,CB.310, CB.312, CB.316, CB.317, CB.319, CB.320, CB.322, CB.325,CB.326, CB.327, CB.331, CB.332, CB.333, CB.334,CB.335, CB.336, CB.337, CB.338, CB.339, CB.341, CB.343,CB.344, CB.345, CB.348, CB.351, CB.354, CB.355, C CB.356,CB.358, CB.359, CB.360, CB.363, CB.363, CB.364,

CB.365, CB.366, CB.367, CB.368, CB.371, CB.373, CB.374, CB.376, CB.380, CB.384, CB.385, CB.386, CB.387, CB.390, CB.391, CB.392, CB.393, CB.394, CB.395, CB.397, CB.398, CB.401, CB.403, CB.405, CB.407, CB.410, CB.411, CB.413, CB.414, CB.612, CB.613, CB.619, CB.624, CB.627, CB.629, CB.632, CB.634, CB.638, CB.639, CB.642,

Dead, variation samples CB.634, CB.696, CB.714.

Morphological remarks: This spinose variety has in the past been regarded as the juvenile form of E.crispum. Examination of mature specimens of E.crispum have shown no evidence for the presence of these peripheral spines in the early test. Resorbtion of possible early spines is a feature that must not be disregarded however. Variation is exhibited in the character of the spines from short stout types to the long slendeed types. Adams and Haynes 1965 recorded this variety from the Holocene deposits of North, Cardiganshire but unfortunately did not include a description or illustration of this variety in their work. One interesting specimen was retrieved from the study area in which the variety was attached to a seaweed frond, not by protoplasm attachment, but by means of the spines transfixing the frond, and thus these spines could be a purely ecological adaptation for more firm attachment.

Diagnosis: This distinctive variety appears to inhabit a similar environment to the parent species.

Elphidium discoidale (d'Orbigny) 1839

Pl.16, figs.5a,5b.

1839	*Polystomella discoidalis*	d'ORBIGNY	Voy.dans l'Am.Merid.Vol.3, p.56,pl.6,figs.23,24.
1922	*Polystomella discoidalis*	d'Orbigny	CUSHMAN. Dept.Marine Biol. Carnegie Inst.Wash.Vol.XVII, p.56,pl.10,fig.3,4.
1930	*Elphidium discoidale*	(d'Orbigny)	CUSHMAN. U.S.NatlMus.Bull.104, pt.7,p.22,23,pl.8,figs.8-9.
1930	*Elphidium discoidale*	(d'Orbigny)	CUSHMAN and COLE. Contr.Cush. Found.Foram.Res.Vol.6,pt.4, p.97,pl.13,figs.10a,b.
1931	*Elphidium discoidale*	(d'Orbigny)	KORNFIELD. Contr.Dept.Geol. Stanford Univ.Vol.1,No.3,p.88, pl.16,figs.3a,3b.
1939	*Elphidium discoidale*	(d'Orbigny)	CUSHMAN. U.S.Geol.Survey Prof. Paper 191, p.56,pl.15,figs.5-7.
1944	*Elphidium discoidale*	(d'Orbigny)	CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.26,pl.3,figs. 38,39.
1949	*Elphidium discoidale*	(d'Orbigny)	BERMUDEZ. Contr.Cush.Found.Foram. Res.Sp.Pub.no.25,p.168,pl.11, fig.36.
1951	*Elphidium discoidale*	(d'Orbigny)	PHLEGER,and PARKER. Geol.Soc.Am. Mem.46,pt.2,p.10,pl.5,figs.10,11.
1953	*Elphidium discoidale*	(d'Orbigny)	DROOGER. Contr.Cush.Found.Foram. Res.Vol.4,pt.4,p.128,pl.20,fig.12.
1953	*Elphidium discoidale*	(d'Orbigny)	PARKER, PHLEGER, and PEIRSON. Contr.Cush.Found.Foram.Res.Sp. Pub.no.2,p.7,pl.3,figs.13,14.
1954	*Elphidium discoidale*	(d'Orbigny)	ANDEL,von, and POSTMA. Verhandl. Konin.Ned.Akad.Weten.Afd.Nat. Deel.XX,no.5,Vol.1,p.211,pl.1, fig.16.

1954	Elphidium discoidale	(d'Orbigny)	BANDY. U.S.Geol.Survey Prof. Paper 254-F,p.136,pl.30,fig.4.
1954	Elphidium discoidale	d'Orbigny)	BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tome III,no.3, p.170,171,pl.VII,fig.2.
1954	Elphidium discoidale	(d'Orbigny)	BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tome III,no.4, p.274,pl.XXIV,figs.3-5.
1954	Elphidium discoidale	(d'Orbigny)	PARKER. Bull.Mus.Comp.Zool. Vol.111,No.10,p.508,pl.6,fig.15.
1954	Elphidium discoidale	(d'Orbigny)	PHLEGER. Bull.Am.Associ.Pet. Geol.Vol.38,no.4,p.638,pl.1, fig.37.
1957	Elphidium discoidale	(d'Orbigny)	BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tomo VI,no.1, p.43,44,pl.VIII,figs.1-5.
1957	Elphidium discoidale	(d'Orbigny)	TODD. U.S.Geol.Survey Prof. Paper,294-F,p.224,pl.28,fig.14.
1957	Elphidium discoidale	(d'Orbigny)	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3, p.39,pl.6,figs.8,9.
1959	Elphidium discoidale	(d'Orbigny)	BOLTOVSKOY. Sec.de Marina Pub. H1005,Buenos Aires,p.94,95, pl.XV,fig.1.
1959	Elphidium discoidale	(d'Orbigny)	LANKFORD. Bull.Am.AssociPet. Geol.Vol.43,no.9,pl.II,fig.6.
1960	Elphidium discoidale	(d'Orbigny) P	PHLEGER. Bull.Am.AssociPet. Geol.pl.4,fig.8.
1962	Elphidium discoidale	(d'Orbigny)	CLOSS and BARBERENE. Inst.Rio Grande do Sul Inst.Cienc.Nat. No.16,p.42,Est.3,figs.13-15, Est.4,figs.10-13.
1963	Elphidium discoidale	(d'Orbigny)	AYALA-CASTANARES. Uni.Nac. Autonoma de Mexico Inst.Geol. Bol.no.67,pt.3,p.92,pl.8, figs.2a,b.

Test free, planispiral, bi-laterally symmetrical, involute, strongly compressed in apertural view, sides flat to slightly convex, sub-cércular in outline, diameter four times the thickness, periphery sub-rounded, slightly lobate, biumbilicate, biumbonate, umbilicae filled with large circular flattened bosses of clear shell material. Chambers distinct, 9 visible in the last whorl, twice as high as long, rapidly increasing in size as added. Sutures distinct, curved, impressed. Sutural pores distinct, set in deep, narrow, short depressions, 8 to 10 along each suture, limited to the posterior 1/5th. of the chambers. Septal bridges distinct. Apertural face compressed, oval to sagitatte in outline, convex, smooth. Aperture a row of pores along the basal suture of the last chamber. Wall calcareous, smooth, transparent, very finely perforate.

Dimensions: Diameter 0.35 mm. Thickness 0.10 mm.

Occurrence: Living CB.343.

Dead CB.308, CB.309, CB.312, CB.315, CB.316, CB.317, CB.322, CB.323, CB.326, CB.327, CB.328, CB.333, CB.334, CB.336, CB.337, CB.338, CB.339, CB.340, CB.343, CB.344, CB.345, CB.346, CB.347, CB.348, CB.349, CB.352, CB.358, CB.359, CB.360, CB.361, CB.362, CB.363, CB.364, CB.366, CB.368, CB.369, CB.370, CB.371, CB.373, CB.374, CB.379, CB.380, CB.381, CB.382, CB.383, CB.384, CB.385, CB.386, CB.387, CB.398, CB.401, CB.402, CB.403, CB.404, CB.411, CB.412, CB.612, CB.628, CB.629, CB.631,

CB.634, CB.638, CB.641, CB.642.

Dead, variation samples CB.634, CB.690, CB.696,

CB.700, CB.705, CB.717.

Morphological remarks: This species exhibits considerable variation in test compression, suture impression, and umbo development. Although extremely variable, no evidence has been obtained from the study area to justify placing this species under Cribroelphidium discoidale as did Lehmann (1957).

Distribution: This species has not been recorded from British waters to the present day.

The species has been recorded from the Tortugas region (Cushman 1922), from off Porto Rico (Cushman 1926), from down to 16 fathoms in the Florida area (Norton 1930), from the Atlantic (Cushman 1930), from the shallow waters of Texas and Louisiana (Kornfield 1931), from the New England coast (Cushman 1944), from the North West Gulf of Mexico (Phleger 195; Phleger and Parker 1951), from Narragansett Bay (Said 1951), and from San Antonio Bay, South West Texas (Parker, Phleger and Peirson 1953). The species was recorded in 1954 from the shallow water area of the Gulf of Mexico, by Bandy, from 1-20 fathoms in the Gulf of Paria by Andel and Postma, from the Gulf of San Jorge and San Blas Bay, Argentina by Boltovskoy, from Mississippi Sound and environs by Phleger, and from the North Eastern Gulf of Mexico by Parker. Boltovskoy in 1955 obtained this form from the shore sands at Quequen, Buenos Aires, Bandy in 1956 obtained it from the North Eastern Gulf of Mexico, and Phleger in 1956 noted it along the Central Texas coast.

In 1957 the form was noted from the estuary of the Rio de la Plata by Boltovskoy, from the nearshore and offshore zones of the Eastern Gulf of Paria by Todd and Bronnimann, from the Duras-Scofield Bayou area of South East Louisiana by Warren, and from Lower San Antonio Bay, Texas by Phleger and Lankford. Todd in 1958 noted this species in the Recent portion of a core taken from the Western Mediterranean. It was recorded in 1959 from off Argentina by Boltovskoy, and from the East Mississippi delta margin by Lankford. Phleger in 1960 obtained the species from the beach of the Northern Gulf of Mexico, and in 1961 it was noted from the continental platform between Santo Tome and the Rio de la Plata by Boltovskoy, from the Gulf of California by Bandy, and from the Gulf of Mexico by Shifflett. It has been recorded from shore sands of Southern Brazil (Closs and Barberena 1962), from the Gulf of Mexico (Kane 1962), from Laguna de Terminos, Campeche, Mexico (Ayala-Castanares 1963), from the littoral zone of Matamoros, Gulf of Mexico (Segura 1963), from the inner shelf, 0-31 metres, off the Southern Atlantic coast of the United States (Wilcoxin 1964) and from Tampa-Sarasota Bay, Florida (Walton 1964). Phleger in 1965 recorded this species from Guerrero Negro Lagoon, Baja, California.

Stratigraphic Occurrence: This species has only been recorded from the Holocene deposits of Borth, Cardiganshire (Adams and Haynes 1965).

Boltovskoy in 1959 noted the form in the Holocene deposits at Quequen, Buenos Aires.

Drooger in 1953 noted the species in the Lower and Upper Miocene of the Netherlands Antilles, and Bermudez in 1949 noted the form

Cleongart (Munthe 1897), Skye and County Antrim (MacFadyen 1937), Anglesey (Earland for McMillan 1949), and Borth, Cardiganshire (Adams and Haynes 1965).

In 1961 Funnel noted this species ranging from the Paleogene to Early Pleistocene in Norfolk and in 1965 Curry, Murray and Whittard obtained this species from the Neogene and Miocene of the Western approaches to the English Channel. Prestwich in 1871 noted it in the Pliocene of Suffolk, and MacFadyen in 1932 noted it in the Pliocene and Pleistocene of East Anglia. Crosskey and Robertson recorded Post Tertiary occurrences at Loch Gilp in 1868, Loch Fyne and Duntroon in 1869, and Campbeltown in 1873. Robertson also noted Post Tertiary occurrences from the Isle of Bute in 1876, and from Lewis in 1882. MacFadyen in 1940 noted a Pleistocene occurrence on the Wexford coast. Boulder Clay occurrences have been recorded from Cheshire (Shone 1874), and Carrickfergus (Wright 1903). Reade in 1874 noted an occurrence in the Lower Boulder Clay of Lancashire and Cheshire, and Shone in 1878 noted an Upper Boulder Clay occurrence in West Cheshire and Liverpool. An occurrence in the Drift of County Cork was recorded by Wright in 1902.

In 1898 Reade obtained this species from the Holocene at Bruges and in 1960 Voorthuysen obtained it from the Holocene of the Dollart-Ems estuary.

Elphidium excavatum (Terquem) 1875

Pl.17, figs.1a,1b.

1858 *Polystomella umbilicata* (Walker) WILLIAMSON. Rec.For.Gt.Brit. Ray.Soc.London,p.42,pl.3,figs. 81,82.

1930 *Elphidium excavatum* (Terquem) CUSHMAN. U.S.Nat.Mus.Bull.104, pt.7,p.21,pl.8,figs.4&6

1932 *Elphidium (Polystomella) excavatum* (Terquem)HERON-ALLEN and EARLAND. Disc.Repts.Vol.4,pt.1, p.439,pl.XVI,figs.22,23.

1939 *Elphidium excavatum* (Terquem) CUSHMAN. U.S.Geol.Survey Prof. Paper,191,p.58,pl.16,figs.7-12.

1944 *Elphidium excavatum* (Terquem) CUSHMAN. Contr.Cush.Found.Foram. Res.Sp.Pub.no.12,p.26,pl.3,fig.40.

1949 *Elphidium excavatum* (Terquem) CUSHMAN. Inst.Roy.des Sci.Nat. de Belgique.Mem.111,p.28,pl.6, fig.2.

1950 *Elphidium excavatum* (Terquem) VOORTHUYSEN,van. Med.Geol.Stichting, n.s.No.4,p.42,pl.3,fig.10.

1952 *Elphidium excavatum* (Terquem) PARKER. Bull.Mus.Comp.Zool.Vol.106, no.9,p.412,pl.5,fig.8.

1952 *Elphidium excavatum* (Terquem) PARKER. Bull.Mus.Comp.Zool.Vol.106, no.10,p.448,pl.5,fig.13.

1954 *Elphidium excavatum* (Terquem) BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol. Tome III,no.4,p.275, pl.XXIV,fig.10.

1955 *Elphidium excavatum* (Terquem) RONAI. Contr.Cush.Found.Foram.Res. Vol.6,pt.4,p.147,pl.21,fig.11.

1957 *Elphidium excavatum* (Terquem) TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.39, pl.6,figs.11,12.

1957 *Elphidium excavatum* (Terquem) VOORTHUYSEN,van. Med.Geol.Stichting, n.s. No.11,p.31,Taf.23,figs.8a,b.

1961	Elphidium excavatum	(Terquem)	TODD and LOW. Contr.Cush.Found. Foram.Res.Vol.12,pt.1,p.19,pl.2, fig.5.
1962	Elphidium excavatum	(Terquem)	HAAKE. Geol.Inst.Univ.Kiel.Meyniana, Band 12,p.47,48,Taf.5,fig.5.
1964	Elphidium excavatum	(Terquem)	FEYLING-HANSSEN. Nordes Geol. Undersokelse,Nr.225,p.344,pl.20, figs.7,8.
1965	Elphidium excavatum	(Terquem)	ADAMS and FRAMPTON. Contr.Cush. Found.Foram.Res.Vol.16,pt.2,p.58, pl.5,fig.7.

Test free, planispiral, bi-laterally symmetrical, involute, moderately compressed, sides flat to moderately concave with broad shallow umbilicae with additional small circular central depressions, periphery broadly rounded, very slightly lobate, sub-circular to circular in outline, maximum diameter twice the thickness. Chambers distinct, 12 visible externally, twice as high as long, increasing gradually in size as added, gently inflated. Sutures distinct, slightly curved, impressed. Sutural pores distinct. Septal bridges narrow, extending over the posterior ⅓rd to ½ of the chambers, 10-11 on each chamber side. Apertural face smooth, ovate to sub-quadrate, convex. Aperture a row of elongate slit like pores set vertically along the basal suture of the ultimate chamber. Wall calcareous, transluscent, very finely perforate.

Dimensions: Diameter 0.34 mm. Thickness 0.17 mm.

Occurrence: Living CB.629, CB.634, CB.635, CB.637, CB.638.

Living, variation samples CB.634, CB.690, CB.694, CB.696, CB.700, CB.706, CB.715, CB.717, CB.744, CB.746.

Dead, CB.316, CB.323, CB.326, CB.327, CB.334, CB.335, CB.337,

CB.343, CB.345, CB.346, CB.348, CB.351, CB.358, CB.359, CB.361, CB.380, CB.382, CB.384, CB.385, CB.387, CB.401, CB1612, CB.615, CB.627, CB.628, CB.629, CB.630, CB.631, CB.634, CB.635, CB.636, CB.637, CB.638, CB.641, CB.642.

Dead variation samples CB.176, CB.634. CB.690, CB.694, CB.696, CB.700, CB.706, CB.711, CB.714, CB.715, CB.717, CB.746.

Morphological remarks: This species often tends to be confused with <u>E.incertum</u> (Williamson) 1858, by many authors, as morphologically they are very similar. <u>E.incertum</u> differs from <u>E.excavatum</u> in having a slightly more inflated test, wider and less numerous retral processes, and by the presence of umbilical bosses. Hooper 1964 noted in <u>E.excavatum</u> that the following elements are present :- Si, Mg, Ca. Incorrect idenfification of this species has made the recorded occurrences of this form dubious.

Distribution: Under the name of <u>Polystomella</u> <u>striatopunctata</u> (Fichtel and Moll), Heron-Allen and Earland recorded occurrences from the North Sea(1913), West of Scotland (1916) and from Plymouth (1930). Le Calvez in 1958 recorded a Mer Celtique occurrence West of France.

This species has been recorded from the Atlantic (Cushman 1930), from the ice free area of the Falkland Islands region (Heron-Allen and Earland 1932), from the Falklands sector of the Antarctic (Earland 1934), from the Scotia Sea (Earland 1936), from the Rance estuary (Marie 1938), from the New England coast and from Belgium (Cushman 1944;1949).

In 1951 it was noted from the Netherlands Wadden Sea by Voorthuysen, from Narraganset Bay by Said, and from St. Nazaire by Le Calvez and Le Calvez. Parker in 1952 obtained a few specimens off Portsmouth (N.H.), and noted it in the Long Island Sound-Buzzards Bay region with a temperature range of 1-21°C, and a salinity range of 28-30‰ and in the same year Akers obtained it from the Louisiana coast. Boltovskoy recorded the form from San Blas Bay, Argentina in 1954 and from shore sands at Quequen, Buenos Aires in 1955. Ronai in 1955 noted the form in brackish water in New York Bight. In 1957 it was noted from the nearshore zone of the Eastern Gulf of Paria by Todd and Bronnimann, and from the Egyptian Mediterranean coast by Said and Kamel. The species was recorded from 875 metres in the Gulf of Gascogne (Berthois and Le Calvez 1959), from protected bays, brackish ponds, and stream entrances at Marthas Vineyard Island, Massachusetts (Todd and Low 1961), from the North Sea (Haake 1962), and from Isafjordur and Leirafjordur, Iceland (Adams and Frampton 1965).

Stratigraphic Occurrence: Recorded occurrences of this species in the British Holocene have been made from Kings Lynn, Skye and County Antrim, English Fens, and Swansea Docks (MadFadyen 1933; 1937; 1938; 1942), from Anglesey (Earland 1949), and from Borth, Cardiganshire (Adams and Haynes 1965).

The form has been noted from the Paleogene and Early Pleistocene of Norfolk (Funnell 1961), and from the Early Pleistocene of Suffolk (Funnell and West 1962).

Holocene occurrences have been recorded from the N.O.Polder, the Hague, and the Dollart-Ems estuary (Voorthuysen 1950; 1951; 1960).

Pleistocene occurrences of this species have been noted from the Oslo Fjord area (Feyling-Hanssen 1964), from the Netherlands, the Hague and the Western Netherlands (Voorthuysen 1949; 1950). Feyling-Hanssen in 1964 noted it in the Norwegian Late Quaternary1.

Diagnosis: This species appears to prefer the more protected type of habitat such as lagoons, estuaries, and protected bays in temperate latitudes where the water tends to be somewhat brackish, salinity appearing to be the main controlling factor of this form. It is restricted stratigraphically to the Pleistocene to Recent.

Elphidium macellum (Fichtel and Moll) 1798

Pl.17, figs12a,2b.

1798 Nautilus macellus FICHTEL and MOLL Test.Micro.p.66.

1884 Polystomella macella (Fichtel and Moll) BRADY. Chall.Rep.Zool. Vol.9,p.737,pl.110,figs. 8-11.

1890 Polystomella macella (Fichtel and Moll)BURROWS, SHERBORN, and BAILEY. Journ.Roy.Micro.Soc.pt.VIII, p.15,pl.XI,figs.26a,b.

1902 Polystomella macella (Fichtel and Moll)CHAPMAN.Foraminifera,Longmans p.237,pl.13,fig.D.

1906 Pòlystomella macella (Fichtel and Moll)BULLEN.Geol.Mag.Vol.111, p.357,pl.XIX,fig.18.

1909 Polystomella macella (Fichtel and Moll)HERON-ALLEN and EARLAND. Journ.Roy.Micro.Soc.p.696, pl.XXI,figs.3a,b.

1925 Polystomella macella (Fichtel and Moll)CUSHMAN. Smith.Miscell.Coll. Vol.77,no.4,p.74,pl.13,fig.3.

1927 Elphidium macella (Fichtel and Moll)CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.3,pt.1,pl.10, fig.5.

1929 Elphidium macellum (Fichtel and Moll)CUSHMAN and LEAVITT.Contr. Cush.Found.Foram.Res.Vol.5, pt.1,p.18,19,pl.4,figs.1,2.

1933 Elphidium macellus (Fichtel and Moll)GALLOWAY. A manual of foraminifera. p.269,pl.24,figs.1,2.

1939 Elphidium macellum (Fichtel ahd Moll)CUSHMAN. U.S.Geol.Survey Prof. Paper,191,p.51,pl.14,figs. 1-3,pl.15,figs.9,10.

1946 Elphidium macellum (Fichtel and Moll)CUSHMAN.Contr.Cush.Found. Foram.Res.Sp.Pub.no.17,p.7,8, pl.1,fig.15,pl.2,fig.9.

1949 Elphidium macellum (Fichtel and Moll)CUSHMAN. Inst.Roy.des Sci. Nat.de Belgique,Mem.111, p.27,pl.5,figs.7,8.

1951 Elphidium macellum (Fichtel and Moll)VOORTHUYSEN,van. Med.Geol. Stichting,n.s.No.5,p.24,25, pl.2,fig.18.

1952 Elphidium macellum (Fichtel and Moll)BERMUDEZ. Bol.de Geol.Caracas, Vol.II,no.4,p.111,pl.20,fig.11.

1954 Elphidium macellum (Fichtel and Moll)BOLTOVSKOY.Mus.Argentino de Cienc.Nat.Geol.Tome III,no.4, p.273,pl.XXIV,fig.8.

1954 Elphidium macellum (Fichtel and Moll)KLEINPELL.Bernice P.Bishop Mus.Bull.211,p.43,44,pl.2, fig.9.

1957 Elphidium macellum (Fichtel and Moll)FORAMINIFERI PADANI, Agip Mineraria,pl.XXII,fig.4.

1960 Elphidium macellum (Fichtel and Moll)BARKER.Soc.Econ.Pal. and Min. Sp.Pub.no.9,p.226,pl.110, figs.8-11.

1961 Elphidium macellum (Fichtel and Moll)BRAGA.Pub.Inst.de Zool.Fac. Ciencias do Porto 77,p.126, pl.XIII,figs.8,9.

1962 Elphidium macellum (Fichtel ahd Moll)CHIERICI,BUSI, and CITA. Rev.de Micropaleo.Vol.5, No.2,p.133,pl.1(2),fig.8.

1962 Elphidium macellum (Fichtel and Moll)CITA and CHIERICI,Est.Arch. Ocean.Limnol.Vol.XII,fasc.3, p.351,pl.IV,fig.1,pl.VI,fig.9.

1962 Elphidium macellum (Fichtel and Moll)McKENZIE.Journ.Roy.Soc. Western Australia,Vol.45,pt.4, p.127,pl.III,fig.24.

1963 Elphidium macellum (Fichtel and Moll)BOLTOVSKOY.Contr.Cush.Found. Foram.Res.Vol.14,pt.2,p.62, pl.6,fig.16.

1963 Elphidium macellum (Fichtel and Moll)SOUAYA.Journ.Pal.Vol.37, No.2,p.443,pl.55,fig.9.

1964 Elphidium macellum (Fichtel and Moll) FEYLING-HANSSEN. Nordes Geol. Undersokelse. Nr. 225, p. 347, pl. 20, fig. 16.

Test free, planispiral, bi-laterally symmetrical, involute, biconvex, compressed, circular to sub-circular in outline, the diameter being over three times the thickness, biumbonate, biumbilicate, the shallow umbilical regions slightly impressed with a small central boss present. Initially the periphery is sub acute later becoming sub rounded in the last formed chambers, slightly lobate. Chambers distinct, 10 visible in the last whorl, one and a half times as high as long, increasing gradually in size as added. Sutures distinct impressed, durved. Sutural pores distinct, set in elongate, deep, wide impressions which increase in length in the later chambers, and extend over the posterior ½ to ⅓rd of these chambers, 11 on each chamber side. Septal bridges distinct. Apertural face sagitatte, smooth, perforate, convex. Aperture a row of pores along the basal suture of the ultimate chamber. Wall calcareous, transluscent, densely and coarsely perforate.

Dimensions: Diameter 0.40 mm. Thickness 0.15 mm.

Occurrence: Living CB.612, CB.629.

Dead CB.304, CB.308, CB.309, CB.314, CB.315, CB.316, CB.317, CB.318, CB.321, CB.322, CB.323, CB.324, CB.326, CB.327, CB.328, CB.330, CB.331, CB.332, CB.334, CB.335, CB.336, CB.337, CB.338, CB.339, CB.340, CB.341, CB.344, CB.345, CB.346, CB.347, CB.348, CB.349, CB.354, CB.355, CB.358, CB.359,

CB.360, CB.361, CB.362, CB.363, CB.364, CB.366, CB.367, CB.368, CB.373, CB.364, CB.379, CB.380, CB.381, CB.382, CB.384, CB.385, CB.386, CB.388, CB.398, CB.401, CB.403, CB.412, CB.612, CB.627, CB.628, CB.629, CB.630, CB.638, CB.641, CB.642.

Dead, variation samples CB.696, CB.700, CB.714, CB.746.

Morphological remarks: The gradation of this species into the allied form E.crispum with associated variation, has been discussed earlier. Hay, Towe, and Wright examined this species in 1963 and noted that in reflected light the test is glistening and subhyaline to subopaque, in transmitted light the fine pores are only visible under high magnification, in polarised light a somewhat complicated pattern due to the presence of the canal system and the retral processes is observed, but on close inspection the test can be shown to be made of radial crystals of calcite. They stated that an electron micrograph of a part of the cameral wall away from the retral processes shows the surface to be perforated by a number of small pores about $\frac{1}{4}\mu$ in diameter, the pore index being 480 $-\frac{1}{4}$ and about 6% of the surface is represented by pore space.

Distribution: This species has been recorded from Dogs Bay (Wright 1900), Rathlin Island (Wright 1902), the Redent clay of the River Lune valley (Wright 1902), Plymouth (Worth 1904), Larne Lough, Ireland (Gough 1906), and from Lambay, County Dublin (Wright 1907), Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from the Clare Island area in 1913, from 5 fathoms off

Jura, 20 fathoms off Ardnamuchan, and from 62 fathoms in Loch Sunart in 1914, from off the South coast of Cornwall and West of Scotland in 1916, and from the Plymouth area in 1930. Heron-Allen in 1915 noted this form as being frequent at 20 fathoms off the Isle of Man, as did Bruce, Colman and Jones in 1963.

The species was recorded from Crete (Jones and Parker 1860), off South Africa and off Australia (Brady 1884), from Funafuti Atoll (Chapman 1899; 1900), from Cocos Keeling Atoll (Chapman 1902), the Antarctic (Pearcey 1914), Lord Howe Island (Heron-Allen and Earland 1923), down to 16 fathoms in the Florida area (Norton 1930), from the Antarctic area (Wiesner 1931; Heron-Allen and Earland 1932; Earland 1934; Chapman and Parr 1937), and from 37 metres and 91 metres in the Gulf of Aden (Stubbings 1939). Cushman noted the form from the Austrian shore of the Adriatic, the Isle of Delos, and the Mediterranean in 1946, and from Belgium in 1949. Parr recorded the species from off Australia, and Tasmania in 1950, and Voorthuysen noted it in the Netherlands Wadden Sea in 1951. Boltovskoy obtained the form from San Blas Bay, Argentina in 1954, and from the estuary of the Rio de la Plata in 1957. In the same year Said and Kamel noted the species from the Egyptian Mediterranean coast. In 1958 it was recorded from the Western Mediterranean by Todd, and from the Central Tyrrhenian Sea by Morin. It was recorded off the Mozambique coast (Braga 1961), from the Adriatic Sea (Chierici, Busi, and Cita 1962; Cita and Chierici 1962), from Oyster Harbour, Albany, Western Australia (McKenzie 1962), from Puerto Deseado, Patagonia, (Boltovskoy 1963; 1964). As a result of his work at Puerto Deseado Boltovskoy noted that this species lives one year, starts reproduction in September/October, ending in February/March, the greater reproductive activity is in November, and the total living population is greatest in January. Albani in 1965 obtained a few small specimens from Durban Bay, South Africa.

Stratigraphic Occurrence: The occurrence of this species in British Holocene deposits has been noted from Cleongart (Munthe 1897), Altcar, Great Crosby (Wright 1904; 1908), Skye and County Antrim, the English Fens, Swansea Docks (MacFadyen 1937; 1938; 1942), and from Borth, Cardiganshire (Adams and Haynes 1965).

Pleistocene occurrences were recorded from the Isle of Man by Reade and Wright in 1906, and from the Wexford coast by MacFadyen in 1940. Wright noted this form in the Drift deposits of County Cork in 1902, and of Herefordshire in 1923. Boulder Clay occurrences have been recorded from the Vale of Clwyd (Reade 1897), Cheshire, Carrickfergus and County Down (Wright 1899; 1903; 1904).

Reade in 1898 obtained this form from the Holocene deposits of Bruges. In 1893 Howchin noted it in the Eocene and Miocene of Australia, and in 1949 Henson, Browne, and McGinty noted it in the Oligocene of Cyprus. Miocene occurrences were recorded from Egypt and Sinai (MacFadyen 1930), the Vienna Basin (Marks 1951), the Carpathian foreland (Luczkowska 1957), Sicily (Cite 1958), Cagliari (Caria 1959), and Egypt (Nakaddy 1958; Souaya 1963). Hilly and Magne in 1953 recorded it from the Lower Miocene of Northern Algeria. In 1962 Borsetti obtained this form from the Upper Pliocene at Foggia, and Papani and Pelosio noted it ranging from the Pliocene to Pleistocene at Parma. Tertiary occurrences have been noted from Palermo (Jones and Parker 1860), Western Australia (Crespin 1955), and from California (Bandy and Kolpack 1963). Lys and Vatan in 1952 noted the species in the Neogene of the Rhone valley, and in 1954 Kleinpell obtained it from the Neogene of Lou, Fiji. Pleistocene occurrences have been recorded from East Crete (Bullen 1906), Western Victoria (Collins 1953), the Western Mediterranean (Todd 1958) and from the Red Sea coast of Egypt (Souaya 1963). In 1964 Feyling-Hanssen noted this form in the Late Quaternary of the Oslo Fjord area.

Diagnosis: This species appears to be fairly common in most shallow water regions of the world, and stratigraphically ranges from the Paleogene to Recent.

Elphidium magellanicum Heron-Allen and Earland 1932

Pl.17, figs.3a,3b.

1932 Elphidium (Polystomella) magellanicum HERON-ALLEN and EARLAND. Disc.Repts.Vol.4,pl.1, p.440,pl.16,figs.26-28.

1939 Elphidium magellanicum Heron-Allen and Earland. CUSHMAN.U.S. Geol.Survey Prof.Paper 191, p.62,pl.17,figs.11,12.

1954 Elphidium aff. magellanicum Heron-Allen and Earland.BOLTOVSKOY. Mus.Argentino de Cienc.Nat. Geol.Tome III,no.4,p.276, pl.XXV,fig.7.

1962 Elphidium magellanicum Heron-Allen and Earland. HAAKE. Geol.Inst. Univ.Kiel.Meyniana,Band 12, p.48,49,Taf.5,fig.8.

1963 Elphidium magellanicum Heron-Allen and Earland. BOLTOVSKOY.Contr. Cush.Found.Foram.Res.Vol.14, pt.2,p.62,pl.6,figs.17,18.

Test free, planispiral, bi-laterally symmetrical, involute, compressed, maximum diameter two and a half times the thickness, sides flat to gently convex, periphery rounded, slightly lobate, bi-umbilicate. Chambers distinct, 6 visible, slightly inflated, the ultimate markedly so, increasing gradually at first and then papidly in size as added. Sutures impressed, moderately distinct, masked to a marked degree by the sutural depressions being infilled with a very fine granular matter, giving the sutures a white appearance. This material also infills the umbilicae. The greatest concentration of this material is at or near the umbilicus and tapering off towards the periphery. Sutural pores indistinct, 8-9 on each chamber side. Apertural face rounded to quadrate, smooth, convex, perforate. Aperture indistinct, a series of pores along the basal suture of the last chamber, but masked by the white material. Wall thin, transluscent, densely and finely perforate, with a "frosted" appearance along the sutures.

Dimensions: Diameter 0.35 mm. Thickness 0.15 mm.

Occurrence: Dead CB.322, CB.323, CB.326, CB.327, CB.346, CB.347, CB.348, CB.352, CB.358, CB.361, CB.373, CB.374, CB.380, CB.381, CB.384, CB.385, CB.398, CB.403, CB.634, CB.638, CB.641.

Dead, variation samples CB.634, CB.690 CB.696, CB.700, CB.706, CB.717, CB.746.

Morphological remarks: This distinctive species only exhibits variation in the amount of granular white material present, and in the number of chambers present in the last whorl, these varying in number from 5 to 6.

Distribution: This species has not been recorded from the British area to the present day.

Heron-Allen and Earland in 1932 obtained the type species from the North and South sides of the Eastern entrance to the Straits of Magellan, and from the ice free area of the Falkland Islands and adjacent seas. Earland in 1934 obtained one specimen from the Falklands sector of the Antarctic, and Haake in 1962 noted it in the North Sea. Boltovskoy recorded this species from San Blas Bay, Argentina in 1954, from the estuary of the Rio de la Plata in 1957, off Argentina in 1959, and from Puerto Deseado, Patagonia, Argentina.

Stratigraphic Occurrence: This form has not been stratigraphically recorded from the British Region.

Boltovskoy in 1959 noted this species occurring in the Pleistocene and Holocene deposits at Porto Quequen, Buenos Aires.

Diagnosis: This species is a typical shallow water, cold to temperate water form, stratigraphically restricted to the Pleistocene, Holocene, and Recent.

Elphidium selseyense (Heron-Allen and Earland) 1911

Pl.17, figs.4a,4b.

1909 *Polystomella striatopunctata* (Fichtel and Moll) *var.selseyensis* HERON-ALLEN and EARLAND. Journ.Roy.Micro.Soc.p.695, pl.21,fig.2,ibid.1911,p.448.

1939 *Elphidium selseyense* (Heron-Allen and Earland) CUSHMAN. U.S.Geol. Survey Prof.Paper 191,p.59, pl.16,figs.26-28.

1957 *Elphidium selseyensis* (Heron-Allen and Earland) VOORTHUYSEN,van. Med.Geol.Stichting,n.s.No.11, p.31,Taf.23,figs.9a,b.

1962 *Elphidium selseyense* (Heron-Allen and Earland) HAAKE. Geol.Inst. Univ.Kiel.Meyniana,Band 12, p.49,50,Taf.5,figs.12-15, Taf.6,figs.1-5.

Test free, planispiral, bi-laterally symmetrical, involute, sides flat to gently convex- bi-umbilicate, the umbilical regions impressed and infilled with small bosses giving a granular appearance to this region, periphery broadly rounded, very slightly lobate. Chambers distinct, 8 visible in the last whorl, increasing gradually at first and later rapidly in size as added. Sutures distinct, curved, markedly impressed laterally, almost flush at the periphery. Sutural pores indistinct, set in faint depressions, about 6 to a chamber side. Apertural face ovate, smooth, convex. Aperture indistinct, a row of pores along the basal suture of the last chamber. Wall calcareous, smooth, transluscent, finely and densely perforate.

Dimensions: Diameter 0.35 mm. Thickness 0.15 mm.

Occurrence: Living CB.371, CB.379, CB.384, CB.401.

Livihg, variation sample CB.696.

Dead CB.304, CB.306, CB.307, CB.308, CB.309, CB.311, CB.312, CB.313, CB.314, CB.315, CB.316, CB.317, CB.320, CB.321, CB.322, CB.323, CB.324, CB.326, CB.327, CB.328, CB.330, CB.333, CB.334, CB.335, CB.337, CB.338, CB.339, CB.340, CB.343, CB.344, CB.345, CB.346. CB.347, CB.348, CB.349, CB.350, CB.351, CB.352, CB.353, CB.354, CB.358, CB.359, CB.360, CB.361, CB.362, CB.363, CB.364, CB.366, CB.367, CB.368, CB.369, CB.370, CB.371, CB.372, CB.373, CB.374, CB.375, CB.376, CB.379, CB.380, CB.381, CB.382, CB.383, CB.384, CB.385, CB.386, CB.387, CB.388, CB.389, CB.390, CB.391, CB.392, CB.396, CB.398. CB.399, CB1401, CB.402, CB.403, CB.404, CB.407, CB.408, CB.411, CB.412, CB.414, CB.415, CB.618, CB.623, CB.624, CB.628, CB.630, CB.631, CB.632, CB.636, CB.637, CB.638, CB.639, CB.642.

Dead, variation samples, CB.690, CB.694, CB.696, CB.699, CB.700, CB.706, CB.714.

Morphological remarks: This species is very similar to E.orbiculare (Brady) 1881, and is often found in association with it.

Distribution: Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909, and 1911, from the shore sands and shallow water zone of the South coast of Cornwall in 1916, and from the Plymouth area in 1930. In 1957 the Marine Biological Association obtained this species from five stations in the Plymouth area.

In 1962 Haake recorded the species from the North Sea, and in 1964 Hulme obtained it from Manukau Harbour, Auckland, New Zealand.

Stratigraphic Occurrence: Funnell and West in 1962 recorded this species from the Early Pleistocene of Suffolk.

In 1960 Voorthuysen recorded the form from the Holocene deposits of the Dollart-Ems estuary.

Diagnosis: This species appears to prefer a shallow water, temperate, environment, mainly with a fine to medium sand substrate. This form is common in the Recent and stratigraphically ranges through to the Pleistocene.

Super Family: Globigerinacea Carpenter, Parker and Jones 1862

Family: Globigerinidae Carpenter, Parker, and Jones 1862

Sub Family: Globigerininae Carpenter, Parker and Jones 1862

Genus: Globigerina d'Orbigny 1826

Globigerina cf. hexagona Natland 1938

Pl.16, figs.6a,6b,6c.

1938	Globigerina hexagona	NATLAND	Scripps.Inst.Ocean.Bull.Tech. Ser.Vol.4,no.5,p.149,pl.7, fig.1.
1953	Globigerina hexagona	Natland	PHLEGER, PARKER, and PEIRSON. Rep.Swed.Deep Sea Exped.Vol.VII, fasc.1,p.12,13,pl.1,figs.13,14.
1959	Globigerina hexagona	Natland	BRADSHAW. Contr.Cush.Found.Foram. Res.Vol.10,pt.2,p.36,pl.6,figs. 11-15.

Test free, trochospiral, biconvex, to concavo-convex, dorsally medium convex, periphery broadly rounded, extremity lobate. Dorsal evolute, early chambers indistinct, later distinct, composed of 15 chambers, arranged 4:4:5:2, in 3+ dextrally coiled whorls, longer than high, sub-globose, inflated, increasing gradually in size as added. Dorsal sutures distinct, radial, impressed, spiral suture distinct, impressed. Ventral involute, only the chambers of the last whorl visible, 5 in number, sub-triangular in outline. Ventral sutures distinct, straight to sub-radial, impressed. Umbilicus open, deep, incised. Aperture a fairly large semi-circular opening at the base of the last chamber opening into the umbilicus. Wall calcareous, opaque, densely and coarsely perforate.

Dimensions: Diameter 0.18 mm. Height 0.12 mm.

Occurrence: Dead, CB.308, CB.362.

Morphological remarks: This species is very similar to the type only differing to a very slight degree in ornamentation.

Distribution: This species has not been recorded from the British area to the present day.

This form has been recorded from Long Beach, California (Natland 1938), the North Atlantic (Phleger, Parker and Peirson 1953), from the Mid-Pacific Sea Mounts (Hamilton 1953), from the North and Equatorial Pacific Ocean (Bradshaw 1959), and from the Gulf of California (Bandy 1961).

Stratigraphic Occurrence: There have not been any recorded stratigraphical occurrences to the present day.

Diagnosis: This Recent species appears to be quite well distributed throughout the oceans of the world, except in the Antarctic and Arctic regions.

CHAPTER 9

The ORBITOIDACEA and CASSIDULINACEA

The Sub Order ROTALIINA Delage and Herouard includes both these Super Families, the first characterised by forms having basically coiled tests, with radial laminated calcite walls composed of two layers, and the second with enrolled, planispiral, or trochospiral tests, the wall being of perforate granular calcite, with a slitlike, loop shaped, or multiple aperture.

Super Family: Orbitoidacea Schwager 1876

Family: Cibicididae Cushman 1927

Sub Family: Cibicidinae Cushman 1927

Genus: *Cibicides* de Montford 1808

Cibicides fletcheri Galloway and Wissler 1927

Pl.18, figs.1a,1b.1c.

1927	*Cibicides fletcheri*	GALLOWAY and WISSLER.	Journ.Pal.Vol.1, No.1,p.64,pl.10, figs.8a-c.
195			
1952	*Cibicides fletcheri*	Galloway and Wissler	MARTIN.Contr.Cush.Found. Foram.Res.Vol.3,pt.3, p.125,126,pl.20,figs. 2a-c.
1953	*Cibicides fletcheri*	Galloway and Wissler	BANDY.Journ.Pal.Vol.27, No.2,p.176,pl.24,fig.2.
1954	*Cibicides* cf.*fletcheri*	Galloway and Wissler.	BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III,no.3, p.215,pl.XVI,figs.1,2,8.
1955	*Cibicides fletcheri*	Galloway ahd Wissler	WALTON.Journ.Pal.Vol.29, No.6,p.1005,pl.104, figs.11,12.
1960	*Cibicides fletcheri*	Galloway and Wissler	UCHIO.Contr.Cush.Found. Foram.Res.Sp.Pub.no.5, pl.10,figs.1-3.
1965	*Cibicides fletcheri*	Galloway and Wissler	ADAMS and FRAMPTON. Contr.Cush.Found.Foram. Res.Vol.16,pt.2,p.58, pl.5,fig.11.

Test attached, plano-cónvex, low trochospire, dorsal side flat to slightly concave, ventral strongly convex with a typical small umto of clear shell material, periphery angular and very slightly lobate. Dorsal evolute, à5 chambers visible, arranged 6:9 in 2 whorls, gradually increasing in size as added, ventral involute, only the chambers of the last whorl visible, 9 present. Sutures distinct, backward curved on both sides, slightly limbate dorsally. Aperture low interiomarginal, an arched opening with a distinct narrow lip on the periphery extending ¼ back along the ultimate chamber ventrally, and extending 2½ chambers back dorsally along the spiral suture. Wall calcareous, ventrally opaque, dorsally transluscent, both sides densely and coarsely perforate.

Dimensions: Diameter 0.34 mm. Height 0.16 mm.

Occurrence: Living CB.332.

Dead CB.299, CB.311, CB.316, CB.323, CB.326, CB.327, CB.337, CB.346, CB.347, CB.352, CB.335, CB.358, CB.359, CB.360, CB.361, CB.363, CB.368, CB.374, CB.379, CB.396, CB.397, CB.398, CB.404, CB.407, CB.410, CB.412, CB.627, CB.628, CB.638, CB.639.

Dead, variation sample CB.714.

Morphological remarks: This species is characterised by the ventral umbo of clear shell material.

Distribution: This species has not been recorded from British waters to the present day.

The species has been recorded from Coronado Bank, California (Butcher 1951), off California(Bandy 1953), San Pedro Shelf (Crouch 1954), from the Gulf of San Jorge, Argentina (Boltovskoy 1954), from Todos Santos Bay, California (Walton 1955), from the inner shelf of the Central American coast (Bandy and Arnal 1957), from the estuary of the Rio de la Plata (Boltovskoy 1957), and from Santa Cruz Basin, California (Resig 1958). In 1959 this form was noted from Santa Monica Bay, California by Zalesney, and by Reiter from Santa Catalina Island, California by McGlasson, and in 1960 from coarse sand at San Diego, California by Uchio . It was recorded in 1961 from the Gulf of California by Bandy, from the intertidal zone, 0-20 feet, in the Orange County Outfall area, Southern California by Watkins, and from the intertidal zone of the Oregon and California coast by Cooper. This species has been recorded from the Gulf of California (Bandy 1963), from Juan de Fuca and Georgia Straits, British Columbia (Cockbain 1963), from San Pedro and Santa Monica Basins, California (Bandy 1964), from the inshore zone of the Los Angeles County Outfall area (Bandy, Ingle and Resig 1964), from Santa Barbara Basin, California (Harman 1964), from Isafjordur,Iceland (Adams and Frampton 1965), and from Guerrero Negro Lagoon, Baja, California (Phleger 1965).

Stratigraphic Occurrence: Adams and Haynes 1965 noted this species in the Holocene deposits of Borth, Cardiganshire.

This species has been recorded from the Upper Eocene of Egypt (Ansary 1954), from the Miocene to Lower Pleistocene of the San Pedro Shelf (Crouch 1954), from the Pliocene of California (Martin 1952; Goodwin and Thomson 1954), and from the Pleistocene of California (Galloway and Wissler 1927).

Diagnosis: This species is typical of shallow water, warm temperate areas, with sandy substrates. It is a fairly common form especially in the California area. The stratigraphic range is Upper Eocene to Recent.

Cibicides lobatulus (Walker and Jacob) 1793

Pl.18, figs.2a, 2b, 2c.

1897	Nautilus lobatulus	WALKER AND JACOB in	Kanmacher, Adams essays on the microscope Ed.2, London, p.642, pl.14, fig. 36 (after Walker and Boys).
1846	Truncatulina lobatula	d'Orbigny	d'ORBIGNY. For. Foss. Vienne p.168, pl. IX, figs. 18-23.
1858	Truncatulina lobatulus	(Walker and Jacob)	WILLIAMSON. Rec. For. Gt. Brit. Ray Soc. Londonp. p.59, pl.5, figs.112-123.
1882	Truncatulina lobatula	d'Orbigny	TERQUEM. Mem. Geol. Soc. France, Ser.3, Vol.2, Mem. 3, p.94, pl. IX, figs.27a, b.
1884	Truncatulina lobatula	(Walker and Jacob)	BRADY. Chall. Rep. Zool. Vol.9, p.660, 661, pl. XCII, fig.10, pl. XCIII, figs. 1, 4, 5. pl. CXV, fig.5.
1894	Planorbulina lobatula	(Walker and Jacob)	GOES. Kongl. Svensk. Veten. Akad. Handl. N.F. Bd.25, No.9, p.88, Taf.15, fig.774.
1897	Truncatulina lobatula	(Walker and Jacob)	FLINT. U.S. Nat. Mus. Ann. Rep. p.333, pl.76, fig.4.
1898	Truncatulina lobatula	(Walker)	CHAPMAN. Journ. Roy. Micro. Soc. p.2, 3, pl.1, fig.2.
1902	Truncatulina lobatula	(Walker and Jacob)	CHAPMAN. Foraminifera, Longmans, p.219, pl.12, fig.B.g.
1906	Truncatulina lobatula	(Walker and Jacob)	BULLEN. Geol. Mag. Vol.111, p.357, pl. XIX, fig.15.
1912	Truncatulina lobatula	(Walker and Jacob)	BAGG. U.S. Geol. Survey Bull.513, p.82, pl.24, figs.9-14.

1915	*Truncatulina lobatula*	(Walker and Jacob)	CUSHMAN. U.S.Nat.Mus.Bull. 71,pt.5,p.31-33,pl.15, fig.1,text-fig.34.
1916	*Truncatulina lobatula*	(Walker and Jacob)	HERON-ALLEN and EARLAND. Journ.Roy.Micro.Soc.p.51, pl.IX,fig.1.
1921	*Truncatulina lobatula*	(Walker and Jacob)	CUSHMAN.U.S.Nat.Mus.Bull. 100,Vol.4,p.313,pl.63, figs12a-c.
1927	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.3,pt.1,p.93, pl.20,fig.4.
1927	*Cibicides lobatulus*	(d'Orbigny)	GALLOWAY and WISSLER. Journ.Pal.Vol.1,No.1, p.64,pl.11,fig.1.
1928	*Truncatulina lobatula*	(Walker and Jacob)	FRANKE. Her.Preub.Geol. Land.p.176,Taf.XVI,fig.1.
1932	*Cibicides lobatula*	(Walker and Jacob)	MacFADYEN. Geol.Mag.Vol. 69,pl.XXXIV,figs.10a-c.
1933	*Cibicides lobatulus*	(Walker and Jacob)	GALLOWAY. A manual of Foraminifera, p.291,pl.26, fig.10.
1934	*Cibicides lobatulus*	(Walker and Jacob)	CHAPMAN,PARR, and COLLINS. Journ.Linn.Soc.Zool.London, Vol.38,p.570,571,pl.11, fig.41.
1934	*Cibicides lobatulus*	(Walker and Jacob)	EARLAND. Disc.Repts.Vol.X, p.183,pl.VIII,figs.42-45.
1935	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN.U.S.Geol.Survey Prof.Paper,181,p.52, pl.22,figs.4-6.
1939	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN. Contr.Cush. Found.Foram.Res.Vol.15, pt.3,p.76,pl.12,fig.25.
1942	*Cibicides* cf. *lobatulus*	(Walker and Jacob)	CUSHMAN and McGLAMERY. U.S.Geol.Survey Prof.Paper, 197B,p.75,pl.7,figs.11-13.

1943	*Cibicides lobatulus*	(Walker and Jacob)	BECK. Journ.Pal.Vol.17, No.6,p.611,pl.109,figs. 17,18,21.
1944	*Cibicides lobatulus*	(d'Orbigny)	BANDY. Journ.Pal.Vol.18, No.4,p.374,pl.62,figs.la-c.
1944	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.12, p.36,pl.4,figs.27,28.
1945	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.13, p.27,pl.3,fig.16,pl.6, figs.13-15.
1945	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN. Proc.Am.Phil.Soc. Vol.89,no.1,p.288,fig.21.
1945	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN and TODD.Contr.Cush. Found.Foram.Res.Vol.21, pt.4,p.105,pl.16,figs.23,24.
1946	*Cibicides lobatulus*	(Walker and Jacob)	BELLEN,van. Med.Geol. Stichting.Ser.C.V.No.4,p.82, pl.13,figs.4-6.
1946	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN.Contr.Cush.Found. Foram.Res.Sp.Pub.no.17, p.9,pl.2,figs,6,7,p.15, pl.3,fig.15.
1946	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN and GRAY. Contr. Cush.Found.Foram.Res.Sp. Pub.no.19,p.45,pl.8,fig.141
1947	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN and TODD.Contr. Cush.Found.Foram.Res.Sp. Pub.no.21,p.23,pl.4,fig.6.
1947	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN and TODD. Contr. Cush.Found.Foram.Res.Vol. 23,pt.3,p.71,pl.16,fig.33.
1948	*Cibicides lobatulus*	(Walker and Jacob)	CUSHMAN.Contr.Cush.Found. Foram.Res.Sp.Pub.no.23, p.78,79,pl.8,fig.14.

1949 <u>Cibicides</u> cf. <u>lobatulus</u> (Walker and Jacob) ASANO.Journ.Pal.Vol.23, No15, p.476, Fig.2-7a,b.

1949 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) BANDY.Bull.Am.Pal.Vo.32, No.131, p.105, pl.19, figs. 3a-c.

1949 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) BERMUDEZ.Contr.Cush. Found.Foram.Res.Sp.Pub.no. 25, p.301, pl.25, figs.46-48.

1949 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) CUSHMAN.Inst.Roy.des Sci. Nat.de Belgique, Mem.III, p.51, pl.X, fig.6.

1949 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) SAID.Contr.Cush.Found. Foram.Res.sp.Pub.no.26, p.42, pl.4, fig.21.

1950 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) BANDY. Journ.Pal.Vol.24, No.3, p.279, pl.42, figs.9a-c.

1950 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) LLARENA, de. Bol.Inst.Espanol Ocean.No.29, Lam.VIII, fig.16.

1950 <u>Cibicides</u> <u>lobatula</u> (Walker and Jacob) VOORTHUYSEN, van. Med.Geol. Stichting, n.s.No.4, p.39, 40, pl.2, fig.4.

1950 <u>Cibicides</u> <u>lobatula</u> (Walker and Jacob) VOORTHUYSEN, van.Med.Geol. Stichting, n.s.No.4, p.65, pl.3, fig.13.

1951 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) CUSHMAN and STAINFORTH. Journ.Pal.Vol.25, No.2, p.163, pl.28, fig.26.

1951 <u>Cibicides</u> <u>lobatula</u> (Walker and Jacob) VOORTHUYSEN, van. Med.Geol. Stichting, n.s.No.5, p.24, 25, pl.2, fig.11.

1952 <u>Cibicides</u> <u>lobatula</u> (Walker and Jacob) COLOM.Bol.Inst.Espanol Ocean.No.51, p.39, Lam.III, figs.23-25.

1952 <u>Cibicides</u> <u>lobatulus</u> (Walker and Jacob) PARKER.Bull.Mus.Comp.Zool. Vol.106, no.10, p.446, pl.5, fig.11.

1952	*Cibicides lobatulus*	(Walker and Jacob)	PHLEGER.Contr.Cush.Found. Foram.Res.Vol.3,pt.2, p.83,pl.14,fig.29.
1953	*Cibicides lobatulus*	(Walker and Jacob)	BANDY.Journ.Pal.Vol.29, No.2,p.176,pl.24,fig.3.
1953	*Cibicides lobatulus*	(Walker and Jacob)	PARKER,PHLEGER, and PEIRSON. Rep.Swed.Deep Sea Exped. VolVII,fasc.1,p.49,pl.11, figs.9,14.
1954	*Cibicides lobatulus*	(Walker and Jacob)	BOWEN.Proc.Geol.Assoc. Vol.65,pt.2,p.134,fig.A4-6.
1954	*Cibicides lobatulus*	(Walker and Jacob)	KLEINPELL.Bernice P.Bishop Mus.Bull.211,p.75,pl.10, fig.7.
1955	*Cibicides lobatulus*	(Walker and Jacob)	KAASSCHIETER,in Drooger, Kaasschieter and Key. Verhandle.Konin.Ned.Akad. Weten.Nat.Deel XXI,No.2, p.94,pl.11,figs.5a-c.
1955	*Cibicides lobatulus*	(Walker and Jacob)	KRUIT.Kon.Ned.Geol.Minjb. Gen.Veerh.Deel 15,p.474, pl.3,figs.2a-c.
1956	*Cibicides lobatulus*	(Walker and Jacob)	BHATIA. Contr.Cush.Found. Foram.Res.Vol.7,pt.1,p124, pl.5,fig.7.
1956	*Cibicides lobatulus*	(Walker and Jacob)	HAQUE.Geol.Survey Pakistan Vol.1,p.208,209,pl.16,fig.7.
1956	*Cibicides* cf. *lobatulus*	(Cushman)nd	McLEAN,Jr.Bull.Am.Pal.Vol. 36,No.160,p.366,pl.48, figs.12-13.
1957	*Cibicides lobatulus*	(Walker and Jacob)	BHATIA and MANDWAL.Journ. Pal.Soc.India,Vol.2,p.171, text-fig.C,4a-c.
1957	*Cibicides lobatulus*	(Walker and Jacob)	FORAMINIFERI PADANI. Agip Mineraria,pl.51,fig.6.
1957	*Cibicides lobatulus*	(Walker and Jacob)	TODD.U.S.Geol.Survey.Prof. Paper 280-H,pl.71,figs. 10-12,pl.84,fig.9.

1957 Cibicides lobatulus (Walker and Jacob) TODD.U.S.Geol.Survey Prof. Paper,294-F,p.224,pl.29, fig.17.

1957 Cibicides lobatulus (Walker and Jacob) TODD and BRONNIMANN.Contr. Cush.Found.Foram.Res.Sp. Pub.no.3,p.41,pl.12,fig.11.

1957 Cibicides lobatula (Walker and Jacob) VOORTHUYSEN,van. Med.Geol. Stichting,n.s.No.11,p.35, Taf.24,figs.24a,b.c.

1958 Cibicides lobatulus (Walker and Jacob) DETLING.Contr.Cush.Found. Foram.Res.Vol.9,pt.2,p.31, pl.8,fig.16.

1959 Cibicides lobatulus (Walker and Jacob) BHATIA and MOHAN.Journl Pal.Vol.33,No.4,p.658, Text-fig.6,figs.4a-c.

1959 Cibicides lobatulus (Walker and Jacob) BOLTOVSKOY.Sec.de Marina Pub.H1005,Buenos Aires, p.103,pl.XVII,fig.1.

1959 Cibicides cf. C.lobatulus(Walker and Jacob) GARRISON.Journ.Pal. Vol.33,No.4,p.667,pl.86, figs.6a-c.

1960 Cibicides lobatulus (Walker and Jacob) BARKER. Soc.Econ.Pal.and Min.Sp.Pub.no.9,p.190, pl.92,fig.10,p.192,pl.93, figs.1,4,5.

1960 Cibicides lobatulus (Walker and Jacob) ECHOLS and SCHAEFFER. Micropaleontology.Vol.6, No.4,pl.2,fig.16.

1960 Cibicides cf. lobatulus (Walker and Jacob) HERRICK.Bull.Am.Pal. Vol.41,No.187,p.125, pl.14,fig.9,pl.16,fig.19.

1960 Cibicides lobatulus (Walker and Jacob) HOFKER.Palaontologische Zeitschriff,Stuttgart W. Band 34,Nr.3/4,p.256,pl.E, figs.139,140,142.

1960 Cibicides lobatulus (Walker and Jacob) ROMPF.van. Freib.Forsch. C89,Palaont.Akad.Verlang. Berlin,p.50,Taf.XX,figs. 1a-c,2a-c.

1961	Cibicides lobatula	(Walker and Jacob)	BRAGA. Pub.Inst.de Zool. Fac.Ciencias do Porto 77, p.184,185,pl.XX,figs.4,5.
1961	Cibicides lobatulus	(Walker and Jacob)	KAASSCHIETER. Inst.Roy.des Sci.Nat.de Belgique,Mem. 147,p.221,pl.XIV,fig.5.
1961	Cibicides lobatulus	(Walker and Jacob)	NYHOLM. Zool.Bidrag.Fran. Uppsala,Band.333,pl.I, figs.1-4.
1961	Cibicides lobatulus	(Walker and Jacob)	TODD and LOW. Contr. Cush.Found.Foram.Res. Vol.12,pt.1,p.21,pl.2, fig.20.
1962	Cibicides lobatulus	(Walker and Jacob)	CITA and CHIERICI.Est.Arch. Ocean.Limnol.Vol.XII, fasc.3,p.349,pl.II,fig.3.
1962	Cibicides lobatulus	(Walker and Jacob)	DUPEUBLE.Rev.de Micropal. Vol.4,No.4,p.197,pl.1, fig.1,pl.2,figs.5-10.
1962	Cibicides lobatulus	(Walker and Jacob)	HAAKE.Geol.Inst.Univ.Kiel. Meyniana,Band.12,p.44, Taf.4,figs.7-9.
1962	Cibicides lobatulus	(Walker and Jacob)	McKENZIE.Journ.Roy.Soc. Western Australia,Vol.45, pt.4,p.129,pl.III,fig.29.
1963	Cibicides lobatulus	(Walker and Jacob)	KUMMERLE.Abhand.Hess. Landes,Boden.Heft.45,p.55, Taf.9,figs.4a-c.
1963	Cibicides lobatulus	(d'Orbigny)	SOUAYA. Journ.Pal.Vol.37, No.2,p.452,pl.57,fig.10.
1964	Cibicides lobatulus	(Walker and Jacob)	COOPER.Contr.Cush.Found. Foram.Res.Vol.15,pt.3, p.102,pl.6,figs.19,20.
1964	Cibicides lobatulus	(Walker and Jacob)	FEYLING-HANSSEN.Norges Geol.Undersokelse,Nr.225, p.339,pl.19,figs.1-3.

1964 Cibicides lobatulus (Walker and Jacob) LEROY. U.S.Geol.Survey Prof.Paper,454-F,p.F45, pl.8,figs.10-12.

1965 Cibicides lobatulus (Walker and Jacob) ADAMS and FRAMPTON.Contr. Cush.Found.Foram.Res.Vol. 16,pt.2,p.53,pl.5,fig.10.

Test attached, plano to convavo-convex, low trochospire, dorsal side flat to slightly concave, ventral side strongly convex, sub-circular in outline, lobate, periphery acute. Dorsal evolute, 12 chambers visible arranged 5:7 in two whorls, increasing gradually in size as added, ventral involute, only the chambers of the last whorl visible, 7 in number. Sutures distinct, dorsal flush, limbate, curved, ventral flush at first, later markedly impressed. Aperture interiomarginal, a slit with a small lip developed around it, at the peripheral edge of the basal suture of the last formed chamber extending onto the dorsal side along the spiral suture for one and a half chambers. Wall calcareous, ventrally opaque, dorsally transluscent, both sides perforated with medium size pores.

Dimensions: Diameter 0.56 mm. Height 0.23 mm.

Occurrence: Dead, CB.308, CB.311, CB.315, CB.316, CB.318, CB.323, CB.327, CB.328, CB.330, CB.331, CB.334, CB.337, CB.339, CB.340, CB.346, CB.347, CB.352, CB.358, CB.359, CB.360, CB.362, CB.363, CB.364, CB.368, CB.370, CB.371, CB.373, CB.374, CB.380, CB.385, CB.386, CB.391, CB.398, CB.401, CB.402, CB.403, CB.404, CB.412, CB.414, CB.623, CB.627, CB.628,

CB.629, CB.631, CB.638, CB.639, CB.640, CB.642.

Dead, variation samples CB.690, CB.700, CB.706, CB.714, CB.715.

Morphological remarks: The high degree of variation exhibited by this species in its shape is attributed to the method and substance of attachment, as specimens conform to the substrate configuration.

Due to the extreme moephological variation, distinction between this species, C.refulgens, C.aknerianus, C.variablis, Dyocibicides biserialis and D.primitiva is extremely difficult, and any differentiation between these forms below the species level is virtually impossible. Hulme 1964 stated that the above are simply variants of a single species for which the name C.lobatulus should be used. In 1956 McLean made a very interesting note concerning this problem, stating, "Unfortunately, so many different forms have been ascribed to Walker and Jacobs' species that assigning the name "lobatulus" to a Cibicides is tantamount to giving the form a status more truthfully described by the term "incertae sedis". The species should probably be suspended as being of no taxonomic value - it was badly figured and inadequately described in the first place". The classic work on this species was carried out by Nyholm in 1964 who examined the life cycle of C.lobatulus and collected and cultured specimens for four years. He noted that three main testttypes were formed, (i) a monothalmous test resembling Crithionina or Webbina; (ii) a chambered test resembling Cibicides, Dyocibicides, Annulocibididea, or Rectocibicides according to the conditions of growth; and (iii) a planorbulinoid test. The above author believes that many of the species and subspecies of Cibicides are only ecological modifications; genera such as Rectocibicides, Cyclocibicides, and Dyocibicides are of no taxonomic value; the genus Cibicidella must be strongly doubted taxonomically, the genus Acervulina is of no taxonomic value, and possibly forms belonging to the Planorbulinidae are invalid.

In this work only definite forms have been assigned to different species, any intergradational forms being assigned to C. lobatulus

Distribution: (Text-fig.43A). This species has been recorded from Belfast Bay (Williamson 1958), the Shetland Seas (Waller 1868), Montrose Basin, Budle Bay, the Rivers Aln, Wansbeck, Blyth, Tyne and Tees, the Firth of Forth, Hartlepool Slake, Oulton Broad, and Yarmouth (Brady 1870), South East of Eddystone (Robertson 1870), the Firth of Clyde (Robertson 1875), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), the River Dee (Sidall 1876), and 50 miles South West of Ushant (Jones and Parker 1876). It was noted in 1883 from the Atlantic Docks, Liverpool by Robertson, in 1889 from off the South West coast of Ireland by Wright, in 1890 from the Faeroe Channel by Pearcey, and in 1891 from the River Mersey by Burgess, and from Caernarvon Bay and Liverpool Bay by Pearcey. This form was recorded from Portree Bay, Isle of Skye (Robertson 1892), Dogs Bay (Wright 1895;1900), the Irish Sea (British Association 1896), the Salcombe estuary (Worth 1900), Recent clay in the River Lune valley (Wright 1902), Rathlin Island (Wright 1902), the Exe estuary (Worth 1902), the Firth of Forth (Pearcey 1903), Plymouth (Worth 1904), Larne Lough, Red Bay, Gobbins, and Belfast Lough

(Gough 1906), and from Lambay, County Dublin (Wright 1807). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1919 and 1911, from Clare Island and the North Sea in 1913, from 5 fathoms off Jura, 20 fathoms off Ardnamuchan, 12 fathoms in Loch Sunart, and 20 fathoms in the Sound of Mull ih 1914, from West of Scotland and from the South coast of Cornwall in 1916. In 1915 Heron-Allen obtained this form from 20 fathoms off the Isle of Man. It was recorded from the Plymouth area (Heron-Allen and Earland 1930; Myers 1943; Marine Biological Assocation 1957). In 1958 Le Calvez noted this species South of Ireland, West of France, and in the Western English Channel, and in 1963 Bruce, Colman and Jones obtained it off the Isle of Man.

This species has been recorded from Crete, Syra, Serpho and Rimini (Jones and Parker 1860), from the Gulf and River St. Lawrence (Dawson 1870), the Arctic (Brady 1878), every latitude from the Northern Arctic Ocean to Antarctic ice barrier (Brady 1884), Scandinavia and the Arctic (Goes 1894), off Brazil (Flint 1897), Funafuti Atoll (Chapman 1899), the Malay Archipelago (Millett 1904), the Antarctic (Pearcey 1914), Guam and off Japan (Cushman 1915), and from the Philippine Islands region (Cushman 1921). This form was noted in 1923 from Lord Howe Island by Heron-Allen and Earland, in 1927 off San Francisco Bay by Hanna and Church, in 1930 in the Florida area by Norton, and in 1931 from the South Pole area by Wiesner. It has been recorded from the Southern California region (Natland 1933), the Antarctic area

(Heron-Allen and Earland 1932; Earland 1934; Chapman and Parr 1937), the Weddell Sea (Earland 1936), the Rance estuary (Marie 1938), off Japan (Asano 1938), and from 91, 183, 201, 310, 695 metres in the Gulf of Aden, 609 metres in the Gulf of Oman, 101, 207, 329, 353 metres in the Zanzibar area, and 238, 914, 1,317 metres in the Maldive area (Stubbings 1939). Cushman noted this form off the New England coast in 1944, and from Nery Fjord in the Antarctic in 1945, and also in 1945 Norvang obtained it from Iceland. In 1946 it was noted off the Island of Ceram by Rutten and Hotz, and in the following year noted off the Washington coast, and off Amchitka Island, Alaska by Cushman and Todd. This form was recorded from Hudson Bay and North East Greenland (Cushman 1948), from the continental shelf from the Gulf of Maine to Maryland (Parker 1948), from Belgium (Cushman 1949), from 90-400 metres in the Red Sea (Said 1949), from Tasmania (Parr 1950), from off the West African coast (Colom 1950; Llarena 1950), from the Netherlands Wadden Sea (Voorthuysen 1951), and from Narraganset Bay (Said 1951). In 1952 the form was noted from the Canadian and Arctic Greenland (Phleger), Long Island Sound - Buzzards Bay area (Parker), Portsmouth (N.H.) area (Parker; Phleger), Hachijo Island, Tokyo, (Uchio), and from the coast of Galicia (Colom). Bandy in 1953 obtained this form off California, Crouch in 1954 from San Pedro Shelf and vicinity, Kruit in 1955 from the Rhone delta, Harrington in 1955 from the Bay of Fundy, and Bhatia in 1956 from the shore sands of Western India. In 1957 Bandy and Arnal obtained this form from the outer shelf fauna off the Central American coast.

Todd obtained it from the Mariana Islands, Todd and Bronnimann noted it in the Eastern Gulf of Paria, and Said and Kamel obtained it from the Egyptian Mediterranean coast. In 1958 this species was recorded from the Orinoco-Trinidad-Paria Shelf by Drooger and Kaasschieter, from Santa Cruz Basin, California by Resig, from the Western Mediterranean by Todd, from the Central Tyrrhenian Sea by Norim, from the Eastern Mediterranean by Parker, from the Marseille coast by Blanc-Vernet, and from Sunset Bay, Oregon by Detling. It was recorded in 1959 by Boltovskoy from off Southern Brazil, and off Argentina, by Zalesny from Santa Monica Bay, California, by McGlasson around Santa Catalina Island, California, and by Polski from the inner shelf (49-150 feet) of the Yellow Sea and South Korean Sea, central shelf (150-285 feet) of the Yellow Sea, South Korean Sea, and Taiwan Strait, and outer shelf (285-400 feet) of the East China Sea, and off the North Asiatic coast. It was recorded in 1960 from the Gulf of Naples by Hofker, off the South China coast by Waller, and from the Arctic Basin by Green. In 1961 it was noted from the continental platform between Santo Tome and the Rio de la Plata, Argentina by Boltovskoy, from off the Mozambique coast by Braga, from the Red Sea and Mediterranean coast of Israel by Reiss, Klug, and Merling, from the Marthas Vineyard area by Todd and Low, from the Gulf of California by Bandy, from the Orange County Outfall area, California by Watkins, and from the intertidal zone of the California and Oregon coast by Cooper. This form was recorded in

1962, by Chierici, Dusi, and Cita and by Cita and Chierici from the Adriatic Sea, by Haake from the North Sea, by Wagner from the Arctic Polar Continental Shelf, by Dupeuble from Finistere, and by McKenzie from Oyster Harbour, Albany, Western Australia. In 1963 it was recorded from the Bering Sea by Anderson, from off the Ivory coast by Le Calvex, from Hudson Bay, Canada, by Leslie, from Juan de Fuca and Georgia Straits, British Columbia by Cockbain, and again from Finistere by Dupeuble. In 1964 it was noted from off South Eastern Nova Scotia by Bartlett, from the North Bering Sea by Cooper, from Manukau Harbour, Auckland, New Zealand by Hulme, and from Scandinavia by Nyholm. Albani in 1965 recorded this species from Durban Bay, South Africa, and in the same year Adams and Frampton recorded it as being the most dominant form in Isafjordur, Lonseyri, and Leirafjordur, Iceland.

Stratigraphic Occurrence: (Text-fig.43B). Occurrences in the British Holocene have been recorded from Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar and Great Crosby (Wright 1904;1908), English Fens (MacFadyen 1933; 1938), County Antrim and Skye, Swansea Docks (MacFadyen 1937;1942), Anglesey (Ovey for McMillan 1949), and Borth, Cardiganshire (Adams and Haynes 1965).

Jones and Parker in 1872 obtained this form from the Gault of Kent, and Chapman in 1896 obtained it from the Gault of Folkestone. Cretaceous occurrences were recorded from Gravesend (Jones and Parker 1872), County Derry (Wright 1886),Taplow (Chapman 1892), and Southern England (Jones 1900). In a well at Suffolk, Bullen in 1901 obtained derived Cretaceous forms, and Heron-Allen and Earland in 1910 obtained

Cretaceous derived forms from Selsey Bill, Sussex. Eocene occurrences have been recorded from London (Sherborn and Burrows 1891), the Isle of Wight (Bowen 1954), and Hampshire (Bowen 1957). Funnel in 1961 noted this species ranging from the Paleogene to Early Pleistocene in Suffolk and in 1965 Curry, Murray, and Whittard noted this form in the Paleogene and Neogene of the Western approaches to the English Channel. In 1932 MacFadyen obtained the form from the Pliocene and Pleistocene of East Anglia, and in 1951 Carter noted it in the Pliocene of Suffolk. Crosskey and Robertson recorded Post-Tertiary occurrences at Dalmuir in 1867, Loch Gilp, Isle of Cumbrae in 1868, Loch Fyne, Crinan, Duntroon, Renfew, Paisley in 1869, Greenock in 1871, Campbeltown and Bute in 1873 and Robertson noted similar occurrences at Garnock, Kilwinning, Paisley in 1877, Lewis in 1882 and Greenock in 1885. This species was noted in the Pleistocene of the Wexford coast by MacFadyen in 1940, and in the Early Pleistocene of Suffolk by Funnell and West in 1962. Boulder Clay occurrences have been recorded from Caithness (Brady 1867), Cheshire (Shone 1874), Bridlington Quay (Crosskey 1884), the vale of Clwyd (Reade 1897), Great Crosby, Cheshire, Carrickfergus, County Down and Lancashire(Wright 1898; 1899; 1903; 1904; 1905). Reade in 1874 noted it in the Lower Boulder Clay of Lancashire and Cheshire. Shone in 1878 obtained this form form the Upper Boulder Clay of West Cheshire and Liverpool, Wright noting it from similar deposits in 1903 from Dumfrieshire and from County Down. Occurrences in Drift deposits have been noted from County Cork and from Herefordshire (Wright 1902; 1923).

Holocene occurrences have been recorded from Bruges (Reade 1898), the Dollart-Ems estuary (Vóorthuysen 1960), South West Barents Island, and from Spitzbergen (Feyling-Hanssen 1961; 1965).

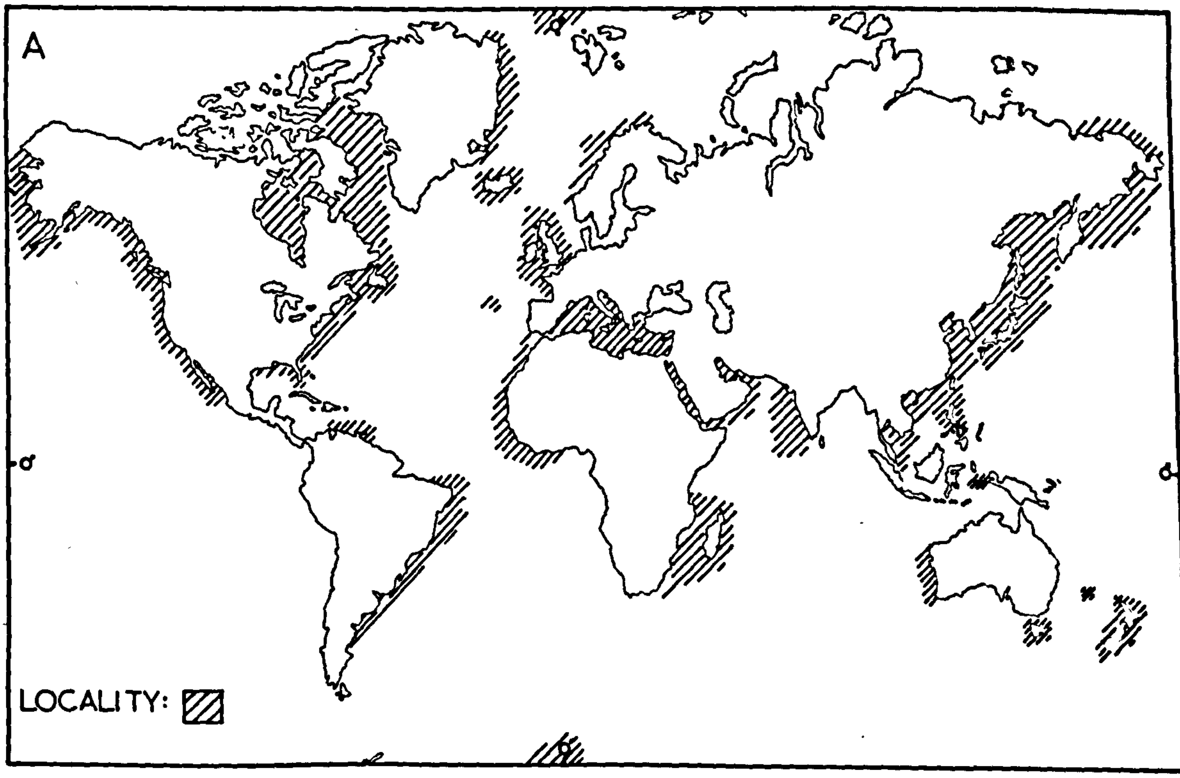
Jones and Parker in 1872 noted this form in the Jurassic of Germany, and in the Cretaceous of Bohemia, Austria, Gossau, France and Westphalia. In 1892 Jukes, Browne and Harrison obtained the form from the Cretaceous of Barbados. Howchin in 1893 noted the form occurring in the Cretaceous, Eocene, Miocene, and Post Tertiary deposits of Australia. In 1936 Cushman obtained the species from the Cretaceous and Late Tertiary deposits of the Georges Banks Canyons. Upper Cretaceous occurrences were noted from North and Middle Germany (Franke 1928), and from Western Australia (Crespin 1938). Haque in 1956 obtained the species from the Paleocene and Eocene of the Nammal Gorge, Pakistan. Eocene occurrences have been recorded from the Paris area (Terquem 1882), Belgium (Kaasschieter 1961), in a core off the East coast of North America (Cushman 1939), Georgia (Cushman and Herrick 1945; Herrick 1960), Washington (Beck 1943), Alabama (Garrett 1936; Bandy 1949), Oregon (Bandy 1944), Mississippi (Mornhinveg 1941), and from coastal Ecuador (Cushman and Stainforth 1951). This form was recorded from the Middle Eocene of Cyrenaica in 1911 by Chapman and by Gregory et.al. Halkyard also obtained this form from the Middle Eocene at Biarritz in 1917 and 1919. Rutten and Hotz in 1946 noted the species ranging from the Eocene to Recent in the Island of Ceran. Nuttall in 1928 obtained the form from the Upper Eocene and Miocene of Trinidad, and Ansary in 1954 recorded it from the Upper Eocene of Egypt. Occurrences in the Lower

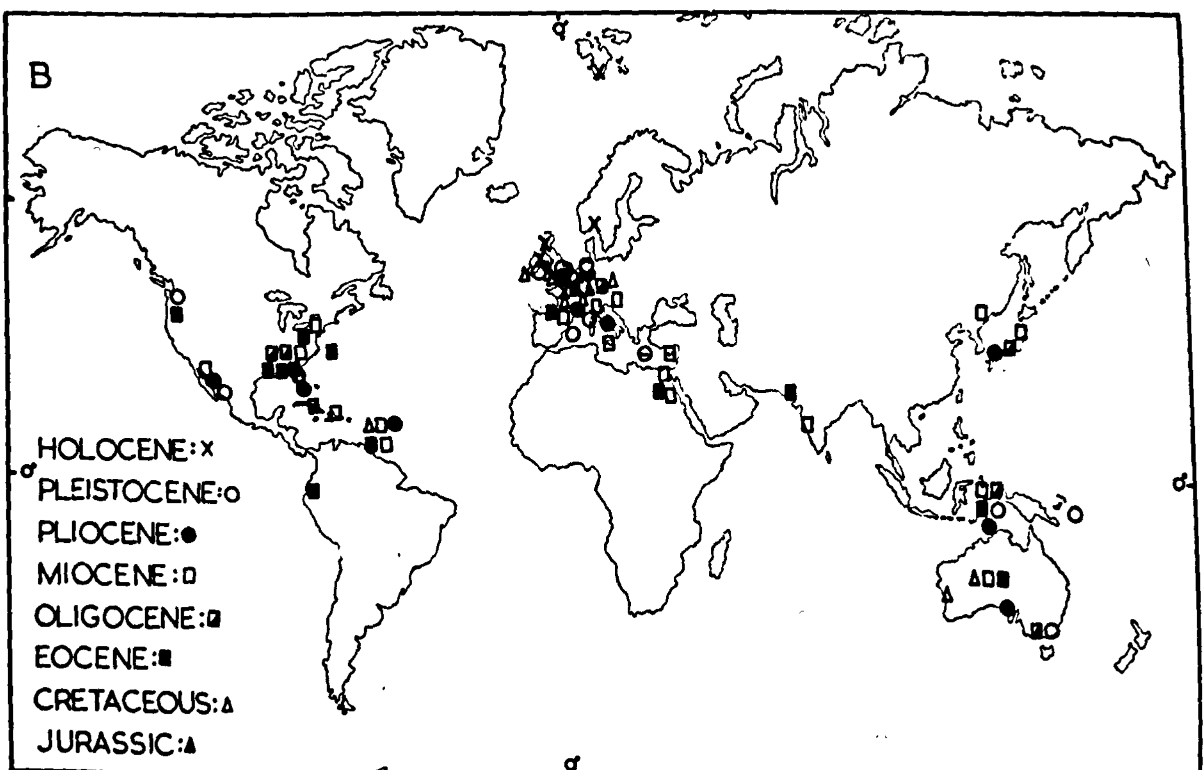
Oligocene have been noted from Mississippi (Cushman and Todd 1948), and from Cuba (Bellen, Puyt, Rutgers and Solst 1941), in the Middle Oligocene from the North East Rhineland (Langer 1962), from Mississippi (Hoppin 1953), and from Texas (Cushman and Ellisor 1945), and in the Upper Oligocene of Germany (Kummerle 1963). Oligocene occurrences have been recorded from Alabama (Cushman and McGlamery 1942; Echols and Schaeffer 1960; Howe 1942), from Mississippi (Cushman and Todd 1946; Howe 1928), from Japan (Asano 1949;1950), from Texas (Garrett 1938), and in a Hungarian core (Majzon 1940). Oligo-Miocene occurrences were noted from the Maltese Islands by Cooke in 1893, and from Victoria, Australia by Reed in 1965. In 1946 Schijfsma noted this species in the Paleogene of South Limberg, and in 1961 it was recorded from the Paleogene of North Kyushu, Japan, by Murata. Lower Miocene occurrences have been noted by Colom in 1958 from Majorca and by Henson, Browne and McGinty in 1949 from Cyprus. Upper Miocene occurrences were noted by Garrison in 1959 from California, by Bermudez in 1949 from the Dominician Republic, and by Huang in 1963 from the Peikang shelf area of Taiwan, China. Drooger in 1953 noted this species in the Lower and Upper Miocene of the Netherlands Antilles. Miocene occurrences have been recorded from Western India (Bhatia and Mandwal 1957; Bhatia and Mohan 1959), Egypt and Sinai (MacFadyen 1930), the Carpathian foreland (Luczkowska 1957), South West France (Kaasschieter 1955), the Vienna Basin (Marks 1951), Northern Italy (Drooger and Socin 1959), Virginia (McLean 1956; Malkin 1953; Sabol 1960), New Jersey, Maryland (Malkin 1953), Egypt (Nakaddy 1958; Souaya 1963), Japan (Asano 1949), Cagliari

(Caria 1959), Sicily (Cita 1959), and the Southern Appenines (Dandi 1962). Chapman in 1898 noted the form ih the Miocene and Pliocene of Barbados-and LeRoy in 1964 noted it in the Miocene and Pliocene of Southern Okinawa. Howchin and Parr in 1938 recorded this form in the Upper Pliocene of Adelaide, and Zanfra in 1961 noted it in the Riviera Upper Pliocene. Pliocene occurrences have been recorded from Italy (Cushman 1945;1946), Timms Point, California (Cushman and Gray 1946), France (Sourdillon 1960), and from a borehole at Oosterhaut, Netherlands (Voorthuysen 1953). A range by this species from the Pliocene to Pleistocene has been noted from Southern California (Bagg 1912), Florida (Cole 1931), West Netherlands, (Voorthuysen 1950), San Pedro shelf (Crouch 1954), Parma (Papani and Pelosio 1962), Japan (Uchio 1952), and from a borehold at the Hague (Voorthuysen 1950). Lys and Vatan in 1952 obtained this form from the Neogene of the Rhone valley, and in 1954 Kleinpell recorded it from the Neogene of Fiji. Tertiary occurrences have been recorded from Malaga, Turin, Palermo, Malta (Jones and Parker 1860), Australia (Chapman, Parr, and Collins 1934; Crespin 1955; Rao 1955), South Caroline (Cook and MacNeil 1952), the Philippines (Crespin 1956), South Eastern United States (Cushman 1935), North East Alaska (Todd 1957), the Rhine area and from West Emsland, Germany (Ellermann 1960; 1963). Pleistocene occurrences have been recorded from East Crete (Bullen 1906), Ischia (Broeck 1878), California (Galloway and Wissler 1927), Netherlands (Voorthuysen 1949),Western Victoria, Australia (Collins 1953), Oregon (Bandy 1950), Western Mediterranean core [illegible]

1958), and from the Mindano Trough, West Pacific (Reymend 1959). In 1964 Feyling-Hanssen obtained the species from the Late Quaternary deposits of the Oslo Fjord area.

Diagnosis: This highly variable species is found at every latitude in the world, generally in shallow waters, although deep occurrences have been noted. It appears to prefer a sandy/pebbly substrate and is also often found on eel grass and seaweed fronds. The main ecological factor controlling its distribution appears to be salinity as it is only very rarely found in brackish water regions. Stratigraphically it ranges from the Jurassic to Recent, being well represented throughout, especially from the Tertiary to Recent, but pre-Eocene forms are doubtful true members of this species due to the morphological differences.





TEXT FIG. 43 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- <u>CIBICIDES LOBATULUS</u>

Cibicides refulgens de Montford 1808

Pl.18, figs.3a,3b,3c.

1808	*Cibicides refulgens*		MONTFORD.de. Conch.Syst.Vol.1,pl.22,
1884	*Truncatulina refulgens*	(Montford)	BRADY. Chall.Rep.Zool.Vol.9,p.659, pl.92,figs.7-9.
1894	*Planorbulina refulgens*	(Montford)	GOES. Kongl.Svensk.Veten.Akad. Handl.N.F.Bd.25,No.9,p.89, Taf.15,figs.775-776.
1898	*Truncatulina refulgens*	(Montford)	CHAPMAN. Journ.Roy.Micro.Soc. p.1,2,pl.1,fig.1.
1915	*Truncatulina refulgens*	(Montford)	CUSHMAN. U.S.Nat.Mus.Bull.71, pt.5,p.30,31,pl.12,fig.2.t.fig.331
1921	*Truncatulina refulgens*	(Montford)	CUSHMAN. U.S.Nat.Mus.Bull.100, Vol.4,p.312,pl.63,figs.1a-c.
1931	*Cibicides refulgens*	Montford	WIESNER. Duetsche.SudPolar. Exped.Bd.XX,Bd.XII,p.136,Taf.XXII, figs.268-269.
1933	*Cibicides refulgens*	Montford	GALLOWAY. A manual of foraminifera p.291,pl.26,fig.9.
1946	*Cibicides refulgens*	Montford	CUSHMAN and GRAY. Contr.Cush.Found. Foram.Res.Sp.Pub.no.19,p.45,pl.8, figs.15-17.
1947	*Cibicides refulgens*	Montford	CUSHMAN and TODD. Contr.Cush.Found. Foram.Res.Sp.Pub.no.21,p.23,pl.4, fig.7.
1948	*Cibicides refulgens*	Montford	PARKER. Bull.Mus.Comp.Zool.Vol.100, No.2,pl.6,fig.10.
1949	*Cibicides refulgens*	Montford	CUSHMAN. Inst.Roy.des Sci.Nat.de Belgique,Mem.111,p.51,pl.10,fig.7.
1949	*Cibicides refulgens*	Montford	SAID. Contr.Cush.Found.Foram. Res. Sp.Pub.no.26,p.42,pl.4,fig.17.
1950	*Cibicides refulgens*	Montford	VOORTHUYSEN,van. Med.Geol.Stichting, n.s.No.4,p.40,pl.2,fig.7.

1951 <u>Cibicides refulgens</u> Montford HOFKER. Siboga.Exped.Monog.IVa, Pt.III,p.346-348,figs.233,234.

1952 <u>Cibicides refulgens</u> Montford BERMUDEZ. Bol.de Geol.Caracas, Vol.II,no.4,p.87,pl.14,fig.6.

1952 <u>Cibicides refulgens</u> Montford COLOM. Bull.Inst.Espanol Ocean. No.51,p.38,Lam.IV,figs.27-31.

1953 <u>Cibicides</u> sp.cf.<u>C.refulgens</u> Montford MILLER,Jr. Contr.Cush.Found. Foram.Res.Vol.4,pt.2,p.61,62, pl.9,fig.12.

1953 <u>Cibicides</u> cf. <u>refulgens</u> Montford PHLEGER,PARKER and PEIRSON. Rep.Swed.Deep Sea Exped.Vol.VII, gasc.1,p.49,50,pl.11,figs.10,11.

1954 <u>Cibicides refulgens</u> Montford BOLTOVSKOY. Mus.Argentino de Cienc.Nat.Geol.Tome III,no.3, p.212,pl.XVI,fig.5.

1954 <u>Cibicides refulgens</u> Montford BOLTOVSKOY. Mus.Argentino de Cienc. Nat.Geol.Tome III,no.4,p.290, pl.XXVIII,fig.8.

1954 <u>Cibicides refulgens</u> Montford KLEINPELL. Bernice P.Bishop Mus. Bull.211,p.76,pl.10,fig.9.

1955 <u>Cibicides refulgens</u> Montford BHATIA. Journ.Pal.Vol.29,No.4, p.688,pl.67,fig.6.

1957 <u>Cibicides refulgens</u> Montford FORAMINIFERI PADANI. Agip Mineraria,pl.52,fig.2.

1957 <u>Cibicides refulgens</u> Montford TODD and BRONNIMANN.Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.41, pl.12,fig.12.

1957 <u>Cibicides refulgens</u> Montford VOORTHUYSEN,van. Med.Geol. Stichting,n.s.No.11,p.35,Taf.25, fig.26a,b,c.

1960 <u>Cibicides refulgens</u> Montford BARKER. Soc.Econ.Pal. and Min. Sp.Pub.no.9,p.190,pl.92,figs.7-9.

1960 <u>Cibicides</u> cf. <u>refulgens</u> Montford HERRICK. Bull.Am.Pal.Vol.41, No.187,p.126,pl.15,fig.15.

1962	Cibicides refulcens	Montford	McKNIGHT, Jr. Bull. Am. Pal. Vol. 44, no. 201, p. 129, pl. 23, fig. 150a, b.
1964	Cibicides refulgens	Montford	LEROY. U.S. Geol. Survey Prof. Paper, 454-F, p. F, 44, pl. 8, figs. 22-24.

Test attached, strongly plano-convex, high trochospire, dorsal side flat, ventral side strongly convex, circular in outline, periphery acute. Dorsal evolute, 10 chambers visible, arranged 4:6 in 2 whorls, gradually increasing in size as added, ventral involute, only the chambers of the last whorl visible, 6 present. Dorsal sutures initially indistinct, later distinct, limbate, curved, slightly impressed, ventral sutures sub-radial, slightly impressed. Aperture interiomarginal, a slit with a small thickened lip, along the basal suture of the last chamber on the periphery extending onto the dorsal suture along the spiral suture for ½ to ¾ chamber and along the ventral for ¼ chamber. Wall calcareous, ventrally opaque, dorsally transluscent, both sides perforate with fine to medium size pores.

Dimensions: Diameter 0.27 mm. Height 0.15 mm.

Occurrence: Dead, CB.308, CB.309, CB.311, CB.316, CB.317, CB.330, CB.338, CB.343, CB.345, CB.347, CB.358, CB.370, CB.374, CB.384, CB.385, CB.386, CB.387, CB.388, CB.390, CB.393, CB.404, CB.407, CB.624, CB.626, CB.628, CB.630, CB.639.

Dead, variation samples CB.696, CB.700, CB.704.

Morphological remarks: The difficulty of identifying this form and distinguishing it from C. lobatulus has been discussed earlier. In this work C. refulgens is differentiated on the basis of the high convex test and finer perforations. Hofker in 1951 stated that in this species the dorsal pores are larger than ventral pores. Kureshy in 1959 stated that the high domed nature of C.refulgens represents the initial growth stages of C.lobatulus, but no evidence has been obtained from the study area to support this view.

Distribution: This species has been recorded from the Shetland Seas (Waller 1868), Hickling Broad (Brady 1870), the River Dee (Sidall 1876), off the coast of Durham and North Yorkshire (Robertson and Brady 1870), Souty West of Ireland (Brady 1884), the Faeroe Channel (Pearcey 1890), Liverpool Bay (Pearcey 1891), the Irish Sea (British Association 1896), Dogs Bay, Rathlin Island (Wright 1900; 1902) and from Larne Lough, Ireland (Gough 1906). Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1911, from Clare Island and the North Sea in 1913, from 5 fathoms off Jura and 20 fathoms off Ardnamuchan in 1914, from West of Scotland and from the South coast of Cornwall in 1916. Occurrences in the Plymouth area have been noted by Heron-Allen and Earland 1930; Myers 1943; and by the Marine Biological Association in 1957. In 1958 Le Calvez recorded this species from South of Ireland, West of France, and from the Western English Channel.

The species has been recorded from Rimini and Syra (Jones and Parker 1860), from the North Atlantic, Mediterranean, Adriatic, off the Cape of Good Hope, East coast of Australia, and the Western shores of Patagonia (Brady 1884), from the Arctic and Scandinavia (Goes 1894), Funafuti Atoll (Chapman 1899), from the Malay

Archipelago (Millet 1904), from the North Pacific (Cushman 1915), the Philippines area (Cushman 1921), Lord Howe Island (Heron-Allen and Earland 1923), and the Antarctic area (Wiesner 1931; Heron-Allen and Earland 1932; Earland 1934, Chapman and Parr 1937). In 1936 Earland obtained this form from the Weddell Sea, and in 1939 Stubbings noted it from 201 metres in the Gulf of Aden, 256 metres in the Maldive area and from 48 metres off the South Arabian coast. It has been recorded from Iceland (Norvang 1945), the Island of Ceram (Rutten and Hotz 1946), off the Washington coast and from Amchitka Island, Alaska (Cushman and Todd 1947), from the continental shelf from the Gulf of Maine to Maryland (Parker 1948), Belgium (Cushman 1949), and from the Egyptian Mediterranean coast (Said 1949). In 1950 Parr noted this form from Australia and Tasmania, and Colom noted it off the West African coast. Voorthuysen in 1951 obtained the species from the Netherlands Wadden Sea, and in the following year Uchio obtained it from Hachijo Island, Tokyo, and Colom off the coast of Galicia. Miller in 1953 noted the form from Mason Inlet, North Carolina. Boltovskoy recorded the species from the Gulf of San Jorge and San Blas Bay, Argentina in 1954, from shore sands at Quequen, Buenos Aires in 1955, from the estuary of the Rio de la Plata in 1957, and off Argentina in 1959. This form was noted from the Eastern Gulf of Paria (Todd and Bronnimann 1957), the Egyptian Mediterranean coast (Said and Kamel 1957)1957), Santa Cruz Basin, California (Resig 1958), Santa Monica Bay, California (Zalesney 1959), Santa Catalina Island, California (McGlasson 1959), from 171 metres in the Gulf of Gascogne (Berthois and Le Calvez 1959), and off the South China coast (Waller 1960). In 1961 Reiss, Klug and Merling noted this form off the Red Sea and Mediterranean coasts of Israel, and Cooper noted it from the intertidal zone of the California and Oregon coast. In 1962 it was recorded from the North Sea by Haake, from Oyster Harbour, Albany, Western Australia by McKenzie, and from the Antarctic area by McKnight. Bartlett in 1964 recorded the species from off SoutheEastern Nova Scotia, and Albani in 1965 recorded it from Durban Bay, South Afrida.

Stratigraphic Occurrence: Occurrences in the British Holocene have been recorded from Cleongart (Munthe 1897), County Antrim, Swansea Docks (MacFadyen 1937;1942), and from Borth, Cardiganshire (Adams and Haynes 1965).

Chapman in 1896 obtained this species from the Gault at Folkestone and in 1899 obtained it from a raised beach in Sussex, the specimens being derived from the Chalk and/or Gault. Heron-Allen and Earland in 1911 obtained Cretaceous derived forms from shore sands at Selsey Bill, Sussex. Bowen in 1957 recorded this form from the Upper Eocene of Hampshire, and Bhatia in 1955 and 1957 obtained it from the Paleogene of the Isle of Wight. Pleistocene occurrences have been recorded from the Isle of Man (Reade and Wright 1906), and the Wexford coast (MacFadyen 1940), and Shone in 1878 noted the species in the Upper Boulder Clay of West Cheshire.

This species was recorded in 1961 by Murata from the Paleogene of North Kyushu, Japan. Halkyard in 1917 and 1919 obtained the species from the Blue Marl (Middle Eocene) of Biarritz, Herrick in 1960 noted it in the Eocene of Georgia, and Nuttall in 1928 recorded it from the Upper Eocene and Miocene of Trinidad. Miocene occurrences have been recorded from Cagliari (Caria 1959), and from Southern Okinawa (LeRoy 1964). In 1898 Chapman noted this form in the Miocene and Pliocene of Barbados, and in 1954 Crouch noted it ranging from the Miocene to Pleistocene on the San Pedro Shelf. It was recorded from the Pliocene of Timms Point, California by Cushman and Gray in 1946, and a range from the Pliocene to Pleistocene by the species was noted by Voorthuysen in 1950 from a borehold at the Hague, Netherlands, and by Papani and Pelosio in 1962 from Parma. Neogene occurrencesshave been noted from the Rhone valley (Lys and Vatan 1952), and from Lau, Fiji (Kleinpell 1954). Rutten and Hotz in 1946 noted the form ranging from the Neogene to Recent in the Island of Ceram. Tertiary occurrences have been recorded from the Netherlands (Ten Dam 1944), South Australia, West Australia and the Philippines (Crespin 1954;1955;1956). The species has been recorded fmom the Quaternary of the Alps (Bourcart, Damiani, Vernet, and Le Calvez 1963).

Diagnosis: This species has a similar distribution to C.lobatulus, and is often found in association with C.lobatulus in shallow water regions. The stratigraphic range is certainly Tertiary to Recent, possibly Jurassic to Recent.

Genus: *Dyocibicides* Cushman and Valentine 1930

Dyocibicides biserialis Cushman and Valentine 1930

Pl.18, figs.4a,4b,4c.

1930 *Dyocibicides biserialis* CUSHMAN and VALENTINE.Contr.Stanford Univ. Dept.Geol.Vol.1,No.1, p.31,pl.10,figs.1,2a,b.

1930 *Dyocibicides biserialis* Cushman and Valentine. CUSHMAN. Contr.Cush. Found.Foram.Res.Sp.Pub.no. 2,p.19,pl.3,fig.12.

1931 *Dyocibicides biserialis* Cushman and Valentine. COLE.Florida State Geol.Survey Bull.no.6, p.57,58,pl.5,figs.11,12.

1934 *Dyocibicides biserialis* Cushman and Valentine. CHAPMAN,PARR, and COLLINS. Journ.Linn.Soc. Zool.London,Vol.38,p.572, pl.11,fig.43.

1946 *Dyocibicides biserialis* Cushman and Valentine. CUSHMAN and GRAY. Contr.Cush.Found.Foram. Res.Sp.Pub.no.19,p.46,pl. 8,figs.18,19.

1947 *Dyocibicides biserialis* Cushman and Valentine. CUSHMAN and TODD. Contr.Cush.Found.Foram. Res.Vol.23,pt.3,p.72, pl.16,figs.34,35.

1947 *Dyocibicides biserialis* Cushman and Valentine. CUSHMAN and TODD. Contr.Cush.Found.Foram. Res.Sp.Pub.no.21,p.23, pl.4,fig.8.

1952 *Dyocibicides biserialis* Cushman and Valentine. BERMUDEZ. Bol.de Geol.Caracas.Vol.II,no.4, p.89,pl.15,figs.6-8.

1953 *Dyocibicides biserialis* Cushman and Valentine. REDMOND. Journ.Pal. Vol.27,No.5,p.732,pl.77, figs.16a,b.

1954 *Dyocibidides biserialis* Cushman and Valentine. BOLTOVSKOY. Mus. Argentino de Cienc.Nat.Geol. Tome III,no.4,p.269,pl.29, fig.8.

1955 Dyocibicides biserialis Cushman and Valentine. WALTON. Journ.Pal. Vol.29,No.6,p.1006,pl.104, figs.22,23.

1956 Dyocibicides biserialis Cushman and Valentine. McLEAN,Jr. Bull.Am. Pal.Vol.36,No.160,p.368, pl.49,figs.7a,b.

1959 Dyocibicides biserialis Cushman and Valentine. BOLTOVSKOY.Sec de Marine Pub.H1005,Buenos Aires,p.107,pl.17,fig.3.

1960 Dyocibicides biserialis Cushman and Valentine BARKER.Soc.Econ.Pal. and Min.Sp.Pub.no.9,p.192, pl.93,fig.6.

1961 Dyocibicides biserialis Cushman and Valentine. HORNIBROOK,de. New Zealand Geol.Survey Pal.Bull.34(1),p.165, pl.26,fig.516.

1962 Dyocibicides biserialis Cushman and Valentine. DUPEUBLE. Rev.de Micropaleo.Vol.4,No.4,p.197, 198,pl.1,fig.3.

1963 Cibicides variablis (d'Orbigny) forma biserialis. Cushman and Valentine. BOLTOVSKOY. Contr.Cush.Found.Foram.Res. Vol.14,pt.2,p.61,pl.6,fig.11.

Test attached, fairly large, biform, the early portion trochospirally coiled, the later portion in a spreading series of irregular biserial plano-convex chambers, periphery acute. Dorsal side flattened, ventral side convex. Dorsal evolute, 15 chambers visible, 12 in the trochospiral portion and 3 in the biserial portion. Chambers arranged 5:6:1., in 2+ whorls with 5 later chambers increasing gradually in size as added, gently inflated. Dorsal sutures distinct, flush, limbate, and backward curved at first, later becoming flush and limbate. Spiral suture, distinct, flush. Ventral involute in trochospiral part with 7 chambers visible, sub-triangular in outline with a small umbilical boss present in the shallow umbilicus. Later ventral chambers become more inflated, and slightly enveloping in nature. Ventral sutures distinct, flush at the umbilical region, later impressed towards the periphery, and in the biserial portion. Aperture in the early coiled part peripheral or slightly dorsal, and in the uncoiled portion apertures formed by elongate slits at the outer edges of the chambers at the lines of attachment. Well developed lips present. Wall calcareous, dorsal side transluscent, ventral opaque, both sides densely and coarsely perforate.

Dimensions: Maximum diameter 0.42 mm. Height 0.12 mm.

Occurrence: Living CB.299.

Dead CB.301, CB.402.

Morphological remarks: There is a gradation between this species and D.perforata. Boltovskoy 1963 stated that the genus Dyocibicides has no zoological value and quotes Nyholms work (1961). Boltovskoy then uses the taxonomic category 'forma' and states that "this category has no status .....but ......at the same time it 'saves' all the small differences, which, although of infraspecific character, are nevertheless interesting from the ecological point of view."

Distribution: This species has not been recorded from the British area to the present day.

This species has been recorded from off the West coast of New Zealand (Brady 1884), from the Channel Islands of Southern California (Cushman and Valentine 1930), from 256 metres in the Maldive area (Stubbings 1939), off the Washington and Californian coast, and from

Amchitka Island, Alaska (Cushman and Todd 1947), from off Venezuela (Bermudez 1952), from Mason Inlet, North Carolina (Miller 1953), and from San Blas Bay, Argentina (Boltovskoy 1954). In 1957 the species was recorded from off the coast of Central America by Bandy and Arnal, from the estuary of the Rio de la Plata by Boltovskoy, from the Eastern Gulf of Paria by Todd and Bronnimann, and from Cook Strait, New Zealand by Vella. Resig in 1958 obtained the form from Santa Cruz Basin, California, Boltovskoy in 1959 from off Southern Brazil, and McGlasson in 1959 from Santa Catalina Island, California. The species has been recorded from the intertidal zone of the California and Oregon coast (Cooper 1961), Finistere (Dupeuble 1962), Oyster Harbour, Albany, Western Australia (McKenzie 1962), Puerto Deseado, Patagonia (Boltovskoy 1963), and from 50 to 82 metres off El Salvador, South America (Smith 1964).

Stratigraphic Occurrence: The only stratigraphic record of this species in the British area was that made by Adams and Haynes in 1965 who obtained the species from the Holocene deposits of Borth, Cardiganshire.

The species was obtained from the Holocene of Porto Quequen, Buenos Aires by Boltovskoy in 1959.

Lys and Vatan in 1952 recorded the form from the Neogene of the Rhone valley. Miocene occurrences have been noted from the West Coast of New Zealand (Kennett 1962), Virginia (McLean 1956), Northern Columbia (Redmond 1953), and from Southern Florida (Schroeder and Bishop 1954). Pliocene occurrences have been recorded from Timms Plint, California (Cushman and Gray 1946), New Zealand (Vella 1964), and from Florida where the species ranges into the Pleistocene (Cole 1931). Tertiary occurrences were noted from Victoria, Australia (Chapman, Parr, and Collins 1934), Western Australia (Crespin 1955), and from Oomaru, New Zealand (Hornibrook 1961). In 1953 Collins obtained this species from the Pleistocene of Port Fairy, Western Victoria, and in 1959 Boltovskoy recorded it from the Pleistocene of Porto Quequen, Buenos Aires.

Diagnosis: This form appears to be more typically found in shallow water temperate areas. The stratigraphic range is Miocene to Recent, being never common at any time.

Family: Planorbulinidae Schwager 1877

Genus: Planorbulina d'Orbigny 1826

Planorbulina mediterranensis d'Orbigny 1926

Pl.19, figs.7a,7b,7c.

1826	~~Plano~~rbulina mediterranensis	d'ORBIGNY	AnnlSci.Nat.Paris,France, Ser.1,Tome 7,p.280,pl.14, figs.4-6.
1946	Planorbulina mediterranensis	d'Orbigny	d'ORBIGNY. For.Foss.Vienne, p.166,pl.IX,figs.15-17.
1884	Planorbulina mediterranensis	d'Orbigny	BRADY. Chall.Rep.Zool. Vol.9,p.656,657,pl.XCII, figs.1-3.
1894	Planorbulina mediterranensis	d'Orbigny	GOES. Kongl.Svenska.Veten. Akad.Handl.N.F.Bd.25,No.9, p.91,Tab.15,fig.786.
1897	Planorbulina mediterranensis	d'Orbigny	FLINT. U.S.Nat.Mus.Ann. Rept.p.328,pl.72,fig.6.
1906	Planorbulina mediterranensis	d'Orbigny	BULLEN.Geol.Mag.Vol.111, p.357,pl.XIX,fig.10.
1915	Planorbulina mediterranensis	d'Orbigny	CUSHMAN. U.S.Nat.Mus.Bull. 71,pt.5,p.28,pl.12,fig.1, text-fig.31.
1922	Planorbulina mediterranensis	d'Orbigny	CUSHMAN. Dept.Marine Biol. Carnegie Inst.Wash.Vol.XVII, p.45,pl.6,figs.1,2.
1925	Planorbulina mediterranensis	d'Orbigny	CUSHMAN. Smith.Miscell.Coll. Vol.77,No.4,p.72,pl.11,fig.1.
1927	Planorbulina mediterranensis	d'Orbigny	CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.3,pt.1,p.95, pl.20,fig.8.
1931	Planorbulina mediterranensis	d'Orbigny	COLE. Florida State Geol. Survey.Bull.no.6,p.58, pl.5,fig.1.

1933 Planorbulina mediterraneanensis d'Orbigny GALLOWAY. A manual of foraminifera, p.297, pl.27, fig.10.

1949 Planorbulina mediterranensis d'Orbigny BANDY. Bull.Am.Pal.Vol. 32, No.131, p.116, pl.21, figs. 2a-c.

1949 Planorbulina mediterranensis d'Orbigny CUSHMAN. Inst.Roy.des Sci. Nat.de Belgique, Mem.111, p.52, pl.X, fig.9.

1949 Planorbulina mediterranensis d'Orbigny SAID. Contr.Cush.Found. Foram.Res.Sp.Pub.no.26, p.44, pl.4, fig.25.

1951 Planorbulina mediterranensis d'Orbigny PHLEGER and PARKER. Geol.Soc.Am.Mem.46, pt.2, p.33, pl.19, figs.5a.b.

1951 Planorbulina mediterranensis d'Orbigny VOORTHUYSEN, van. Med.Geol. Stichting, n.s.No.5, p.24, 25, pl.2, fig.14.

1952 Planorbulina mediterranensis d'Orbigny BERMUDEZ. Bol.de Geol. Caracas, Vol.II, no.4, p.121, pl.24, figs.1, 2.

1952 Planorbulina mediterranensis d'Orbigny COLOM. Bull.Inst.Espanol Ocean.No.51, p.40, Lam.V, fig.43.

1953 Planorbulina mediterranensis d'Orbigny MILLER, Jr. Contr.Cush.Found. Foram.Res.Vol.4, pt.2, p.62, pl.9, fig.13.

1953 Planorbulina mediterranensis d'Orbigny PHLEGER, PARKER, and PEIRSON. Rep.Swed.Deep Sea Exped. Vol.VII, fasc.1, p.50, pl.11, figs.20, 21.

1953 Planorbulina mediterranensis d'Orbigny REDMOND. Journ.Pal.Vol.27, No.5, p.732, pl.77, figs.17a, b.

1954 Planorbulina mediterranensis d'Orbigny BANDY. U.S.Geol.Survey Prof. Paper.254F, p.37, pl.31, fig.3.

1954	*Planorbulina mediterranensis*	d'Orbigny	PARKER. Bull.Mus.Comp.Zool. Vol.111,No.10,p.545,pl.13, fig.9.
1955	*Planorbulina mediterranensis*	d'Orbigny	KAASSCHIETER.in Drooger, Kaasschieter, and Key. Verhandl.Konin.Ned.Akad. Weten.Nad.Deel XXI,No.2, p.95,96,pl.11,figs. 6a,b.
1955	*Planorbulina mediterranensis*	d'Orbigny	KRUIT. Kon.Med.Geol.Mijnb. Gen.Veerh.Deel 15,p.475, pl.3,fig.3.
1957	*Planorbulina mediterranensis*	d'Orbigny	FORAMINIFERI PADANI. Agip.Mineraria pl.52,fig.8.
1957	*Planorbulina mediterranensis*	d'Orbigny	TODD. U.S.Geol.Survey Prof. Paper,280-H,pl.72,fig.12.
1957	*Planorbulina mediterranensis*	d'Orbigny	VOORTHUYSEN,van. Med.Geol. Stichting.n.s.No.11,p.36, Taf.25,figs.33a,b.
1958	*Planorbulina mediterranensis*	d'Orbigny	PARKER. Rep.Swed.Deep Sea Exped.Vol.VIII,fasc.II, no.4,p.276,pl.4,fig.4.
1959	*Planorbulina mediterranensis*	d'Orbigny	BHATIA and MOHAN. Journ. Pal.Vol.33,No.4,p.660, Text fig.6,fig.7.
1959	*Planorbulina mediterranensis*	d'Orbigny	BOLTOVSKOY. Sec.de Marina Pub.H1005,Buenos Aires, p.108,pl.18,fig.7.
1959	*Planorbulina mediterranensis*	d'Orbigny	HOFKER.Contr.Cush.Found. Foram.Res.Vol.10,pt.4,p.116, text-figs.16-18.
1960	*Planorbulina mediterranensis*	d'Orbigny	BARKER. Soc.Econ.Pal.and Min. Sp.Pub.no.9,p.190,pl.92, figs.1-3.
1960	*Planorbulina mediterranensis*	d'Orbigny	HOFKER. Palaontologische Zeitschriff,Stuttgart.W. Band 34,Nr.3/4,p.254,pl.E, figs.128,129.

1961 Planorbulina mediterranensis d'Orbigny DOLTOVSKOY. Mus.Argentino de Cienc.Nat.Zool.Tome VI, no.6,p.294,pl.5,fig.36.

Test attached, discoidal, low trochospire, compressed, plano-convex to concavo-convex, sub-circular to quadrate in outline, periphery acute, lobate. Dorsal flat to concave, evolute with an early planispiral portion which becomes irregularly annular later. Chambers moderately distinct, 19 present, arranged 5:6 in 2 wherls coiled dextrally in the planispiral part, with 8 annular chambers. Chambers at first as long as wide, then with growth longer than wide, gradually increasing in size as added at first then later rapidly and evenly, gently inflated. Dorsal sutures distinct, limbate, gently curved, flush. Ventral involute, chambers more inflated than on the dorsal side. Ventral sutures distinct, impressed, very slightly curved. Chambers in adult bi-apertural, apertures being interiomarginal low arched openings, extending from the periphery onto the ventral and dorsal sides. Moderate development of lips around the aperture. Test wall calcareous, transluscent, thin, coarsely ahd densely pefforate.

Dimensions: Diameter 0.60 mm. Height 0.20 mm.

Occurrence: Dead CB.308, CB.316, CB.317, CB.322, CB.323, CB.326, CB.327, CB.328, CB.330, CB.334, CB.337, CB.340, CB.343, CB.345, CB.346, CB.352, CB.358, CB.359, CB.363, CB.372, CB.373, CB.374, CB.379, CB.380, CB.382, CB.384, CB.385, CB.386, CB.387, CB.398,

CB.402, CB.403, CB.404, CB.410, CB.415, CB.630,

CB.638, CB.639, CB.642,

Dead, variation samples CB.696, CB.700.

Morphological remarks: Variation is exhibited by this species in chamber formation, in extreme cases the test assuming an 'acervuline' appearance.

Distribution: (Text-fig.44A). This species has been recorded from the Shetland Seas (Waller 1868), South East of Eddystone (Robertson 1870), the Clyde, Montrose Basin, Budle Bay, Skye, Forth of Forth, Yarmouth, Breydon Water and from the Rivers Aln, Wansbeck, and Blyth (Brady 1870), the Firth of Clyde (Robertson 1875), the River Dee (Sidall 1876), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), North West of Ireland (Brady 1884), the River Mersey (Burgess 1891), Liverpool Bay and off Penrhos (Pearcey 1891), Portree Bay, Isle of Skye (Robertson 1892), Dogs Bay (Wright 1895, 1900), the Irish Sea (British Association 1896), Salcombe estuary (Worth 1900), and from the Exe estuary (Worth 1902). Pearcey in 1903 noted this form in the Firth of Forth, Worth in 1904 from Plymouth, Gough in 1906 from Larne Lough and Wright in 1907 from Lambay, County Dublin. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1919 and 1911, from Clare Island in 1913, from 5 fathoms off Jura, 20 fathoms off Ardnamuchan and 12 fathoms in Loch Sunart in 1914, West of Scotland and from the South coast of Cornwall in 1916, and from the Plymouth area in 1930. In 1915 Heron-Allen obtained it from 20 fathoms off the Isle of Man, and it was recorded from the Plymouth area by Myers in 1943, and by the Marine Biological Association in 1957. Le Calvez in 1958 recorded the form from South of Ireland, West of France, and from the Western English Channel, and in 1963 it was recorded from the Isle of Man by Bruce, Colman and Jones.

The species has been recorded from Crete and Syra (Jones and Parker 1860), every sea within the temperate and tropical zones, mainly at depths of less than 50 fathoms (Brady 1884), the Arctic and Scandinavia (Goes 1894), the Gulf of Mexico (Flint 1897), Funafuti Atoll (Chapman 1899; 1900), the Malay Archipelago (Millett 1904), the North Pacific (Cushman 1915), the Tortugas region (Cushman 1922), off Porto Rico (Cushman 1922), Lord Howe Island (Heron-Allen and Earland 1923), from the Florida area (Norton 1930), and from the Southern California area (Natland 1933). Marie in 1938 obtained this form from the Rance estuary, Le Calvez in 1939 from the Indochina coast, Norvang in 1945 from Iceland, Rutten and Hotz in 1946 from the Island of Ceram, Cushman in 1949 from Belgium, and Said in 1949 from the Red Sea and Gulf of Suez. In 1950 the species was noted off the West African coast by Colom, and in 1951 it was recorded from the Netherlands Wadden Sea by Voorthuysen, and from the North West Gulf of Mexico by Phleger and by Phleger and Parker. In 1952 Bermudez noted the species from off Venezuela, Florida, and the Mediterranean, Uchio from Hachijo Island, Tokyo, and Colom from the coast of Galicia. It was recorded from Mason Inlet, North Caroline (Miller 1953), the Gulf of Mexico (Bandy 1954), San Blas Bay, Argentina (Boltovskoy 1954), the North Eastern Gulf of Mexico (Parker 1954), Todos Santos

Bay, California (Walton 1955), the Rhone delta (Kruit 1955), and from the North East Gulf of Mexico (Bandy 1956). In 1957 the form was noted by Boltovskoy from the estuary of the Rio de la Plata, by Bandy and Arnal from off the West coast of Central America, by Todd from the Mariana Islands, and by Said and Kamel from the Egyptian Mediterranean coast. In 1958 it was recorded from the Orinoco-Trinidad-Paria shelf by Drooger and Kaasschieter, from Santa Cruz Basin, California by Resig, from the Western Mediterranean by Todd, from the Central Tyrrhenian Sea by Mrán, from the Eastern Mediterranean by Parker, and from the Marseille coast by Blanc-Vernet. It was noted in 1959 by Boltovskoy from off Southern Brazil, by McGlasson from Santa Cataline Island, California, and by Berthois and Le Calvez from 35 metres in the Gulf of Gascogne. The species was recorded from the Gulf of Naples(Hofker 1960), the continental platform between Santo Tome and the Rio de la Plata (Boltovskoy 1961), the Red Sea and Mediterraneah coast of Israel (Reiss, Klug and Merling 1961), the Gulf of Gaiifornia (Bandy 1961), and from the intertidal zone of the California and Oregon coast (Cooper 1961). Lynts in 1962 obtained the form from the Upper Florida Bay area, and in 1963 it was noted off the Ivory coast by Le Calvez, and from Finistere by Dapeuble. In 1964 Wilcoxin obtained this species from off the Southern Atlantic coast of the United States, and in 1965 Phleger obtained it from Guerrero Negro Lagoon, Baja, California.

Stratigraphic Occurrence: (Text-fig.44B). This species has been noted in the British Holocene at Altcar (Wright 1904), County Antrim and

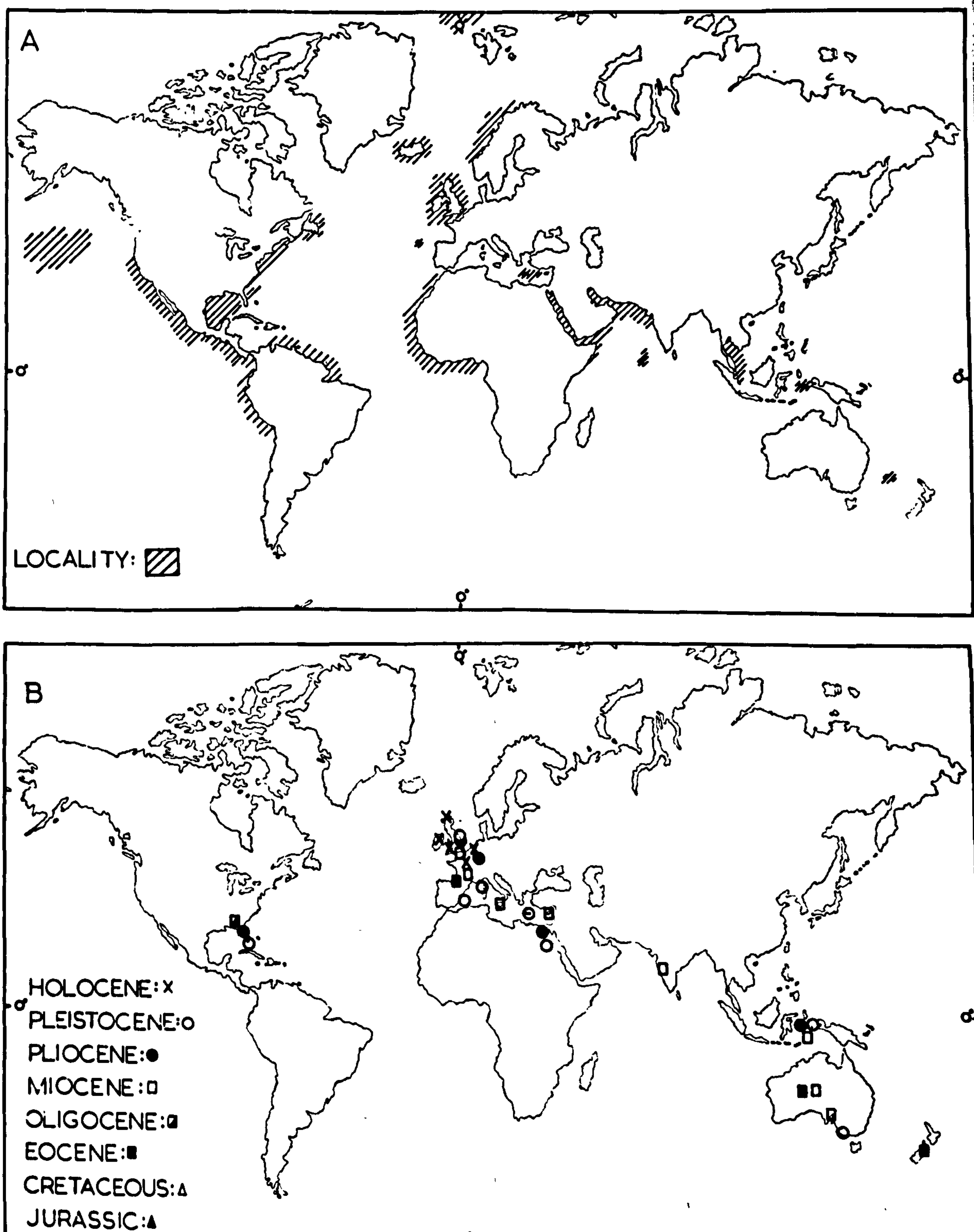
Skye, the Fens, and Swansea Docks (MacFadyen 1937;1938;1942), and at Borth, Cardiganshire (Adams and Haynes 1965).

Funnell in 1961 noted the form ranging from the Paleogene to Early Pleistocene in Norfolk. Post Tertiary occurrences were recorded by Robertson from Garnock and Kilwinning in 1877, and from Greenock in 1885. Boulder Clay occurrences have been recorded from Caithness (Crosskey and Robertson 1868), Cheshire (Shone 1874), Great Crosby and Carrickfergus (Wright 1898; 1903). Shone recorded this form from the Upper Boulder Clay of West Cheshire in 1878, and in 1902 Wright obtained it from the Drift of County Cork.

Holocene occurrences were recorded from Bruges (Reade 1898), N.O.Polder, and the Dollart-Ems estuary (Voorthuysen 1951;1960).

Howchin in 1893 recorded this species from the Eocene, Miocene and Post-Tertiary of Australia. Halkyard obtained the form from the Middle Eocene Blue Marls of Biarritz in 1917 and 1919, and Dorreen in 1948 noted this species from the Upper Eocene of New Zealand. Oligocene occurrences in Alabama have been noted by Bandy in 1949, and by Echols and Schaeffer in 1960. Henson, Browne and McGinty in 1949 obtained this species from the Lower Miocene of Cyprus and other Miocene occurrences have been recorded from Adelaide (Howchin and Parr 1938), South West France (Kaasschieter 1955), Northern Columbia (Redmond 1953), Western India (Bhatia and Mohan 1959), and Sicily (Cita 1958). In 1953 Voorthuysen obtained this form from the Pliocene portion of a bore at Oosterhaut, Netherlands. A range by this species from the Pliocene to Pleistocene has been noted by Cole in Florida (1931), by Schroeder and Bishop in 1954 from the same area, and by Souaya in 1963 along the Red Sea coast of Egypt. In 1946 Rutten and Hotz noted the form ranging from the Neogene to Recent on the Island of Ceram. Tertiary occurrences have been recorded from Turin and Palermo (Jones and Parker 1960), from Southern and Western Australia (Crespin 1954; 1955). Pleistocene occurrences have been recorded from Ischia (Broeck 1878), East Crete (Bullen 1906), Western Victoria (Collins 1953), and in a core from the Western Mediterranean (Todd 1958).

Diagnosis: This shallow water species appears to prefer a temperate to warm water environment, and is only rarely found in cold water areas. The stratigraphic range of this species is Eocene to Recent.



TEXT FIG. 44 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- PLANORBULINA MEDITERRANENSIS

Family: Acervulinidae Schultze 1854

Genus: Acervulina Schultze 1854

Acervulina inhaerens Schultze 1954

Pl.18, figs.5a,5b,5c.

1854	Acervulina inhaerens	SCHULTZE	Uber.der Organismus der Polythalamien (Foraminiferen) Nebst Bemerkungen uber die Rhizopoden im allgemeinen Deutschland.p.68,pl.6,fig.12.
1884	Gypsina inhaerens	(Schultze)	BRADY.Chall.Rep.Zool.Vd.9,p.718, pl.102,figs.1-6.
1894	Gypsina inhaerens	(Schultze)	GOES.Kongl.Svensk.VetenAkad.Handl. N.F.Bd.25,No.9,p.91,Tab.15,fig.787.
1897	Gypsina inhaerens	(Schultze)	FLINT.U.S.Nat.Mus.Ann.Rept.p.336, pl.79,fig.6.
1915	Gypsina inhaerens	(Schultze)	CUSHMAN.U.S.Nat.Mus.Bull.71,pt.5, p.74,pl.21,figs.6,7.
1923	Gypsina inhaerens	(Schultze)	HERON-ALLEN and EARLAND.Journ. Linn.Soc.London,Vol.35,p.637, 638,pl.37,figs.62-64.
1925	Gypsina inhaerens	(Schultze)	CUSHMAN. Smith.Miscell.Coll.Vol. 77,No.4,p.74,pl.13,fig.1.
1927	Acervulina inhaerens	Schultze	CUSHMAN.Contr.Cush.Found.Foram. Res.Vol.3,pt.1,p.97,pl.21,fig.6.
1927	Acervulina inhaerens	Schultze	GALLOWAY and WISSLER. Journ.Pal. Vol.1,No.1,p.67,pl.11,fig.3.
1933	Acervulina inhaerens	Schultze	GALLOWAY. A manual of foraminifera, p.308,pl.28,fig.9.
1952	Acervulina inhaerens	Schultze	BERMUDEZ. Bol.de Geol.Carqcas. Vol.II,no.4,p.122,pl.24,figs.5,6.
1954	Gypsina inhaerens	(Schultze)	BOLTOVSKOY.Mus.Argentino de Cienc. Nat.Geol.Tome III,no.4,p.292, pl.XXIX,fig.6.

1957 *Aaervulina inhaerens* Schultze — TODD. U.S.Geol.Survey Prof.Paper 280-H,pl.93,fig.15.

1959 *Acervulina inhaerens* Schultze — BOLTOVSKOY. Sec.de Marine Pub.H1005, Buenos Aires,p.108,109,pl.XVII, fig.10.

1960 *Acervulina inhaerens* Schultze — BARKER.Soc.Econ.Pal.and Min.Sp. Pub.no.9,p.210,pl.102,figs.1-6.

Test attached, dorsally, irregularly globular in outline. Initial portion coiled, discoidal, masked by later encrusting and irregular coiling of the chambers. Chambers numerous, indistinct at first later distinct, irregular, approximately 16 present, inflated. Sutures distinct, markedly impressed. Wall calcareous, opaque coarsely perforate. No aperture present other than the coarse perforations.

Dimensions: Diameter 0.55 mm. Height 0.10 mm.

Occurrence: Dead, CB.318, CB.337, CB.338, CB.382, CB.402, CB.640, CB.642.

Morphological remarks: This species is distinguished from members of the Planorbulinidae by the absence of any distinct aperture, the coarse perforations assuming an apertural role. In 1927 Galloway and Wissler stated that the genus *Acervulina* evolved from *Cibicides* by loss of the regular coiled form. Nyholm in 1964 stated that the genus *Acervulina* is of no taxonomic value but is simply a resting schizont stage of the family Anomalinidae, strongly modified by the substratum.

Distribution: This species has been recorded from Dogs Bay (Brady 1884), Liverpool Bay and off Penrhos (Pearcey 1891), Portree Bay (Robertson 1892), Dogs Bay (Wright 1895; 1900), Rathlin Island (Wright 1902), the Firth of Forth (Pearcey 1903), the Gobbins and Larne Lough (Gough 1906), and from Lambay, County Dublin (Wright 1907).

Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909, and 1911, from ClareIsland in 1913, from 20 fathoms off Ardnamuchan, 12 fathoms in Loch Sunart in 1914, West of Scotland and from the South coast of Cornwall in 1916, and from the Plymouth area ih 1930. Heron-Allen in 1915 obtained this form from 20 fathoms off the Isle of Man. This form was obtained from three stations in the Plymouth area in 1957 by the Marine Biological Association, from West of France and South West of Lands End in 1958 by Le Calvez, and from the Isle of Man area in 1963 by Bruce, Colman, and Jones.

This species has been recorded from Bass Strait, Booby Island, South of New Guinea, and from the European coast line (Brady 1884), the Tonga Islands (Lister 1891), the Arctic and Scandinavia (Goes 1894), Florida Keys, Exuma Sound and Yucatan Straits (Flint 1897), Funafuti Atoll (Chapman 1899;1900), Cocos Keelihg Atoll (Chapman 1902), Fiji (Sherlock 1903), and from the North Pacific (Cushman 1915). Heron-Allen and Earland recorded this form from Lord Howe Island in 1923, and from the ice free area of the Falkland Islands area in 1932. This species was noted from the Southern California region by Natland in 1933, from the Antarctic by Chapman and Parr in 1937, from 44 metres in the Maldive area by Stubbings in 1939, from Australia and Tasmania by Parr in 1950, and from the Mariana Islands by Todd in 1957. Boltovskoy recorded tho species from San Blas Bay, Argentina in 1954, off Brazil in 1959, and from the continental platform between Santo Tome and the Rio de la Plata, Argentina in 1961. McKenzie in 1962 noted this form in Oyster Harbour, Albany, Western Australia, and in the following year it was recorded from off the Ivory coast by Le Calvez, and from Finistere by Dupeuble.

Stratigraphic Occurrence: MacFadyen in 1937 obtained this species from the Holocene of Skye and County Antrim, and Adams and Haynes in 1965 noted it in the Holocene deposits of Borth, Cardiganshire.

Wright in 1902 noted this form in the Drift deposits of County Cork.

In 1893 Howchin recorded this species from the Australian Eocene, and in 1917 and 1919 Halkyard noted it in the Middle Eocene Blue Marls of Biarritz. This form was noted ranging from the Upper Oligocene to Lower Miocene in Fiji by Crespin in 1958, and Souaya in 1963 recorded it from the Pliocene of the Red Sea coast of Egypt. Tertiary occurrences have been recorded from South and West Australia (Crespin 1954; 1955). Pleistocene occurrences have been noted from California (Galloway and Wissler 1927), and from Western Victoria, Australia (Collins 1953).

Diagnosis: This species has a similar distribution to _P. mediterranensis_ but does appear to extend into cooler waters. This species ranges from the Eocene to Recent, never being common at any time.

Super Family: Cassidulinacea d'Orbigny 1839

Family: Nonionidae Schultze 1854

Sub Family: Nonioninae Schultze 1854

Genus: Nonion de Montford 1808

Nonion boueana (d'Orbigny) 1846

Pl.19, figs.2a, 2b.

1846	Nonionina boueana	d'ORBIGNY	For.Foss.Vienn.Bas.p.108,pl.V, figs.11-12.
1884	Nonionina boueana	d'Orbigny	BRADY.Chall.Rep.Zool.Vol.9, p.729,pl.CIX,figs.12,13.
1894	Nonionina boueana	d'Orbigny	GOES.Kongl.Svensk.Veten.Akad. Handl.N.F.Bd.25,no.9,p.104,Tab. XVII,fig.829.
1897	Nonionina boueana	d'Orbigny	FLINT. U.S.Nat.Mus.Ann.Rep. p.337,pl.79,fig.5.
1922	Nonionina boueana	d'Orbigny	HOFKER. Flora en Fauna dor Zuidersee, Protozoa,p.154,fig.53.
1930	Nonionina boueana	d'Orbigny	NUTTALL. Journ.Pal.Vol.4,No.3, p.284,pl.23,figs.11,14.
1965	Nonion boueanus	(d'Orbigny)	SOUAYA. Micropaleo.Vol.11,No.3, p.326,pl.3,fig.37.

Test free, small, planispiral, involute, bi-laterally symmetrical, biumbonate, compressed, flat to slightly concave sides, periphery sub-acute to rounded, very slightly lobate. Chambers distinct, 11 visible in the last whorl, three times as high as long, increasing gradually in size as added. Sutures distinct, flush to slightly depressed, curved and somewhat thickened. Apertural face elongate oval, convex. Aperture equatorial, interiomarginal, a very small semi-circular opening at the base of the apertural face. Wall calcareous, smooth, thin, transluscent, very finely and densely perforate.

Dimensions: Diameter 0.40 mm. Thickness 0.12 mm.

Occurrence: Dead CB.338, CB.384.

Morphological remarks: This species exhibits variation in the degree of compression, and nature of periphery.

Distribution: This species has been recorded by Heron-Allen and Earland from Selsey Bill, Sussex in 1911, from the Clare Island area in 1913, and from Plymouth in 1930.

Brady recorded the species in 1884 from 11 fathoms in Vigo Bay, 18-200 fathoms in the Bay of Biscay, 10-15 fathoms in the Red Sea, 7 fathoms in Hong Kong Harbour, and from 125 fathoms off the West coast of Patagonia. It has been recorded from Scandinavia and the Arctic (Goes 1894), the Gulf of Tokyo (Flint 1897), the Malay Archipelago (Millett 1904), the Antarctic (Pearcey 1914; Earland 1934), the Philippine area (Cushman 1921), the Zuidersee (Hofker 1922), off the West African coast (Colom 1950), and from Durban Bay, South Africa (Albani 1965).

Stratigraphic Occurrence: Heron-Allen and Earland in 1910 obtained specimens from the shore at Selsey Bill, Sussex, which they stated were derived from the Cretaceous.

Reade in 1898 recorded this species from the Holocene deposits at Bruges.

In 1919 Halkyard obtained this form from the Middle Eocene Blue Marl of Biarritz, and in 1930 Nuttall noted it in the Eocene of Mexico. Asano in 1950 noted the species ranging from the Oligocene to Pliocene in Japan. It was noted in the Neogene of the central coastal plain of Israel in 1953 by Avnimelech. Hilly and Magne in 1953 obtained the form from the Lower Miocene of Algeria, and Dandi in 1962 noted it ranging from the Miocene to Quaternary in the Southern Appenines. Miocene occurrences have been recorded from Egypt (MacFadyen 1930; Nakaddy 1958; Souaya 1963), Sinai (MacFadyen 1930), the Gulf of Suez region (Souaya 1965), Cagliari (Caria 1959), and from Sicily (Cita 1958). d'Orbigny in 1948 obtained the type specimens from the Tertiary of the Vienna Basin. In 1961 Zanfra obtained this form from the Upper Pliocene of the Riviera, and in 1962 Borsetti obtained it from the Pliocene portion of a core taken at Foggia, and Papani and Pelosio noted it ranging from the Pliocene to Pleistocene at Parma.

Diagnosis: This species occurs in cold and temperate latitudes with varying depth. Stratigraphically it ranges from the Cretaceous (?) Eocene to Recent.

Nonion depressulum (Walker and Jones) 1798

Pl.19, figs.3a, 3b.

1798	Nautilus depressulus	WALKER and JACOB in	Kanmacher, Adams essays on the microscope. Ed.2,p.641, pl.14,fig.33.
1884	Nonionina depressula	(Walker and Jacob)	BRADY.Chall.Rep.Zool.Vol.9, p.725,pl.109,figs.6,7.
1894	Nonionina depressula	(Walker and Jacob)	GOES. Kongl.Svensk.Veten. Akad.Handl.N.F.Bd.25,No.9, p.103,Tab.17,figs.825-826.
1900	Nonion depressulum	(Walker and Jacob)	READE. Geol.Mag.Vol.VII, p.100,pl.V,fig.23.
1912	Nonionina depressula	(Walker and Jacob)	BAGG. U.S.Geol.Survey Bull. 513,p.88,pl.26,fig.16,pl.28, figs.7,8.
1916	Nonionina depressula	(Walker and Jacob)	HERON-ALLEN and EARLAND. Trans.Linn.Soc.Zool.London, Ser.2,Vol.XI,pt.13,p.279, pl.43,figs.4-7.
1922	Nonionina depressula	(Walker and Jacob)	HOFKER. Flora en Fauna der Zuidersee, Protozoa,p.154, 155,fig.54.
1939	Nonion depressulum	(Walker and Jacob)	CUSHMAN. U.S.Geol.Survey Prof.Paper 191,p.20,21,pl.5, figs.22-25.
1946	Nonion depressulum	(Walker and Jacob)	CUSHMAN and GRAY. Contr.Cush. Found.Foram.Res.Sp.Pub.no.19, p.25,pl.4,fig.32.
1950	Nonion depressulus	(Walker and Jacob)	VOORTHUYSEN,van. Med.Geol. Stichting,n.s.No.4,p.41, pl.3,fig.4.
1955	Nonion depressulum	(Walker and Jacob)	BHATIA. Journ.Pal.Vol.29, No.4,p.677,pl.66,fig.4.

1955 Nonion cf. depressulum (Walker and Jacob) KRUIT. Kon.Med.Geol. Mijnb.Gen.Verh.Deel 15, p.470,pl.2,fig.6.

1957 NonionYdepressulum (Walker and Jacob) BOWEN. Micropaleontology. Vol.3,No.1,p.57,pl.1, figs.20-21.

1957 Nonion depressulum (Walker and Jacob) FORAMINIFERI PADANI. Agip Mineraria,pl.XXI,fig.1.

1957 Nonion depressulus (Walker and Jacob) VOORTHUYSEN,van. Med.Geol. Stichting,n.s.No.11,p.28, Taf.23,fig.2a,b.

1960 Nonion depressulum (Walker and Jacob) BARKER. Soc.Econ.Pal. and Min.Sp.Pub.no.9,p.224,pl.109, figs.6,7.

1962 Nonion depressulum (Walker and Jacob) HAAKE. Geol.Inst.Univ.Kiel. Meyniana,Band 12,p.40,41, Taf.3,figs.1,2.

1962 Nonion depressulum (Walker and Jacob) McKENZIE. Journ.Roy.Soc. Western Australia, Vol.45, pt.4,p.129,pl.III,fig.28.

1963 Nonion depressulum (Walker and Jacob) BOLTOVSKOY. Contr.Cush. Found.Foram.Res.Vol.14, pt.2,p.63,pl.7,fig.61

Test free, small planispiral, involute, bilaterally symmetrical, biumbonate, compressed, flat to slightly convex sides, periphery rounded, slightly lobate. Chambers distinct, 9 visible in the last whorl, twice as high as long, increasing gradually in size as added. Sutures distinct, flush, slightly limbate at first, later depressed, gently curved. Apertural face sub-rounded, convex. Aperture an equatorial, interiomarginal slit at the base of the apertural face extending from the periphery a short distance onto both sides. Umbilical areas occupied by bosses which are flat and transluscent.

Wall calcareous, smooth, thin, transparent, very finely and densely perforate.

Dimensions: Diameter 0.38 mm. Thickness 0.15 mm.

Occurrence: Living CB.359, CB.617, CB.629, CB.634,

Living, variation samples, CB.176, CB.634, CB.696, CB.700, CB.706, CB.717, CB.746,

Dead, CB.346, CB.358, CB.380, CB.627, CB.628, CB.629, CB.634, CB.638, CB.640, CB.641,

Dead, variation samples, CB.176, CB.634, CB.690, CB.694, CB.696, CB.700, CB.706, CB.714, CB.716, CB.717, CB.746.

Morphological remarks: This species exhibits considerable variation in

(i) Size of test.

(ii) Character of test varying from depressed to turgid.

(iii) Sutures range from limtate to sunken.

(iv) Umbilical region flush and simple to raised and decorated with secondary growths linking this species with N.asterizans (Fitchel and Moll), or it may be depressed, or depressed and filled with secondary shell substance.

(v) In extreme cases the sutural lines when depressed may exhibit rudimentary retral processes.

Distribution: (Text-fig.45A). This species has been recorded from the Shetland Seas (Waller 1868), the Clyde, Montrose Basin, Budle Bay, Firth of Forth, Seaton Sluice, Hartlepool Slake, Yarmouth, Breydèn Water, Skye, the Rivers Aln, Wansbeck, Blyth, Tay, Tyne, Tees, Exe, Ribble and Cam (Brady 1870), the Firth of Clyde (Robertson 1875), the

River Dee (Sidall 1876), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), Atlantic Docks, Liverpool (Robertson 1883), the River Mersey (Burgess 1891), off Penmhos, Liverpool Bay (Pearcey 1891), Portree Bay (Robertson 1892), Dogs Bay (Wright 1895; 1900), Barry Docks (Chapman and Jones 1896), the Irish Sea (British Association 1896), and from Salcombe estuary (Worth 1900). In 1902 this form was noted from the Exe estuary by Worth, and from Recent clay in the River Lune valley by Wright. It was recorded from the Firth of Forth by Pearcey in 1903, from Plymouth by Worth in 1904, from Larne Lough, Gobbins, and Belfast Lough by Gough in 1906, and from Lambay, County Dublin by Wright in 1907. Heron-Allen and Earland recorded this species from Selsey Bill, Sussex in 1909 and 1911, from the North Sea and Clare Island in 1913, from 5 fathoms off Jura, 20 fathoms off Ardnamuchan, 12 fathoms in Loch Sunart and 20 fathoms in the Sound of Mull in 1914. West of Scotland and from the South coast of Cornwall in 1916, and Heron-Allen in 1915 obtained the form from 20 fathoms off the Isle of Man. This species was recorded from the Plymouth area (Heron-Allen and Earland 1930; Myers 1943) Marine Biological Association 1957) and from the Isle of Man region (Bruce, Colman and Jones 1963).

This species has been recorded from the Arctic (Brady 1878), temperate latitudes common in estuaries and brackish water pools (Brady 1884), Scandinavia and the Arctic (Goes 1894), the Malay Archipelago (Millet 1904), the Zuidersee (Hofker 1922), Lord Howe Island (Heron-Allen and Earland 1923), Florida area (Norton 1930), the Antarctic area (Wiesner 1931; Heron-Allen and Earland 1932; Earland 1934; Chapman and

Parr 1937) and from Belgium (Cushman 1949). It was recorded from St.Nazaire in 1951 by Le Calvez and Le Calvez, from the Netherlands Wadden Sea in 1951 by Voorthuysen, from the Rhone delta in 1955 by Kruit, from the Marseille coast in 1958 by Blanc-Vernet, and from 35 metres in the Gulf of Gascogne in 1959 by Berthois and Le Calvez. In 1962 it was noted in the North Sea by Haake, from Upper Florida Bay by Lynts, and in Oyster Harbour, Albany, Western Australia by McKenzie. It was recorded in 1963 from Puerto Deseado, Patagonia by Boltovskoy, and from the Caspian Sea by Shokina (quoted by Zenkivitch). Adams and Frampton in 1965 recorded this species from Isafjordar, Lonseyri, and Leirafjordur, Iceland.

Stratigraphic Occurrence: (Text-fig.45B). Occurrences of this species in the British Holocene have been recorded from Norfolk (Jones 1865), Cumbrae (Robertson 1877), Cleongart (Munthe 1897), Formby and Leasowe (Reade 1900), Altcar, Great Crosby (Wright 1904; 1908), Skye and County Antrim, Fend, Swansea Docks (MacFadyen 1937; 1938; 1942), Anglesey (Earland for McMillan 1949), and from Borth, Cardiganshire (Adams and Haynes 1965).

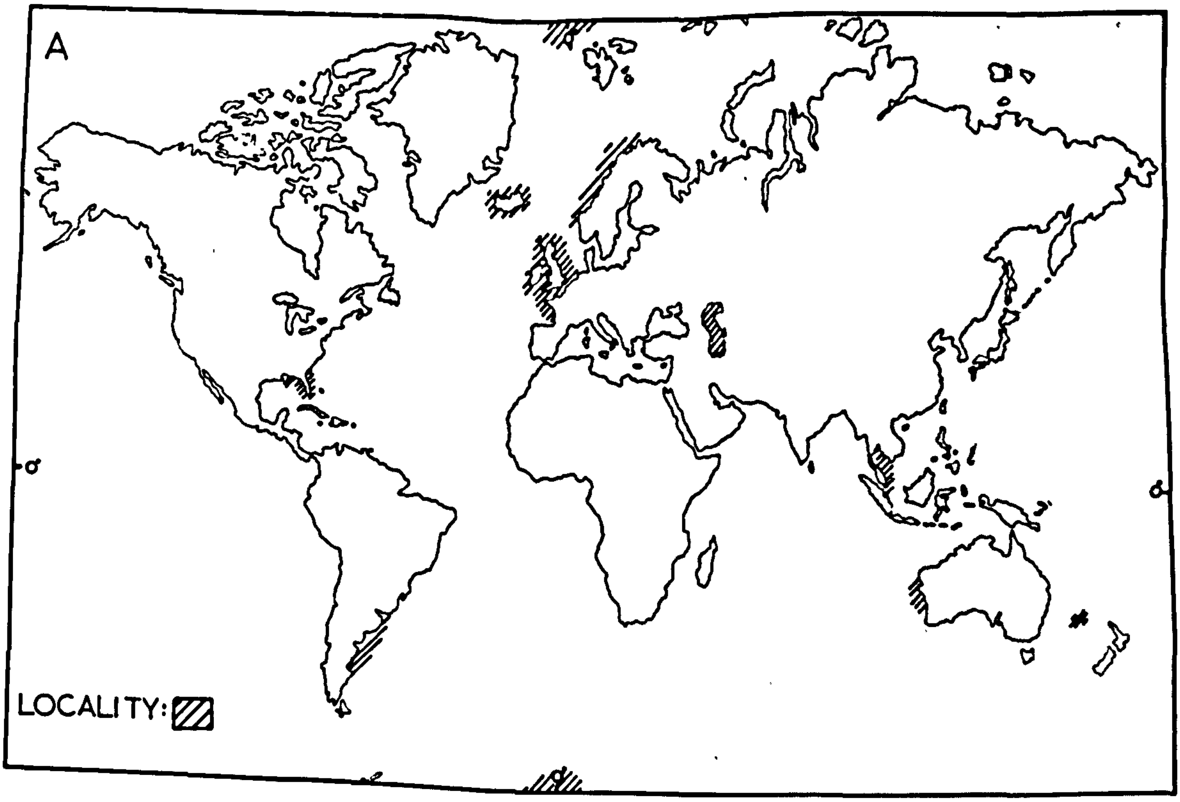
Heron-Allen and Earland in 1910 obtained Cretaceous derived specimens from the shore sands at Selsey Bill, Sussex. In 1957 Bowen noted this form in the Upper Eocene of Hampshire, and Bhatia in 1955 and 1957 recorded it from the Oligocene in the Isle of Wight. MacFadyen in 1932 recorded the species from the Pliocene and Pleistocene of East Anglia. Post-Tertiary occurrences have been noted by Crosskey and Robertson from Dalmuir (1867), Crinan, Paisley (1869), Greenock (1871), Bute, Campbeltown (1873), Stobcross, Paisley, Ayrshire and the Kyles of Bute (1874), and by Robertson from Garnock, Paisley (1877), Lewis (1882), and Greenock (1885). Pleistocene occurrences have been recorded from Moel y Tryfaen (Wright 1900), the Isle of Man (Reade and Wright 1906), and from the Wexford coast (MacFadyen 1940). Reade in 1874 obtained the form from the Lower Boulder Clay of Lancashire and Cheshire, and Lamphigh in 1881 noted it in identical depositsaat Bridlington. In 1878 Shone noted the species in the Upper Boulder Clay of West Cheshire and Liverpool, and Wright in 1903 noted it from the Upper Boulder Clay of Dumfreishire, Ayrshire and County Dublin. Boulder Clay occurrences have been noted from Caithness (Brady 1867), Cheshire (Shone 1874), the Vale of Clwyd (Reade 1897), Great Crosby, Cheshire, Carrickfergus, County Down, and Lancashire (Wright 1989; 1899; 1903; 1904; 1905). Wright noted this species in the Drift deposits of County Cork in 1902, and of Herefordshire in 1923.

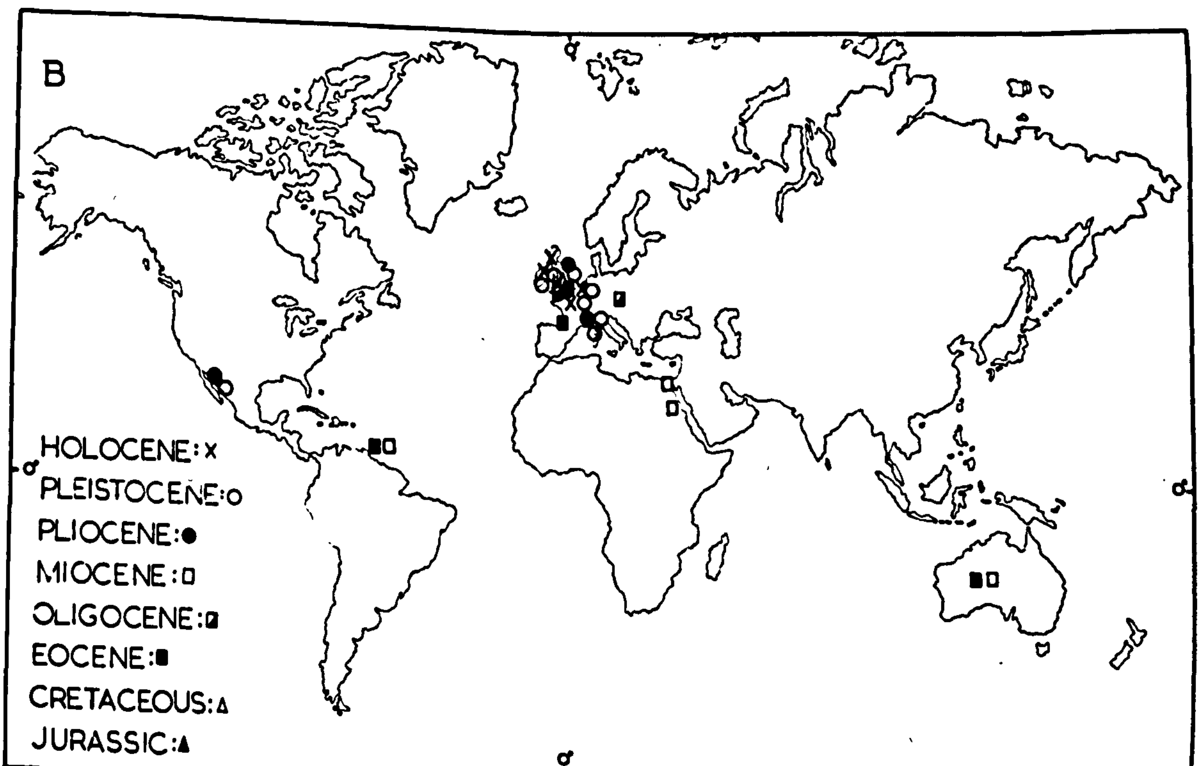
In 1898 Reade obtained this species from the Holocene deposits at Bruges and Voorthuysen noted it occurring in the Holocene deposits of the N.O.Polder, Netherlands in 1951, and of the Dollart Ems estuary in 1960.

In 1892 Guppy obtained this form from the Eocene of Trinidad, and Howchin in 1893 obtained it from the Eocene and Miocene of Australia. Halkyard in 1917 and 1919 recorded the species from the Middle Eocene Blue Marl of Biarritz, and Nuttall in 1928 noted it from the Upper Eocene and Miocene of Trinidad. It was recorded from the Eocene and Oligocene of Pmugia by Nocchi in 1961. In 1951 Friese noted the species in the Middle Oligocene of Bavaria. Miocene occurrences have been noted from Egypt and Sinai (MacFadyen 1930), and from the Gulf of Suez area (Souaya 1965). In 1946 Cushman and Gray noted the form in the Pliocene of Timms Point, California. This species was noted ranging from the Pliocene to Pleistocene in Southern California by Bagg in 1912, and from Parma by Papani and Pelosio in 1962.

A Tertiary occurrence was noted at Cape Range, Western Australia in 1955 by Crespin. Broeck in 1878 recorded the species from the Pleistocene of Ischia, and Voorthuysen noted the species from the Netherlands in 1949, from the Western Netherlands in 1950, and from a borehole at the Hague in 1950.

Diagnosis: This species has a world wide distribution, although not common in tropical areas. It is tolerant of brackish water and is often found in estuaries and lagoons. Stratigraphically it ranges from the Cretaceous (?) Tertiary to Recent.





TEXT FIG. 45 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF:- *Nonion depressulum*

Nonion pompilioides (Fichtel and Moll) 1798

Pl.19, figs.4a, 4b.

1798 *Nautilus pompilioides* FICHTEL and MOLL. Test.Micro.p.31,pl.2, figs.a-c.

1884 Nonionina pompilioides (Fichtel and Moll) BRADY. Chall.Rep.Zool. Vol.9,p.727,pl.109,figs. 10,11.

1929 *Nonion pompilioides* (Fichtel and Moll) CUSHMAN. Contr.Cush.Found. Foram.Res.Vol.5,pt.4,p.89, pl.13,figs.25,a.b.

1930 *Nonion pompilioides* (Fichtel and Moll) CUSHMAN. U.S.Nat.Mus.Bull. 104,pt.7,p.4,pl.1,figs.7-11, pl.2,figs.1,2.

1930 *Nonion pompilioides* (Fichtel and Moll) CUSHMAN and COLE. Contr. Cush.Found.Foram.Res.Vol.6, pt.4,p.95,pl.13,figs.4a-c.

1931 *Nonion pompilioides* (Fichtel and Moll) COLE. Florida Geol.Survey Bull.6.p.32,pl.6,fig.2.

1931 *Nonion pompilioides* (Fichtel and Moll) GALLOWAY and MORREY. Journ.Pal.Vol.5,No.4,p.341, pl.38,fig.10.

1933 *Nonion pompilioides* (Fichtel and Moll) CUSHMAN. U.S.Nat.Mus.Bull. 161,pt.2,p.41,42,pl.10, figs.1,2.

1939 *Nonion pompilioides* (Fichtel and Moll) CUSHMAN.U.S.Geol.Survey Prof.Paper 191,pl.5,figs.8-12.

1939 *Nonion pompilioides* (Fichtel and Moll) PHLEGER. Bull.Geol.Soc.Am. Vol.50,No.9,pl.3,figs.3,4.

1945 *Nonion pompilioides* (Fichtel ahd Moll) CUSHMAN and STAINFORTH. Contr.Cush.Found.Foram.Res. Sp.Pub.no.14,p.35,pl.5,fig.8.

1946 *Nonion pompilioides* (Fichtel and Moll) CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.17, p.6,pl.1,figs.1,2.

1948 Nonion pompilioides (Fichtel and Moll) RENZ. Geol.Soc.Am.Mem.32, p.149, pl.V, figs.31,32.

1951 Nonion pompilioides (Fichtel and Moll) PHLEGER and PARKER. Geol. Soc.Am.Mem.46, pt.2, p.11, pl.15, figs.19,20.

1952 Nonion pompilioides (Fichtel and Moll) CROUCH. Bull.Am.Assoc.Pet. Geol.Vo.36, No.5, p.826, pl.1, figs.13,14.

1952 Nonion pompilioides (Fichtel and Moll) MARTIN. Contr.Cush.Found. Foram.Res.Vol.3, pt.3, p.123, pl.19, figs.2a,2b.

1953 Nonion pompilioides (Fichtel and Moll) BANDY. Journ.Pal.Vol.27, No.2, pt.1, p.177, pl.21, fig.12.

1953 Nonion pompilioides (Fichtel and Moll) PHLEGER, PARKER and PEIRSON. Rep.Swed.Deep Sea Exped.Vol. VII, fasc.1, p.30, pl.6, figs.7,8.

1954 Nonion pompilioides (Fichtel and Moll) PARKER. Bull.Mus.Comp.Zool. Vol.111, No.10, p.506,507, pl.6, fig.4.

1956 Nonion pompilioides (Fichtel and Moll) WHITE. Journ.Pal.Vol.30, No.2, p.247, pl.27, figs.9a,b.

1957 Nonion pompilioides (Fichtel and Moll) FORAMINIFERI PADANI. Agip Mineraria, pl.XXI, fig.41

1958 Nonion pompilioides (Fichtel and Moll) TODD. Rep.Swed.Deep Sea Exped.Vol.VIII, no.3, p.190, pl.1, fig.11.

1959 Nonion pompilioides (Fichtel and Moll) MURATA. Bull.Kyushu Inst. Tech.No.5, p.42, pl.2, fig.3.

1959 Nonion pompilioides (Fichtel and Moll) NORVANG. Meddel.Fra.Dansk. Geol.Foren.Bd.14, Copenhagen.

1960 Nonion(?) pompilioides (Fichtel and Moll) BARKER. Soc.Econ.Pal. and Min.Sp.Pub.no.9, p.224, pl.109, figs.10,11.

1960 Gavelinonion pompilioides (Fichtel and Moll) HOFKER. Palaontologische Zietschriff, Stuttgart, W. Band 34, Nr.3/4, p.261, pl.F, figs.177,178.

1960 Nonion pompilioides (Fichtel and Moll) PHLEGER. Am. Assoc. Pet. Geol. pl.6, fig.20.

1961 Nonion pompilioides (Fichtel and Moll) BANDY. Micropaleontology. Vol.7, No.1, p.16, pl.5, fig.12.

1964 Nonion pompilioides (Fichtel and Moll) LEROY. U.S. Geol. Survey Prof. Paper 454-F, p.F27, pl.10, figs.10,11.

Test free, planispiral, involute, bi-laterally symmetrical, biumbilicate, depressed, circular in outline, periphery broadly rounded. Chambers moderately distinct, 8 present in the last whorl, one and a half times as high as long, increasing gradually in size as added. Sutures subradial, flush, limbate near the umbilicus. Apertural face fairly low, sub-rounded to oval, convex. Aperture an equatorial, interiomarginal slit along the basal suture of the apertural face. Wall calcareous, smooth, thin, transluscent, very finely and densely perforate.

Dimensions: Diameter 0.20 mm. Thickness 0.10 mm.

Occurrence: Dead CB.321, CB.340.

Morphological remarks: N.halkyardi, N.planatum, N.affine, N.soldanii and N.barleeanum were considered to be conspecific with N.pompilioides by Norvang in 1959, the variability exhibited claimed to be functions of either age or localised ecologic differences. Some of the large, less compressed specimens of N.barleeanum are difficult to separate from N.pompilioides, but generally speaking N.pompilioides is more coarsely perforate, more deeply umbilicate, and does not have the thickened ring around the umbilicus as is typical of N.barleeanum.

Distribution: (Text-fig.46A). This species is not common in the British area, Heron-Allen and Earland having recorded it from Selsey Bill, Sussex in 1911, and from the Clare Island area in 1913.

Brady in 1884 stated that this species was typical of deep water of the main oceans. The species was recorded from the Malay Archipelago (Millett 1904), the Antarctic (Pearcey 1914), the Philippinesxxarda (Cushman 1921), the Atlantic (Cushman 1930), the Falkland Islands area (Heron-Allen and Earland 1932), the Tropical Pacific (Cushman 1933) the Falklands sector of the Antarctic (Earland 1934), the Weddell Sea (Earland 1936), the Antarctic (Chapman and Parr 1937), and from 209 and 329 metres in the Zanzibar area (Stubbings 1939). It was noted in 1946 by Rutten and Hotz from the Island of Ceram, in 1951 by Phleger and Parker from the North West Gulf of Mexico, and by Le Calvez and Le Calvez from St.Nazaire. In 1952 Crouch recorded the form off Southern California, and Colom recorded it from the coast of Galicia. It was recorded from the North Atlantic (Phleger, Parker, and Peirson 1953), off California (Bandy 1953), the North Eastern Gulf of Mexico (Parker 1954), off the Marseilles coast (Blanc-Vernet 1958), the Western Mediterranean (Todd 1958), and from the Central Tyrrhenian Sea (Norin 1958). In 1960 it was noted in the Northern Gulf of Mexico by Phleger, and in the Gulf of Naples by Hofker. Bandy in 1961 recorded the form from the Gulf of California, and in 1962 Cita and Chierici obtained it from the Adriatic Sea.

Stratigraphic Occurrence: (Text-fig.46B). Holocene occurrence have been recorded from County Antrim, the Fens, and Swansea Docks

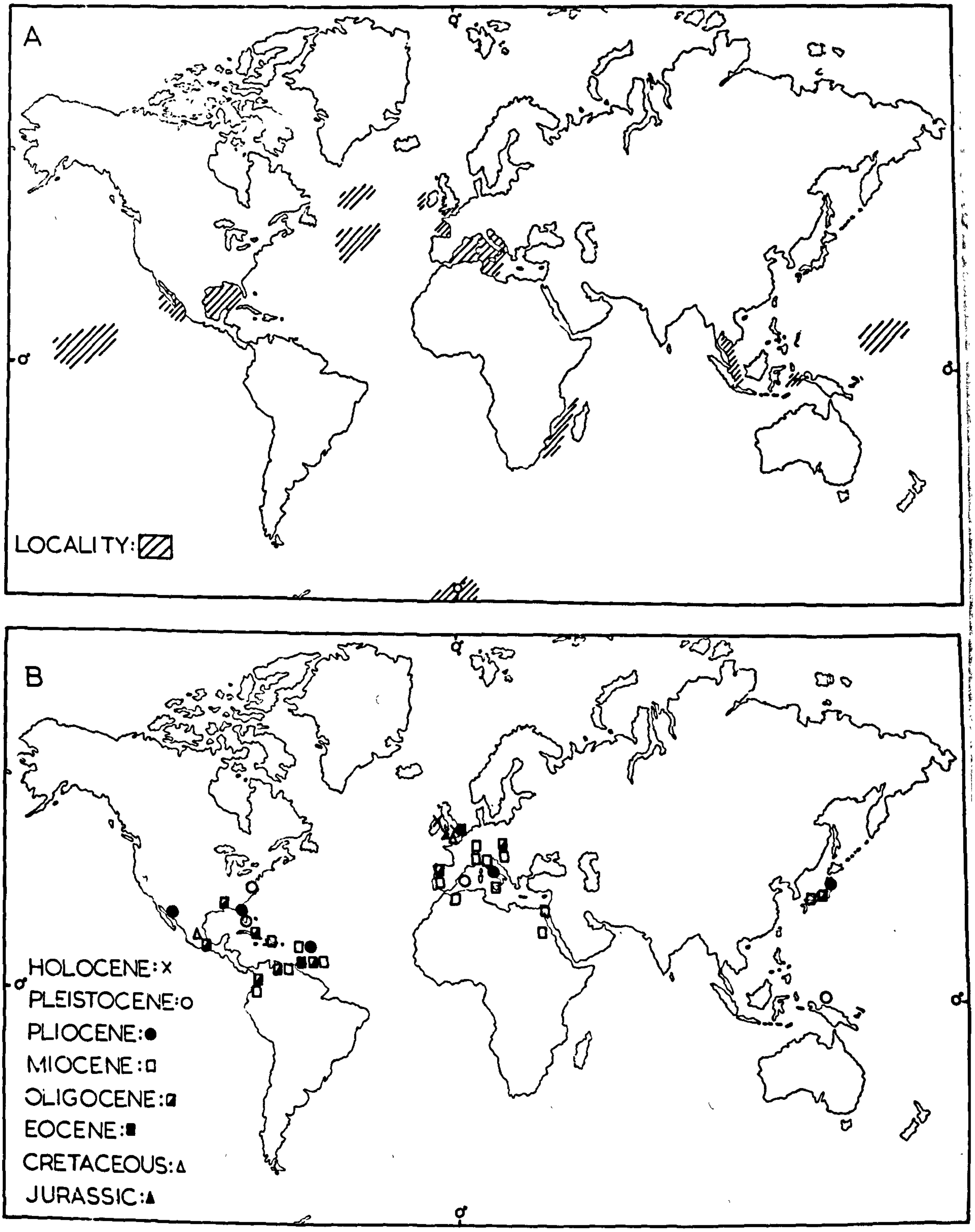
(MacFadyen 1937; 1938; 1942), and from Borth, Cardiganshire (Adams and Haynes 1965).

Cretaceous derived forms were obtained from the shore sands at Selsey Bill, Sussex by Heron-Allen and Earland in 1910, and Sherborn and Burrows in 1891 recorded this species from the London Clay.

In 1931 Galloway and Morrey noted this form in the Late Cretaceous of Mexico. Guppy in 1892 noted the species in the Trinidad Eocene, as did Nuttall in 1928, who noted it ranging from the Upper Eocene to Miocene. It was recorded ranging from the Eocene to Oligocene at Perugia by Nocchi in 1961. Oligocene occurrences have been recorded from Trinidad (Cushman and Stainforth 1945), Nagasaki, Japan (Murata 1959), Hungary (Majzon 1940), and Louisiana (Garrett 1938). Dorr in 1933 noted the form in the Lower Oligocene of South and Central America and of South Mexico, Bellen, Puyt, Rutgers, and Soest in 1941 from the Lower Oligocene of Cuba, and Nuttall in 1932 from the Lower Oligocene of Mexico. Petters and Sarmiento in 1956 noted the species ranging from the Lower Oligocene to Lower Miocene of Colombia. It was recorded from the Upper Oligocene and Miocene of Spain by Delga and Magne in 1958, and from the Oligocene and Miocene of Venezuela by Renz in 1948. In 1961 Murata obtained the form from the Paleogene of North Kyushu, Japan. Miocene occurrences have been recorded from North and North West Germany (Langer 1963), Egypt and Sinai (MacFadyen 1930), the Carpathian foreland (Luczkowska 1957), the Vienna Basin (Marks 1951), Northern Italy (Drooger and Socin 1959), the Dominician Republic (Bermudez 1949), Venezuela (Blow 1959), Haiti (Coryell and Rivero 1940), Egypt

(Stainforth 1949; Nakaddy 1958), Sicily (Cita 1958), Algeria (Dame and Magne 1956), and from the Gulf of Suez area (Souaya 1965). A range by this species from the Miocene to Pliocene was noted by Chapman in 1898 on Barbados, and by LeRoy in 1964 from Southern Okinawa. Pliocene occurrences have been recorded from Italy (Cushman 1946), California (LeRoy 1941; Martin 1952; Goodwin and Thomson 1954; Harrington 1955; White 1956), the Riviera (Zanfra 1961), and Japan (Asano 1950). It was noted in the Pliocene and Pleistocene of Florida by Cole in 1931, of the San Pedro Shelf by Crouch in 1954, and of Parma by Papani and Polosio in 1962. Lys and Vatan in 1952 obtained the form from the Neogone of the Rhone valley, and in 1946 Rutten and Hotz noted it ranging from the Neogene to Recent on the Island of Ceram. Tertiary occurrences have been noted from Ecuador, Venezuela, and Trinidad (Cushman 1929), from California (Bandy and Kolpack 1963), and from West Emsland, Germany (Ellermann 1963). The species was recorded from the Pleistocene of Maryland (Cushman and Cole 1930), the Western Mediterranean (Todd 1958), and of the Mindano Trough, West Pacific (Reyment 1959). In 1962 Borsetti obtained the species from the Quaternary portion of a core taken at Foggia.

Diagnosis: This species has a world wide distribution and appears to prefer a deep water environment. The stratigraphic range of this form is Cretaceous to Recent, being abundant throughout the Tertiary.



TEXT FIG. 46 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- NONION POMPILIOIDES

Genus: *Astrononion* Cushman and Edwards 1837

Astrononion gallowayi Loeblich and Tappan 1953

Pl.19, figs.1a, 1b.

1948 *Astrononion stelligerum* (d'Orbigny) CUSHMAN. Contr.Cush.Found. Foram.Res.Sp.Pub.no.23,p.55, pl.6,fig.6.

1953 *Astrononion gallowayi* LOEBLICH and TAPPAN. Smith.Miscell.Coll. Vol.121,No.7,p.90,pl.17, figs.4-7.

1957 *Astrononion* cf. *gallowayi* Loeblich and Tappan. VOORTHUYSEN,van. Med.Geol.Stichting,n.s.No.11, p.31,Taf.23,figs.7a,b.

1958 *Astrononion gallowayi* Loeblich andTappan. DETLING. Contr.Cush. Found.Foram.Res.Vol.9,pt.2, p.28,pl.8,fig.1.

1960 *Astrononion gallowayi* Loeblich and Tappan. ASANO. Sci.Rep.Tohoku. Univ.Ser.2,(Geol.),Spec.Vol. No.4,p.195,pl.21,fig.9.

1964 *Astrononion gallowayi* Loeblich and Tappan. FEYLING-HANSSEN.Nordes Geol.Undersokelse,Nr.225,p.332, pl.18,fig.4.

Test free, planispiral, involute, slightly compressed, biumbilicate, circular in outline, periphery rounded, very slightly lobate. Chambers moderately distinct, 8 visible externally, one and a half times as high as long, inflated, increasing gradually in size as added, with small triangular supplementary chambers in the umbilical region, extending from the umbilicus and tapering towards the periphery along the sutures, extending one third to two thirds of the distance from the umbilicus to the periphery, giving a typical stellate appearance to this area. Sutures distinct, curved, impressed. Apertural face rounded to ovate, convex. Aperture an interiomarginal equatorial slit with supplementary apertures present on the outer posterior margins of each supplementary chamber. Wall calcareous, smooth, transluscent, the large chambers distinctly perforate, the supplementary chambers indistinctly so.

Dimensions: Diameter 0.33 mm. Thickness 0.10 mm.

Occurrence: Dead CB.311, CB.349, CB.403, CB.412. CB.640.

Dead, variation samples CB.696, CB.700.

Morphological remarks: A.stelligerum (d'Orbigny) is very similar to this species, but this form differs in the more rounded apertural face, fewer chambers, more depressed test, and broader supplementary chambers. In extreme cases the supplementary chambers become rhomboid in appearance.

Distribution: This species has not been recorded from the British area to the present day.

In 1953 Loeblich and Tappan recorded this species from the Arctic. It has been recorded from the Oregon coast (Detling 1958), from 150-201 metres at temperatures of 2.9°C - 13.0°C in the Japan Sea (Asano 1960), from the Arctic Basin (Green 1960), from Hudson Bay, Canada (Leslie 1963), from Juan de Fuca and Georgia Straits, British Columbia (Cockbain 1963), and from Hardangerfjord, Norway, (Holterdahl 1965).

Stratigraphic Occurrence: Holocene occurrences in the British area have been noted from County Antrim (Wright 1911), and Borth, Cardiganshire (Adams and Haynes 1965).

Feyling-Hanssen has recorded this species from the Holodene of South West Barents Island in 1961, from the Holocene of Spitzbergen in 1965, and from the Late Pleistocene of the Oslo Fjord area in 1964.

Diagnosis: This species is characteristic of cold to cool temperate, shallow water, environments, and is stratigraphically restricted to the Late Pleistocene, Holocene and Recent.

Genus: Nonionella Cushman 1926

Nonionella atlantica Cushman 1947

Pl.19, figs.5a,5b,5c.

1947	Nonionella atlantica	CUSHMAN	Contr.Cush.Found.Foram.Res.Vol.23, pt.4,p.90,91,pl.20,figs.4,5.
1951	Nonionella atlantica	Cushman	PHLEGER and PARKER. Geol.Soc.Am. Mem.46,pt.2,p.11,pl.5,figs.21a,b, 22a,b, 23a,b.
1952	Nonionella atlantica	Cushman	PARKER. Bull.Mus.Comp.Zool.Vol.106, No.10,p.453,pl.3,fig.15.
1953	Nonionella atlantica	Cushman	PARKER,PHLEGER and PEIRSON. Contr. Cush.Found.Foram.Res.Sp.Pub.no.2, p.11,pl.3,figs.30,31.
1953	Nonionella atlantica	Cushman	PHLEGER, PARKER and PEIRSON. Rep. Swed.Deep Sea Exped.Vol.VII,fasc.1, p.31,pl.6,figs.9,10.
1953	Nonionella atlantica	Cushman	REDMOND. Journ.Pal.Vol.27,No.5,p.717, pl.74,figs.15a-c.
1954	Nonionella atlantica	Cushman	ANDEL,van, and POSTMA. Verhand.Konin. Ned.Akad.Weten.Afd.Nat.Deel XX,No.5, Vol.1,p.210,pl.1,figs.15a,b.
1954	Nonionella atlantica	Cushman	BANDY. U.S.Geol.Survey Prof.Paper 254-F,p.137,pl.29,fig.10.
1954	Nonionella atlantica	Cushman	PARKER. Bull.Mus.Comp.Zool.Vol.111, No.10,p.507,pl.6,figs.6,7.
1954	Nonionella atlantica	Cushman	PHLEGER. Bull.Am.Assoc.Pet.Geol. Vol.38,No.4,p.642,pl.2,figs.25,26.
1957	Nonionella atlantica	Cushman	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.32, pl.5,figs.30.31.
1959	Nonionella atlantica	Cushman	BOLTOVSKOY. Sec.de Marina Pub.H1005, Buenos Aires,p.76,pl.X,figs.14a-c.
1959	Nonionella atlantica	Cushman	LANKFORD. Bull.Am.Assoc.Pet.Geol. Vol.43,No.9,pl.2,fig.13.

1960 Nonionella atlantica Cushman HOFKER. Palaeontologische Zietschriff, Stuttgart, W. Band 34, Nr. 3/4, p. 262, pl. F, figs. 190A.

1960 Nonionella atlantica Cushman PHLEGER. Am. Assoc. Pet. Geol. pl. 5, figs. 3, 4.

1960 Nonionella atlantica Cushman UCHIO. Contr. Cush. Found. Foram. Res. Sp. Pub. no. 5, pl. 4, figs. 11, 12.

1961 Nonionella atlantica Cushman BANDY. Micropaleontology. Vol. 7, No. 1, p. 16, pl. 2, fig. 11.

1961 Nonionella atlantica Cushman BOLTOVSKOY. Mus. Argentino de Cienc. Nat. Zool. Tome VI, no. 6, p. 289, pl. V, figs. 14-16.

1962 Nonionella atlantica Cushman CLOSS and BARBERENA. Inst. Rio Grande do Sul Inst. Cienc. Nat. No. 16, p. 31, Est. 2, figs. 9, 10a, b, c, 11a, b.

1963 Nonionella atlantica Cushman AYALA-CASTANARES. Univ. Nac. Autonoma de Mexico, Inst. Geol. Bol. no. 67, pt. 3, p. 105, pl. 11, figs. 4a-c.

Test free, sub-trochospiral, compressed, lenticular, biconvex, ovate in outline, periphery rounded and very slightly lobate. Dorsal slightly evolute, 11 chambers visible, three times as high as long, increasing gradually in size as added. Dorsal sutures distinct, impressed, gently curved. Umbilicus somewhat papillase. Ventral involute, 11 chambers visible, higher than long. Sutures distinct, impressed, gently curved, limbate. Apertural face asymmetrical, sub-rounded to ovate, convex. Aperture an interiomarginal low arch extending from the periphery along the ventral margin of the ultimate chamber. Wall calcareous, smooth, transluscent, densely and finely perforate.

Dimensions: Diameter 0.30 mm. Thickness 0.10 mm.

Occurrence: Dead, CB.343.

Morphological remarks: This species is very similar to <u>Nonion sloanii</u> but is definitely a <u>Nonionella</u>.

Distribution: To the present day this species has not been recorded from the British Area.

The species has been recorded off the South Eastern coast of the United States (Cushman 1947), from Coronado Bank, and vicinity,, California(Butcher 1951), from the North West Gulf of Mexico (Phleger 1951; Phleger and Parker 1951), from Narragansett Bay (Said 1951), from Long Island Sound - Buzzards Bay area (Parker 1952), and from the North Atlantic (Phleger, Parker and Peirson 1953). In 1954 the form was noted in the Gulf of Mexico by Bandy, from the Gulf of Paria by Andel and Postma, from the Mississippi Sound area by Phleger, and from the North Eastern Gulf of Mexico by Parker. Phleger in 1955 recorded it from the South Eastern Mississippi delta area, in 1956 from the Central Texas coast, Bandy in 1956 noted it in the North Eastern Gulf of Mexico, and in 1957 it was recorded from off the West coast of Central America by Bandy and Arnal, from the Eastern Gulf of Paria by Todd and Bronnimann, off South East Louisiana by Warren, and from the Texas coast by Phleger and Lankford. It was recorded from the Orinoco-Trinidad-Paria Shelf with very high frequencies off the Orinoco (Drooger and Kaasschieter 1958), off Brazil (Boltovskoy 1959), from the East Mississippi delta margin (Lankford 1959), from 35 and 171 metres in the Gulf of Gascogne (Berthois and Le Calvez 1959), from the Gulf of Naples (Hofker 1960), San Diego, California (Uchio 1960), and from the inner continental shelf of the Northern Gulf of Mexico

(Phleger 1960). In 1961 it was noted from the continental platform between Santo Tome and the Rio de la Plata, Argentina by Boltovskoy, from the Gulf of California by Bandy, and from the Gulf of Mexico by Shifflett. Closs and Barberena obtained this species from the littoral zone of Southern Brazil in 1962, and in the following year it was recorded from Laguna de Terminos, Campeche, Mexico by Ayala-Castanares, off the Ivory Coast by Le Calvez, from Hudson Bay, Canada by Leslie, and from the Littoral zone at Matamoros, Gulf of Mexico, by Segura. It was recorded in 1964 by Wilcoxin off the Southern Atlantic coast of the United States, by Walton from Tampa-Sarasota Bay, Florida, and by Davis from Campeche Bank, Mexico.

Stratigraphic Occurrence: Adams and Haynes in 1965 obtained this form from the Holocene deposits at Borth, Cardiganshire.

Redmond in 1953 recorded this species from the Miocene of Northern Columbia where he stated it was rare to abundant.

Diagnosis: This species appears to prefer inner marine environments in temperate to warm temperate latitudes. Stratigraphic records are very rare.

Nonionella turgida (Williamson) 1858

Pl.19, figs.6a,6b,6c.

1858	Rotalina turgida	WILLIAMSON	Rec.For.Gt.Brit.Ray Soc.London, p.50,pl.4,figs.95-97.
1884	Nonionina turgida	(Williamson)	BRADY. Chall.Rep.Zool.Vol.9, p.731,pl.109,figs.17-19.
1894	Nonionina turgida	(Williamson)	GOES. Kongl.Svensk.Veten.Akad. Handl.Band 25,No.9,p.105,Tab. XVII,fig.832.
1926	Nonionina turgida	(Williamson)	PLUMMER. Univ.Texas Bull.2644, p.159,160,pl.XII,figs.6,7.
1930	Nonionella turgida	(Williamson)	CUSHMAN. U.S.Nat.Mus.Bull.104, pt.7,p.15,pl.6,figs.1-4.
1939	Nonionella turgida	(Williamson)	CUSHMAN. U.S.Geol.Survey Prof. Paper 191,p132,33, pl.9,figs.2,3.
1941	Nonionellaturgida	(Williamson)	TOULMIN. Journ.Pal.Vol.15,No.6, p.597,pl.80,fig.23.
1948	Nonionella turgida	(Williamson)	PARKER. Bull.Mus.Comp.Zool.Vol.100, No.2,pl.2,fig.6.
1957	Nonionella turgida	(Williamson)	FORAMINIFERI PADANI. Agip Mineraria, pl.XXI,fig.7,7bis.
1957	Nonionella turgida	(Williamson)	TODD and BRONNIMANN. Contr.Cush. Found.Foram.Res.Sp.Pub.no.3,p.32, pl.6,figs.3,4.
1959	Nonionella turgida	(Williamson)	BOLTOVSKOY. Sec.de Marina Pub.H1005, Buenos Aires,p.76,pl.X,figs.12a-c.
1960	Nonionella turgida	(Williamson)	BARKER. Soc.Econ.Pal.and Min.Sp. Pub.no.9,p.224,pl.109,figs.17-19.
1960	Nonionella turgida	(Williamson)	HOFKER. Palaontologische Zietschriff, Stuttgart,W. Band 34,Nr.3/4,p.262, pl.F,figs.181,182.
1964	Nonionella turgida	(Williamson)	FEYLING-HANSSEN.Nordes Geol.Under-sokelse Nr.225,p.328,pl.17,figs. 2-6.

1965 <u>Nonionella</u> <u>turgida</u> (Williamson) SOUAYA.Micropaleontology.Vol.11, No.3,p.326,pl.3,figs.4a-b.

Test free, sub-trochospiral, compressed, lenticular, gently biconvext, ovate in outline; periphery rounded, slightly lobate, umbilical side involute, spiral side only partly so. Chambers moderately distinct, 12 visible, with 7 present in the last whorl increasing rapidly in size as added on the involute side with the later chambers developing a large inflated basal lobe which covers the first 3 or 4 chambers of the last whorl and forms a distinct portion offset from the previous whorls in ventral view. Sutures distinct, slightly depressed, gently curved. Apertural face assymmetrical, elongate ovate, Aperture interiomarginal, indistinct, on the periphery extending under the basal lobes on both sides. Wall calcareous, smooth, transluscent, densely and finely perforate.

Dimensions: Diamèter 0.25 mm. Thickness 0.20 mm.

Occurrence: Dead CB.363, CB.382.

Morphological remarks: Little variation is exhibited by this distinctive species except in the amount of test compression and in the degree of turgidity of the overlapping chambers.

Distribution: This species has been recorded from the Shetland Seas (Waller 1868), South East of Eddystone (Robertson 1870), Montrose Basin (Brady 1870), the Firth of Clyde (Robertson 1875), off the coast of Durham and North Yorkshire (Robertson and Brady 1876), the River Dee (Sidall 1876), the British shores (Brady 1884), off the South West coast of Ireland (Wright 1889), the Faeroe Channel

(Pearcey 1890), Portree Bay, Isle of Skye (Robertson 1892), and the Irish Sea (British Association 1896). It was noted from Dogs Bay by Wright in 1900, from the Firth of Forth by Pearcey in 1903, and from the Plymouth area by Worth in 1904. Heron-Allen and Earland recorded this species from the North Sea and Clare Island area in 1913, from 5 fathoms off Jura, 20 fathoms in the Sound of Mull, and 12 fathoms in Loch Sunart in 1914, from West of Scotland and the South coast of Cornwall in 1916, and from the Plymouth area in 1930. It was obtained from one station in the Plymouth area by the Marine Biological Association in 1957, and in the following year Le Calvez noted this form South of Ireland and South of Lands End.

The species has been recorded from the North and South Atlantic and North and South Pacific (Brady 1884), the Arctic and Scandinavia (Goes 1894), the Malay Archipelago (Millett 1904), the Atlantic (Cushman 1930), the Antarctic area (Wiesner 1931), the Southern California area (Natland 1933), the Falklands sector of the Antarctic (Earland 1934), off Bergen and from Iceland (Norvang 1941; 1945). Parker in 1948 noted this form occurring from the Gulf of Maine to Maryland, and Cushman in 1948 obtained it from the Arctic. In 1957 Todd and Bronnimann obtained this form from the offshore zone of the Eastern Gulf of Paria, and Vella noted it in Cook Strait, New Zealand. In 1958 Todd recorded it from the Western Mediterranean, Norin from the Central Tyrrhenian Sea, and Parker from 86-567 metres in the Eastern Mediterranean. It was noted off Brazil in 1959 by Boltovskoy, from

35 and 875 metres in the Gulf of Gascogne in 1959 by Berthois and Le Calvez, and from the Gulf of Naples in 1960 by Hofker. In 1961 it was recorded from the continental platform between Santo Tome and the Rio de la Plata, Argentina by Boltovskoy, and from the Mediterranean coast of Israel by Reiss, Klug, and Merling. It was recorded by Cita and Chierici in 1962 from the Adriatic Sea, by Hulme in 1964 from Manukau Harbour, Auckland, New Zealand, and by Holtedahl in 1965 from Hardangerfjord, Norway.

Stratigraphic Occurrence: Reade in 1900 recorded this species from the Holocene deposits of Formby and Leasowe.

In 1891 Sherborn and Burrows noted it occurring in the London Eocene. Post-Tertiary occurrences were noted by Crosskey and Robertson from Loch Gilp in 1868, Duntroon in 1868, Bute in 1873, and the Kyles of Bute in 1874. Robertson in 1876 also noted this form occurring in the Post Tertiary of the Isle of Bute, and of Greenock in 1885. Wright recorded the species from the Drift deposits of County Cork in 1902 and from the Boulder Clay of County Down in 1904.

In 1964 Feyling-Hanssen recorded the species from the Holocene deposits of the Oslo Fjord area.

Eocene occurrences have been noted from Texas (Plummer 1926), and Alabama (Toulmin 1941). Occurrences in the Miocene were recorded from Egypt and Sinai (MacFadyen 1930), the Carpathian foreland (Luczkowska 1957), and the Gulf of Suez region (Souaya 1965). In 1955 Rao noted the form in the Tertiary of India. Papani and Pelosio in 1962 noted the species ranging from the Pliocene to Pleistocene at

Parma, and Todd in 1958 recorded it in the Pleistocene portion of a core taken from the Western Mediterranean. It was recorded in 1964 from the Late Quaternary of Norway by Feyling-Hanssen.

Diagnosis: This species is widely distributed in temperate latitudes, generally in nearshore regions. The stratigraphic range is from the Eocene to Recent.

CHAPTER 10

A taxonomic re-interpretation and emendation of the genus *Technitella* Norman 1878

Introduction: A number of specimens of this genus were retrieved from Tremadoc Bay samples and as a result of investigation into the relevant literature, examination of these specimens as well as specimens deposited in the British Museum (Natural History), London, a re-interpretation of this genus was found to be desirable, with a consequent emendation of the genus.

It is proposed to describe and examine all the known species of *Technitella*, as well as the genus itself, with an analysis of the various authot interpretation, to describe the specimens from Tremadoc Bay, and then to re-interpret this genus and its species in the light of this new evidence.

Super Family: Ammodiscacea Reuss 1862

Family: Saccamminidae Brady 1884

Sub Family: Saccammininae Brady 1884

Genus: Technitella Norman 1878

Technitella Norman 1878 = Brady 1881, de Folin 1881, Jones in Griffith and Henfrey 1883; Brady 1884; Robertson 1885; Perrier 1893; British Association 1896; Flint 1899; Chapman 1902; Cushman 1910; Rhumbler 1913; Heron-Allen 1915; Cushmah 1918; Cushman 1925; Cushman 1927; Cushman 1929, Cushman 1933; Galloway 1933; Marie 1938, Cushman 1959; Glaessner 1963; Pokorny 1963; Loeblich and Tappan 1964.

Test free, consisting of single elongate, oval, fusiform or cylindrical chamber; wall thin, composed of longitudinally aligned sponge spicules, with some sand grains; aperture terminal, rounded, may be on short neck. (Protista Treatise 1964).

Remarks: The occurrence of this genus has either been simply recorded, or recorded and described as being a free form by the authors mentioned above.

British Museum specimens: Slide D23259-260 (Brady; Challenger expedition) contains two specimens, one broken, and one entire. Specimens are only superficially like Technitella and the slide is labelled Technitella? Slide G30682 (Heron-Allen and Earland; Goldseeker Haul 7427). One collapsed specimen

Technitella archaeonitida Stainforth and Stevenson 1946

Pl.21, figs.1,2,3.

= T.archaeonitida Hofker 1956

Type Description: This species is ellipsoidal and in its usual flattened state of presentation appears from 1-½ to 3 times as long as broad...........The test is made of closely spaced sponge spicules set parallel to the long axis in a minumum of non-calcareous cement. The diameter of the spicules chosen varies from one specimen to another, but it is usually uniform in any one specimen. Tests made of very fine spicules predominate. The small aperture is terminal, a simple circular opening formed by the ends of spicules neatly arranged to lie flush with one another. Thd aboral end is equally neatly made, either with long spicules forming a point, or with a few fragmentary ones fitting into a smooth contour of the test.

British Museum specimen: Slide Y91P31565. Thin section of this species.

Remarks: Stainforth and Stevenson distinguished this species from other similar forms on morphological and stratigraphical grounds.

Technitella atlantica Cushman 1947

Pl.21, fig. 4.

Type Description: Test composed of a single chamber, somewhat compressed, the sides nearly parallel, base truncated, apertural end contracted to a cylindrical neck; wall composed of sponge spicules arranged generally lengthwise of the test and usually with one or more elongate ones extending beyond the base of the test; aperture rounded, at the end of the apertural neck.

Remarks: Cushman comments on the affinity of this species to T.nitida

Technitella asciformis Pearcey 1914

Pl.21, figs.5,6.

Type Description: Test free, flask shaped, consisting of a single chamber, ovately curved at the apical end; produced to a short thick neck; terminating in an everted phial-like lip grooved on the inside; aperture a small circular opening. Walls comparatively thick, composed of fine spicular material and fine argillaceous cement, with a strong chitinous lining which permits of the whole test becoming more or less flexible.

Technitella bradyi Earland 1934

Pl.21, figs.8,9,10.

= T.melo Brady 1884; T.melo Cushman 1918; T.melo Wiesner in Drygalski 1931; T.bradyi Parr 1950; T.bradyi Barker 1960

Type Description: Test monothalmous, flask shaped, oval or roughly spherical; wall firm and thin, composed of a single layer of sand grains and fragments of large sponge spicules in varying proportions, evenly cemented together; aperture round and simple, with collar of the cement seldom produced beyond the body of the test. Size and shape variable.

British Museum specimens: Slide A30ZF3512 (Heron-Allen and Earland; Discovery station 482), 11 specimens, 10 entire, 1, broken.

Globular to elongate globulqr with simple circular aperture.

Slide W4.901. (Heron-Allen and Earland; Clarence Island). Thin section of this species.

Remarks: Earland comments on the similarities between this species, T.melo and abnormal specimens of T.legumen

Technitella candida Wiesner 1931

Pl.21,figs.7.

Technitella flexibilis Wiesner 1931

Pl.21,figs.11,12.

Technitella globulus Wiesner 1932

The type descriptions of the above three species are in German, but do not indicate any variation from a typical Technitella

Technitella hystrix Chapman and Parr 1937

Pl.21, fig.13.

Type Description: Test cylindrico-ovate as in some examples of Technitella legumen, but with the spicules set at varying angles from the body, producing an echinate appearance. Aperture at wider end. Material of test mainly spicular, possibly set in a little chitinous mud.

Technitella legumen Norman 1878

Pl.21, figs.14,15,16.

= T.legumen Brady 1884; T.legumen Goes 1894; T.legumen Chapman 1902; T.legumen Cushman 1910, 1918, 1925, 1927, 1933, 1948, 1959; T.legumen Heron-Allen and Earland 1912; T.legumen Lacroix 1929; T.legumen Wiesher in Drygolski 1931; T.legumeh Galloway 1933;

T.legumen Hoglund 1947; *T.legumen* Sigal in Piveteau 1952; *T.legumen* Barker 1960; *T.legumen* Pokorny 1963.

Type Description: The form of the test...........being cylindrical throughout the greater part of its length, with the aboral extremity slightly extruded, and that rather out of the central line......while the mouth opening is in the form of a contracted tube.....the body wall... is built up of the fragments of minute acerate spicula, laid in regular order side by side, and cemented with a mortar composed probably of the finest dust of quartz.

British Museum specimens: Slide C58ZF2427 (Brady; Challenger Expedition 1491), 2 specimens, 1 intact, 1 broken. Elongate-ovate test with simple aperture.

Slide C58ZF2428 (Brady; Challenger Expecition 276), 1 intact specimen. Circular aperture on produced part of elongate-ovate test.

Slide D23255 (Brady; Challenger Expedition 23) 1 specimen. Elongate and open at both ends.

Slide D23256 (Brady; Challenger Expedition 323) 1 denuded specimen with circular aperture.

Slide D23257 (Brady; Challenger Expedition 122) 1 irregular abnormal specimen.

Slide D23258 (Brady; Challenger Expedition 164A) 1 regularly elongate-ovate specimen with circular aperture.

Slide H2088-101 (Brady; S.W. of Isle of Man). 14 specimens, 10 broken, 4 intact. Tests have circular aperture with spicule concentration at opposite end.

Slide H20-102-106 (Brady; 16 miles off Hawthorne) 5 specimens, all collapsed to a certain degree. One specimen in this slide will be discussed later.

Slide H20 107,108 (Brady; Hebrides) 2 specimens broken. Spicule concentration present.

Slide H20 109-117 (Brady; S.W. of Isle of Man) 9 specimens. Circular aperture present as well as spine concentrations.

Slide H30 131 (Brady; S.W. of Isle of Man) Thin section of this species.

Slide H30 2 (Brady; off Cumbrae) 2 specimens, 1 broken, 2 intact. Considerable amount of arenaceous material included in the test. Spicule concentrations present.

Slide D47 494 (Brady; off Cumbrae) 1 specimen with arenaceous material incorporated into the test wall.

Slide G29641-644 (Heron-Allen and Earland;Goldseeker Haul 141). 3 specimens, 1 intact with circular aperture and spicule concentration.

Slide G29 645 (Heron-Allen and Earland; Goldseeker Haul 141) Thin section of this species.

Slides G29646-648/G29649/G29650 (Heron-Allen and Earland; Goldseeker Haul 141) Thin sections of the species.

Slide G30651-652 (Heron-Allen and Earland; Goldseeker Haul 72) 2 specimens, 1 intact, 1 open at both ends, broken.

Slide G30653-655 (Heron-Allen and Earland; Goldseeker Haul 228) 3 specimens, 1 broken, 2 collapsed. Spicule concentrations present. Aperture produced on one specimen.

Slide G30 656-657 (Heron-Allen and Earland; Goldseeker Haul 225)

2 specimens, both broken but with arenaceous material incorporated into the test wall.

Slide G30 658-660 (Heron-Allen and Earland; Goldseeker Haul 141)

3 specimens, 2 broken, 1 intact with circular aperture and spicule concentration.

Slide G30 661 (Heron-Allen and Earland; Goldseeker Haul 141) 2 specimens, 1, broken, other has spicule concentration.

Slide G30 662 (Heron-Allen and Earland; Goldseeker Haul 141). Thin section of the species.

Slide G30 665 (Heron-Allen and Earland; Goldseeker Station 39B). Thin section of the species.

Slide F41 4751-4771 (Millett; Malay Archipelago) 21 specimens all with circular apertures and spicule concentrations.

Slide F10 1495 (Norman; Bergen, Norway) 2 broken specimens.

Slide F10 1496 (Norman; Oster Fiord, Norway) 9 specimens, 2 showing openings at both ends.

Slide H612F3628 (Norman; W. of Valentia) Type species.

<u>Technitella melo</u> Norman 1878

Pl.22,figs.1,2.

= <u>T.melo</u> Folin 1888; <u>T.melo</u> Cushman 1910; 1948; non. <u>T.melo</u> Brady 1884; <u>T.melo</u> Cushman 1918; <u>T.melo</u> Wiesner in Drygalski 1931.

Type Description: Test regularly ovoid, broadly and evenly rounded below (aborally), greatest diameter below the middle; above the middle sloped away to the central anterior (oral) opening. Oral opening not markedly extruded or tubular........but compressed, so that the opening is in the form of a slit; this slit in the type is wider at the sides than in its central portion. The test is formed of minute linear sponge-spicules, built carefully into the walls, and the interstices filled with.........snow white cement,......the aboral portion is garnished with scattered acerate projecting spicula, the pointed ends of which are protruded considerably from the body wall, and are invariably directed backwards

British Museum specimens: Slide C58ZF2429 (Brady; Challenger Expedition 344) 4 intact specimens varying in size, with simple, circular apertures and spicule concentrations.

Slide E39834 (Norman; Porcupine No.28) 1 specimen with simple aperture.

Technitella mestayeri Cushman 1919

Pl.22,fig.9.

Type Description: Test elongate, slightly tapering cylindrical, arcuate; wall composed of fine acicular sponge spicules with a very little graying cement; initial end broadly rounded; apertural end truncate with a slight lip, colour graying yellow; surface fairly smooth.

Remarks: Cushman compares this species to T.legumen

Technitella nitida Heron-Allen and Earland 1932

Pl122,fig. 3.

= T.nitida Stainforth 1949

Type Description: Test monothalmous, an elongate oval, broadest below the middle, and narrowing towards the oral end, where there is a large simple aperture surrounded by a slightly thickened and everted lip......

Constructed of fine acerate sponge spicules, mostly unbroken, neatly cemented together with a white cement, in a single layer, so that the spicules lie regularly parallel to the long axis of the test. Surface smooth and without any projedting spicules.

Remarks: The authors state that this species appears to occupy a position intermediate between _T.legumen_ and _T.melo_

British Museum specimens. Slide A30ZF3513 (Heron-Allen and Earland; Discovery Station W5531). One irregular collapsed specimen with a circular aperture.

Technitella raphanus Brady 1884

Pl.22, figs.7,8.

= _T.raphanus_ Perrier 1893; _T.raphanus_ Wiesner in Drygalski 1931

Type Description: Test free, elongate, subcylindrical, straight or somewhat curved; broad near the superior extremity and tapering to a point at the inferior. Aperture a simple round orifice formed by the gradual constriction of the superior end of the test.

British Museum specimens: Slide C58ZF2430 (Brady; Challenger Expedition Station 174C). Syntypes. 2 specimens, open at both ends of the test.

Technitella richardi de Folin 1887

Details for this species have been unotbainable.

Technitella thompsoni Heron-Allen and Earland 1909

Pl.22, figs.4,5,6.

= _T.thompsoni_ Heron Allen 1915; _T.thompsoni_ Cushman 1918.

Type Description: Test free, sub-cylindrical, rounded and slightly tapering at one extremity and bluntly truncate at the other, consisting of a hollow chamber with composite walls built up entirely of echinoderm plates in a more or less perfect condition. The plates which overlap each other are fastened together without visible cement. No special aperture at either end of the test, the extremities being closed by means of similar plates set at an angle.....Surface of the test near and regular, and entirely devoid of extraneous matter, but the projecting ddges of the flat (or slightly durved) plates used in the construction of the test give a somewhat irregular or serrate appearance to the outline.

British Museum specimens: Slide G30666-671 (Heron-Allen and Earland; Goldseeker Station Burghead) 6 thin sections of this species.

Slide G30 672 (Heron-Allen and Earland; Goodseeker Haul 73) "Mock specimen".

Slide G30 673 (Heron-Allen and Earland; Goldseeker Haul 73) Topotype. Specimen open at both ends.

Slide G30 674-679 (Heron-Allen and Earland; Goldseeker Haul 73) 6 broken specimens.

Slide G30 680 (Heron-Allen and Earland; Goldseeker Haul 73). Thin section with protoplasm traces at both ends of the form.

Slide G30681 (Heron-Allen and Earland; Goldseeker Haul 2182). Specimen open at both ehds.

Discussion: In 1878 Norman in his paper "On the genus *Haliphysema*, with description of several forms apparently allied to it" suggested that a possible relationship existed between *Haliphysema* and *Technitella*, but that the latter genus was distinguished from the attached

Haliphysema by nature of its free and unattached character. An interesting feature of this paper is that his figured specimens are drawn with the aperture at the base of the test, and the figures are shown with the spicules directed upwards. All workers to the present day have follåwed Norman except with regard to diagram orientation and described the various species with the following general phrases:-

(i) Test free and unattached.

(ii) Test monothalmous

(iii) Simple circular aperture at one end, and spicule concentrations at the other.

These free, unattached, monothalmous forms have been obtained from Tremadoc Bay (Pl.20, figs.1-5,7), but in addition a monothalmous, fixed form was obtained (Pl.20, fig.6), and a colonial, fixed specimen was retrieved (Pl.20, fig.8). All the species that have been erected to date, vary only on the test appearance, degree of inflation, relative length and breadth (excluding _T.thompsoni_), and these morphological features are believed, from evidence of Tremadoc Bay specimens, to be simply a factor of age, and corresponding development of the colony. When for some reason, the colony dies or is destroyed, it breaks up owing to the fragile nature of the test wall and varied specimens resembling the aformentioned "species" are releasei. Very few, if any of the _Technitella_ species have been recorded as being found living. Since destruction or death can occur in the colony at any time, the various components of a colony can be of varying sizes (depending on the stage of development), and these components when they have been found by previous authors have been erected to a species level, instead of being recognised as parts of a larger organism. As these "fragments" have been considered to be an entity in themselves, authors have been forced into recognising oral, aboral, superior and inferior ends, and of course an aperture. The aperture has always been taken as being the circular or slit like opening at one end of the test, sometimes produced on a neck. This aperture is in fact the attachment area (that is, the weakest point when a colony breaks up), and it is proposed that the actual aperture is at the opposite end of the test, where masking by spicules occur. The aperture can be in the form of a simple opening surrounded by spicules, can sometimes have plates or grains incorporated into the test wall surrounding it, or possibly can take the form of a number of perforations in between the spicules. The spicules projecting beyond the test could then be possibly regarded as a filter/defensive adaptation to the apertural region. The masking by these spicules makes any recognition of an aperture hazardous but on Slide H20 102-106 in the British Museum there is one specimen with a definite aperture in this region, a minute circular opening (not a break in the test wall), slightly masked by spicules), at the opposite end to the supposed "aperture". The former neck and lips of authors are believed to be an attachment modification similar to the attachment disc of _Haliphysema_. The dactyloid fringes of Hoglund (1947) could be part of this disc. In the light of this new evidence it has been found desirable to emend the generic description as follows:-

Technitella Norman emend. Haman

Test attached, simple monothalmous, or colonial polythalmous, consisting of a single, elongate, oval, fusiform chamber, or of a branching tubular colony. Attachment area may have a disc developed, or may be simple. Aperture at opposite end of test to attached portion, small, simple, circular, with or without grains or plates incorporated into test wall around it; or a number of small pores set between the spicules. Wall thin, composed of acicular sponge spicules set longitudinally parallel into the test wall or at an angle to it and projecting from it in the apertural direction. Concentration of these spicules found in the apertural region projecting beyond the limit of the test. Small amouht of cement present although some sand grains may be incorporated into the test wall. Colour brilliant white to grey, pink when stained with Rose Bengal.

Dimensions: Variable.

Under the Rules of Nomenclature Normans type species *T. legumen* must stand as being valid, but it is again necessary to emend the type description. Since the type species should be either the monothalmous attached form or the colonial attached form, it is proposed that both these forms be included in the type species as genoholotypes with the taxonomic category 'forma' used for convenience, although it has no taxonomic validity as such.

Technitella legumen Norman emend. Haman

forma colonial

Pl.20, fig. 8.

Test attached, colonial, composed of four to five elongate tubes, arising either from one another or from different parts on the anchoring material.

Attachment area large, disc like. Aperture indeterminate, formed by the open ends of the tubes which are broken. Test wall thin, with acicular spicules set in it randomly, somewhat denuded (due to transport?), matte like in appearance.

Dimensions: Length of branches up to .75mm.

Diameter of branches 0.25 mm.

Occurrence: Shallow water sheltered environment to the lee of St.Tudwals Island.

forma solitary

Pl.20, fig.6.

Test attached, simple, monothalmous, tubular, longer than broad, breadth equal throughout, except in the upper one third of the test, where it becomes bluntly pointed, slightly curved. Apertural opening indistinct situated at the masked superior end. Test wall thin, tectinous, covered with acicular sponge spicules wholly or partly embedded in the wall, 70-75% of the spicules directed superiorly where there is a distinct concentration of the spicules extending beyond the limit of the test. Remainder of the spicules are randomly scattered over the wall and projecting at varying angles. Colour pink.

Dimensions: Length of body up to 1.85 mm.

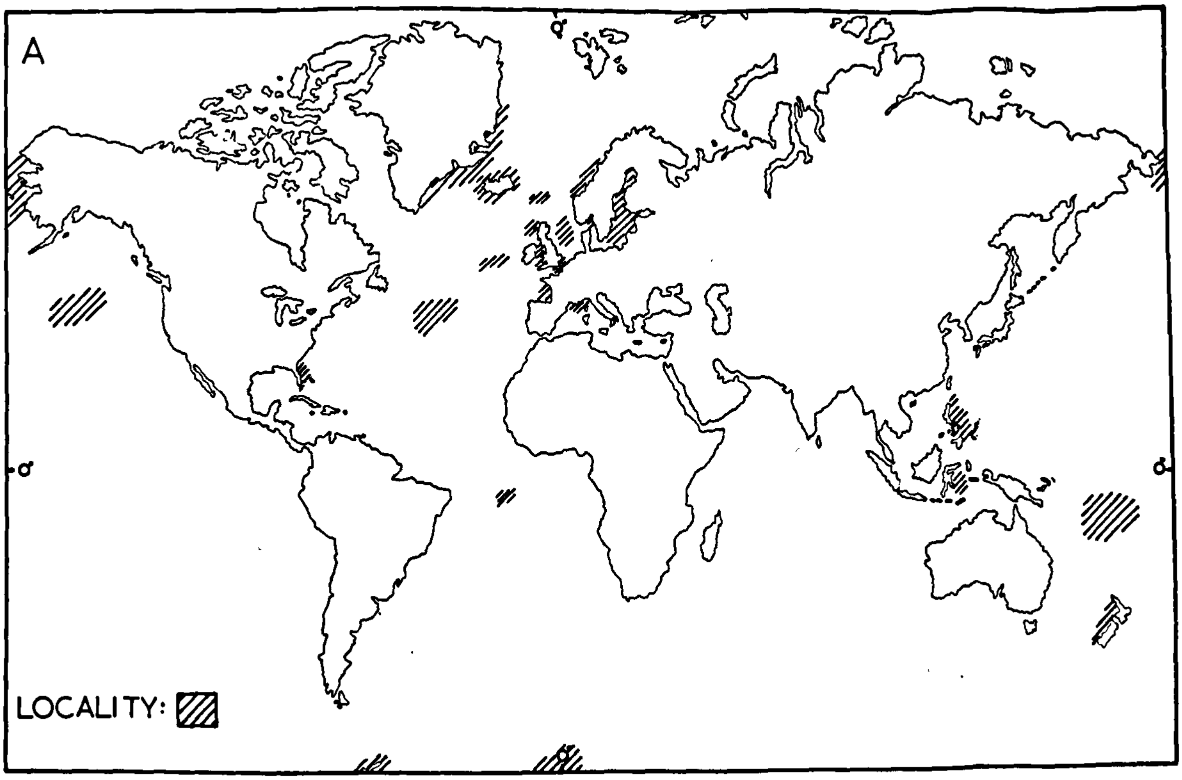
Diameter of body (maximum)0.55 mm.

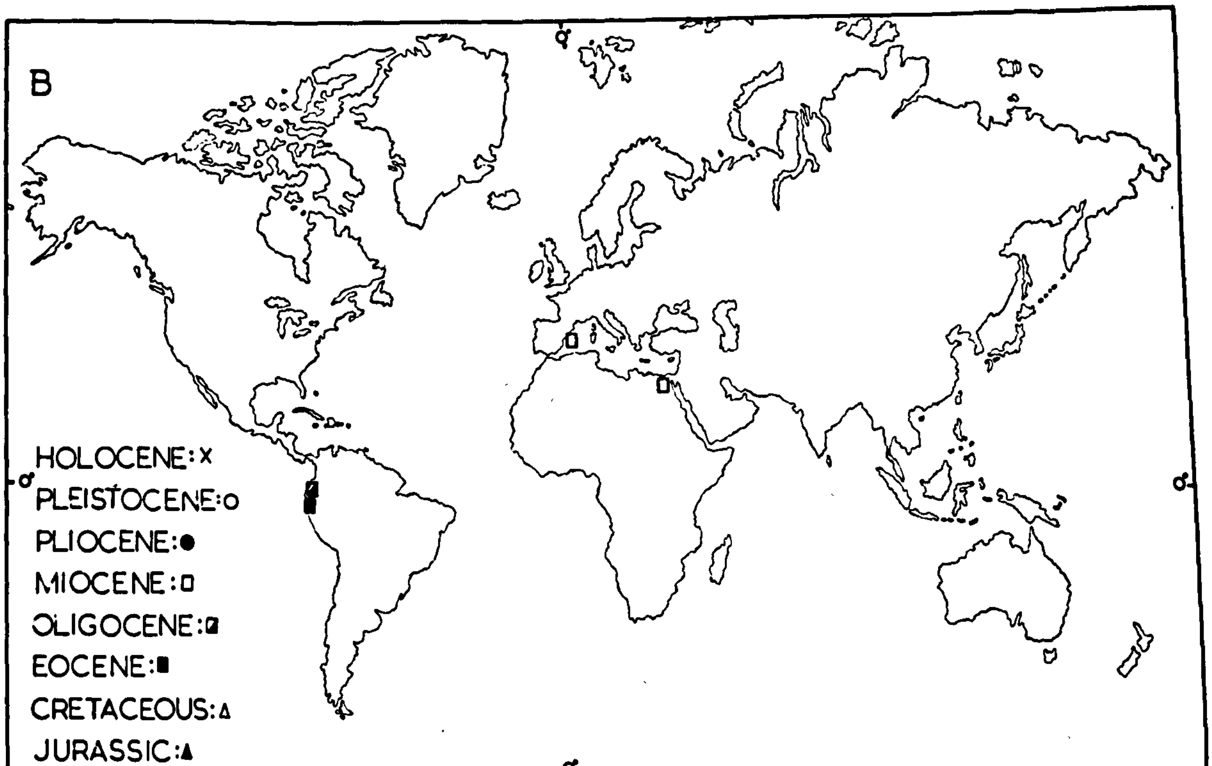
Occurrence: Shallow water sheltered environment to the lee of St. Tudwals Island.

The prâblem now remains of where the species Techâitella thompsoni Heron-Allen and Earland fits in to the new scheme. It is proposed that this species should not have been placed in the genus Technitella in the first place, as it does not show any of the typical generic features. Heron-Allen and Earland discuss the test material in their remarks on the species and also note Wrights statement that this form was "probably not a foram at all". The authors proved the rhizopodal nature of the test, and possibly due to the high degree of selection of the material for the test wall placed it in the genus Technitella. The nature of the species being fusiform, agglutinated, and without a distinct aperture place it in the Family Astrorhizidae Brady 1884 but its exact taxonomic position is open to conjecture.

The genus Technitella and its representatives appear to have an essentially boreal distribution (Text-fig.47A), although recorded occurrences have been noted from more temperate and hot environments. The optimum environment appears to be in shallow water (Marine), with little wave or current disturbance. The stratigraphic range (Text-fig.47B), is Eocene to Recent, although recorded occurrences prior to the Recent are very rare.

Conclusion: All previous theories concerning the mode of life of the genus Technitella have been shown to be incorrect. The generic description has been emended, as has the description of the type species, all other species of Technitella being now invalidated.





TEXT FIG. 47 : RECORDED RECENT (A) AND STRATIGRAPHIC (B) OCCURRENCE OF :- TECHNITELLA REPRESENTATIVES

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CHAPTER 11

On thin sections of selected foraminifera species

A number of foraminifera were selected to be thin sectioned by means of the Polymethyl Methacrylate method (Moore and Carroway 1963), and these thin sections were examined and the results listed below.

Vernauilina media. Test wall medium to coarsely arenaceous, composed of grains showing every degree of shape from angular to sub-rounded. The grains are predominately quartz, with accessory felspar and mica set in a distinct brown, ferruginous cement. Small quartz grains and cement fill the interstices between the larger components of the wall. The wall thickness is not constant varying from one grain up to three grains in thickness. The grains are randomly arranged.

Massilina secans. Test wall homogenous in appearance due to the calcareous nature of the wall. No distinct preferred orientation of the component crystals. Wall imperforate.

Quinqueloculina agglutinata. Homogenous appearance to the test wall, the ultimate and penultimate chambers having fairly distinct quartz grains adhering to the wall. No distinct preferred orientation of the component crystals. Wall calcareous, imperforate.

Quinqueloculina aspera. Test calcareous, imperforate, homogenous in appearance, with no distinct preferred orientation of the component crystals. Distinct covering of small quartz grains on the ultimate and penultimate chambers.

Quinqueloculina bicornis. Wall calcareous, imperforate, homogenous in appearance with no distinct preferred orientation of the component crystals. Striae on the early chambers have not been absorbed by the later chamber walls.

Quinqueloculina lata

Quinqueloculina seminulum

Triloculina angulata

Triloculina trigonula

The above four species, due to the calcareous nature of the test are homogenous in appearance in thin section, imperforate, with no distinct orientation of the component crystals.

Pyrgo williamsoni. Wall calcareous, homogenous in appearance, imperforate. Previous aperture is quite distinct, and has not been absorbed by the later chamber.

Miliolinella chuckchiensis. Wall homogenous in appearance, imperforate, calcareous, with no distinct preferred orientation of the component crystals.

Lagena sulcata var. interrupta. Test thin walled, lamellar, radial hyaline, densely and finely perforate.

Bulimina gibba. Test wall composite lamellar, radial hyaline. Earlier chambers are distinctly enveloped by the lamellae formed in the later chambers. Wall densely and finely perforate by regular, circular pores set normal to the test surface.

Discorbis williamsoni. Test wall lamellar, densely perforate with composite pores interspersed with smaller regular pores.

Ammonia beccarii. Test wall composite lamellar, radial hyaline.

Elphidium crispum. Test wall radial hyaline, composite lamellar. Densely perforate by two different sized pores. Keel similarly perforate. Doubtful trace of spines present in juvenile portion of test but this may be a secondary deposit of calcite along the chamber walls.

Elphidium crispum var. spinosum

Elphidium discoidale

Elphidium excavatum

Elphidium magellanicum

Elphidium selseyense

The above five forms have a test structure identical with *E. crispum*. *E. excavatum* is perforate by pores of three differing sizes.

Cibicides lobatulus Test wall calcareous, radial, bilamellar, densely and evenly perforate by pores of irregular shape.

Planorbulina mediterranensis. Test wall composite, radial hyaline. Wall perforated by large, widely and evenly distributed circular and sub-circular regular pores, interspersed amongst smaller punctae. The initial *Cibicides* like portion of this species if clearly shown before the development of the lateraannular chambdrs.

CHAPTER 12

On the ecological features of Tremadoc Bay

Introduction: In ecological studies of this type numerous workers have listed all the possible ecological factors and have then attempted to work out the relative importance of each factor. This is quite justified, but when workers emphasize a single dominant factor and tend to ignore the other factors the work becomes dangerous to a certain degree because later workers could follow these ideas and thus misinterprete the overall pattern. It must be emphasized that it is not one ecological factor alone that determines a foraminiferal environment but that it is essentially a complex, interelated process in which all the factors combine into an overall ecological picture. It is proposed to examine all the ecological factors with regard to Tremadoc Bay, then in a later chapter draw a correlation between the foraminiferal associations and the ecological zones.

Edological factors:-

(i) Depth; The bathymetry of this area has been discussed earlier (Chapter 1; Text-fig.9). In a nearshore, shallow water area such as Tremadoc Bay depth is not of paramount importance as the greatest depths are in the region of about only 20 fathoms, and it is extremely difficult to delimit depth zones in such a shallow area. Four depth zones have been drawn up :-

Zone A: Supra Littoral; above High Water Mark.

Zone B: Littoral; between High Water and Low Water Marks.

Zone C: 'Shoal' Neritic; 0-10 fathoms.

Zone D: 'Hollow' Neritic; 10-25 fathoms.

The boundary between Zones C and D is tentative as the delimiting factor of depth may also be related to the sediment size.

(ii) Temperature; There is a great mass of information available concerning temperature as an ecological factor but its actual operation is sometimes difficult to evaluate as temperatures are simply recorded without consideration of gradients or duration. The temperature gradient may be as important to the ecology of an organism as its total summation, its average, or its actual range within a given environment during a period of time.

In Tremadoc Bay no actual temperature readings were taken and thus the author is forced to hypothesise from readings taken at other stations in Cardigan Bay. This can be done with a reasonable degree of certainty as from Cardigan Bay readings a uniformity can be noted at different localities at any one time. During 1963 regular weekly readings were taken at Aberystwyth by Dr. J.R. Haynes and the following ranges were noted :-

January	1.0°C - 2.5°C.	July	14.0°C -17.0°C.
February	0.7°C - 2.3°C.	August	14.0°C -16.0°C.
March	0.7°C - 7.5°C.	September	13.0°C -15.0°C.
April	8.0°C - 10.0°C.	October	11.0°C -13.0°C.
May	10.0°C - 11.0°C.	November	9.0°C -11.5°C.
June	12.0°C - 15.0°C.	December	4.0°C -8.5°C.

These figures show; a maximum annual range of 16.3°C.

a maximum monthly range of 4.5°C.

a lowest mean temperature of 0.7°C.

a maximum mean temperature of 17°C.

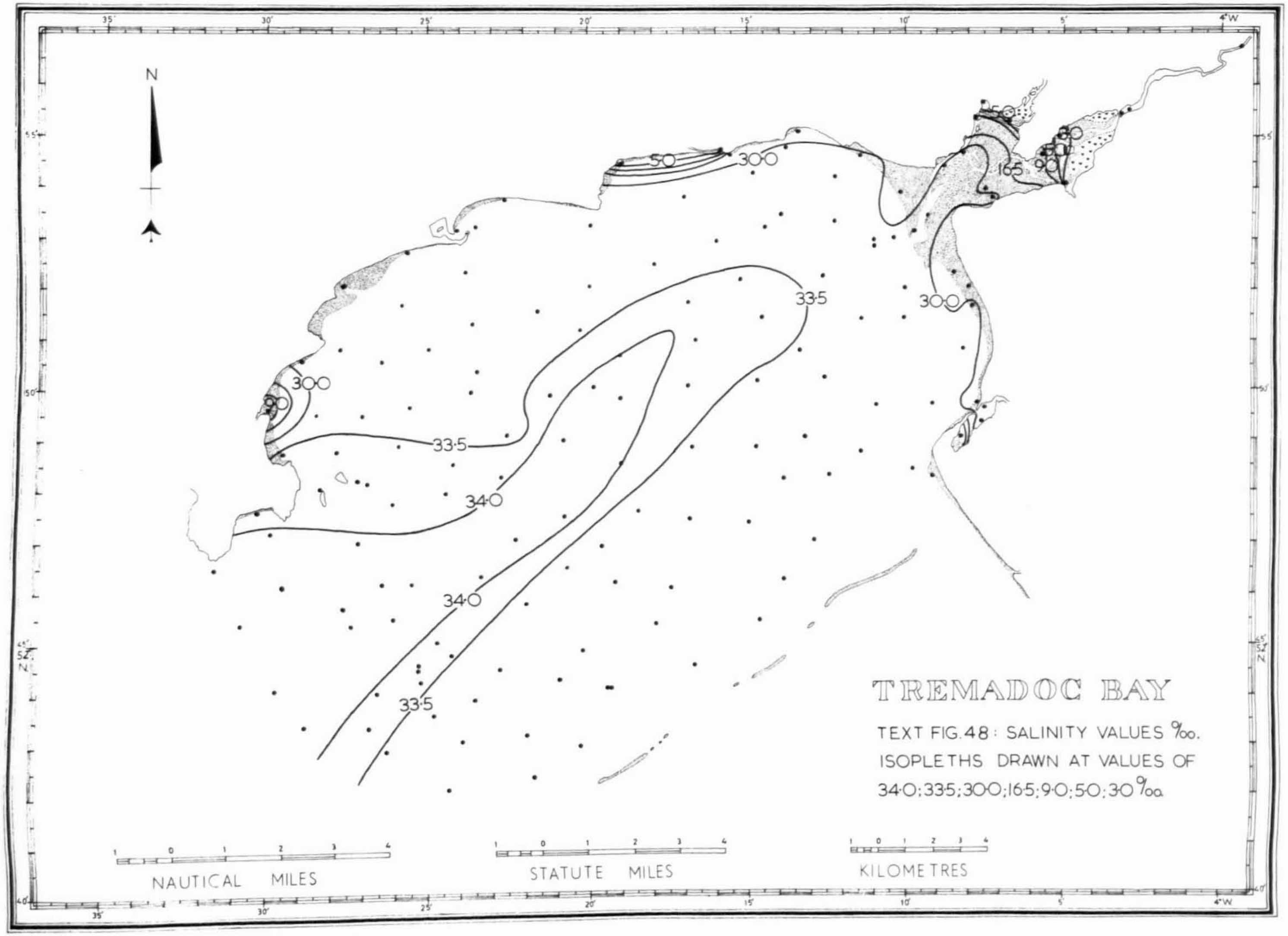
Temperature readings taken elsewhere in Cardigan Bay show a close uniformity with those taken at Aberystwyth, thus the Tremadoc Bay temperatures fairly certainly agree with those listed above. There is no evidence from anywhere in Cardigan Bay of a distinct thermocline being present. Three profiles were taken, the S.W. of the Patches Buoy in July 1963, where the surface temperature was 17.5°C, and at 13 fathoms 15.3°C, one in the "trawling grounds" to the South of Aberystwyth in October 1963 where the surface temperature was 12.9°C, this remaining constant down to 10 fathoms, and another in the same area in February 1964, where a constant temperature was noted of 5.3°C from the surface down to 5 fathoms. The maximum gradation noted with depth has been 2.2°C in 13 fathoms. It is believed that the temperature effect is seasonal and that the diurnal effect is secondary.

(iii) Salinity; In sea water the chief metallic salts, Na, Mg, Ca, K, Sr, are present in such constant proportions that for most purposes a simple analysis of one component, the chloride, is sufficient for the determination of the total salinity. As an ecological factor salinity is geographically restricted, its effects being most obvious in near shore areas, such as Tremadoc Bay where there is a certain amount of runoff and mixing.

Forty water samples were taken for salinity calculation (Harvey 1955) and the results are listed below :-

CB.341	34.3‰	CB.621	0.9‰
CB.342	34.0‰	CB.622	29.2‰
CB.343	33.7‰	CB.623	32.3‰
CB.344	33.7‰	CB.624	22.5‰
CB.345	33.2‰	CB.626	1.1‰
CB.347	33.2‰	CB.627	0.5‰
CB.349	33.7‰	CB.629	2.5‰
CB.350	34.0‰	CB.630	31.3‰
CB.351	33.9‰	CB.631	22.7‰
CB.352	33.2‰	CB.632	29.8‰
CB.611	33.9‰	CB.633	28.5‰
CB.612	33.9‰	CB.634	28.3‰
CB.613	5.0‰	CB.635	27.8‰
CB.614	33.1‰	CB.636	32.1‰
CB.615	33.1‰	CB.637	35.3‰
CB.616	33.1‰	CB.638	30.7‰
CB.617	33.1‰	CB.639	26.8‰
CB.618	33.1‰	CB.640	11.9‰
CB.619	2.8‰	CB.641	17.0‰
CB.620	20.0‰	CB.642	3.3‰

When these readings were plotted (Text-fig 48), it was noticeable that the highest salinities occurred in the centre of the bay approximately coinciding with the line of the muddy hollow. Water sample salinities from the beach and marsh stations were noticeably lower, especially where rivers occurred nearby. The classification worked out by Remane, modified by Hiltermann (1949), and listed in Pokorny (1963)



TREMADOC BAY

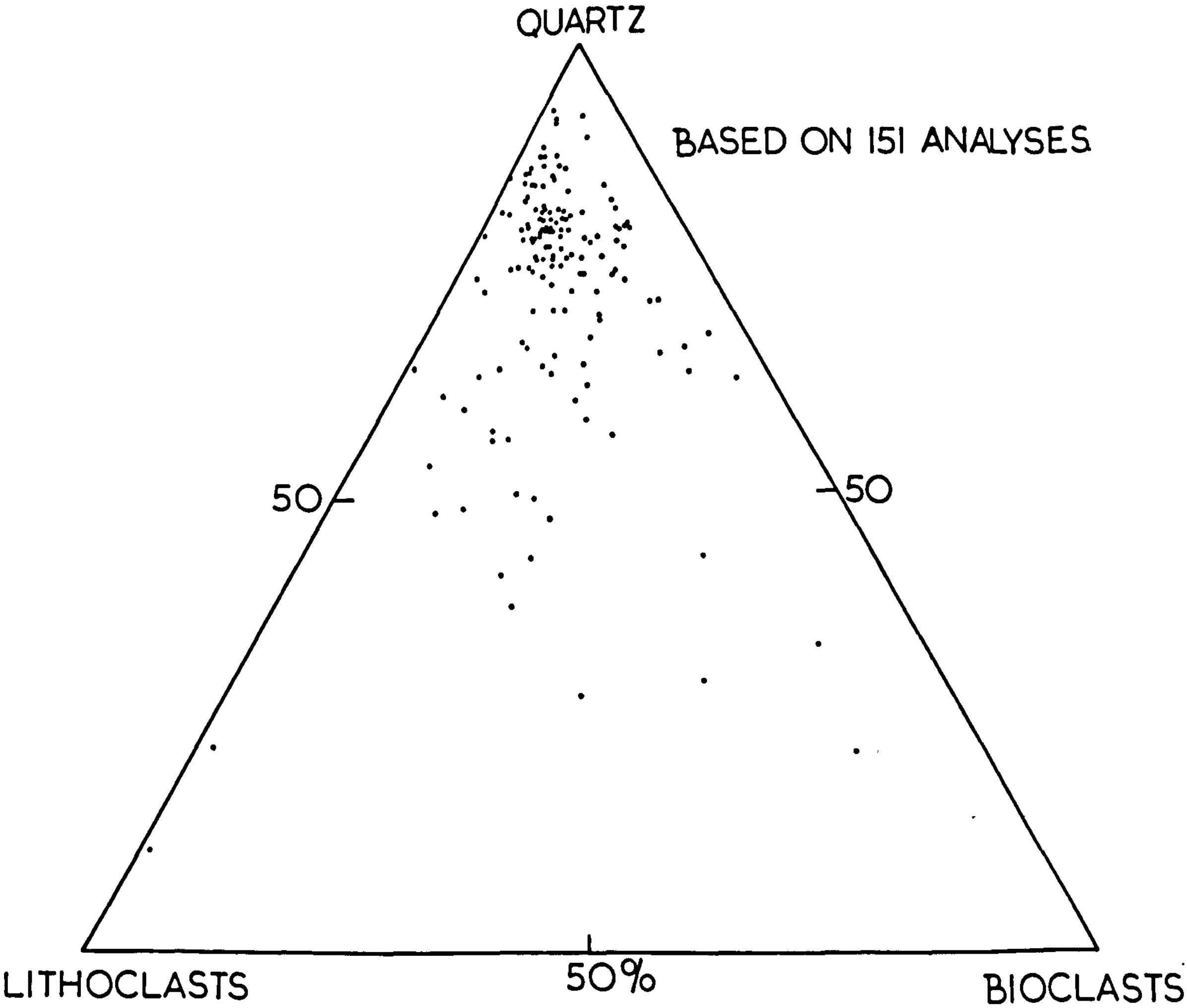
TEXT FIG. 48 : SALINITY VALUES ‰.
ISOPLETHS DRAWN AT VALUES OF
34·0; 33·5; 30·0; 16·5; 9·0; 5·0; 3·0 ‰.

has been utilised in this work, the classification being :-

	Salinity (‰)
Fresh Water	0 - 0.5
Oligohaline brackish water	0.5 - 3.0
Miohaline brackish water	3.0 - 5.0
Mesohaline brackish water	5.0 - 9.0
Pliohaline brackish water	9.0 - 16.5
Brachyhaline sea water	16.5 - 30.0
Sea water	above 30.0

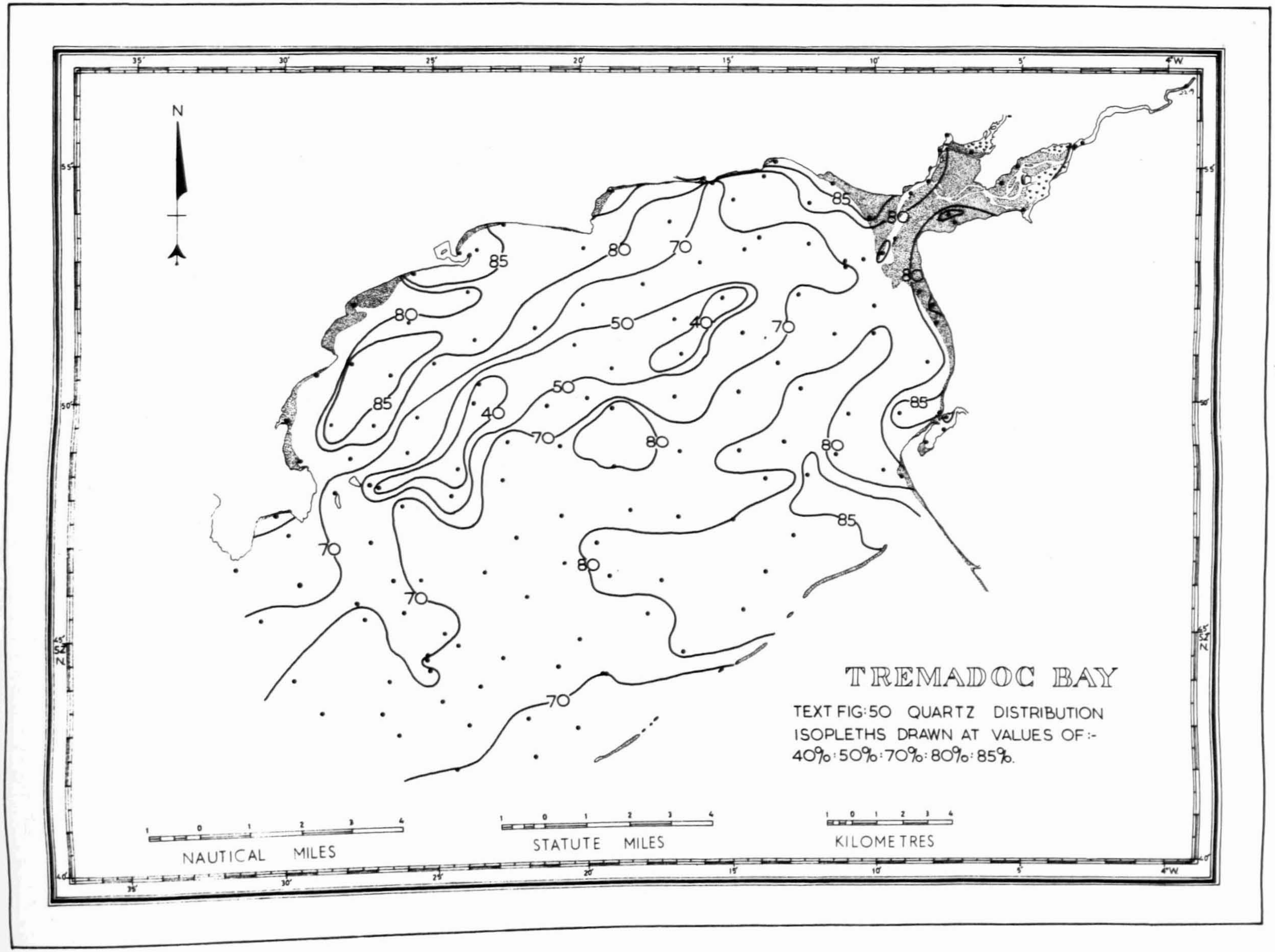
All the above divisions are represented in Port Madoc Estuary. Chlorinity values were calculated, these ranging from 1.4 - 19.5‰, and showing the same trends as the salinity values. The Tremadoc Bay salinities correlate closely with salinity readings taken at Aberystwyth at regular weekly intervals during 1963. The salinity here varied in the range 28‰ - 33‰. In Cardigan Bay as a whole there is little or no decrease or increase of salinity with depth, the maximum increase recorded to date being 0.4‰ at 10 fathoms. Due to the shallow nature of Port Madoc estuary it is believed that the "wedging" of saline and fresh water is of no importance.

(iv) Bottom sediments; There appear to be two opposed schools of thought about bottom sediments and the character of the substrate, one stating that the character of the substrate is a relatively unimportant environmental factor (e.g. Phleger 1960), whereas the other states that each type of bottom produces a distinct foraminiferal assemblage (e.g. Myers 1945). In Tremadoc Bay distinct sedimentological areas are present, and these correlate with foraminiferal assocations, so the author is of the opinion that the second theory above is true.

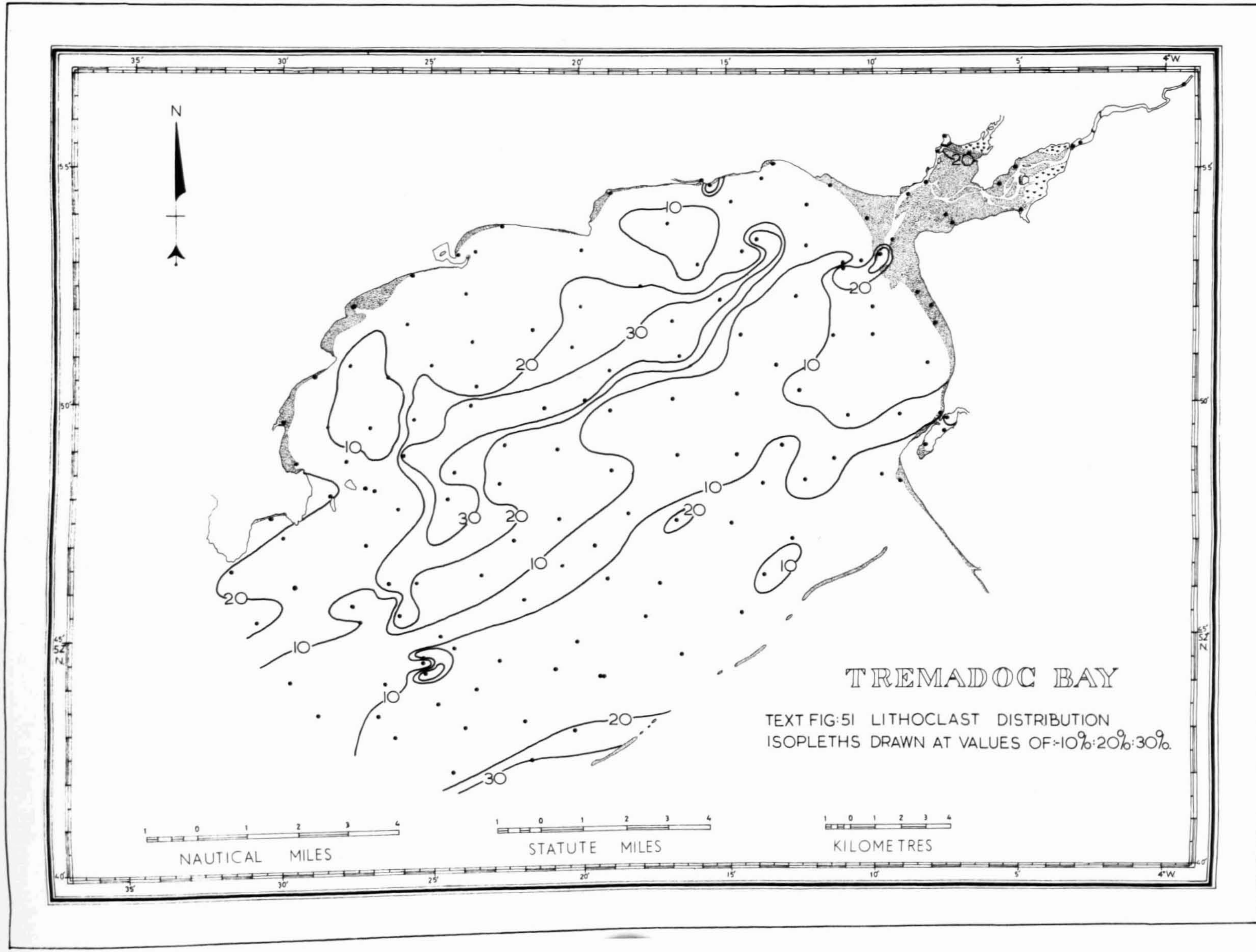

QUARTZ
BASED ON 151 ANALYSES
50
50
LITHOCLASTS
50%
BIOCLASTS
TEXT FIG: 49.

The Polymethyl Methacrylate method (Moore and Garroway 1963), was utilised in the petrological examination of the bottom sediments of this area. No detailed mineralogical examination was carried out as this is the province of another research project, but they were simply divided into Quartz, Lithoclasts, and Bioclasts. Each result was plotted on a triangle diagram (Text-fig.49), and maps drawn up for each component, Quartz (Test-fig.50), Lithoclasts (Text-fig.51), and Bioclasts (Text-fig.52).

The lowest percentages of Quartz (less than 70%) occur approximately along the line of the muddy hollow, the highest percentages (80-85%+) occur in the shallower water shoal area. Lithoclasts do not occur with high percentages anywhere in Tremadoc Bay, the highest (30%+) occurring along the muddy hollow line and at the entrance to the Port Madoc estuary. Bioclasts occur with percentages of 30-50% along the muddy hollow while the shoal areas have up to 10% bioclasts. The Wentworth scale of sediment size was noted in examination of the samples (Chapter 1). The sediments in Tremadoc Bay are fairly well sorted and thus are quite easily differentiated, those of Port Madoc estuary are not so earily differentiated However as the sediments here are formed of an admixture of silt-mud/very fine sand to coarse sand to coarse sand. Generally the coarse sand is present on the beach areas, the medium to coarse sand, just offshore on the shoal areas, the fine to medium sand along the margins of the muddy hollow, and the silt/mud to very fine sand fractions occur in the deeper hollow. Rocky patches are present as well as areas where there is a complete range of sediment


TREMADOC BAY
TEXT FIG: 50 QUARTZ DISTRIBUTION
ISOPLETHS DRAWN AT VALUES OF:-
40% : 50% : 70% : 80% : 85%.
N
NAUTICAL MILES
STATUTE MILES
KILOMETRES
4°W
52°N

from very fine sand through to coarse sand, pebbles and rocks as occurs along the Sarn. There is a direct relationship between the foraminifera of Tremadoc Bay and between the sediment sizes. The foraminiferal numbers obtained from each sample and the live/dead ratio give an indication of the rate of deposition of the sediment. High numbers of foraminifera tests are obtained from the muddy hollow samples, in the region of 1,000 to 2,000 tests per 10 ml. of sediment. This indicates that there is a very slow rate of deposition in this area and in fact the living foraminifera may be moving around on a surface covered with empty tests. Additional evidence for this theory is the extremely low percentage of living forms obtained from this region. The surrounding shoal areas are in continuous movement but are not areas of deposition but essentially areas of transport. It is believed that these areas are in equilibrium, and examination of the foraminifera tests indicates that these areas are regions of contemporaneous reworking. Port Madoc estuary is an area of aggregation and degradation, both these processes occurring in the marsh area, degradation occurring in the channels and deposition occurring at the mouth of this estuary. The degree of reworking in this area is very difficult to evaluate. As stated contemporaneous reworking is evident, and it is highly probable that Holocene deposits are being reworked in this region. One species has been obtained from this area which is typical of the Jurassic, the form being *Lenticulina varians*. This species has obviously been reworked from the Irish Sea Drift and could possibly have been derived from the

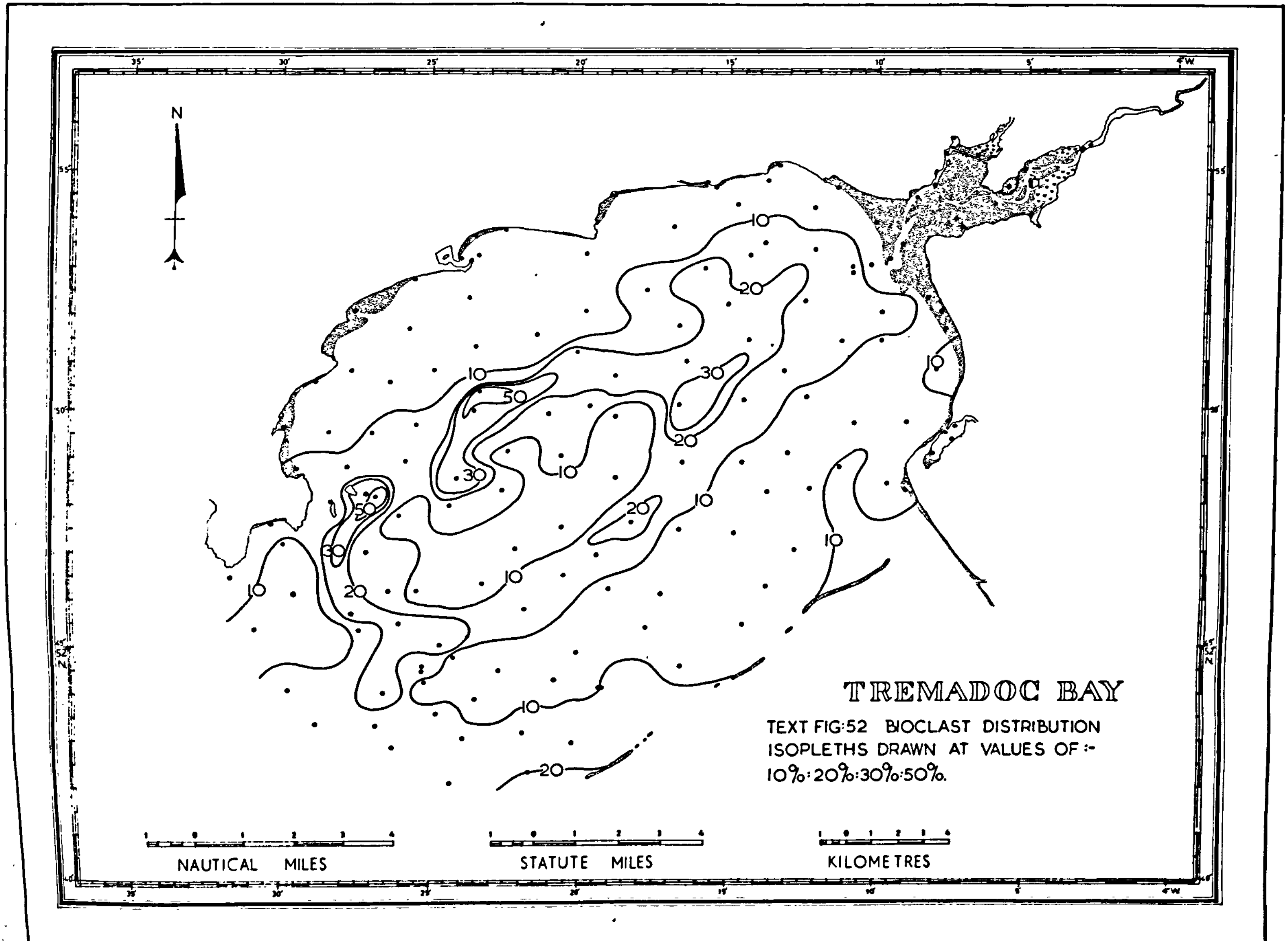

TREMADOC BAY
TEXT FIG: 51 LITHOCLAST DISTRIBUTION
ISOPLETHS DRAWN AT VALUES OF:-10%:20%:30%.
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°
N
40'

Jurassic of Mull, or from an outcrop hitherto undiscovered, on the bottom of the Irish Sea.

(v). Bottom vegetation; As it is believed that the character of the substrate is important in environmental studies, so it is believed that the character and distribution of the bottom vegetation is also important. Numerous foraminifera live attached to seaweed fronds, which when they die drop off and are contributed to the sediment. Examples of the Red, Brown, and Green seaweeds are abundant in Tremadoc, being more common on the coarse sand, rocky areas, such as around the shoals and on the Sarn. Little evidence of seaweed being present was obtained from the muddy hollow.

(vi) Food Supply; It has been stated (Lister 1903) that foraminifera feed on copeopods, infusoria, diatoms and algae, either alive or in a state of decay. The two main cycles in the nutrient process is the nitrogen cycle and the silicon cycle. The silicon cycle is impossible to evaluate in Tremadoc Bay, but the nitrogen cycle is seen to be of importanceewhen the Penrhyndeudraeth sewage disposal area is considered. As the nitrogen cycle is of importance in the breakdown of organic compounds, such as sewage, for assimilation by foraminifera, the outfall area in the estuary provides an amenable environmeht for foraminifera.

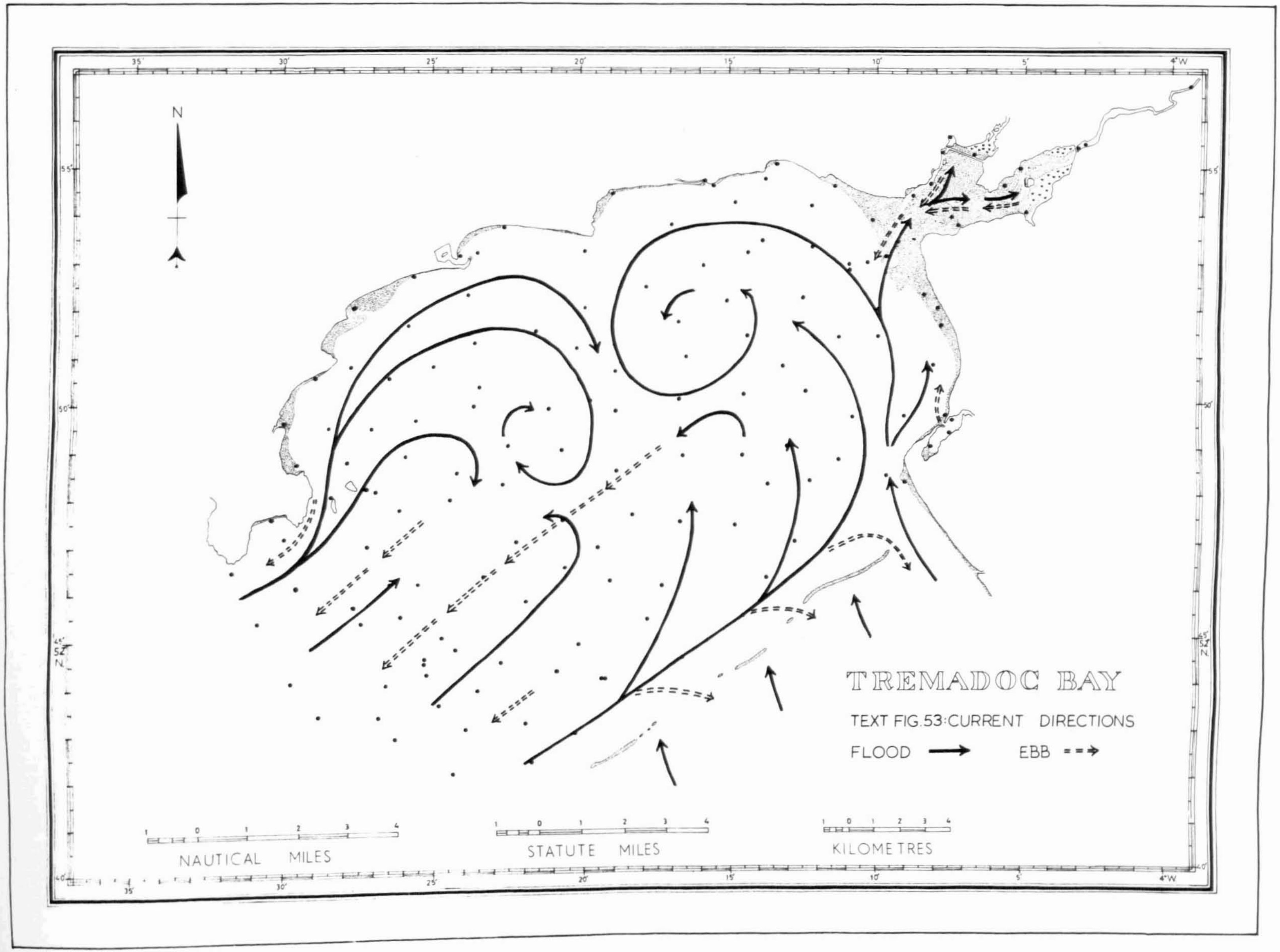
(vii) Light penetration: This factor as such would not appear to affect the zonation of foraminifera, except that it would influence the bottom vegetation and might influence the potential food supply. The degree of light penetration is controlled by absorption (by the water, by particles, and by dissolved substances, and by scattering (by the water and by particles). Thus it can be seen that the depth light


TREMADOC BAY
TEXT FIG:52 BIOCLAST DISTRIBUTION
ISOPLETHS DRAWN AT VALUES OF :-
10%:20%:30%:50%.
NAUTICAL MILES
STATUTE MILES
KILOMETRES

can penetrate to is variable due to the amount of particles, and by dissolved substances present, these being in proportion to weather conditions. Observations in Tremadoc Bay showed that on the shoal areas light penetration varied from a few inches in poor weather to 6-8 fathoms in a clear day, with a similar range in the deeper areas.

(viii) Turbulence: This factor is responsible for the mixing and homogenising of the waters in Tremadoc Bay. As the whole area of Tremadoc Bay falls into Phlegers "turbulent zone" (0-50 metres) it is reasonable to assume that the bottom sediments are well oxygenated, especially so in the shallower water regions. Due to sea water being alkaline any water of acidic composition being introduced into the bay, will, as a result of this turbulence be rapidly mixed so that the overall composition of the water would be in the region of 8-8.5pH. Naturally this composition will be slightly more acidic in the marsh and lagoon areas. The amount and severity of turbulence in Tremadoc Bay is reflected in the nature of the foraminifera tests, strong, highly ornamented tests predominating in areas of high turbulence such as the shoals, and thin slightly ornamented tests occurring in regions of weak turbulence, as in the deeper hollows. Another feature of the turbulence in this area is that the calcium carbonate content of the waters also tends to be homogenised, as well as helping in the overall distribution of nutrient.

(ix) Circulation: Water movement, apart from turbulence, in any area is ecologically important as it is responsible for sediment deposition, foraminiferal transport and dispersion. The waters of Tremadoc Bay are an offshoot of St.Georges Channel to the West, and due to the shallow nature of the bay, it is a high energy environment, as a result of water pile up. The prevailing current direction in Cardigan Bay as a whole is N.N.W. with a clockwise circulation around the bay. This simple circulation is complicated in Tremadoc Bay by the presence of Sarn Badrig acting as a barrier to the N.N.W. movement. As a result of examination of the bathymetry, sediment patterns, and foraminifera dispersion patterns in Tremadoc Bay a tentative circulatory system has been hypothesised (Text-fig.53). The currents move essentially clockwise along the Sarn and around Port Madoc estuary. At the landward end of the Sarn a current flows into Tremadoc Bay from the South via the "scour" channel. This current joins the Sarn current and continues with it past Port Madoc estuary. As this current continues around in a clockwise direction to Criccieth it meets an anticlockwise current which has entered the bay past St.Tudwals Headlands. The convergence of these two currents causes a deflection of direction to affect both so that they tend to swirl around, these swirls roughly coinciding with the deeper hollows. The two main outflowing currents appear to be; one along the centre of the bay flowing in a E.S.E. direction and the other through the channel at the end of the Sarn. Obviously there is an inflow and outflow of water across the Sarn. As no actual current data was collected it must be remembered that the above is simply a hypothesis. Current strength is believed to be the strongest along the shoal areas, with very weak currents in the centre of the bay. (The Naval Hydrographic Survey recorded a current strength of 0.1 knot

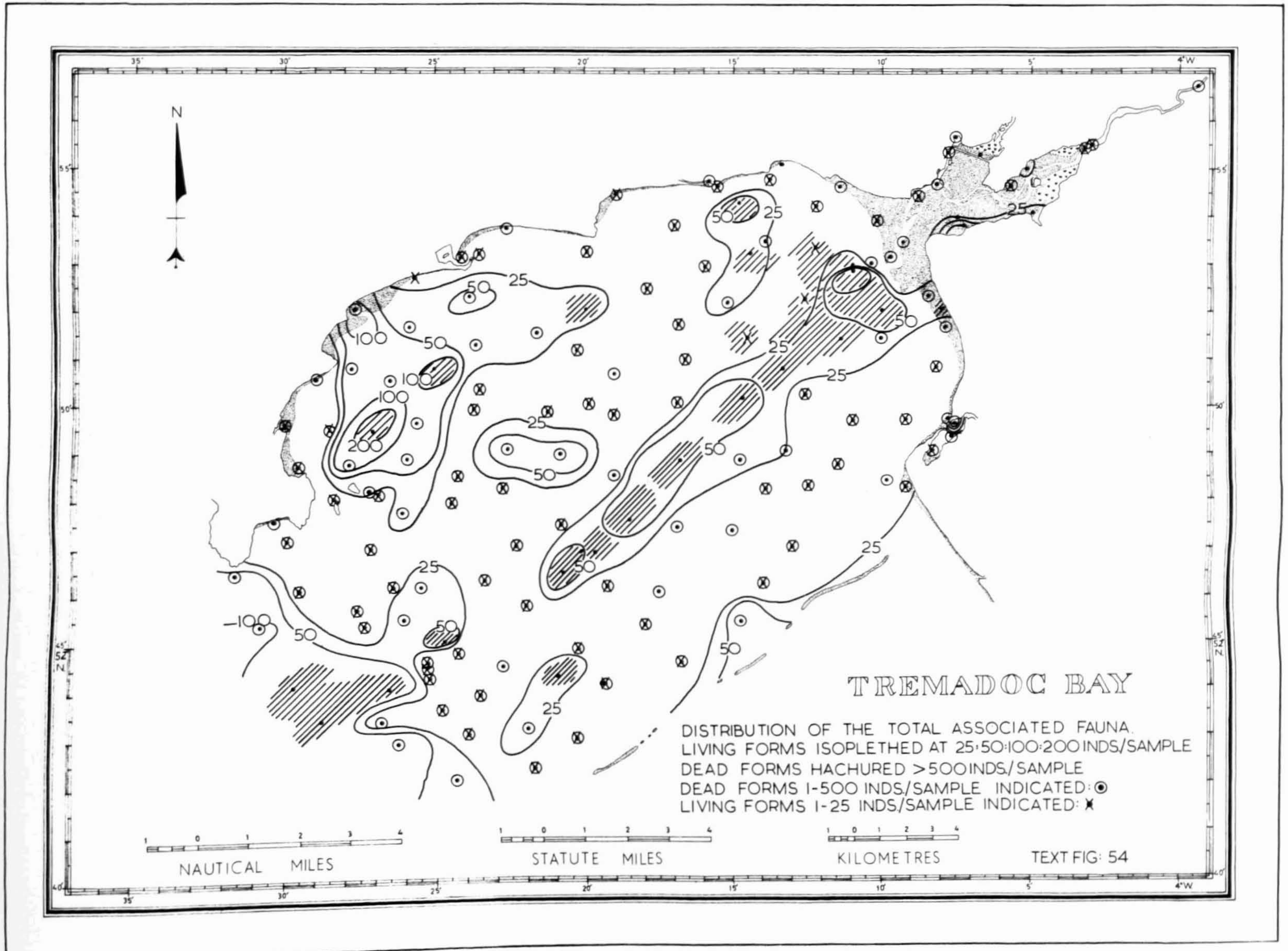

TREMADOC BAY
TEXT FIG.53: CURRENT DIRECTIONS
FLOOD
EBB
N
NAUTICAL MILES
STATUTE MILES
KILOMETRES
4°W
52°N

in the centre of the bay).

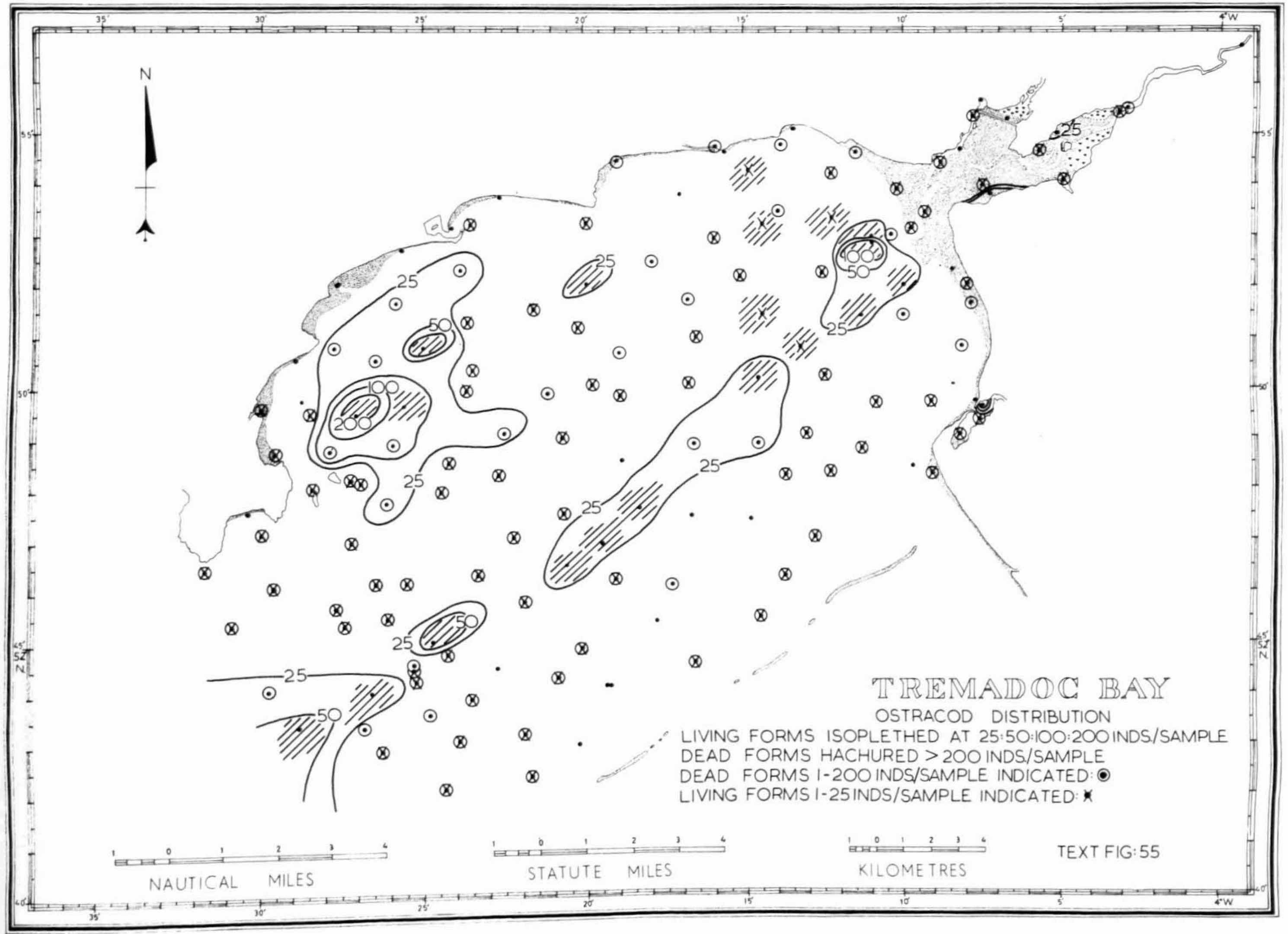
(x) Associated Fauna; Although the associated fauna is not strictly an ecological factor, it is essential when attempting to study foraminiferal ecology to study the entire bottom dwelling community as a whole. The associated fauna in this area is quite variable and is composed of Ostracods, Gastropods, Pelecypods, Mussells, Crustaceans (excluding Ostracods), Starfish Annelids and occasional Echinoids. Other remains are present in the samples such as worm tubes, fish bones, echinoid spines and plates and a note has been made on the numbers present.

(a) Total Fauna: The greatest number of living forms (Text-fig.54) occur on the shoal area north of St. Tudwals Island, in the Western limit of the bay, in Llandanwg lagoon, on the Southern side of Port Madod estuary and just off the mouth of this estuary. The numbers of living forms varied in the range 0-382 specimens per sample. The areas of concentration of dead forms occurred in the same areas as above except that high numbers of dead forms occurred to the North West and South East of Port Madoc estuary. The numbers of dead forms varied in the range 0-1784 specimens per sample.

b) Ostracods: These organisms form one of the major constituents of the associated fauna. The differentiation between living ahd dead ostracods was based on the presence/absence of hair like processes protruding between the valves of the shell, single valves being regarded as dead forms. The living forms (Text-fig.55) are concentrated on the shoal areas to the North of St. Tudwals and to the South of the muddy


N
TREMADOC BAY
DISTRIBUTION OF THE TOTAL ASSOCIATED FAUNA.
LIVING FORMS ISOPLETHED AT 25:50:100:200 INDS/SAMPLE
DEAD FORMS HACHURED >500 INDS./SAMPLE
DEAD FORMS 1-500 INDS./SAMPLE INDICATED:
LIVING FORMS 1-25 INDS./SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES
4°W
52°
N

TEXT FIG: 54

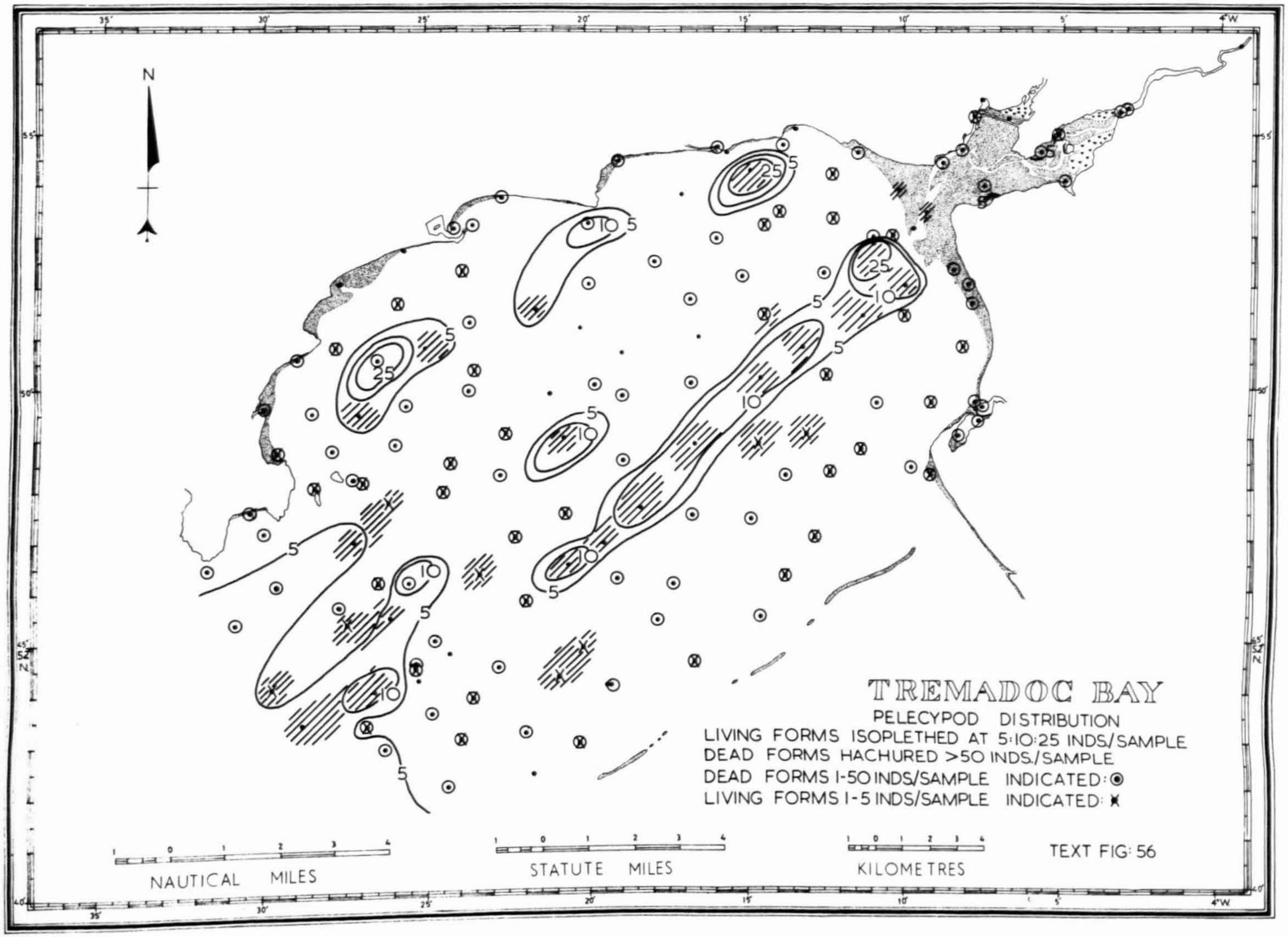

TREMADOC BAY
OSTRACOD DISTRIBUTION
LIVING FORMS ISOPLETHED AT 25:50:100:200 INDS./SAMPLE
DEAD FORMS HACHURED > 200 INDS./SAMPLE
DEAD FORMS 1-200 INDS/SAMPLE INDICATED: ◉
LIVING FORMS 1-25 INDS/SAMPLE INDICATED: ✕
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
25
50
100
200
4°W
52° N

TEXT FIG: 55

hollow, in Llandanwg lagoon, and in the Western limit of the bay, the numbers varying from 0-234 specimens per sample. The dead forms, numbering from 0-1063 specimens per sample are concentrated on the shoal North of St.Tudwals Islands, in the Western limit of the area and off Port Madoc estuary.

c) Gastropods: These forms tend to occur in two main areas, one the littoral zone, and the other in the mud areas, forms in the latter area attaining larger sizes. Very few living forms were obtained, only five samples yielding living forms in the range 0-127 specimens per sample (Text-fig.57). Dead forms are quite widely distributed over the whole area, greatest concentrations occurring around St. Tudwals Islands, on the shoals to the North of these islands and off Port Madoc estuary. These forms ranged from 0-207 specimens per sample. The living forms were obtained in greatest numbers from Llandanwg lagoon and from a beach station just North of St. Tudwals Headlands.

d) Pelecypods: The heavily costate pelecypods tend to occur on the shoal areas, and the thinner shell types occur in the deeper regions. The living forms (Text-fig.56) are concentrated in the following areas, in numbers ranging from 0-29 specimens per sample; North of St. Tudwals Islands, off Port Madoc estuary and on the shoals to the North West of this estuary. Lower concentrations can be noted along a line South West of Port Madoc estuaryy on the shoal just off Pwllheli, and in the deeper area to the West of the bay. Living forms are not particularly common in the mud areas. The greatest concentrations of


TREMADOC BAY
PELECYPOD DISTRIBUTION
LIVING FORMS ISOPLETHED AT 5:10:25 INDS/SAMPLE
DEAD FORMS HACHURED >50 INDS./SAMPLE
DEAD FORMS 1-50 INDS/SAMPLE INDICATED:
LIVING FORMS 1-5 INDS/SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N

TEXT FIG: 56

dead forms are off Port Madoc estuary, to the South West of this estuary, and in the deeper West portion of the bay, the numbers ranging from 0-191 specimens per sample, although dead forms occur in nearly every sample in the area.

e) Hydrozoans: Individual living specimens were retrieved from the majority of the samples, and two concentrations were noted, one North of and around St. Tudwals Islands with up to 43 living specimens per sample, and the other in the deep West portion of the bay, with up to 121 living specimens per sample, dead forms having a similar distribution with numbers ranging 0-111 specimens per sample.

f) Bryozoans: Only a small number of samples yielded living Bryozoans these samples being mainly in three regions, on the shoal area South of Pwllheli, around St. Tudwals Islands, and in the West of the area, the maximum number of living forms obtained from one sample being 19. The maximum number of dead forms retrieved from one sample was 20, the dead forms showing a similar distribution. One interesting feature is that of the distribution of the bryozoan genus Celeria. This genus has been found living in the centre of St. Georges Channel, and this form has also been found in Tremadoc Bay. The genus however, does not extend into the bay further East than St. Tudwals Island, thus giving an indication of the maximum limit ofttransport into the study area.

g) Mussels: Distinct mussel patches have been found (Text-fig.57) off Port Madoc estuary, in the Llandanwg area, on Pen-ychain shoal, in Abersoch Roads, along the Sarn with sporadic occurrences in Port Madoc estuary. Dead mussels were noted from most of the shallow water shoal samples.

h) Crustaceans (excluding Ostracods): Sporadic crustacean occurrances have been recorded from both sandy and muddy samples. The greatest concentrations of living forms (up to 30 specimens per sample) appear to be in the shoal areas off Abersoch and off Criccieth. Very few dead forms were obtained, possibly due to thermapid rate of decay.

i) Starfish: Occasional starfish occurrences were noted (Text-fig. 57), the more robust types, such as the common starfish, being obtained from the shoals, and the feather and brittle types being obtained from the finer sediment.

j) Miscellanea: It was noted that worm tubes, echinoid spines and plates, and fish bones formed essential components of the sediment, each type being distributed in sediments of a corresponding size. Echinoid spines were a common constituent of all the sediments, occurring in numbers of 0-769 per sample. Echinoid plates were not so common and were found in the shoal samples, whereas the fish bones were essentially found in the finer sediment areas.

Conclusion: Although all the above factors have been discussed separately it can not be too strongly emphasised that the ecology of any area is an interelated complex process of physical, biological and chemical factors no one factor along dominating the ecological pattern.

CHAPTER 13

Foraminifera distribution in Tremadoc Bay

Introduction: The numbers of foraminifera obtained from a 10 ml. sample are extremely variable in this area, ranging from 0-over 2,800 individuals per sample. In general most samples had a higher number of dead forms than living types present, a total of 50,760 individuals being obtained of which only 413 were alive at the time of collection, this giving a living:total percentage of ·81%, which though low, falls within a normal range for the continental shelf (Smith 1964). 54 genera were identified with 106 species and varieties the most abundant (over 1,000 total individuals obtained) being :-

	Total	:	Living
Elphidium selseyense	17,561	:	10
Ammonia beccarii	11,875	:	71
Quinqueloculina seminulum	5,266	:	70
Verneuilina media	2,670	:	8
Elphidium discoidale	2,371	:	1
Elphidium crispum	1,949	:	12
Miliolinella subrotunda	1,189	:	3
Elphidium excavatum	1,153	:	33

The next most common (over 500 total individuals obtained) forms are

	Total	:	Living
Elphidium macellum	919	:	8
Quinqueloculina aspera	916	:	8
Elphidium magellanicum	753	:	0
Bulimina gibba	570	:	9
Elphidium crispum var.spinosum	564	:	56

Forms that occurred with over 100 total individuals are :-

	Total	:	Living
Quinqueloculina lata	444	:	1

	Total	:	Living
Cibicides lobatulus	410	:	0
Planorbulina mediterranensis	370	:	0
Elphidium bartletti	288	:	0
Cibicides fletcheri	240	:	1
Eoeponidella mamilla	186	:	0
Triloculina trigonula	147	:	3
Massilina secans	136	:	3
Bulimina elongata	126	:	8
Quinqueloculina agglutinata	114	:	1
Nonion depressulum	108	:	21
Cibicides refulgens	108	:	0
Lagenammina laguncula	103	:	0

The remaining species and varieties occurred with a total number of less than 100 individuals. 24 aberrant types were obtained of which one form was living.

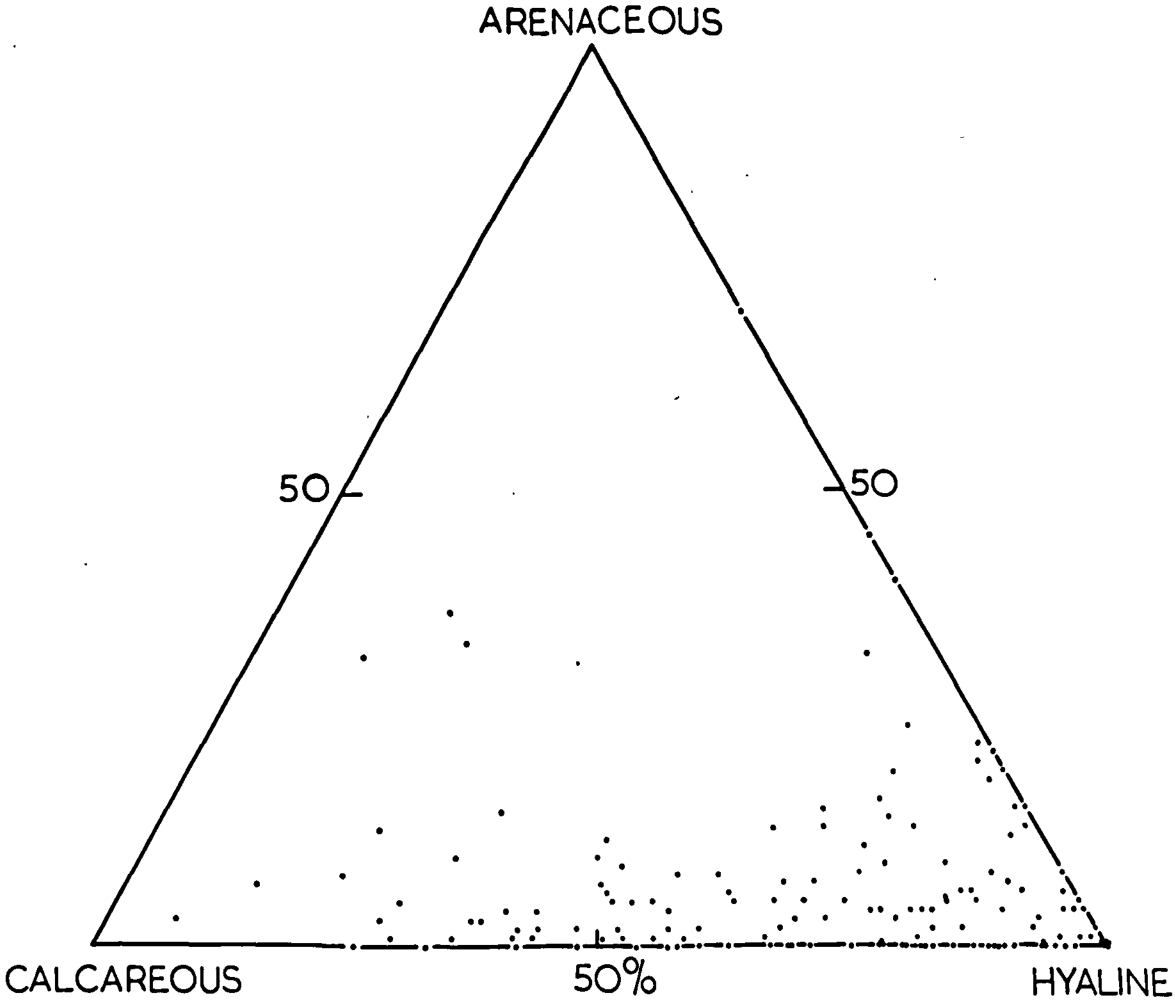
The foraminifera from each sample were grouped into arenaceous, calcareous, and hyaline, and percentages calculated for each group (total number of forms) for each sample. These results were plotted on a triangular graph (Text-fig.58), and it proved that the hyaline forms were dominant in 60%+ of the samples followed by calcareous forms, while dominance by arenaceous forms was never evident.

The arenaceous forms show distribution concentrations (above 40%) (Text-fig.59), at :-

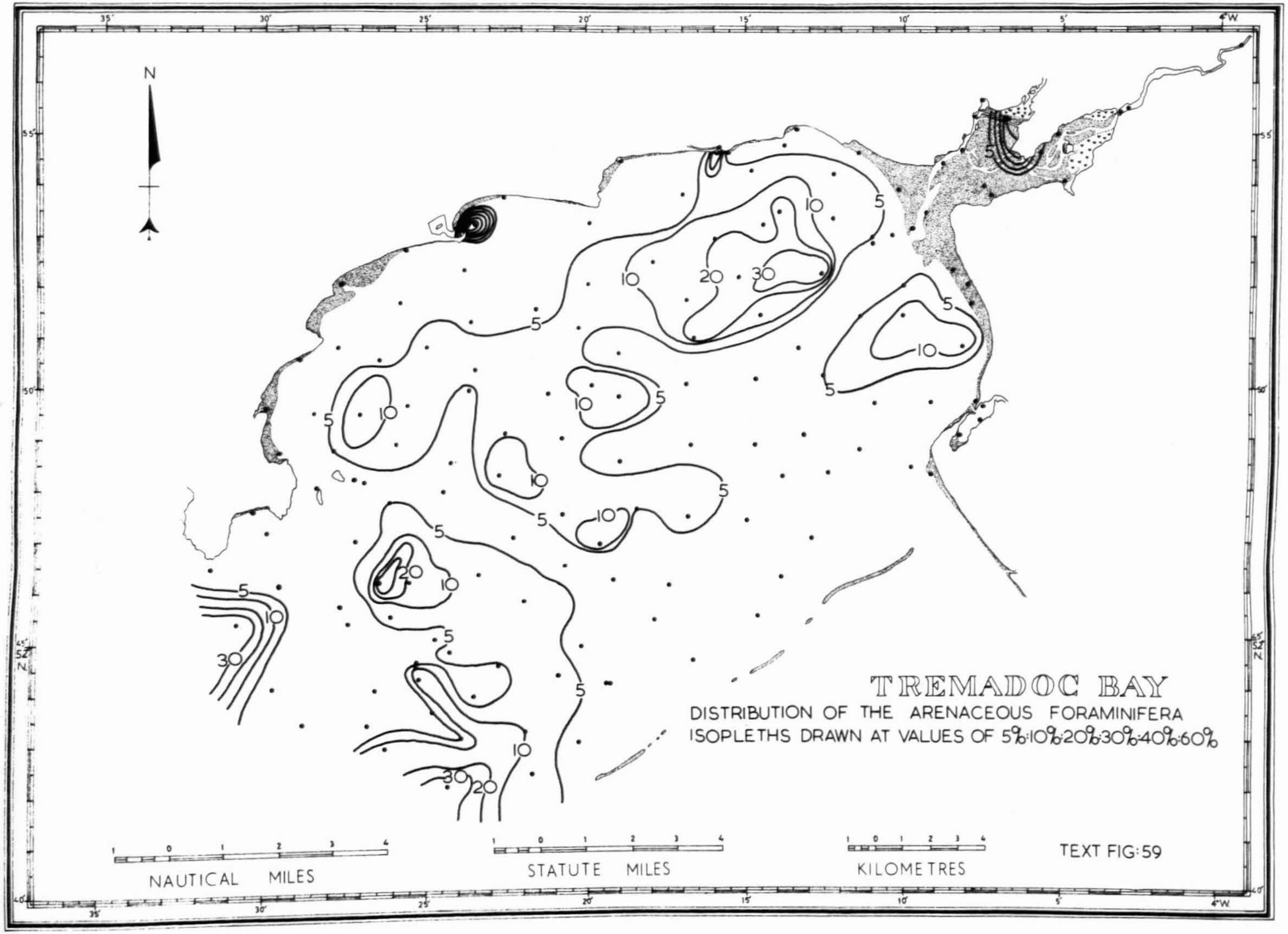
i) Pwllheli harbour.
ii) West of Criccieth
iii) West of the mouth of Port Madoc estuary
iv) In Port Madoc estuary (Northern portion)

Secondary concentrations (above 10%) can be noted at :-

i) On the Northern shoal areas
ii) On the shoal area to the South of Port Madoc estuary
iii) In the hollow to the West of the area
iv) At the seaward end of Sarn Badrig and extending onto the Southerly shoal area.



TEXT FIG: 58.


TREMADOC BAY
DISTRIBUTION OF THE ARENACEOUS FORAMINIFERA
ISOPLETHS DRAWN AT VALUES OF 5%:10%:20%:30%:40%:60%
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
40'
52°
N.

TEXT FIG: 59

The calcareous forms show distribution concentrations (above 60%) (Text-fig.60) at :-

i) East and North East of St. Tudwals Island.
ii) South of St. Tudwals Headland
iii) On the southern shoal area.

It is noticeable that the calcareous forms do not occur with percentages higher than 40% West of Pen-ychain Point except on the southern shoal areas.

The hyaline forms are dominant over the whole area (Text-fig.61), but have their greatest concentration (above 90%) at :-

i) Port Madoc estuary
ii) Llandanwg lagoon
iii) Pwllheli harbour
iv) Coastal zone from Abersoch to North East of Llanbedrog
v) Coastal zone from the Afon Dwyfor to South of Port Madoc estuary.
vi) Shoal area South of Pen-ychain point
vii) Shoal area North of Sarn Badrig.

The living foraminifera (35 species) in the study area occur in seven main regions (Text-fig.62), these regions being correlated into three main environmental zones on the basis of the number of living forms obtained from each sample.

Zone A : More than 50 living individuals per sample.

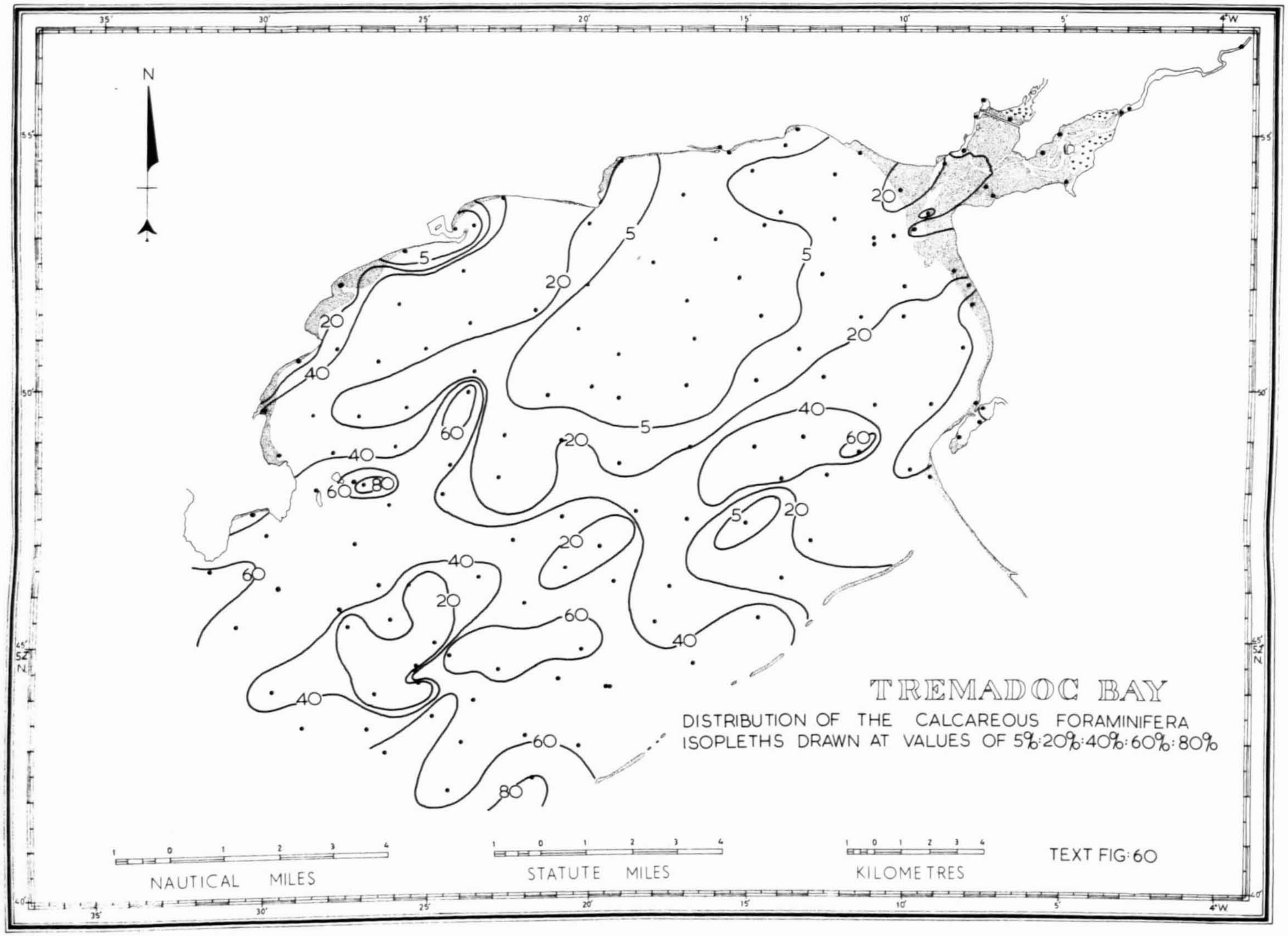
i) St. Tudwals Island area.

Zone B : More than 20 living individuals per sample

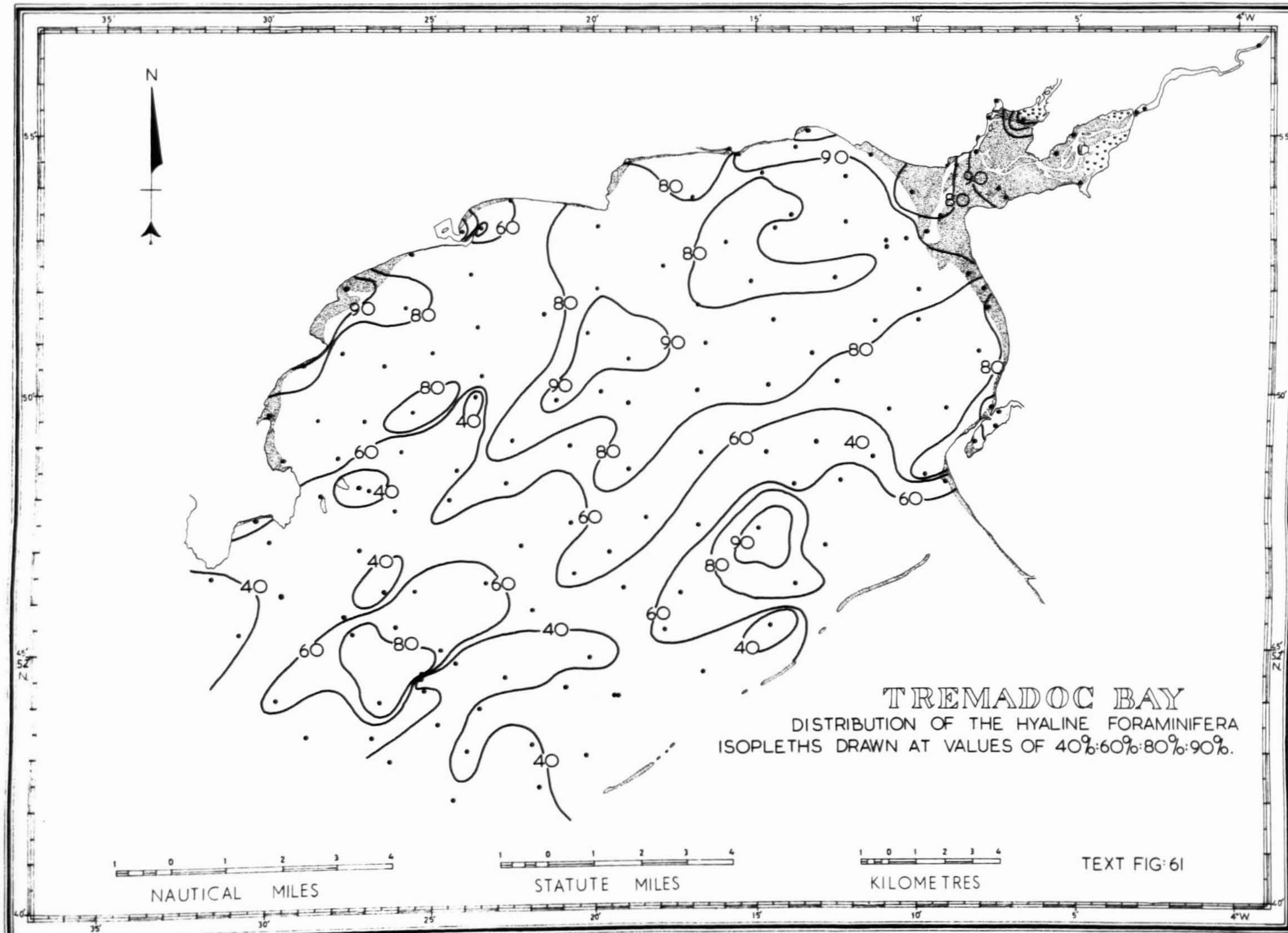
i) Llandanwg lagoon
ii) Deep area in West of region.

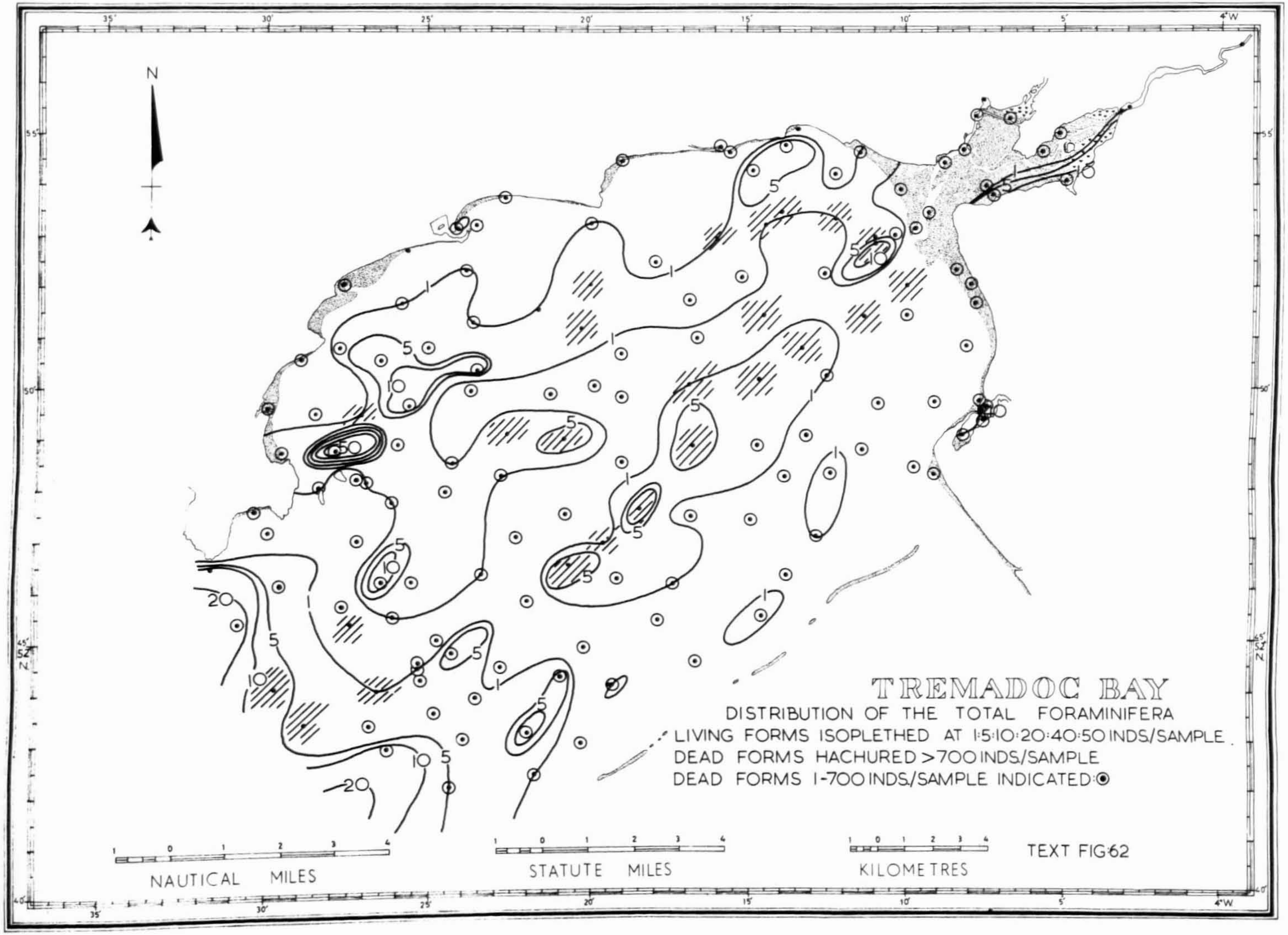
Zone C: Between 10-20 living individuals per sample

i) Off Port Madoc estuary
ii) In Port Madoc estuary (South side)
iii) Shoal area North West of the Sarn
iv) Outer muddy hollows


TREMADOC BAY
DISTRIBUTION OF THE CALCAREOUS FORAMINIFERA
ISOPLETHS DRAWN AT VALUES OF 5%:20%:40%:60%:80%
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
40'

TEXT FIG: 60


TREMADOC BAY
DISTRIBUTION OF THE HYALINE FORAMINIFERA
ISOPLETHS DRAWN AT VALUES OF 40%:60%:80%:90%.
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N
TEXT FIG: 61


TREMADOC BAY
DISTRIBUTION OF THE TOTAL FORAMINIFERA
LIVING FORMS ISOPLETHED AT 1:5:10:20:40:50 INDS/SAMPLE.
DEAD FORMS HACHURED >700 INDS/SAMPLE
DEAD FORMS 1-700 INDS/SAMPLE INDICATED
NAUTICAL MILES
STATUTE MILES
KILOMETRES

TEXT FIG 62

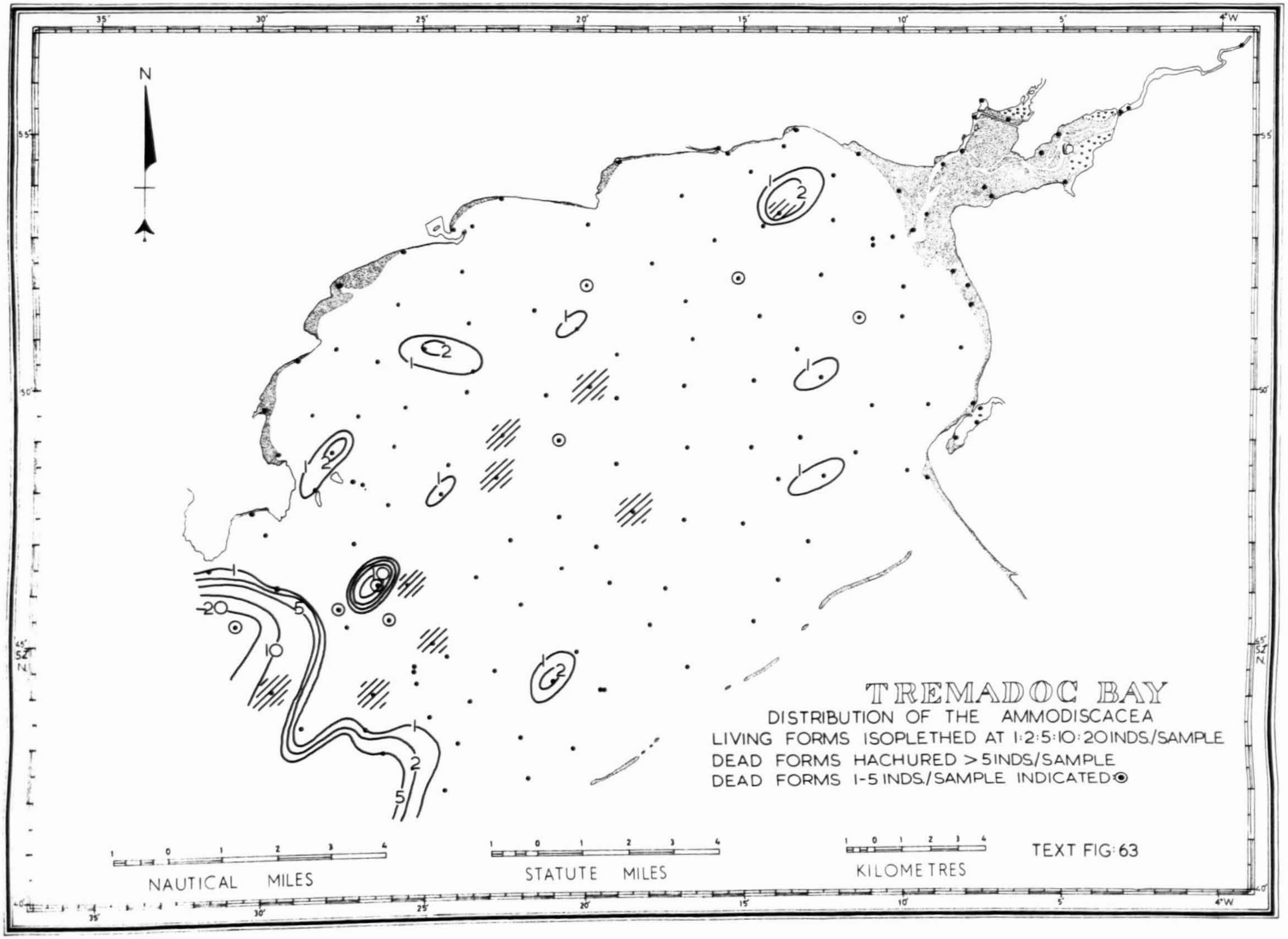
The greatest concentration of dead foraminifera (above 700 per sample) are along the line of the muddy hollow, around past the mouth of Port Madoc estuary, south of the Pen-ychain Point and in the west of the area. These living and dead foraminifera distribution maps give an indication of the main current directions as the pattern is the result of 'winnowing' of the tests after death.

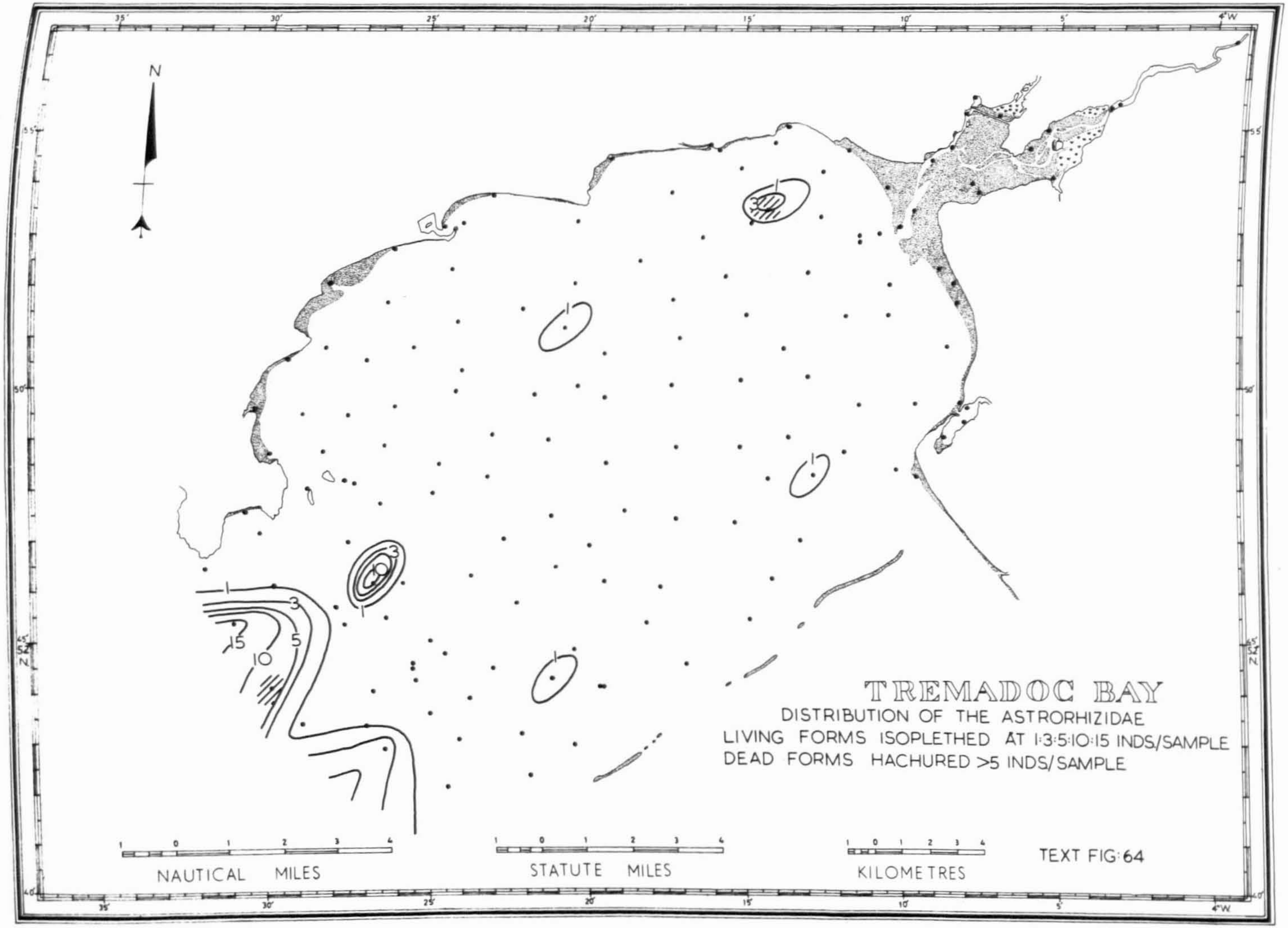
It is now proposed to examine the distribution of the Super Families in Tremadoc Bay, as well as selected families, genera, species and varieties.

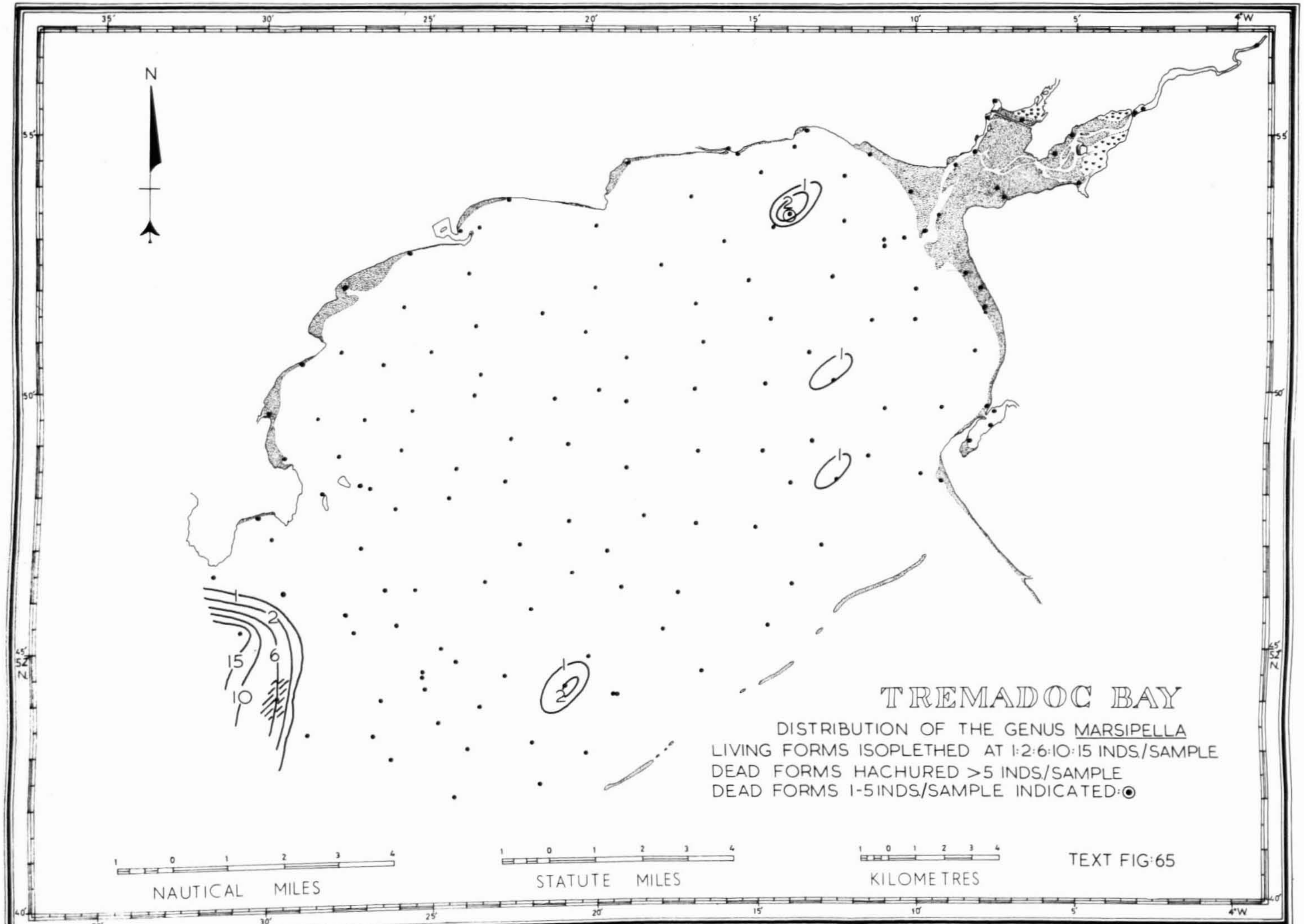
The Ammodiscacea (Text-fig.63) do not occur in great numbers in this area, the highest number living per sample being 24. The main areas of living forms are the muddy hollow and in the deeper western portion of the region with other sporadic occurrences on the shoal areas and around St. Tudwals Island. The dead forms are concentrated (above 5 dead/sample) in the deeper parts of the muddy hollow area, illustrating post mortem transport.

The Astrorhizidae (Text-fig.64) show the greatest living concentration in the West of the area, generally associated with the greater depths, although other occasional occurrences are noted on the shoals, the dead forms having a similar distribution. In this area the most common representative of this family is the genus Marsipella (Text-fig.65) which has a similar distribution as the family, with the greatest living concentration of this form in the deeper western portion of the area.

The Saccamminidae (Text-fig.66) show a somewhat more selective

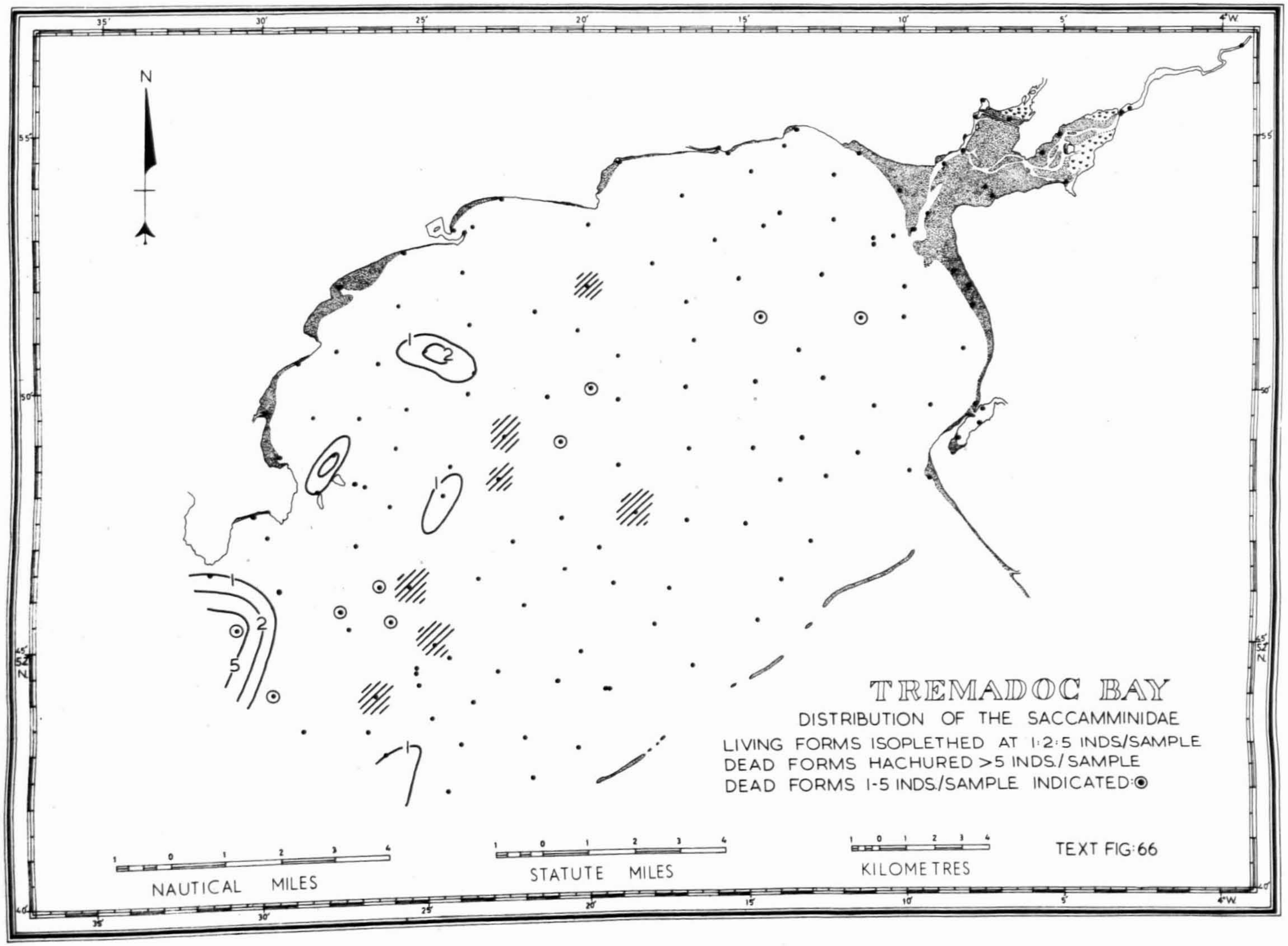

TREMADOC BAY
DISTRIBUTION OF THE AMMODISCACEA
LIVING FORMS ISOPLETHED AT 1:2:5:10:20 INDS./SAMPLE
DEAD FORMS HACHURED >5 INDS./SAMPLE
DEAD FORMS 1-5 INDS./SAMPLE INDICATED ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
TEXT FIG: 63


TREMADOC BAY
DISTRIBUTION OF THE ASTRORHIZIDAE
LIVING FORMS ISOPLETHED AT 1:3:5:10:15 INDS/SAMPLE
DEAD FORMS HACHURED >5 INDS/SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
TEXT FIG: 64
N



N
TREMADOC BAY
DISTRIBUTION OF THE GENUS MARSIPELLA
LIVING FORMS ISOPLETHED AT 1:2:6:10:15 INDS./SAMPLE
DEAD FORMS HACHURED >5 INDS./SAMPLE
DEAD FORMS 1-5 INDS./SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES

TEXT FIG: 65


N
TREMADOC BAY
DISTRIBUTION OF THE SACCAMMINIDAE
LIVING FORMS ISOPLETHED AT 1·2·5 INDS/SAMPLE
DEAD FORMS HACHURED >5 INDS./SAMPLE
DEAD FORMS 1-5 INDS./SAMPLE INDICATED:◉
NAUTICAL MILES
STATUTE MILES
KILOMETRES
TEXT FIG·66

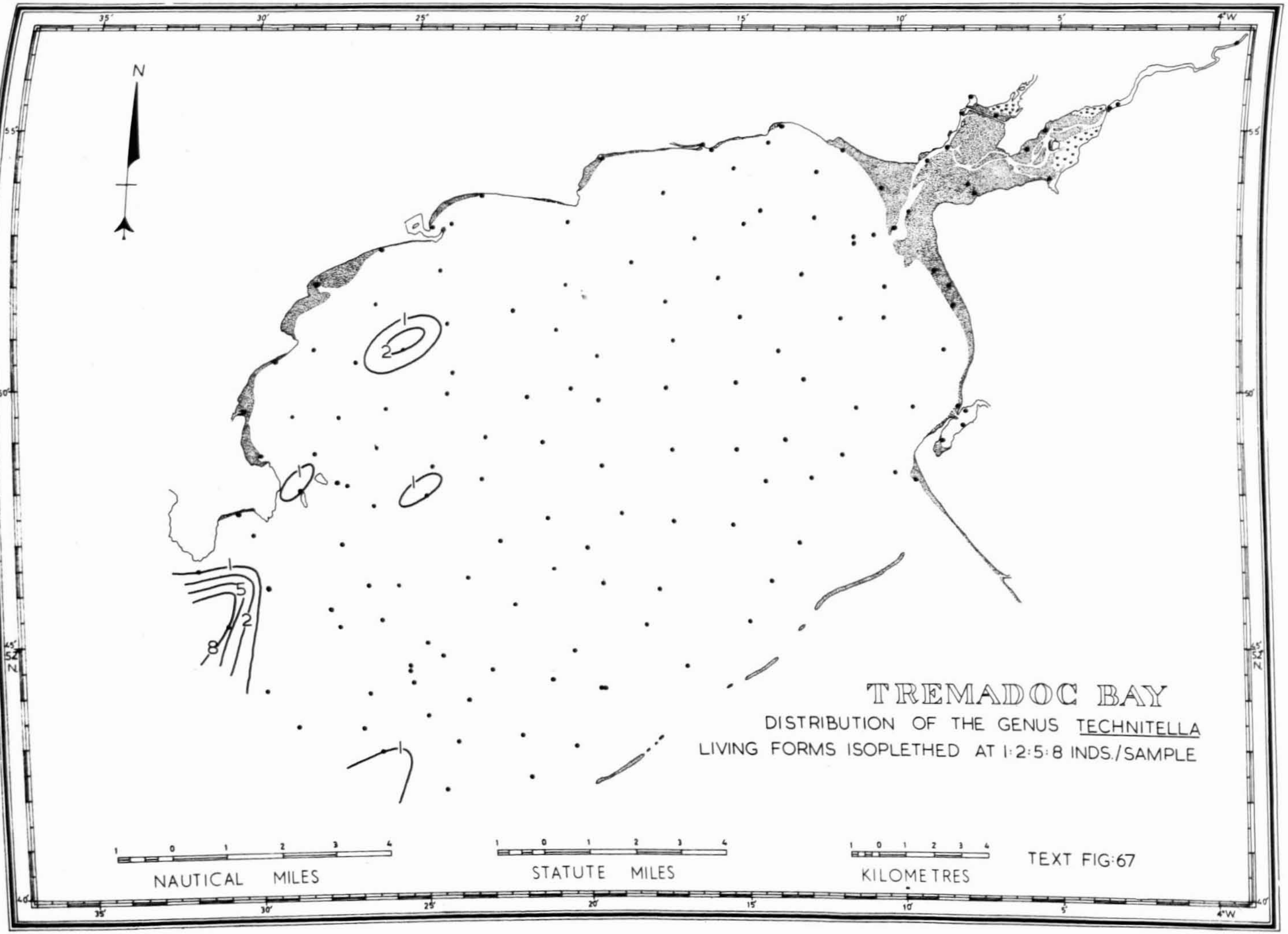
distribution, the greatest living concentration being on the shoal areas, especially South of St. Tudwals headlands, living forms are not being found East of Pwllheli. The deeper muddy hollow shows a concentration of dead representatives and other dead forms have been noted occurring sporadically on the shoal areas. The most distinct genus belonging to this family in Tremadoc Bay is the genus Technitella (Text-fig.67) which has living representatives concentrated to the South of St. Tudwals headlands and on the shoal areas to the South of Pwllheli. Scattered occurrences were noted living at St. Tudwals Islands, and to the North West of the seaward end of the Sarn.

The Tremadoc Bay representatives of the Ammodiscacea are listed below in order of abundance (total), living representatives being indicated with an asterisk :-

Lagenammina lagunoula 103
* Marsipella elongata 30
* Bathysiphon acuta 17
* Technitella representatives 14
* Marsipella elongata var. A. 5
Rhabdammina scabra 4
* Psammosphaera parva 3
* Saccammina sphaerica 2
Dendrophyra arborescens 1
Jaculella acuta 1

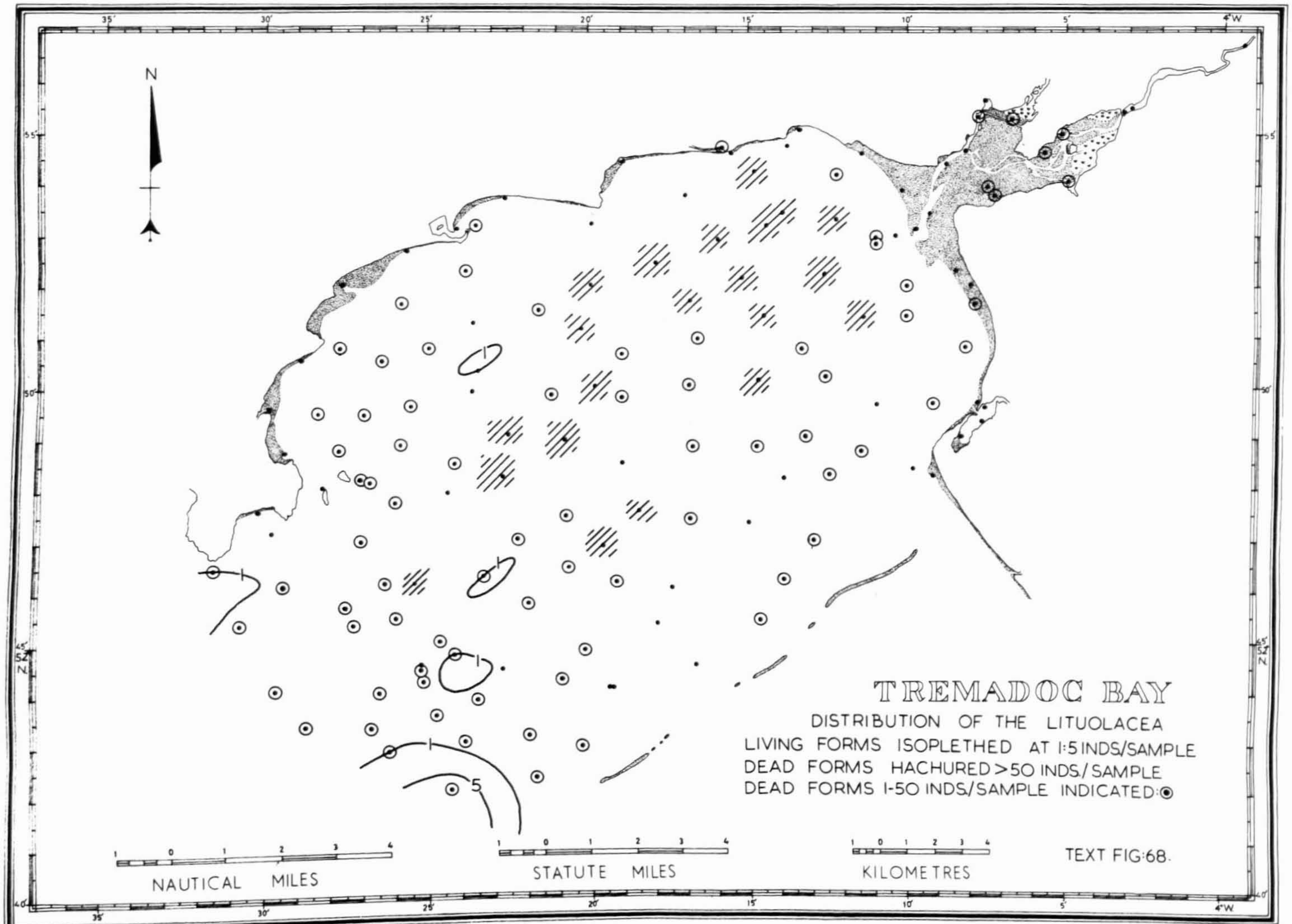
Representatives of the Lituolacea (Text-fig.68) are widely distributed over the entire region with a maximum of 8 living specimens/sample and 252 dead specimens/sample. The greatest living concentration occurs off the seaward end of Sarn Badrig on the shoal area, and scattered living occurrences were noted on the shoal area, although no living representatives were found East of Pwllheli. Most samples yielded dead forms, the greatest concentrations being in the inner muddy hollow and in the eastern end of the outer muddy hollow.

The Family Hormosinidae is represented by species of the genus



N
TREMADOC BAY
DISTRIBUTION OF THE GENUS TECHNITELLA
LIVING FORMS ISOPLETHED AT 1:2:5:8 INDS./SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45' 52° N.
40'

TEXT FIG:67


TREMADOC BAY
DISTRIBUTION OF THE LITUOLACEA
LIVING FORMS ISOPLETHED AT 1:5 INDS/SAMPLE
DEAD FORMS HACHURED >50 INDS./SAMPLE
DEAD FORMS 1-50 INDS./SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N

TEXT FIG: 68.

Reophax, no living specimens being retrieved, the dead specimens being obtained mainly from the shoal regions, although not in any great numbers.

Miliammina fusca is the sole representative of the Family Rzehakinidae, this species being found on the North and South sides of Port Madoc estuary, off the mouth of the estuary, and to the North West of this.

Representatives of the Family Lituolidae are moderately common in the area and are characterised by the genera *Haplophragmoides*, *Cribrostomoides* and *Ammobaculites* which were retrieved from medium to fine sand in the area. One species *Haplophragmoides subinvolutum* appears to be characteristic of the marsh environment, being found only in Port Madoc estuary.

The Family Textulariidae is very poorly represented in the area, only two species obtained from the western region, belonging to this family.

The Trochamminidae has its representatives primarily concentrated in Port Madoc estuary and just off the estuary mouth.

Two species, *Clavulina gracilis* and *Verneuilina media* represent the Family Ataxophragmidae, the former species being very rare in the region. with the latter being extremely common, being obtained from most of the samples. The living forms of this species could not be easily difrerentiated from the dead so difficulty was encountered when attempting to evaluate the distribution pattern. The greatest total numbers however were recorded from the East of the area, off the mouth of Port Madoc estuary.

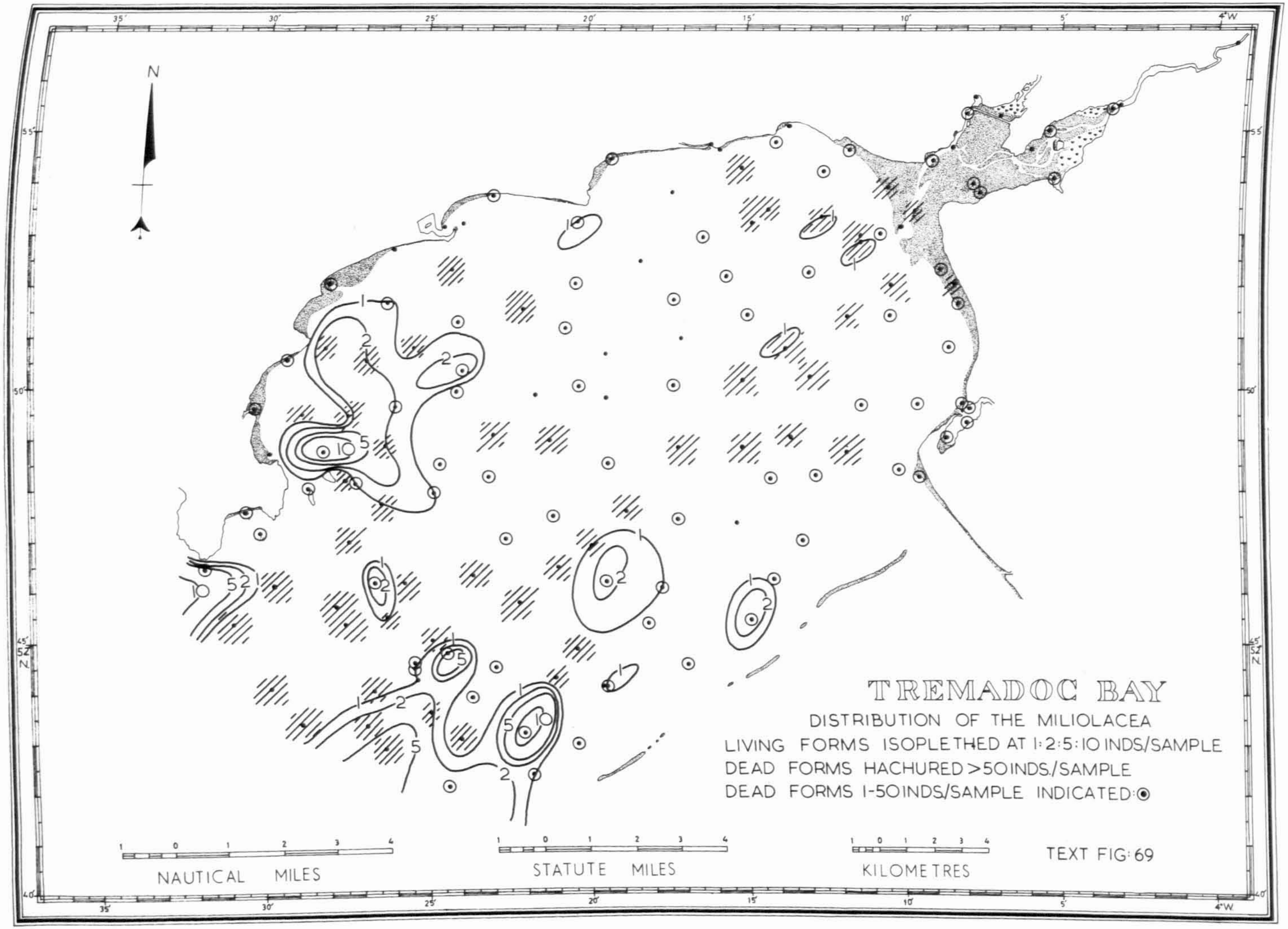
The Tremadoc Bay representatives of the Lituolacea are listed below in order of abundance (total), living representatives being indicated with an asterisk :-

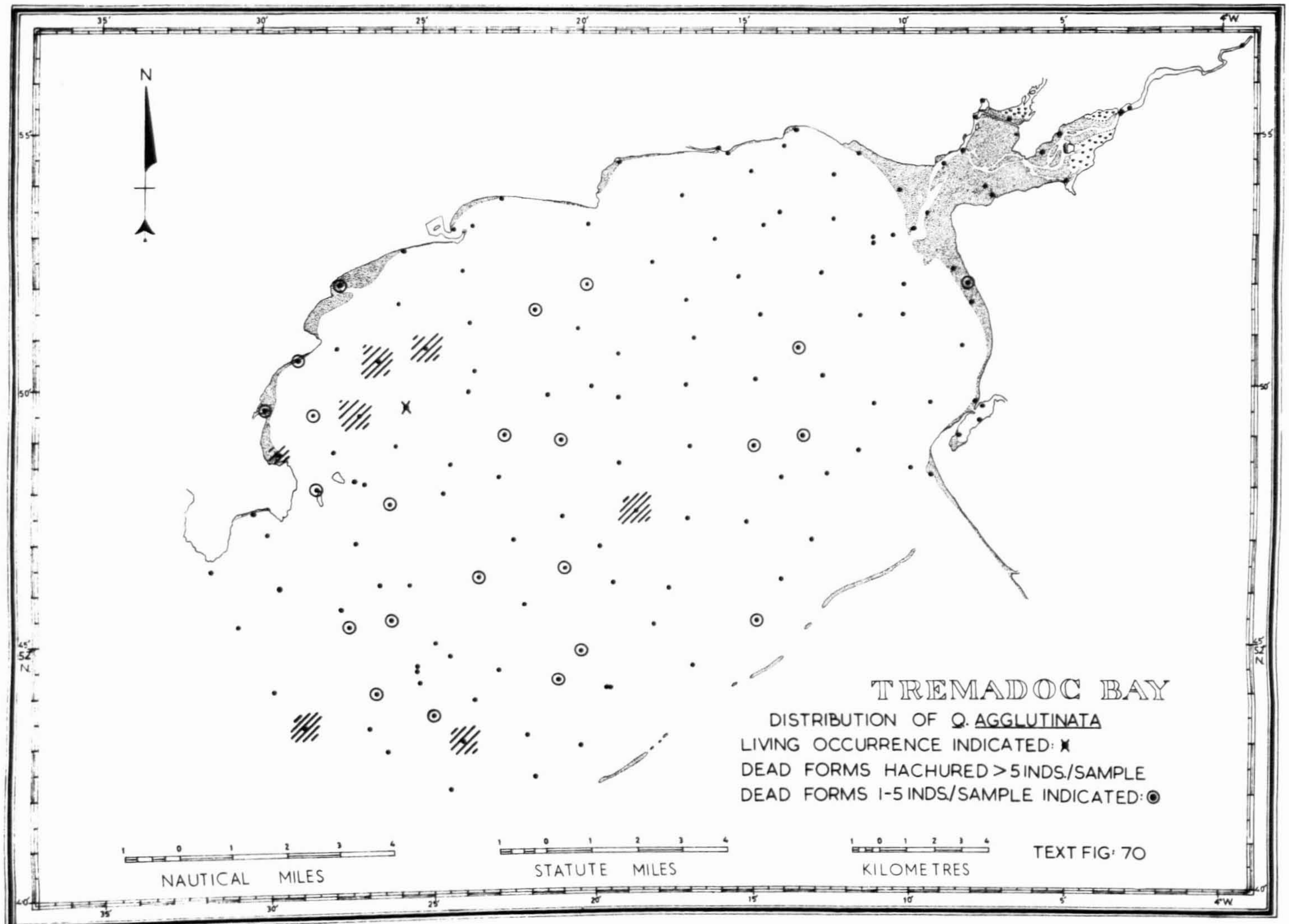
* Verneuilina media 2670	Reophax fusiformis 12
* Ammobaculites subagglutinans 73	Haplophragmoides canariensis 11
Ammobaculites agglutinans var. filiformis 63	Haplophragmoides subinvolutum 3
Miliammina fusca 45	Clavulina gracilis 2
Cribrostomoides jeffreysi 35	Reophax artica 1
Trochammina inflata 15	Textularia bocki 1
Reophax subfusiformis 13	Textularia gramen 1
	Trochammina globigeriniformis 1

One of the most common Super Families in the area is the Miliolacea (Text-fig.69) with up to 12 living specimens/sample and up to 916 dead specimens/sample, the most common family being the Miliolidae, followed by the Nubeculariidae and then the Fischerinidae. The Miliolacea have three main areas of living concentrations, one being just south of St. Tudwals headlands, one off the seaward end of Sarn Badrig, and one to the north of St. Tudwals Islands, these areas being shoals. Secondary occurrences are present elsewhere in the shoal areas. Dead concentrations (above 750 specimens/sample) occur in the west of the area, north of St. Tudwals Islands, and along the line of the muddy hollow.

The Fischerinidae and Nubeculariidae are very poorly represented in the area, only a few isolated occurrences being noted.

The Miliolidae have essentially the same distribution as the Super Family, with the most common genus being Quinqueloculina, the four most common species of this genus being Q.agglutinata, Q.aspera, Q.lata, and Q.seminulum (Text-fig.70) was noted living primarily to the North of St. Tudwals Islands, with dead concentrations on the shoal areas in the north

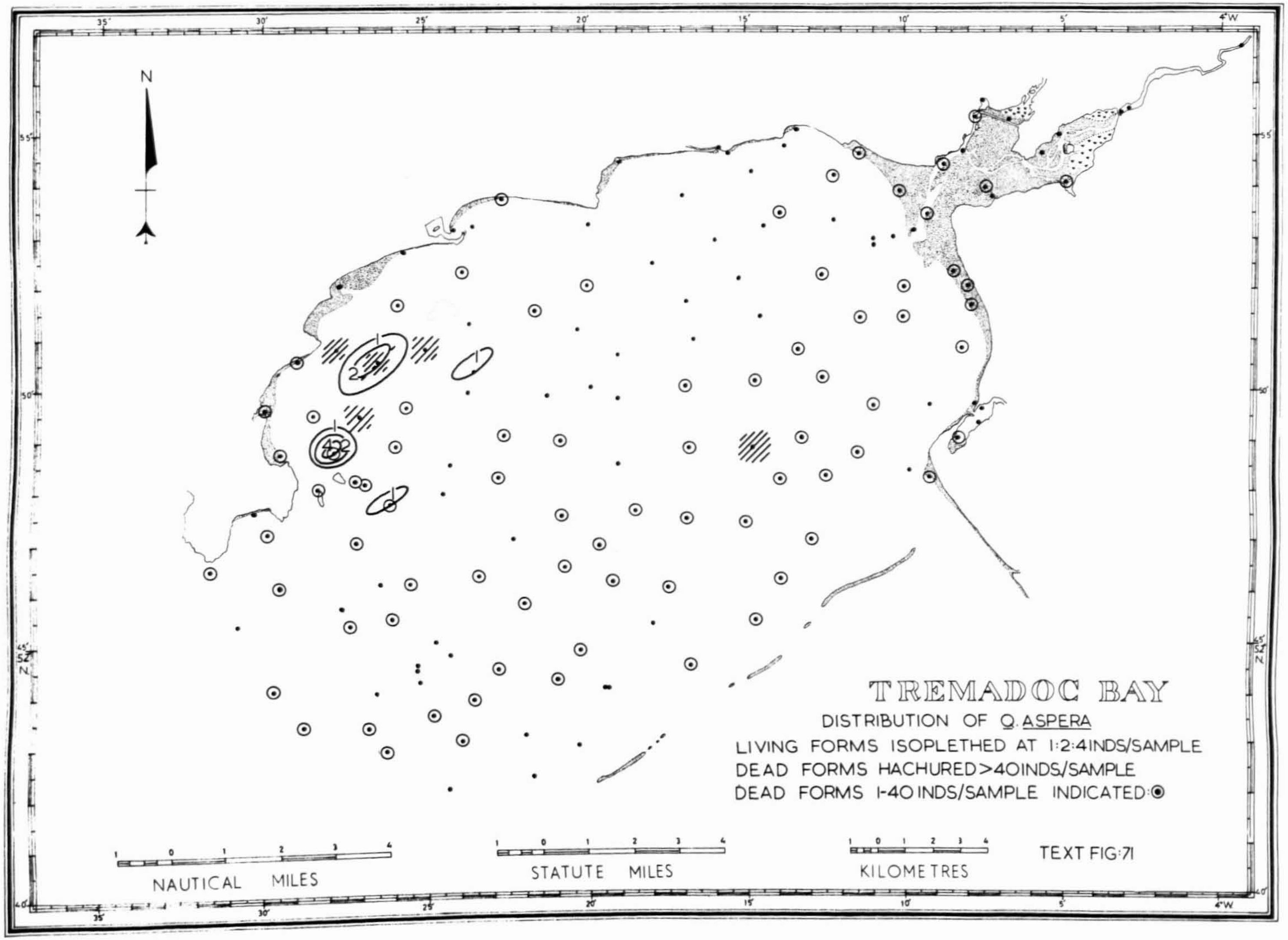

TREMADOC BAY
DISTRIBUTION OF THE MILIOLACEA
LIVING FORMS ISOPLETHED AT 1:2:5:10 INDS/SAMPLE
DEAD FORMS HACHURED >50 INDS./SAMPLE
DEAD FORMS 1-50 INDS/SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°
N.
40'
TEXT FIG: 69



N
TREMADOC BAY
DISTRIBUTION OF Q. AGGLUTINATA
LIVING OCCURRENCE INDICATED:
DEAD FORMS HACHURED > 5 INDS./SAMPLE
DEAD FORMS 1-5 INDS./SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES

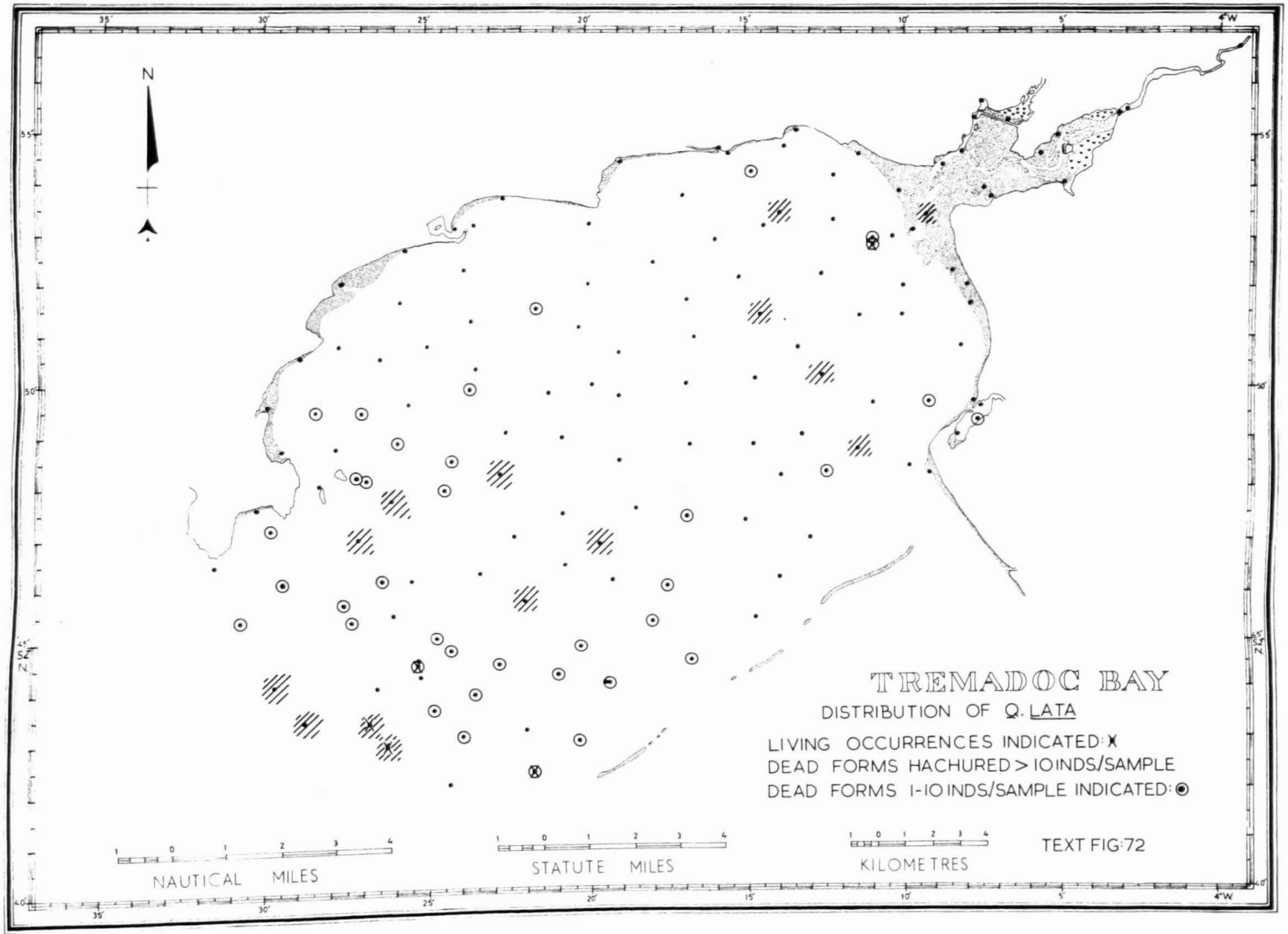
TEXT FIG: 70

and south of the area. Q.aspera (Text-fig.71) is slightly more widespread in the area, both living and dead forms being noted on the shoal areas, the living forms being concentrated in the area of St. Tudwals Islands. Living representatives of Q.lata (Text-fig.72) are noted on the medium sand areas off the seaward end of Sarn Badrig and off the mouth of Port Madoc estuary. Dead concentrations were recorded in the west of the area, other areas being on the shoals and in the mouth of Port Madoc estuary. The most common species in this genus is Q.seminulum (Text-fig.73) which has its living forms concentrated south of St. Tudwals headlands and just north of the seaward end of Sarn Badrig. Secondary concentrations are present around StlTudwals Islands South of these islands, and on the shoal areas slightly further east. Co ncentrations of dead specimens are present in the west of the region and along the line of the muddy hollow. Living representatives of Massilina secans (Text-fig.74) were retrieved from North of St. Tudwals Islands and from the shoal area just north of Sarn Badrig. Scattered dead concentrations are noted just north of Sarn Badrig, shoal areas, west of the area, off Port Madoc estuary, and in the estuary mouth. Another common genus in this family is Triloculina (Text-fig.75) which has its greatest living concentration just north of St. Tudwals Islands, with secondary areas south of St. Tudwals headlands, on the shoal south of Pwllheli, and on the south shoal area. Dead concentrations are present in the shoal areas. The genus Miliolinella (Text-fig.76) has living concentrations to the north and north north west of St. Tudwals Islands

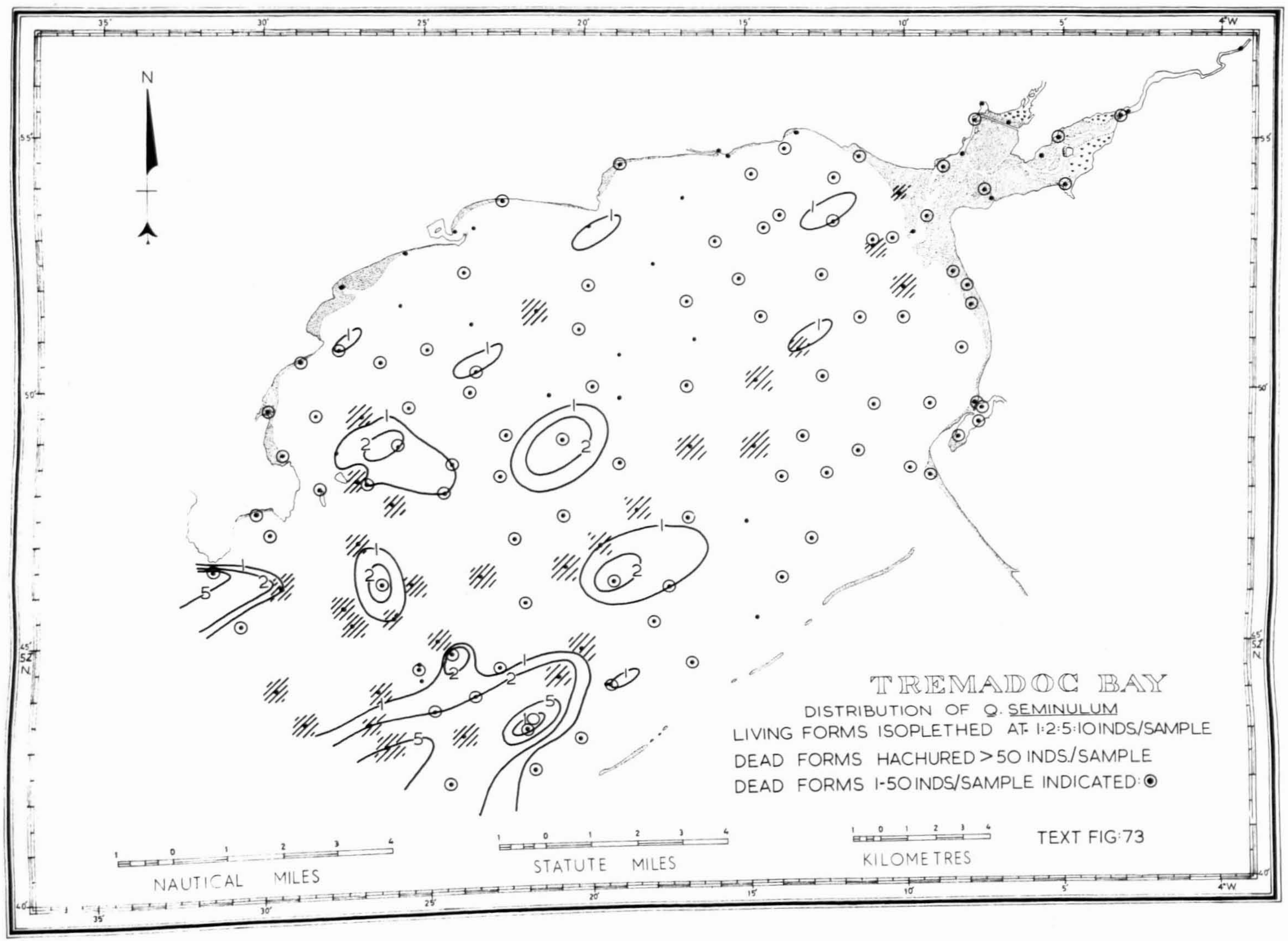


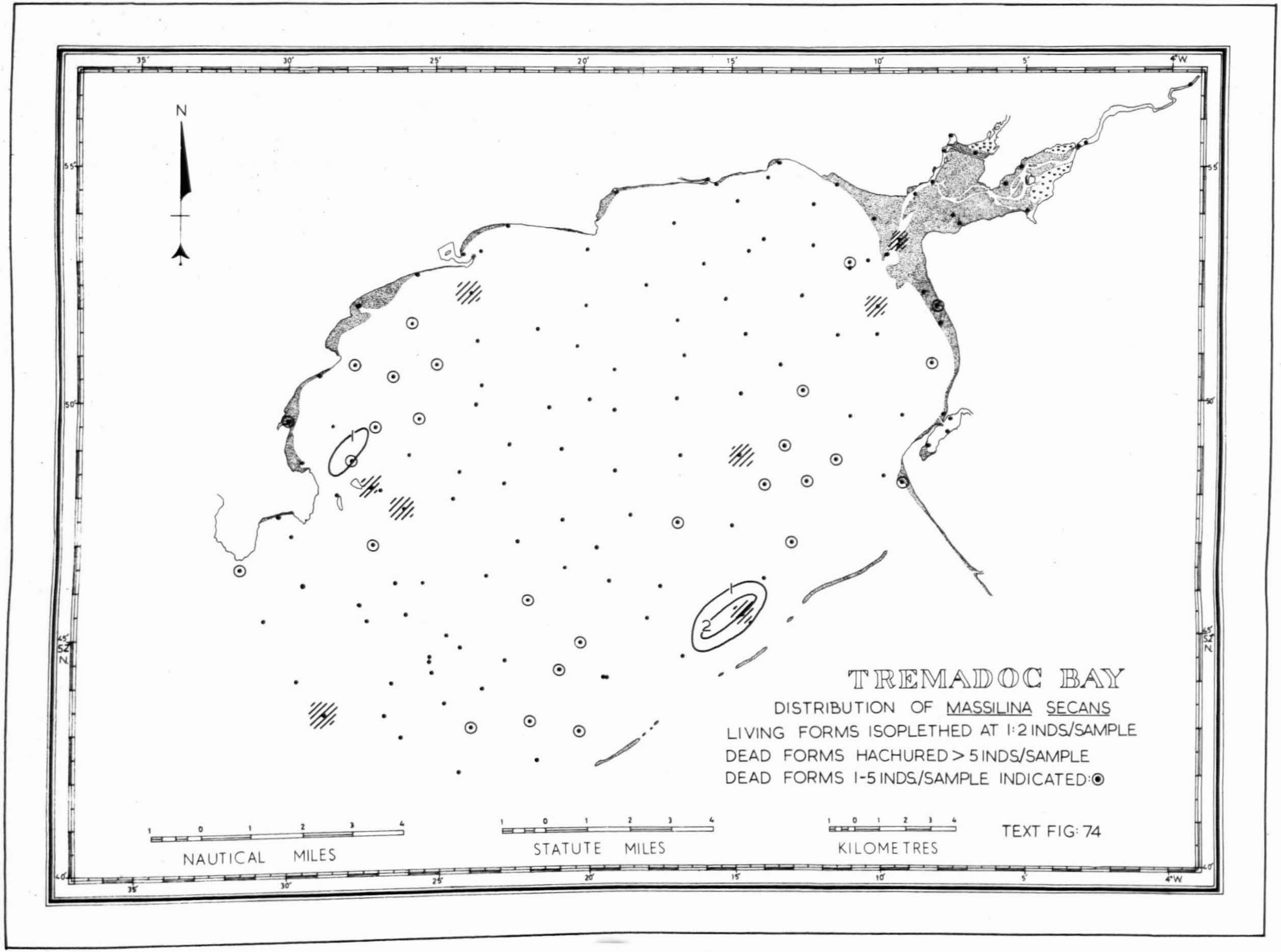
TREMADOC BAY
DISTRIBUTION OF Q. ASPERA
LIVING FORMS ISOPLETHED AT 1:2:4 INDS/SAMPLE
DEAD FORMS HACHURED >40 INDS/SAMPLE
DEAD FORMS 1-40 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45' 52° N.
40'

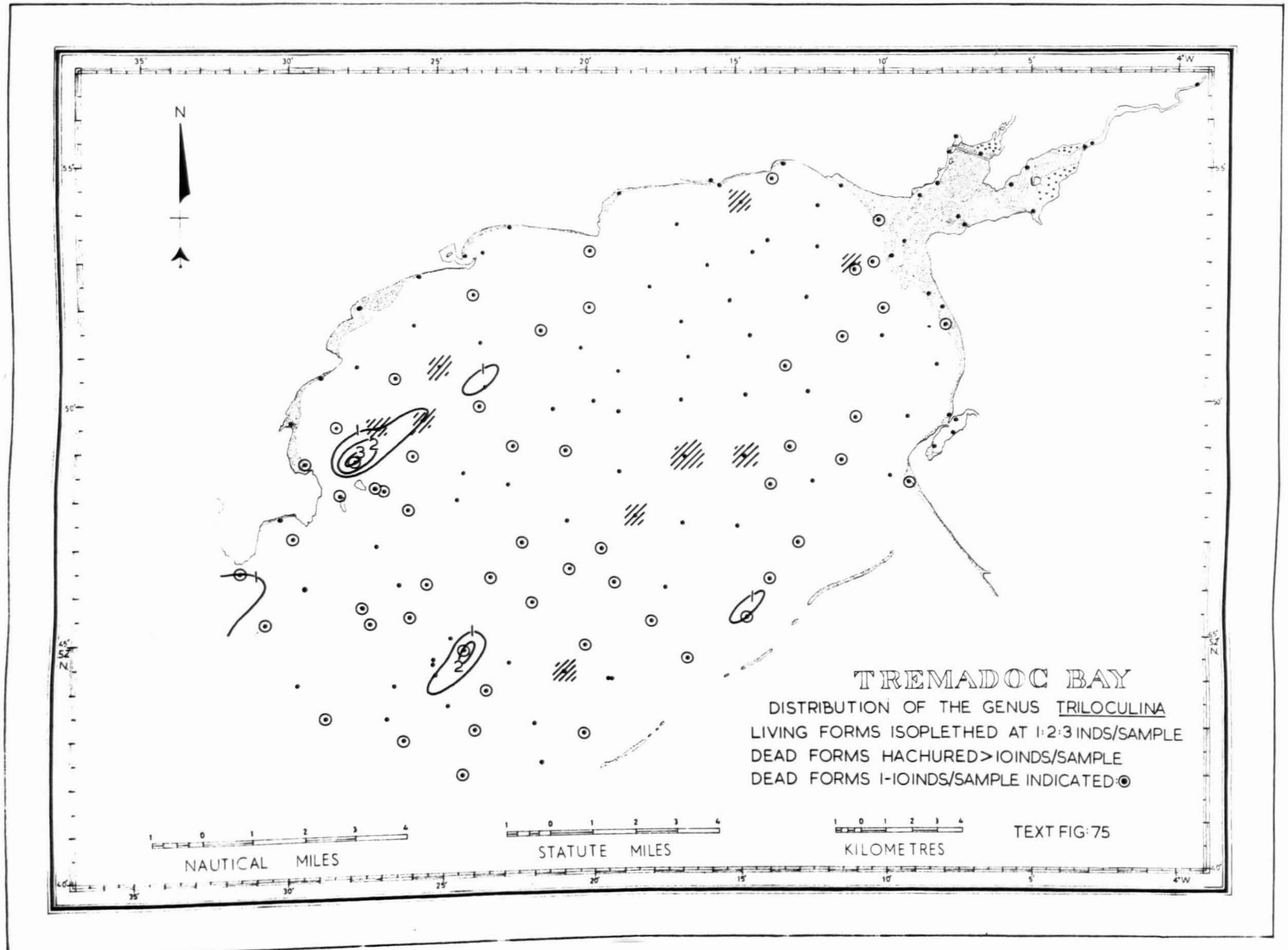
TEXT FIG: 71


TREMADOC BAY
DISTRIBUTION OF Q. LATA
LIVING OCCURRENCES INDICATED: X
DEAD FORMS HACHURED > 10 INDS/SAMPLE
DEAD FORMS 1-10 INDS/SAMPLE INDICATED: ⊙
N
NAUTICAL MILES
STATUTE MILES
KILOMETRES
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
40'

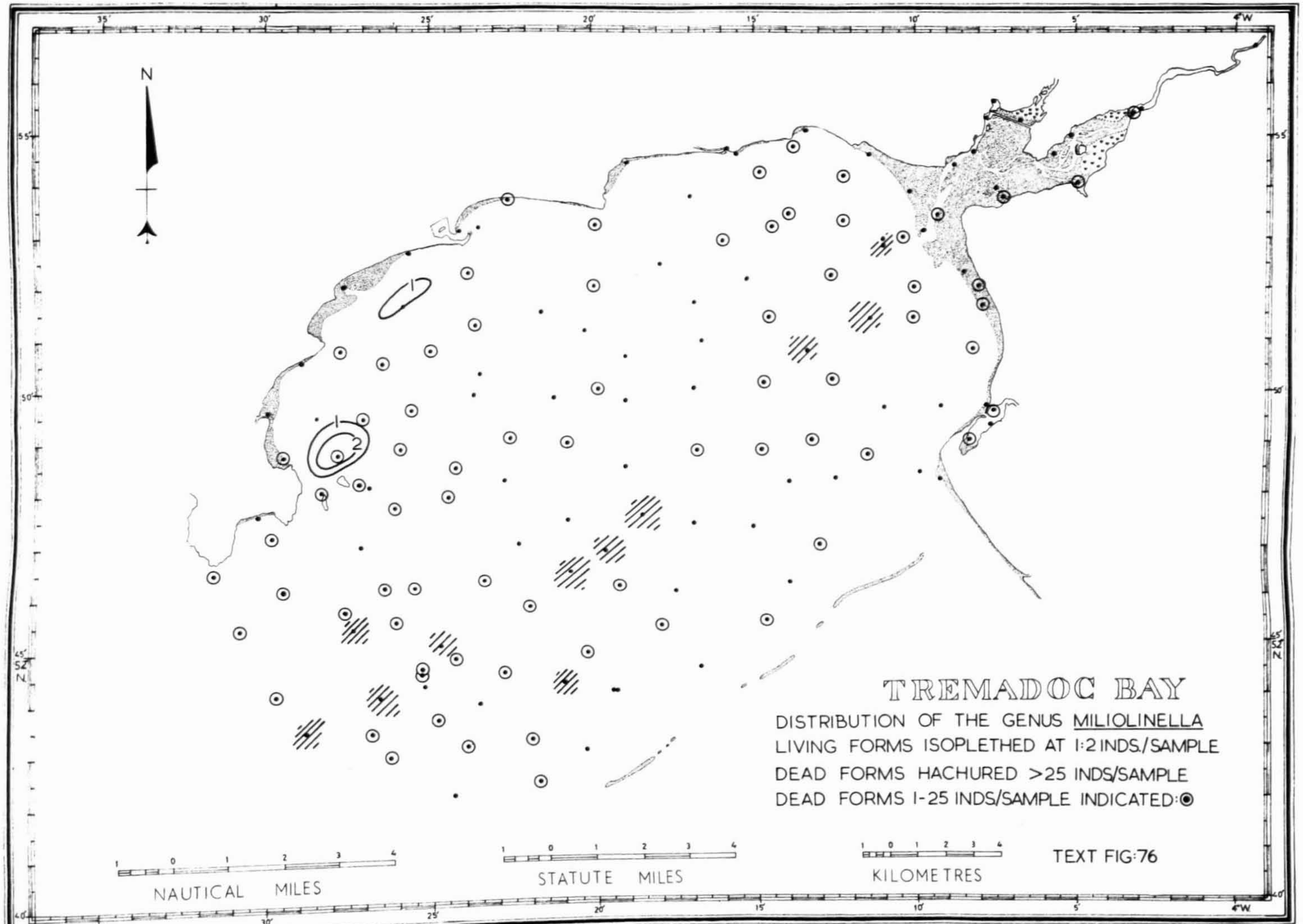
TEXT FIG: 72


TREMADOC BAY
DISTRIBUTION OF Q. SEMINULUM
LIVING FORMS ISOPLETHED AT 1:2:5:10 INDS./SAMPLE
DEAD FORMS HACHURED > 50 INDS./SAMPLE
DEAD FORMS 1-50 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N
TEXT FIG:73


N
TREMADOC BAY
DISTRIBUTION OF MASSILINA SECANS
LIVING FORMS ISOPLETHED AT 1:2 INDS/SAMPLE
DEAD FORMS HACHURED > 5 INDS/SAMPLE
DEAD FORMS 1-5 INDS/SAMPLE INDICATED: ◉
NAUTICAL MILES
STATUTE MILES
KILOMETRES
4°W
52°N
TEXT FIG: 74


TREMADOC BAY
DISTRIBUTION OF THE GENUS TRILOCULINA
LIVING FORMS ISOPLETHED AT 1:2:3 INDS/SAMPLE
DEAD FORMS HACHURED>10INDS/SAMPLE
DEAD FORMS 1-10INDS/SAMPLE INDICATED
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N

TEXT FIG: 75


TREMADOC BAY
DISTRIBUTION OF THE GENUS MILIOLINELLA
LIVING FORMS ISOPLETHED AT 1:2 INDS./SAMPLE
DEAD FORMS HACHURED >25 INDS/SAMPLE
DEAD FORMS 1-25 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N

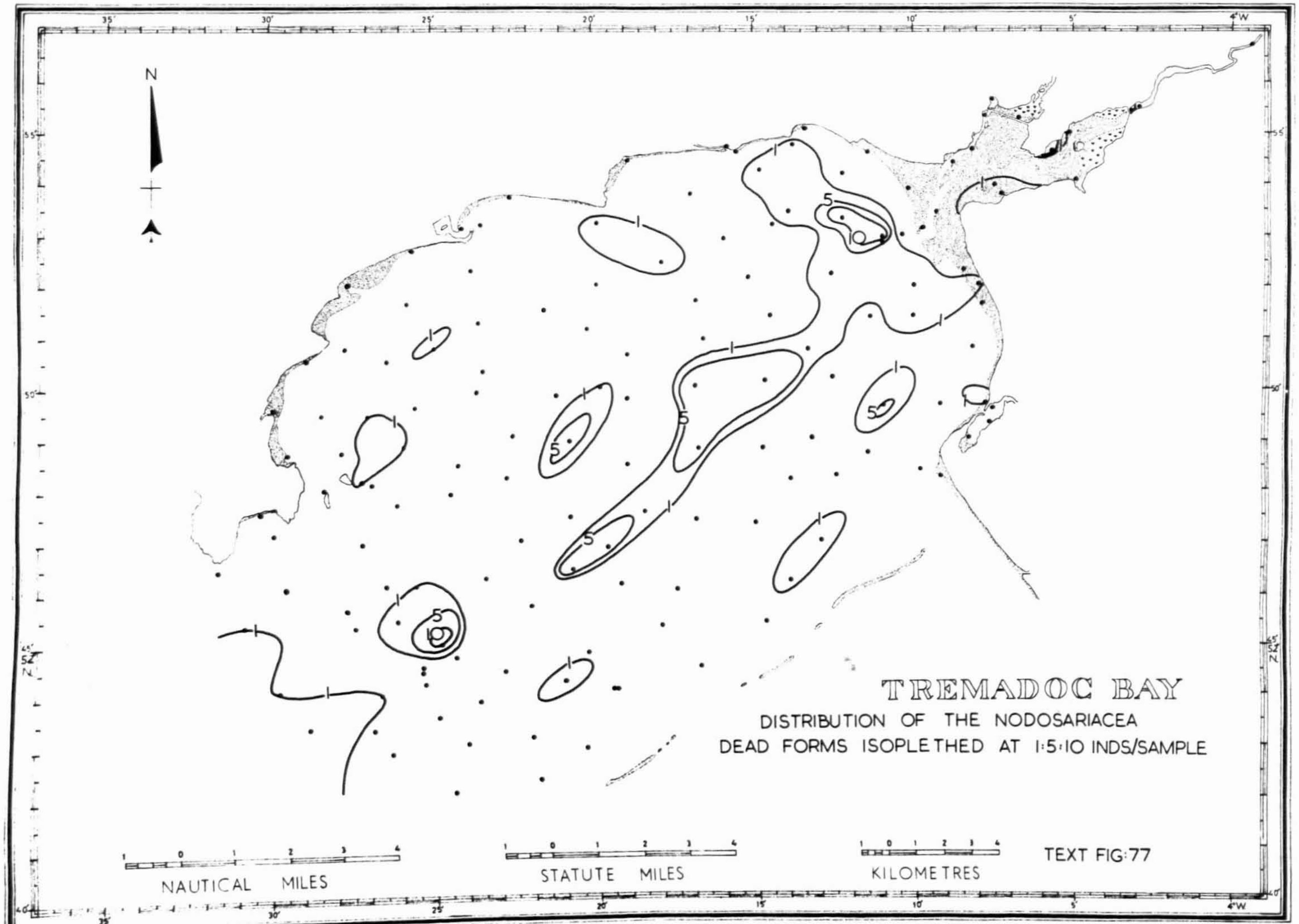
TEXT FIG: 76

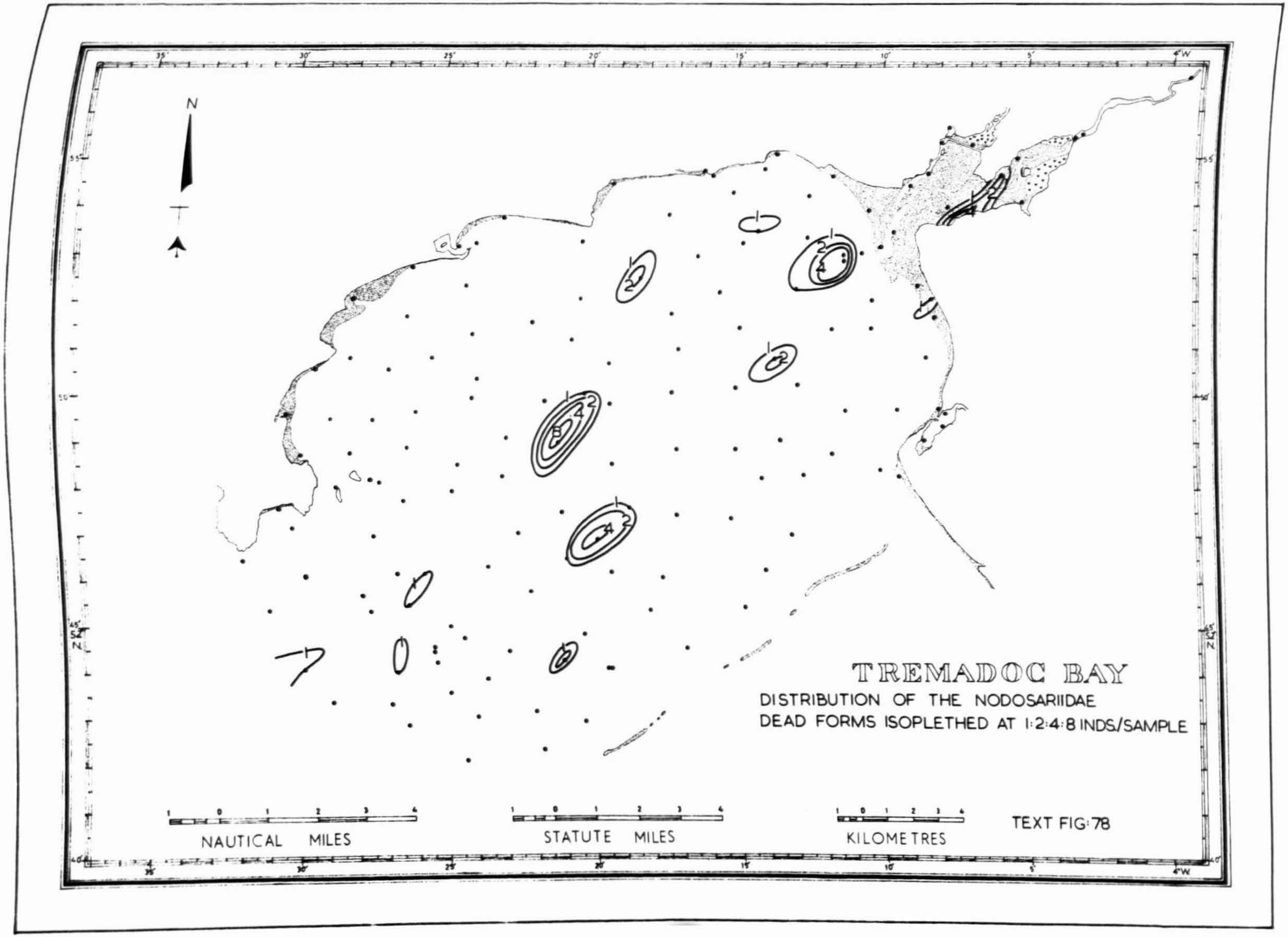
with dead concentrations in the south of the area.

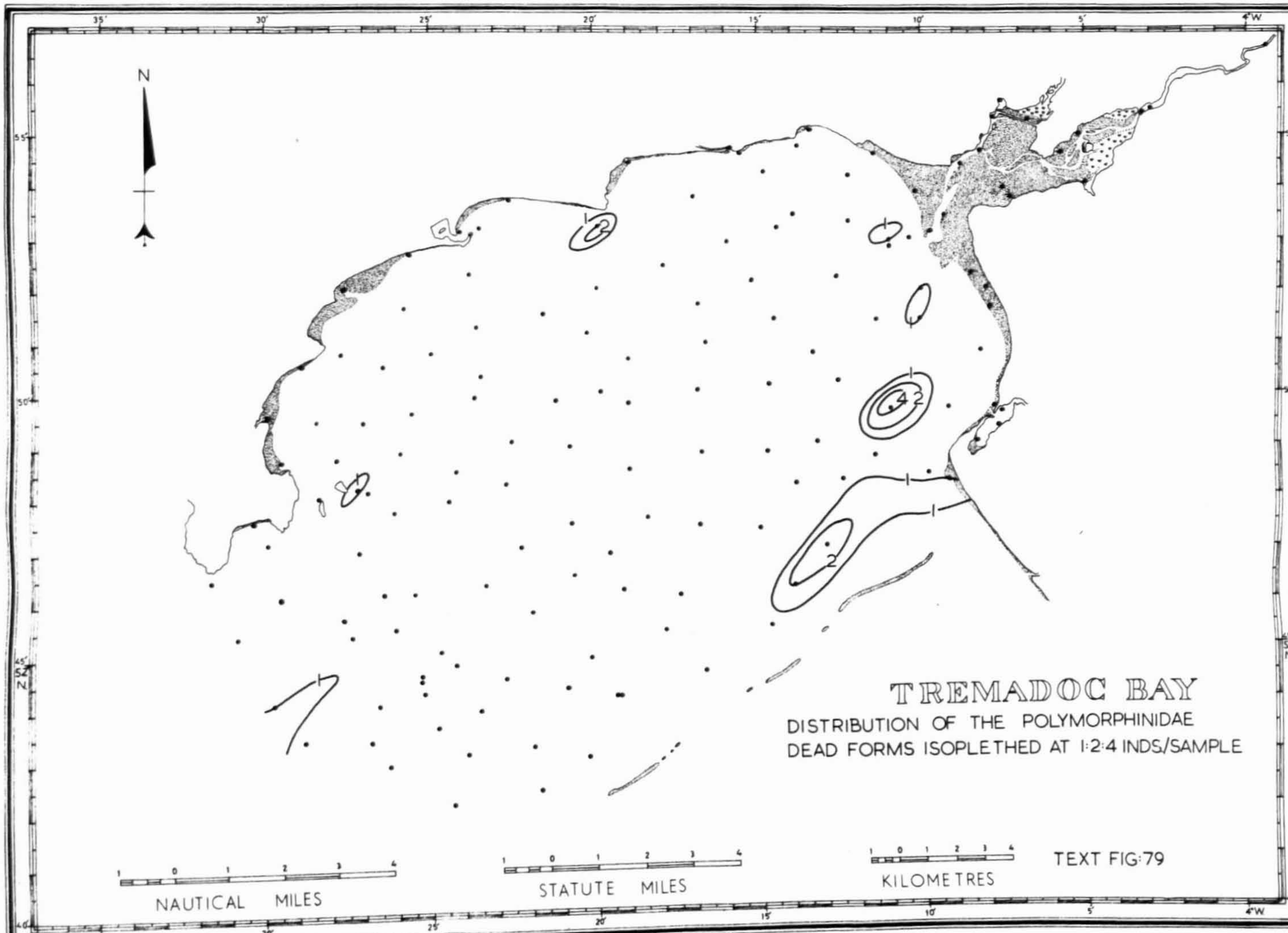
The Tremadoc Bay representatives of the Miolacea are listed below in order of abundance (total), living representatives being indicated with an asterisk:-

* * *Quinqueloculina seminulum* 5266
* * *Miliolinella subrotunda* 1189
* * *Quinqueloculina aspera* 916
* * *Quinqueloculina lata* 444
* * *Triloculina angulata* 175
* * *Triloculina trigonula* 147
* * *Massilina secans* 136
* * *Quinqueloculina agglutinata* 114
* * *Miliolinella chuckchiensis* 83
* * *Quinqueloculina bicornis* 81
* * *Quinqueloculina pulchella* 73
* *Miliolinella oblonga* 70
* *Triloculina dubia* 69
* * *Quinqueloculina seminulangulata* 56
* *Pateoris hauerinoides* 30
* *Spėroloculina subimpressa* 19
* *Quinqueloculina cliarensis* 15
* * *Quinqueloculina inconstans* 12
* *Quinqueloculina frigida* 11
* *Pyrgo williamsoni* 7
* *Quinqueloculina angularis* 3
* *Quinqueloculina granula-costata* 2
* *Cyclogyra involvens* 1
* *Planispirinella tenuis* 1
* *Ophthalmidium acutimargo* 1
* *Massilina płanisparoidea* 1
* *Triloculina trihedra* 1

The Nodosariacea in this area is represented by members of the families Nodosariidae, Polymorphinidae, and Glanduiinidae. The Nodosariacea (Text-fig.77) does not have any living representatives in the region, the dead concentrations being off the mouth of Port Madoc estuary, and in the outer muddy hollow with secondary occurrences in the shoals and along the line of the inner muddy hollow. The Nodosariidae is one of the more common families of this group and shows (Text-fig.78) an essentially similar distribution. The Polymorphinidae (Text-fig.79) are very poorly represented by only two species, the maximum number of specimens (dead) obtained from any sample being five. This family appears to have a shoal distribution. The most abundant family in this group is the Glandulinidae (Text-fig. 80) although again no living representatives were obtained. Dead concentrations were noted off the Port Madoc estuary, and along

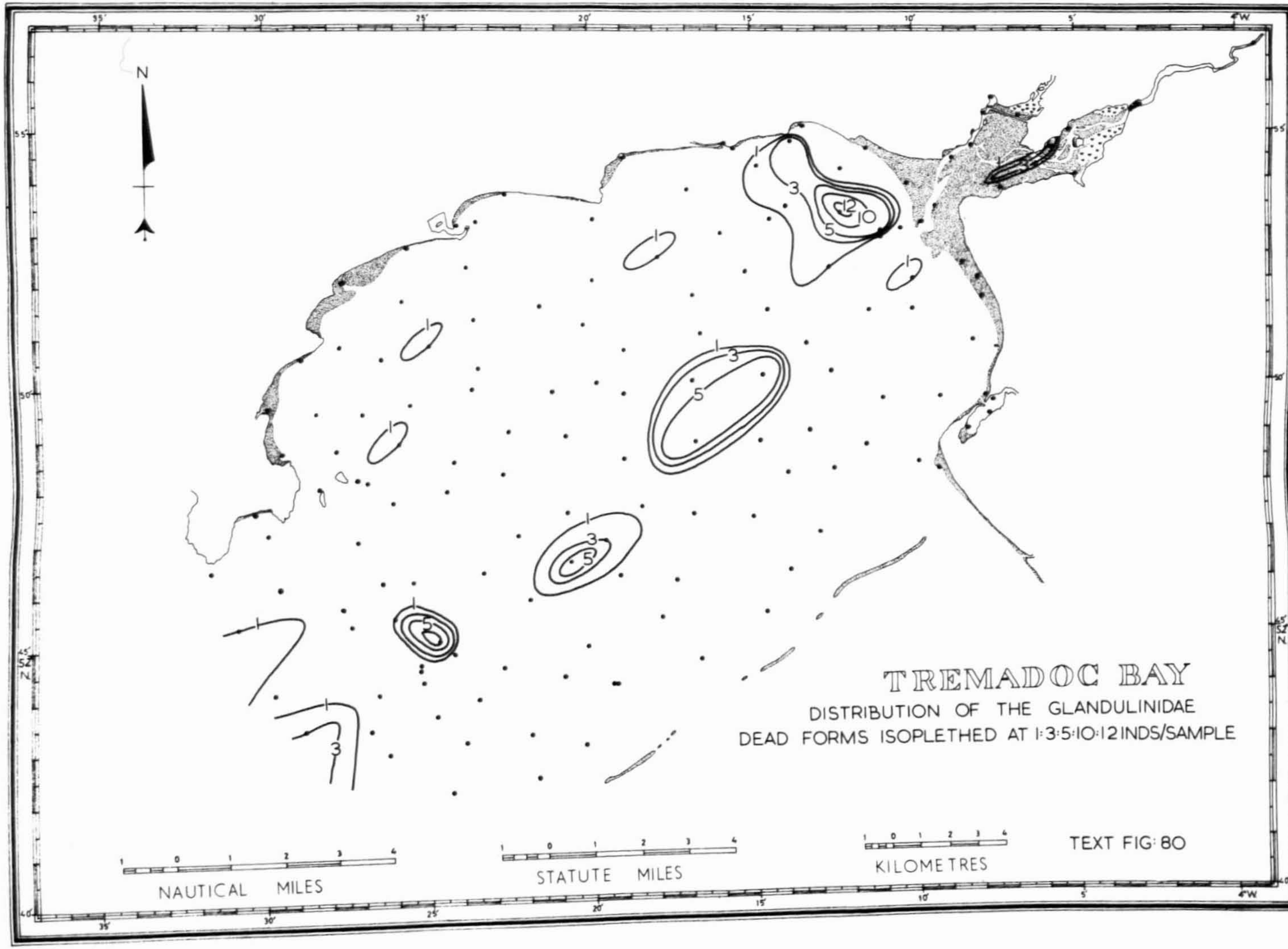

TREMADOC BAY
DISTRIBUTION OF THE NODOSARIACEA
DEAD FORMS ISOPLETHED AT 1:5:10 INDS/SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
35'
30'
25'
20'
15'
10'
5'
55'
50'
45'
52°N
40'
TEXT FIG:77


TREMADOC BAY
DISTRIBUTION OF THE NODOSARIIDAE
DEAD FORMS ISOPLETHED AT 1:2:4:8 INDS/SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°
TEXT FIG: 78



TREMADOC BAY
DISTRIBUTION OF THE POLYMORPHINIDAE
DEAD FORMS ISOPLETHED AT 1:2:4 INDS/SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
40'

TEXT FIG:79



N
TREMADOC BAY
DISTRIBUTION OF THE GLANDULINIDAE
DEAD FORMS ISOPLETHED AT 1:3:5:10:12 INDS/SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
40'

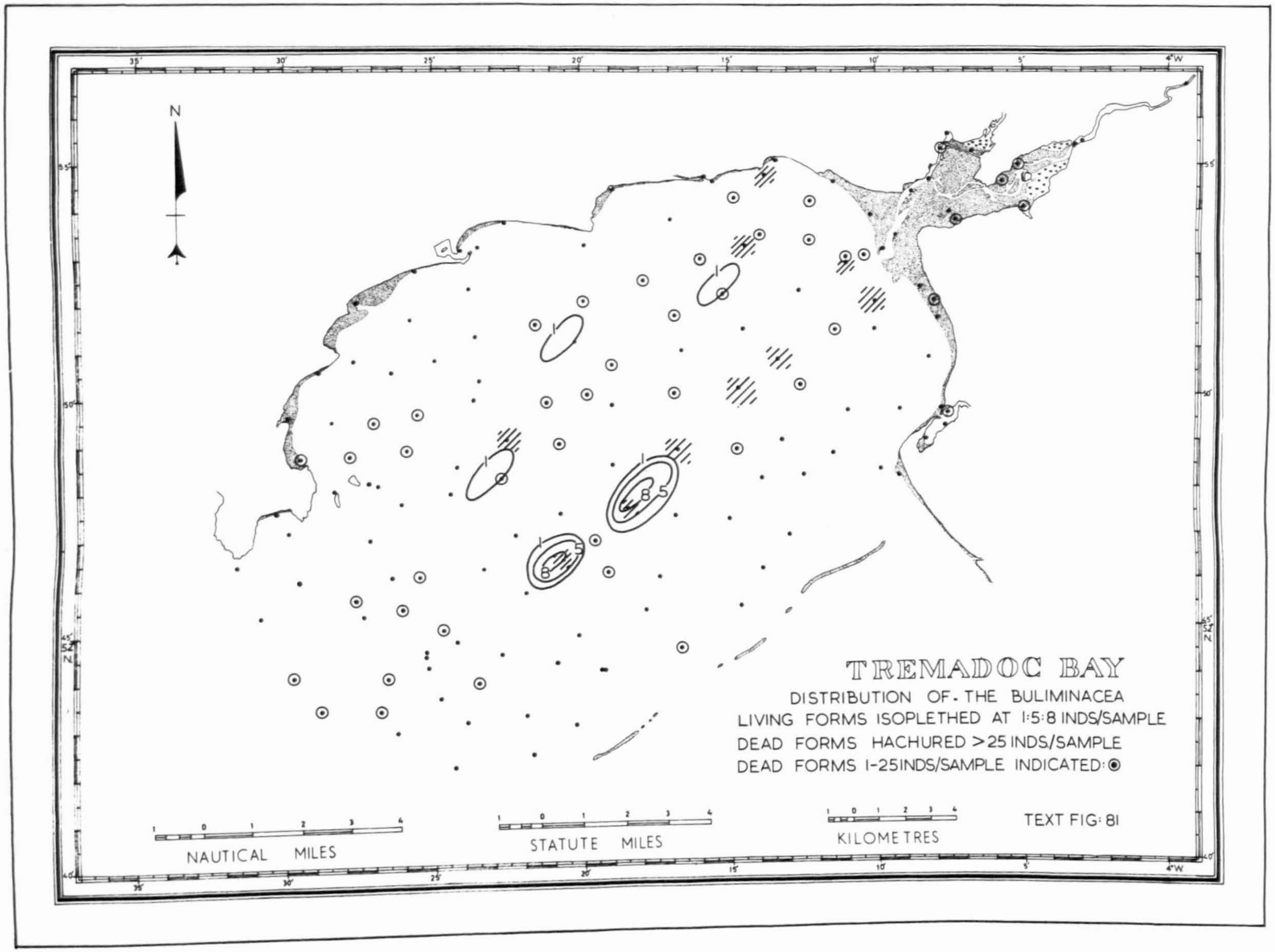
TEXT FIG: 80

the line of the muddy hollow, with secondary concentrations in the west of the area and on the shoal areas.

The Tremadoc Bay representatives of the Nodosariacea are listed below in order of abundance (total) :-

Oolina williamsoni 52	Lagena sulcata var. interrupta 3
Oolina patennae 24	Lagena substriata 2
Lagena sulcata var. spirita 16	Oolina hexagona 2
Buttulina lactea 15	Lagena semistriata 1
Lagena sulcata 11	Lagena laevigata 1
Lagena laevis 10	Lagena lineato-punctata 1
Fissurina marginata 9	Lenticulina suborbicularis 1
Fissurina lucida 6	Lenticulina varians 1
Globulina gibba 3	

The Super Family Buliminacea is mainly represented by the families Buliminidae and Turrilinidae, with occasional representatives of the families Bolivinitidae and Islandiellidae. The Buliminicea (Text-fig.81) are fairly well represented in the area with up to 8 living specimens/sample and 64 dead specimens/sample. The living forms are concentrated in the finer grained sediments of the muddy hollow with the dead forms showing a similar concentration, with other scattered occurrences in the shoals. The Family Turrilinidae is solely represented by Buliminella elegantissima which was found living in the muddy hollow, with dead forms elsewhere along the hollow. The Bolivinitidae appear to be distributed in the shallower areas of the muddy hollow, although the two species representing this family were not found in abundance. Only one dead specimen of Cassidulinoides tenuis representing the Islandiellidae was retrieved, this being from the shoal area to the North West of Port Madoc estuary. The most common family of this group,


TREMADOC BAY
DISTRIBUTION OF THE BULIMINACEA
LIVING FORMS ISOPLETHED AT 1:5:8 INDS/SAMPLE
DEAD FORMS HACHURED >25 INDS/SAMPLE
DEAD FORMS 1-25 INDS/SAMPLE INDICATED: ⊙
N
NAUTICAL MILES
STATUTE MILES
KILOMETRES
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
TEXT FIG: 81

the Buliminidae show an essentially similar distribution as the Super Family in Tremadoc Bay, as is well shown by its most common species. Bulimina gibba (Text-fig.82) with both the living and dead concentrations being mainly in the muddy hollow region although dead representatives of this family were found in varying abundance in Port Madoc estuary.

The Tremadoc Bay representatives of the Buliminacea are listed below in order of abundance (total), living representatives being indicated with an asterisk:-

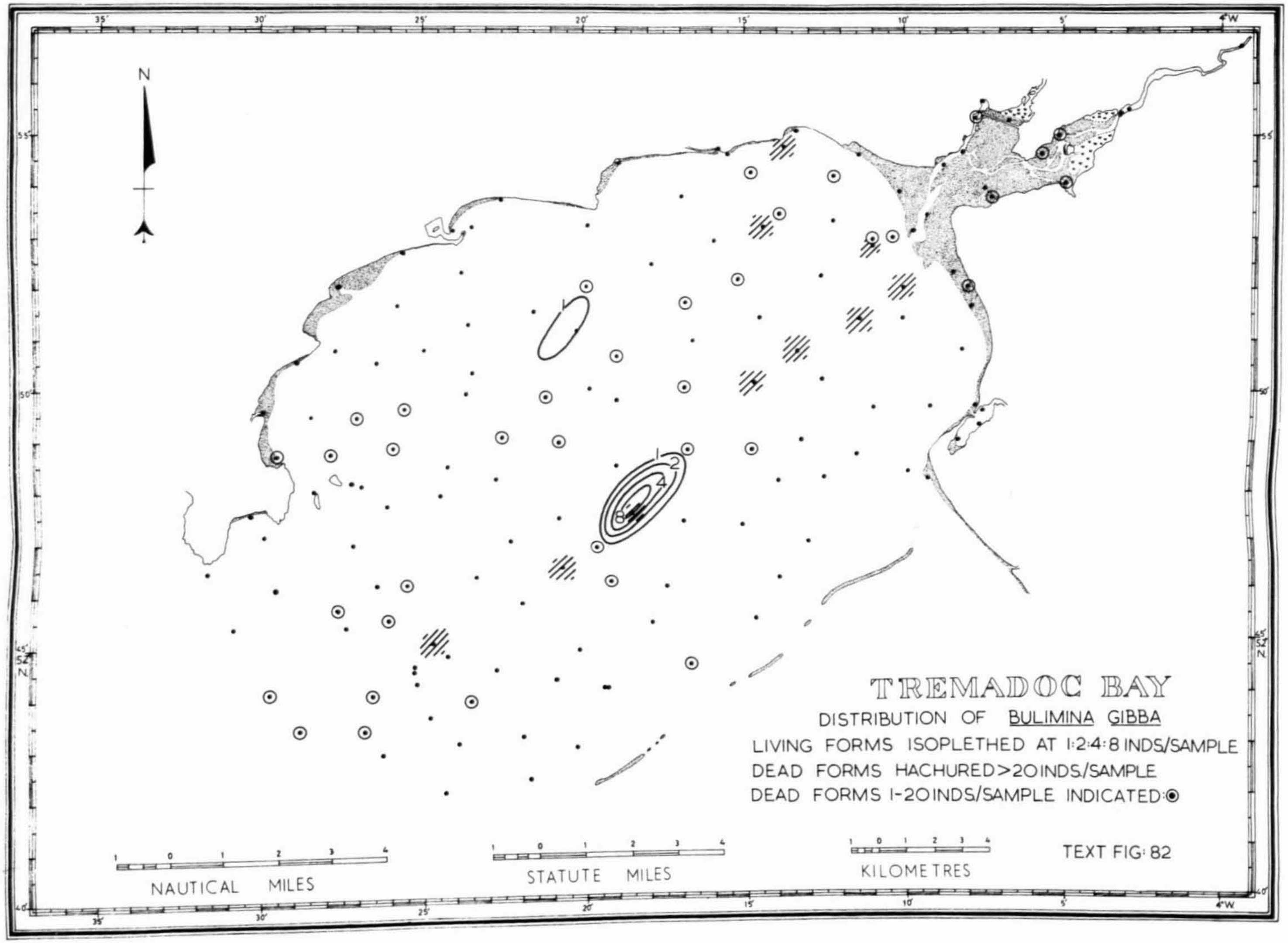
* Bulimina gibba 570	Bolivina spathulata 11
* Bulimina elongata 126	Bolivina variablis 7
* Bulimina marginata 17	Cassidulinoides tenuis 1
* Buliminella elegantissima 14	

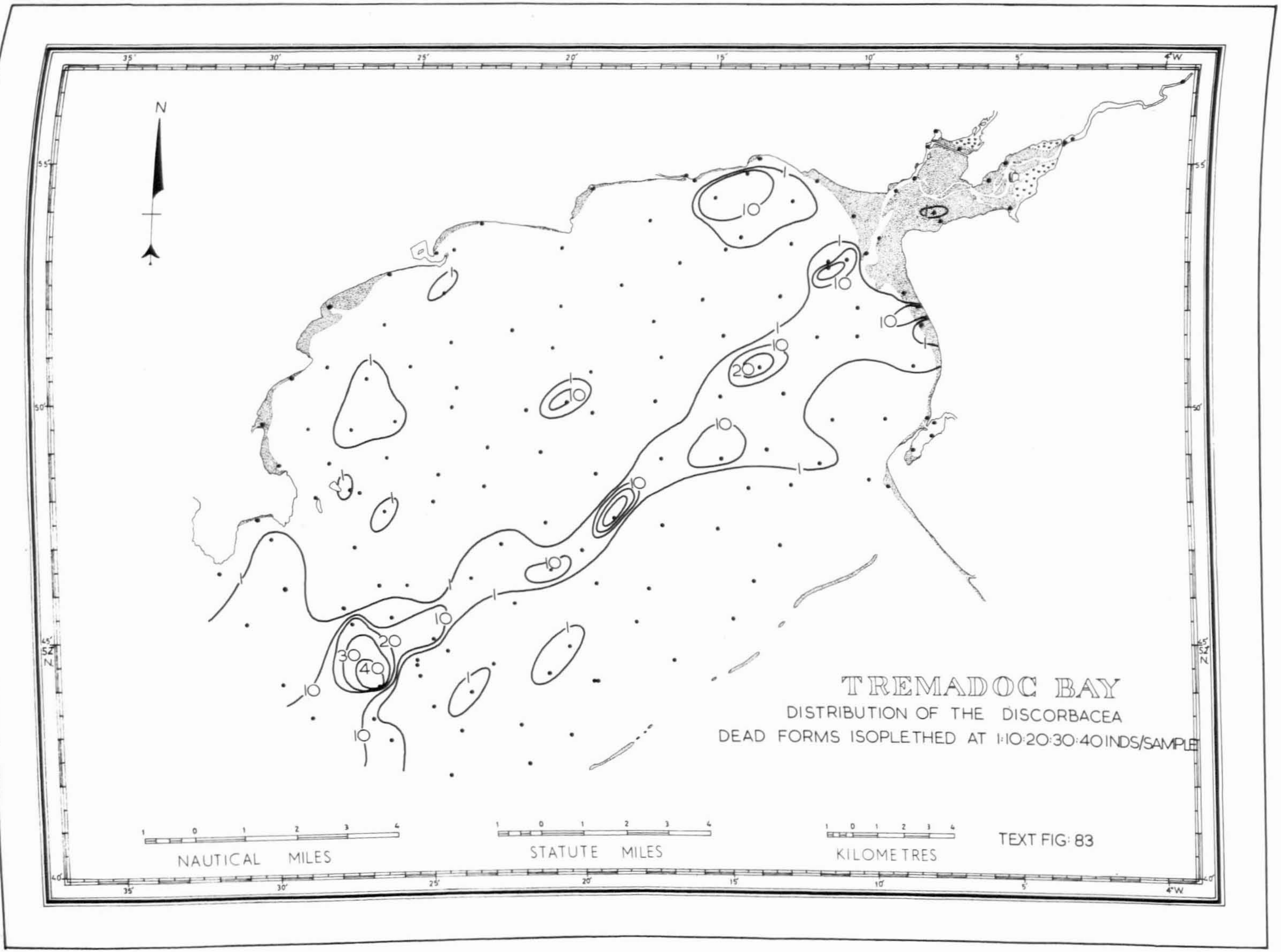
The Discorbacea (Text-fig.83) in this area is only represented by one family, the Discorbidae, with two genera Discorbis and Eoeponidella, the former with three species and the latter with one, no specimens being living. Up to 43 dead specimens/sample have been obtained, the main distribution concentrations being along the line of the muddy hollow and to the north west of Port Madoc estuary, with secondary concentrations on the shoal areas.

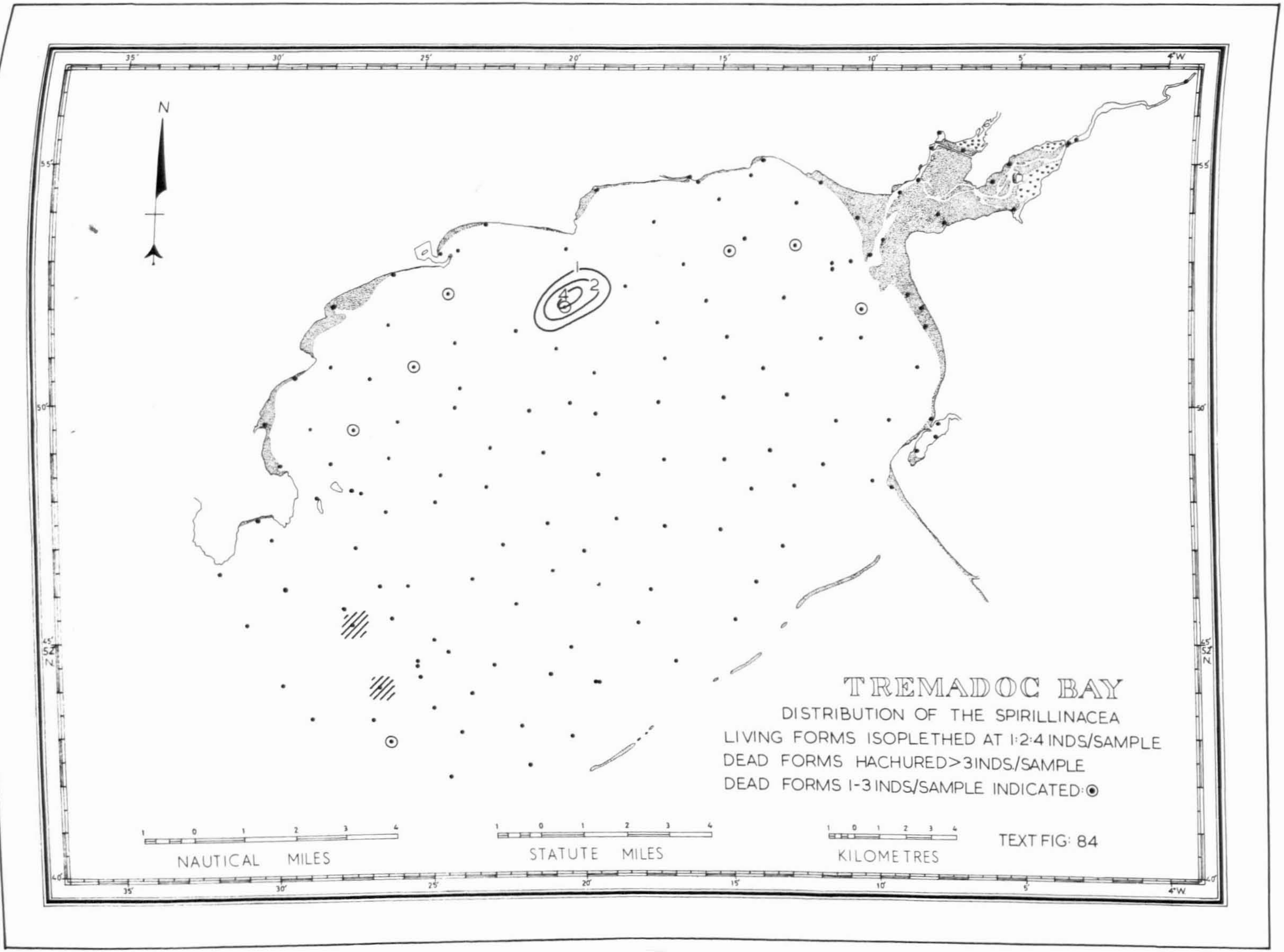
The Tremadoc Bay representatives of the Discorbacea are listed below in order of abundance (total) :-

Eoeponidella mamilla 186
Discorbis williamsoni 98
Discorbis bradyi 82
Discorbis malovensis var. nidiformis 43

Another poorly represented Super Family in Tremadoc Bay is the Spirillinacea (Text-fig.84), two species, two genera, and one family comprising the group. The main living area is just South of Pen-ychain


TREMADOC BAY
DISTRIBUTION OF BULIMINA GIBBA
LIVING FORMS ISOPLETHED AT 1:2:4:8 INDS/SAMPLE
DEAD FORMS HACHURED>20 INDS/SAMPLE
DEAD FORMS 1-20 INDS/SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°
N
40'
TEXT FIG: 82


TREMADOC BAY
DISTRIBUTION OF THE DISCORBACEA
DEAD FORMS ISOPLETHED AT 1:10:20:30:40 INDS/SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
TEXT FIG: 83



N
TREMADOC BAY
DISTRIBUTION OF THE SPIRILLINACEA
LIVING FORMS ISOPLETHED AT 1:2:4 INDS/SAMPLE
DEAD FORMS HACHURED>3 INDS/SAMPLE
DEAD FORMS 1-3 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES

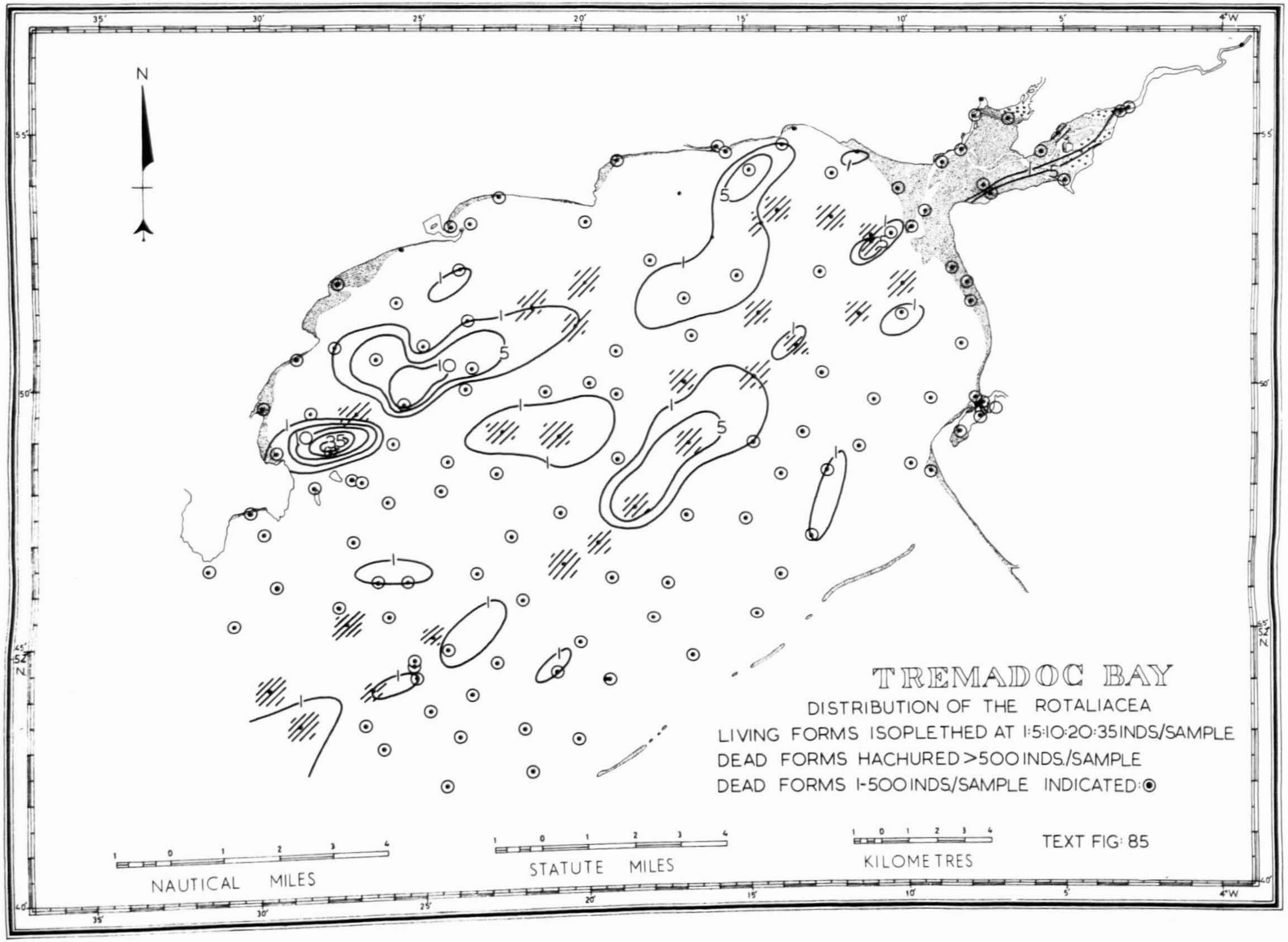
TEXT FIG: 84

Point, with scattered dead occurrences on the shoals and a slight concentration in the deeper west area.

The Tremadoc Bay representatives of the Spirillinacea are listed below in order of abundance (total), living representatives being indicated with an asterisk:-

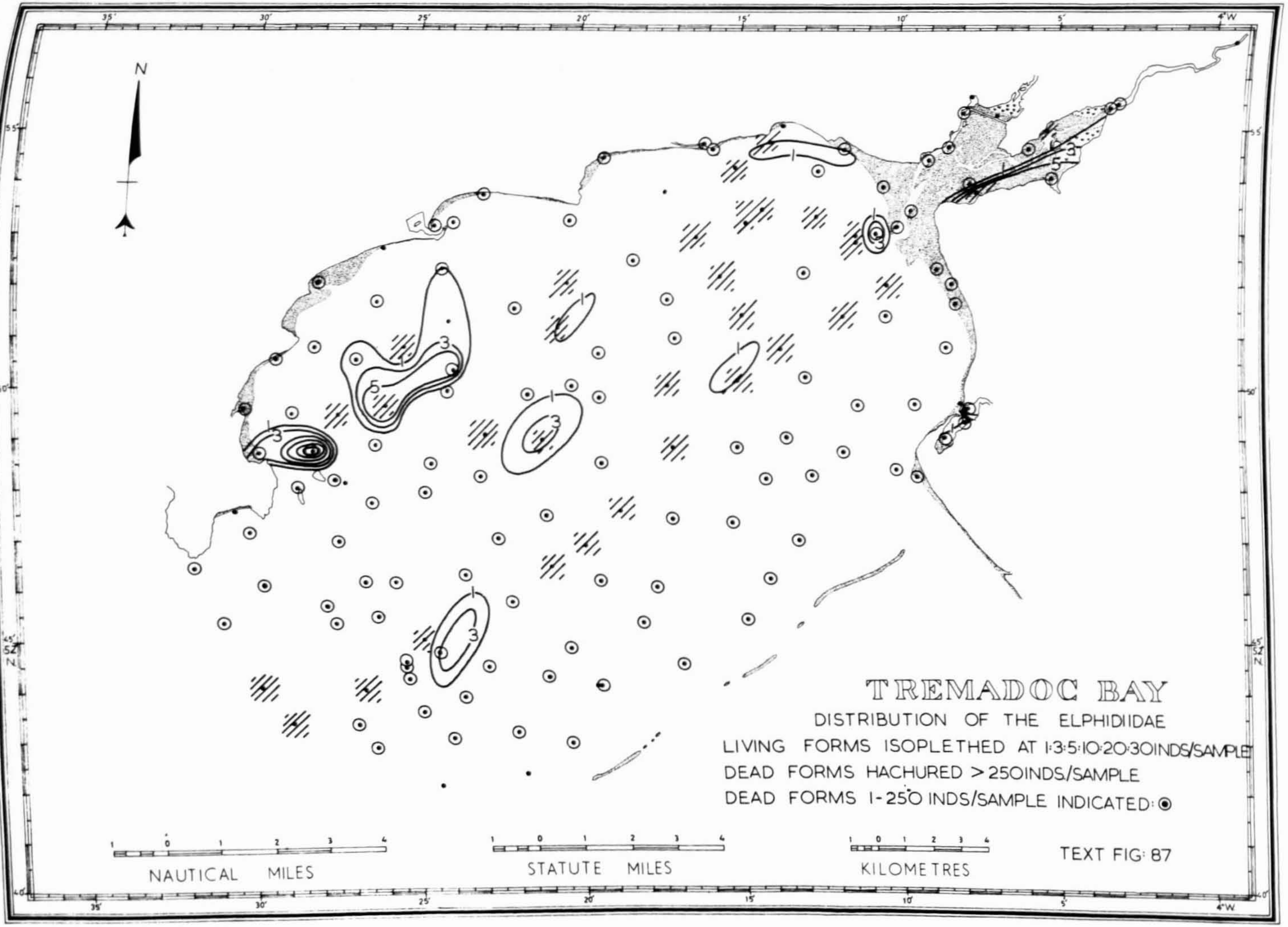
* Patellina corrugata 22
Spirillina vivipara 4

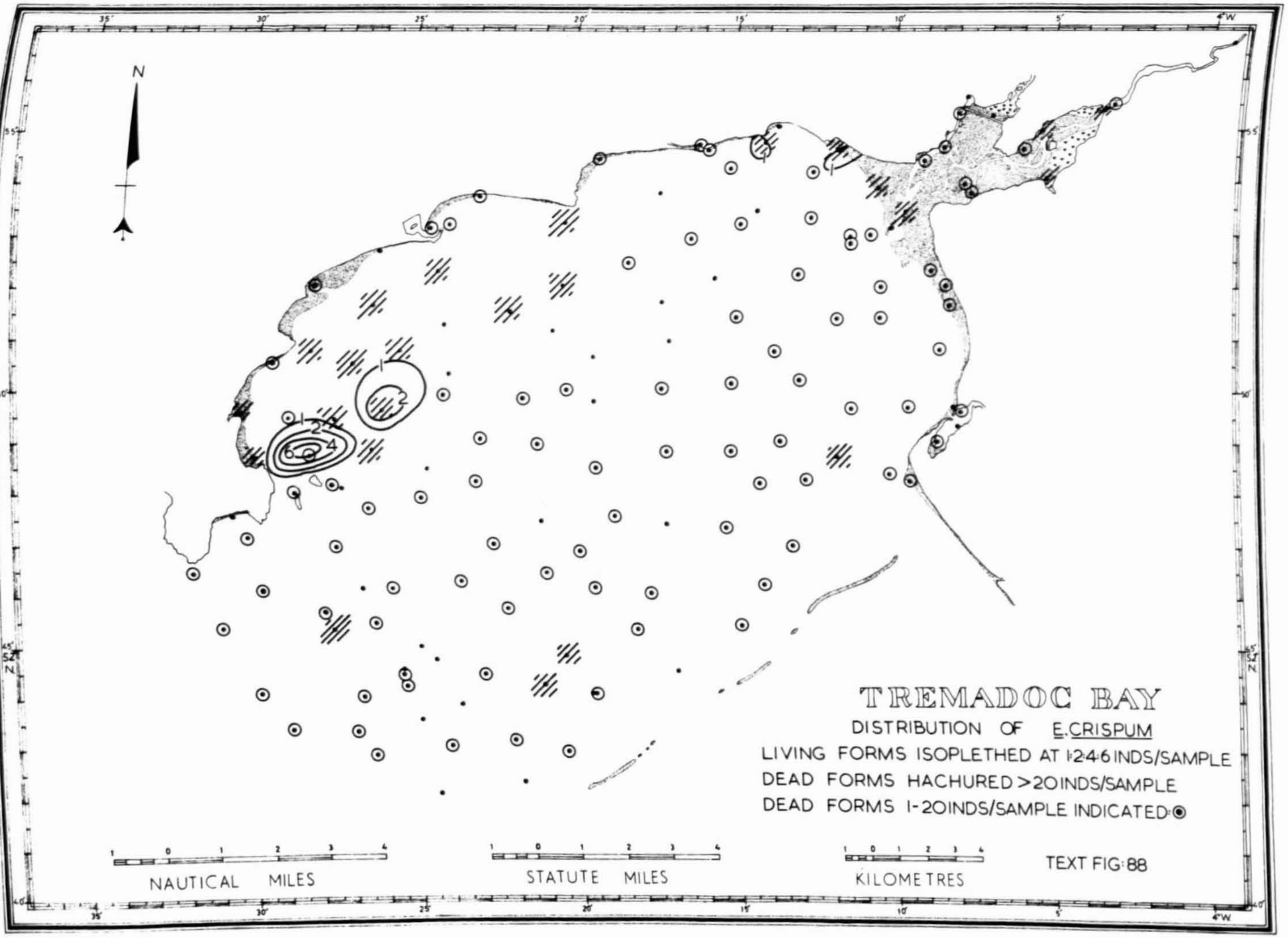
The most abundant and widespread Super Family in Tremadoc Bay is the Rotaliacea with up to 39 living specimens/sample and up to 1983 dead specimens/sample. Two families comprise this group in the area, the Rotalidae, represented by Ammonia beccarii, and the Elphidiidae represented by 8 species, both families being common. The Rotaliacea (Text-fig.85) are abundant and present in varying numbers in all the sediment types with the greatest living concentration around St. Tudwals Islands and to the north east of these islands, with secondary areas on the shoals surrounding the muddy hollow, in the muddy hollow itself and on the South side of Port Madoc estuary. The dead concentrations are mainly in the deeper portions of the bay, in the west and in the muddy hollow although some concentrations are noted on the shoal south of Pen-ychain Point and to the north of St. Tudwals Islands. The family Rotaliidae (Text-fig.86) is represented by the species Ammonia beccarii which is one of the most common species in the area with up to 9 living specimens/ sample and up to 795 dead specimens/sample. The living forms are concentrated North of St. Tudwals Islands, south of Criccieth, off Port Madoc estuary, on the south shoals, and East of

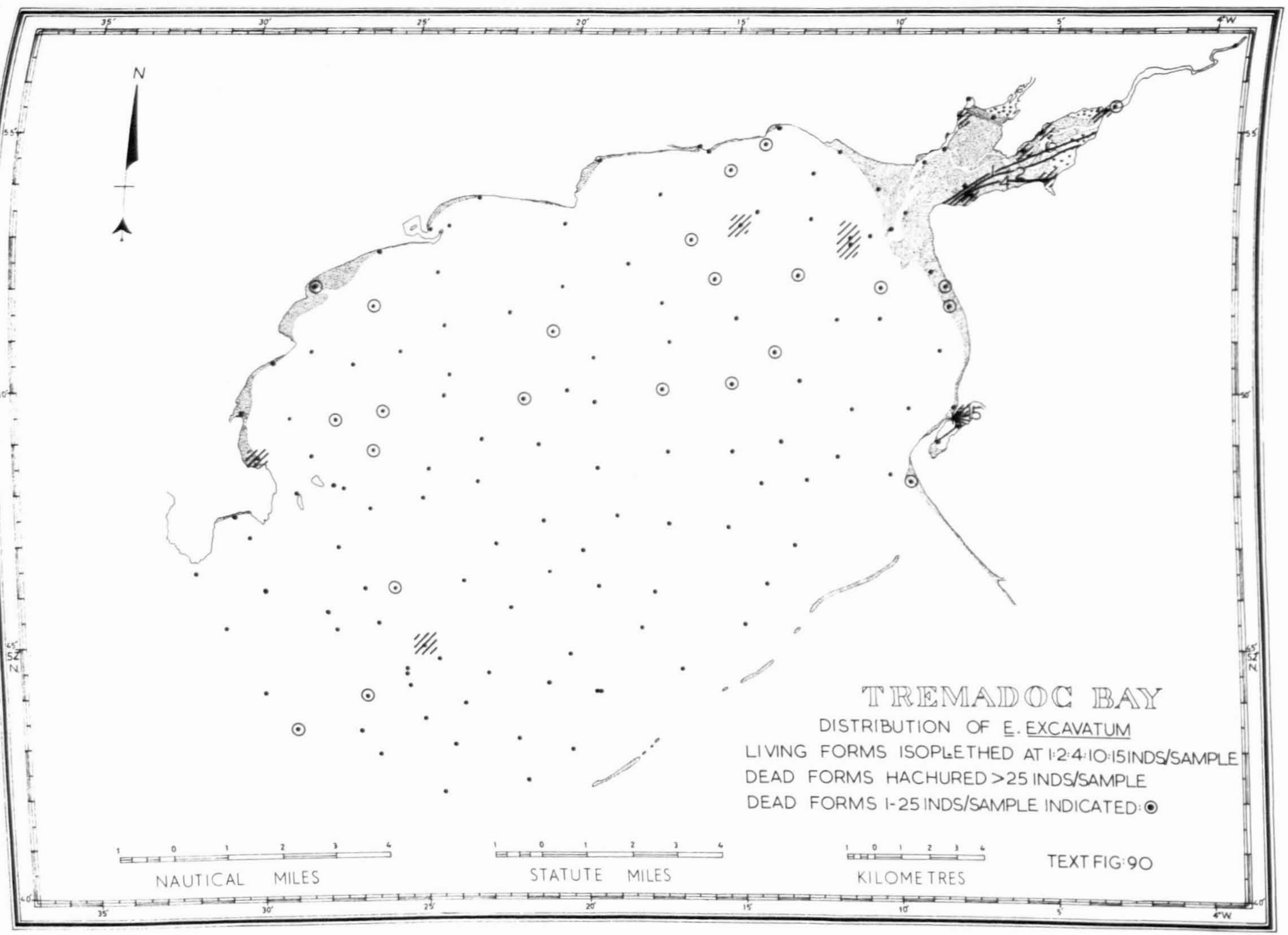

TREMADOC BAY
DISTRIBUTION OF THE ROTALIACEA
LIVING FORMS ISOPLETHED AT 1:5:10:20:35 INDS/SAMPLE
DEAD FORMS HACHURED >500 INDS./SAMPLE
DEAD FORMS 1-500 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N

TEXT FIG: 85

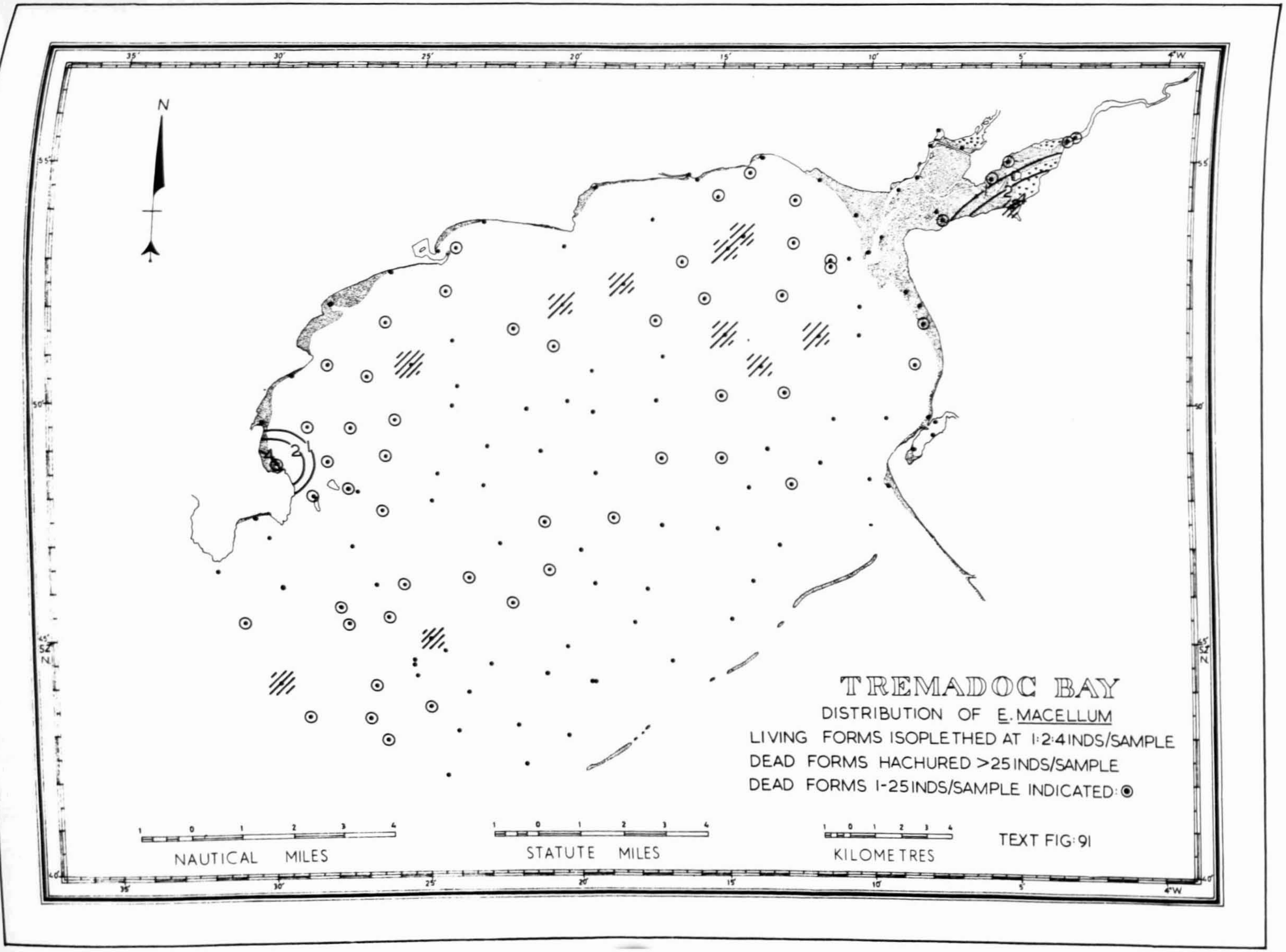
St. Tudwals Islands, with secondary concentrations in the muddy hollow region, and other shoal regions. Dead concentrations are primarily in the muddy hollow with secondary shoal areas. The family Elphidiidae (Text-fig.87) is the other major family of this group with up to 39 living specimens/sample and 1323 dead specimens/sample the area just north and to the north west of St. Tudwals Islands being the main living concentration areas with secondary areas in the shoals and on south side of Port Madoc estuary. There is a concentration of dead forms in the muddy hollow. Most of the species of Elphidium are common over the area. E.crispum (Text-fig.88) has living representatives concentrated in the St. Tudwals Islands region with single occurrences near Criccieth. The dead forms of this species are concentrated in similar areas and are also found in Port Madoc estuary. E.crispum var. spinosum (Text-fig.89) shows a similar distribution with living forms concentrated around St. Tudwals Islands, Criccieth and also on the southern shoal areas, the dead forms mirroring this distribution. E.excavatum (Text-fig.90) shows a very selective distribution only being noted living on the south side of Port Madoc estuary and in Llandanwg lagoon, although dead forms are found scattered over most of the west and north regions of the bay, especially in the deeper western portion and off the mouth of Port Madoc estuary, this distribution indicating post morten transport of the foraminifera tests. E.macellum (Text-fig.91) shows a similar distribution, living forms concentrated on the south side of Port Madoc estuary and also to the lee of St. Tudwals headland, with scattered dead occurrences over the bay,


TREMADOC BAY
DISTRIBUTION OF THE ELPHIDIIDAE
LIVING FORMS ISOPLETHED AT 1:3:5:10:20:30 INDS/SAMPLE
DEAD FORMS HACHURED > 250 INDS/SAMPLE
DEAD FORMS 1-250 INDS/SAMPLE INDICATED: ◉
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52° N
TEXT FIG: 87


N
TREMADOC BAY
DISTRIBUTION OF E.CRISPUM
LIVING FORMS ISOPLETHED AT 1·2·4·6 INDS/SAMPLE
DEAD FORMS HACHURED >20 INDS/SAMPLE
DEAD FORMS 1-20 INDS/SAMPLE INDICATED ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
4°W
52°N
TEXT FIG:88


TREMADOC BAY
DISTRIBUTION OF E. EXCAVATUM
LIVING FORMS ISOPLETHED AT 1:2:4:10:15 INDS/SAMPLE
DEAD FORMS HACHURED >25 INDS/SAMPLE
DEAD FORMS 1-25 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
52°
4°W

TEXT FIG: 90


TREMADOC BAY
DISTRIBUTION OF E. MACELLUM
LIVING FORMS ISOPLETHED AT 1:2:4 INDS/SAMPLE
DEAD FORMS HACHURED >25 INDS/SAMPLE
DEAD FORMS 1-25 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
40'
TEXT FIG: 91

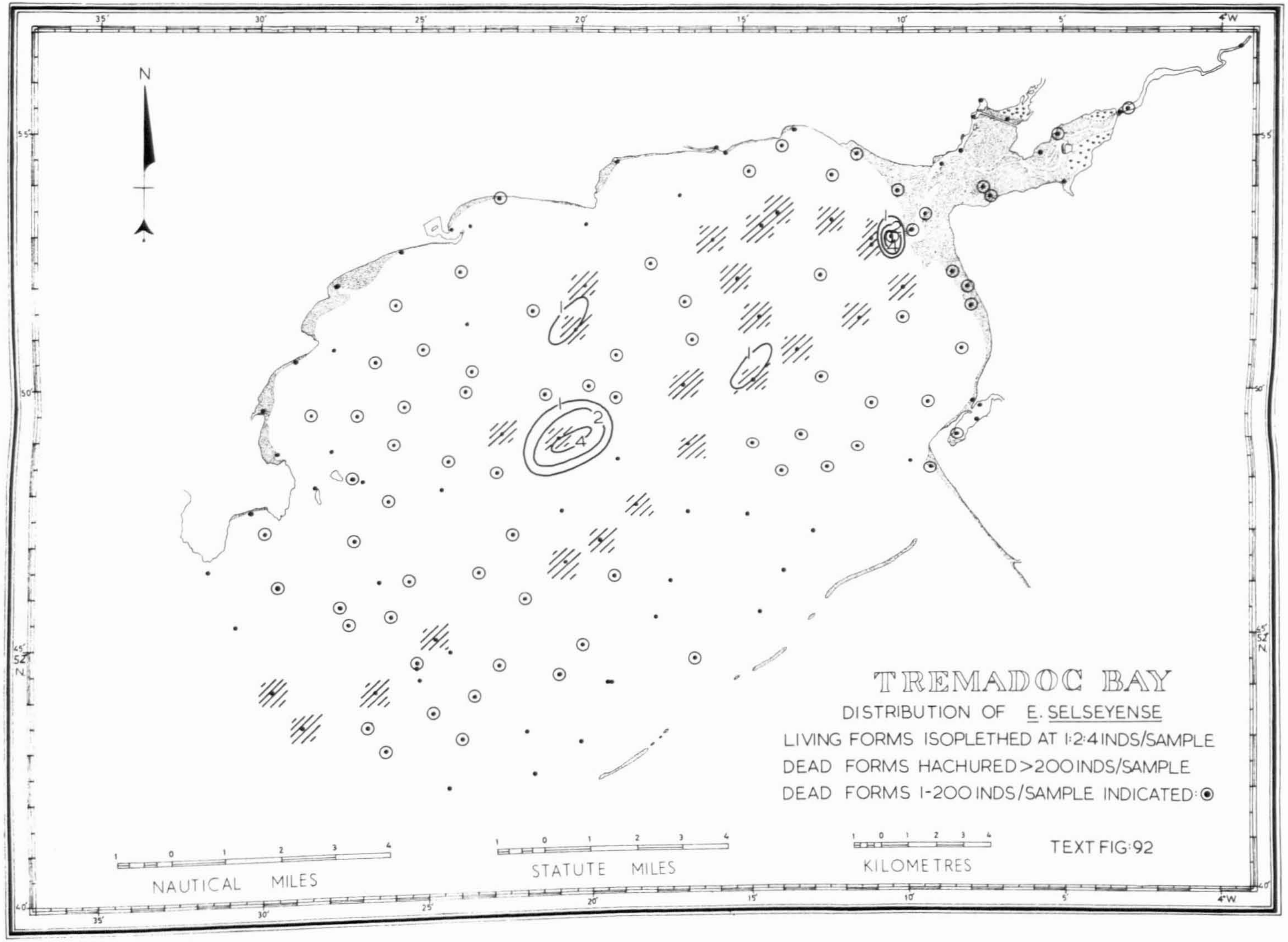
especially off Port Madoc estuary, on the northern shoals, and in the western portion of the region. The most abundant species of this family is _E. selseyense_ with up to 4 living specimens/sample and up to 1450 dead specimens/sample. The living occurrences of this species (Text-fig.92) are noted off Port Madoc estuary, on the shoal south of Pen-ychain Point, and in the muddy hollow, with the dead forms concentrated along the muddy hollow with other occurrences in most of the other samples.

The Tremadoc Bay representatives of the Rotaliacea are listed below in order of abundance (total), living representatives being indicated with an asterisk:-

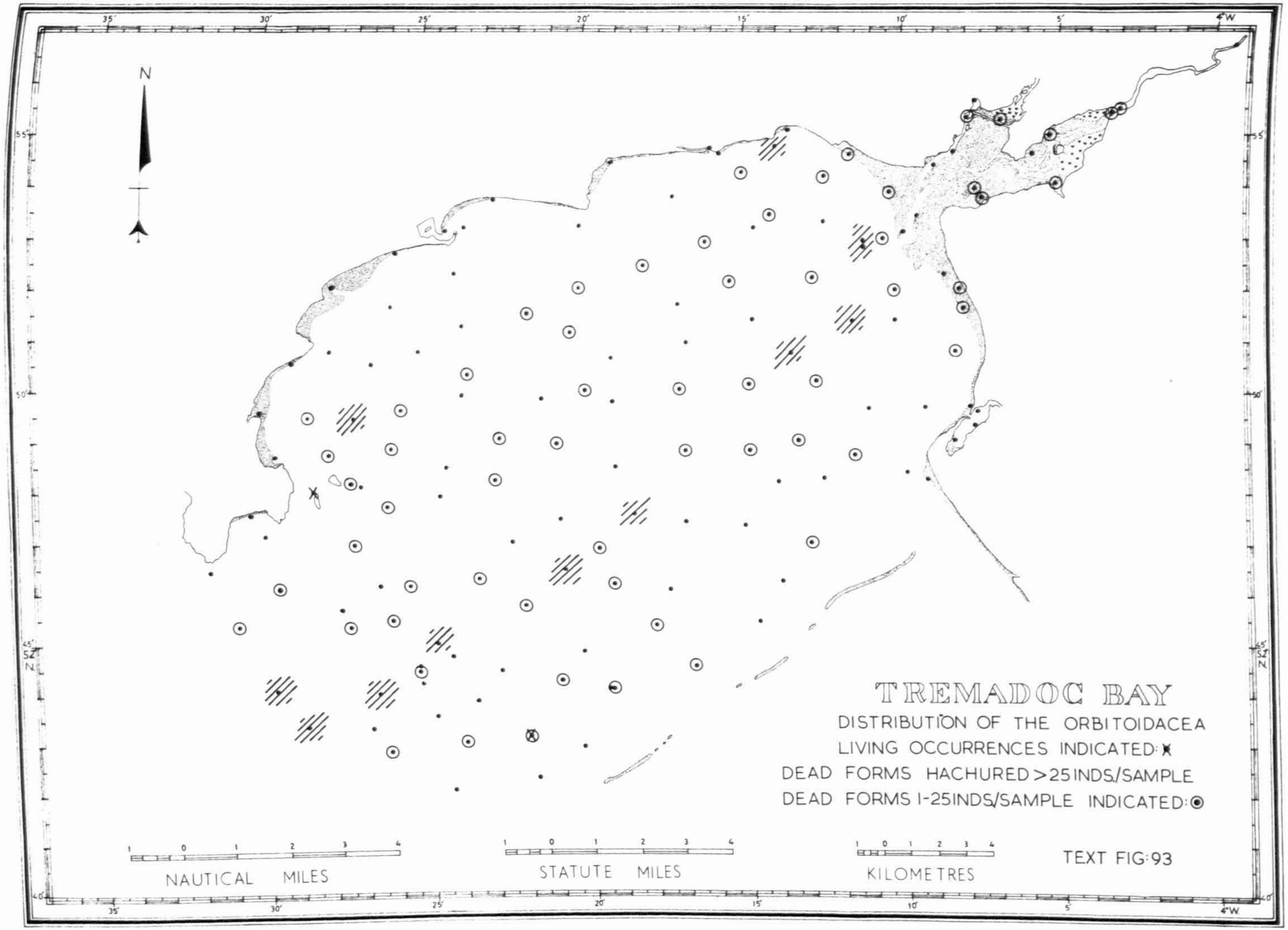
*_Elphidium selseyense_ 17,561	*_Elphidium macellum_ 919
*_Ammonia beccarii_ 11,875	_Elphidium magellanicum_ 753
*_Elphidium discoidale_ 2,371	*_Elphidium crispum_ _var. spinosum_ 564
*_Elphidium crispum_ 1,949	_Elphidium bartletti_ 288
*_Elphidium excavatum_ 1,153	

The Super Family Globigerinacea is only represented by one species, the distribution of which, being a planktonic form, is of no value when obtained from bottom sediments. The species was obtained from the shoal areas.

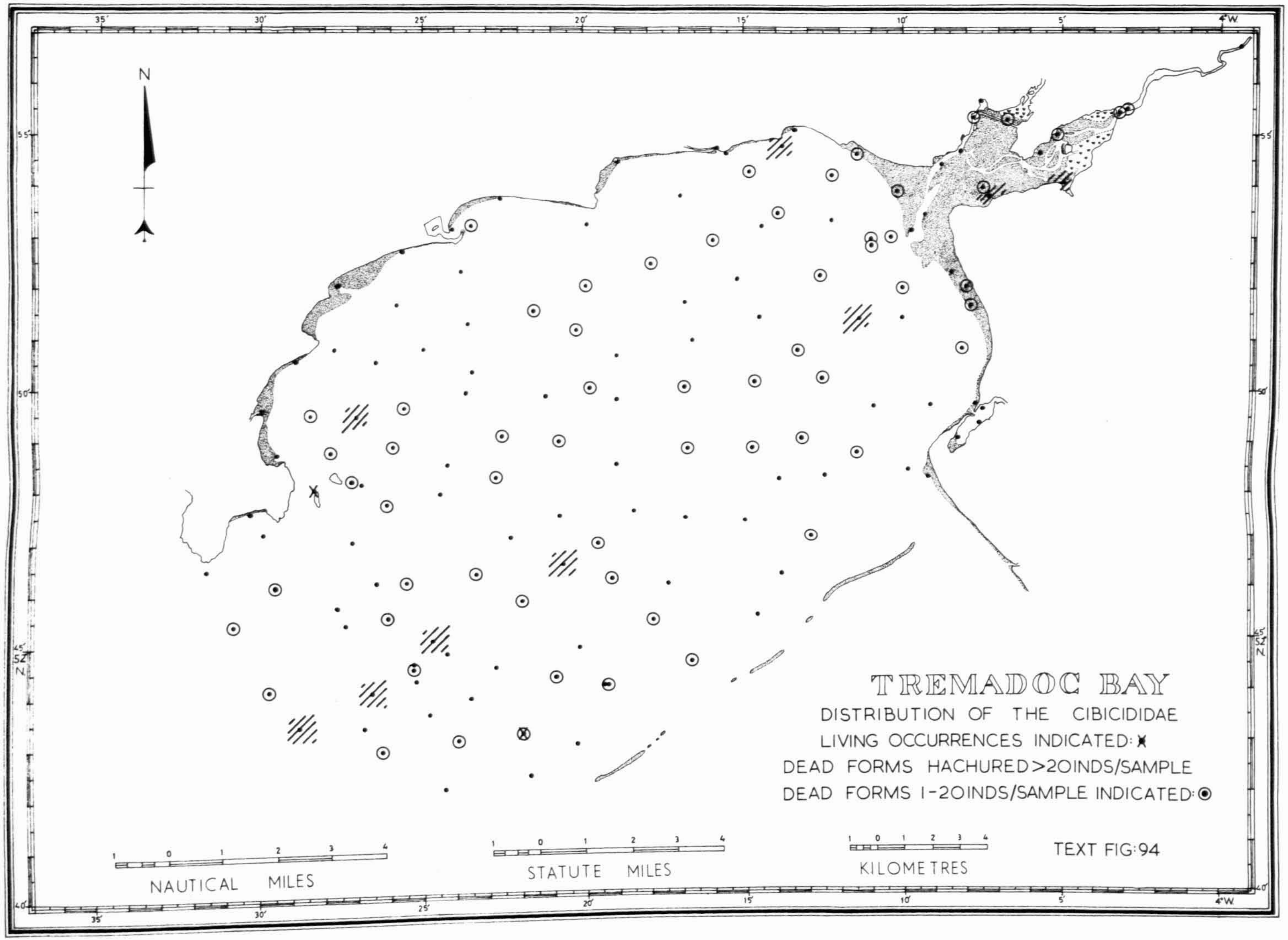
The Super Family Orbitoidacea (Text-fig.93) is fairly well represented in total over the whole area although living occurrences are very scarce. Up to 159 dead specimens/sample have been obtained, the greatest concentrations being along the line of the muddy hollow with less important areas on the shoals. The Cibicididae (Text-fig. 94) is the most important family in this group and shows an essentially similar distribution to the Super Family. The Planorbulinidae (Text-fig.95) is the next most abundant family, although no living forms were

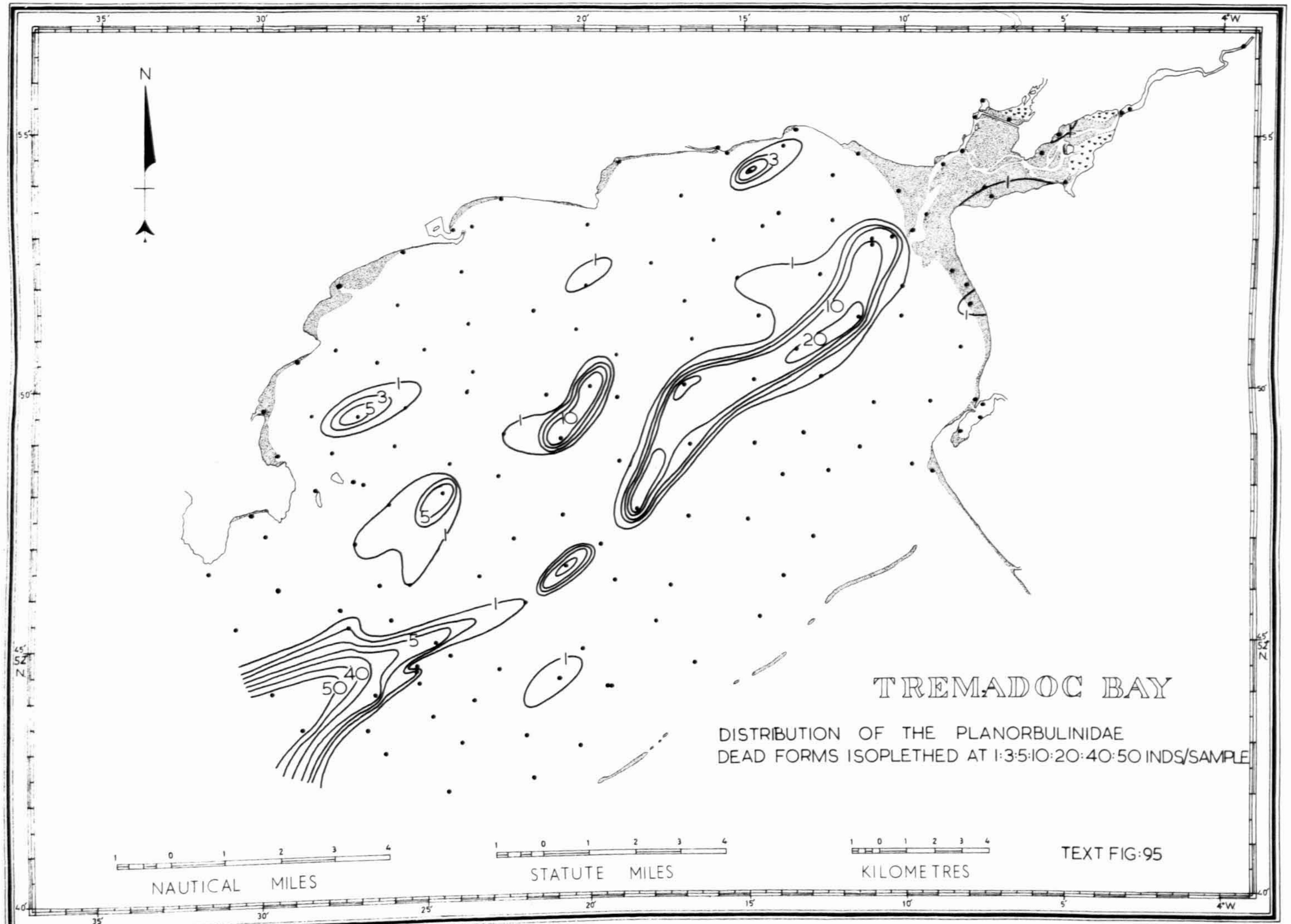

TREMADOC BAY
DISTRIBUTION OF E. SELSEYENSE
LIVING FORMS ISOPLETHED AT 1:2:4 INDS/SAMPLE
DEAD FORMS HACHURED >200 INDS/SAMPLE
DEAD FORMS 1-200 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N

TEXT FIG: 92


N
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°
N.
40'
TREMADOC BAY
DISTRIBUTION OF THE ORBITOIDACEA
LIVING OCCURRENCES INDICATED: X
DEAD FORMS HACHURED > 25 INDS/SAMPLE
DEAD FORMS 1-25 INDS/SAMPLE INDICATED: ⊙
NAUTICAL MILES
STATUTE MILES
KILOMETRES

TEXT FIG: 93


TREMADOC BAY
DISTRIBUTION OF THE CIBICIDIDAE
LIVING OCCURRENCES INDICATED:
DEAD FORMS HACHURED>20INDS/SAMPLE
DEAD FORMS 1-20INDS/SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
4°W
52°N
TEXT FIG:94


N
TREMADOC BAY
DISTRIBUTION OF THE PLANORBULINIDAE
DEAD FORMS ISOPLETHED AT 1:3:5:10:20:40:50 INDS/SAMPLE
NAUTICAL MILES
STATUTE MILES
KILOMETRES
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45' 52° N
40'

TEXT FIG: 95

found, the dead forms exhibiting their greatest concentration in the west of the area and extending east along the line of the muddy hollow. Representatives of the Acervulinidae were all dead, being obtained from the Northern shoal areas and deeper western area.

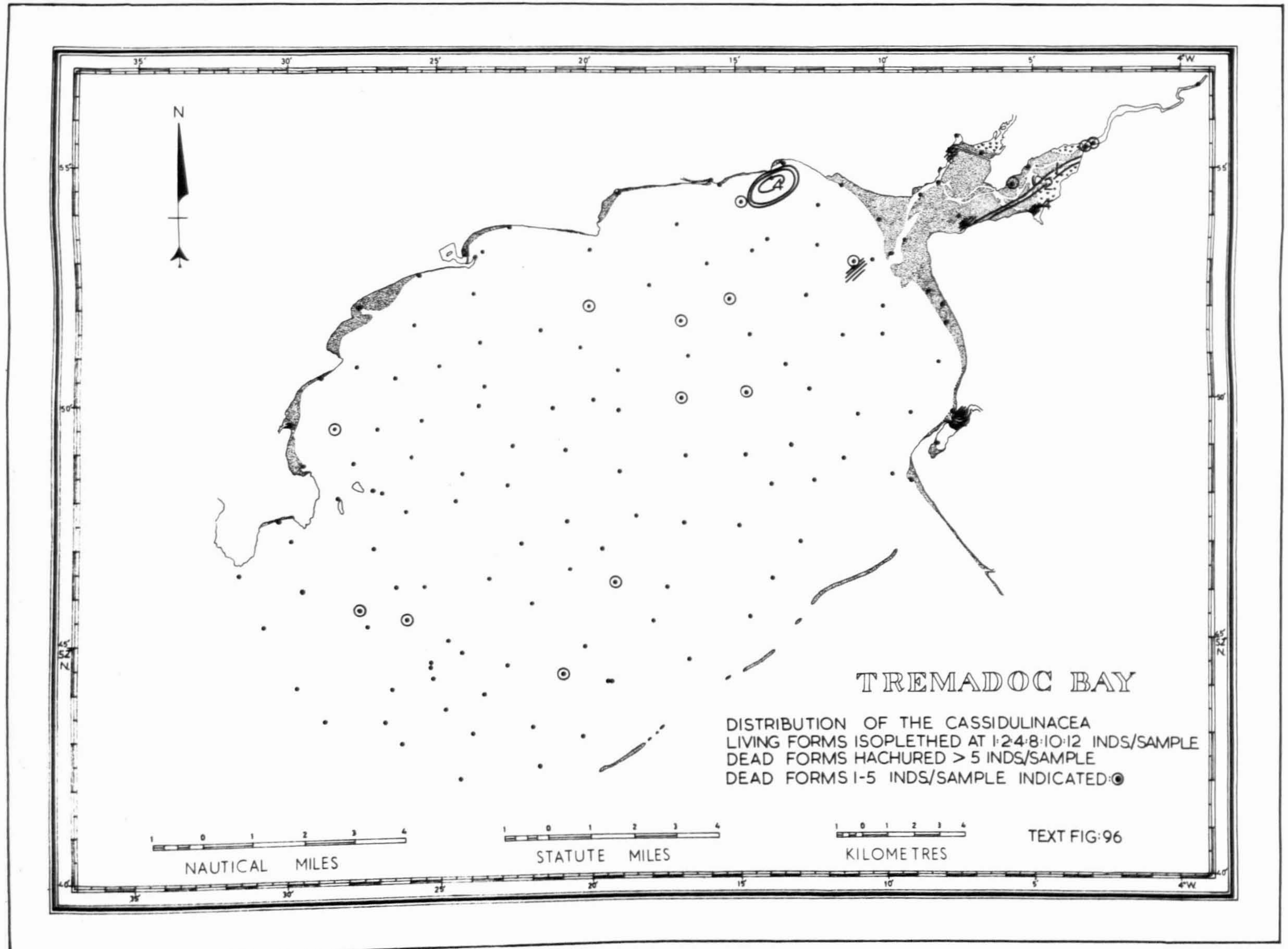
The Tremadoc Bay representatives of the Orbitoidacea are listed below in order of abundance (total), living representatives being indicated with an asterisk:-

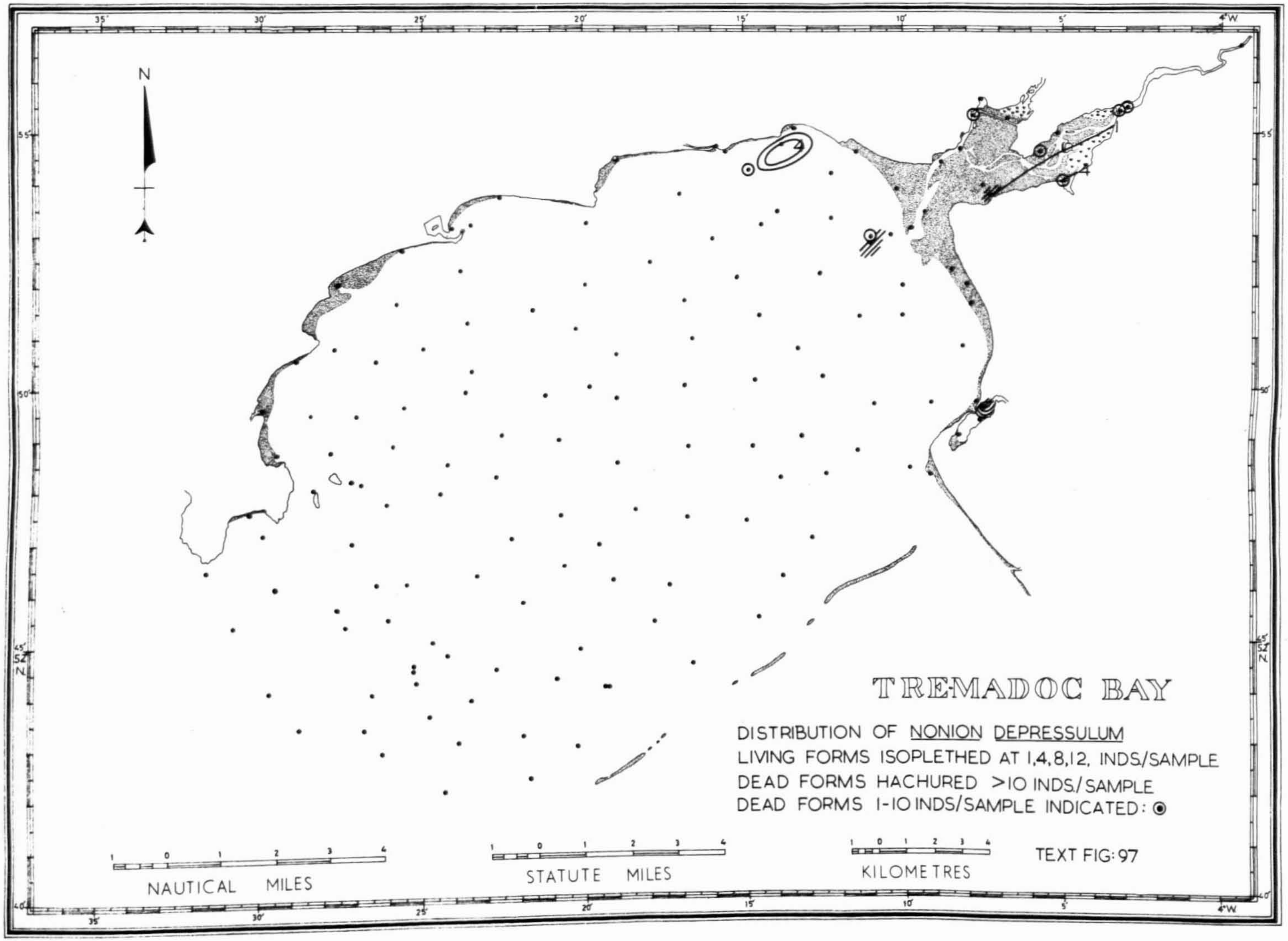
Cibicides lobatulus 410	Cibicides refulgens 108
* Planorbulina mediterranensis 370	Acervulina inhaerens 8
Cibicides fletcheri 240	* Dyocibicides biserialis 3

The Cassidulinacea (Text-fig.96) is represented by one family, the Nonionidae. The Cassidulinacea has up to 12 living specimens/sample and up to 16 dead specimens/sample, and indicates a fairly selsective distribution, living specimens being found south of Criccieth, Llandanwg lagoon, and on the south side of Port Madoc estuary, the dead concentrations living in Port Madoc estuary, just off the mouth of the estuary, and in Llandanwg lagoon, isolated occurrences being noted elsewhere in the bay. The most common species in this Super Family in Nonion depressulum (Text-fig.97) whéch shows the same distribution pattern as the Super Family.

The Tremadoc Bay representatives of the Cassidulinacea are listed below in order of abundance (total), living representatives being indicated by an asterksk :-

* Nonion depressulum 108	Nonion boueana 2
Astrononion gallowayi 10	Nonionella turgida 2
Nonion pompilioides 5	Nonionella atlantica 1


TREMADOC BAY
DISTRIBUTION OF THE CASSIDULINACEA
LIVING FORMS ISOPLETHED AT 1:2:4:8:10:12 INDS/SAMPLE
DEAD FORMS HACHURED > 5 INDS/SAMPLE
DEAD FORMS 1-5 INDS/SAMPLE INDICATED:
NAUTICAL MILES
STATUTE MILES
KILOMETRES
N
TEXT FIG: 96


N
TREMADOC BAY
DISTRIBUTION OF NONION DEPRESSULUM
LIVING FORMS ISOPLETHED AT 1,4,8,12, INDS/SAMPLE
DEAD FORMS HACHURED >10 INDS/SAMPLE
DEAD FORMS 1-10 INDS/SAMPLE INDICATED: ◉
NAUTICAL MILES
STATUTE MILES
KILOMETRES
35'
30'
25'
20'
15'
10'
5'
4°W
55'
50'
45'
52°N
40'
TEXT FIG: 97

With all the distribution patterns described above moderately distinct foraminiferal associations can be drawn up (to be discussed in Chapter 14) although it must be remembered that these associations are not ribidly delimited as there are gradational areas due to variation in populations both with depth and lateral distribution. The post mortem transport of the foraminifera tests iq quite well exemplified with all the Super Families, and the winnowing effect of the currents of forms from the sHallow areas into the deeper hollow regions is also well exhibited. In aâl the samples there was a distinct relationship between sediment size and the size of the foraminifera test. Naturally all the above maps are drawn on the assumption that the Rose Bangal technique is valid in determination of living forms.

CHAPTER 15

Foraminiferal associations and bio-zones of Tremadoc Bay

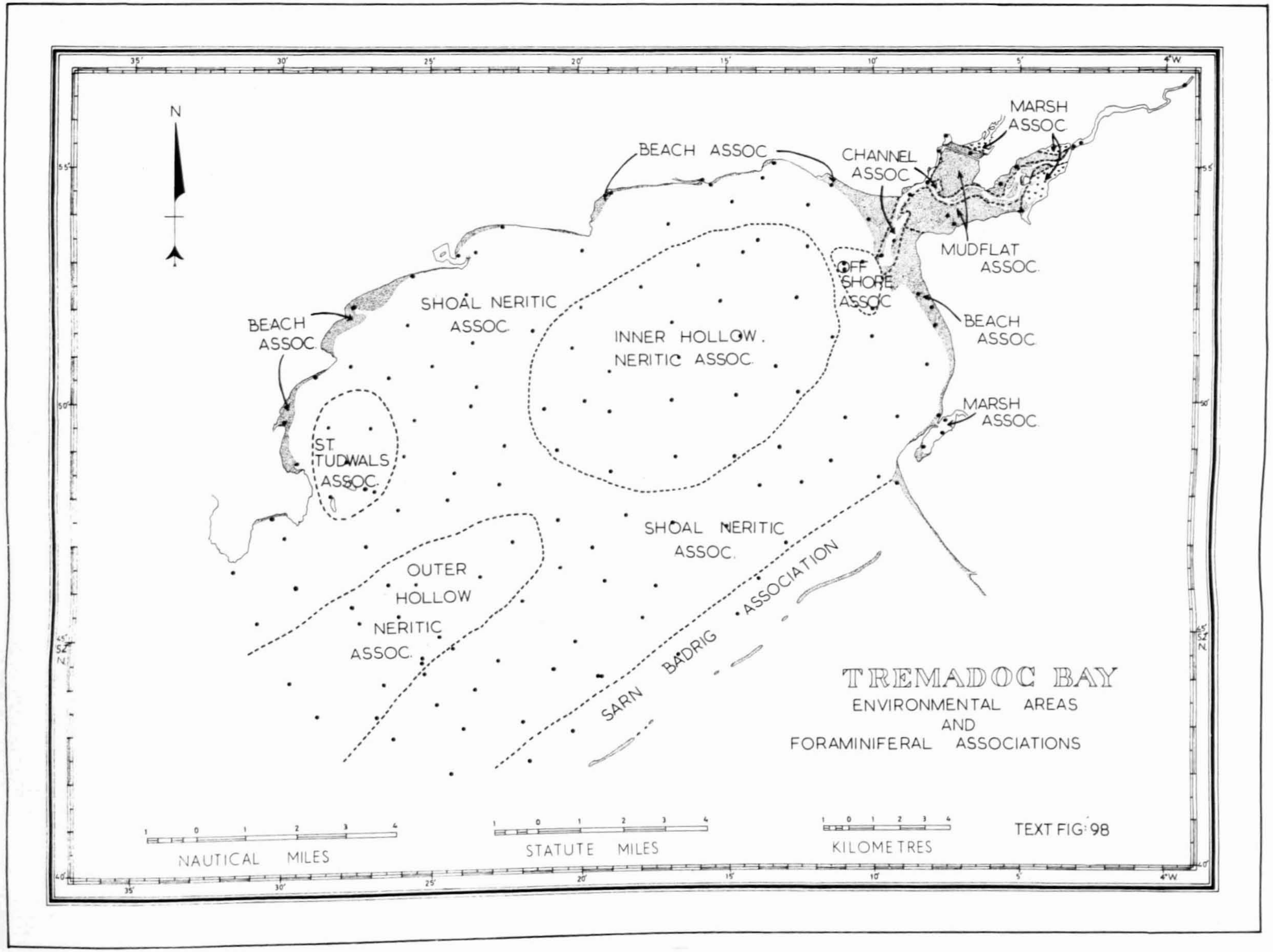
In an earlier chapter (Chap.10) four main ecological zones were delimited mainly on the basis of depth and type of substrate. Within these broad zones subzones (Text-fig.98) can be delimited on foraminiferal evidence, such as Llandanwg lagoon, and the St. Tudwals Islands area, and it is proposed to examine these zones and subzones noting the foraminiferal associations and ecological factoss operating in these areas.

Zone A: Supra Littoral:

This zone is above high water mark, with a salinity range of 0-0.5‰ (Fresh water-oligohaline brackish water), essentially a riverine environment. The sediment type is coarse grained river gravells composed of 70-80% lithoclasts, 20-25% quartz, and 0-5% bioclasts. No foraminifera were obtained from the zone, the associated fauna being of terrestrial origin.

Zone B: Littoral:

This zone occurs between high and low water marks, with a salinity range of 0.5‰-16.5‰ (Oligohaline brackish water - brachyhaline sea water), except at the mouth of Port Madoc estuary where marine readings are encountered. The sediments of this zone are essentially coarse sand with regional variations down the Wentworth scale, composed of 70-85% quartz, 10-30% lithoclasts, and 5-20% bioclasts. Generally the more robust foraminifera occur within the zone. It has been found necessary to divide this zone into three subzones as follows:-



N
MARSH ASSOC.
BEACH ASSOC.
CHANNEL ASSOC.
MUDFLAT ASSOC.
OFF SHORE ASSOC.
BEACH ASSOC.
MARSH ASSOC.
SHOAL NERITIC ASSOC.
BEACH ASSOC.
INNER HOLLOW. NERITIC ASSOC.
ST. TUDWALS ASSOC.
SHOAL NERITIC ASSOC.
OUTER HOLLOW NERITIC ASSOC.
SARN BADRIG ASSOCIATION
TREMADOC BAY
ENVIRONMENTAL AREAS
AND
FORAMINIFERAL ASSOCIATIONS
NAUTICAL MILES
STATUTE MILES
KILOMETRES
TEXT FIG: 98

B^1 - Marsh association

B^2 - Mud flats association

B^3 - Channel association

Subzone B^1

This marsh environmental area is characterised by the following species and varieties.

Universal (100% total sample occurrence) :-

Ammonia beccarii
Elphidium excavatum

Abundant (above 65% total sample occurrence) :-

Nonion depressulum
Elphidium crispum
Quinqueloculina seminulum

Frequent (50-65% total sample occurrence) :-

Elphidium bartletti
Elphidium macellum
Cibicides lobatulus
Elphidium discoidale
Elphidium crispum var. spinosum
Miliolinella subrotunda

Common (35-50% total sample occurrence) :-

Cibicides fletcheri

Moderately common (20-35% total sample occurrence) :-

Bulimina gibba
Trochammina inflata
Quinqueloculina aspera
Miliammina fusca
Oolina williamsoni
Vernouilina media
Elphidium selseyense
Cibicides refulgens
Elphidium magellanicum
Miliolinella oblonga
Buliminella elegantissima
Quinqueloculina lata

Subzone B^2

This mud flats subzone is characterised by the following species and varieties :-

Universal (100% total sample occurrence) :-

Ammonia beccarii
Elphidium crispum

Abundant (above 65% total sample occurrence) :-

Miliammina fusca
Trochammina inflata

Frequent (50-65% total sample occurrence) :-

Elphidium excavatum
Elphidium selseyense
Elphidium bartletti
Elphidium discoidale
Bulimina gibba
Cibicides lobatulus
Planorbulina mediterranensis
Elphidium macellum

Common (35-50% total sample occurrence) :-

Elphidium magellanicum
Nonion depressulum
Cibicides fletcheri
Elphidium crispum var. spinosum
Cibicides refulgens
Quinqueloculina seminulum

Moderately common (20-35% total sample occurrence) :-

Lagena sulcata var. spirata
Haplophragmoides canariensis
Lagena laevis
Haplophragmoides subinvolutum
Miliolinella subrotunda
Discorbis bradyi
Acervulina inhaerens
Verneuilina media
Oolina patennae
Quinqueloculina aspera
Oolina williamsoni
Pateoris hauerinoides

Subzone B^3

This subzone comprises the main channel areas of Port Madoc estuary, and is characterised by the following species and varieties :-

Abundant (above 65% total sample occurrence) :-

Ammonia beccarii
Elphidium crispum

Frequent (50-65% total sample occurrence) :-

Quinqueloculina seminulum
Quinqueloculina aspera

Moderately common (20-35% total sample occurrence) :-

Elphidium selseyense

Moderately rare (5-20% total sample occurrence) :-

Massilina secans
Quinqueloculina lata
Quinqueloculina bicornis
Elphidium crispum var. spinosum
Miàiolinella chuckchiensis
Elphidium excavatum
Elphidium bartletti
Nonion depressulum
Nonion pompilioides
Miliammina fusca
Cibicides lobatulus
Bulimina gibba
Astrononion gallowayi
Acervulina inhaerens

Zone C : 'Shoal' Neritic

This zone ranges from 0-10 fathoms, with a salinity range of 16.5‰-33.5‰ (Brachyhaline sea water - sea water). The sediments of this zone are mainly medium to coarse sand, composed of 80-85% quartz, 10-30% lithoclasts, and 10-15% bioclasts. It has been found necessary to divide this zone into five subzones as follows :-

C^1 - Offshore estuarine association

C^2 - Shoal association proper

C^3 - St. Tudwals Islands area

C^4 - Beach association

C^5 - Sarn Badrig association

<u>Subzone</u> <u>C^1</u>

This subzone was erected to include the mixing area of the marine and estuarine forms, this subzone showing a wide diversification of forms, both major zone types being present in this region. The species and varieties occurring in this subzone are listed below :-

Universal (100% total sample occurrences) :-

<u>Elphidium</u> <u>selseyense</u>
<u>Ammonia</u> <u>beccarii</u>
<u>Quinqueloculina</u> <u>seminulum</u>
<u>Bulimina</u> <u>gibba</u>
<u>Elphidium</u> <u>discoidale</u>
<u>Miliolinella</u> <u>subrotunda</u>
<u>Elphidium</u> <u>crispum</u>
<u>Planorbulina</u> <u>mediterranensis</u>
<u>Discorbis</u> <u>williamsoni</u>

Abundant (above 65% total sample occurrences) :-

<u>Verneuilina</u> <u>media</u>
<u>Elphidium</u> <u>excavatum</u>
<u>Elphidium</u> <u>macellum</u>

Frequent (50-65% total sample occurrences) :-

<u>Massilina</u> <u>secans</u>
<u>Elphidium</u> <u>crispum</u> <u>var.</u> <u>spinosum</u>
<u>Ammobaculites</u> <u>agglutinans</u> <u>var.</u> <u>filiformis</u>
<u>Lagena</u> <u>sulcata</u> <u>var.</u> <u>spirata</u>
<u>Quinqueloculina</u> <u>seminulangulata</u>
<u>Triloculina</u> <u>angulata</u>
<u>Miliolinella</u> <u>oblonga</u>
<u>Triloculina</u> <u>trigonula</u>

Eoeponidella mamilla
Elphidium magellanicum
Cibicides lobatulus
Nonion depressulum
Discorbis bradyi
Cibicides fletcheri
Elphidium bartletti
Quinqueloculina lata

Moderately common (20-35% total sample occurrences) :-

Trochammina inflata
Triloculina dubia
Cribrostomoides jeffreysi
Quinqueloculina aspera
Cibicides refulgens
Lagena laevis
Globulina gibba
Oolina williamsoni
Oolina patannae
Guttulina lactea
Spirillina vivipara
Bolivina variablis
Lagena sulcata
Bulimina elongata
Miliolinella chuckchiensis
Miliammina fusca
Bulimina marginata

Subzone C^2

This is the shoal area of Tremadoc Bay and is characterised by the following species and varieties :-

Abundant (above 65% total sample occurrence) :-

Ammonia beccarii
Quinqueloculina seminulum
Elphidium crispum
Quinqueloculina aspera

Frequent (50-65% total sample occurrence) :-

Verneuilina media
Elphidium selseyense
Elphidium crispum vari spinosum
Miliolinella subrotunda

Common (35-50% total sample occurrence) :-

Quinqueloculina lata
Elphidium macellum
Triloculina trigonula

Moderately common (20-35% total sample occurrence) :-

Quinqueloculina bicornis
Massilina secans
Cibicides lobatulus
Elphidium discoidale
Triloculina angulata
Quinqueloculina pulchella
Triloculina dubia
Cibicides refulgens
Ammobaculites subagglutinans
Cibicides fletcheri
Miliolinella chuckchiensis
Quinqueloculina agglutinata
Eoeponidella mamilla

Moderately rare (5-20% total sample occurrence) :-

Quinqueloculina seminulangulata
Planorbulina mediterranensis
Bulimina gibba
Pateoris hauerinoides
Miliolinella oblonga
Discorbis bradyi
Elphidium magellanicum
Ammobaculites agglutinans var. filiformis
Discorbis williamsoni
Cribrostomoides jeffreysi
Technitella representatives
Quinqueloculina cliarensis
Quinqueloculina frigida
Elphidium bartletti
Elphidium excavatum
Quinqueloculina inconstans
Bulimina elongata
Guttulina lactea
Lagena sulcata
Lagenammina laguncula
Oolina williamsoni
Spiroloculina subimpressa

Rare (1-5% total sample occurrence) :-

Psammosphaera parva
Nonion depressulum
Lagena sulcata var. spirata
Haplophragmoides canariensis
Quinqueloculina angularis
Reophax subfusiformis
Spirillina vivipara
Fissurina lucida
Discorbis malovensis var. nudiformis
Bathysiphon acuta
Buliminella elegantissima
Clavulina gracilis
Dyocibicides biserialis
Marsipella elongata
Acervulina inhaerens
Astrononion gallowayi
Bolivina spathulata
Cyclogyra involvens
Fissurina marginata
Lagena sulcata var. interrupta
Lagena laevis
Massilina planisparoidea
Marsipella elongata var. A.
Miliammina fusca
Oolina patannae
Reophax fusiformis
Saccammina sphaerica
Trochammina globigeriniformis
Trochammina inflata
Triloculina trihedra

Subzone C^3

This subzone comprises that area partially protected by St. Tudwals Islands, to the West of St. Tudwals headland, the subzone boing characterised by the following species and varieties:-

Universal (100% total sample occurrence) :-

Quinqueloculina seminulum
Ammonia beccarii
Quinqueloculina aspera

Abundant (above 65% total sample occurrence) :-

<u>Quinqueloculina</u> <u>bicornis</u>
<u>Triloculina</u> <u>angulata</u>
<u>Verneuilina</u> <u>media</u>
<u>Elphidium macellum</u>
<u>Elphidium</u> <u>crispum</u>
<u>Quinqueloculina</u> <u>lata</u>
<u>Elphidium</u> <u>crispum</u> <u>var.</u> <u>spinosum</u>
<u>Miliolinella</u> <u>subrotunda</u>
<u>Quinqueloculina</u> <u>pulchella</u>
<u>Miliolinella</u> <u>chuckchiensis</u>

Frequent (50-65% total sample occurrence) :-

<u>Massilina</u> <u>secans</u>
<u>Elphidium</u> <u>selseyense</u>
<u>Cibicides</u> <u>lobatulus</u>
<u>Triloculina</u> <u>trigonula</u>

Moderately common (20-35% total sample occurrence)-:-

<u>Acervulina</u> <u>inhaerens</u>
<u>Planorbulina</u> <u>mediterranensis</u>
<u>Bulimina</u> <u>gibba</u>
<u>Cibicides</u> <u>fletcheri</u>
<u>Elphidium</u> <u>discoidale</u>
<u>Cibicides</u> <u>refulgens</u>
<u>Quinqueloculina</u> <u>granulo-costata</u>
<u>Discorbis</u> <u>bradyi</u>
<u>Quinqueloculina</u> <u>agglutinata</u>

Moderately rare (5-20% total sample occurrence)

<u>Quinqueloculina</u> <u>seminulangulata</u>
<u>Quinqueloculina</u> <u>cliarensis</u>
<u>Triloculina</u> <u>dubia</u>
<u>Spirillina</u> <u>vivipara</u>
<u>Psammosphaera</u> <u>parva</u>
<u>Planispirinella tenuis</u>
<u>Eoeponidella</u> <u>mamilla</u>
<u>Nonion</u> <u>boueana</u>
<u>Pateoris</u> <u>hauerinoides</u>
<u>Haplophragmoides</u> <u>canariensis</u>
<u>Technitella</u> representatives
<u>Elphidium</u> <u>excavatum</u>
<u>Lagena</u> <u>sulcata</u>
<u>Globulina</u> <u>gibba</u>
<u>Saccammina</u> <u>sphaerica</u>
<u>Bulimina</u> <u>elongata</u>
<u>Quinqueloculina</u> <u>inconstans</u>

Subzone C^4

This beach area is characterised by the following species and varieties.

Abundant (above 65% total sample occurrence) :-

Elphidium crispum
Ammonia beccarii
Quinqueloculina seminulum

Frequent (50-65% total sample occurrence) :-

Quinqueloculina aspera

Common (35-50% total sample occurrence) :-

Elphidium selseyense

~~Mode~~ Moderately common (20-35% total sample occurrence) :-

Elphidium crispum var. spinosum
Elphidium excavatum
Quinqueloculina agglutinata
Triloculina trigonula

Moderately rare (5-20% total sample occurrence) :-

Massilina secans
Elphidium discoidale
Elphidium macellum
Bulimina gibba
Miliolinella chuckchiensis
Cibicides lobatulus
Triloculina angulata
Cibicides refulgens
Miliolinella subrotunda

Rare (1-5% total sample occurrence) :-

Miliolinella oblonga
Triloculina dubia
Nonion depressulum
Miliammina fusca
Planorbulina mediterranensis
Eoeponidella mamilla
Lagena sulcata var. interrupta
Guttulina lactea

Subzone C^5

Sarn Badrig, being a problematical area, has been designated as a subzone, and is characterised by the following species and varieties:-

Universal (100% Total sample occurrence) :-

Ammonia beccarii

Abundant (above 65% total sample occurrence)

Quinqueloculina seminulum
Elphidium crispum var. spinosum

Frequent (50-65% total sample occurrence) :-

Triloculina angulata
Quinqueloculina lata
Quinqueloculina aspera
Verneuilina media

Common (35-50% total sample occurrence) :-

Elphidium crispum
Massilina secans
Quinqueloculina seminulangulata

Moderately common (20-35% total sample occurrence) :-

Quinqueloculina pulchella
Quinqueloculina bicornis
Ammobaculites agglutinans var. filiformis
Miliolinella oblonga
Elphidium selseyense
Bulimina gibba
Triloculina trigonula
Cibicides fletcheri
Miliolinella chuckchiensis
Miliolinella subrotunda
Quinqueloculina agglutinata
Haplophragmoides canariensis
Guttulina lactea

Zone D 'Hollow' neritic

This zone ranges from 10-25 fathoms, with a salinity range of 33.5‰-34‰+ (Sea Water). The sediments of this zone range from silt/mud to very fine sand, composed of 40-70% quartz, 30-40% lithoclasts, and 30-50% bioclasts. It has been found necessary to divide this zone into two subzones as follows :-

D^1 - Inner Muddy Hollow association

D^2 - Outer Muddy Hollow association

Subzone D^1

This subzone is the shallower of the two hollows, and is characterised by the following species and varieties :-

Universal (100% total sample occurrence) :-

Ammonia beccarii
Elphidium selseyense
Verneuilina media

Abundant (above 65% total sample occurrence) :-

Elphidium discoidale
Quinqueloculina seminulum
Bulimina gibba
Elphidium macellum
Elphidium crispum
Elphidium crispum var. spinosum

Frequent (50-65% total sample occurrence) :-

Miliolinella subrotunda

Common (35-50% total sample occurrence) :-

Planorbulina mediterranensis
Quinqueloculina aspera
Cibicides lobatulus
Elphidium excavatum

Moderately common (20-35% total sample occurrence) :-

<u>Bulimina</u> <u>elongata</u>
<u>Cibicides</u> <u>refulgens</u>
<u>Elphidium</u> <u>magellanicum</u>
<u>Triloculina</u> <u>angulata</u>
<u>Bulimina</u> <u>marginata</u>

Moderately rare (5-20% total sample occurrence) :-

<u>Quinqueloculina</u> <u>agglutinata</u>
<u>Reophax</u> <u>subfusiformis</u>
<u>Ammobaculites</u> <u>subagglutinans</u>
<u>Ammobaculites</u> <u>agglutinans</u> <u>var.</u> <u>filiformis</u>
<u>Lagenammina</u> <u>laguncula</u>
<u>Quinqueloculina</u> <u>lata</u>
<u>Quinqueloculina</u> <u>pulchella</u>
<u>Triloculina</u> <u>dubia</u>
<u>Reophax</u> <u>fusiformis</u>
<u>Buliminella</u> <u>elegantissima</u>
<u>Cibicides</u> <u>fletcheri</u>
<u>Discorbis</u> <u>williamsoni</u>
<u>Discorbis</u> <u>bradyi</u>
<u>Patellina</u> <u>corrugata</u>
<u>Triloculina</u> <u>trigonula</u>
<u>Lagena</u> <u>sulcata</u> <u>var.</u> <u>spirata</u>
<u>Lagena</u> <u>substriata</u>
<u>Acervulina</u> <u>inhaerens</u>
<u>Bolivina</u> <u>spathulata</u>
<u>Bolivina</u> <u>variablis</u>
<u>Eoeponidella</u> <u>mamilla</u>
<u>Quinqueloculina</u> <u>bicornis</u>
<u>Quinqueloculina</u> <u>seminulangulata</u>
<u>Milliolinella</u> <u>chuckchiensis</u>
<u>Massilina</u> <u>secans</u>
<u>Marsipella</u> <u>elongata</u>
<u>Oolina</u> <u>williamsoni</u>
<u>Pateoris</u> <u>bauerinoides</u>

Rare (1-5% total sample occurrence:-

<u>Astrononion</u> <u>gallowayi</u>
<u>Bathysiphon</u> <u>acuta</u>
<u>Cassidulinoides</u> <u>tenuis</u>
<u>Discorbis</u> <u>malovensis</u> <u>var.</u> <u>nodiformis</u>
<u>Dyocibicides</u> <u>biserialis</u>
<u>Dendrophyra</u> <u>arborescens</u>
<u>Fissurina</u> <u>marginata</u>

Fissurina lucida
Jaculella acuta
Lagena laevis
Lagena sulcata
Lagena semistriata
Lagena sulcata var. interrupta
Marsipella elongata var. A.
Miliolinella oblonga
Oolina hexagona
Oolina patannae
Ophthalmidium acutimargo
Quinqueloculina cliarensis
Reophax arctica
Rhabdammina scabra
Nonion boueana
Nonionella atlantica
Nonionella turgida

Subzone D^2

This subzone comprises the deepest area of Tremadoc Bay, and is characterised by the following species and varieties :-

Universal 100% (total sample occurrence) :-

Ammonia beccarii

Abundant (above 65% total sample occurrence) :-

Quinqueloculina seminulum
Verneuilina media
Elphidium selseyense
Elphidium crispum
Miliolinella subrotunda

Frequent (50-65% total sample occurrence) :-

Elphidium crispum var. spinosum
Elphidium macellum.
Quinqueloculina lata
Elphidium discoidale
Bulimina gibba
Quinqueloculina aspera

Common (35-50% total sample occurrence) :-

Planorbulina mediterranensis
Quinqueloculina bicornis
Lagenammina laguncula

Miliolinella oblonga
Cibicides fletcheri
Eoeponidella mamilla
Quinqueloculina pulchella

Moderately common (20-35% total sample occurrence) :-

Quinqueloculina agglutinata
Triloculina trigonula
Cibicides lobatulus
Miliolinella chuckchiensis
Triloculina angulata
Patellina corrugata
Discorbis bradyi
Elphidium excavatum
Elphidium magellanicum

Moderately rare (5-20% total sample occurrence) :-

Pateoris hauerinoides
Triloculina dubia
Bathysiphon acuta
Cibicides refulgens
Discorbis williamsoni
Discorbis malovensis var. nudiformis
Oolina williamsoni
Lagena sulcata
Pyrgo williamsoni
Quinqueloculina frigida
Spiroloculina subimpressa
Ammobaculites subagglutinans
Ammobaculites agglutinans var. filiformis
Astrononion gallowayi
Bulimina elongata
Bolivina spathulata
Cribrostomoides jeffreysi
Globulina gibba
Oolina lineato-punctata
Marsipella elongata
Nonion pompilioides
Oolina patannae
Oolina laevigata
Oolina hexagona
Quinqueloculina cliarensis
Quinqueloculina angularis
Reophax fusiformis
Textularia bocki
Trochammina inflata
Textularia gramen

Discussion:

From the above associations it has been shown that the different subzones are characterised by certain diagnostic species, although in some cases a number of subzones can yield the same species. It must be realised that post mortem transport does tent to obscure these subzones. In order to determine any exact biofacies, the distribution of the living species must be plotted (as in the accompanying table), and then analysed. From the table two main biofacies can be distinguished a marsh-estuarine type, and a marine type. Although only these two biofacies can be determined, the subzones are believed to be valid (although the limits may be modified) on the basis of the idea of the existance of favourable ecological niches in an otherwise inhospitable environment. The question of these ecological niches is very important in a study of Recent associations and of paramount importance in a palaeoecological study. When a foraminifera assemblage is examined in a stratigraphic horizon, a palaeoecological picture is drawn up, generally assuming that the assemblage is a biocoenosis. It could however merely be a thanatocoenose. In the Tremadoc Bay assemblage all the species, in general, were represented by a considerably higher number of empty tests (dead) than by those with protoplasm (living), and in addition, the living and dead concentrations are not in the same region. This assemblage, if stratigraphically examined, would therefore, give no idea of the distribution of the biocenose. Another factor is that the dead/living numbers have accumulated post-Holocene (indicating

ZONE	Zone B Littoral			Zone C Shoal Neritic					Zone D Hollow Neritic	
SUBZONE	Marsh (B')	Mud Flats (B^2)	Channel (B^3)	Offshore estuarine (C^1)	Shoal (C^2)	St.Tudwals (C^3)	Beach (C^4)	Sarn Badrig (C^5)	Inner Hollow (D^1)	Outer Hollow (D^2)
Species/Varieties										
B.acuta					X				X	X
M.elongata					X				X	X
M.elongata var.X					X				X	
P.parva					X	X				
S.sphaerica						X				
Technitella					X	X				
A.subagglutinans										X
V.media					X	X				X
M.secans						X		X		
Q.agglutinata					X					
Q.aspera					X	X				
Q.bicornis					X					
Q.inconstans					X					
Q.lata				X	X		X	X		X
Q.pulchella					X					
Q.seminulum					X	X			X	X
T.angulata					X	X		X		X
T.trigonula					X					X
M.chuckchiensis					X					
M.subrotunda						X				
B.elegantissima					X					
B.elongata					X					
B.gibba					X				X	
B.marginata									X	
P.corrugata									X	
A.beccarii	X			X	X				X	X
E.crispum					X	X	X			
E.crispum var.spinosum					X	X				
E.discoidale									X	X
E.excavatum	X	X	X				X			
E.macellum	X						X			
E.selseyense				X					X	
C.fletcheri						X				
D.biserialis					X					
N.depressulum	X				X		X			

a slow sediment deposition rate), that is, in a very short time range, so that when dealing with longer time intervals the question of biocoenosis and thanatocoenosis becomes much more important. Obviously in strata the determihation of living forms is impossible, but in order to understand the assemblage the principle of uniformitarianism must be applied to it, this necessitating a study of the allied present day forms. When a rich stratigraphical assemblage is examined the assumption that a certain area is a hospitable zone should not be adopted uncritically as in fact, the opposite may be true, and the assemblage be merely a thanatocoenosis. Generally however, in present day sediments, the patterns displayed by the living foraminifera are reflected in varying degrees by the dead populations, although post mortem transport does tend to obscure the picture. On the sample grid used in this work a number of ecological niches have been noted, but it is highly probable that if the sampling had been carried out with greater intensity, more niches would have been found as it is strongly believed that a foraminiferal population will establish itself (with dominance of certain species) in any marsh or marine environment, providihg that there is a certain degree of protection from the elements. It cannot be stated that any one species is restricted to any one subzone as there is certain to be a degree of overlap between the subzones, <u>but</u> over a large area such as Tremadoc Bay, the foraminiferal associations are good indicators of the major environmental areas, although the dead concentration zones illustrate the difficulty in interpreting any stratigraphic assemblage as shown above.

CHAPTER 15

On the seasonal occurrence of some living foraminifera from Llandanwg Lagoon

Introduction: The purpose of this study is to determine whether, in this area, seasonal occurrences of benthonic foraminifera occur, and whether these seasonal occurrences are directly related to ecological factors or not. A number of authors have paid attention to this process, and a comprehensive list of their works can be found in Boltovskoy 1964.

Samples: Sample collection was taken at monthly intervals from February 1965 to January 1966 at two stations, one station being on the beach on the seaward side of the Northerly spit of the lagoon, and the other station being in the lagoon proper. The samples wereoobtained as described earlier by means of a bottom scrape, and were treated with exactly the same method as all previous samples.

Area description: Llandanwg Lagoon is situated on the West coast of North Wales approximately 12 Kms. due South of Port Madoc estuary (Text-fig.2; Text-fig.#A,B.C.E), and experiences the same ecological factors as Tremadoc Bay as a whole, the salinity varying from appoximately 3.0‰ - 30‰ (miohaline brackish water - brachyhaline sea water/sea water), and the temperature ranging from approximately 1°C-17°C. The beach station sediment was composed of 89.6% quartz, 4.3% lithoclasts and 6.1% bioclasts, the lagoon station sediment being composed of 74.4% quartz, 23.3% lithoclasts, and 2.3% bioclasts.

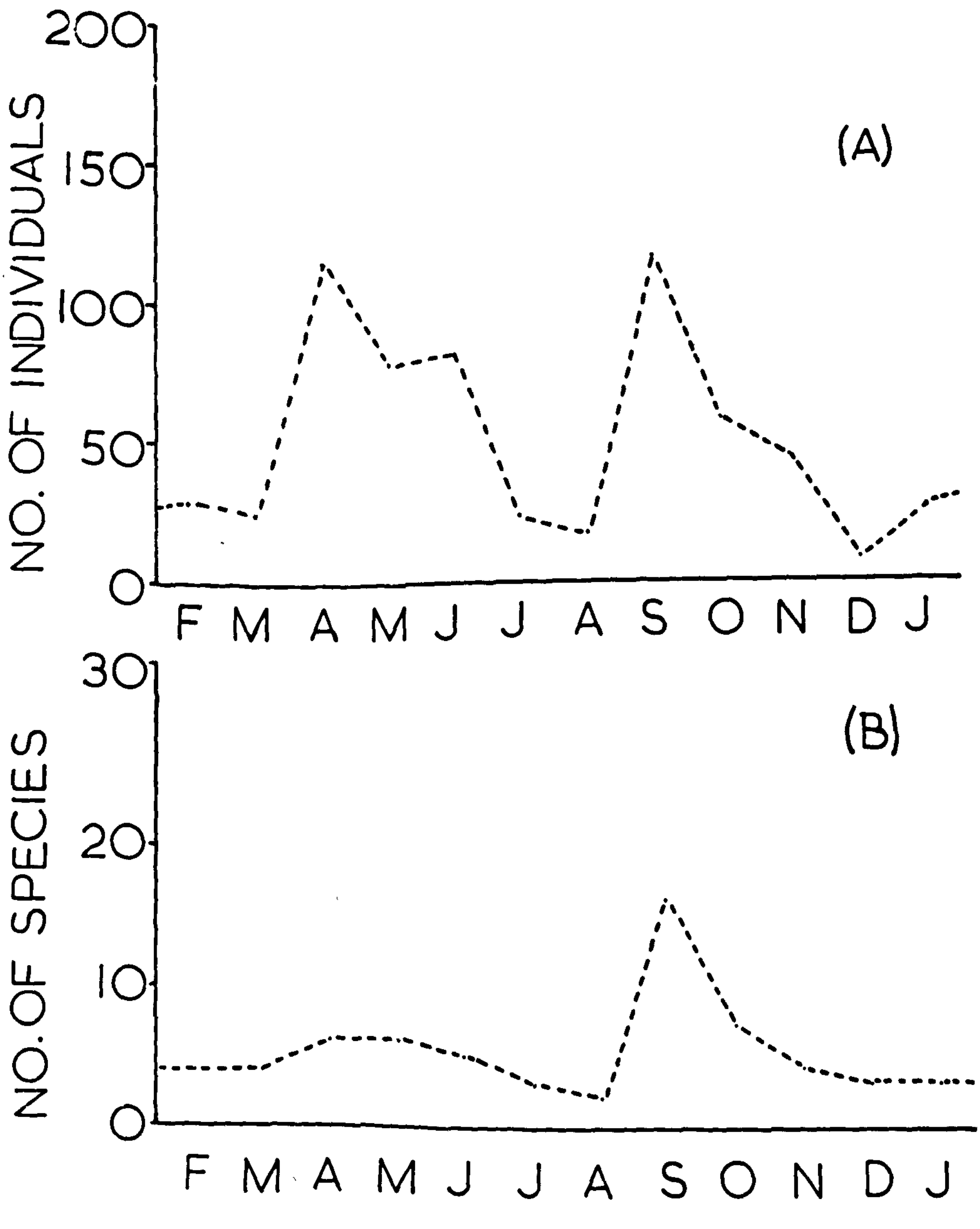
Beach station: From this station the following were obtained (over a period of 12 months), of which none were retrieved living :-

Listed in frequency of occurrence (100% = 12 monthly occurrences):-

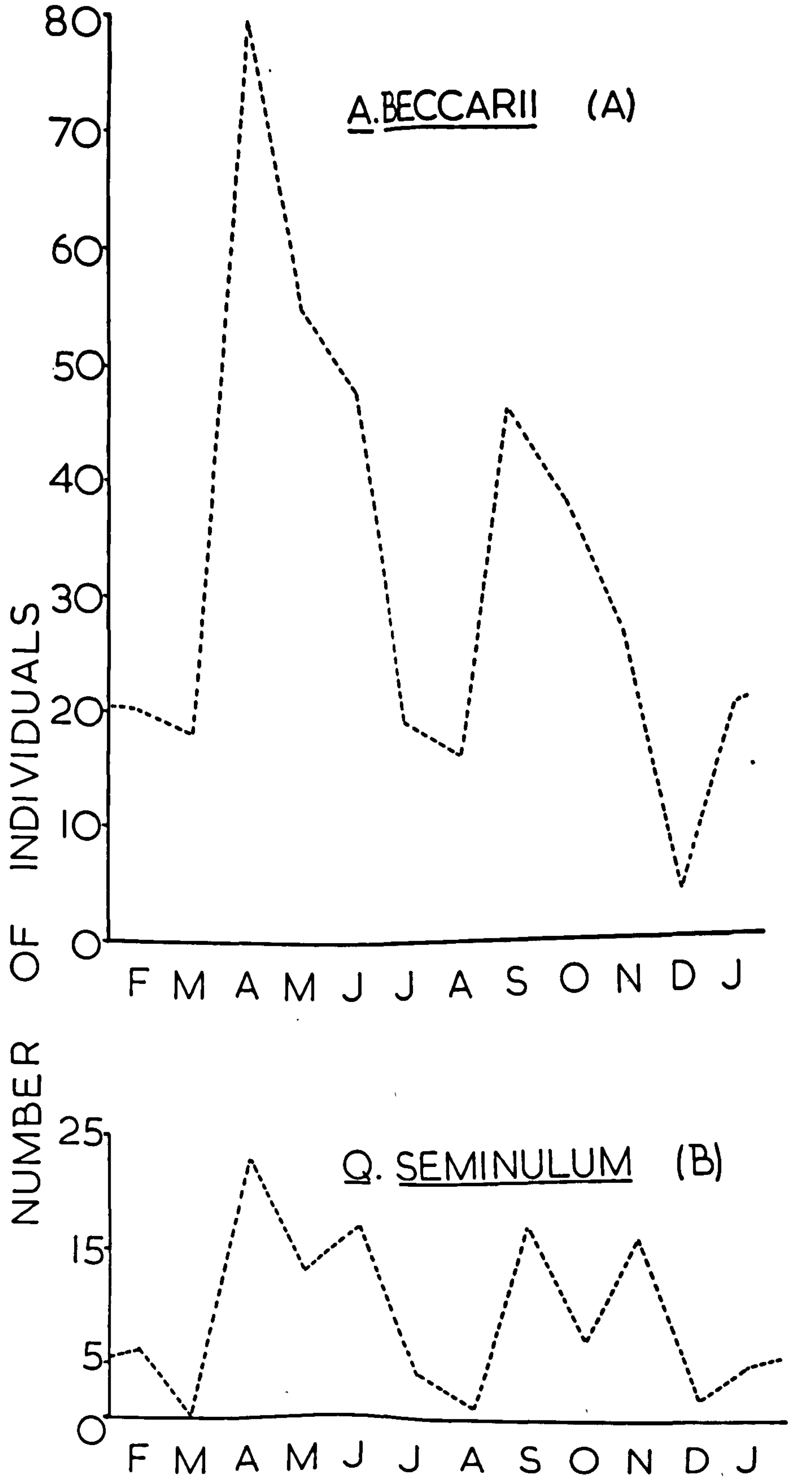
100%	Ammonia beccarii
75 - 100%	Quinqueloculina seminulum
	Elphidium crispum
30 - 75%	Quinqueloculina agglutinata
	Massilina secans
1-30%	Miliolinella subrotunda
	Elphidium selseyense
	Quinqueloculina aspera
	Nonion depressulum
	Elphidium discoidale
	Quinqueloculina pulchella
	Quinqueloculina lata
	Elphidium excavatum
	Elphidium macellum
	Elphidium bartletti
	Ammobaculites agglutinans var. filiformis
	Elphidium crispum var. spinosum
	Guttulina lactea
	Cibicides fletcheri
	Cibicides lobatulus
	Cibicides refulgens
	Discorbis williamsoni

Since a beach station such as this would possibly only yield the occasional living form, the main reason for the choice of position of this station was, that due to current direction and post mortem transport of foraminiferal tests it was believed that it would reflect any seasonal activity on Sarn Badrig..

On examination of the number of individuals per beach sample (Text-fig.99A) it can be seen that there are two main peaks of abundance, in April, and in September. This increase in number of individuals corresponds to the number of species present (Text-fig.99B), which show similar peaks. The most common species in this suite of samples of Ammonia beccarii, and again April and September 'highs' are noted (Text-fig.100A). With the next most abundant species Quinqueloculina seminulum (Text-fig.100B) the picture is not so clear.


(A)
NO. OF INDIVIDUALS
200
150
100
50
0
F M A M J J A S O N D J
(B)
NO.OF SPECIES
30
20
10
0
F M A M J J A S O N D J

TEXT FIG: 99


A. BECCARII (A)
Q. SEMINULUM (B)
NUMBER OF INDIVIDUALS
80
70
60
50
40
30
20
10
0
25
15
5
0
F M A M J J A S O N D J
F M A M J J A S O N D J

TEXT FIG: 100

The April high is present but so are three others, in June, September and November. In conclusion, with regard to the beach samples seasonal occurrences do occur in the numbers of dead individuals, and if the assumption of derivation is correct, then there are seasonable occurrences of foraminifera along Sarn Badrig. The time factor in this set of samples cannot be relied on as one must take into account, a) length of reproduction period, and, b) transport time of the tests, but these samples do show that in Tremadoc Bay seasonal variation of foraminifer occur.

Lagoon station: From this station the following species were obtained (over a period of 12 months), the species being listed in frequency of occurrence (100% = 12 monthly occurrences), and living species indicated with an asterisk :-

100%	*Ammonia beccarii*
75-100%	*Elphidium excavatum* *
30-75%	*Nonion depressulum* *
	Elphidium magellanicum
	Elphidium selseyense
	Bulimina gibba
	Quinqueloculina seminulum
	Miliolinella subrotunda
	Elphidium crispum
	Elphidium discoidale
	Miliolinella oblonga
	Cibicides lobatulus
1-30%	*Elphidium bartletti*
	Elphidium macellum
	Trochammina inflata
	Astrononion gallowayi
	Cibicides refulgens
	Quinqueloculina lata
	Cyclogyra involvens
	Planorbulina mediterranensis
	Discorbis williamsoni
	Lagena sulcata var. interrupta
	Elphidium crispum var. spinosum
	Patellina corrugata

Discorbis bradyi
Triloculina angulata
Miliammina fusca
Reophax artica
Saccammina sphaerica •
Lagena laevis
Oolina hexagona
Lagena sulcata

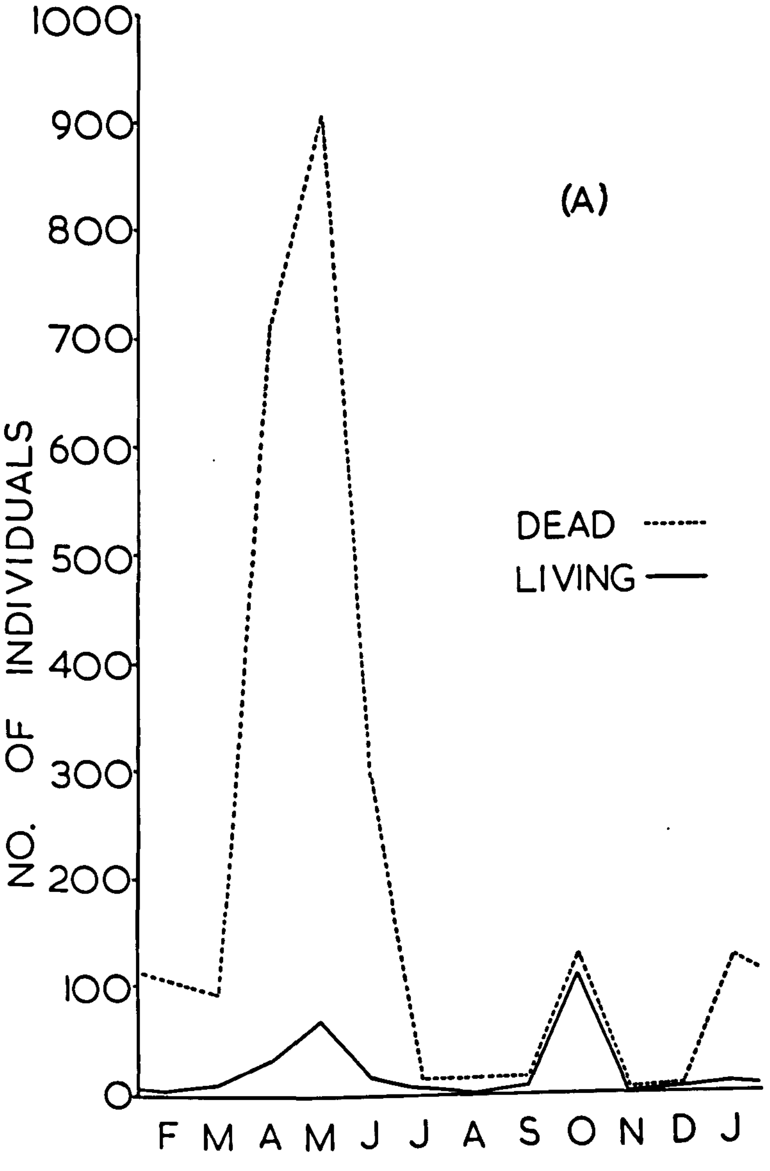
Examination of the number of individuals per sample (Text-fig. 101A) shows a major peak occurring in total numbers from April to June, with a second peak occurring in October. The living individuals per sample show a similar though more subdued pattern. With the increase in number of individuals, both total and living, there is a corresponding increase in the number of species (Text-fig.101B).

Of the four living species *S.sphaerica* and *E.selseyense* did not show any seasonal occurrence, only occuring living once each. The other two forms did show this seasonal variation as follows :-

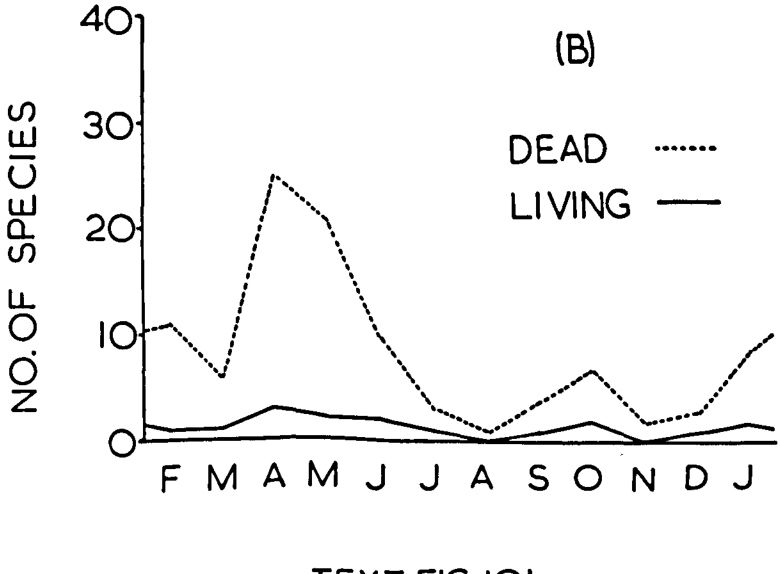
Elphidium excavatum: When this form was plotted as a percentage of the total living population (Text-fig.102A) in the samples, it was seen to be the exclusive living foraminifer in four samples, and the dominating form (above 50%) in six sampèes. When actual numbers (Text-fig.102B) were plotted for both living and total representatives, two major peaks were evident, in May, and in October, with a minor peak in January. As a result of interpretation of this graph and observations on the individuals the following pattern is hypothesised :-

i) In January, a minor phase of reproductive activity takes place.

ii) Not all the January 'juveniles' survive so that there is a slight drop in living numbers through February and March until April.

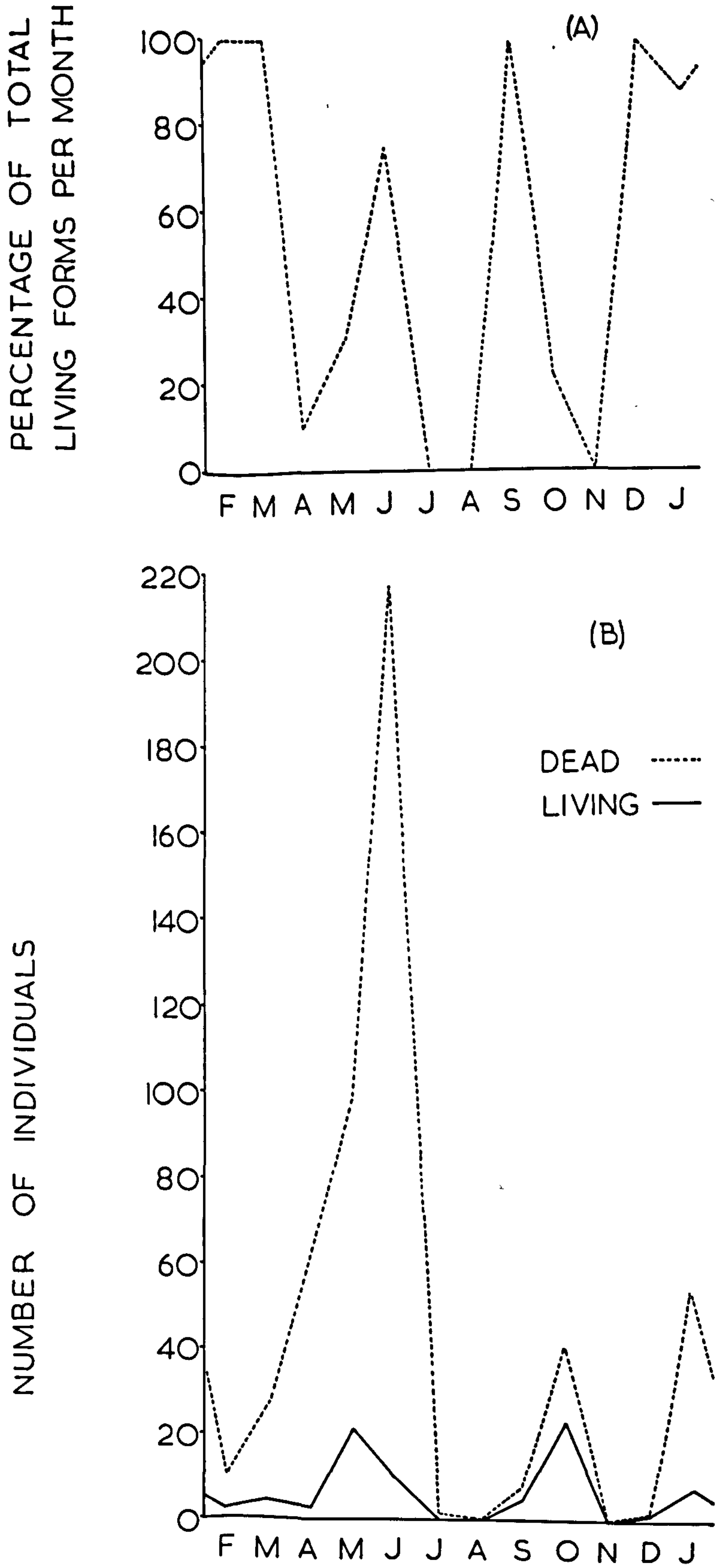


(A)
NO. OF INDIVIDUALS
1000
900
800
700
600
500
400
300
200
100
0
DEAD
LIVING
F M A M J J A S O N D J



(B)
NO. OF SPECIES
40
30
20
10
0
DEAD
LIVING
F M A M J J A S O N D J

TEXT FIG: 101


(A)
PERCENTAGE OF TOTAL LIVING FORMS PER MONTH
100
80
60
40
20
0
F M A M J J A S O N D J
(B)
DEAD
LIVING
NUMBER OF INDIVIDUALS
220
200
180
160
140
120
100
80
60
40
20
0
F M A M J J A S O N D J

TEXT FIG: 102

iii) Towards the end of April a reproductive burst starts which reaches its acme in May.

iv) After the May acme a gradual decline in the living population is noted, and in July and August no living individuals were obtained.

v) At the end of August and in September another reproductive phase commences culminating in an October peak.

vi) This peak declines sharply, with no living representatives in November.

vii) After November there is a very slight increase in the living population leading up to the January phase.

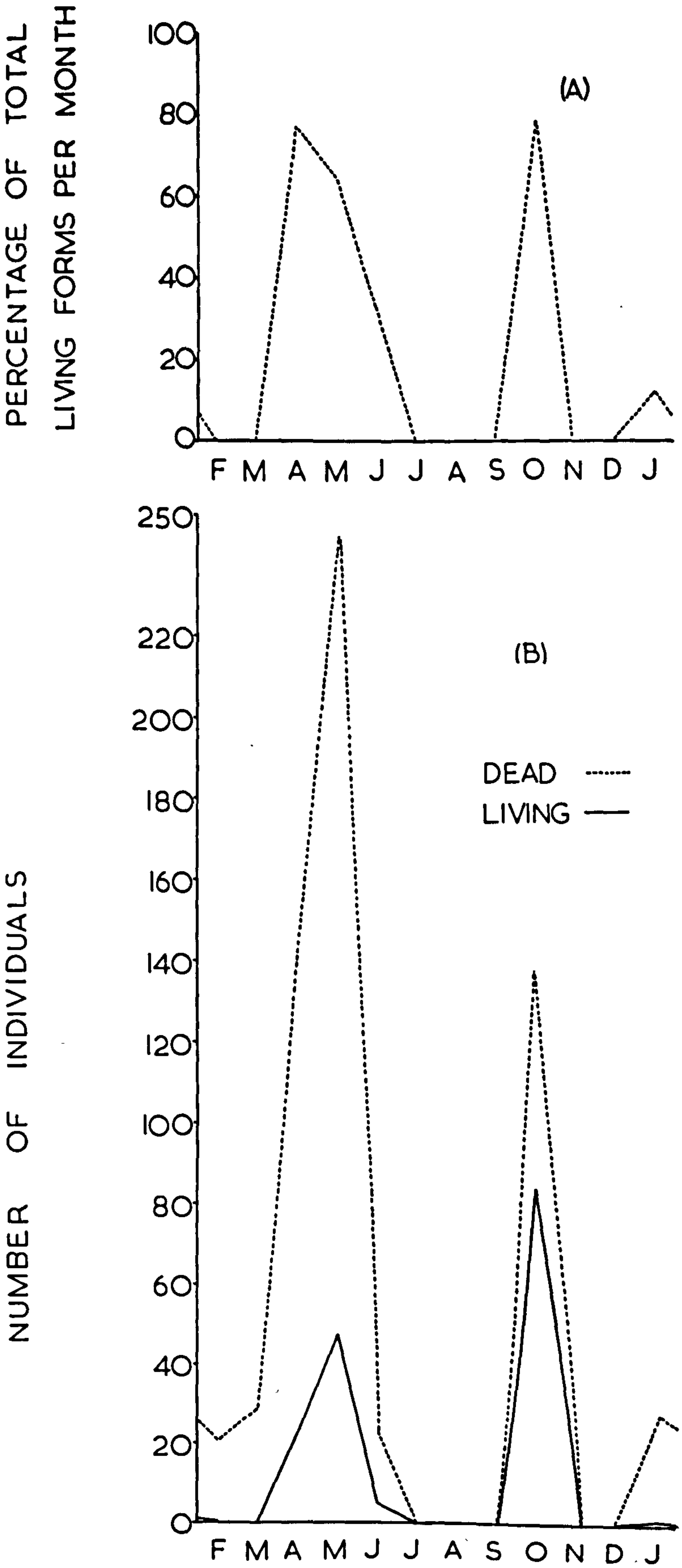
Nonion depressulum: This species has been plotted as a percentage of the total living population (Text-fig.103A), and it was noted as the dominant form (above 50%) in 3 samples. Actual numbers (Text-fig.103B) were plotted for both living and total representatives, and two major peaks were in evidence, one in May, and one in October. As a result of interpretation of this graph and observations on the individuals the following pattern is hypothesised :-

i) In January a very few living population was noted which rapidly disappears in February.

ii) No living forms were obtained in February or March, this time possibly being a 'dormant' period prior to the reproductive phase.

iii) After the dormant period, there is a burst of reproductive activity reaching the acme in May.

iv) A sharp decline in numbers is seen after May, through June, to July when no living representatives were obtained.


PERCENTAGE OF TOTAL LIVING FORMS PER MONTH
100
80
60
40
20
0
(A)
F M A M J J A S O N D J
250
220
200
180
160
140
120
100
80
60
40
20
0
(B)
DEAD
LIVING
NUMBER OF INDIVIDUALS
F M A M J J A S O N D J

TEXT FIG: 103

v) Another 'dormant' period is evident in July, August and September.

vi) At the end of September another reproductive phase commences which rapidly takes place reaching the zenith in October.

vii) Another rapid decline after the October high is seen until November and December, when no living individuals were obtained.

Conclusions: These two typical marsh/lagoon species indicate that they undergo seasonal variation, and the conclusions concerning the life history of these two forms can be summarised as follows :-

Elphidium excavatum:-

a) Commences reproduction in January, remaining stable until April.

b) Commences rapid reproduction in April, ending it at the end of May.

c) Undergoes a dormant period in July and August.

d) Commences the second reproductive phase in September, and ends it in October.

e) Undergoes a general decline until April.

f) The greatest reproductive activity takes place in September/October.

g) The greatest population numbers occur in October.

Nonion depressulum :-

a) Undergoes a fairly dormant period from January to March.

b) Commences reproduction in March/April, ends it in May/June.

c) Undergoes a dormant period until September.

d) Commences rapid reproduction in September/October, ending in October/November.

e) Undergoes a fairly dormant period until March.

f) The greatest reproductive activity takes place in September/October.

g) The greatest population numbers occur in October.

For both these species two population peaks are in evidence at the same time, in the spring, and the autumn, with two quiescent periods in the summer and winter, this indicating that these species at least have their reproduction period (about 6-7 weeks) limited by the milieu, that is, they will not peproduce when any of the ecological factors are at an extreme, in this case temperature being the limiting factor. Another important feature could be the rate of sedimentation at these times, but since Sarn Badrig indicates similar highs at corresponding periods, and since sedimentation is believed to be negligable along the Sarn, it is believed that although this process may be of some importance, it is not of major importance in limiting the time or rate of reproduction of these species in the lagoon.

PLATES 1 - 22

EXPLANATION OF PLATE 1

Fig.1:	*Marsipella elongata var. A.* (p.56)	x 70
Figs.1a,2b:	*Rhabdammina scabra* a) Side view b) Apertural view (p.51)	x 65
Figs.3a,3b:	*Lagenammina laguncula* a) Side view b) Apertural view (p.73)	x125
Fig.4:	*Marsipella elongata* (p.53)	x 20
Figs.5a,5b:	*Saccammina cf. sphaerica* a) Exterior b) Interior (p.67)	x 75
Figs.6a,6b:	*Jaculella acuta* a) Side view b) Apertural view (p.57)	x 60
Figs.7a,7b:	*Bathysiphon acuta* a) Side view b) Apertural view (p.52)	x 85
Figs.8a,8b:	*Dendrophyra arborescens* (p.61)	x 90
Fig.9:	*Psammosphaera parva* (p.64)	x120

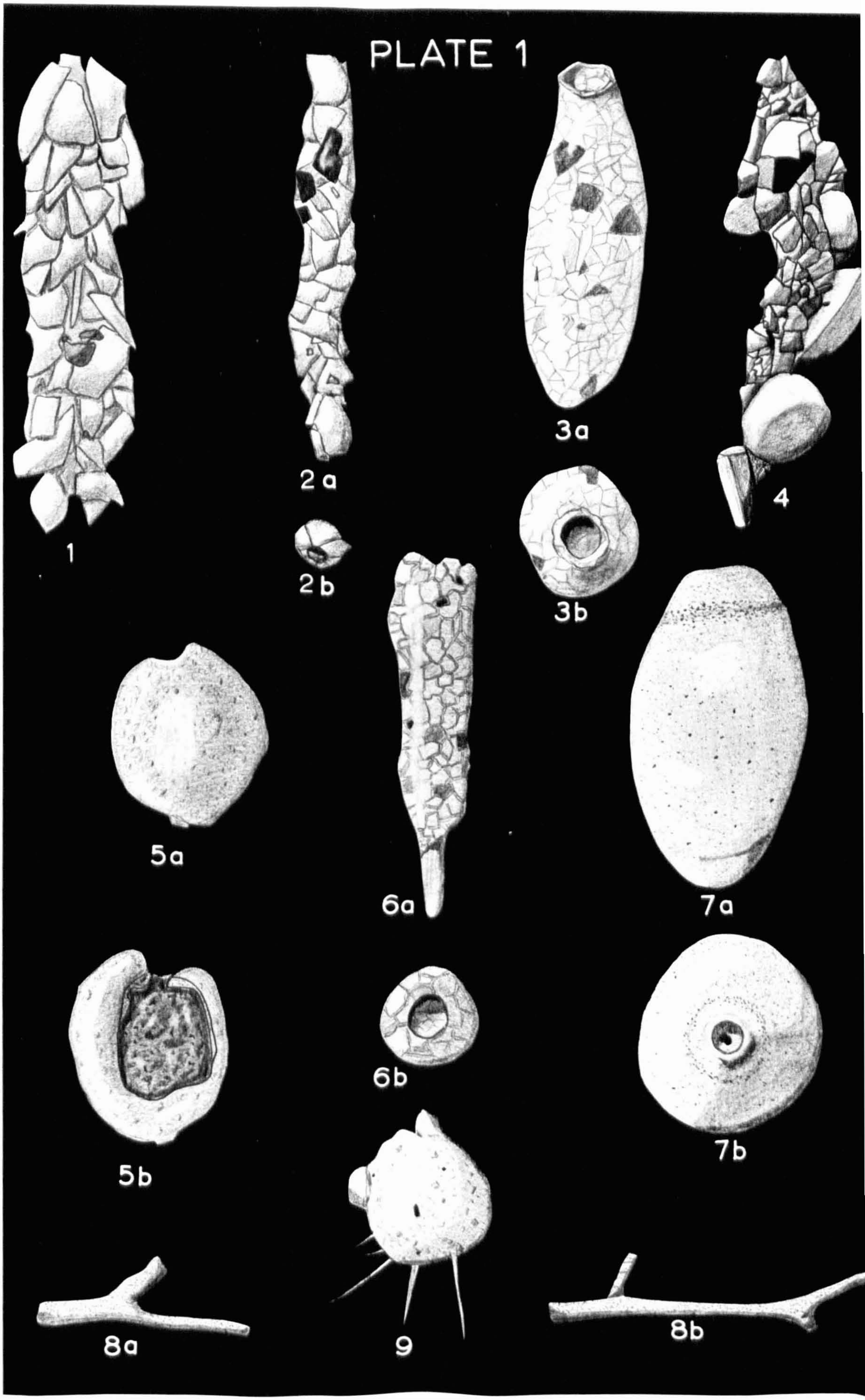
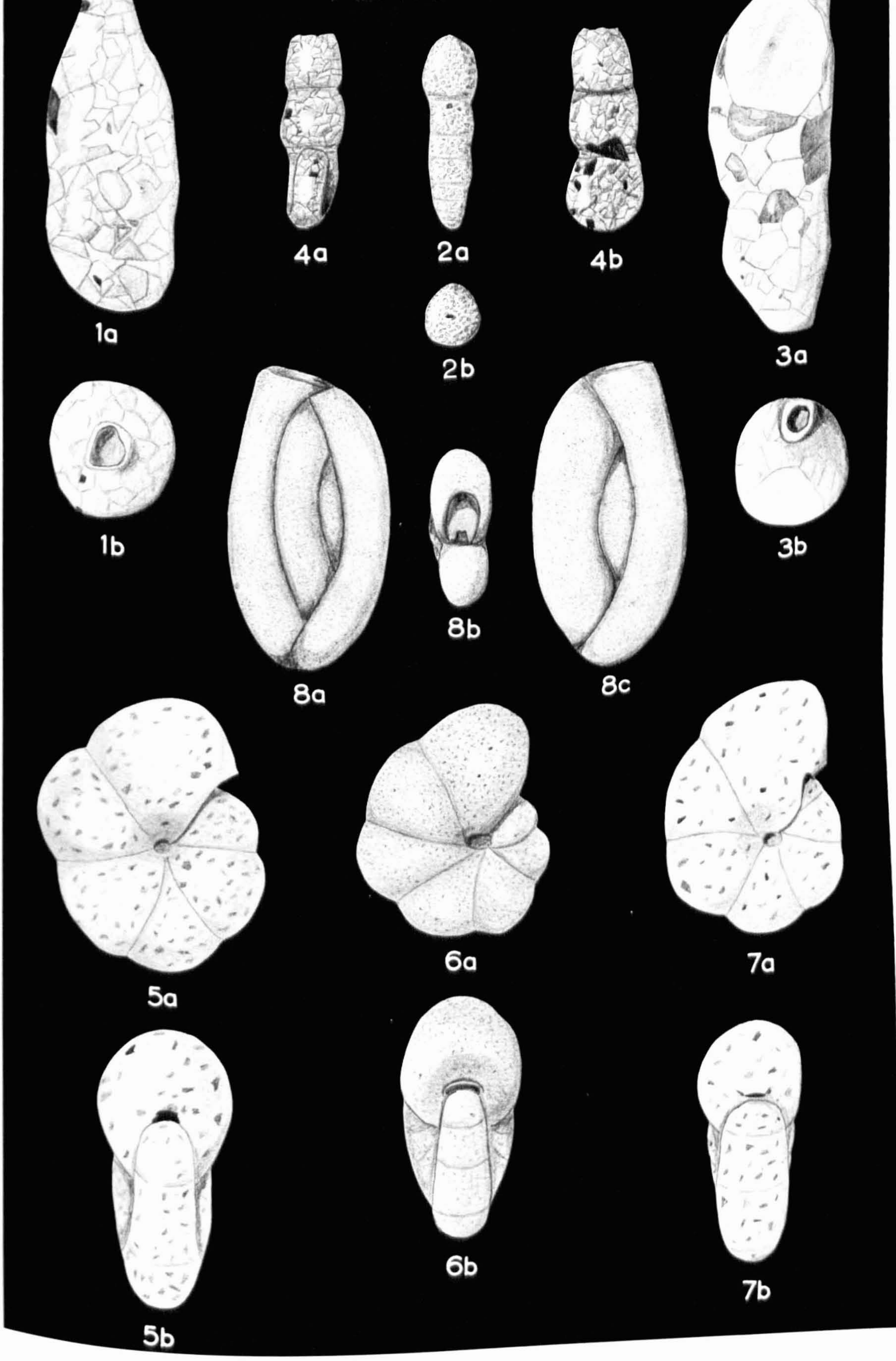


PLATE 1
1
2 a
2 b
3a
3b
4
5a
5b
6a
6b
7a
7b
8a
8b
9

EXPLANATION OF PLATE 2

Figs.1a,1b:	*Reophax fusiformis* a) Side view b) Apertural view (p.77)	x 110
Figs.2a,2b:	*Reophax arctica* a) Side view b) Apertural view (p.75)	x120
Figs.3a,3b:	*Reophax subfusiformis* a) Side view b) Apertural view (p.80)	x135
Figs.4a,4b:	*Ammobaculites subagglutinans* a) Front view b) Side view (p.100)	x 65
Figs.5a,5b:	*Haplophragmoides canariensis* a) Side view b) Apertural view) (p.91)	x135
Figs.6a,6b:	*Haplophragmoides subinvolutum* a) Side view b) Apertural view (p.94)	x 75
Figs.7a,7b:	*Cribrostomoides jeffreysi* a) Side view b) Apertural view (p.96)	x145
Figs.8a,8b,8c:	*Miliammina fusca* a)c) Side views b) Apertural view (p.82)	x110

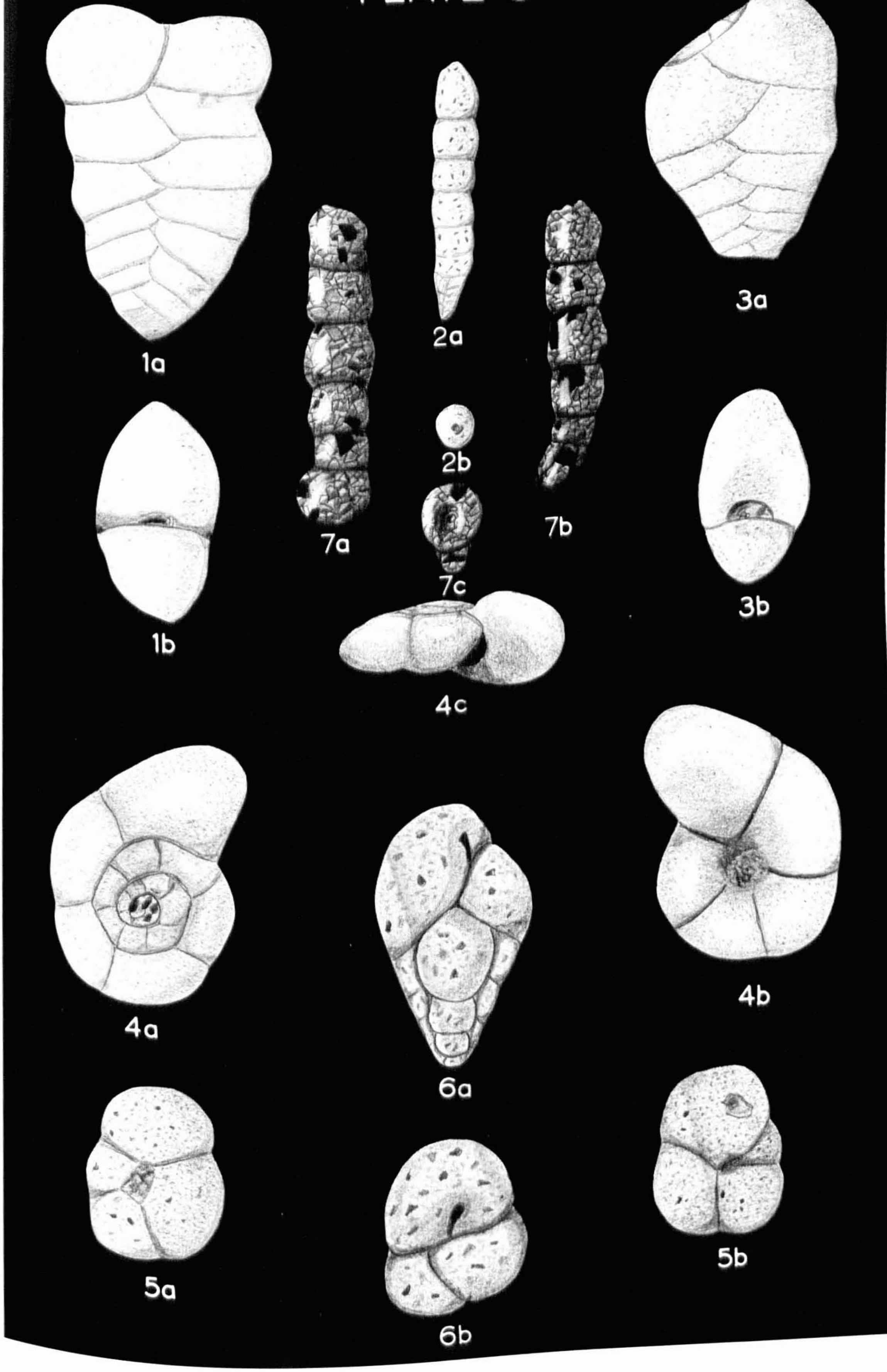
PLATE 2



EXPLANATION OF PLATE 3

Figs.1a,1b:	Textularia bocki a) Front view b) Apertural view (p.102)	x115
Figs.2a,2b:	Clavulina gracilis a) Side view b) Apertural view (p.12[illegible])	x110
Figs.3a,3b:	Textularia gramen a) Front view b) Apertural view (p.104)	x 65
Figs.4a,4b,4c:	Trochammina inflata a)Dorsal view b) Ventral view c)Apertural view (p.117)	x 70
Figs.5a,5b:	Trochammina globigeriniformis a) Dorsal view b) Ventral view (p.111)	x150
Figs.6a,6b:	Verneuilina media a) Side view b) Apertural view (p.126)	x 65
Figs.7a,7b,7c:	Ammobaculites agglutinans var.filiformis a)Side view b)Front view c)Apertural view (p.98)	x80

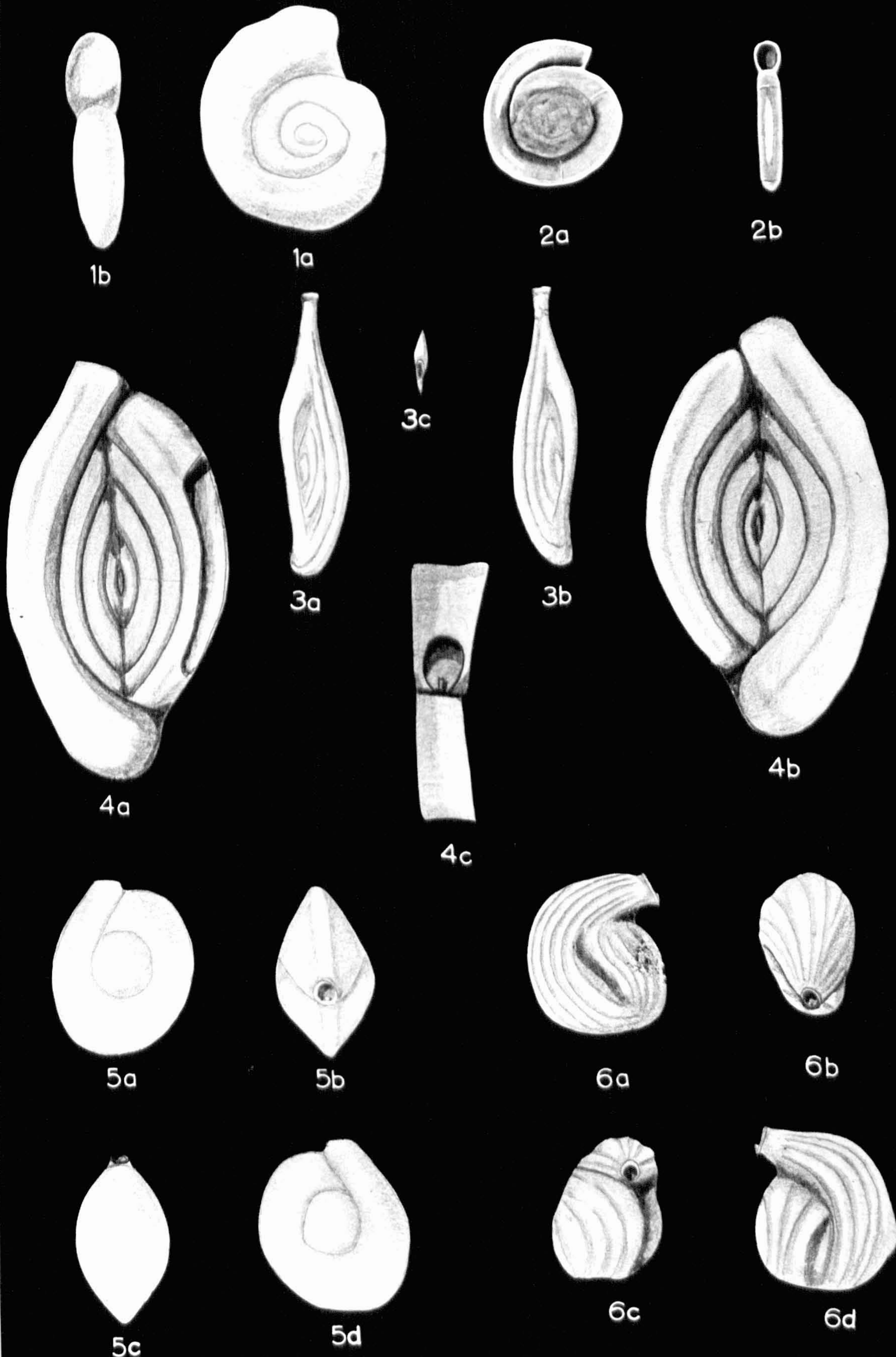
PLATE 3



EXPLANATION OF PLATE 4

Figs.1a,1b:	Cyclogyra involvens a) Side view b) Apertural view (p.131)	x125
Figs.2a,2b:	Planispirinella tenuis a) Side view b) Apertural view (p.141)	x160
Figs.3a,3b,3c:	Ophthalmidium acutimargo a)b) Side views c) Apertural view (p.142)	x 55
Figs.4a,4b,4c:	Spiroloculina subimpressa a)b) Side views c) Apertural view (p.145)	x110
Figs.5a,5b,5c,5d:	Miliolid sp.A. a)d) Side views b) Apertural view c) Front view (p.147)	x140
Figs.6a,6b,6c,6d:	Miliolid sp.B. a)d) Side views b) Apertural view d) Front view (p.148)	x 70

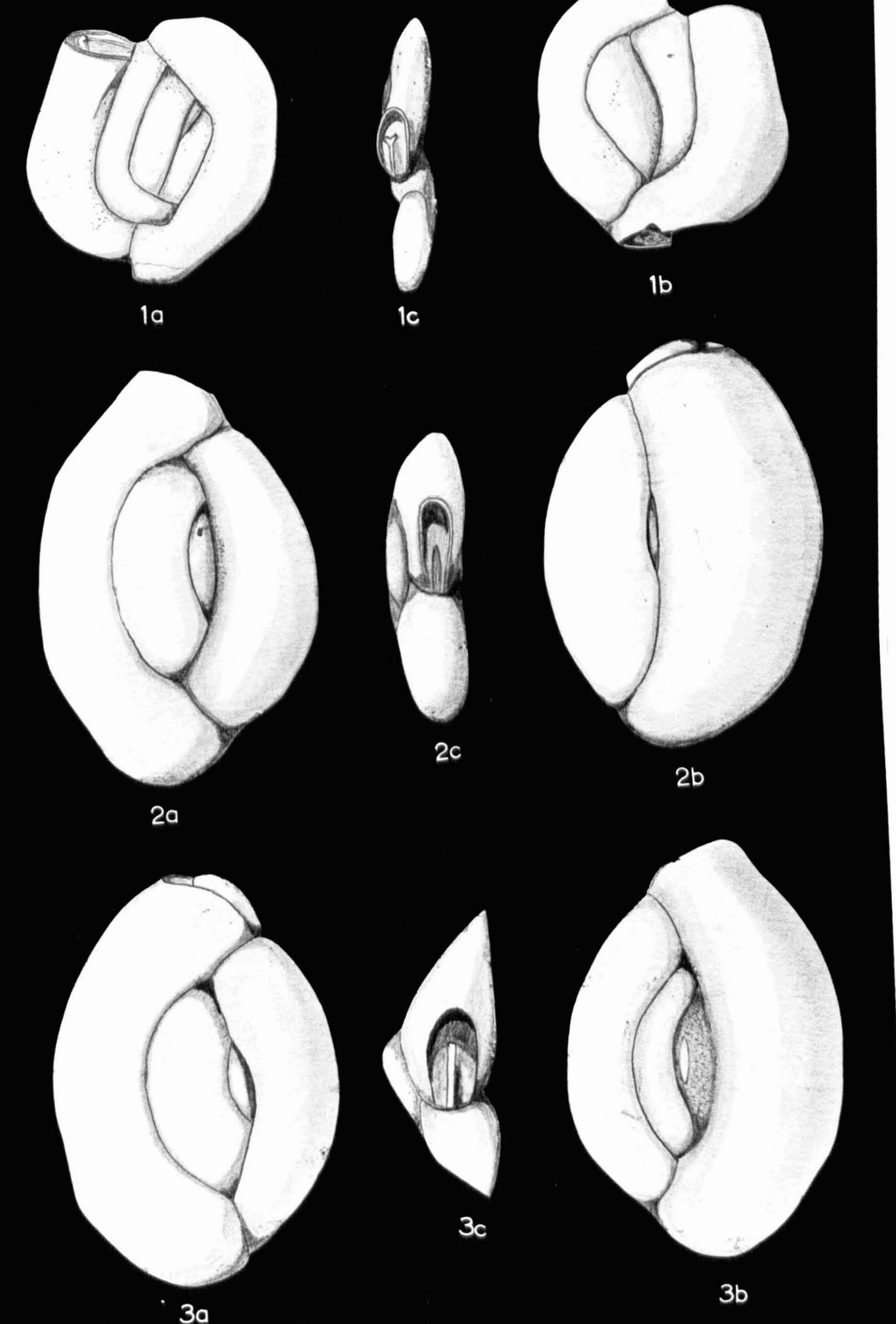
PLATE 4



EXPLANATION OF PLATE 5

Figs.1a,1b,1c:	Massilina planisparoidea a)b) Side views c) Apertural view (p.198)	x 40
Figs.2a,2b.2c:	Massilina secans a)b) Side views c) Apertural view (p.200)	x 50
Figs.3a,3b,3c:	Quinqueloculina seminulangulata a)b) Side views c) Apertural view (p.176)	x115

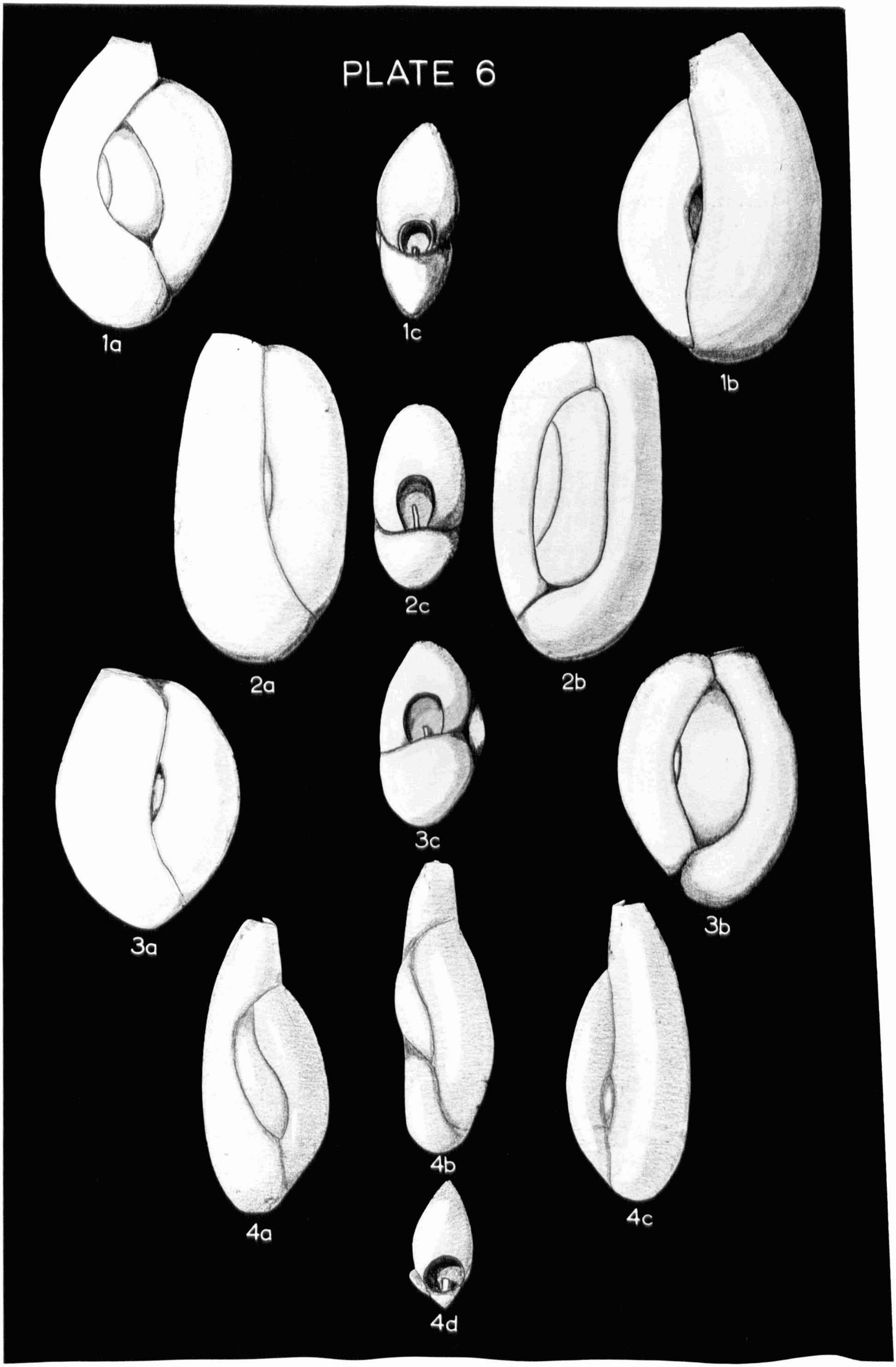
PLATE 5



EXPLANATION OF PLATE 6

Figs.1a,1b,1c:	*Quinqueloculina cliarensis* a)b) Side views c) Apertural view (p.160)	x 60
Figs.2a,2b,2c:	*Quinqueloculina lata* a)b) Side views c) Apertural view (p.169)	x100
Figs.3a,3b,3c:	*Quinqueloculina seminulum* a)b) Side views c) Apertural view (p.178)	x 50
Figs.4a,4b,4c,4d:	*Triloculina dubia* a)c) Side views b) Front view d) Apertural view (p.210)	x 60

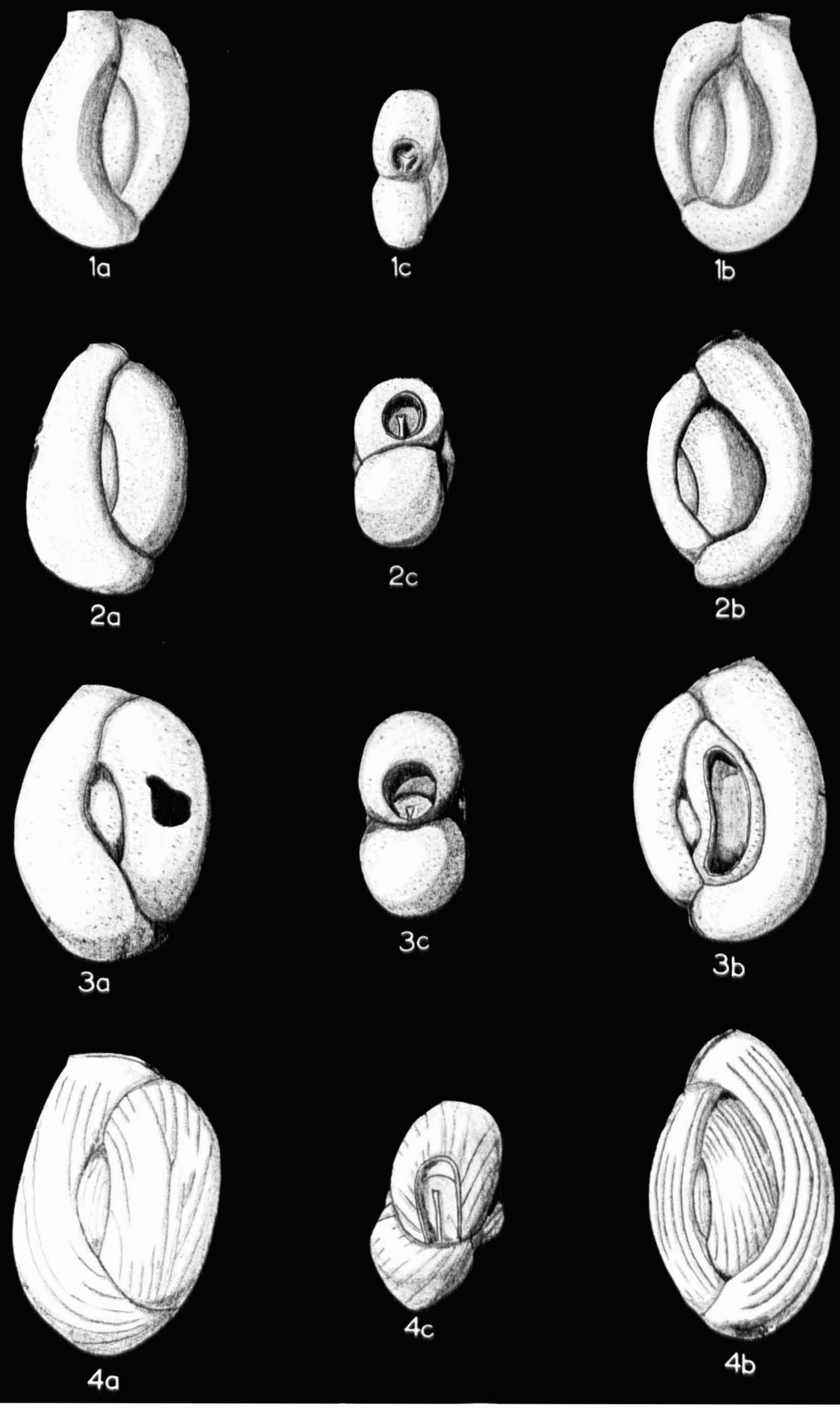
PLATE 6



EXPLANATION OF PLATE 7

Figs.1a,1b,1c:	*Quinqueloculina agglutinata* a)b) Side views c) Apertural view (p.149)	x 60
Figs.2a,2b,2c:	*Quinqueloculina aspera* a)b) Side views c) Apertural view (p.152)	x 70
Figs.3a,3b,3c:	*Quinqueloculina frigida* a)b) Side views c) Apertural view (p.162)	x 60
Figs.4a,4b,4c:	*Quinqueloculina bicornis* a)b) Side views c) Apertural view (p.154)	x 75

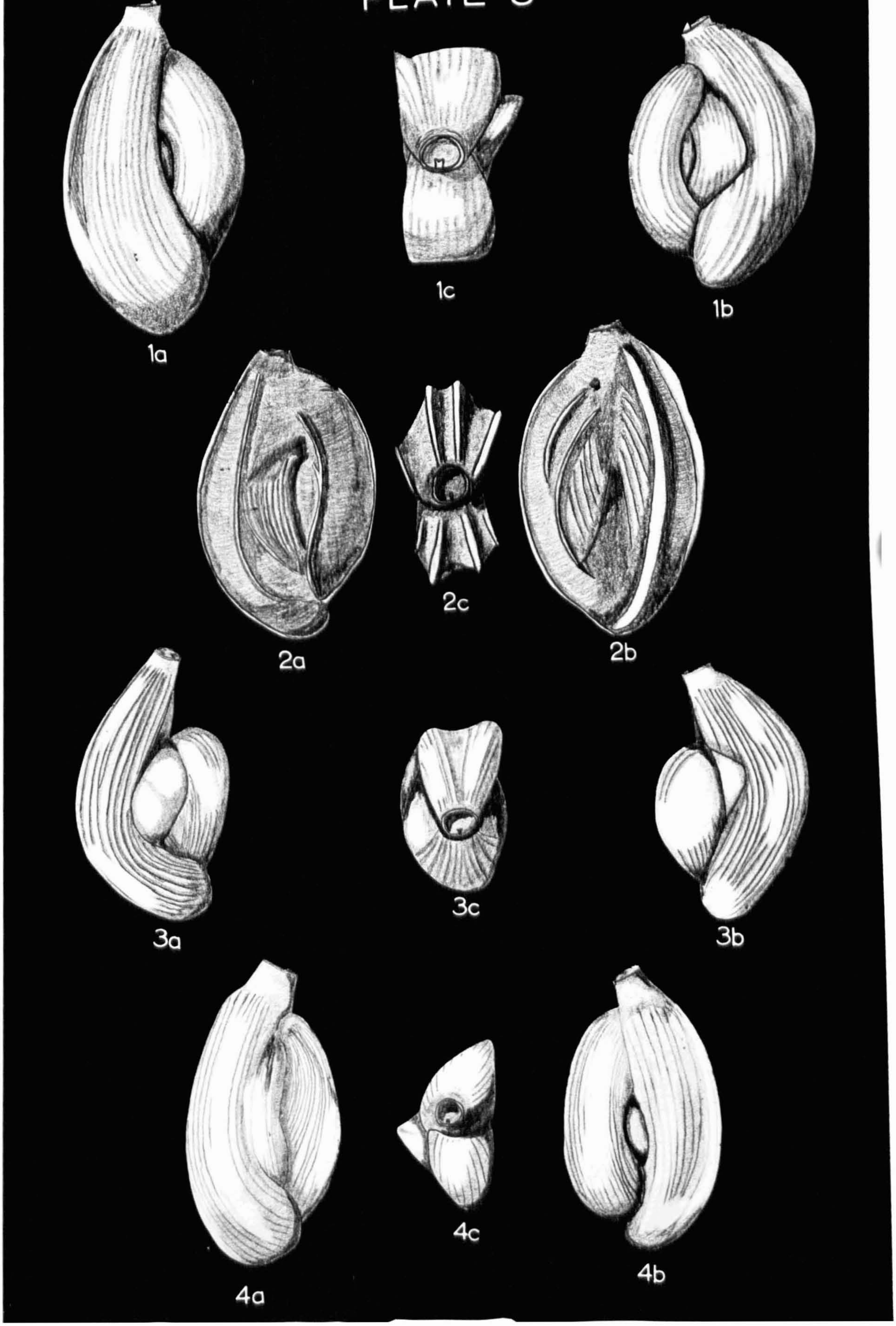
PLATE 7



EXPLANATION OF PLATE 8

Figs. 1a, 1b, 1c:	*Quinqueloculina angularis* a)b) Side views c) Apertural view (p.151)	x 70
Figs. 2a, 2b, 2c:	*Quinqueloculina* cf. *granulo-costata* a)b) Side views c) Apertural view (p.164)	x 30
Figs. 3a, 3b, 3c)	*Quinqueloculina inconstans* a)b) Side views c) Apertural view (p.167)	x 55
Figs. 4a, 4b, 4c:	*Quinqueloculina pulchella* a)b) Side views c) Apertural view (p.172)	x 60

PLATE 8



EXPLANATION OF PLATE 9

Figs.1a,1b,1c:	Triloculina angulata a)b) Side views c) Apertural view (p.208)	x 60
Figs.2a,2b,2c:	Triloculina trigonula a)b) Side views c) Front view d) Apertural view (p.212)	x 65
Figs.3a,3b,3c,3d:	Triloculina trihedra a)b) Side views c) Front view d) Apertural view (p.223)	x125
Figs.4a,4b,4c:	Pyrgo williamsoni a) Side view b) Front view c) Apertural view (p.206)	x115

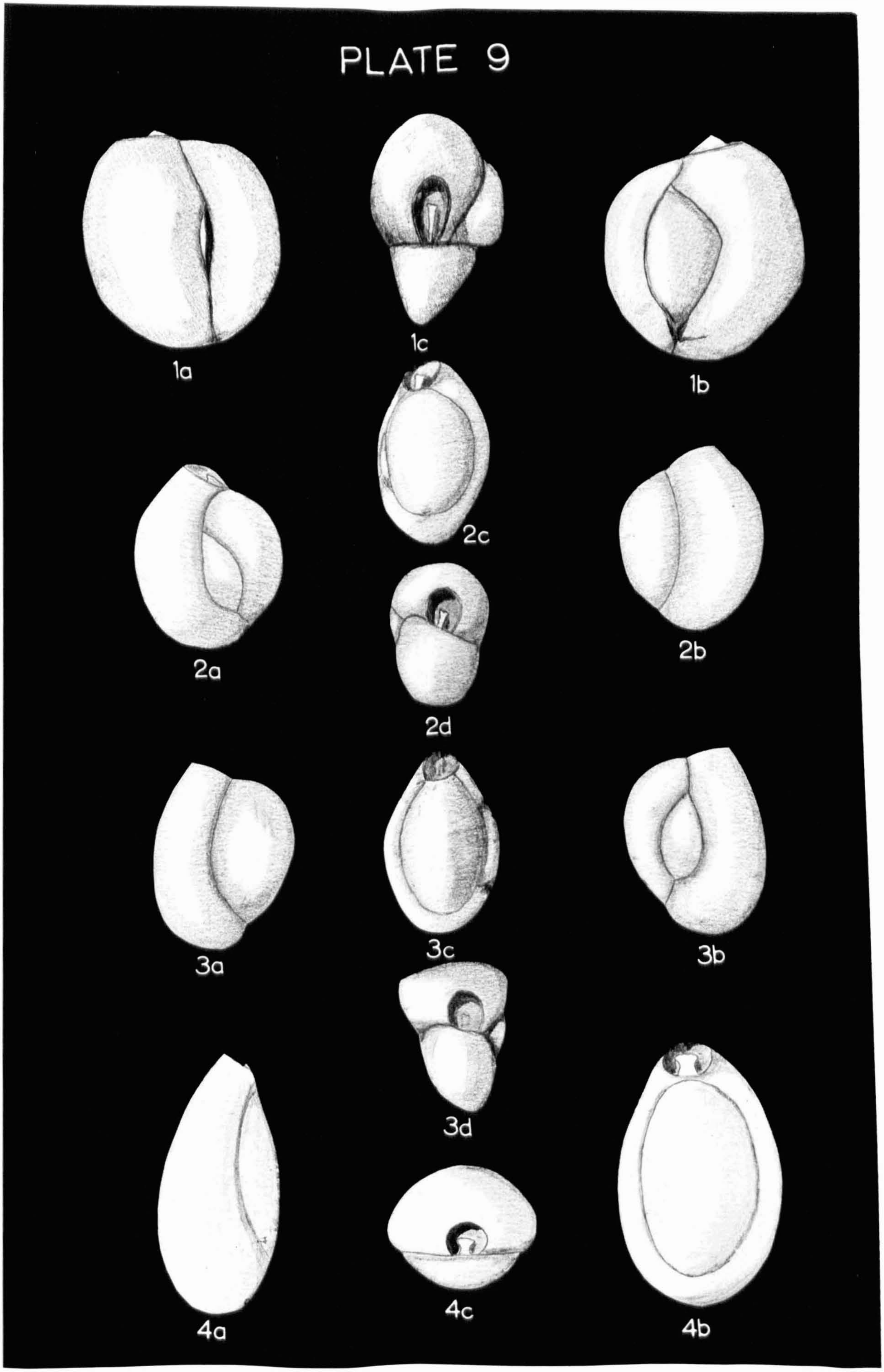
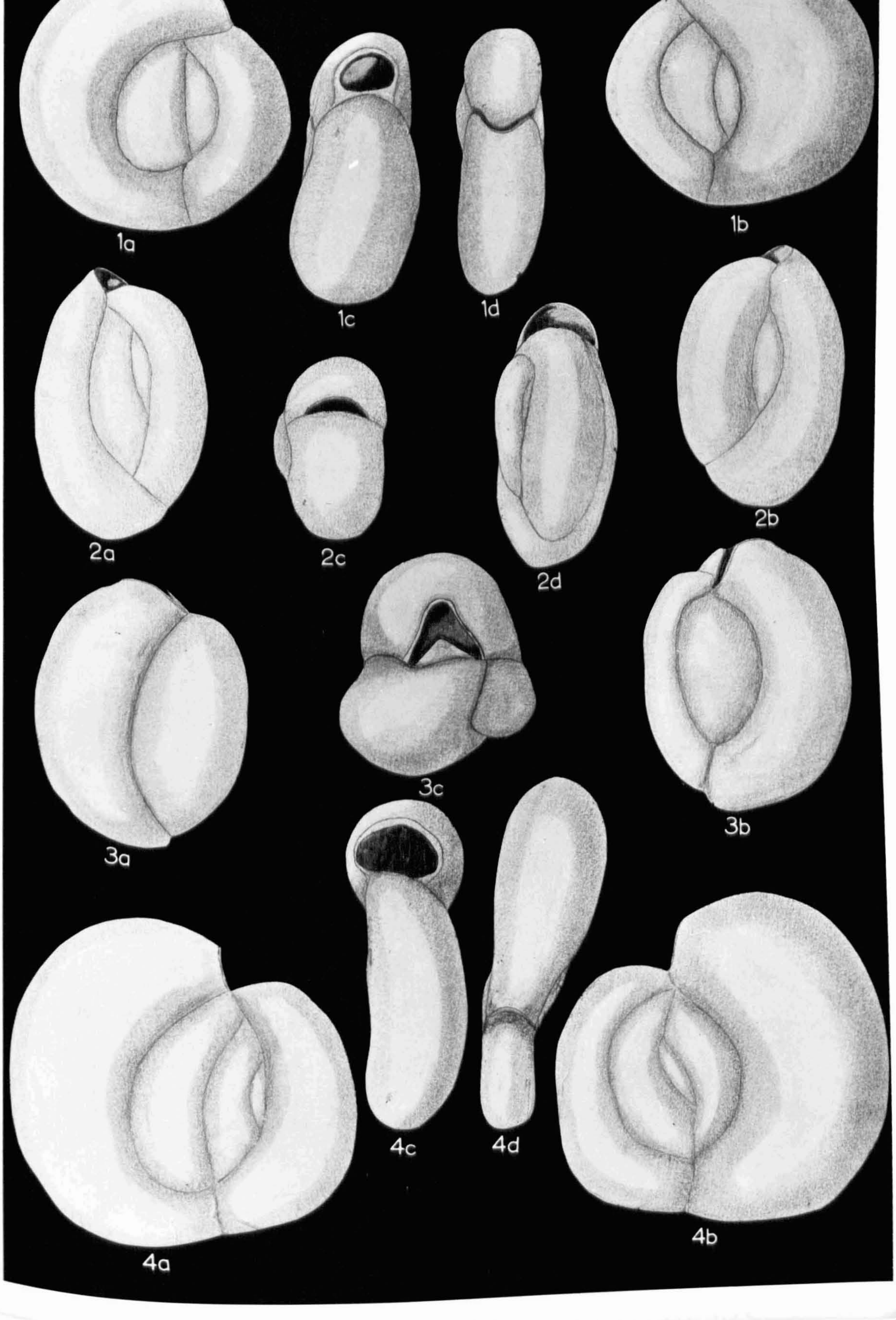


PLATE 9
1a
1c
1b
2c
2a
2b
2d
3a
3c
3b
3d
4a
4c
4b

EXPLANATION OF PLATE 10

Figs.1a,1b,1c:	Miliolinella subrotunda a)b) Side views c) Apertural view d) Upper view (p.232)	x110
Figs.2a,2b,2c,2d:	Miliolinella oblonga a)b) Side views c) Upper view d) Apertural view (p.227)	x110
Figs.3a,3b,3c:	Miliolinella chuckchiensis a)b) Side views c) Apertural view (p.225)	x130
Figs.4a,4b,4c,4d:	Pateoris hauerinoides a)b) Side views c) Apertural view d) Upper view (p.204)	x 110

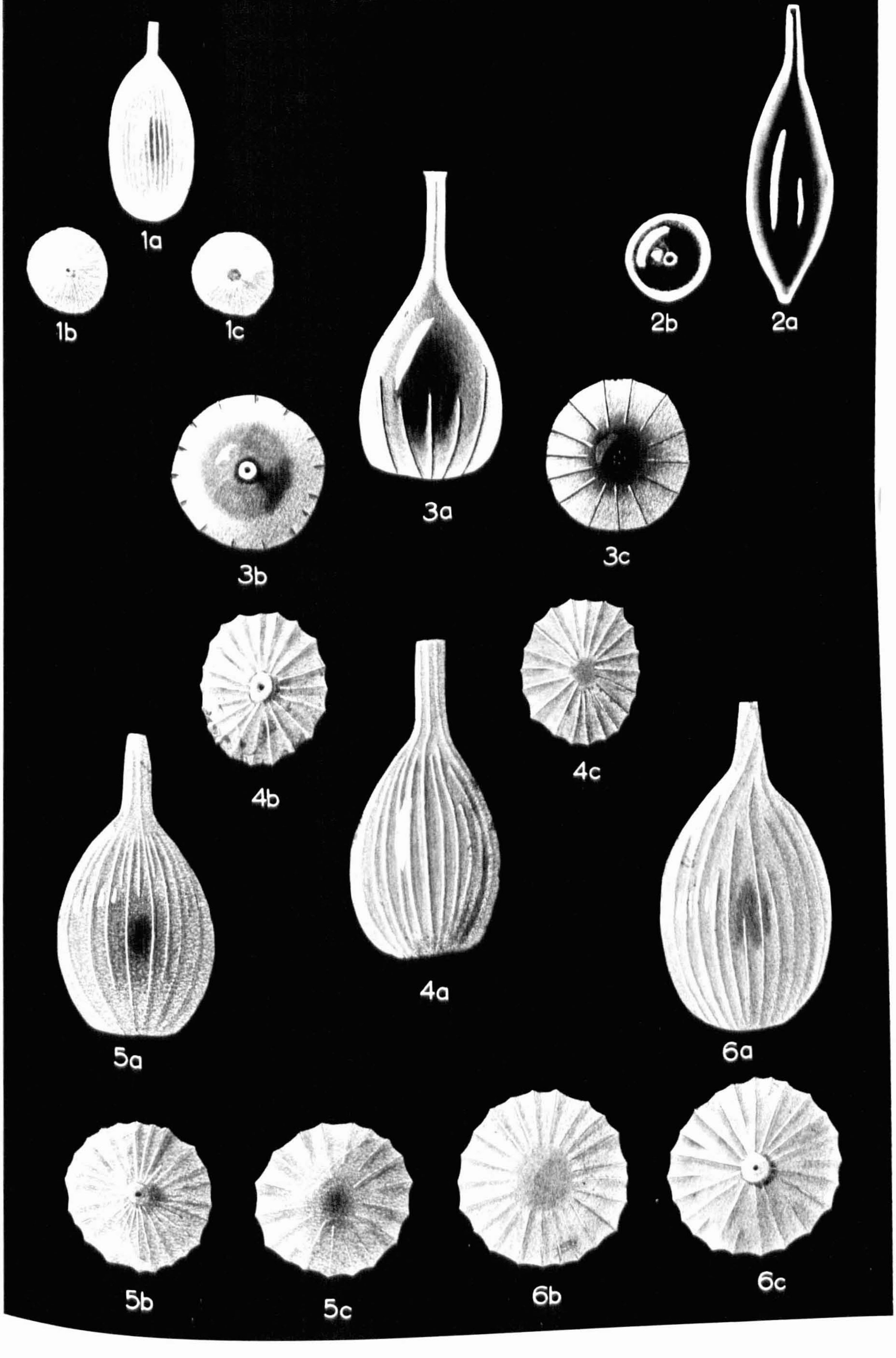
PLATE 10



EXPLANATION OF PLATE 11

Figs.1a,1b,1c:	Lagena substriata a) Side view b) Apertural view c) Basal view (p.258)	x140
Figs.2a,2b:	Lagena laevis a) Side view b) Apertural view (p.241)	x120
Figs.3a,3b,3c:	Lagena semistriata a) Side view b) Apertural view c) Basal view (p.252)	x130
Figs.4a,4b,4c:	Lagena sulcata a) Side view b) Apertural view c) Basal view (p.262)	x145
Figs.5a,5b,5c:	Lagena sulcata var. interrupta a) Side view b) Apertural view c) Basal view (p.272)	x120
Figs.6a,6b,6c:	Lagena sulcata var. spirata a) Side view b) Basal view c) Apertural view (p.275)	x115

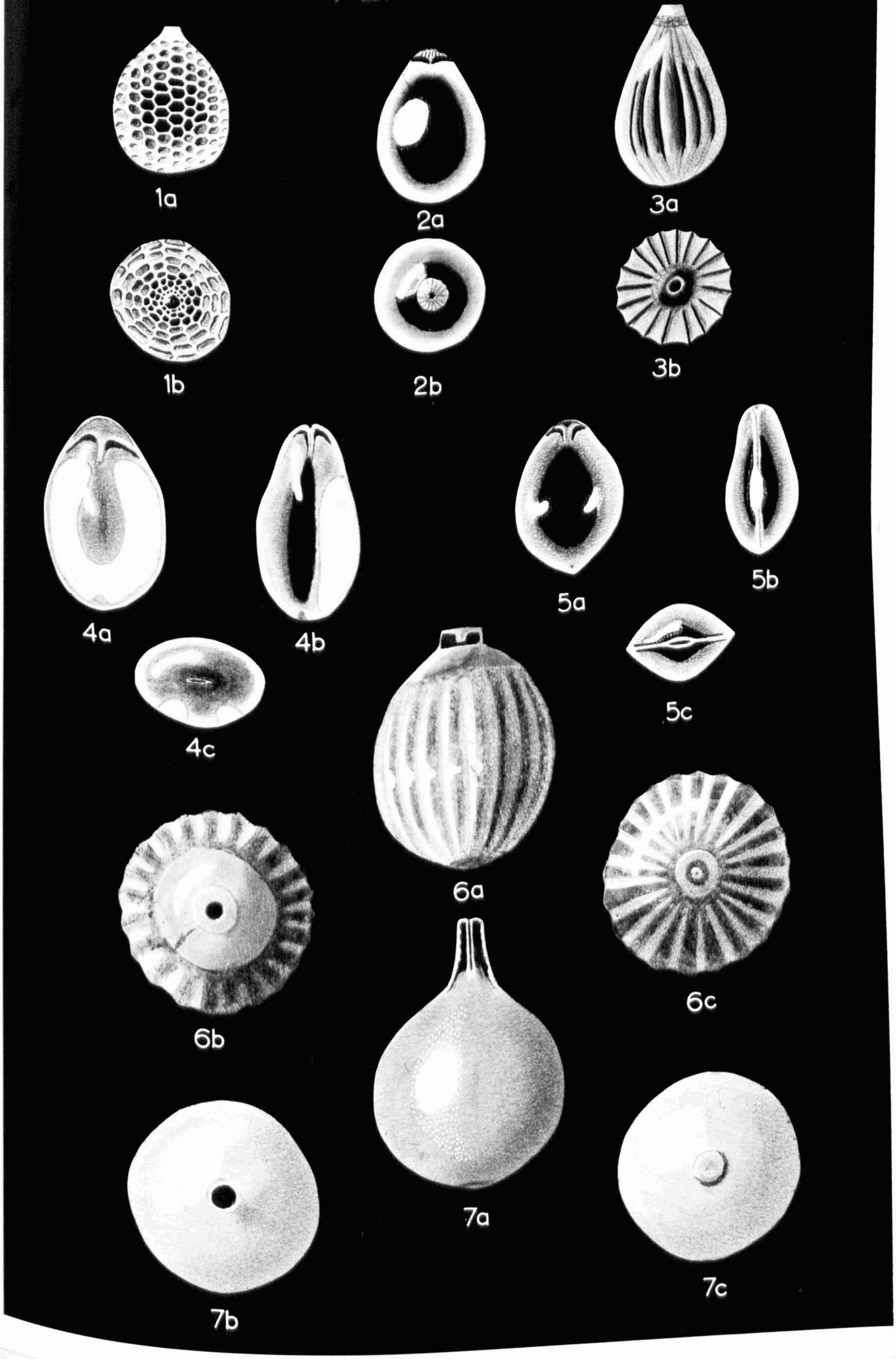
PLATE 11



EXPLANATION OF PLATE 12

Figs.1a,1b:	Oolina hexagona a) Side view b) Apertural view (p.301)	x140
Figs.2a,2b:	Oolina laevigata a) Side view b) Apertural view (p.310)	x120
Figs.3a,3b:	Oolina williamsoni a) Side view b) Apertural view (p.315)	x 70
Figs.4a,4b,4c:	Fissurina lucida a) Front view b) Side view c) Apertural view (p.320)	x140
Figs.5a,5b,5c:	Fissurina marginata a) Front view b) Side view c) Apertural view (p.326)	x135
Figs.6a,6b,6c:	Oolina patannae a) Side view b) Apertural view c) Basal view (p.314)	x120
Figs.7a,7b,7c:	Oolina lineato-punctata a) Side view b) Apertural view c) Basal view (p.312)	x140

PLATE 12



EXPLANATION OF PLATE 13

Figs.1a,1b,1c,1d: Guttulina lactea — x140
a)b) Side views d) Apertural view
c) Front view attached form
(p.293)

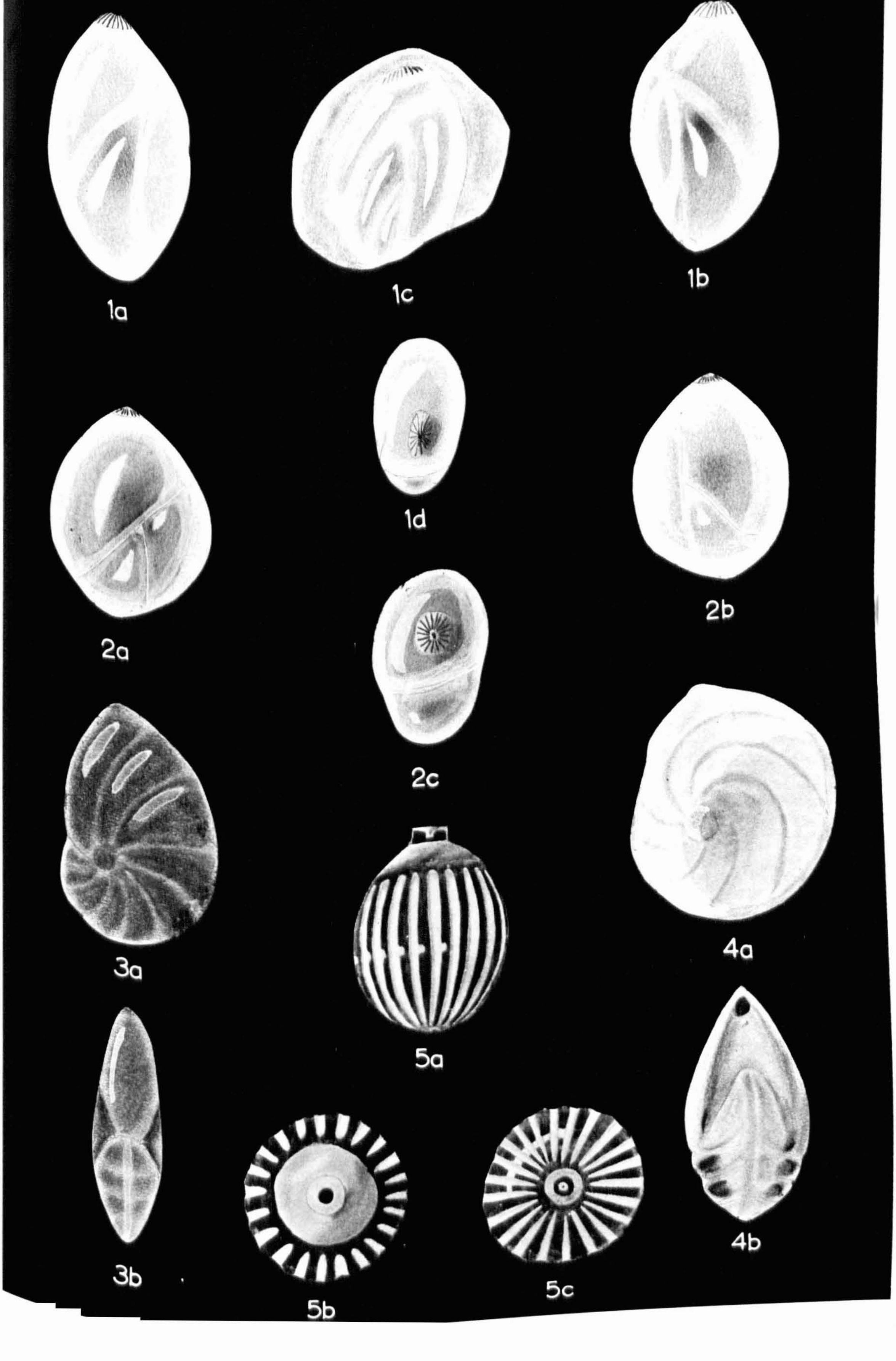
Figs.2a,2b,2c: Globulina gibba — x100
a)b) Side views c) Apertural view
(p.282)

Figs.3a,3b: Lenticulina varians — x 60
a) Side view b) Apertural view
(p.279)

Figs.4a,4b: Lenticulina suborbicularis — x 70
a) Side view b) Apertural view
(p.277)

Figs.5a,5b,5c: Oolina patannae — x 90
a) Side view b) Apertural view
c) Basal view
(p.314)

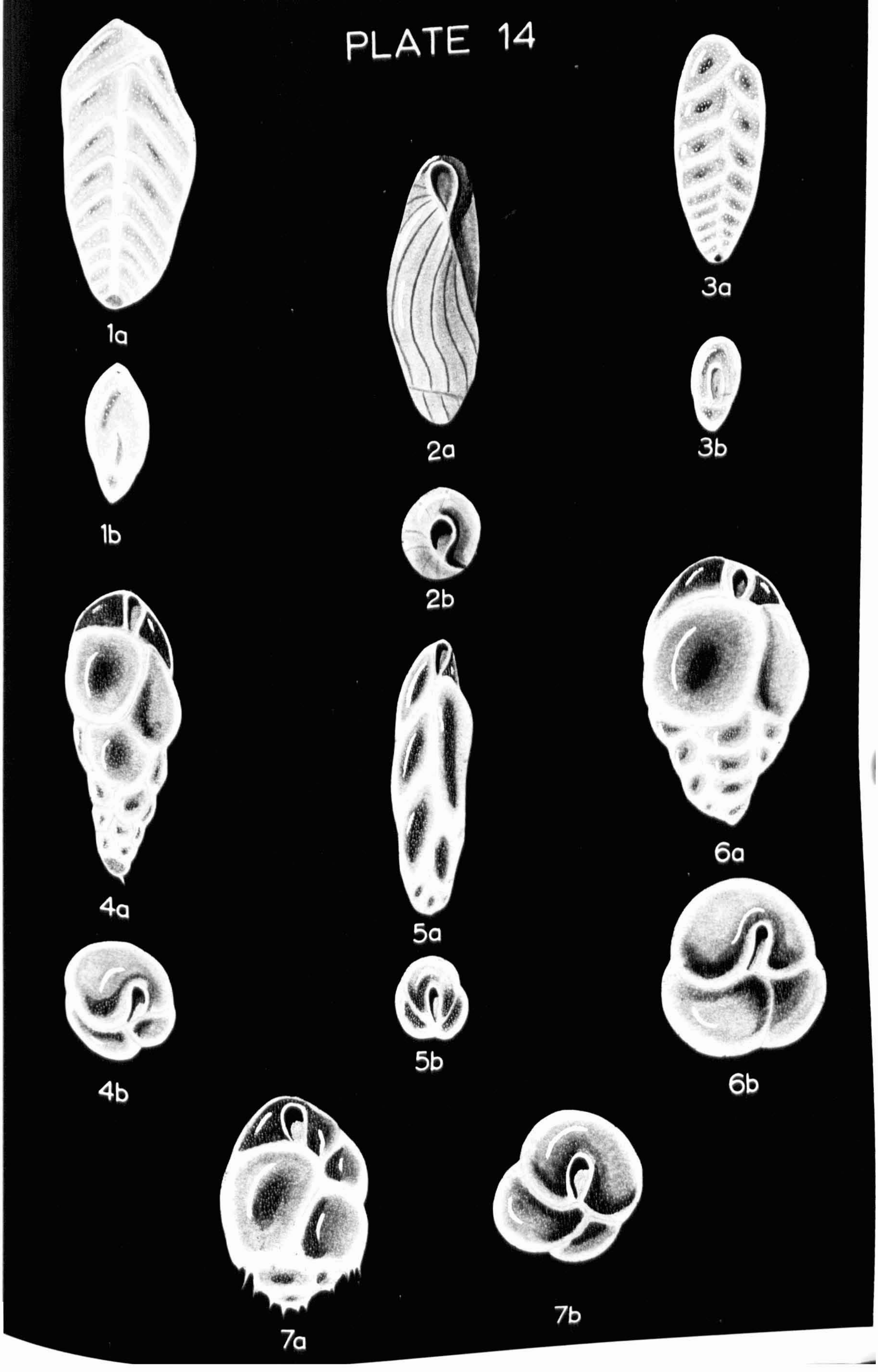
PLATE 13



EXPLANATION OF PLATE 14

Figs. 1a, 1b:	Bolivina spathulata a) Front view b) Apertural view (p.352)	x150
Figs. 2a, 2b:	Buliminella elegantissima a) Front view b) Apertural view (p.339)	x 160
Figs. 3a, 3b:	Bolivina variablis a) Front view b) Apertural view (p.356)	x170
Figs. 4a, 4b:	Bulimina elongata a) Front view b) Apertural view (p.362)	x160
Figs. 5a, 5b:	Cassidulinoides tenuis a) Front view b) Apertural view (p.359)	x 90
Figs. 6a, 6b:	Bulimina gibba a) Front view b) Apertural view (p.367)	x160
Figs. 7a, 7b:	Bulimina marginata a) Front view b) Apertural view (p.370)	x150

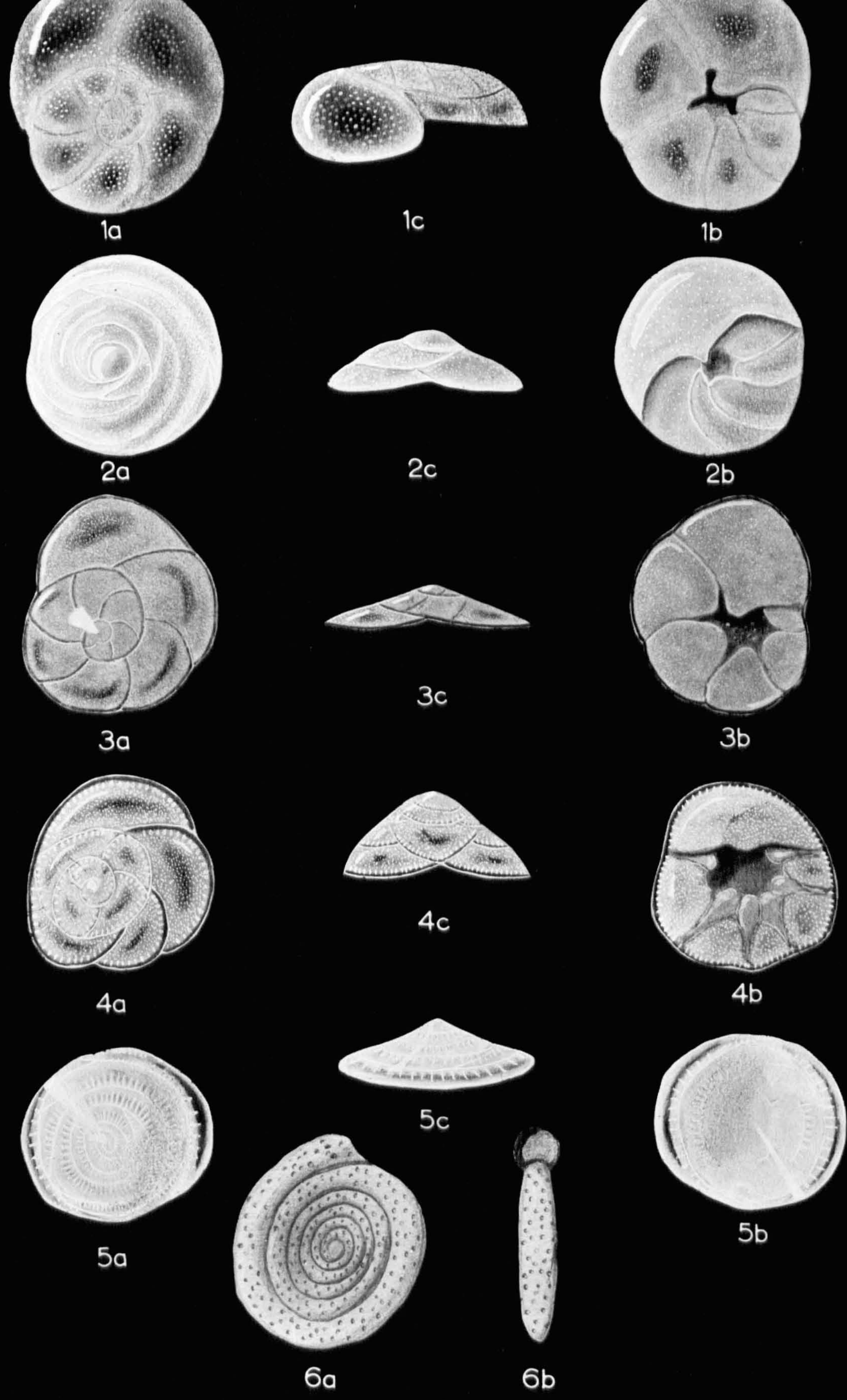
PLATE 14



EXPLANATION OF PLATE 15

Figs.1a,1b,1c:	*Discorbis bradyi* a) Dorsal view b) Ventral view c) Side view (p.381)	x160
Figs.2a,2b,2c:	*Discorbis malovensis var. nudiformis* a) Dorsal view b) Ventral view c) Side view (p.384)	x 75
Figs.3a,3b,3c:	*Discorbis williamsoni* a) Dorsal view b) Ventral view c) Side view (p.386)	x 90
Figs.4a,4b,4c:	*Eoeponidella mamilla* a) Dorsal view b) Ventral view c) Side view (p.391)	x150
Figs.5a,5b,5c:	*Patellina corrugata* a) Dorsal view b) Ventral view c) Side view (p.402)	x 80
Figs.6a,6b:	*Spirillina vivipara* a) Side view b) Apertural view (p.394)	x180

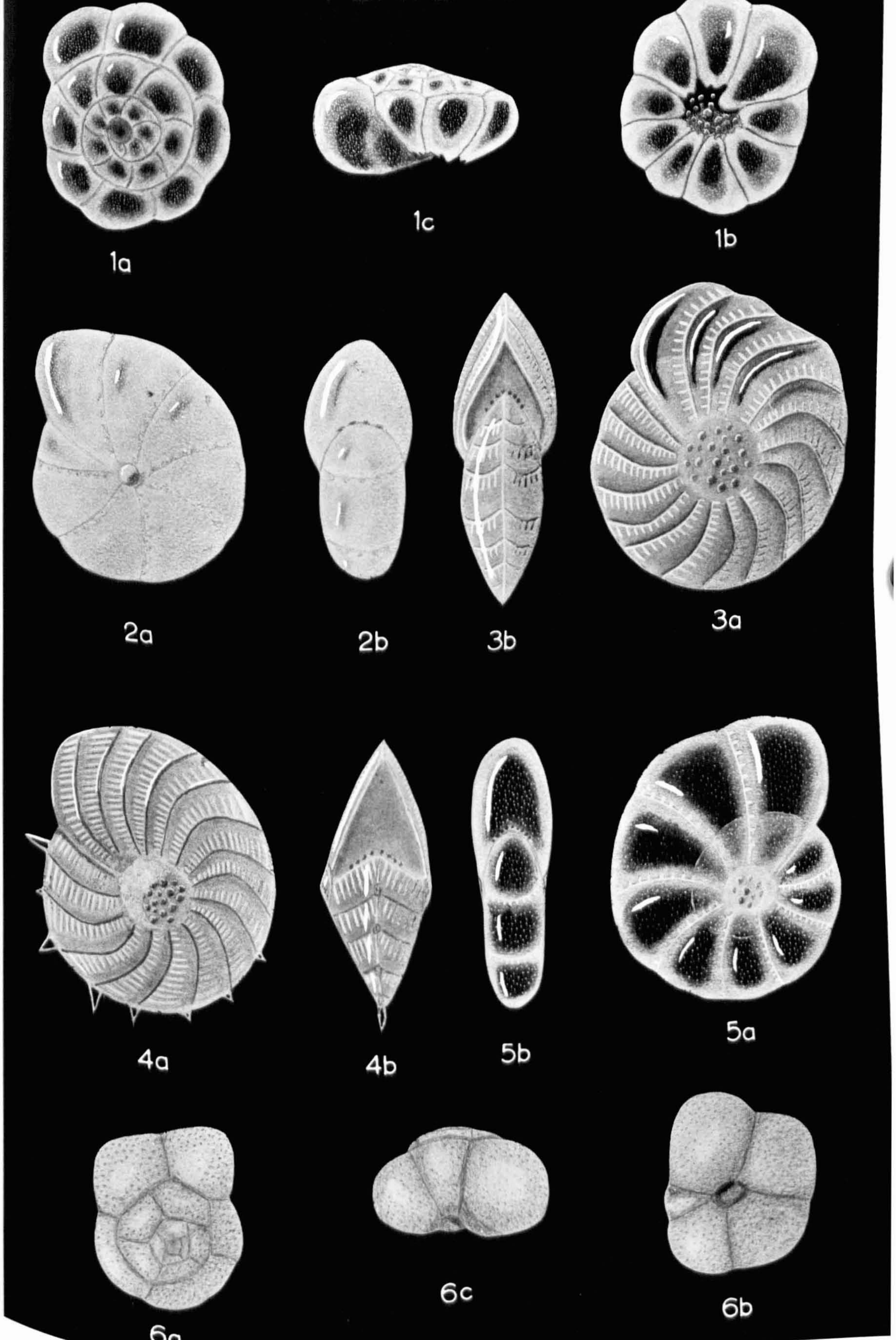
PLATE 15



EXPLANATION OF PLATE 16

Figs.1a,1b,1c:	*Ammonia beccarii* a) Dorsal view b) Ventral view c) Side view (p.413)	x 80
Figs.2a&2b:	*Elphidium bartletti* a) Side view b) Apertural view (p.429)	x160
Figs.3a,3b:	*Elphidium crispum* a) Side view b) Apertural view (p.433)	x 75
Figs.4a,4b:	*Elphidium crispum var. spinosum* a) Side view b) Apertural view (p.445)	x 85
Figs.5a,5b:	*Elphidium discoidale* a) Side view b) Apertural view (p.447)	x135
Figs.6a,6b,6c:	*Globigerina cf. hexagona* a) Dorsal view b) Ventral view c) Side view (p.471)	x170

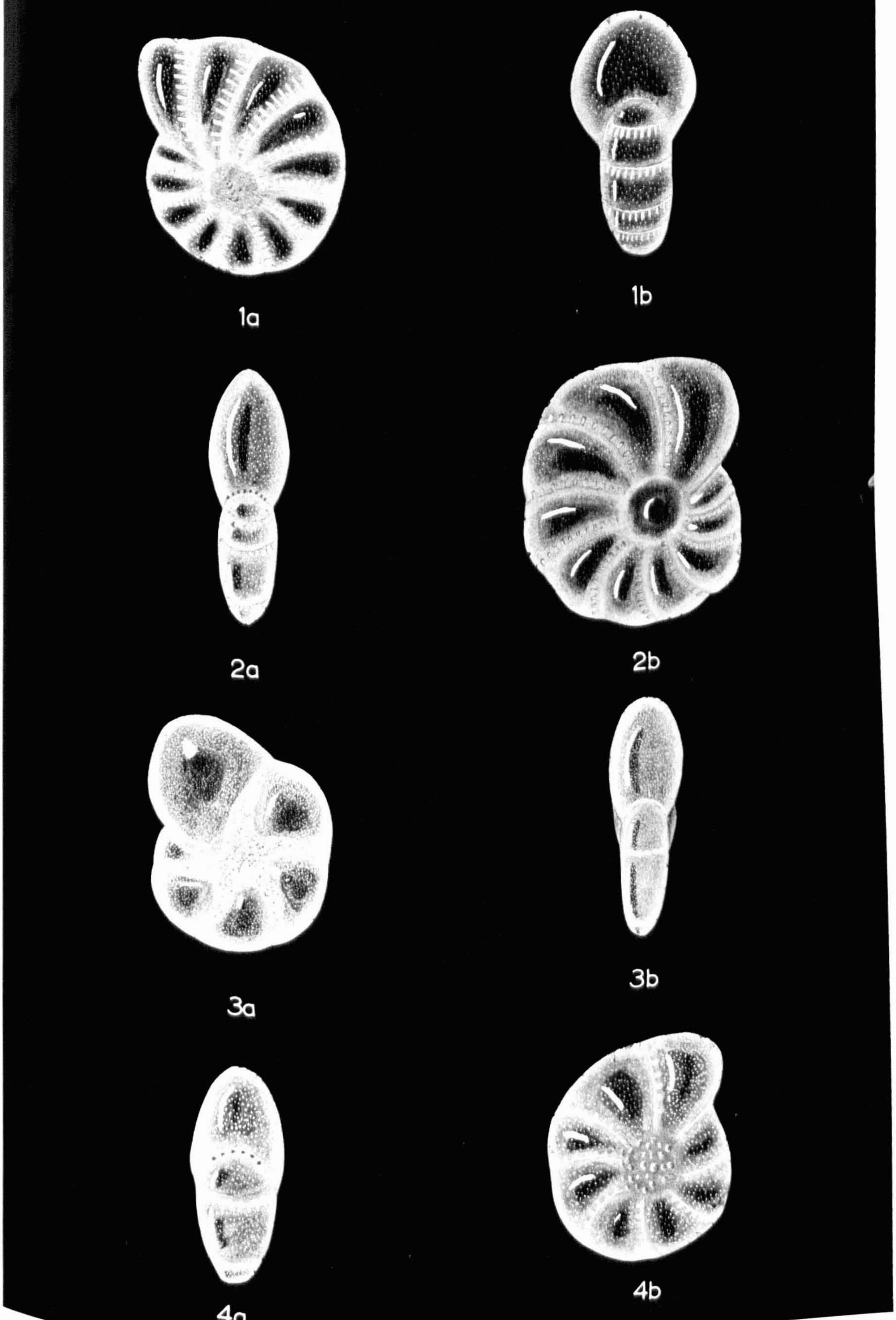
PLATE 16



EXPLANATION OF PLATE 17

Figs. 1a, 1b:	*Elphidium excavatum* a) Side view b) Apertural view (p.453)	x125
Figs. 2a, 2b:	*Elphidium macellum* a) Apertural view b) Side view (p.458)	x115
Figs. 3a, 3b:	*Elphidium magellanicum* a) Side view b) Apertural view (p.465)	x120
Figs. 4a, 4b:	*Elphidium selseyense* a) Apertural view b) Side view (p.468)	x110

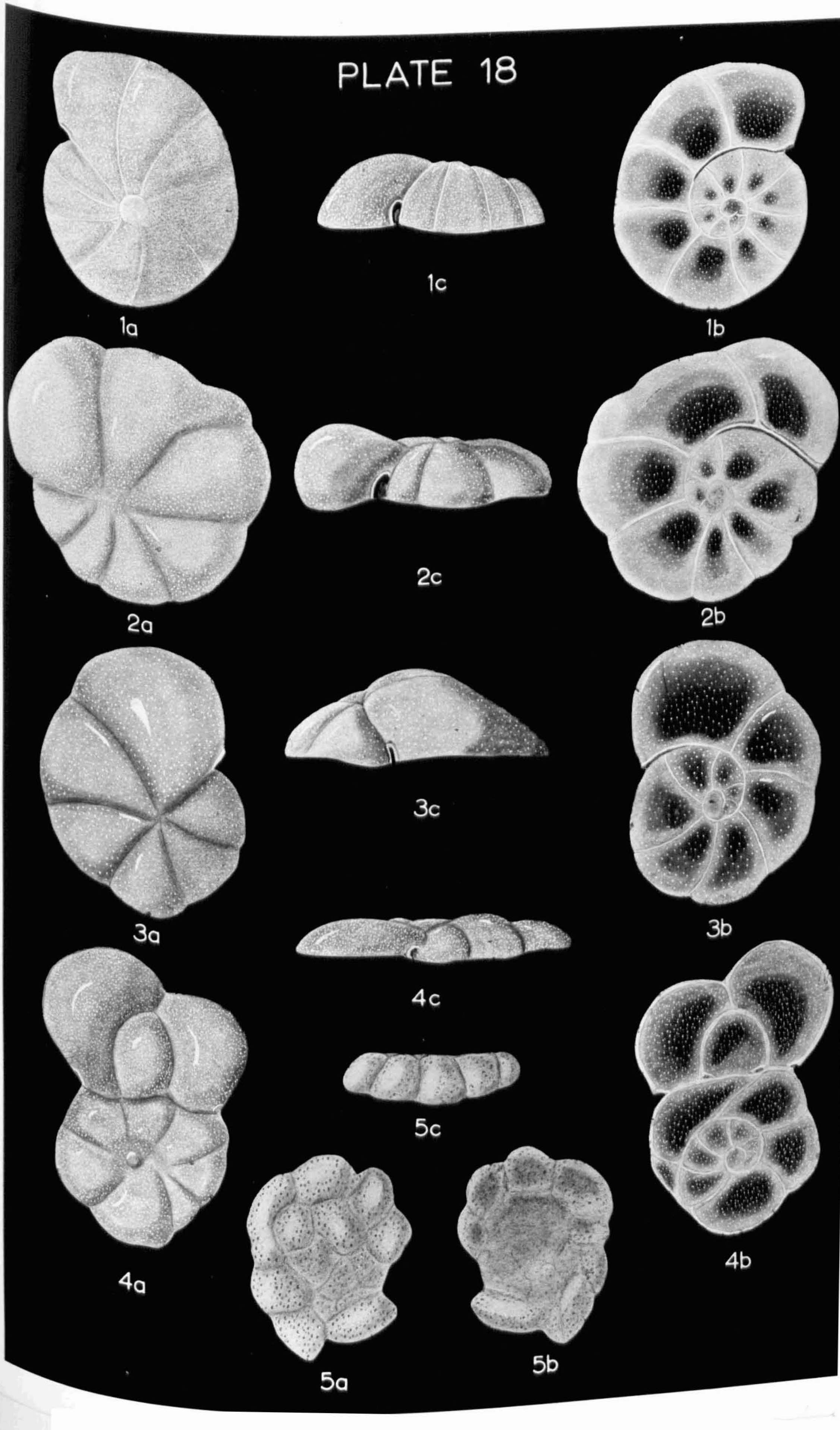
PLATE 17



EXPLANATION OF PLATE 18

Figs.1a,1b,1c:	*Cibicides fletcheri* a) Ventral view b) Dorsal view c) Apertural view (p.474)	x120
Figs.2a,2b,2c:	*Cibicides lobatulus* a) Ventral view b) Dorsal view c) Apertural view (p.477)	x 80
Figs.3a,3b,3c:	*Cibicides refulgens* a) Ventral view b) Dorsal view c) Apertural view (p.496)	x180
Figs.4a,4b,4c:	*Dyocibicides biserialis* a) Ventral view b) Dorsal view c) Apertural view (p.503)	x120
Figs.5a,5b,5c:	*Acervulina inhaerens* a) Ventral view b) Dorsal view c) Side view (p.517)	x 60

PLATE 18



EXPLANATION OF PLATE 19

Figs.1a,1b: x 95

Astrononion gallowayi
a) Side view b) Apertural view
(p.537)

Figs.2a,2b: x 90

Nonion boueana
a) Apertural view b) Side view
(p.521)

Figs.3a,3b: x100

Nonion depressulum
a) Side view b) Apertural view
(p.524)

Figs.4a,4b: x110

Nonion pompilioides
a) Apertural view b) Side view
(p.531)

Figs.5a,5b,5c: x 90

Nonionella atlantica
a) Dorsal view b) Ventral view
c) Apertural view
(p.540)

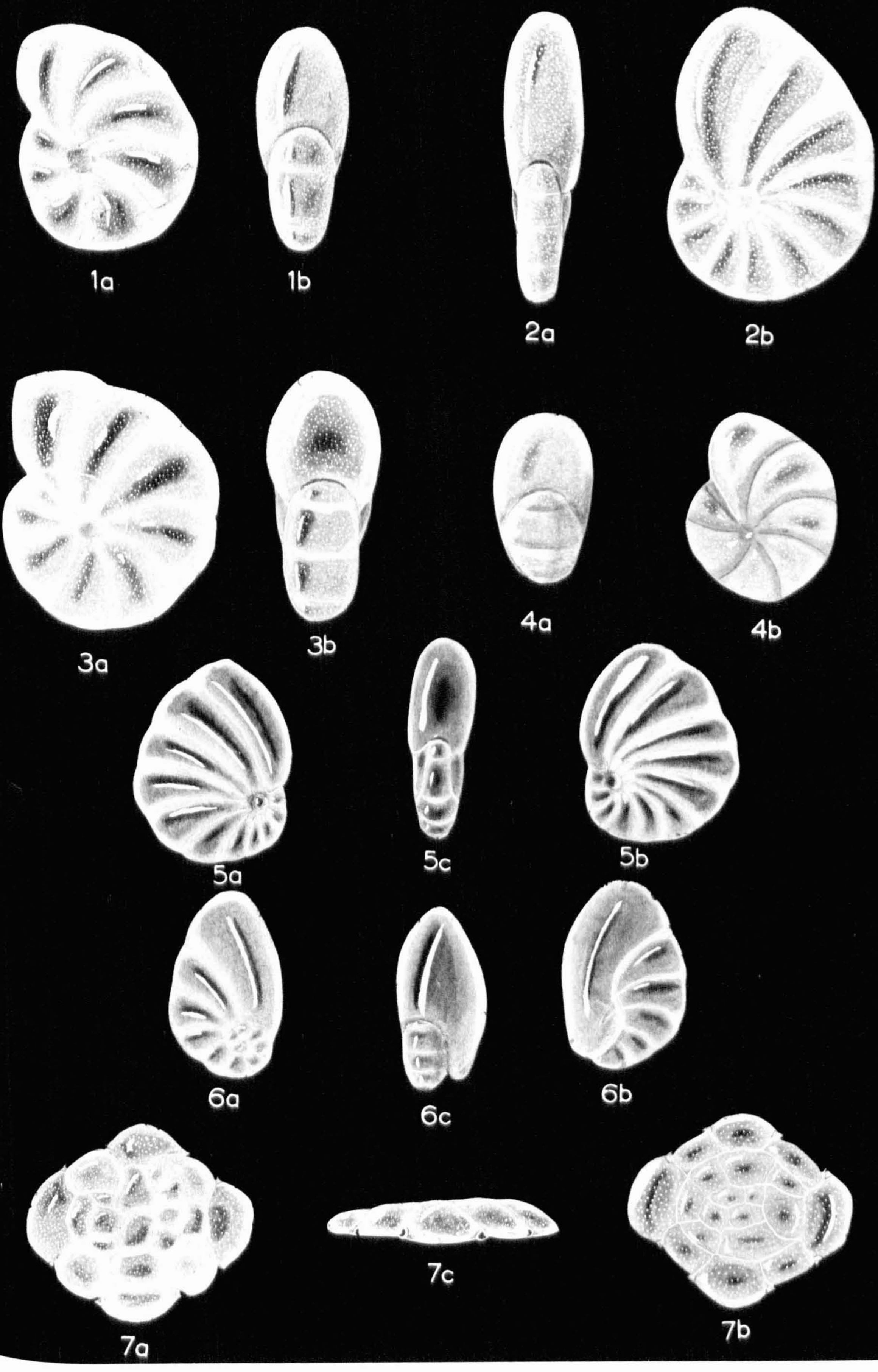
Figs.6a,6b,6c: x 80

Nonionella turgida
a) Dorsal view b) Ventral view
c) Apertural view
(p.544)

Figs.7a,7b,7c: x 70

Planorbulina mediterranensis
a) Ventral view b) Dorsal view
c) Side view
(p.508)

PLATE 19



EXPLANATION OF PLATE 20

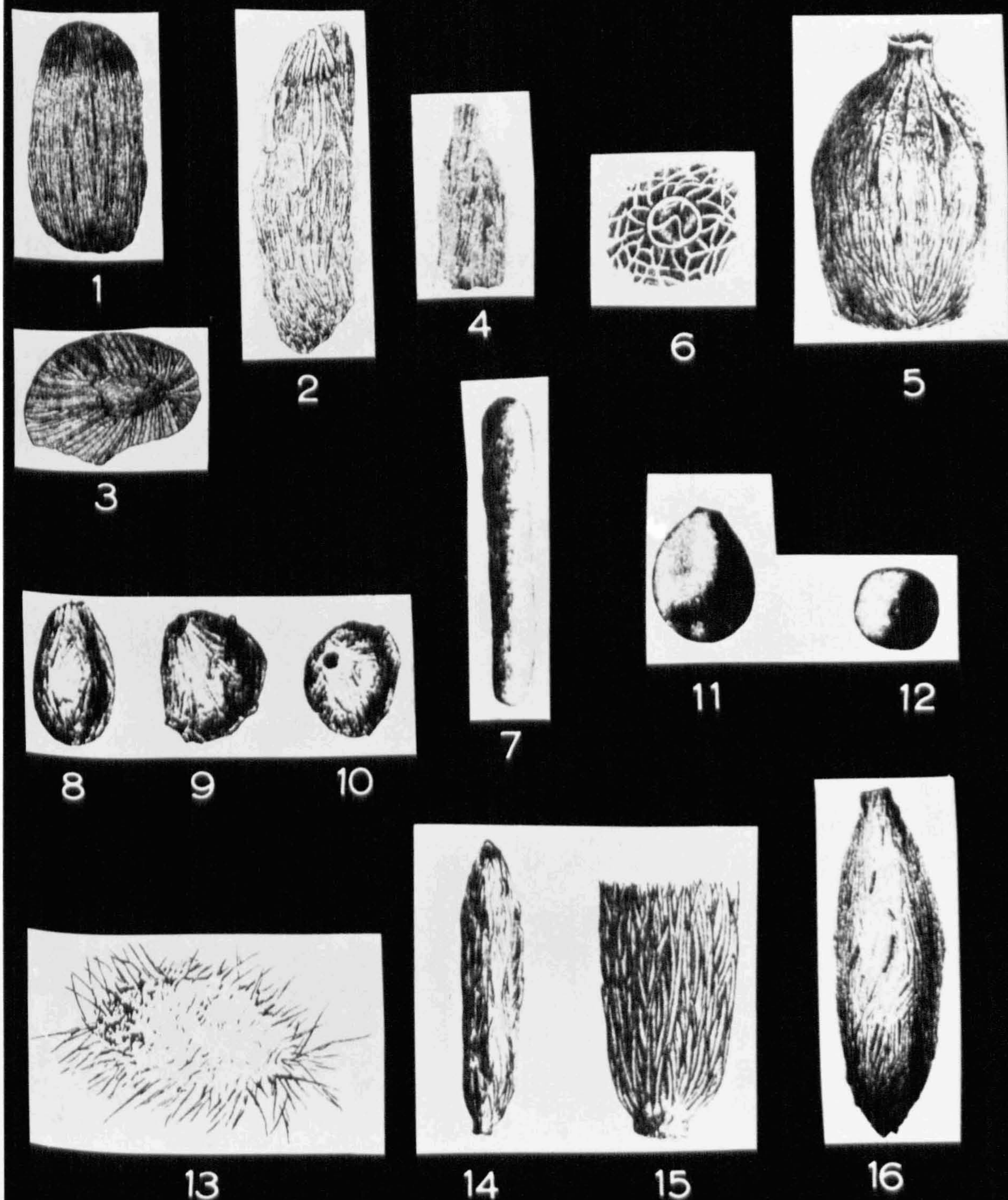
Figs.1-5, 7:	*Technitella* fragments	x 40 approx.
Fig.6:	*Technitella legumen 'forma' solitary*	x 35
Fig.8:	*Technitella legumen 'forma' colonial*	x 40

PLATE 20

EXPLANATION OF PLATE 21

Figs.1,2,3:	*Technitella archaeonitida*	(p.551)
Fig.4:	*Technitella atlantica*	(p.551)
Figs.5,6:	*Technitella asciformis*	(p.552)
Fig.7:	*Technitella candida*	(p.553)
Figs.8,9,10:	*Technitella bradyi*	(p.552)
Figs.11,12:	*Technitella flexibilis*	(p.553)
Fig.13:	*Technitella hystrix*	(p.553)
Figs.14,15,16:	*Technitella legumen*	(p.553)

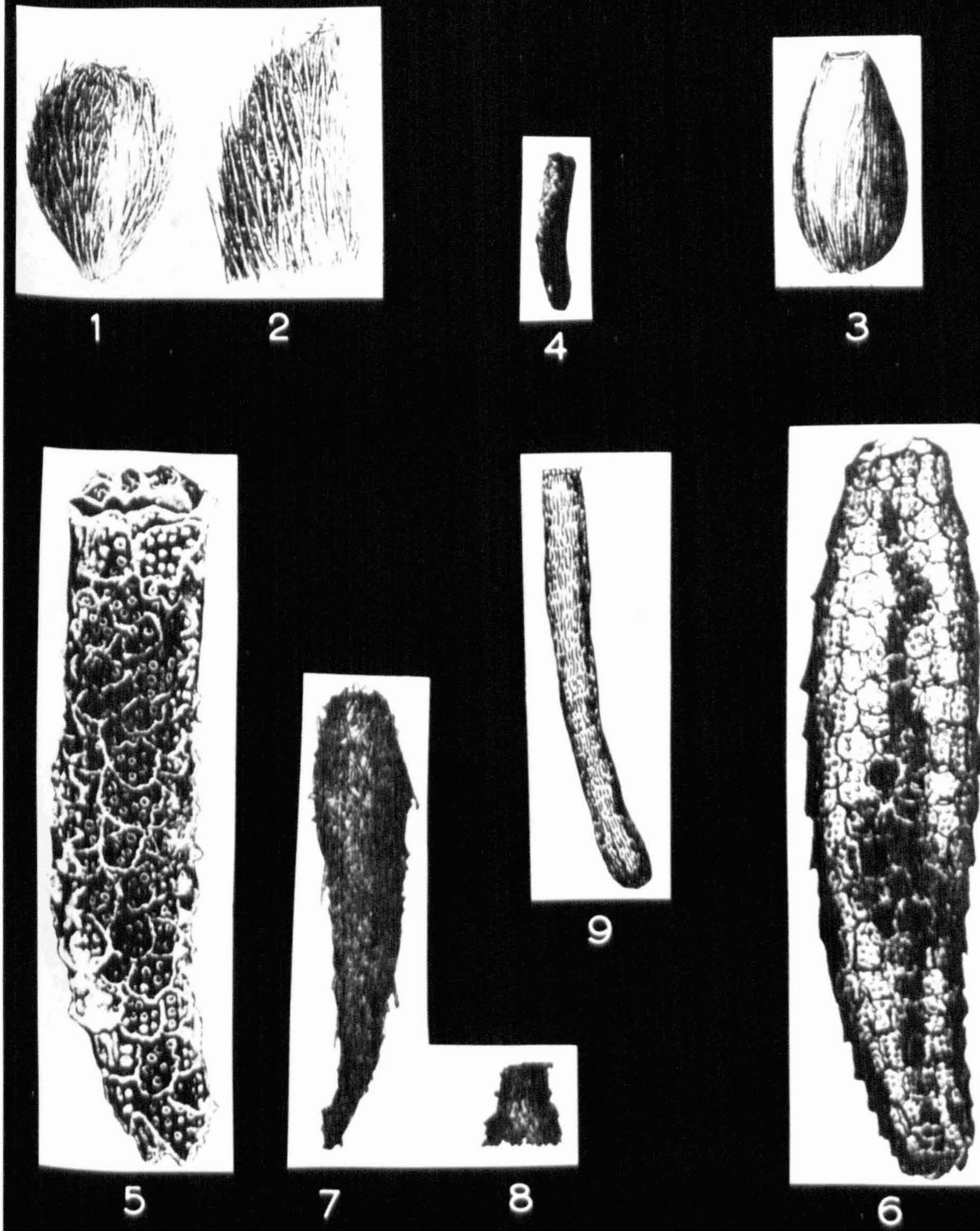
PLATE 21



EXPLANATION OF PLATE 22

Figs.1,2:	*Technitella melo*	(p.556)
Fig.3:	*Technitella nitida*	(p.557)
Figs.4,5,6:	*Technitella thompsoni*	(p.558)
Figs.7,8:	*Technitella raphanus*	(p.559)
Fig.9:	*Technitella mestayeri*	(p.557)

PLATE 22



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Sample: CB.298

Date: 17.9.63

Time: 14.00 hours

Location: Decca Fix: Red F5.94
Green D45.51

Depth: 47'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	1	0	1
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	1	0	1
QUINQUELOCULINA bicornis	30	1	0	1
	60	1	1	0
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	3	0	3
	60	10	3	7
	100	1	0	1
	200	-	-	-
TRILOCULINA trihedra	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
VERNEULINA media	30	-	-	-
	60	6	0	6
	100	3	1	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	4	0	4
	60	23	4	19
	100	7	1	6
	200	2	0	2
	Total	36	5	31

GENERAL FAUNA

Grade	X 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	2	0	0	11	0	4	0	0	2	15
Gastropods	0	9	0	0	0	2	0	0	0	11
Hydrozoans	5	0	8	16	10	13	2	2	25	31
Pelecypods	0	11	0	0	0	0	0	0	0	11
Bryozoans	1	0	0	0	0	0	0	0	1	0
Echinoid spines	0	3	0	4	0	1	0	1	0	9
Mussels	10	30	0	0	0	0	0	0	10	30
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	4	-	0	-	0	-	0	-	4
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 149
Living:- 38
Dead:- 111

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	210	70
Lithoclasts	40	13.3
Bioclasts	50	16.7
	(300)	

Sample: CB.299

Date: 17.9.63

Time: 14.21 hours

Location: DECCA FIX: Red F4.00
Green D46.5

Depth: 46'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	11	0	11
	100	-	-	-
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
DYOCIBICIDES biserialis	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	3	0	3
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA planisparoidea	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	4	0	4
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	5	0	5
	100	3	0	3
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA angularis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	10	6	4
	60	13	6	7
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Aberrent Form	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	18	6	12
	60	47	7	40
	100	5	0	5
	200	0	0	0
	Total	70	13	57

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	10	4	3	43	1	2	0	1	14	50
Gastropods	0	54	0	16	0	1	0	0	0	71
Hydrozoans	13	10	1	29	3	5	0	0	17	43
Pelecypods	0	10	0	0	0	0	0	0	0	10
Bryozoans	3	0	0	0	0	0	0	0	3	0
Echinoid spines	-	0	-	5	-	0	-	0	-	5
Mussels	3	15	0	0	0	0	0	0	3	15
Crustaceans (exl.Ostracods)	0	0	1	0	1	0	0	1	2	1
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	9	-	0	-	0	-	0	-	9
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 244
Living:- 40
Dead:- 204

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	190	67.8
Lithoclasts	43	15.4
Bioclasts	47	16.8
	(280)	

Sample: CB.300

Date: 17.9.63

Time: 14.38 hours

Location: Decca Fix: Red F2.00
Green E30.5

Depth: 12'

Instrument: Vacuum Grab

NO SAMPLE OBTAINED

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods										
Gastropods										
Hydrozoans										
Pelecypods										
Bryozoans										
Echinoid spines			No Sample Obtained							
Mussels										
Crustaceans (exl.Ostracods)										
Starfish										
Worm Tubes										
Echinoids										

Total Faunal Content:-
Living:-
Dead:-

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
ROCK		

Sample: CB.301

Date: 17.9.63

Time: 14.54 hours

Location: Decca Fix: Red F1.88
Green E30.17

Depth: 36'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
DYOCIBICIDES biserialis	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	2	1	1
	100	1	0	1
	200	-	-	-
Total	30	0	0	0
	60	7	1	6
	100	1	0	1
	200	1	0	1
	Total	9	1	8

GENERAL FAUNA

Grade	x 30		X 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	4	0	5	0	0	0	0	0	9
Hydrozoans	0	0	2	2	0	0	0	0	2	2
Pelecypods	0	1	0	0	0	0	0	0	0	1
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	3	-	1	-	0	-	0	-	4
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 18
Living:- 2
Dead:- 16

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	270	75
Lithoclasts	63	17.5
Bioclasts	27	7.5
	(360)	

Sample: CB.302

Date: 17.9.63

Time: 15.20 hours

Location: Decca Fix: Red E23.9
Green F30.45

Depth: 26'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	20	0	20
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA frigida	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	5	1	4
	100	-	-	-
	200	-	-	-
Total	30	0	0	0
	60	36	1	35
	100	2	0	2
	200	0	0	0
	Total	38	1	37

GENERAL FAUNA

Grade										
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	2	0	4	0	0	0	0	0	6
Gastropods	0	13	0	13	0	0	0	0	0	26
Hydrozoans	0	0	0	3	0	0	0	0	0	3
Pelecypods	0	3	0	1	0	0	0	0	0	4
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	4	-	3	-	0	-	8
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 48
Living:- 0
Dead:- 48

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	284	81.6
Lithoclasts	39	11.2
Bioclasts	25	7.2
	(348)	

Sample: CB.303

Date: 17.9.63

Time: 15.50 hours

Location: Decca Fix: Red E21.75
Green E31.6

Depth: 26'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	5	0	5
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
Total	30	2	0	2
	60	5	0	5
	100	1	0	1
	200	0	0	0
	Total	8	0	8

GENERAL FAUNA

Grade	x 30		X 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	3	0	1	0	0	0	0	0	4
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	2	0	0	0	0	0	0	0	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	3	-	0	-	0	-	0	-	3
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 9
Living:- 0
Dead:- 9

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	312	80.0
Lithoclasts	60	15.4
Bioclasts	18	4.6
	(390)	

Sample: CB.304

Date: 17.9.63

Time: 16.08 hours

Location: Decca Fix: Red E19.65
Green E33.14

Depth: 29'6"

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	15	1	14
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	2	0	2
	60	7	0	7
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	20	0	20
	200	4	0	4
MARSIPELLA elongata	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	2	0	2
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA frigida	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	8	0	8
	100	8	0	8
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	4	0	4
	60	43	2	41
	100	40	0	40
	200	4	0	4
	Total	91	2	89

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	6	1	20	0	4	0	0	1	30
Gastropods	0	6	0	2	0	0	0	0	0	8
Hydrozoans	0	0	2	11	0	0	0	0	2	11
Pelecypods	2	2	1	9	0	0	0	0	3	11
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	11	-	4	-	0	-	16
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid Plates	-	1	-	0	-	0	-	0	-	1
Fish Teeth	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 84
Living:- 6
Dead:- 78

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	280	86.1
Lithoclasts	27	8.3
Bioclasts	18	5.6
	(325)	

Sample: CB.305

Date: 17.9.63

Time: 16.25 hours

Location: Decca Fix: Red E17.92
Green E35.22

Depth: 19'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
	Total	9	0	9

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	0	0	4	0	0	0	0	0	4
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	3	-	0	-	0	-	3
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 8
Living:- 0
Dead:- 8

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	259	78.5
Lithoclasts	55	16.7
Bioclasts	16	4.8
	(330)	

Sample: CB.306

Date: 17.9.63

Time: 17.00 hours

Location: Decca Fix: Red E17.00
Green E34.94

Depth: 22'6"

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	7	0	7
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	3	0	3
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	2	0	2
	100	2	0	2
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	-	-	-
	60	13	0	13
	100	15	0	15
	200	-	-	-
	Total	28	0	28

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	1	2	0	0	0	0	1	2
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	1	0	1	0	1	0	0	0	3
Pelecypods	0	1	1	0	0	1	0	0	1	2
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	6	-	3	-	1	-	0	-	10
Mussels	0	0	0	1	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	1	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 23
Living:- 3
Dead:- 20

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	264	86.5
Lithoclasts	27	8.9
Bioclasts	14	4.6
	(305)	

Sample: CB.307

Date: 17.9.63

Time: 17.23 hours

Location: Decca Fix: Red E17.19
Green E33.0

Depth: 34'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	13	2	11
	100	16	0	16
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
GUTTULINA lactea	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	5	0	5
	100	4	0	4
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
Total	30	-	-	-
	60	25	0	25
	100	48	0	48
	200	-	-	-
	Total	73	0	73

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	5	0	0	0	0	0	5
Gastropods	0	1	0	2	0	0	0	0	0	3
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	1	8	0	5	0	0	0	0	1	13
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	2	-	4	-	0	-	6
Mussels	0	1	0	2	0	0	0	0	0	3
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 31
Living:- 1
Dead:- 30

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	294	82.8
Lithoclasts	23	6.5
Bioclasts	38	10.7
	(355)	

Sample: CB.308

Date: 17.9.63

Time: 17.37 hours

Location: Decca Fix: Red E19.0
Green E31.68

Depth: 42'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	23	0	23
	100	4	0	4
	200	5	0	5
BULIMINA marginata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
CIBICIDES lobatulus	30	1	0	1
	60	-	-	-
	100	4	0	4
	200	5	0	5
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	6	0	6
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	43	0	43
	200	31	0	31
GLOBIGERINA hexagona	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
MARSIPELLA elongata	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	3	0	3
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspera	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA lata	30	-	-	-
	60	13	0	13
	100	3	0	3
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	2	0	2
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	4	0	4
	60	10	0	10
	100	1	0	1
	200	1	0	1
VERNEUILINA media	30	-	-	-
	60	5	0	5
	100	2	0	2
	200	2	0	2
Total	30	11	0	11
	60	75	1	74
	100	66	0	66
	200	47	0	47
	Total	199	1	198

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	5	5	28	0	0	0	0	5	33
Gastropods	0	5	0	4	0	1	0	0	0	10
Hydrozoans	0	0	0	7	0	5	0	0	0	12
Pelecypods	0	8	1	7	0	0	0	0	1	15
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	19	-	0	-	0	-	21
Mussels	0	1	0	0	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	2	-	1	-	0	-	0	-	3
Fish Bones	-	1	-	0	-	0	-	0	-	1

Total Faunal Content:- 102
Living:- 6
Dead:- 96

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	250	80.7
Lithoclasts	35	11.2
Bioclasts	25	8.1
	(310)	

Sample: CB.309

Date: 17.9.63

Time: 17.57 hours

Location: Decca Fix: Red E21.0
Green E30.73

Depth: 46'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	109	1	108
	100	12	0	12
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	4	0	4
CIBICIDES refulgens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	2	0	2
	60	53	0	53
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
EOEPONIDELLA mamilla	30	-	-	-
	60	1	0	1
	100	12	0	12
	200	4	0	4
MASSILINA secans	30	14	0	14
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	48	0	48
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	2	0	2
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	8	0	8
	60	92	2	90
	100	16	0	16
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	11	0	11
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
Total	30	28	0	28
	60	342	3	339
	100	64	0	64
	200	8	0	8
	Total	442	3	439

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	28	46	0	12	0	0	28	58
Gastropods	0	16	0	100	0	4	0	0	0	120
Hydrozoans	0	0	2	6	0	0	0	0	2	6
Pelecypods	0	46	2	48	0	8	0	0	2	102
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	26	-	8	-	0	-	36
Mussels	0	12	0	16	0	0	0	0	0	28
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	3	-	0	-	0	-	0	-	3
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 387
Living:- 34
Dead:- 353

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	325	81.2
Lithoclasts	37	9.3
Bioclasts	38	9.5
	(400)	

Sample: CB.310

Date: 17.9.63

Time: 18.26 hours

Location: Decca Fix: Red E22.95
Green E30

Depth: 42'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	18	0	18
	100	8	0	8
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Total	30	-	-	-
	60	38	0	38
	100	12	0	12
	200	-	-	-
	Total	50	0	50

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	1	0	15	0	4	0	0	0	20
Hydrozoans	0	0	0	1	0	0	0	0	0	1
Pelecypods	0	3	0	3	0	0	0	0	0	6
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echninoid spines	-	0	-	3	-	0	-	0	-	3
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 30
Living:- 0
Dead:- 30

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	230	73
Lithoclasts	74	23.5
Bioclasts	11	3.5
	(315)	

Sample: CB.311

Date: 18.9.63

Time: 11.54 hours

Location: Decca Fix: Red F1.00
Green D46.95

Depth: 59'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	7	0	7
	100	4	0	4
	200	-	-	-
ASTRONONION gallowayi	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	4	0	4
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	4	0	4
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	1	0	1
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	9	0	9
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	3	0	3
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	13	1	12
	100	9	2	7
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
Total	30	1	0	1
	60	30	1	29
	100	38	2	36
	200	8	0	8
	Total	77	3	74

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	2	1	2	0	0	1	4
Gastropods	0	11	1	1	0	1	0	0	1	13
Hydrozoans	0	0	0	1	0	0	0	0	0	1
Pelecypods	0	7	0	8	0	1	0	0	0	16
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	2	-	0	-	3
Mussels	0	1	0	0	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 50
Living:- 2
Dead:- 48

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	275	80.9
Lithoclasts	47	13.8
Bioclasts	18	5.3
	(340)	

Sample: CB.312

Date: 18.9.65

Time: 12.11 hours

Location: Decca Fix: Red F2.15
Green D47.0

Depth: 56'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	22	0	22
	100	7	0	7
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	24	0	24
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	6	0	6
	200	2	0	2
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	2	0	2
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	3	0	3
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	13	0	13
	100	5	0	5
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA cliarensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA seminulum	30	15	0	15
	60	61	0	61
	100	10	0	10
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	3	0	3
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	17	0	17
	60	136	0	136
	100	38	0	38
	200	2	0	2
	Total	193	0	193

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	4	10	0	3	0	0	4	13
Gastropods	0	46	0	49	0	8	0	0	0	103
Hydrozoans	0	0	0	12	0	2	0	0	0	14
Pelecypods	0	37	2	18	1	3	0	0	3	58
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	7	-	3	-	0	-	12
Mussels	0	5	0	8	0	0	0	0	0	13
Crustaceans (exl.Ostracods)	0	0	0	0	1	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	2	-	1	-	0	-	0	-	3

Total Faunal Content:- 224
Living:- 8
Dead:- 216

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	250	75.8
Lithoclasts	50	15.1
Bioclasts	30	9.1
	(330)	

Sample: CB.313

Date: 18.9.63

Time: 12.24 hours

Location: Decca Fix: Red F4.05
Green D45.16

Depth: 56'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	4	0	4
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	1	0	1
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	8	0	8
	100	8	0	8
	200	-	-	-
Total	30	1	0	1
	60	24	0	24
	100	16	0	16
	200	1	0	1
	Total	42	0	42

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	0	0	0	0	0	0	0
Gastropods	0	0	0	0	0	4	0	0	0	4
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	0	7	0	0	0	0	0	0	0	7
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	2	-	8	-	4	-	0	-	14
Mussels	0	0	0	0	0	0	0	0	0	0
Crustraceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 25
Living:- 0
Dead:- 25

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	300	78.9
Lithoclasts	60	15.8
Bioclasts	20	5.3
	(380)	

Sample: CB.314

Date: 18.9.63

Time: 12.36 hours

Location: Decca Fix: Red F5.8
Green D44.1

Depth: 56'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
AMMONIA beccarii	30	1	0	1
	60	16	0	16
	100	3	0	3
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspera	30	-	-	-
	60	4	0	4
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA seminulum	30	2	1	1
	60	35	1	34
	100	5	0	5
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
Total	30	3	1	2
	60	58	1	57
	100	15	0	15
	200	2	0	2
	Total	78	2	76

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	9	0	2	0	0	0	11
Gastropods	0	1	0	2	0	0	0	0	0	3
Hydrozoans	4	0	3	7	1	6	0	0	8	13
Pelecypods	0	2	0	1	0	0	0	0	0	3
Bryozoans	5	0	0	0	0	0	0	0	5	0
Echinoid spines	-	2	-	7	-	2	-	0	-	11
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	2	-	0	-	0	-	0	-	2

Total Faunal Content:- 56
Living:- 13
Dead:- 43

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	303	73.5
Lithoclasts	66	16.1
Bioclasts	43	10.4

Sample: CB.315

Date: 18.9.63

Time: 12.48 hours

Location: Decca Fix: Red F7.00
Green D43.4

Depth: 65'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var.filiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
AMMONIA beccarii	30	1	0	1
	60	32	0	32
	100	7	0	7
	200	-	-	-
BATHYSIPHON acuta	30	1	1	0
	60	1	1	0
	100	2	2	0
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	1	0	1
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	5	0	5
	100	2	0	2
	200	1	0	1
PATEORIS hauerinoides	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	5	0	5
	100	5	0	5
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	10	0	10
	100	10	1	9
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	4	0	4
	60	76	4	72
	100	27	1	26
	200	-	-	-
TECHNITELLA A3	30	1	1	0
	60	-	-	-
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	7	1	6
	100	19	0	19
	200	-	-	-
Total	30	7	2	5
	60	152	6	146
	100	75	4	71
	200	3	0	3
	Total	237	12	225

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	7	16	39	2	8	0	1	18	45
Gastropods	0	17	0	26	0	4	0	0	0	47
Hydrozoans	9	8	12	86	4	18	0	0	25	112
Pelecypods	3	18	3	25	0	0	0	0	6	43
Bryozoans	1	4	0	4	0	0	0	0	1	8
Echinoid spines	-	5	-	27	-	5	-	1	-	38
Mussels	0	1	0	0	0	0	0	0	0	1
Crustraceans (exl.Ostracods)	1	0	0	0	0	0	0	0	1	0
Starfish	1	0	0	0	0	0	0	0	1	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	5	-	0	-	0	-	0	-	5
Annelids	4	0	0	0	0	0	0	0	4	0
Fish Bones	-	0	-	0	-	1	-	0	-	1

Total Faunal Content:- 357
Living:- 56
Dead:- 301

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	216	70.6
Lithoclasts	50	16.3
Bioclasts	40	13.1
	(306)	

Sample: CB.316

Date: 18.9.63

Time: 13.20 hours

Location: Decca Fix: Red F8.55
Green D41.10

Depth: 148'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	486	2	484
	100	279	0	279
	200	32	0	32
BULIMINA gibba	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	16	0	16
	100	-	-	-
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
DISCORBIS malovensis var. nudiformis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
DISCORBIS williamsoni	30	-	-	-
	60	4	0	4
	100	1	0	1
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var. spinosum	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	3	0	3
	200	8	0	8
ELPHIDIUM excavatum	30	-	-	-
	60	7	0	7
	100	1	0	1
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	44	0	44
	100	180	0	180
	200	60	0	60
EOEPONIDELLA mamilla	30	-	-	-
	60	3	0	3
	100	2	0	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
GLOBULINA gibba	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	39	0	39
	100	30	0	30
	200	-	-	-
OOLINA lineato-punctata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
OOLINA patannae	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
OOLINA williamsoni	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PATELLINA corrugata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	2	0	2
	60	50	0	50
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
PYRGO williamsoni	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	14	0	14
	100	10	0	10
	200	-	-	-
QUINQUELOCULINA angularis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA cliarensis	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	-	-	-
	100	18	0	18
	200	-	-	-
QUINQUELOCULINA pulchella	30	1	0	1
	60	10	0	10
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	3	0	3
	60	631	0	631
	100	135	0	135
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
SPIROLOCULINA subimpressa	30	-	-	-
	60	7	0	7
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	10	0	10
	100	4	0	4
	200	-	-	-
Aberrent Form;	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	6	0	6
	60	1351	2	1349
	100	666	0	666
	200	100	0	100
	Total	2123	2	2121

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	64	456	0	351	0	32	64	839
Gastropods	0	0	0	28	0	23	0	0	0	51
Hydrozoans	0	2	1	70	0	64	0	0	1	136
Pelecypods	1	19	5	172	0	0	0	0	6	191
Bryozoans	0	3	0	1	0	0	0	0	0	4
Echinoid spines	-	4	-	88	-	60	-	6	-	158
Mussels	0	0	0	9	0	0	0	0	0	9
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	11	-	355	-	27	-	0	-	393
Annelids	1	0	0	0	0	0	0	0	1	0
Echinoid plates	-	0	-	3	-	0	-	0	-	3

Total Faunal Content:- 1856
Living:- 72
Dead:- 1784

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	274	77.2
Lithoclasts	25	7.0
Bioclasts	56	15.8
	(355)	

Sample: CB.317

Date: 18.9.63

Time: 13.35 hours

Location: Decca Fix: Red F8.94
Green D39.9

Depth: 106'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	396	0	396
	100	126	0	126
	200	49	0	49
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	6	0	6
	100	10	0	10
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	9	0	9
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	3	0	3
	100	8	0	8
	200	5	0	5

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	1	0	1
	60	12	0	12
	100	24	0	24
	200	32	0	32
ELPHIDIUM selseyense	30	-	-	-
	60	30	0	30
	100	216	0	216
	200	123	0	123
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
LABENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
LENTICULINA suborbicularis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MARSIPELLA elongata	30	10	5	5
	60	1	1	0
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	6	0	6
	100	1	0	1
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
PLANORBULINA mediterranensis	30	-	-	-
	60	51	0	51
	100	-	-	-
	200	-	-	-
PYRGO williamsoni	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	15	0	15
	100	16	0	16
	200	3	0	3
QUINQUELOCULINA bicornis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	1	0	1
	60	18	0	18
	100	16	0	16
	200	10	0	10
QUINQUELOCULINA pulchella	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	195	0	195
	100	120	0	120
	200	32	0	32
VERNEUILINA media	30	-	-	-
	60	3	0	3
	100	10	0	10
	200	1	0	1
Total	30	13	5	8
	60	759	1	758
	100	555	0	555
	200	255	0	255
	Total	1582	6	1576

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	27	141	16	42	3	15	46	198
Gastropods	0	1	0	9	0	10	0	0	0	20
Hydrozoans	0	2	6	3	0	0	0	0	6	5
Pelecypods	3	6	0	51	0	15	0	0	3	72
Bryozoans	0	1	0	0	0	0	0	0	0	1
Echinoid spines	-	21	-	159	-	60	-	15	-	255
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	6	0	3	0	0	0	0	0	9	0
Fish Bones	-	3	-	42	-	0	-	0	-	45
Echinoid plates	-	0	-	3	-	0	-	0	-	3

Total Faunal Content:- 663
Living:- 64
Dead:- 599

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	266	79.4
Lithoclasts	18	5.4
Bioclasts	51	15.2
	(335)	

Sample: CB.318

Date: 18.9.63

Time: 13.53 hours

Location: Decca Fix: Red F9.28
Green D38.08

Depth: 80'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
ACERVULINA inhaerens	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	8	0	8
	100	3	0	3
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	-	-	-
	100	7	0	7
	200	4	0	4
DISCORBIS bradyi	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
FISSURINA marginata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
MARSIPELLA elongata	30	10	10	0
	60	6	6	0
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	2	0	2
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	3	0	3
	100	4	0	4
	200	-	-	-
PSAMMOSPHAERA parva	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA bicornis	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQURLOCULINA lata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	2	0	2
	60	29	0	29
	100	6	0	6
	200	-	-	-
REOPHAX fusiformis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	1	0	1
SACCAMMINA cf.sphaerica	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A'	30	1	1	0
	60	-	-	-
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A2'	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A4'	30	-	-	-
	60	3 + frags	3 + frags	-
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A5'	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A6'	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
TECHNITELLA 'B'	30	1	1	0
	60	-	-	-
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TROCHAMMINA globigeriniformis	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
VERNEUILINA media	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
Total	30	15	12	3
	60	73	12	61
	100	26	0	26
	200	8	0	8
	Total	122	24	98

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	1	3	16	19	5	7	0	0	23	29
Gastropods	0	21	0	5	0	0	0	0	0	26
Hydrozoans	18	19	78	56	25	36	0	0	121	111
Pelecypods	0	1	1	3	4	0	0	0	5	4
Bryozoans	3	0	1	1	0	0	0	0	4	1
Echinoid spines	-	1	-	19	-	2	-	0	-	22
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	1	0	8	0	2	0	0	0	11	0
Starfish	2	0	0	0	0	0	0	0	2	0
Worm Tubes	-	2	-	0	-	0	-	0	-	2
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	-	8	-	5	-	0	-	0	-	13
Echinoid plates	-	2	-	0	-	0	-	0	-	2
Annelids	3	0	0	0	0	0	0	0	3	0

Total Faunal Content:- 379
Living:- 169
Dead:- 210

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	210	64.6
Lithoclasts	85	26.2
Bioclasts	30	9.2
	(325)	

Sample: CB.319

Date: 18.9.63

Time: 14.10 hours

Location: Decca Fix: Red F95
Green D36.6

Depth: 66'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	3	0	3
	60	20	0	20
	100	3	0	3
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	5	0	5
	100	-	-	-
	200	-	-	-
MASSILINA secans	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA subrotunda	30	-	-	-
	60	9	0	9
	100	6	0	6
	200	1	0	1
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	1	0	1
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	10	3	7
	60	18	3	15
	100	-	-	-
	200	-	-	-
TECHNITELLA 'A1'	30	1	1	0
	60	-	-	-
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	1	1	0
	60	2	0	2
	100	-2	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	1	0
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
Aberrent Form	30	-	-	-
	60	2	1	1
	100	-	-	-
	200	-	-	-
Total	30	17	5	12
	60	57	6	51
	100	11	0	11
	200	1	0	1
	Total	86	11	75

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	4	21	31	1	7	0	3	22	45
Gastropods	0	16	0	5	0	0	0	0	0	21
Hydrozoans	6	26	16	43	3	1	0	0	25	70
Pelecypods	0	10	0	1	0	0	0	0	0	11
Bryozoans	15	13	0	2	0	0	0	0	15	15
Echinoid spines	-	11	-	20	-	0	-	0	-	31
Mussels	0	52	0	0	0	0	0	0	0	52
Crustaceans (exl.Ostracods)	6	0	0	0	0	0	0	0	6	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	-	35	-	12	-	0	-	0	-	47

Total Faunal Content:- 364
Living:- 69
Dead:- 295

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	288	76.2
Lithoclasts	50	13.2
Bioclasts	40	10.6
	(378)	

Sample: CB.320

Date: 18.9.63

Time: 14.23 hours

Location: Decca Fix: Red F8.1
Green D37.4

Depth: 44'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	15	0	15
	100	19	0	19
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	4	0	4
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	3	0	3
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	-	-	-
	100	5	0	5
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	12	0	12
	100	6	0	6
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	3	0	3
	100	3	0	3
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	41	0	41
	100	44	0	44
	200	-	-	-
	Total	85	0	85

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	2	14	0	0	0	0	2	14
Gastropods	frags		0	7	0	2	0	0	0	9
Hydrozoans	0	0	2	13	0	9	0	0	2	22
Pelecypods	0	0	0	12	0	4	0	0	0	16
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	0	-	1	-	4	-	0	-	5
Mussels	0	3	0	8	0	3	0	0	0	14
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	0	-	2	-	0	-	0	-	2

Total Faunal Content:- 86
Living:- 4
Dead:- 82

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	280	76.7
Lithoclasts	59	16.2
Bioclasts	26	7.1
	(365)	

Sample: CB.321

Date: 18.9.63

Time: 14.46 hours

Location: Decca Fix: Red F7.02
Green D40.31

Depth: 60'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	49	0	49
	100	3	0	3
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	2	0	2
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
LAGENAMMINA luguncula	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLID 'A'	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
NONION pompilioides	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	6	0	6
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	53	0	53
	100	10	0	10
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	4	0	4
	100	1	0	1
	200	-	-	-
Total	30	1	0	1
	60	123	0	123
	100	21	0	21
	200	4	0	4
	Total	149	0	149

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	2	4	9	2	9	0	2	6	22
Gastropods	0	4	0	6	0	1	0	0	0	11
Hydrozoans	0	0	2	12	2	4	0	0	4	16
Pelecypods	0	3	0	8	0	0	0	0	0	11
Bryozoans	1	0	0	1	0	0	0	0	1	1
Echinoid spines	-	16	-	30	-	11	-	8	-	65
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	3	-	0	-	0	-	0	-	3

Total Faunal Content:- 140
Living:- 11
Dead:- 129

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	266	65.7
Lithoclasts	38	9.4
Bioclasts	101	24.9
	(405)	

Sample: CB.322

Date: 18.9.63

Time: 14.58 hours

Location: Decca Fix: Red F7.00
Green D40.77

Depth: 90'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	310	0	310
	100	72	0	72
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	28	0	28
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	8	0	8
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	12	0	12
	100	64	0	64
	200	32	0	32
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
PATELLINA corrugata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
PLANORBULINA mediterranensis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
PYRGO williamsoni	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	1	0	1
	60	6	0	6
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA pulchella	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	109	0	109
	100	8	0	8
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
Total	30	2	0	2
	60	489	0	489
	100	200	0	200
	200	56	0	56
	Total	747	0	747

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	7	90	0	64	8	0	15	154
Gastropods	0	1	0	14	0	0	0	0	0	15
Hydrozoans	0	0	1	0	0	0	0	0	1	0
Pelecypods	0	31	1	84	0	0	0	0	1	115
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	11	-	114	-	40	-	0	-	175
Mussels	0	1	0	4	0	0	0	0	0	5
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	2	-	5	-	0	-	0	-	7
Fish Bones	-	1	-	16	-	0	-	0	-	17

Total Faunal Content:- 506
Living:- 18
Dead:- 488

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	234	78
Lithoclasts	30	10
Bioclasts	36	12
	(300)	

Sample: C3.323

Date: 18.9.63

Time: 15.07 hours

Location: Decca Fix: Red F6.91
Green D42.34

Depth: 108'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	16	1	15
	100	40	0	40
	200	-	-	-
BOLIVINA spathulata	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	2	0	2
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	16	0	16
	200	-	-	-
CIBICIDES fletcheri	30	-	-	-
	60	10	0	10
	100	32	0	32
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM crispum	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	80	0	80
	200	8	0	8
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	4	0	4
	100	8	0	8
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
ELPHIDIUM selseyense	30	-	-	-
	60	19	0	19
	100	328	0	328
	200	-	-	-
EOEPONIDELLA mamilla	30	-	-	-
	60	1	0	1
	100	40	0	40
	200	-	-	-
LAGENA sulcata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
LAGENAMMINA laguncula	30	-	-	-
	60	3	0	3
	100	8	0	8
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MILIOLINELLA chuckchiensis	30	-	-	-
	60	2	0	2
	100	8	0	8
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	26	0	26
	100	16	0	16
	200	-	-	-
PATELLINA corrugata	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	18	0	18
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	6	0	6
	100	64	0	64
	200	-	-	-
SPIROLOCULINA subimpressa	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TEXTULARIA bocki	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	4	0	4
	100	16	0	16
	200	-	-	-
Aberrent Form	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	124	1	123
	100	666	0	666
	200	10	0	10
	Total	800	1	799

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	20	377	24	200	0	64	44	641
Gastropods	0	0	0	0	0	0	0	0	0	0
Hydrozoans	0	0	2	41	0	0	0	0	2	41
Pelecypods	0	5	6	78	16	0	0	0	22	83
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	33	-	16	-	8	-	58
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Fish Bones	-	0	-	1	-	0	-	0	-	1
Echinoid plates	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 898
Living:- 69
Dead:- 829

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	235	71.2
Lithoclasts	25	7.6
Bioclasts	70	21.2
	(330)	

Sample: CB.324

Date: 18.9.63

Time: 15.55 hours

Location: Decca Fix: Red F7.21
Green D42.7

Depth: 67'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	48	0	48
	100	4	0	4
	200	-	-	-
BATHYSIPHON acuta	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM selseyense	30	-	-	-
	60	1	0	1
	100	2	0	2
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	-	-	-
	100	2	0	2
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	21	1	20
	100	2	0	2
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	2	0	2
	60	44	2	42
	100	6	0	6
	200	1	0	1
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	-	-	-
Total	30	2	0	2
	60	123	4	119
	100	18	0	18
	200	3	0	3
	Total	146	4	142

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	0	9	0	2	0	1	0	12
Gastropods	0	3	0	8	0	0	0	1	0	12
Hydrozoans	0	0	5	13	1	20	0	0	6	33
Pelecypods	0	3	0	8	2	0	0	0	2	11
Bryozoans	0	0	0	1	0	0	0	0	0	1
Echinoid spines	-	3	-	19	-	0	-	0	-	22
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	2	-	1	-	0	-	0	-	3

Total Faunal Content:- 102
Living:- 8
Dead:- 94

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	258	74.8
Lithoclasts	43	12.6
Bioclasts	44	12.6
	(345)	

Sample: CB.325

Date: 18.9.63

Time: 16.20 hours

Location: Decca Fix: Red F5.02
Green D43.71

Depth: 34'6"

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES subagglutinans	30	-	-	-
	60	-	-	-
	100	1	1	0
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	5	3	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA frigida	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA seminulum	30	-	-	-
	60	11	2	9
	100	2	1	1
	200	-	-	-
TRILOCULINA angulata	30	-	-	-
	60	1	1	0
	100	1	1	0
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
Total	30	-	-	-
	60	23	6	17
	100	5	3	2
	200	-	-	-
	Total	28	9	19

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	3	0	1	2	1	0	5	2
Gastropods	0	2	1	3	0	0	0	1	1	6
Hydrozoans	1	1	5	5	0	5	3	0	9	11
Pelecypods	0	0	0	0	0	0	0	0	0	0
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	2	-	2	-	0	-	5
Mussels	0	7	0	0	0	0	0	0	0	7
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0

Total Faunal Content:- 46
Living:- 15
Dead:- 31

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	261	76.8
Lithoclasts	49	14.4
Bioclasts	30	8.8
	(340)	

Sample: CB.326

Date: 18.9.63

Time: 16.30 hours

Location: Decca Fix: Red F5.29
Green D43.12

Depth: 102'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	8	0	8
	100	32	0	32
	200	8	0	8
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	24	0	24
CIBICIDES fletcheri	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	16	0	16
DISCORBIS malovensis var. nudiformis	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	2	0	2
	100	88	0	88
	200	24	0	24

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM excavatum	30	-	-	-
	60	1	0	1
	100	16	0	16
	200	8	0	8
ELPHIDIUM macellum	30	-	-	-
	60	8	0	8
	100	24	0	24
	200	-	-	-
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	56	0	56
	200	8	0	8
ELPHIDIUM selseyense	30	-	-	-
	60	11	0	11
	100	184	0	184
	200	48	0	48
EOEPONIDELLA mamilla	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	-	-	-
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
MILIOLINELLA subrotunda	30	-	-	-
	60	10	0	10
	100	64	0	64
	200	-	-	-
OOLINA laevigata	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
OOLINA williamsoni	30	-	-	-
	60	1	0	1
	100	8	0	8
	200	-	-	-
PATELLINA corrugata	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	6	0	6
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	-	-	-
	60	7	0	7
	100	24	0	24
	200	24	0	24
VERNEUILINA media	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	8	0	8
Total	30	-	-	-
	60	64	0	64
	100	392	0	392
	200	184	0	184
	Total	640	0	640

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	0	8	130	48	368	0	80	56	578
Gastropods	0	0	0	1	0	0	0	0	0	1
Hydrozoans	0	0	0	5	0	0	0	0	0	5
Pelecypods	0	2	0	16	0	8	0	0	0	26
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	6	-	108	-	80	-	24	-	218
Mussels	0	0	0	1	0	0	0	0	0	1
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	1	0	0	0	0	0	0	0	1	0
Fish Bones	-	0	-	2	-	0	-	0	-	2
Squid tentacle(?)										

Total Faunal Content:- 888
Living:- 57
Dead:- 831

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	230	67.7
Lithoclasts	12	3.5
Bioclasts	98	28.8
	(340)	

Sample: CB.327

Date: 18.9.63

Time: 16.49 hours

Location: Decca Fix: Red F5.47
Green D41.64

Depth: 65'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMOBACULITES agglutinans var. filiformis	30	-	-	-
	60	2	0	2
	100	4	0	4
	200	-	-	-
AMMONIA beccarii	30	-	-	-
	60	15	0	15
	100	48	1	47
	200	8	0	8
BULIMINA elongata	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	8	0	8
CIBICIDES fletcheri	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	1	0	1
	100	4	0	4
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	-	-	-
	100	24	0	24
	200	8	0	8
ELPHIDIUM excavatum	30	-	-	-
	60	-	-	-
	100	8	0	8
	200	8	0	8
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	8	0	8
ELPHIDIUM magellanicum	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	8	0	8
ELPHIDIUM selseyense	30	-	-	-
	60	8	0	8
	100	123	0	123
	200	8	0	8
LAGENA sulcata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
LAGENAMMINA laguncula	30	-	-	-
	60	-	-	-
	100	12	0	12
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	4	0	4
	200	8	0	8
MILIOLINELLA subrotunda	30	-	-	-
	60	7	0	7
	100	4	0	4
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	21	0	21
	100	40	0	40
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
VERNEUILINA media	30	-	-	-
	60	19	0	19
	100	32	0	32
	200	-	-	-
Total	30	2	0	2
	60	81	0	81
	100	220	1	221
	200	72	0	72
	Total	375	1	374

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	1	9	41	12	64	0	16	21	122
Gastropods	0	6	0	11	0	8	0	0	0	25
Hydrozoans	0	0	3	2	0	0	0	0	3	2
Pelecypods	2	12	3	25	8	0	0	0	13	37
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	1	-	42	-	48	-	8	-	99
Mussels	0	2	0	2	0	0	0	0	0	4
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	0	0	0	0	0	0	2	0
Fish Bones	-	0	-	10	-	0	-	0	-	10
Echinoid plates	-	0	-	1	-	0	-	0	-	1

Total Faunal Content:- 340
Living:- 39
Dead:- 301

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	251	81.0
Lithoclasts	33	10.6
Bioclasts	26	8.4
	(310)	

Sample: CB.328

Date: 18.9.63

Time: 17.15 hours

Location: Decca Fix: Red F5.28
Green D40.0

Depth: 74'6"

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	61	0	61
	100	28	0	28
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
CRIBROSTOMOIDES jeffreysi	30	-	-	-
	60	-	-	-
	100	3	0	3
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	3	0	3
	60	10	0	10
	100	-	-	-
	200	-	-	-
ELPHIDIUM discoidale	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM macellum	30	-	-	-
	60	-	-	-
	100	-	-	-
	200	1	0	1
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	40	0	40
	200	12	0	12
MASSILINA secans	30	5	0	5
	60	-	-	-
	100	-?	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA oblonga	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	11	0	11
	100	1	0	1
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA agglutinata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA aspera	30	-	-	-
	60	9	1	8
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA angularis	30	1	0	1
	60	-	-	-
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA cliarensis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA inconstans	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	5	0	5
	100	6	0	6
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	2	0	2
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	4	0	4
	60	49	0	49
	100	32	0	32
	200	4	0	4

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA dubia	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	1	0	1
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	12	0	12
	100	4	0	4
	200	-	-	-
Total	30	15	0	15
	60	186	1	185
	100	116	0	116
	200	17	0	17
	Total	334	1	333

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	3	1	35	63	0	42	0	8	38	114
Gastropods	0	20	0	27	0	4	0	0	0	51
Hydrozoans	0	0	0	12	0	0	0	0	0	12
Pelecypods	1	41	2	29	0	0	0	0	3	70
Bryozoans	0	1	0	0	0	0	0	0	0	1
Echinoid spines	-	26	-	84	-	8	-	0	-	118
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	1	0	0	0	0	0	1	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	1	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0
Annelids	2	0	1	0	0	0	0	0	3	0
Fish Bones	-	3	-	1	-	0	-	0	-	4
Echinoid plates	-	9	-	2	-	0	-	0	-	11
Fish teeth	-	1	-	0	-	0	-	0	-	1

Total Faunal Content:- 428
Living:- 45
Dead:- 383

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	240	76.2
Lithoclasts	47	14.9
Bioclasts	28	8.9
	(315)	

Sample: CB.329

Date: 18.9.63

Time: 17.27 hours

Location: Decca Fix: Red F5.67
Green D39.04

Depth: 55'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	-	-	-
	60	8	0	8
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulangulata	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	17	1	16
	60	7	0	7
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
Total	30	18	1	17
	60	23	0	23
	100	1	0	1
	200	-	-	-
	Total	42	1	41

GENERAL FAUNA

Grade	x 30 L	x 30 D	x 60 L	x 60 D	x100 L	x100 D	x200 L	x200 D	Total L	Total D
Fauna										
Ostracods	0	0	0	1	1	0	1	0	2	1
Gastropods	0	194	0	13	0	0	0	0	0	207
Hydrozoans	0	0	0	0	0	0	0	0	0	0
Pelecypods	4	39	0	2	0	0	0	0	4	41
Bryozoans	0	0	0	0	0	0	0	0	0	0
Echinoid spines	-	52	-	30	-	0	-	0	-	82
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	1	-	0	-	0	-	0	-	1
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	34	-	0	-	0	-	0	-	34
Annelids	0	0	0	0	1	0	0	0	1	0

Total Faunal Content:- 373
Living:- 7
Dead:- 366

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	46	21.7
Lithoclasts	27	12.7
Bioclasts	139	65.6
	(212)	

Sample: CB.330

Date: 18.9.63

Time: 17.40 hours

Location: Decca Fix: Red F.5.89
Green D38.77

Depth: 65'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	20	0	20
	100	3	0	3
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
CIBICIDES refulgens	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
DISCORBIS bradyi	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	1	0	1
	100	1	0	1
	200	1	0	1

Specimen	Grade	Total Number	Living	Dead
ELPHIDIUM selseyense	30	-	-	-
	60	-	-	-
	100	5	0	5
	200	4	0	4
GLOBULINA gibba	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
HAPLOPHRAGMOIDES canariensis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
MASSILINA secans	30	10	0	10
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	-	-	-
	60	4	0	4
	100	4	0	4
	200	-	-	-
PATEORIS hauerinoides	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
PLANORBULINA mediterranensis	30	-	-	-
	60	3	0	3
	100	1	0	1
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	4	0	4
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
QUINQUELOCULINA bicornis	30	2	0	2
	60	3	0	3
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA cf.granulo-costata	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA lata	30	1	0	1
	60	1	0	1
	100	4	0	4
	200	-	-	-
QUINQUELOCULINA pulchella	30	3	0	3
	60	5	0	5
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	26	0	26
	60	40	0	40
	100	1	0	1
	200	-	-	-
TECHNITELLA	30	frags	frags	frags
	60	frags	frags	frags
	100	-	-	-
	200	-	-	-
TRILOCULINA angulata	30	1	0	1
	60	4	0	4
	100	1	0	1
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	1	0	1
	100	3	0	3
	200	-	-	-
Total	30	43	0	43
	60	93	0	93
	100	26	0	26
	200	5	0	5
	Total	167	0	167

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	0	1	21	42	0	56	0	20	21	119
Gastropods	0	46	0	22	0	6	0	0	0	74
Hydrozoans	6	0	19	21	0	41	0	8	25	70
Pelecypods	0	13	0	1	0	0	0	0	0	14
Bryozoans	2	0	0	4	0	0	0	0	2	4
Echinoid spines	-	28	-	104	-	37	-	0	-	169
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	1	0	0	0	0	0	1
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	2	-	0	-	0	-	0	-	2
Echinoids	0	0	0	0	0	0	0	0	0	0
Echinoid plates	-	16	-	3	-	0	-	0	-	19
Fish Bones	-	2	-	0	-	0	-	0	-	2

Total Faunal Content:- 522
Living:- 48
Dead:- 474

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	127	43.1
Lithoclasts	49	16.6
Bioclasts	119	40.3
	(295)	

Sample: CB.331

Date: 18.9.63

Time: 17.52 hours

Location: Decca Fix: Red F6.18
Green D37.73

Depth: 26'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	1	0	1
	60	36	0	36
	100	6	0	6
	200	-	-	-
BULIMINA gibba	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-
CIBICIDES lobatulus	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum	30	9	3	6
	60	13	3	10
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	4	2	2
	60	67	31	36
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
MASSILINA secans	30	3	1	2
	60	-	-	-
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
MILIOLINELLA subrotunda	30	1	1	0
	60	3	2	1
	100	-	-	-
	200	-	-	-
PSAMMOSPHAERA parva	30	-	-	-
	60	-	-	-
	100	1	1	0
	200	-	-	-
QUINQUELOCULINA aspera	30	-	-	-
	60	31	4	27
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA bicornis	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA pulchella	30	-	-	-
	60	1	0	1
	100	-	-	-
	200	-	-	-
QUINQUELOCULINA seminulum	30	1	0	1
	60	3	1	2
	100	-	-	-
	200	-	-	-
SACCAMMINA cf.sphaerica	30	-	-	-
	60	1	1	0
	100	-	-	-
	200	-	-	-

Specimen	Grade	Total Number	Living	Dead
TRILOCULINA angulata	30	2	1	1
	60	4	2	2
	100	-	-	-
	200	-	-	-
TRILOCULINA trigonula	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
VERNEUILINA media	30	-	-	-
	60	5	0	5
	100	1	0	1
	200	-	-	-
Aberrent Form	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
Total	30	21	8	13
	60	176	44	132
	100	9	1	8
	200	-	-	-
	Total	206	53	153

GENERAL FAUNA

Grade	x 30		x 60		x100		x200		Total	
	L	D	L	D	L	D	L	D	L	D
Fauna										
Ostracods	6	16	66	136	2	14	0	6	74	172
Gastropods	0	21	0	26	0	0	0	0	0	47
Hydrozoans	21	7	22	30	0	4	0	0	43	41
Pelecypods	0	13	0	4	0	0	0	0	0	17
Bryozoans	17	0	2	0	0	0	0	0	19	0
Echinoid spines	-	0	-	12	-	0	-	2	-	14
Mussels	0	0	0	0	0	0	0	0	0	0
Crustaceans (exl.Ostracods)	0	0	0	0	0	0	0	0	0	0
Starfish	0	0	0	0	0	0	0	0	0	0
Worm Tubes	-	0	-	0	-	0	-	0	-	0
Echinoids	0	0	0	0	0	0	0	0	0	0
Crustacean Appendages	-	0	-	1	-	0	-	0	-	1
Annelids	1	0	0	0	0	0	0	0	1	0

Total Faunal Content:- 429
Living:- 137
Dead:- 292

PETROLOGICAL ANALYSIS

Grain	Total	Percentage
Quartz	311	78.7
Lithoclasts	41	10.4
Bioclasts	43	10.9

Sample: CB.332

Date: 19.9.63

Time: 16.58 hours

Location: Decca Fix: Red F6.78
Green D37.9

Depth: 44'

Instrument: Vacuum Grab

FORAMINIFERAL COUNTS

Specimen	Grade	Total Number	Living	Dead
AMMONIA beccarii	30	-	-	-
	60	18	0	18
	100	3	0	3
	200	-	-	-
CIBICIDES fletcheri	-30	-	-	-
	60	-	-	-
	100	1	1	0
	200	-	-	-
ELPHIDIUM crispum	30	3	0	3
	60	10	0	10
	100	-	-	-
	200	-	-	-
ELPHIDIUM crispum var.spinosum	30	-	-	-
	60	3	0	3
	100	-	-	-
	200	-	-	-
ELPHIDIUM macellum	30	-	-	-
	60	2	0	2
	100	-	-	-
	200	-	-	-
MILIOLINELLA chuckchiensis	30	-	-	-
	60	-	-	-
	100	1	0	1
	200	-	-	-