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Nature Conservancy Council
from the
Field Studies Council
Oil Pollution Research Unit
Orielson Field Centre
Pembroke
Dyfed

SOUTH-WEST BRITAIN SUBLITTORAL SURVEY

Field survey of sublittoral habitats and species in
the Upper Bristol Channel

(Mid-Glamorgan, South Glamorgan and North Somerset)

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and

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SURVEY TEAM

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PREFACE

THE SOUTH-WEST BRITAIN SUBLITTORAL SURVEY

The South-west Britain Sublittoral Survey is a three-year project being carried out by the Field Studies Council for the Nature Conservancy Council.

The area included in the survey is the old county of Pembrokeshire, the south coast of Wales, and the coasts of Avon, Somerset, Devon, Cornwall and Dorset. The work consists of an initial review of the scientific literature, together with discussions with other scientists and a programme of field surveys. The field surveys have the following main objectives.

- 1) To carry out a broad survey of the coasts of Pembrokeshire, South Wales, North Devon and North Cornwall. Within each study area, to select sites as representative as possible of the categories in the classification of ecosystems arrived at as a part of the initial literature review.
- 2) To use the information obtained in field surveys to test and refine the classification of sublittoral ecosystems based on the initial literature review.
- 3) To carry out more intensive surveys in areas of recognised or probable scientific interest in order to produce detailed information and maps of the habitats and major communities/species represented, the purpose of this work being to provide the information necessary on which to base an overall management plan for the areas concerned.
- 4) To test various methods for quick survey of a site and to make recommendations on the most appropriate methods to meet the objectives of the present work.
- 5) To start, in a preliminary way, to test various criteria for the selection of areas of highest conservation interest and to produce a list of the 'key sites' for south-west Britain.

SUMMARY

1. This survey was carried out in order to describe the range of sublittoral habitats and the communities of plants and animals present adjacent to the coast of the upper Bristol Channel.
2. A total of sixteen sites were surveyed by diving within 43 km of coastline during one day in June 1978 and four days in July 1979. Sites were selected by inspection of maps and charts to include locations exposed to different environmental conditions. Check lists were used throughout survey and recording to ensure the collection of comparable data. The results are presented as lists and descriptions of the species present in the main communities observed and as an annotated species list. Photographs illustrating the main communities and species were taken and catalogued separately.
3. All of the sites, except Gore Point on the west side of Porlock Bay, included a very small number of species of algae and animals compared to open coast areas of south-west Britain. Algae were only recorded above Chart Datum level. Animal communities were similar from site to site with stable rock surfaces at most sites dominated by Sabellaria spp (mostly S. alveolata) and at some sites by Dendrodoa grossularia, Mytilus edulis or Polydora ciliata. A small variety of sponges, hydrozoans and bryozoans were also present in large amounts. Mobile or scoured substrata were characterised by Balanus crenatus and Pomatoceros triquetèr.
4. A comparison of the number of conspicuous species observed along the South Wales coast at sites from Milford Haven to the furthest east studied during the present survey, revealed a gradual reduction in the number of species from west to east along the coast but with a sharp reduction across Swansea Bay leading to the presence of highly impoverished communities along the coast described here. A comparison of the number of species present at each site along the north Somerset coast revealed a similar reduction in species numbers from west to east though no sharp boundary zone.
5. Compared with areas to the west, the numbers of species of algae, sponges, hydroids, erect bryozoa, echinoderms and ascidians were particularly reduced.
6. Many of the changes which occurred in the composition of animal communities from the open coast to the upper Bristol Channel were similar to those which occur from open coast to enclosed marine areas elsewhere as a result of increasing stress and, whilst poor light penetration is clearly the main factor responsible for the reduced variety and abundance of algae, no single factor is suggested as responsible for the impoverishment of animal communities.
7. Along the majority of the coast studied, the identification of depth zones characterised by the algae present was not possible. It is suggested that the circalittoral zone extended above Chart Datum level and that the upward extent of the sublittoral zone, based on the presence of sublittoral algae, extended to about 2.5 m above Chart Datum compared to about 1 m on the open coast.
8. The presence of extensive areas of sand and of sand in suspension during strong tidal flow is considered here to be important in the development of large colonies of Sabellaria alveolata. In turn, the dominance of Sabellaria and the action of the colonies in binding loose substrata together, are important to the settlement of other sessile species.
9. The lists of conspicuous species obtained during the present survey are similar to lists of species collected in the 1940's by remote sampling for the main organisms and, together with studies carried out in recent years, emphasise the importance of Sabellaria alveolata as a dominant species.
10. Future studies of coastal benthos in the Upper Bristol Channel can be effectively carried out using remote sampling methods offshore. Observations on the shore at extreme low spring tides will provide data on sublittoral communities on bedrock and other immobile substrata but diving will be required wherever immobile substrata are present below Chart Datum level.

SURVEY REPORT

1. INTRODUCTION

1.1. Aims of the survey

The survey was carried out in order to describe the range of sublittoral habitats and the communities of plants and animals present adjacent to the coast of the Upper Bristol Channel as far east as could be investigated using diving in conditions of good (greater than 0.5 m) underwater visibility.

1.2. Location and area

The areas studied are shown in Fig. 1. On the north side of the Bristol Channel, sites were surveyed from the east side of Swansea Bay to Llantwit Major. On the south side, sites were surveyed at Porlock Bay, Minehead and Watchet. Sites were widely separated along 43 km of coastline.

1.3. Status, ownership and management

Four Sites of Special Scientific Interest have been notified along the part of the South Wales coast included in the present survey. Together, they form an almost continuous area from Merthyr Mawr Warren east of Porthcawl to the Monk Nash coast north of North Point and include foreshore sand, shingle, rock and salt-marsh. Along the part of the North Somerset coast studied, the coast from Blue Anchor to Lilstock, extending over about 4 km of coastline to the west and 8 km to the east of Watchet, is a grade 2 site established for its geological interest, with foreshore sand, shingle and rock represented. The coastline from the eastern border of Porlock Bay to about 1 km west of Greenaleigh Point is National Trust property. The remaining coastline adjacent to the areas studied is, as far as is known, in private ownership.

1.4. Review of previous marine studies

The intertidal fauna of the Bristol Channel along the coastlines studied is now well-recorded (Boyden *et al.*, 1977). In the sublittoral, Purchon (1947) sampled the seabed by trawls and dredges on the northern shores near Cardiff whilst, in recent years, the Institute for Marine Environmental Research (I.M.E.R.) have carried out extensive surveys of the sublittoral fauna (Warwick and Davies, 1977).

Haderlie and Clark (1959) suggest three main faunistic zones in the Bristol Channel based on the intertidal fauna. The majority of sites studied during the present survey fall into Zone 1, the outermost region, whilst the sites surveyed off Watchet are within Zone 2, the middle region. Boyden *et al.* (1977) describe the area we have studied here as the 'Lower Severn Estuary'. Their western boundary for the Severn Estuary is based on the locations at which kelp first appears at Kenfig (5 km north-west of Porthcawl) on the Welsh side and Porlock on the English side of the Channel.

2. ENVIRONMENTAL CONDITIONS

2.1. Bathymetry

Fig. 1 includes depth contours. The seabed off most of the coastline studied formed a gradual slope with depths of 10 m rarely exceeded less than 500 m offshore of low water level. Steeper slopes were present adjacent to headlands and offshore rocks but nowhere were nearshore cliffs or very steep slopes indicated by depth contours. The area surveyed off Watchet was a very gradual slope with the 5 m depth contour 1 km offshore.

2.2. Geology

Along the South Wales coast, the region of Porthcawl (including Tusker Rock) is of Carboniferous limestone, whilst the area from Nash Point to Llantwit Major is of Blue Lias (alternating bands of limestone and shale). These liassic rocks form extensive flat platforms on the shore and the cliffs are rapidly undercut by wave action leading to a large supply of boulders (George, 1970).

Along the English coast, rock in the region of Porlock Bay and as far east as Minehead is of Old Red Sandstone. However, Gore Point is composed of boulders. In the area of Watchet, rock is of White Lias (laminated shales and limestones) (Edmonds et al, 1975).

2.3. Seabed characteristics

Admiralty Charts 1160 and 1161 indicate that much of the seabed along the coast studied is of sand or shelly sand with some gravel and mud present. In several locations, rock is indicated as present.

2.4. Temperature and salinity

The Conseil Permanent International pour l'Exploration de la Mer (C.P.I.E.M.) (1962) record surface temperatures in the area studied as varying between 6.5°C to greater than 16°C. C.P.I.E.M. (1962), Hamilton (1973) and I.M.E.R. annual reports indicate surface salinity as ranging from 30‰ to 32‰ through the year.

2.5. Suspended sediment

Levels of suspended sediment are very high for almost all of the year along the coast studied. During the present survey, underwater horizontal visibility was similar at all sites except the area off Watchet where extremely poor visibility suggested different water characteristics.

2.6. Exposure to wave action

All of the coastline studied is open to strong wave action. The south-facing coastline of Wales is more exposed to prevailing winds and therefore wave action than the north-facing coast of Somerset. However, both coasts are sheltered from oceanic swell by the buffering effects of the shallow seabed to the west. In the terminology of Hiscock (1976), most of the seabed studies is 'Exposed' to wave action on the Welsh coast and 'Semi-exposed' on the Somerset coast.

2.7. Exposure to tidal streams

Admiralty (1960) record tidal streams as running at about 3 knots at spring tides along the South Wales coast and 3 knots offshore, and 4 to 5 knots nearshore along the North Somerset coast. Increase in the rate of tidal flow doubtless occurs in the region of headlands.

2.8. Tidal range

Tidal range in the Bristol Channel is very large and in the area studied, ranged from 9.9 m at Porthcawl to 11.4 m at Watchet at high water of spring tides (Admiralty, 1978).

2.9. Residual water flow and water masses

Residual water flow in the outer Channel (defined as east of a line between Mumbles and Foreland Point) is to the east along the English coast and to the west along the South Wales coast (Hamilton, 1973). This anti-clockwise circulation inhibits (according to Hamilton, 1973) mixing of water from the outer Channel and inner Channel.

2.10. Pollution

Concentrations of heavy metals in sediments, water and organisms are high along the coastline studied. (See, for instance, Butterworth et al, 1972; Nickless et al, 1972; Abdullah and Royle, 1974.) However, the concentrations are diffuse and there are no major sources of sewage or industrial pollution adjacent to the sites studied.

3. METHODS

3.1. Survey

The 1979 survey was carried out by three zoologists and one botanist. In 1978, Porlock Bay was surveyed by a team including two zoologists, two biologists and two assistants. All survey work was undertaken from inflatable boats. The time of the survey was chosen to coincide with the period of year when strong winds were unlikely and at the end of a neap tide period during the smallest tides of the year. This timing was necessary to give the team a chance of working in reasonable underwater visibility near high water slack tide and in weak tidal streams. Sites were selected from maps and charts to ensure that as wide a range of habitats as possible was surveyed. Site positions were plotted according to shore topographical features for nearshore locations and by the use of sighting compasses for offshore areas. The species searched for and consistently recorded were those included in check lists (Appendices I and II). Habitat information was recorded on edge-punched cards (Appendix III). Field records were made on laminated plastic writing boats. Records of the abundance of species were made according to the scales shown in Appendix IV. Species which could not be recognised with certainty in the field were usually collected and subsequently identified. Collections of smaller boulders and stones were also made to provide records of small species.

3.2. Photography

Photographs of the different habitat types, communities and species were taken with a Nikonos underwater camera, electronic flash and, where required, a supplementary lens or extension tube for close-up photography.

3.3. Interpretation of results

Sites were numbered sequentially from west to east along the South Wales coast and from east to west along the North Somerset coast. Descriptions of habitats were prepared from the edge-punched cards and the species check lists. Records of species identified from sample material were added to the check lists for each site. A summary of the distribution, abundance and habitat preference of each separate species was prepared. The communities present at separate sites which were considered to represent separate ecosystems present along the coast were illustrated and summarised in tabular form. All records were inspected to provide an account of both the general features of sublittoral ecosystems along the coast of the Upper Bristol Channel and special features of the area compared to other locations studied during the South-West Britain Sublittoral Survey.

4. RESULTS

4.1. Introduction

The 16 sites studied are shown in Fig. 1 and listed, with a note of the main site features, in Table 1. The results of the survey are summarised in Appendix V as an annotated species list and described below. A supplement to this report including all data sheets and copies of edge-punched cards is held by the Nature Conservancy Council and by the Oil Pollution Research Unit. Photographs have been deposited with the NCC and copies of some retained by OPRU.

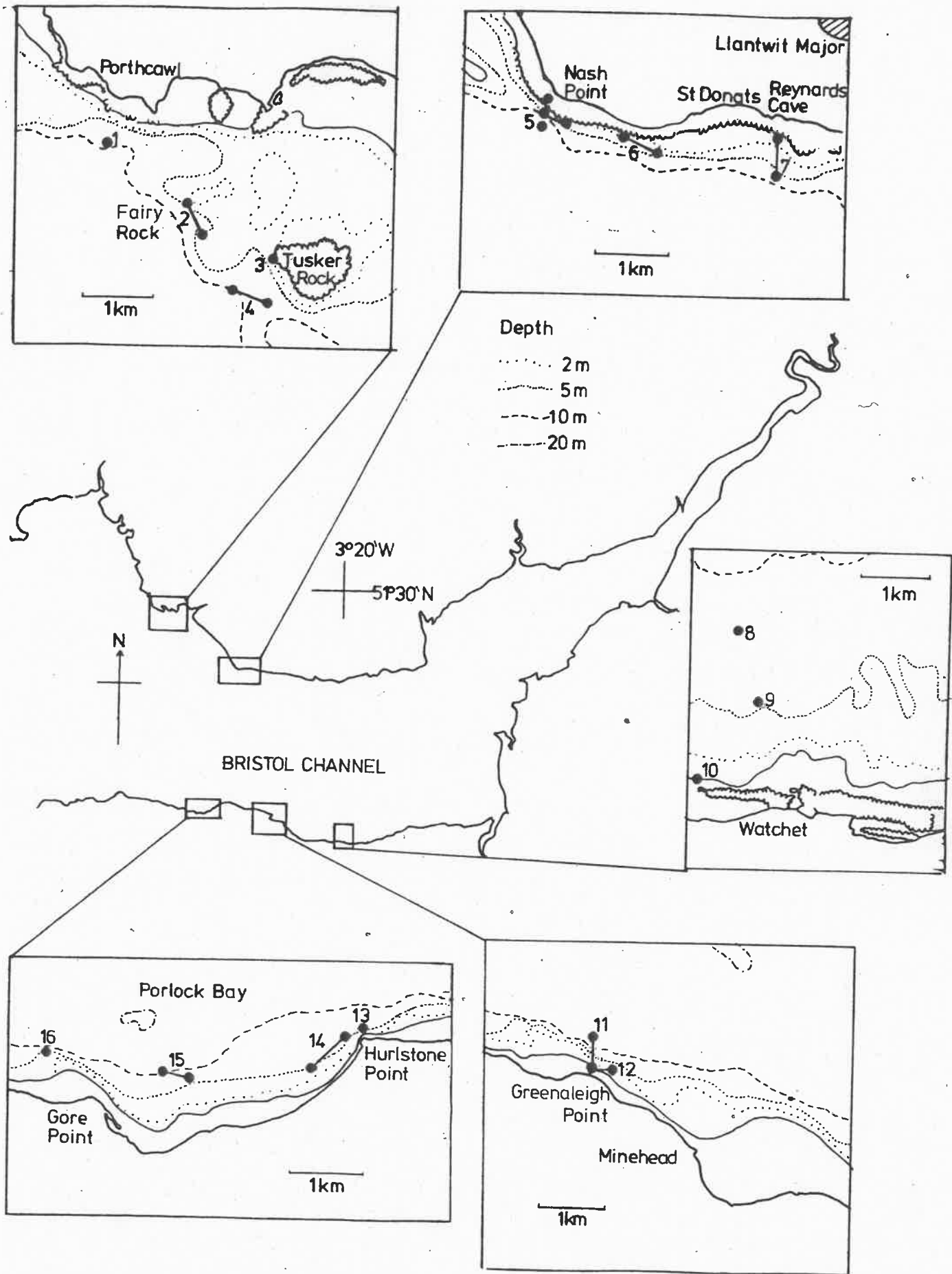


Fig. 1. Location of the survey areas, bathymetry and the location of sites investigated. Site numbers keyed in Table 1.

TABLE 1

Site number, name, location and site features.
 Heights and depths are relative to Chart Datum.
 Heights are preceded by a '+'.
 Depths are preceded by a '-'.

Site No.	Site name, depths surveyed and work carried out	Ordnance Survey Grid Reference	Site features
1	Off Porthcawl (3 m. Animals surveyed, no algae.)	21 812762	Level seabed of clean gravel mixed with sand and widely scattered stones offshore. Clean sand nearshore. Very few epifauna species.
2	Fairy Rock (1.5 to 4.5 m. Animals surveyed, no algae.)	21 828751	A mainly level seabed of limestone bedrock with patches of sand and some small boulders. Some vertical surfaces present. Scoured bare rock adjacent to sand in places. Rocks dominated by <u>Sabellaria</u> which also consolidated some areas of pebbles. Seabed to west of rocks predominantly of sand.
3	W. Tusker Rock (1 to 4 m. Animals surveyed, no algae.)	21 834743	A level seabed of mixed substrata including bedrock, small boulders, pebbles and some patches of mud. <u>Sabellaria</u> dominant on stable rock with <u>Halichondria</u> covering some boulders.
4	West of Tusker Bay (6 to 7 m. Animals surveyed, no algae.)	21 835737	Level seabed of stones with some small boulders and small patches of sand. Pebbles characterised by <u>Balanus crenatus</u> and <u>Sabellaria</u> with <u>Halichondria</u> covering most boulders.
5	Nash Point (+3 to 8 m. Algae and animals surveyed.)	21 915679	Several hundred metres offshore at 8 m, seabed of bare rippled sand. At 4 to 5 m nearshore off Nash Point, seabed of boulders or sandy limestone platform dominated by small <u>Mytilus edulis</u> with large numbers of <u>Tealia felina</u> present. At 3 m, west of Nash Point, seabed of limestone platform, with some short cliffs and a wide variety of species. At 0 m and shallower, limestone platform present with some patches of small <u>Mytilus</u> and a few other species present. Algae and littoral species present shallower than +2.5 m. At +3 m some bedrock dominated by <u>Sabellaria</u> and by <u>Cladostephus spongiosus</u> at Nash Point.

TABLE 1 (cont.)

Site No.	Site name, depths surveyed and work carried out	Ordnance Survey Grid Reference	Site features
6	St. Donats Point and West (+1 to 3 m. Animals surveyed and algae collected.)	21 932675 to 927675	Limestone platform with short cliffs and some patches of large and small boulders, clean sand and bare rock. Raised areas of platform generally dominated by tunicates whilst rock below and beyond cliffs dominated by <u>Sabellaria</u> . Some bare rock colonised by scattered <u>Dendrodoa grossularia</u> and <u>Balanus crenatus</u> . Algae recorded at +1 m.
7	Reynards Cave (Tresilian) (+6 to 4 m. Algae and animals surveyed.)	21 948676 to 948673	Limestone platform present from +6 to +1 m with overlying sand deeper than +2 m. Large boulders present at +1 m followed by bedrock at +0.7 m. At 0.5 m boulders in variable amounts. Clay present below thin cover of rippled sand at 2 m. Littoral species present at +5 m. Between +4 and +1 m, <u>Polydora</u> abundant on rocks with widely scattered individuals of a small variety of other species of algae and animals. Boulders at +1 m and deeper included a wide variety (for the area) of animal species. Majority of rocks deeper than 0.5 m covered in <u>Sabellaria</u> but with large patches of <u>Polydora</u> and <u>Dendrodoa grossularia</u> .
8 & 9	Off Warren Bay, Watchet (5 and 7 m. Animals surveyed, no algae.)	31 063455 and 057458	Predominantly a mud bottom with stones 5 to 10 cm diameter visible on ca 30% of seabed inshore and ca 10% of seabed offshore. Mud found to be a veneer over smooth rounded gravel and pebbles 2 to 4 cm diameter offshore. Large stones colonised by <u>Sabellaria alveolata</u> and small stones by a few small colonies of <u>Electra pilosa</u> .
10	Inshore Warren Bay, Watchet (+1.7 to 0.3 m. Algae and animals surveyed.)	31 055439	Flat bedrock at +1.7 m with bare silt-covered tops and littoral algae present in crevices. Boulders and pebbles +1.7 to 0.3 m dominated by <u>Polydora</u> with a small variety of other species present. Areas of horizontal bedrock covered in thick mud at 0.3 m.

TABLE 1 (cont.)

Site No.	Site name, depths surveyed and work carried out	Ordnance Survey Grid Reference	Site features
11	West of Greenaleigh Point (+1.5 to 12 m. Algae and animals surveyed.)	21 955485	Nearshore a gradual slope with seabed predominantly of large boulders at +1.5 to ca +1 m and scattered sand-scoured boulders on sand to ca 1 m followed by a steep boulder tumble to 5 m. From 5 m to ca 10 m, a gradual slope mainly of small boulders and stone consolidated by <u>Sabellaria</u> , merging into a predominantly (80%) sand seabed with small stones present to 12 m about 150 m offshore. Littoral algae present only at +1.5 m and stable boulders had a wide variety (for the area) of animal species. <u>Dendrodoa grossularia</u> dominant on some boulders and <u>Sabellaria alveolata</u> dominant on stones and small boulders amongst sand.
12	East of Greenaleigh Point (0 to 2.5 m. Animals surveyed.)	21 958484	Gradual slope of large and small boulders with pebbles and sand patches at 0 m. Increasing amounts of sand present with increasing depth to 2-3 m where a sand plain present. <u>Balanus crenatus</u> and <u>Pomatoceros triqueter</u> abundant on scoured rocks on sand and <u>Dendrodoa grossularia</u> abundant on some boulders at 0 m.
13	Hurlstone Point (+1.5 to 7.5 m. Algae and animals surveyed.)	21 899493	Nearshore areas of large muddy boulders followed in deeper water by small boulders with patches of sand present which merged offshore into a gradual slope of clean boulders with some pebbles and gravel. Algae present shallower than 0.3 m with dense foliose algae present above +1 m. Muddy nearshore rocks characterised by <u>Flustra foliacea</u> . Sides of nearshore rocks and all of clean offshore rocks characterised by tunicates and <u>Balanus crenatus</u> .
14	East Porlock Bay (1.2 to 4 m. Animals surveyed.)	21 897492	Nearshore areas at 1 to 3 m of small boulders with pebbles in between dominated by <u>Dendrodoa grossularia</u> and <u>Balanus crenatus</u> . Seabed at 4 m to west of Hurlstone Point of flat stones and small boulders with an overall cover of <u>Sabellaria</u> and <u>Balanus crenatus</u> on the tops of boulders.

TABLE 1 (cont.)

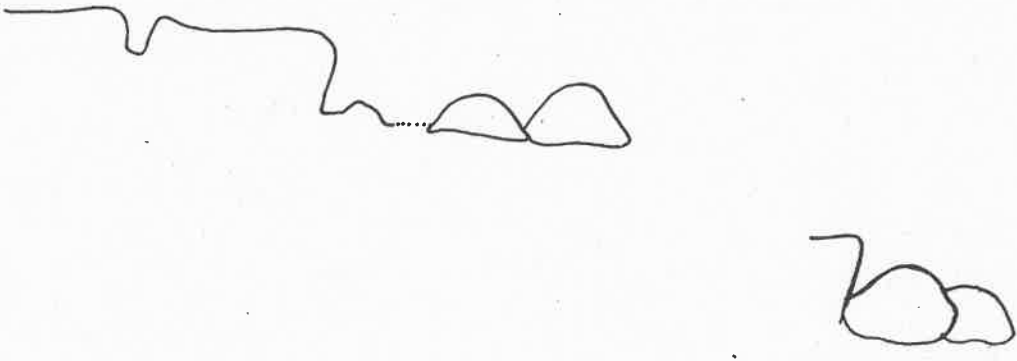
Site No.	Site name, depths surveyed and work carried out	Ordnance Survey Grid Reference	Site features
15	Porlock Bay (5.5 to 8.5 m. Animals surveyed.)	21 870484	Plain of sand with cover of silt and scattered large boulders surrounded by pebbles.
16	Gore Point (0 to 11 m. Algae and animals surveyed.)	21 859491 to 859489	Nearshore gradual slope of large boulders with pebbles and some sand followed in deeper water by a muddy sand plain with scattered boulders. All upward facing rock surfaces heavily silted. <u>Laminaria hyperborea</u> park and dense wide variety of foliose algae present to 0.5 m with scattered, much lower variety of algae to 2 m. Circalittoral boulders dominated by <u>Dendrodoa grossularia</u> with large numbers of terebellids present.

Fig. 2. Fairy Rock and Tusker Rock (sites 2, 3, 4).



	Bedrock ridges with short cliffs, some small boulders, sand patches and sand-covered rock (Fairy Rock, 1.5 to 4 m).	Stones and small boulders (Tusker Rock, 4 to 6 m).
ABUNDANT	<u>Sabellaria</u> spp. (mostly <u>S. alveolata</u>)	<u>B. crenatus</u> (stones), <u>Sabellaria</u> spp. (mostly <u>S. alveolata</u>) (on small boulders)
COMMON	<u>V. spinosa</u> , <u>B. ciliata</u>	<u>H. panicea</u> , <u>H. halecinum</u> , <u>D. grossularia</u> (on small boulders)
FREQUENT	<u>Ha. oculata</u> , <u>T. indivisa</u> , <u>H. halecinum</u> , <u>P. setacea</u> , <u>S. lacerta</u> , <u>Pagurus</u> sp., <u>B. undatum</u> , <u>A. gelatinosum</u> , <u>A. rubens</u>	<u>T. indivisa</u> , <u>H. falcata</u> , <u>T. lofotensis</u> , <u>P. triqueter</u> , <u>V. spinosa</u> , <u>Bu. plumosa</u> , <u>B. ciliata</u> , <u>D. grossularia</u> , <u>S. alveolata</u> , <u>H. halecinum</u> (on stones)
OCCASIONAL	<u>Cliona</u> sp., <u>H. panicea</u> , <u>H. falcata</u> , <u>S. troglodytes</u> , <u>P. triqueter</u> , <u>P. reniformis</u> , <u>H. arctica</u> , <u>B. crenatus</u> , <u>E. modestus</u> , <u>Bu. plumosa</u> , <u>F. foliacea</u> , <u>P. pomaria</u>	<u>Ha. oculata</u> , <u>P. setacea</u> , <u>P. reniformis</u> , <u>S. penicillus</u> , <u>B. crenatus</u> , <u>E. modestus</u> , <u>F. foliacea</u> , <u>A. gelatinosum</u>
RARE	<u>R. hispida</u> f. <u>hispida</u> , <u>N. antennina</u> , <u>N. lapillus</u>	<u>S. cupressina</u> , <u>S. elegans</u> var. <u>nivea</u> , <u>B. undatum</u> , <u>C. papposus</u>

Fig. 3. Nash Point (site 5) (including records of algae from between Nash Point and St. Donats Point).



	Limestone platform with some large boulders and sand patches + 2.5 m	0 m	3 m	Lg. boulders, some bedrock 5 m	Rippled clean sand 8 m
ABUNDANT					
COMMON		<u>H. panicea</u> <u>T. indivisa</u> <u>B. crenatus</u> <u>M. edulis</u> <u>B. ciliata</u>	<u>H. panicea</u> <u>B. ciliata</u> <u>F. foliacea</u>		
FREQUENT	<u>H. panicea</u> <u>A. fucorum</u> <u>T. felina</u> <u>N. lapillus</u>	<u>H. halecinum</u> <u>P. setacea</u> <u>T. lofotensis*</u> <u>F. foliacea</u> <u>V. spinosa</u> <u>Bu. plumosa</u> <u>D. grossularia</u>	<u>P. setacea</u> <u>T. lofotensis</u> <u>M. edulis</u> <u>V. spinosa</u> <u>B. plumosa</u> <u>D. grossularia</u>	<u>H. falcata</u> <u>T. lofotensis</u> <u>A. rubens</u>	
OCCASIONAL	<u>Br. plumosa</u> <u>C. crispus</u> <u>Ceramium sp.</u> <u>C. ramosa</u> <u>H. woodwardii</u> <u>Lithothamnia</u> <u>P. nigrescens</u> <u>T. indivisa</u> <u>P. setacea</u> <u>S. argentea</u> <u>Sabellaria spp.</u>	<u>S. argentea</u> <u>Sabellaria spp.</u> <u>P. reniformis</u> <u>P. triqueter</u> <u>Pagurus sp.</u> <u>H. arctica</u> <u>N. lapillus</u> <u>B. undatum</u> <u>A. rubens</u>	<u>H. halecinum</u> <u>S. cupressina</u> <u>Sabellaria spp.</u> <u>P. reniformis</u> <u>P. triqueter</u> <u>Pagurus sp.</u> <u>H. arctica</u> <u>N. lapillus</u> <u>B. undatum</u> <u>A. rubens</u>	<u>H. panicea</u> <u>H. halecinum</u> <u>P. setacea</u> <u>P. triqueter</u> <u>B. crenatus</u> <u>Pagurus sp.</u> <u>N. lapillus</u> <u>B. undatum</u>	
RARE	<u>G. flosculosa</u> <u>P. rotundus</u> <u>Bu. plumosa</u>	<u>A. fucorum</u>	<u>O. fragilis</u>	<u>Ha. oculata</u> <u>T. indivisa</u> <u>B. ciliata</u> <u>He. oculata</u>	<u>T. lofotensis</u> <u>L. conchilega</u>

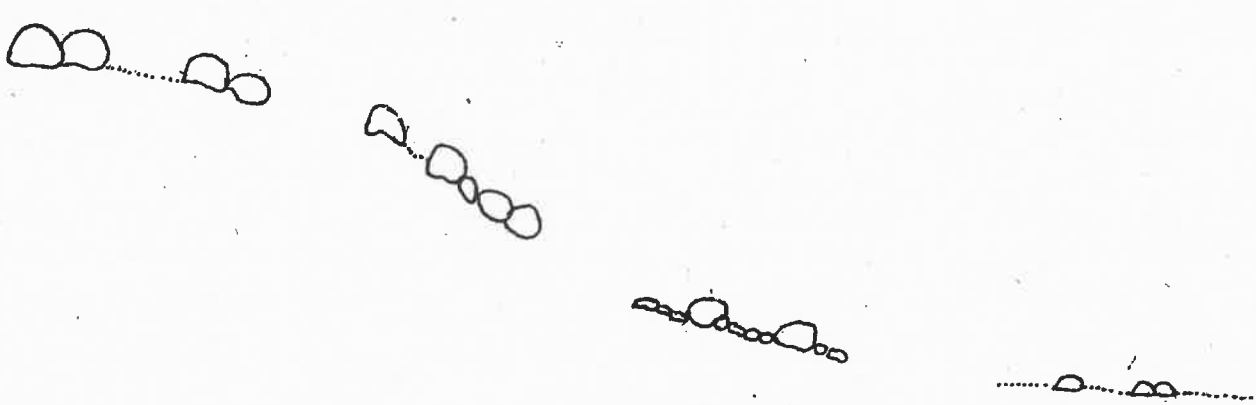
*C-A at bases of cliffs.

Fig. 4. Warren Bay (sites 8 to 10).



	Level seabed of boulders and pebbles with some flat mud-covered rock 0.3 m	Level seabed of mud overlying rounded small stones (2 to 4 cm) with scattered rocks 5 to 30 cm 5 and 7 m
ABUNDANT	<u>Polydora</u> sp.	<u>S. alveolata</u>
COMMON	<u>A. gelatinosum</u>	-
FREQUENT	-	<u>E. pilosa</u> , <u>S. undatum</u> (nearshore only)
OCCASIONAL	<u>T. lofotensis</u> , <u>Pagurus</u> sp., <u>H. arctica</u> , <u>B. ciliata</u> , encr. bryozoa	<u>B. crenatus</u> , <u>Pagurus</u> sp., <u>A. gelatinosum</u>
RARE	-	<u>T. indivisa</u> , <u>T. lofotensis</u> , <u>Facelina</u> sp.

Fig. 5. Greenaleigh Point (sites 11 and 12).




	Large boulders some sand patches 0 to 2.5 m	Boulder tumble amongst sand 2.5 to 5 m	Small boulders and stones consolidated by <u>Sabellaria alveolata</u> 5 to 12 m	Sand with scattered stones and pebbles 12 m
ABUNDANT	Col. diatoms <u>B. ciliata</u>		<u>Sabellaria</u> spp.*	
COMMON	<u>H. panicea</u> <u>S. argentea</u> <u>H. falcata</u> <u>P. triqueter</u> <u>Sabellaria</u> spp.* <u>B. crenatus</u> <u>D. grossularia</u>	<u>Polydora</u> sp. <u>P. triqueter</u> <u>B. crenatus</u> <u>A. gelatinosum</u> ** <u>D. grossularia</u> **		
FREQUENT	<u>C. crispus</u> + <u>T. indivisa</u> <u>H. halecinum</u> <u>S. argentea</u> <u>Bu. plumosa</u> <u>A. gelatinosum</u>	<u>T. indivisa</u> <u>Sabellaria</u> spp.* <u>B. ciliata</u>	<u>Pagurus</u> sp. <u>V. spinosa</u> <u>B. ciliata</u> <u>A. gelatinosum</u>	<u>Sabellaria</u> spp.*
OCCASIONAL	<u>Lithothamnia</u> <u>Ha. oculata</u> <u>T. lofotensis</u> <u>Pagurus</u> sp. <u>N. lapillus</u> <u>V. spinosa</u> <u>F. foliacea</u>	<u>H. panicea</u> <u>Pagurus</u> sp. <u>F. foliacea</u>	<u>Ha. oculata</u> <u>T. indivisa</u> <u>P. setacea</u> <u>T. lofotensis</u> <u>P. triqueter</u> <u>B. crenatus</u> <u>C. zizyphinum</u> <u>B. patina</u> <u>E. pilosa</u> <u>D. grossularia</u> <u>P. pomaria</u>	<u>T. indivisa</u> <u>H. falcata</u> <u>T. lofotensis</u> <u>P. triqueter</u> <u>B. crenatus</u> <u>Pagurus</u> sp. <u>C. zizyphinum</u> <u>B. ciliata</u> <u>V. spinosa</u> <u>A. gelatinosum</u> <u>D. grossularia</u>
RARE	<u>Cliona</u> sp. <u>N. antennina</u> <u>F. implexa</u>	<u>He. oculata</u>	<u>Cliona</u> sp. <u>H. panicea</u> <u>H. halecinum</u> <u>H. falcata</u> <u>N. antennina</u> <u>S. argentea</u> <u>P. cupressina</u> <u>Bu. plumosa</u> <u>encr. bryozoa</u> <u>He. oculata</u> <u>C. papposus</u>	<u>N. antennina</u> <u>B. undatum</u> <u>N. lapillus</u> <u>He. oculata</u> <u>C. papposus</u>

*Mostly S. alveolata

**Abundant on tops of boulders

+At 0 m

Fig. 6. Hurlstone Point and East Porlock Bay (sites 13 and 14).



	Bedrock and large boulders +1.4 m	Large muddy boulders +0.4 m	Large muddy boulders, some sand patches-nearshore 0 to 5 m	Small boulders and stones with little mud-offshore 1.2 to 4 m
ABUNDANT	<u>P. pseudo-ceranoides</u>			<u>Sabellaria</u> spp. <u>B. crenatus</u>
COMMON	<u>C. crispus</u> <u>G. stellata</u>			<u>Pagurus</u> sp. <u>F. foliacea</u> <u>D. grossularia</u>
FREQUENT	<u>P. rotundus</u> <u>C. spongiosus</u> Col. diatoms <u>Sabellaria</u> spp. <u>B. ciliata</u> <u>A. hirsutum</u> <u>F. hispida</u> <u>D. grossularia</u>	<u>P. gmelinii</u> <u>Sabellaria</u> spp. <u>D. grossularia</u>	<u>T. lofotensis</u> <u>P. triqueter</u> <u>Sabellaria</u> spp. <u>B. crenatus</u> <u>Pagurus</u> spp. <u>B. ciliata</u> <u>F. foliacea</u> <u>He. oculata</u> <u>D. grossularia</u>	<u>T. lofotensis</u> <u>P. triqueter</u> <u>Sabellaria</u> spp. <u>B. crenatus</u> <u>B. undatum</u> <u>He. oculata</u> <u>D. grossularia</u>
OCCASIONAL	<u>Ceramium</u> sp. <u>H. woodwardii</u> <u>Lithothamnia</u> <u>P. palmata</u> <u>R. confervoides</u> <u>Bu. plumosa</u> <u>A. gelatinosum</u> <u>A. rubens</u>	<u>H. woodwardii</u> <u>P. pseudo-ceranoides</u> <u>Bu. plumosa</u> <u>A. gelatinosum</u> <u>A. rubens</u>	<u>E. modestus</u> <u>N. lapillus</u> <u>B. undatum</u> <u>C. zizyphinum</u> <u>E. pilosa</u> <u>A. rubens</u> <u>P. pomaria</u>	<u>P. triqueter</u> <u>N. lapillus</u> <u>C. zizyphinum</u> <u>F. foliacea</u> <u>L. hispida</u> <u>B. patina</u> encr. bryozoa <u>A. rubens</u> <u>E. esculentus</u>
RARE	<u>M. alata</u> <u>P. gmelinii</u> <u>N. lapillus</u> <u>C. zizyphinum</u> <u>C. eburnea</u>		<u>Ha. oculata</u> <u>D. fragilis</u> <u>G. cineraria</u> encr. bryozoa	<u>D. fragilis</u> <u>T. indivisa</u> <u>S. argentea</u> <u>A. operculata</u> <u>H. vulgaris</u> <u>C. papposus</u>

4.2. Description of plant and animal communities

Figs. 2 to 6 illustrate the habitats and communities present at 5 sites in the area studied. Full names of species listed in the figures can be found in Appendix V. Along the South Wales coast, the species encountered at each site were similar, though dominant or common species were often different at different sites and in different areas at the same site. Along the North Somerset coast, each site was different in the substratum and in the species present and there was a large increase in the number of species present from east to west.

All of the sites except Gore Point (site 16) included a very small number of species of algae and a small number of species of animals. Algae were present only above Chart Datum level and included scattered Chondrus crispus, Bryopsis plumosa, Ceramium rubrum, Hypoglossum woodwardii, Polysiphonia nigrescens, colonial diatoms and small patches of lithothamnia. Most rock surfaces were dominated by Sabellaria spp. (mostly S. alveolata). The sponge Halichondria panicea was present particularly at the tops of rocks and on small boulders, whilst another sponge, Haliclona oculata, was present at most sites. Tubularia indivisa was frequently present at the tops of rocks whilst other hydroids observed at most sites included Plumularia setacea and Halecium halecinum with Hydrallmania falcata particularly abundant on some sandy rocks. Nemertesia antennina was rare at most sites. The anemone Tealia lofotensis was present throughout the area studied, particularly amongst stones or on rocks adjacent to sand, whilst T. felina was only recorded in very shallow water. The tubeworm Pomatoceros triqueter and the barnacle Balanus crenatus were common on stones and on scoured rock. The barnacle Elminius modestus and the dogwhelk Nucella lapillus which are only intertidal on the open coasts, were present at most sites deeper than Chart Datum level. The hermit crab Pagurus sp. was commonly observed at most sites. The topshell Calliostoma zizyphinum was present at most sites on the south side of the Channel. The bryozoans Bicellaria ciliata and Alcyonidium gelatinosum were common throughout the area studied whilst Bugula plumosa was often common on vertical rock, Vesicularia spinosa on sand-covered rock, and Flustra foliacea in depths below about 3 m. The echinoderms Asterias rubens and Henricia oculata were present in small numbers throughout the area studied.

The main features of the communities present at different sites or in different parts of the same site which distinguished them from other areas are summarised below.

- 1) Fairy Rock and Tusker Rock (sites 1, 2, 3, 4). Vesicularia spinosa was particularly common at site 1 with dense patches adjacent to sand. A rock-boring bivalve, probably Hiatella arctica, and the boring sponge Cliona sp. were frequent in the limestone bedrock. Otherwise very similar to the general description of the survey area.
- 2) Nash Point (site 5). The only area in which dense extensive beds of the mussel Mytilus edulis were present. The beds were restricted to the most tide-exposed rocks off the Point and, in the same area, Sabellaria spp. were very sparse except at +3 m. The sponge Amphilectus fucorum was present in large patches in shallow water. Large numbers of siphons of a boring bivalve mollusc were observed at the top edges of limestone cliffs. Several hundred metres offshore, a bare rippled sand plain was present with only two individuals of Tealia lofotensis and one group of the worm Lanice conchilega observed.
- 3) St. Donats Point and West (site 6). Observations in this extensive area surveyed during a drift dive demonstrated the patchiness of dominant or most abundant species along flat limestone platform broken by short cliffs and patches of boulders. The raised limestone platform was, in places, dominated by Dendrodoa grossularia whilst the deeper rock following a cliff was Sabellaria-dominated. Other low-lying areas near to sand-covered rock were almost entirely bare limestone but with scattered individuals of Dendrodoa grossularia and Balanus crenatus. The species noted as present throughout the survey area were also present.

- 4) Reynards Cave (site 7). Animal communities here were rich and varied for the area and notable for the domination of Polydora sp. on some rocks from shallow to deep water. Small Sagartia elegans were common on sandy rock at about +2 m.
- 5) Warren Bay, Watchet (sites 8, 9, 10). Notable as a highly impoverished area both on rocks on the offshore sediments and the rock-dominated shallow water. Sabellaria alveolata, Balanus crenatus and Tubularia indivisa were the main species on offshore rocks whilst pebbles present below the layer of mud on the bottom at slack water (the mud was probably suspended during strong tidal flow) were colonised by the bryozoan Electra pilosa. Polydora sp. was dominant on in-shore rocks and a boring bivalve was present.
- 6) Greenaleigh Point (sites 11, 12). Communities were very similar to those described for the whole survey area. It was notable that Dendrodoa grossularia superseded Sabellaria sp(p). as the dominant species in shallow water on the tops of boulders whilst Hydrallmania falcata was dominant in patches on sandy rock in shallow water. Polydora sp. was common on some boulders. Only a small variety of algae were present at this site in shallow water.
- 7) Hurlstone Point (nearshore) (site 13). This site was basically similar to the description of the whole survey area but Sabellaria was less conspicuous, a much wider variety of sublittoral algae were present and some species of animals characteristic of open coast areas were observed. The algae Phyllophora pseudoceranoides, Chondrus crispus, Gigartina stellata, Polyides rotundus and Cladostephus spongiosus were dominant at +1.4 m. The open coast algae Plocamium cartilagineum, Rhodymenia pseudopalmata var. pseudopalmata, Rhodomela confervoides, Membranoptera alata, Palmaria palmata, Hypoglossum woodwardii and Polyneura gmelinii were present. The open coast animals recorded were Dysidea fragilis, Amphisbetia operculata, Filograna implexa, Homarus vulgaris, Gibbula cineraria, Clavelina lepadiformis, Lichenopora hispida and Berenicea patina.
- 8) Hurlstone Point (clean rock, offshore) and Porlock Bay (sites 13, 14, 15). Notable for the presence of open coast species in addition to those already noted for Hurlstone Point: the sea urchin Echinus esculentus, the sponges Polymastia boletiformis, Ciocalypa penicillus and the barnacle Balanus perforatus. In the middle of Porlock Bay, the large area of sand present supported Common Sabella penicillus, an individual burrowing decapod Munida bamffica, the snail Nassarius reticulatus and Common brittle stars, Ophiura texturata.
- 9) Gore Point (site 16). Although similar in many of the species present to the general description of the area, the communities present at Gore Point also included many open coast elements. A major feature was the presence of sparse Laminaria hyperborea plants above Chart Datum level and the wide variety of algae present. The algae present included those already listed for Hurlstone Point, together with large areas covered in lithothamnia and other encrusting algae, Stenogramme interrupta, Cryptopleura ramosa, Phycodrys rubens, Heterosiphonia plumosa, Dictyota dichotoma and possibly Brongniartella byssoides (small plants). Animal communities were similar to those noted for Hurlstone Point and Porlock Bay but included large numbers of Nemertesia antennina and Clavelina lepadiformis in depths below 5 m.

5. DISCUSSION AND CONCLUSIONS

5.1. Comparison of communities with areas to the west and the definition of boundary zones in the Channel

Table 2 summarises the numbers of species observed at sites along the South Wales coast from the entrance to Milford Haven to the coast studied in the present survey. There is a gradual reduction in the number of species present from west to east with a sharp reduction in species numbers across Swansea Bay which leads to highly impoverished communities being present along the coast studied. All of the main species groups except for conspicuous polychaetes show a reduction in the number of species present compared to western areas but both the numbers of

TABLE 2. Numbers of species in the main groups of conspicuous rocky sublittoral organisms present along the coast from Sheep Island (entrance to Milford Haven) to Reynards Cave (near Llantwit Major). Blocks of about seven sites are used to provide comparison with the survey area with the lowest number of sites and to ensure the inclusion of locations where a wide variety of habitats are represented and with full records of algae and animals at several of the sites.

Coastline included	SOUTH PEMBROKESHIRE						CARMARTHEN BAY	GOWER			SWANSEA BAY	UPPER BRISTOL CHANNEL
	Sheep Island to Crow Rock	Pen-y-Holt Bay to The Castle	St Gowans Shoals to Stackpole Head	N. Stackpole Head to Westmoor Cliff	Eastmoor Cliff to West Beacon Point	The Flats to St Catherines Island		Worms Head to S. Oxwich Point	E. Oxwich Point to Seven Slades	Off Caswell Bay to Mumbles Head		Fairy Rock, Porthcawl to Reynards Cave, Llantwit Major
Linear distance included west to east (km)	4.5	6.6	3.9	4.4	9.5	4.5*	22.5	12.9	6.9	5.2	19.3	12.1
Number of survey sites	7	8	7	7	7	7		7	7	7		6
Algae	57	60	49	50	49	40	no survey sites	45	52	19	no survey sites	17
Porifera	19	20	18	17	17	13		16	15	11		5
Hydrozoa	11	9	12	13	11	9		12	14	10		8
Anthozoa	7	8	10	6	7	7		9	6	6		5
Polychaeta	4	4	4	7	8	4		7	6	6		6
Decapoda	4	6	9	8	10	9		10	8	6		2
Bryozoa	14	14	13	16	18	10		10	12	12		10
Echinodermata	7	7	8	6	8	5		2	2	2		3
Ascidiacea	11	12	13	13	11	7	13	14	10	2		
Total number of species	134	140	136	136	139	104		124	129	82		58

*South to north

species and the abundance of algae, sponges, hydrozoa, echinoderms and ascidians show particularly great reductions. Although the numbers of species of conspicuous bryozoa were only slightly smaller along this faunal gradient, the relative abundance of erect bryozoa was greatly reduced compared to open coast sites where they are often dominant. In the absence of a wide variety of species competing for living space, only a few species of animals were dominant over large areas of rock. Sabellaria alveolata was not recorded in the open coast areas but was the most abundant species in the upper Channel whilst Dendrodoa grossularia, Vesicularia spinosa and Polydora ciliata were species rarely observed as dominant in open coast areas but were abundant in patches along the coast described here. Another feature of rocks below Chart Datum level in the Upper Bristol Channel was the presence of the usually intertidal species Elminius modestus and Nucella lapillus, species also found subtidally in the upper reaches of Milford Haven (report in preparation). Table 3 summarises information on species present at the four sites studied from shallow to deep water along the North Somerset coast. The results are not directly comparable with those in Table 1 where groups of about seven sites were used. However, there is clearly a progressive reduction in the number of conspicuous species present from west to east with a sharp drop between Minehead and Watchet. Of particular significance is the reduction in variety of algae found from site to site and the absence of Laminaria hyperborea east of Porlock Bay. Although Porlock Bay does not appear to be a major boundary area on the basis of a discontinuity in the number of species present, the area does mark the easternmost recorded limit of several open coast species in terms of either presence or presence in large amounts: Laminaria hyperborea, Plocamium cartilagineum, Stenogramme interrupta, Cryptopleura ramosa, Membranoptera alata, Phycodrys rubens, Dictyota dichotoma, Ciocalyptra penicillus, Dysidea fragilis, Polymastia boletiformis, Nemertesia antennina, Balanus perforatus and Echinus esculentus.

The location of a boundary zone marking open coast and enclosed coast areas of the Bristol Channel between Porlock Bay and the east side of Swansea Bay as defined by Boyden *et al* (1977), is supported by the findings of the present survey. Also, our single site which was located in the 'middle region' of the Channel as defined by Haderlie and Clark (1959) at Watchet, was very impoverished compared to the remainder located in the 'outer region' and the suggestion of a further boundary west of Watchet is supported.

5.2. Comparison with other areas under 'stress'

Many of the features of the marine environment in the Upper Bristol Channel can be regarded as 'stressful' to marine organisms including high turbidity, high levels of suspended material, variable and often low salinity and high levels of pollutants. In such a situation, it would be expected that a large number of species would be unable to survive and that the diversity of species would fall whilst a few species would become dominant, and this is the observed situation. Poor light penetration is doubtless the major factor in causing the reduced algal communities present. However, it is difficult to identify a single factor which might cause the reduction in the variety of animal species.

It is also notable that many of the changes which occur in animal communities from the open coast to the Upper Bristol Channel are similar to those which occur from open coast to enclosed marine areas elsewhere (for instance, in the region of Abereiddy Quarry in Pembrokeshire, Hiscock and Hoare, 1975; in the region of Lough Ine, south-west Ireland, Hiscock, 1976; from the open Irish Sea to Liverpool Bay coasts of Anglesey, Hiscock, 1976) or along a severe pollution gradient such as that near to the bromine extraction plant on Anglesey (Hoare and Hiscock, 1974).

TABLE 3

Numbers of species in the main groups of conspicuous rocky sublittoral organisms recorded in situ at the four sites studied for shallow to deep water along the North Somerset coast.

Site Name and Number	Gore Point (16)	Hurlstone Point & East Porlock Bay (13, 14)	Greenaleigh Point (11, 12)	Warren Bay, Watchet (8, 9, 10)
Linear distance from Gore Point (km) eastwards	0	3.9	9.7	19.6
Algae	19	13	5	2
Porifera	3	3	3	0
Hydrozoa	5	3	7	1
Anthozoa	2	2	3	2
Polychaeta	4	5	6	2
Cirripedia	3	2	2	1
Decapoda	3	2	2	1
Mollusca	5	4	4	2
Bryozoa	2	5	5	2
Echinodermata	4	3	2	0
Ascidiacea	1	2	2	0
Total number of species	51	44	41	13

5.3. Distribution of species with depth - zonation

The distinction of different depth zones on the open coast is based on the species and abundance of algae present. The littoral zone is separated from the sublittoral at the upper limit of kelp whilst the most basic division of the sublittoral zone is between the infralittoral (algal-dominated) zone and the circalittoral (animal-dominated) zone. However, along the majority of the coast studied, sublittoral species of algae were nowhere dominant and kelp was absent. The circalittoral zone therefore could be interpreted as extending into the intertidal where an upper circalittoral zone (sparse algae present) could be described as present above Chart Datum level or about +1 m. The upper limit of the sublittoral zone was also difficult to define in the absence of kelp. However, sublittoral algae were present to about +2.5 m along the South Wales coast and, at +3 m, littoral species of algae and animals were encountered. Thus the sublittoral zone extended to about +2.5 m compared to +1 m on the open coast. The sparsity of algae and the absence of Laminaria is no doubt the result of poor light penetration whilst the upward extension of the sublittoral zone is most likely a response to the expanded tidal range in the Upper Bristol Channel compared to the open coast and the lack of competition from algae. It is also notable that many of the species of algae found above Chart Datum level are those normally restricted to depths below the Laminaria forest on the open coast.

5.4. Sand cover and scour

Much of the seabed studied included extensive areas of sand. The sand is regarded here as probably the main reason for the presence of very large amounts of Sabellaria species, particularly S. alveolata. S. alveolata thrives where a supply of sand in suspension is available for tube building (Wilson, 1968). In some areas west of St. Donat's Point where Dendrodoa grossularia was dominant on nearshore platforms raised above the general rock level, it is possible that the supply of sand was insufficient for Sabellaria to thrive. However, S. alveolata was present in large amounts on low rock platforms following a drop in the level of the seabed across a low cliff to a position where sand was probably accumulated. Vesicularia spinulosa and Hydrallmania falcata also thrived on sand-covered rocks.

Sand-scoured rocks were observed at several sites and the species present were generally the rapid-colonising, fast-growing species observed on other coasts in south-west Britain: Pomatoceros triqueter and Balanus crenatus. Dendrodoa grossularia was also noted as a colonising species on bare limestone west of St. Donat's Point.

5.5. Importance of Sabellaria species

Sabellaria alveolata was important both as a dominant species smothering large areas of seabed and in binding together gravel and cobbles to form a stable substratum onto which sessile species such as erect bryozoa and hydrozoa could settle. S. alveolata and S. spinulosa were also likely to be important in preventing access to limestone rock for boring species including Hiatella arctica, Cliona sp., Polydora sp. and various sabellid worms.

5.6. Comparison of results with surveys using remote sampling methods and methods for future surveys

Comparison of the lists of conspicuous sublittoral species obtained during the present survey and by Purchon (1947) from the South Wales coast east of our survey area reveals a similarity in the main species present. However, a notable exception is the absence of any record of Dendrodoa grossularia from the earlier work. Thus, it would appear that areas of hard substratum to the east of the area worked by us and to the east of Cardiff have a basically similar fauna dominated by Sabellaria alveolata.

The 'Reduced hard bottom community' of Warwick and Davies (1977) described as present in much of the Bristol Channel east of Swansea Bay is most likely the community observed by the present survey in nearshore areas. They also emphasise the widespread distribution and dominance of species of Sabellaria. However, further comparison is difficult since our work was concerned with conspicuous organisms recognised in situ, whereas Warwick and Davies (1977) specifically exclude 'sessile forms ... mainly hydroids, bryozoans and barnacles' and list mostly small mobile species.

It is considered here that, because of the loose-lying or unconsolidated nature of hard substrata offshore in most areas studied, remote sampling should provide an adequate means of describing communities present. However, since the communities are characterised at many locations by hydrozoa, bryozoa and other sessile species it seems essential that these groups are identified. Adjacent to the shore where bedrock is present, remote sampling cannot adequately collect substratum plus attached organisms and diving, although difficult, offers the only effective means of describing the communities present below Extreme Low Water of Spring Tides level. However, in view of the extension of circalittoral communities above Chart Datum level, study of nearshore plant and animal communities on bedrock or boulders can be carried out during periods of extremely low spring tides.

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APPENDIX I

List of algal taxa to be searched for and noted at each survey station.

RHODOPHYTA

Scinaia forcellata
 Scinaia turgida
 Naccaria wiggii
 Asparagopsis armata
 Bonnemaisonia hamifera
 Bonnemaisonia asparagoides
 Schizymenia dubyi
 Furcellaria lumbricalis
 Polyides rotundus
 Halarachnion ligulatum
 Calliblepharis ciliata
 Cystoclonium purpureum
 Rhodophyllis divaricata
 Plocamium cartilagineum
 Sphaerococcus coronopifolius
 Gracilaria verrucosa
 Ahnfeltia plicata
 Phyllophora crispa
 Phyllophora pseudoceranoïdes
 Phyllophora trailii
 Schottera nicaeensis
 Stenogramme interrupta
 Chondrus crispus
 Gigartina acicularis
 Gigartina stellata
 Gigartina teedii
 Gigartina pistillata
 Corallina sp.
 Jania sp.
 'Lithothamnia'
 Mesophyllum lichenoides
 Dilsea carnososa
 Callophyllis laciniata
 Kallymenia reniformis
 Meredithia microphylla
 Palmaria palmata
 Lomentaria clavellosa
 Lomentaria orcadensis
 Rhodymenia delicatula
 Rhodymenia pseudopalmata
 R. pseudopalmata var. ellisiae
 R. pseudopalmata var. pseudopalmata
 Antithamnion plumula
 Antithamnion sp.
 Ceramium rubrum
 Ceramium sp.
 Griffithsia flosculosa
 Griffithsia corallinoides
 Halurus equisetifolius
 Ptilota plumosa
 Sphondylothamnion multifidum
 Acrosorium reptans
 Acrosorium uncinatum
 Cryptopleura ramosa
 Apoglossum ruscifolium
 Hypoglossum woodwardii
 Delesseria sanguinea
 Membranoptera alata

Myriogramme sp.
 Nitophyllum punctatum
 Phycodrys rubens
 Polyneura gmelinii
 Polyneura hilliae
 Radicilingua thysanorhizans
 Dasya sp.
 Heterosiphonia plumosa
 Brongniartella byssoides
 Chondria dasyphylla
 Chondria sp.
 Halopitys incurvus
 Polysiphonia sp.
 Pterosiphonia complanata
 Pterosiphonia parasitica
 Pterosiphonia pennata
 Pterosiphonia thuyoides
 Rhodomela confervoides
 Porphyra sp.
 'Encrusting browns/reds'

PHAEOPHYTA

Ectocarpus sp.
 'Aglaozonia parvula'
 Cutleria multifida
 Zanardinia prototypus
 Arthrocladia villosa
 Desmarestia aculeata
 Desmarestia ligulata
 Desmarestia viridis
 Carpomitra costata
 Sporochnus pedunculatus
 Chorda filum
 Laminaria digitata
 Laminaria hyperborea
 Laminaria saccharina
 Laminaria ochroleuca
 Saccorhiza polyschides
 Alaria esculenta
 Halopteris filicina
 Cladostephus spongiosus
 Dictyopteris membranacea
 Dictyota dichotoma
 Padina pavonia
 Taonia atomaria
 Cystoseira foeniculacea
 Cystoseira nodicaulis
 Cystoseira tamariscifolia
 Cystoseira sp.
 Halidrys siliquosa

CHLOROPHYTA

Enteromorpha sp.
 Codium sp.
 Ulva sp.
 Cladophora sp.
 Bryopsis plumosa
 Bryopsis hypnoides

List of animal taxa to be searched for and noted at each survey station. The numbers following each name refer to the scale to be used in estimating abundance.

ROCK-LIVING SPECIES (ON PEBBLES AND LARGER)	PHORONIDAE	ASCIDIACEA	
PORIFERA	Phoronis hippocrepia 3	Clavelina lepadiformis 2	
Pachymatisma johnstonia 1	CRUSTACEA-CIRRIPIEDIA	Dendrodoa grossularia 2	
Polymastia boletiformis 1	Balanus crenatus 3	Molgula manhattensis 2	
Polymastia mammilaris 1	Balanus perforatus 3	Stolonica socialis 2	
Clathrina coriacea 3	Verruca stroemia 3	Ascidia mentula 1	
Ciocalyptra penicillus 1	Pyrgoma anglicum p/a	Ascidia sp. 2	
Cliona celata 1	CRUSTACEA-DECAPODA	Polyclinum aurantium 2	
Suberites carnosus 1	Caprellidae (in swarms)(2)	'Polyclinidae' 2	
Suberites domuncula 1	Jasiidae (tubes) (2)	Botryllus schlosseri 2	
Tethya aurantia 1	Cancer pagurus 1	Didemnum sp(p). 2	
Haliclona oculata 1	Homarus vulgaris 1	Diplosoma listerianum 3	
Stelligera stuposa 1	Palinurus elephas 1	Ciona intestinalis 2	
Axinella dissimilis 1	Pagurus sp. 1	Distaplia rosea 2	
other 'axinellids' 1	Galathea squamifera 1	PISCES	
Hymeniacion perleve 1/3	Galathea strigosa 1	Labrus mixtus	
Dysidea fragilis 1	Carcinus maenas 1	Labrus bergylta	
Amphilectus fucorum 1/3	Macropipus puber 1	Crenilabrus melops	
Halichondria panicea 3	Maia squinado 1	Ctenolabrus rupestris	
encrusting sponges 3	Palaemon serratus 1	Thorogobius ephippiatus	
HYDROZOA	MOLLUSCA	Pholis gunnellus	
Tubularia indivisa 2	Patella sp(p). 2	Chapparrudo flavescens	
Halecium halecinum 1/2	Acmaea virginea 2		
Amphisbetia operculata 3	Gibbula cineraria 1	SEDIMENT EPIFAUNA (ON COARSE GRAVEL & SMALLER)	
Sertularia 'argentea' 3	Buccinum undatum 1	COELENTERATA	
Hydrallmania falcata 3	Mytilus edulis 3	Corymorpha nutans 2	
Kirchenpaeuria pinnata 3	Modiolus modiolus 3	Cereus pedunculatus 1	
Plumularia setacea 3	Anomiidae 2	Peachia hastata 1	
Aglaophenia spp. 3	Hiatella arctica 2	Ilyanthus mitchelli 1	
Nemertesia ramosa 2	Crepidula fornicata 2	Cerianthus lloydii 1	
Nemertesia antennina 2	BRYOZOA	Virgularia mirabilis 1	
Gymnangium montagui 3	'Crisiidae' 3	ANNELIDA	
ANTHOZOA	Bugula plumosa 3	Terebellidae 1	
Alcyonium digitatum 1	Bugula turbinata 3	Sabellaria alveolata 3	
Alcyonium glomeratum 1	Scrupocellaria sp(p). 3	Sabella penicillus 1	
Eunicella verrucosa 1	Cellaria sinuosa 3	Myxicola infundibulum 1	
Aiptasia couchi 1	Flustra foliacea 3	Arenicola marina (casts) 1	
Anemonia sulcata 1	Securiflustra securifrons 3	Lanice conchilega 2	
Cereus pedunculatus 1	Cellepora pumicosa 1	CRUSTACEA-DECAPODA	
Tealia felina 1	Porella compressa 3	Goneplax rhomboides 1	
Diadumene sp. 1	Pentapora foliacea 1	Munida bamffica 1	
Metridium senile 1	Parasmittina trispinosa 3	Nethrops norvegicus 1	
Sagartia troglodytes 1	Escharoides coccineus 3	Macropipus spp. 1	
Sagartia elegans (small) 1	Umbonula littoralis 3	Carcinus maenas 1	
Sagartia elegans (large) 1	Electra pilosa 3	Pagurus sp. 1	
Actinothoe sphyrodeta 1	other encrusting bryozoa 3	Crangon crangon 1	
Aurelia (scyphistomae) 2	Alcyonidium gelatinosum 1	MOLLUSCA	
Caryophyllia smithi 2	Bowerbankia sp. 3	Gibbula magus 1	
Balanophyllia regia 2	ECHINODERMATA	Buccinum undatum 1	
Corynactis viridis 2/3	Asterias rubens 1	Turritella communis 1	
Parazoanthus dixonii 3	Marthasterias glacialis 1	Nassarius reticulatus 1	
Epizoanthus couchi 2	Henricia oculata 1	Modiolus modiolus 3	
ANNELIDA	Luidea ciliaris 1	Pecten maximus 1	
Pomatoceros triqueter 2	Ophiothrix fragilis 2/3	ECHINODERMATA	
Bispira volutacornis 1	Ophiocoma nigra 2	Astropecten irregularis 1	
Filograna implexa 1	Antedon bifida 2/3	Ophiura/Amphipholis 2	
Polydora sp. 3	Echinus esculentus 1	Ophiothrix fragilis 2/3	
Sabellaria spinulosa 2	Holothuria forskali 1	Ophiocoma nigra 2	
	Cucumaria spp. 1	PISCES	
		Gobiidae 1	

NO SCALE

Scales for the interpretation of abundance notations.

ANIMALS

Large solitary species and colonies. For instance, solitary sponges, Alcyonium digitatum, hydroid clumps, large anemones, Pentapora foliacea, Cellepora pumicosa, echinoderms, large solitary tunicates.

ABUNDANT	One or more per 0.1 m ² .
COMMON	One or more per 1 m ² .
FREQUENT	Less than 1 per m ² but more than about 20 individuals observed.
OCCASIONAL	About 3-20 observed.
RARE	One or two observed.

Small solitary species. For instance, Grantia compressa, small anemones, Caryophyllia smithi, Antedon bifida, small solitary tunicates.

ABUNDANT	One or more per 0.01 m ² .
COMMON	One or more per 0.1 m ² .
FREQUENT	One or more per m ² , scattered patches.
OCCASIONAL	Less than one per m ² , scattered small patches.
RARE	Widely scattered individuals, one or two small patches.

Small colonial species and crustose species. For instance, encrusting sponges, Corynactis viridis, small hydroids, Polydora ciliata, beds of Mytilus edulis, barnacles, bryozoa, encrusting tunicates.

ABUNDANT	Large confluent colonies with more than 50% cover. More than 100 per 0.01 m ² .
COMMON	Many small or a few large patches with 10% to 50% cover. One or more per 0.01 m ² .
FREQUENT	Scattered patches less than 10% cover overall. One or more per 0.1 m ² .
OCCASIONAL	Scattered small patches less than 1% cover overall. One or more per m ² .
RARE	Widely scattered very small patches or individuals. Less than one per m ² .

ALGAE

Kelps.

ABUNDANT	Plants mostly less than 50 cm apart. Difficult to swim between.
COMMON	Plants 50 cm to 1 m apart.
FREQUENT	Plants 1 to 2 m apart. Easy to swim between.
OCCASIONAL	Plants more than 2 m apart, zone still apparent.
RARE	Few plants present.

Foliaceous or filamentous undergrowth species.

ABUNDANT	More than 20% cover over most of area.
COMMON	Less than 20% cover but many plants present throughout zone.
FREQUENT	Less than 20% cover and distribution patchy or scattered plants present throughout zone.
OCCASIONAL	Scattered plants present.
RARE	Few plants seen in dive.

Kelp stipe flora.

ABUNDANT	Plants dense on most stipes.
COMMON	Plants present on most stipes but not dense.
FREQUENT	Distribution patchy, plants may be dense on some stipes, absent on others.
OCCASIONAL	Few plants on many stipes.
RARE	Only few plants seen during dive.

Crustose species.

ABUNDANT	More than 50% cover.
COMMON	More than 20% cover.
FREQUENT	More than 5% cover.
OCCASIONAL	Less than 5% cover. Few scattered large patches or many small patches.
RARE	Few patches seen.

URC

APPENDIX V

List of all algae and animals observed and collected. A summary of distribution and abundance is given but full data for each site are included in site recording sheets deposited with the Nature Conservancy Council.

The nature of the seabed and the detail in which each site was studied are noted in Table 1 which should be used in interpreting information on the distribution of species.

Alga nomenclature is according to Parke and Dixon (1976). Animals are listed by the names used in the Plymouth Marine Fauna (Marine Biological Association, 1957) except the bryozoa where the nomenclature follows Ryland (1969). Where the name of a species has changed from that used in the Plymouth Marine Fauna, the old name is given in parentheses.

Note:

Because of the difficulty of distinguishing a distinct infralittoral zone or fringe, records of species which occur in the sublittoral but which were recorded in the zone mainly occupied by littoral species are included in the Appendix.

ALGAE

RHODOPHYTA

Polyides rotundus: Occasional (5) and Rare (6) in very shallow depths on the north side of the Channel. 10% cover at +1.4 m at Hurlstone Point (13). (5, 6, 13).

Plocamium cartilagineum: Only recorded on the south side of the Channel. Rare at Hurlstone Point (13) at +0.4 and +1.4 m but up to 10% cover around Chart Datum level and present to 1.5 m at Gore Point (16). (13, 16).

?Phyllophora crispa: Possibly present 0 to 0.5 m. (16).

Phyllophora pseudoceranoïdes: Only recorded on the south side of the Channel. 30 to 40% cover at +1.4 m to Occasional at +0.4 m at Hurlstone Point (13) but only scattered individuals at Gore Point (16). (13, 16).

Stenogramme interrupta: Only recorded at Gore Point (16). Scattered individuals 0 to 1.5 m. (16).

Chondrus crispus: Occasional to Frequent at most sites though in very shallow water usually above +1 m. (5, 7, 10, 11, 13, 16).

Gigartina stellata: Present in large amounts mixed with Chondrus crispus at +1.4 m. (16).

'Lithothamnia': Occasional at some sites in the sublittoral but with 40% cover at 0 to 0.5 m at Gore Point (16). Also recorded in the littoral at +3.1 m at Nash Point (5). (5, 6, 11, 13, 16).

Encrusting brown/red algae: Recorded only at Gore Point (16) where 40% cover noted at 0 to 0.5 m to less than 5% at 1.5 m. (16).

Palmaria palmata: Rare at Reynards Cave (7) at 2.7 m, Occasional at Hurlstone Point (13) at +1.4 m and Frequent at Gore Point (16) at 0 to 0.5 m. On kelp stipes at Gore Point (16). (7, 13, 16).

Rhodymenia pseudopalmata (variety not recorded): Up to 5% cover at 0 to 0.5 m. (16).

Rhodymenia pseudopalmata var. pseudopalmata: Rare at +0.4 m. (13).

Callithamnion sp.: Rare. (7).

Ceramium sp.: Occasional or Frequent in very shallow water. (5, 6, 7, 13).

Griffithsia flosculosa: Collected at +1 m West of St. Donats Point. (6).

Cryptopleura ramosa: Occasional at +1 m at West of St. Donats Point (6). Scattered plants at 0 to 0.5 m on rock and present on kelp stipes at Gore Point (16). (6, 16).

Hypoglossum woodwardii: Occasional above Chart Datum. (5, 6, 13, 16).

Membranoptera alata: Rare at 1.4 m at Hurlstone Point (13) and at Gore Point (16) on kelp stipes (16). (13, 16).

Phycodrys rubens: Present from 0 m to 1.5 m with up to 5% cover on rock and present on kelp stipes at Gore Point. (16).

Polyneura gmelinii: Rare on boulders at +0.2 m at Reynards Cave (7). About 5% cover at Hurlstone Point (13) at +0.4 m and Gore Point (16) at 0 to 0.5 m. (7, 13, 16).

Heterosiphonia plumosa: Rare at 1 m at Gore Point. (16).

?Brongniartella byssoides: Few very small individuals at 0 to 0.5 m at Gore Point. (16).

Polysiphonia nigrescens: Occasional at +1 m at West of St. Donats Point. (6).

PHAEOPHYTA

Laminaria hyperborea: Widely separated plants at 0 to 0.5 m at Gore Point. (16).

Cladostephus spongiosus: Abundant at +3.1 m at Nash Point (5), Occasional at +2.2 m at Reynards Cave (7) and 10% to 20% cover at +1.4 m at Hurlstone Point. (5, 7, 13).

Dictyota dichotoma: Frequent at 0 to 0.5 m at Gore Point. (16).

CHLOROPHYTA

Enteromorpha sp.: Occasional at +4.7 m at Reynards Cave. (7).

Ulva sp.: Variable amounts in very shallow water. (5, 7, 10, 11).

Cladophora sp.: Frequent at +3.1 m. (5).

Chaetomorpha sp.: One patch between 0 to 0.5 m. (16).

Bryopsis plumosa: Occasional at 2.6 and 3.1 m and Common on vertical surfaces at Nash Point (5). Rare in very shallow water at Reynards Cave (7) and at 0.2 m at Greenaleigh Point (11). (5, 7, 11).

BACILLARIOPHYCEAE

Colonial diatoms: Recorded in very shallow water as Occasional to Frequent but as Abundant at 0 m at Greenaleigh Point (11). (7, 11, 13).

ANIMALS

PORIFERA

Polymastia boletiformis: Two individuals recorded in Porlock Bay. (15).

Cliona sp. (boring form): Occasional at Fairy Rock (2) and Rare at Greenaleigh Point (11 and 12). (2, 11, 12).

Ciocalyptra penicillus: Rare in Porlock Bay (15) but Frequent off Gore Point (16). (15, 16).

Dysidea fragilis: Rare near Hurlstone Point (13, 14) and recorded as Occasional off Gore Point (16). (13, 14, 16).

Haliclona oculata: Rare or Occasional at most sites though not observed near Watchet. (2, 3, 4, 5, 6, 7, 11, 13, 14, 15).

?Haliclona sp.: (11).

?Amphilectus fucorum: Thick orange encrusting sponge present at 0 m with some large patches at +2.5 m at Nash Point. (5).

Raspailia hispida f. ramosa: One. (2).

Halichondria panicea: Generally Occasional but dominant in patches, particularly on boulders and at tops of rocks. Noted as most abundant in shallow water at sites 5, 7, 11. (2, 3, 4, 5, 6, 7, 11, 12, 16).

Encrusting sponges: Occasional and Rare. (6, 13).

COELENTERATA: HYDROZOA

Tubularia indivisa: Occasional to Frequent throughout the area studied. Most abundant at the tops of rocks and edges of rock platforms. (2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16).

Obelia dichotoma: Occasional at Fairy Rock (2), otherwise Rare as a conspicuous element of the fauna. (2, 5, 11).

Halecium ?beani: On collected stone. (3).

Halecium halecinum: Occasional to Frequent deeper than Chart Datum level at most sites studied on the north side of the Channel but only recorded at Greenaleigh Point (11 and 12) on the south side. (2, 3, 4, 5, 6, 7, 11, 12).

Hydrallmania falcata: Generally Occasional but large amounts often present adjacent to sand or on sand-covered rocks. (2, 4, 5, 6, 7, 11, 16).

Sertularia cupressina: Rare. (3, 5, 7, 11).

Sertularia argentea: Occasional. (5, 11, 13, 16).

Amphisbetia (= Sertularia) operculata: Present offshore at Hurlstone Point. (13).

Plumularia setacea: Occasional or Frequent patches. (2, 4, 5, 6, 7, 11).

Nemertesia antennina: Very rarely recorded except at Gore Point (16) where Frequent. (2, 7, 11, 12, 16).

(Aglaophenia sp.: Large amounts noted in shallow water at Gore Point. (16).

Requires confirmation, probably incorrect).

COELENTERATA: ANTHOZOA

Tealia felina var. felina: Present only in shallow water and at the westernmost sites. At Fairy Rocks, about 40% of the T. felina present were estimated to be of this variety. (2, 3, 5, ?11, ?12, ?13, ?14, ?15, ?16).

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Tealia felina var. lofotensis: Generally Frequent throughout the survey area and particularly abundant on rocks or stones adjacent to or partly covered in sand. (Variety not noted at sites 13 to 16.) (2, 3, 5, 6, 7, 9, 10, 11, 12, ?13, ?14, ?15, ?16).

Sagartia elegans (small varieties): Occasional to Frequent and generally on sandy rock shallower than Chart Datum level. (5, 6, 7, 12).

Sagartia elegans ?var. nivea: Rare. (3).

Sagartia troglodytes: Occasional. (2).

Sagartiogeton lacerta: Occasional to Frequent at sites 2 and 9 and Rare at sites 3, 5 and 7. (2, 3, 5, 7, 9).

ANNELIDA: POLYCHAETA

Polydora sp.: Common on boulders at 0.5 m at Reynards Cave (7), dominant at 0.3 m at Warren Bay, Watchet (10), and Common east of Greenaleigh Point (12). (7, 10, 12).

Sabellaria spinulosa: Frequent to Abundant. Dominant on some rocks. The most abundant Sabellaria species at western sites though incompletely separated from S. alveolata at some sites and therefore possibly present at eastern sites. (2, 3, 4, 5, 6, 12, 13, 14, 15, 16).

Sabellaria alveolata: Frequent to Abundant at eastern sites. Dominant on some rocks. Binding loose stones and gravel together at some sites and over a large area at Greenaleigh Point (11). Incompletely separated from S. spinulosa and probably present at all sites. (2, 3, 4, 5, 6, 7, 8, 9, 11, 13).

Lanice conchilega: Small patch in sand at 8 m. (5).

Terebellidae: Common in sediment. (16).

Sabella penicillus (= pavonina): Occasional, Rare and Frequent in sediment. (3, 7, 15).

Potamilla reniformis: Mostly recorded on collected stones. Noted as probably Frequent on vertical rock at Nash Point (5). (2, 3, 5, 11, 14).

Sabellidae: Small sabellids Common on bedrock at +0.7 m and Rare on boulders. (7).

?Jasminiera elegans: Sabellid worms in rock. (2).

Pomatoceros triqueter: Occasional to Frequent throughout the survey area though not recorded near Watchet. More abundant and dominant in places on scoured vertical rock and stones probably mobile in winter. (2, 4, 5, 6, 7, 11, 12, 13, 14, 15, 16).

Filograna implexa: Small colonies and only recorded on collected stones at sites 13 and 16. (12, 13, 16).

CRUSTACEA: CIRRIPIEDIA

Verruca stroemia: On collected stones. (6, 11, 16).

Balanus crenatus: Generally Occasional to Frequent on stable rock but dominant in patches. An initial colonising species on bare rock platform at West of St. Donats Point (6). Dominant on pebbles at many sites. (2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16).

Balanus perforatus: Occasional. (15, 16).

Elminius modestus: Recorded as scattered individuals on stones collected deeper than Chart Datum level. Present throughout the survey area with the possible exception of Gore Point (16) where specimens were not found on collected stones. (2, 3, 5, 6, 13, 14).

CRUSTACEA: AMPHIPODA

Astacilla longicornis: Collected. (11).

Caprellidae: A few in sample. (2).

CRUSTACEA: DECAPODA

Homarus vulgaris: One. (13).

Munida bamffica: One. (15).

Pagurus (= Eupagurus) sp.: Generally Occasional to Frequent though Common in patches at some sites. (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16).

Cancer pagurus: Rare. (5, 6, 7, 16).

Macropipus (= Portunus) sp.: One. (16).

Carcinus maenas: One at 6 m. (7).

Hyas araneus: One. (11).

MOLLUSCA

Calliostoma zizyphinum: Occasional to Frequent on south side of Channel only. (11, 13, 14, 16).

Gibbula tumida: One. (2).

Gibbula cineraria: Rare. (13, 16).

Nucella lapillus: Rare or Occasional throughout most of the survey area on rocks deeper than Chart Datum level. Locally Abundant in Porlock Bay (15) and at Gore Point (16). (2, 5, 6, 7, 11, 12, 13, 14, 15, 16).

Buccinum undatum: Generally Rare or Occasional but Frequent at Fairy Rock (2) and Porlock Bay (14). (1, 2, 3, 4, 5, 11, 13, 14, 15, 16).

Nassarius reticulatus: Few in sand. (15).

Dendronotus frondosus: One. (11).

Facelina sp.: On Tubularia indivisa. (9).

Mytilus edulis: Small mussels dominant over extensive areas of rocks off Nash Point (5) from 5 m to +2.5 m. Large mussels present shallower than +2.5 m. (5).

Ostrea edulis: One. (3).

Heteranomia squamula: On collected stones. (16).

Hiatella arctica: Live individuals observed in small numbers at few sites but large numbers at top edges of cliffs off Nash Point (5). Holes only at West of St. Donats Point (6). (2, 5, 6, 10).

Sepiola atlantica: One. (15).

BRYOZOA

- Bicellaria ciliata: Generally Frequent to locally Common throughout the survey area though not recorded west of Hurlstone Point in Somerset. (2, 3, 4, 5, 6, 7, 10, 11, 12, 13).
- Bugula turbinata: One on collected stone. (6).
- Bugula plumosa: The only erect branching bryozoan present in large amounts. Generally Frequent on the north side of the Channel. Occasional colonies at Greenaleigh Point (11) and to the west on the south side of the Channel. (2, 3, 4, 5, 6, 7, 11, 12, 13).
- Flustra foliacea: Occasional to Frequent with some dense patches. Recorded as Common at Porlock Bay (15). (2, 4, 5, 7, 11, 12, 13, 14, 15, 16).
- Conopeum reticulum: On collected stones. (2).
- Electra monostachys: Recorded from collected stones. (10, 13).
- Electra pilosa: Identified from collected stones including cobbles below mud off Watchet (8). (2, 6, 8, 12, 13).
- Callopora lineata: On collected stones. (13).
- Callopora dumerilii: Recorded from collected stone. (10).
- Callopora aurita: On collected stones. (9, 10).
- Phaeostachys (= Escharina) spinifera: On collected stones. (13).
- Schizomavella linearis: One patch on collected stone (2). Several patches on collected stones (13). (2, 13).
- Schizomavella auriculata: On collected stone. (14).
- Smittoidea reticulata: On collected stones. (13, 16).
- Escharella immersa: On collected stones. (8, 9, 13).
- Crisidia cornuta: Present on Polycarpa pomaria in sample. (13).
- Crisia eburnea: Very small amounts. (6, 13, 16).
- Berenicea patina: Several on collected stones. (6, 11, 13, 14, 16).
- Diplosolen obelia: On collected stone. (13).
- Disporella hispida: On collected stones. (13, 14, 16).
- Alcyonidium gelatinosum: Small colonies generally Occasional or Frequent but Common in patches at some sites and Abundant on tops of rocks shallower than 5 m at Greenaleigh Point (11). (2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16).
- Alcyonidium hirsutum: Encrusting on algae. (13).
- Alcyonidium mytili: On collected stone. (16).
- Flustrellidra hispida: Encrusting on algae in shallow water. (13).
- Vesicularia spinosa: Frequent on rocks amongst sand and dense colonies adjacent to sand in the Porthcawl area (sites 2 and 4) but less Abundant to the east. On the south coast of the Channel, recorded as Frequent at Greenaleigh Point (11) and not noted elsewhere. (2, 4, 5, 6, 7, 11).
- Amathia lendigera: On collected stone. (6).
- Bowerbankia gracilis: On collected stones. (2, 10).

Anguinella palmata: On collected stone. (10).

?Pedicellina cernua: Attached to Sabellaria tube. (2).

Baerentsia gracilis: On collected stones. (2, 10).

Orange encrusting bryozoa: Rare. (7, 11).

ECHINODERMATA

Crassoster (= Solaster) papposus: Individuals but Occasional at Porlock Bay (15) and Gore Point (16). (3, 7, 11, 15, 16).

Asterias rubens: Generally Occasional or Frequent. Rare on sand off Porthcawl (1) and Common in Porlock Bay (15). (1, 2, 3, 4, 5, 6, 13, 14, 15, 16).

Henricea oculata: Rare or Occasional at sites on the north side of the Channel, Rare at Greenaleigh Point (11 and 12) but Frequent in the Porlock Bay area (13, 14, 15, 16). (5, 6, 7, 11, 12, 13, 14, 15, 16).

Ophiothrix fragilis: One juvenile observed on cliff. (5).

Ophiura texturata: Common. (15).

Echinus esculentus: Occasional. (14, 15, 16).

ASCIDIACEA

Polycarpa pomaria: Scattered individuals though with some large groups recorded at Fairy Rock (2) and Reynards Cave (7). (2, 7, 11, 13).

Dendrodoa grossularia: Frequent at most sites on stable rock but not recorded from Watchet area. Dominant in patches at some sites but with variable depth distribution of greatest abundance. Dense areas appeared to be on rocks clear of sand. (3, 4, 5, 6, 7, 11, 12, 13, 14, 16).

PISCES

Trisopterus (= Gadus) luscus: One. (5).

Pollachius (= Gadus) pollachius: Shoal. (16).

Gobius paganellus: Three observed. (7).