

PLANKTON COMMITTEE

(Dr D.H. Cushing)

1972

Belgium

(R. de Clerck)

A sampling of eggs and larvae of commercial fishes was carried out on 27 fixed stations along the Belgian coast during February and May.

Canada

(T. Platt)

The feasibility has been studied of stimulating primary production in coastal impoundments by tidally induced upwelling (Biological Station, Nanaimo, B.C). Preliminary research has been started on establishing the optimal rate of upwelling and the pipe diameter necessary to achieve such optimal rates for impoundments of particular size. In another study (Marine Ecology Laboratory, Bedford Institute of Oceanography, Dartmouth, N.S.) the effect of phytoplankton production in the surface waters of coastal inlets by enriching with varying amounts of bottom water is being studied. The aim is to quantify and classify systematically the response of surface inshore phytoplankton communities to this kind of enrichment. This work is also at an early stage but preliminary results indicate that particulate enrichment is achieved with less than 1% addition of bottom water.

Comparative studies in different inlets on the coast of Nova Scotia have revealed that fluctuations in phytoplankton nutrients follow strikingly similar patterns (MEL). It is concluded that except during the spring bloom, nutrient levels in these inlets are controlled more by water exchanges with the continental shelf than by biological processes within the inlets. Flushing of the inlets is most extensive in late summer and autumn. Major water replacement occurs at least once a year on this coast and the flushing takes place on a broad front rather than affecting isolated inlets.

Studies on the nature and significance of heterogeneity of phytoplankton distribution in nearshore environments is being continued (MEL). Spectral analysis of data obtained on the Bradelle Bank, (Gulf of St Lawrence) using a continuous-flow fluorometer system showed that the distribution of the variance of phytoplankton abundance in the mixed layer follows a minus five-thirds power relationship over a range of length scales from 10 m - 1000 m. This result is consistent with, but does not necessarily prove, the hypothesis that local concentration of phytoplankton is controlled largely by turbulence.

An intensive study of the spatial distribution of biomass and productivity of phytoplankton in the Bedford Basin, Nova Scotia was made during the summer of 1972. Six stations were used, and the experimental design, which allowed 10 replicate biomass measures and six replicate productivity measures for each station, enabled calculation of the productivity to biomass ratio, and its standard error, for each of the six stations on each of ten sampling days. The results showed that the assumption of equal P/B for different stations at the same depth on the same day is not always tenable, the departure from homogeneity being a function of the stability of the water column as influenced by the recent wind regime.

A detailed study has been made of grazing on natural foods by neritic copepods, with particular emphasis on the size spectrum of the particulate matter encountered by the grazers (MEL). In the surface waters of Bedford Basin, (Nova Scotia), the dominant copepod species, Pseudocalanus minutus, Temora longicornis, Acartia clausi and Eurytemora herdmani all graze preferentially on, and derive the larger proportion of their nutrition from particle peaks at the high end of the particle spectrum (30 to 50  $\mu$ ) regardless of the season and despite the fact that the species of algae representing these peaks varied markedly from spring to fall. When the data were assembled in terms of a modified Ivlev equation it was concluded that asymptotic feeding rates may be approached only rarely (under bloom conditions), and that threshold food levels could be identified which induced a switch from feeding on particles of a certain size to those of another size.

#### Denmark

(E. Smidt)

#### Home Waters

In connection with the herring larvae programme RV "DANA" has collected 141 samples in the Shetland-Orkney area, in the Buchan area and in the Kattegat. The cruise took place in September-October 1972 and a "Dutch-type" Gulf-III sampler was used for oblique hauls from the surface to 5-10 m above the sea bottom. Salinity, temperature and bathythermograph readings were recorded from 61 stations. Following the separation of the herring larvae, the entire preserved material (4% Formol) was handed over to the Zoological Museum, University of Copenhagen. At 61 stations sampling for Coccolithophorids were performed.

#### West Greenland Waters

Measurements of primary production ( $^{14}\text{C}$ -method) have been made in the coastal water at Godthåb.

In connection with hydrographic observations 36 stramin-net samples (ring diameter 2 m, oblique hauls from ca. 50 m depth) were taken in February-July on three standard east-west sections in the Davis Strait (off Holsteinsborg, Sukkertoppen and Godthåb). Displacement volumes were measured. Invertebrates, fish eggs and larvae were sorted and counted.

#### Programme for 1973

The investigations in West Greenland waters will be continued.

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#### Programme for 1973

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Federal Republic of Germany

(J. Krey)

Institut für Meereskunde, Universität Kiel

(Prof. Dr J. Krey, Dr R. Boje, Dipl. Biol. K. v. Bröckel, Dr U. Horstmann, Dr J. Lenz, Dipl. Biol. P. Martens, Dipl. Biol. V. Smetacek, Doz. Dr B. Zeitzschel)

The investigations to estimate the standing stock of phytoplankton and zooplankton in relation to environmental factors were continued in the Kiel Bight (Krey). In addition to the long-term observations at station Boknis Eck, another station at the entrance of the Eckernförde Fjord was visited every two weeks during 1972. The following properties were measured : temperature, salinity, phosphate, nitrate, nitrite, ammonia, silicate, oxygen, seston, chlorophylla, particulate N, particulate C, caloric content of seston, phytoplankton abundance and species composition, zooplankton abundance and species composition (v. Bröckel, Martens, Smetacek, Zeitzschel). A steel platform was installed at a depth of 12 m in the Eckernförde Fjord to investigate the production, decomposition and sedimentation of organic matter in plastic bags of 13m<sup>3</sup> volume which are attached to the tower. Each of the bags contains a natural population of organisms and can be regarded as a micro-ecosystem with a small known supply of matter and simplified system of energy transfer.

Several scientists of the department took part in the German METEOR Upwelling Expedition (19 January to 20 February 1972) off West Africa (CINECA). Studies on primary production and the standing stock of plankton were carried out with different methods. A new plankton pump and a new in situ fluorometer were used successfully (Boje, Lenz, Weigmann, Zeitzschel).

Research was also carried out in the Baltic on eutrophication processes caused by blue-green algae (Horstmann).

Bundesforschungsanstalt für Fischerei - Institut für Küsten- und Binnenfischerei, Hamburg (Prof. Dr. K. Tiews)

Plankton sampling for the study of the distribution of Crangon larvae in relation to hydrographic and other factors along the German North Sea coast were discontinued.

Routine investigations on the plankton composition in the Elbe estuary were continued.

Institut für Hydrobiologie und Fischereiwissenschaft, Hamburg

Phytoplankton and organic carbon (Gillbricht) and zooplankton (Weikert) have been investigated in the upwelling area off NW Africa in January/March 1972 (R/V "METEOR"), and the studies on other material from this region have been completed.

More detailed zooplankton studies of the samples collected with the Longhurst-Hardy Plankton Recorder in different areas of the North Atlantic have been continued.

As for sampling from the Norwegian Sea, special interest was paid to the short time variation of the zooplankton distribution as a function of light, discontinuity layer and other factors (Krause).

The vertical migration and distribution of zooplankton in the sub-tropical NE Atlantic has been studied more thoroughly (Schirmer).

#### The Plankton Programme of the Institut für Seefischerei, Hamburg

At present planktological work is done in the Institut für Seefischerei (Hamburg) in order to estimate the influence of the ocean currents on the zooplankton distribution on the shelf area of Patagonia. Especially the entrance of the nutrient rich Falkland current into this area is of great interest for fisheries purposes.

Some zooplankton groups are important in research on account of their tracer function for the different water bodies: Euphausiades (Schulz, Hamburg), Chaetognathes (Kapp, Hamburg), Fish eggs and larvae (John, Hamburg-Kiel), Appendiculariae (Bückmann, Hamburg). The work will be finished at the end of 1973.

#### Biologische Anstalt Helgoland

Research activities of the Department of Biological Oceanography in 1972 :

1. The year round observations on plankton and seston stocks and the measurements of chemical and hydrographical parameters were continued at the Station Helgoland Roads. Salinity and temperature were measured daily (except at week-ends), chemistry, seston and plankton three times a week.

The weight, chlorophyll-a and protein content of the seston was determined. Plankton analysis of some samples was made by qualitative and quantitative counting. The hydrochemical analyses comprised inorganic phosphate, nitrate, nitrite, ammonia, calcium and magnesium. The pH and the visibility (Secchi discs) were measured.

2. From 1 April until 16 October 1972 daily sampling of surface water from four German lightships in the southern German Bight was continued. Quantitative and qualitative counting of the phytoplankton in some 760 samples will provide information on the succession of phytoplankton in different water masses of the southern German Bight during the year cycle.

3. From 28 to 30 June 1972 plankton investigations were carried out at hourly intervals at Helgoland Roads. Ninetysix water samples were taken at two depths and analysed quantitatively for their plankton content to study the influence of tides on the plankton distribution.

4. Three 2 to 3-day cruises in the Helgoland Bight were undertaken to measure the plankton distribution in June, July and August. Ninetysix samples are being analysed qualitatively and quantitatively.

5. Investigation of the ecology of the Waddensea between the island of Sylt and the mainland was started. Twice daily (high and low water) during April through to December 1972, samples of zooplankton and larger phytoplankton were concentrated from 10 litres of water taken from a bridge near List /Sylt. Water temperature and visibility (Secchi disc) were measured. The seasonal fluctuation of the plankton of the Waddensea is investigated from plankton counts.

From 1 to 4 August and 21 to 24 August 1972 intensive studies of chemical, hydrographical and planktological properties of the Waddensea east of Sylt were carried out from R/V "FRIEDRICH HEINCKE". From a total of 280 water samples for phosphate, silicate, nitrate, nitrite and ammonia, data on exchange of nutrients by tidal currents were obtained from vertical series

of water samples taken at hourly intervals at fixed positions. Particulate organic carbon and nitrogen in the samples were determined.

6. From 25 May to 9 June 1972, R/V "FRIEDRICH HEINCKE" made a cruise to the Bay of Biscay. As in 1972, the distribution of eel larvae near the continental slope was investigated in relation to hydrographical, chemical and planktological conditions in the upper 300 m of the water column. On 27 stations vertical series of water samples were taken after measurement of thermal and salinity stratification using a temperature-salinity probe. Phosphate, silicate, nitrate, nitrite and ammonia were measured in 166 water samples, using the Auto-Analyzer. Salinity and temperature were measured. Quantitative plankton samples were taken. Most of the stations were close to the continental slope; the inner part of the Bay of Biscay (Fosse de Capbreton) was investigated most intensively.

7. From 24 May to 15 June 1972, a cruise undertaken by the Dutch RV "TRIDENS" from the English Channel to the Azores served the same purpose. On a section from England to the Azores, 87 water samples were analysed for phosphate, nitrate, nitrite, ammonia and salinity. Phytoplankton was counted in 91 samples.

#### Institut für Meeresforschung, Bremerhaven

Taxonomy of plankton diatoms of the Indian Ocean (Dr Simonsen).

Size distribution of suspended particles in sea water (Dr Wellershaus).

Identification of zoëa-larvae of brachyuran crabs of the North Sea (Dr Wellershaus).

#### Finland

(Å. Niemi)

#### Institute of Marine Research, Helsinki

##### Phytoplankton and primary production

- a) Investigations on phytoplankton, primary production ( $^{14}\text{C}$  in situ), total phosphorus and nitrogen, and environmental parameters were performed in unpolluted sea areas at 3 coastal stations: Orrengrund (mid part of the Gulf of Finland), Tvärminne (entrance to the Gulf of Finland) and Kaskinen/Kaskö (north-eastern part of the Bothnian Sea). Samplings were performed every second or third week; during the ice-period more sparsely and sporadically.
- b) Studies on primary production ( $^{14}\text{C}$  in situ) and phytoplankton have been made in the Lovisa area (mid part of the Gulf of Finland) and at Olkiluoto (off Eurajoki, Bothnian Sea) in order to get background data from these two areas, where atomic power plants are to be built. One or two samplings a month have been made during the ice-free period.
- c) During the summer cruises with R/V "ARANDA" measurements of chlorophyll-a and the primary production ability ( $^{14}\text{C}$ , incubator, constant light and temperature), and sampling of phytoplankton were performed at international stations in the Baltic proper, Gulf of Finland and Gulf of Bothnia.

##### Zooplankton

Zooplankton sampling (Hensen net, mesh size 150  $\mu\text{m}$ , vertical haul : 25-0 m) has been carried out for several years at the following coastal stations : Orrengrund (1967- ), Tvärminne (1966- ), Seili/Själö in the

Archipelago Sea (1966- ), Valassaaret/Valsöarna in the Quark (1971- ) and Krunnit in the north-eastern part of the Bothnian Bay (1966- ). Sampling has been performed three times a month (once a month during the ice period).

During the summer cruises with R/V "ARANDA" zooplankton has been sampled (Nansen net, mesh size 150  $\mu\text{m}$ , vertical hauls) at international stations in the Baltic.

#### Tvärminne Zoological Station

Phytoplankton, chlorophyll-a, primary production ( $^{14}\text{C}$ , in situ), total phosphorus and nitrogen, and environmental parameters have been studied in the Tvärminne-Pojovik area. Sampling was performed 1-2 times a month; once a month during the winter season. A detailed qualitative phytoplankton study in this area was performed in early August. Daily variations of the primary production level were studied during a week in early July and late August.

#### The Finnish IBP-PM Project

Phytoplankton, primary production ( $^{14}\text{C}$ , in situ), and environmental parameters were studied in the Krunnit area (north-eastern part of the Bothnian Bay) at two stations. The outer station represents the unpolluted sea area, the inner one a weakly polluted coastal area.

#### Water Conservation Laboratory of Helsinki City

Phytoplankton and zooplankton (vertical series, mesh size 50  $\mu\text{m}$ ), were sampled and primary production ( $^{14}\text{C}$ , in situ) and environmental parameters were measured in the archipelago waters off Helsinki and Espoo twice a month during the ice-free period. Samplings were made at several stations extending from the severely polluted inner bays to the unpolluted area outside the Archipelago.

#### France

(L. Marteil)

#### 1. Institut des Pêches Maritimes

##### Ichthyoplancton

Les travaux ont porté sur :

- les aires de ponte de la sardine et de l'anchois dans le golfe de Gascogne, en relation avec les conditions hydrologiques; (une relation des travaux effectués en 1971 a été faite au CIEM (S. Arbault et N. Lecroix)).
- les pêches de post larves des mêmes poissons;
- l'identification des oeufs et larves de divers autres poissons, tels que Scomber scombrus, Solea solea, Merlucius merlucius, etc.
- la fécondité des sardines; la connaissance de l'indice gonado-somatique peut être un facteur intéressant pour la détermination des stocks de ponte.

##### Zooplancton

L'étude qualitative et quantitative du plancton récolté trimestriellement sur le plateau continental du golfe de Gascogne a été réalisée en 1972. Des comparaisons et la mise en évidence de variations dans la répartition des principales espèces récoltées dans les 140 échantillons de 1971 et dans ceux de 1972 seront établies.



### Zones chonchylicoles

Les laboratoires des régions d'élevage de mollusques ont étudié qualitativement et quantitativement le phytoplancton en relation avec la croissance et la reproduction des coquillages. Ils ont recherché particulièrement les planctontes susceptibles de toxicité; un phénomène "d'eaux rouges" à Gonyaulax spinifera a été observé en juin en Bretagne sans qu'il y ait de conséquences néfastes.

Les populations larvaires d'huîtres et de moules ont été étudiées au moment de la reproduction de ces mollusques.

### Programme pour 1973

Poursuite des travaux entrepris.

### 2. Travaux du Laboratoire de Biologie Animale (Plancton) Marseille

#### Atlantique

- Etude de Décapodes pélagiques (Pénéides et Carides) de l'Atlantique nord-africain.
- Distribution verticale des Siphonophores de l'Atlantique oriental, d'après une station de longue durée du "METEOR".

Ces travaux ont donné lieu à un compte rendu (CIEM, 1972, J.P. Casanova).

- Recherches sur l'influence des ions ferriques sur divers organismes planctoniques (collaboration avec ISTEPM).
- Etude radiographique de larves de poissons, de différentes tailles.

#### Méditerranée

La poursuite du programme générale de recherche sur le zooplancton des Bassins occidental et oriental a été accompagnée de quelques études particulières :

- Investigations sur le zooplancton des eaux des Baléares dans le cadre de campagnes de recherche sur le thon rouge (collaboration avec ISTEPM).
- Ptéropodes : structure de la coquille au microscope à balayage. Clé de détermination d'après des éléments autres que la coquille;
- Propositions en vue de la standardisation des engins et méthodes de récolte du plancton pour l'Etude en Commun de la Méditerranée.

### Programmes pour 1973

Regroupement des résultats obtenus pour les Décapodes pélagiques dans l'Atlantique eurafricain depuis 1967.

Etude du plancton récolté par la "THALASSA", en 1971, dans l'Upwelling mauritanien.

Expérimentation sur la nutrition des Mollusques d'élevage avec certaines espèces phytoplanctoniques.

Ecologie expérimentale sur les Copépods : conditions de survie en laboratoire, comportement nutritif vis-à-vis de diverses espèces phytoplanctoniques, métabolisme respiratoire selon sexe et âge, développement.



Iceland  
(I. Hallgrímsson)

Phytoplankton

Measurements of primary production in Icelandic waters by means of the  $^{14}\text{C}$  technique were carried out on samples from standard depth 0, 10, 20 and 30 metres. As previously, samples for quantitative analysis of phytoplankton were collected wherever productivity was measured. Chlorophyll-a was determined in samples from the 10 metre level only. Secchi disc readings were made whenever possible.

During the period 30 May to 12 June productivity was measured at 60 stations in the waters off the north-west, north and north-east coasts of Iceland; at 51 of these stations chlorophyll-a was determined.

During the period 5-8 February, 26-29 April, 25-29 May and 18-22 July measurements of primary production were made at fixed stations in the waters off the south-west and south coasts of Iceland (Häfadjúp-Snafellsnes programme), about 26 stations each time. In this area chlorophyll-a was only determined during the periods 25-29 May and 18-22 July at 13 and 21 stations respectively.

Zooplankton

Zooplankton sampling was carried out at 336 stations in 11 surveys in 1972.

In the waters off the west, south-west and south coasts of Iceland 117 stations were worked in 4 surveys. Off the north-west and north coasts of Iceland 71 stations were worked in 1 survey. In the Irminger Sea and in East-Greenland waters 112 stations were worked in 3 surveys. East of Iceland 20 stations were worked in 2 surveys. En route Langesnes-Jan Mayen-Spitsbergen 16 stations were worked in 1 survey.

The sampling was carried out with a Hensen net from 50 - 0 m and Icelandic High Speed Samplers at different depths.

As previously, the continuous plankton survey between Reykjavik and New York and Reykjavik and Leith, worked in cooperation with the Oceanographic Laboratory in Edinburgh, were still in progress.

Ireland

Nothing to report.

Italy

No report received.

Netherlands  
(P. Korringa)

During various cruises the Dutch research ships "TRIDENS", "WILLEM BEUKELSZ", "SCHOLLEVAAR" and "STERN" have collected plankton samples for various purposes in the year 1972. The two larger ships operated in the North Sea, the smaller ones in the Waddensea and in the Zeeland estuaries. The samples were taken to study quantitatively the larvae of herring, cod and brown shrimp.

In the coastal water off IJmuiden plankton samples have been taken with regular intervals. The pattern observed in the phytoplankton did not differ

appreciably from that in previous years. Asterionella japonica increased in numbers till late in May, further Chaetoceros sp., Nitzschia sp., three kinds of Rhizosolenia and also Skeletonema and Thalassionema were common inhabitants of the inshore water.

Early in June Coscinodiscus concinnus was found to be of normal abundance at the station at 51°57'N, 03°46'E. (4 000 cells/litre). It was very surprising to note that in the first two weeks of July this diatom developed such a tremendous bloom in the coastal water of the province North Holland that the public complained about a cow-like stench of the sea water.

Later in summer dinoflagellates developed, finally leading to a bloom early in October with 60 000 cells of Ceratium lineatum, 12 000 cells of Dinophysis acuta and 22 000 cells of Prorocentrum redfieldi.

To watch for possible dinoflagellate blooms in the mussel district in Zeeland plankton samples have been taken throughout the summer season. A modest bloom of Noctiluca miliaris was observed, whereas the numbers of Phalacroma rotundata remained rather modest. At the end of July, Ceratium fusus appeared and Prorocentrum micans reached a concentration of 1 500 cells per litre, which increased late in summer to a maximum of 5 600 cells.

Tests with white rats carried out during the plankton bloom led to negative results only : the rats did not show symptoms of diarrhoea. There was no need to postpone the opening of the mussel season, as had been done in 1971.

#### Norway

##### 1. Institute of Marine Research (G. Berge)

###### Phytoplankton (G. Berge)

1. The primary production rates and the standing stock of phytoplankton were measured at the coastal banks west of Norway, with the emphasis on the nursery grounds of cod and herring. The programme is a long-term monitoring of environmental conditions during and after hatching of the fish larvae and includes also light and turbidity measurements and particle size frequency analysis. The primary production rates per unit of chlorophyll at standardised conditions (PI) was used to compare local and annual changes in the activity of the producing plankton.
2. A survey of primary production, chlorophyll and particle size frequency was made from 4 to 15 April covering the northwestern Norway as to the biological conditions and presence of herring larvae after the spawning periods.
3. From 5 April to 13 May a survey of primary production, chlorophyll and particle size frequency was undertaken to the coast of Finnmark and the Barents Sea.
4. As part of the CINECA programme, a cruise was arranged to the west coast of Africa, between Villa Cisneros (Spanish Sahara) and RioCasamance (Senegal). Amongst the objectives was the study of distribution of pelagic fish in relation to environmental factors. Primary production, chlorophyll, particle size frequency as well as nutrients and oxygene analysis were made.

###### Zooplankton (Kr.Fr. Wiborg)

Sampling was continued at the permanent oceanographical stations along the coast of Norway and at the Station M. The material is being worked up by the short cut method after measurement of the displacement volume: A programme has been prepared for an easy calculation of the biomass of the various species.

For the period April-August, the average plankton volumes in ml/m<sup>2</sup> during 1971-1972 were as follows :

Year	Utsira SW Norway	Sognesjøen W Norway	Skrova NW Norway	Ingøy N Norway	Station M	
					66°N 100-0m	02°E 600-0m
1970	10.4	9.3	36.2	61.4	19.9 <sup>x)</sup>	63.7 <sup>x)</sup>
1971	26.7	21.1	36.6	36.6	35.2	61.9
1972	14.7 <sup>xx)</sup>	32.8 <sup>x)</sup>	35.8	22.6	24.0	59.7

x) April-June      xx) June-August

Salps were observed at Station M at the beginning of November and on herring drift nets off Andenes, NW Norway on 23 October.

No investigations were carried out in connection with the fishery for Galanus. The quantity taken commercially was limited by the demand to about 50 metric tons.

## 2. University of Bergen, Biological Station, Espegrend

Common to all plankton sampling in 1972 was an emphasis on the variations on standing stock in Norwegian fjords and the causes which lie behind them.

In Lindåspollene, a system of small branched fjords north of Bergen, monthly samples of zooplankton have been taken at three fixed stations using Clarke-Bumpus samplers and WP-2 nets, the aim being to study community structure, standing stock and production.

In Korsfjorden, a more open fjord filled with Atlantic water below the surface layers; fortnightly sampling was continued at one fixed station with a plankton net designed to take a Longhurst-Hardy plankton sampler, and with Beyer's low-speed midwater trawl, the aim being to record the dynamics of the community structure in the water column and investigate trophic relationships of the carnivores. Associated investigations in the laboratory on the feeding and assimilation of major elements in the community have been started.

In Hardangerfjorden, monthly sampling with water samplers (phytoplankton), Clarke-Bumpus samplers and a Nansen net continued until July with the aim of recording the situation before a proposed hydroelectric scheme came into operation. When the scheme was dropped the investigation was moved to Ryfylke where a similar sampling programme at 9 fixed stations is designed to study the effect on the plankton so that one receives all the fresh water run-off, the other none, by comparing the present communities with those which develop after the scheme becomes operative.

Investigations continue on the systematics and biology of bottom-living copepods, work which, inter alia adds to the knowledge of distributional patterns in Norwegian fjords (J.B.L. Matthews and U. Lie).

## 3. University of Trondheim, Biological Station and the Norwegian Institute of Seaweed Research, Trondheim

1. Studies on the phytoplankton ecology of Trondheimsfjorden, with special reference to the dynamics of phytoplankton blooms in relation to the environmental factors. Biomass experiments and parameters for the physiological state of the population (Sakshaug and Myklebust).

2. Production of protein and carbohydrates in the dinoflagellate Amphidium carteri (Hulburt). (Myklestad and Sakshaug).

3. Zooplankton ecology of Trondheimsfjorden with special reference to annual variations in relation to current systems (Strømgren).

4. Statens Biologiske Stasjon, Flödevigen

No plankton research was carried out in 1972.

5. Tromsø Museum, Marinbiologisk Stasjon, Tromsø

1. The taking of bi-monthly routine stations in some fjords in Troms and Finmark was continued. Displacement volume assessments are being based on divided vertical hauls with 500  $\mu$ mesh Juday net.

2. Looking particularly for pelagic fish eggs and larvae, coastal waters of Nordland, Troms and Finmark were sampled by means of Bongo net and Zaitsev hyponeuston net.

3. In the Skjomen-Ofotenfjord, routine quantitative and qualitative plankton investigations were continued by means of divided vertical hauls with a 200  $\mu$ mesh Juday net. Samples were taken weekly from mid-April to mid-August and bi-monthly during the rest of the year.

4. From April through August, fish eggs and larvae were sampled monthly in the Skjomen by means of Zaitsev hyponeuston net, Clarke-Bumpus plankton samplers or Bongo net, and Isaacs-Kid midwater trawl.

6. University of Oslo, Institutt for Marinbiologi og Limnologi, Avd. A/C

1. Chemical studies were continued on the compounds produced by photosynthesis in marine algae (E. Föyn and S. Hanneborg).

2. Investigations were carried out on the uptake of nutrients in plankton algae (E. Föyn and B. Löken).

3. The studies of long-term changes in the composition of the Oslofjord zooplankton were completed (H.R. Hovde).

4. Investigations on the concentration of heavy metals in selected species of zooplankton from the Oslofjord and coastal waters outside were continued. (L. Kirkerud, F. Beyer).

5. Investigations on the local ecology of euphausiids in the Oslofjord were continued (S. Fevolden, F. Beyer).

6. The working up of the material on the diurnal variations in the vertical distribution of certain zooplankton species in the vicinity of the bottom in Kiel Bay was completed. (I. Hesthagen).

Avd. B (F. Beyer)

1. Phytoplankton Surveys

a) The investigation of the spring phytoplankton in the spawning areas for cod and herring (Lofoten-Møre) was continued, in collaboration with the Marine Research Institute of the Fisheries Directorate, Bergen, and part of the Norwegian IBP/PM programme (I. Nygaard).

b) The phytoplankton part of oceanographic surveys with the object of obtaining a basis for comparison with the situation after changes in the freshwater supply through regulations connected with the building of hydroelectric power plants. Samples from two surveys have been worked up and reports will be prepared: x) From Skjomen, near Narvik (B. Schei), xx) from Hardangerfjorden (A. Dick). Samples are being collected from a third survey, in the Ryfylkefjords.

c) A survey of the phytoplankton in coastal waters of the southern Norwegian coast in autumn and winter. (In collaboration with the Marine Research Institute, Fisheries Directorate, Bergen). (K.E. Berg).

d) A report is being prepared on an all-year survey of the phytoplankton in Nordåsvatn, near Bergen (K. Tangen).

## 2. Special Phytoplankton Studies

a) Taxonomic studies with the use of transmission and scanning electron microscope continued on coccolithophorids (K.R. Gaarder and B.R. Heimdal), diatoms (G.R. Hasle and B.R. Heimdal) and microflagellates (J. Throndsen).

b) The study of Coccolithus huxleyi, its life cycle, fine structure and coccolith formation has been continued (D. Klaveness).

c) Experiments on primary production and photosynthetic activity in nanoplankton flagellates (J. Throndsen).

d) Electron microscope studies on coccolithophorids from the German "Rossbreiten" Expedition, 1970 (B.R. Heimdal).

e) An investigation has been continued on the effect of elevated temperatures on the growth of the phytoplankton of the Oslo Fjord. This investigation was prompted by the announcement of plans for a power plant using Fjord water for cooling purposes. (E. Dahl).

f) The growth of marine plankton diatoms under conditions of silicate limitation is being studied (E. Paasche).

## Programme for 1973

### 1. Phytoplankton surveys

a) Investigations mentioned under 1972 - a), -c) will be continued.

### 2. Special phytoplankton studies

a) Studies mentioned under 1972 - 2a,c,d,e,f will be continued.

b) New projects :

1. Enrichment and other studies of the possible role of silicon as a limiting nutrient in the Oslo Fjord (B.-J. Langemyr).

2. Changes in the silica content of diatoms accompanying light- and temperature induced variations in growth rate. (E. Paasche, others).



Poland

(W. Mańkowski)

Polish investigations in 1972 were conducted by three institutions in several areas.

The Sea Fisheries Institute carried out the investigation concerned with phyto- and zooplankton in the southern Baltic area. The phytoplankton samples were taken with the standard Copenhagen net, gauze no. 25 and with a Petersen bottle. The Copenhagen net was used to make vertical hauls from the whole water column divided into 5 water layers:

- from the bottom to 70 m depth
- from 70 m to 50 m depth
- from 50 m to 30 m depth
- from 30 m to 15 m depth
- from 15 m to 0 m depth

In total, 237 samples were taken.

By means of the Petersen bottle samples were taken from 0.5 m, 5 m, 10 m, 15 m, 20 m and further down to the bottom at 10 m intervals. Only the samples of the 0-20 m layer were examined qualitatively and quantitatively. Altogether 266 samples were worked up and the following phytoplankton composition was found :

- 10 species of Cyanophyceae
- 12 species of Dinoflagellatae
- 1 species of Silicoflagellatae
- 1 species of Chrysophyceae
- 32 species of Bacillariophyceae
- 15 species of Chlorophyceae

In all 71 species.

The North Sea water influx that had taken place in April 1972 introduced into the Baltic 7 species that were either quite new for the Baltic or had rarely been noted hitherto. These were six species of Bacillariophyceae and one species of Dinoflagellatae.

Quantitative changes as regards the southern Baltic phytoplankton composition were found as follows : In March the predominant species was Skeletonema costatum in the Bornholm Deep area. The quantitative determinations gave as a result 348 million cells per 1 m<sup>3</sup> of water. In May, the prevailing species in the Gdańsk Deep was Kirchneriella obesa (1 050 million/m<sup>3</sup>). In June, Kirchneriella obesa was found to be the predominant species in the waters of the Slupsk Furrow (630 million/m<sup>3</sup>); in July in the Bornholm Deep areas the predominant species was Microcystis aeruginosa (1 293 million m<sup>3</sup>). In August, the predominant species in the Bornholm Deep was found to be Cyclotella meneghiniana (1 432 million/m<sup>3</sup>). In October, Cyclotella meneghiniana was the most numerous among the phytoplankton species of the Gdańsk Deep area (222 million/m<sup>3</sup>). In December, the same species was predominant in the area of the Slupsk Furrow (100 million cells/m<sup>3</sup>).

For studies on microzooplankton the samples were taken by vertical hauls with a Nansen net, gauze No. 8 from the depths given above. Altogether 600 samples were taken, and in addition, nearly 600 samples were taken with the plankton sampler of 9 liter capacity from the above water layers.

The sampling was made at station G<sub>2</sub> of the Gdańsk Deep at 12 and 24 hours with the Nansen net and at 6 and 18 hours with the Hensen bottle. The above material was examined in the Sea Fisheries Institute and in the Faculty of the Sea

Fisheries Academy of Agriculture at Szczecin. The studies concentrated on the vertical and horizontal distribution of particular species in the annual cycle and the distribution of biomass. The plankton material was also used to learn the biology and ecology of the microzooplankton in the area of the southern Baltic.

The Oceanographical Institute of the Gdańsk University was concerned with the determination of the actual composition of the phyto- and zooplankton as well as with its vertical and horizontal distribution within the Bay of Puck, as this area is now extremely exposed to pollution by industrial and agricultural waste waters. The water samples for investigation were taken at 5 stations once a month by vertical hauls from the bottom to the surface by means of the Copenhagen net and the Petersen water sampler of two liter capacity from three different depths.

For the investigations by the Sea Fisheries Institute concerning the macroplankton and the occurrence of fish eggs and larvae, the samples were taken 10 times in the year at 10 routine stations in the area from the Arkona Deep in the west to the Gdańsk Deep in the east. For this purpose vertical hauls were made with the Hensen net from the bottom to the surface. At each station three hauls were made and on the whole 288 samples were collected. The samples destined for investigation of the vertical distribution of the macroplankton were taken from particular water layers by means of a closable net of the Nansen type. The samples have been partly worked up and have given a view on the occurrence and distribution of the macroplankton. It was striking that Sagitta elegans baltica occurred numerously in the region of the Gdańsk Deep; yet it was there only in the period of February and March, being merely present in the periphery of this deep, i.e. where the depth was about 77 m, thus where it was by about 35 m shallower than the maximum depths of the Gdańsk Deep. Four hundred and four individuals per  $\text{lm}^2$  of the sea surface were caught there. During the remaining part of the year only single individuals were caught. A similar situation was also observed in other deep areas, such as the Slupsk Furrow, Bornholm Deep and Arkona Deep, the number of individuals per  $\text{lm}^2$  of the sea surface being comparable with that of the Gdańsk Deep only in the Bornholm Deep, where 376 individuals were caught under  $\text{lm}^2$  of the surface.

In spite of the strong influx of saline waters in April, the organisms that will commonly be brought in this way did not occur in great numbers this time, for instance Sagitta setosa failed to be numerous. Its numbers were below 300 individuals under  $\text{lm}^2$  of sea surface. This species was found to be more abundant in November and December but then probably due to another influx which was observed in the autumn to drive out the Baltic waters of intermediate layers ("wedging influx"). Besides these species, the presence of the copepod Calanus finmarchicus and of the appendicularian Oikopleura dioica was proved.

The same material contained fish eggs and larvae. As an indicator of intensity of fish spawning I have adopted the quantitative occurrence of eggs of the two fish species that indicate fairly different ecological requirements during this specific period of life. The cod requires a rather low temperature of the water for spawning at a salinity higher than 10‰, thus it spawns exclusively in the bottom water layer of the Baltic Deep. The sprat needs rather warmer water, whereas it tolerates quite a wide range of salinity above 6‰.

As compared with 1971, the spawning of cod in 1972 was more intensive, since more cod eggs were found per  $\text{lm}^2$  of the sea surface, whereas the spawning of sprat was found to be weaker than in 1971, especially when the occurrence of sprat larvae was used for the estimation.

The microplankton from the same catches was measured with respect to volume and weight of its wet and dry mass. Hitherto I used to present the results of such measurements in terms of wet weight, therefore I will do the same now. The year of 1972 was better as regards the microplankton production in comparison with 1971. In that year the maximum of the average biomass amounted to 27.8 g whereas in 1972 the values of the production in June, July and August were found to be 31.6 g, 34.8 and 42.0 g respectively.

Thus, the year 1972 is to be considered as a considerably better one than 1971 as regards the secondary production.

The Sea Fisheries Institute conducted also the plankton investigation in the North Sea, namely in its western part between 55°30' and 58°30'N. in the period September-October. The distribution of 77 stations there was regular. The fish larvae were caught by means of a speed plankton sampler of the type "Hai". 377 herring larvae, of 7-29mm in length, were caught. The average length was 14.4mm.

In the Oceanographic Institute at the Gdańsk University the phyto- and zooplankton material from the Bear Island and Spitsbergen area were examined with respect to the qualitative and quantitative composition. This material was sampled with the standard Copenhagen net. The hauls were made vertically from the bottom to 30 m depth and from 30 m to the surface.

The above area was visited in the spring and autumn of 1972. During the cruise plankton samples were taken along the ships' route from Øresund to Spitsbergen at about 1° intervals. Seventytwo samples from this region are now worked up.

In the same Institute the plankton material from previous years, collected during a cruise to the NW African shelf, was studied. The distribution and seasonal changes in the intensity of development of Penilia avirostris was worked on in 1972.

In 1973 the investigations in the Baltic and North Sea will continue. Also the older material collected from some other marine regions will continue to be studied.

#### Portugal

(M. H. Vilela)

The cruises along the western and meridional Portuguese coast started at the end of 1970 and have been continued during the years of 1971 and 1972. These cruises study different seasonal situations and will continue up to the beginning of 1974. Thereby we try to acquire a general knowledge about plankton organisms and their possible connection with the distribution and movement of large water masses, as well as a knowledge concerning the spawning zone and season of some of the most important commercial fish species and of the most suitable environmental conditions for their settlement. The identification and volumetric evaluation of zooplankton and some species of ichthyoplankton as well as pigment evaluation studies are continued at the laboratory. The preliminary results of each cruise are about to be published together with hydrographical data.

Besides these campaigns, the Hydrographic Institute has supported other organisations engaged in similar works, collecting and analysing the data.

Marine Biology Institute

Maintenance of cultures of diatoms and phytoflagellates. Cultures of some Copepoda species. Study of the growing stages of Acartia grani are published in "Notas e estudos do Instituto de Biologia Marítima no.40".

Spain

(J. Corral & M. Durán)

During the "Noriberia I" cruise of the RV "CORNIDE DE SAAVEDRA", north of Spain in April and May 1972, a great number of pigment determinations were made. Their study is in progress. During the same cruise, 200 samples of zooplankton were taken; the selection of eggs and larvae of fish has been started, as well as the study of copepod biomass, salpae and chaetognats.

In the "Norcanarias" cruise in the NW African region, studies of carbon uptake, pigment determinations and content of nutrients were made.

During 1972, methodic studies were continued on productivity and nutrients in Santander Bay, Balearic Islands and Canary Islands.

Sweden

(A. Lindquist)

Skagerak and Kattegat

Regular sampling has been carried out for zooplankton in certain areas during a larger part of the year (mainly by net gears). During March, a survey was made for immigrating eel larvae (Isaac-Kidd Midwater Trawl) and during October a survey for herring larvae (Gulf III sampler and Isaacs-Kidd Midwater Trawl.)

Baltic proper and Bothnian Sea

Intensive plankton investigations have been carried out and form part of a national long-term programme. Points of interest are phyto- and zooplankton sampling, primary production ( $^{14}\text{C}$ ), chlorophyll measurements, detritus measurements and hydrographical observations. The work is divided into four parts:

- 1) zooplankton investigations (for studies of energy flow through different trophic levels).
- 2) measurements of primary production, mainly sections Visby-Västervik and Askö-Landsort, as well as at open sea stations.
- 3) measurements of primary production of four open sea stations in the Baltic and the Bothnian Sea;
- 4) measurement of primary production in the Bay of Hanö.

In the Baltic proper, investigations on ichthyoplankton have been continued. The hydrographic situation point to bad conditions for hatching of cod eggs. For sprat the situation is the reverse : large numbers of eggs and larvae have been encountered which perhaps is related to an eutrophication of surface waters.



United Kingdom

1. England

(D. Harding)

1. Fish egg and larval surveys

A number of plankton surveys were carried out during 1972 by MAFF research vessels and hired craft. On all of these surveys high speed plankton samplers were used to collect the eggs and larvae of commercial fishes for stock and recruitment studies.

a) Offshore surveys

Three surveys were carried out during the year as part of the International Programme to estimate the abundance of herring larvae, and results have been reported to the Herring Committee in greater detail. The areas surveyed were : 1. Southern Bight and Eastern Channel in January; 2. Butt of Lewis, Cape Wrath and the sea area to the west of the Orkney and Shetland Islands in September; and 3. Longstone-Whitby-Dowsing and SW Dogger Bank in October.

Other surveys were carried out in 1972 in the following sea areas : 1. Three surveys in January, February and March to the Western English Channel between 49°30'N to 50°15'N and 2°30'W to 40°10'W for plaice eggs, to estimate extent and size of the local plaice spawning, 2. One survey in March to the Irish Sea north of 53°30'N for cod eggs to estimate the extent of the cod spawning, 3. One survey in the S. Bight in May to sample fish larvae in relation to potential predators; to carry out studies on the vertical distribution of fish larvae and to continue comparative tests between different high speed samplers, 4. One survey of the whole of the North Sea between 52°N and 57°W for sprat eggs and larvae.

b) Inshore surveys

1. Surveys of estuarine and inshore waters were carried out along the West Coast of England and Wales in February, April and June using a paired 30cm and 50cm high speed sampler and a Neuston net, all of which were fitted with 24 m.p.cm nylon plankton nets. The aim was to identify inshore spawning grounds of fish from distributions of eggs and larvae. Samples from the Bristol Channel have been made available to the IMER team from Plymouth which is studying this sea area for seasonal variation in planktonic organisms in relation to environmental changes.

On all these cruises hydrographic measurements of temperature, salinity, pH and oxygen were made continuously.

2. Monthly cruises were also carried out in the Flamborough-Scarborough area of the North East Coast of England using an unencased 50cm plankton sampler (based on the Gulf V sampler) to sample plaice larvae immediately prior to settlement in Filey Bay.

2. Phytoplankton studies

Estimates of phytoplankton standing stock were made on three cruises in the Southern North Sea and two cruises in more distant northern waters. The estimates were made continuously by pumping surface water to a Turner fluorometer Model 111 at sea, and expressing readings as  $\mu\text{g/l}$  of chlorophyll  $a$  after calibrating against samples taken for spectro-photometric analysis in the laboratory.



### 3. Experimental work

To support the work of the plankton section on production cycles of zooplankton, the eggs and larvae of fishes and complete life cycles of certain planktonic crustaceans are being studied in the laboratory. In 1972, the eggs of the cod and plaice were incubated to hatching and the larvae grown through their early development at eight temperatures. Pseudocalanus minutus was grown through its complete life cycle at four temperatures and a start was made on a similar experiment with Calanus finmarchicus. The work was carried out by placing the animals in containers of sea water in specially constructed aluminium incubator blocks which develop a linear gradient along their length when the block is heated at one end and cooled at the other, and allows simultaneous incubation over a selected range of temperatures.

## 2. Scotland

(J. A. Adams for J. H. Steele)

### 1. Marine Laboratory, Aberdeen (DAFS)

The surveys by the research vessels from the Marine Laboratory which included plankton sampling covered various parts of (i) the North Sea north of 56°N during the period February to November, (ii) the Scottish west coast area from mid-September to early December and (iii) the Firth of Clyde from February to December inclusive. Samples were also obtained from the west coast lochs; Loch Ewe from January to September and Loch Linnhe and Loch Eil in June, September and December. The main samplers used were the Dutch version of the Gulf III with a mesh aperture of 250  $\mu$ , a double net with a mouth diameter of 0.5m and mesh apertures of 250  $\mu$  and 69  $\mu$  for the inner and outer nets respectively (known as the Loch Ewe net), the International Standard Net and the Icelandic High Speed Sampler. Tow nets with no exposed metal parts were used for obtaining plankton samples for the study of heavy metals.

The main aspects of plankton investigations at Aberdeen in 1972 are described briefly below.

Standing stock investigations. Chlorophyll a particulate organic carbon and nitrogen, and zooplankton dry weight data have been collected on all suitable cruises. Standing stock data collected during the period 1961-70 is now on punch tape and computer processing of this data, together with other environmental data, was started (J.A. Adams, J.H.A. Martin and I.E. Baird)

Routine monitoring for toxic dinoflagellates. International Standard Net samples from Scottish coastal waters have been examined for the presence of dinoflagellates which have been associated in the past with mass mortalities of marine organisms and/or which are known to be capable of toxin production. No blooms were recorded in 1972 and only two toxic species (Gonyaulax polyedra and G. excavata) were found in very small numbers.

The zooplankton of the northern North Sea in July-August. A study of the zooplankton of the northern North Sea, at the time of the summer surveys of the distribution and abundance of 0-group gadoids, has been continued. Particular attention has been given to the scyphomedusae and those zooplankters which may be of importance as food for the 0-group gadoids (J.A. Adams and S.J. Hay).

Inshore and coastal studies. The descriptive plankton work at Loch Ewe has been largely restricted to standing stock determinations (N.T. Nicoll) and the work at Loch Linnhe and Loch Eil has continued to be based on only a

few surveys per year (J.A. Adams, D.D. Seaton and S.J. Hay). Considerable effort has gone to a description of the zooplankton of the Clyde as a contribution to the Laboratory's pollution and food chain studies in that area (J.A. Adams and N.T. Nicoll).

Fish eggs and larvae. Larval herring were sampled (i) on the Ballantrae Bank in the spring (ii) along the outer part of the continental shelf west of Scotland in the autumn and (iii) in the north western North Sea, also during the autumn, as part of the international survey of herring larvae production in all major North Sea Spawning areas (A. Saville and D.W. McKay). Sprat larvae were sampled in June off the north and west coasts of Scotland (R.S. Bailey). Other studies of fish eggs and larvae were carried out in the Moray Firth in late January to early February (D.W. Armstrong) and throughout the year in the Firth of Clyde (J.A. Adams and G.G. McKay).

Experimental work. The work on the filtering rates of herbivorous marine copepods in relation to heavy metals has continued. In 1972 the work has been aimed at (i) improvement in the experimental techniques used for measuring the filtering rates and (ii) at determining the acute toxicity levels of copper and mercury (R.W. Foster and D.D. Seaton). The effect of low concentrations of copper in sea water on herring larvae has also been investigated (I.G. Baxter).

Heavy metals in zooplankton. Following on the analysis of bulk collection of zooplankton in 1971, the major effort in 1972 was directed towards the determination of copper, zinc, lead and cadmium in various size components of the catch and in various individual species. Although most of the sampling was from the Firth of Clyde, some samples were also obtained from the Moray Firth and Irish Sea.

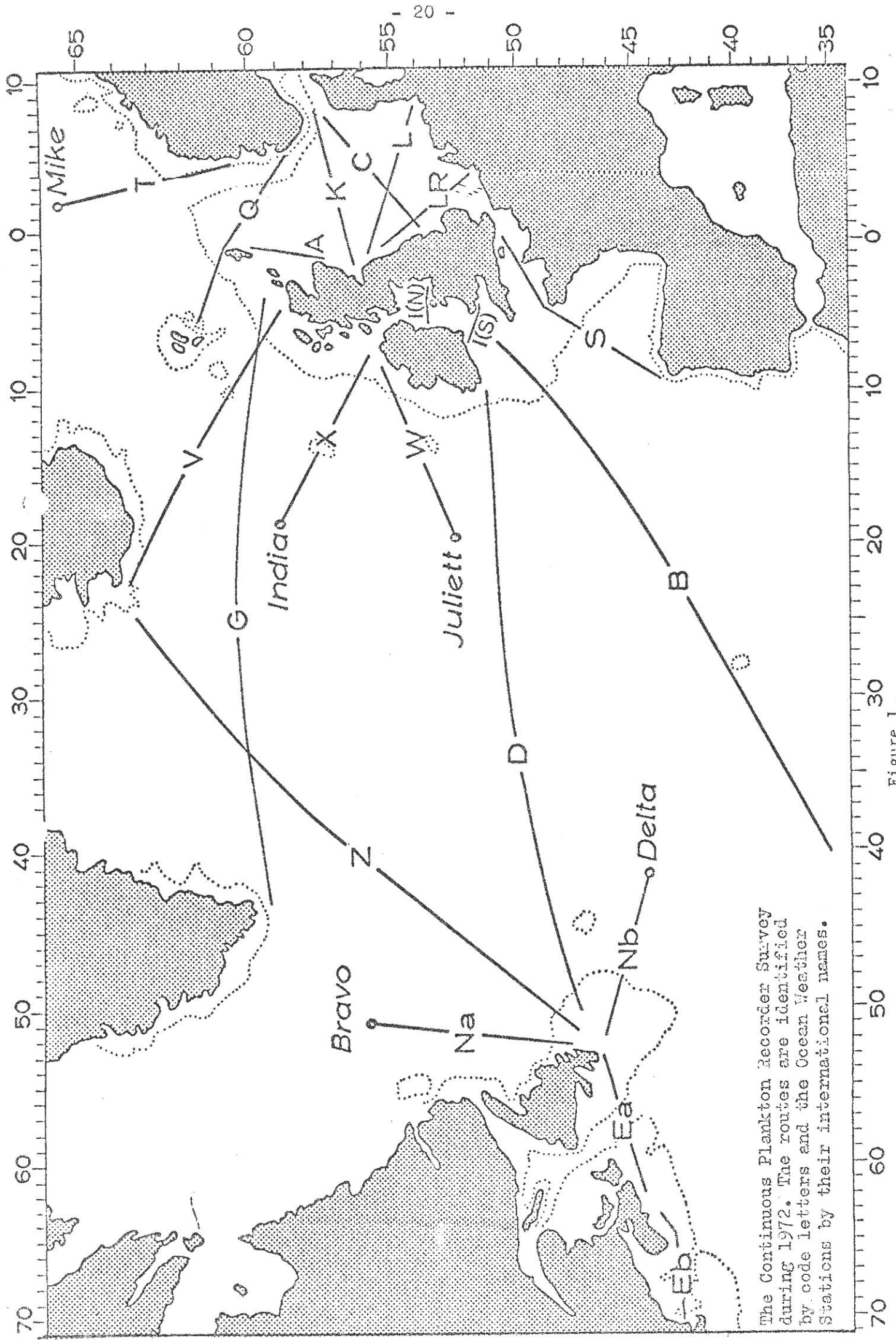
The programme in 1973. This will be more or less similar to that of the previous few years. The following developments should, however, be noted: (i) Greater effort will be directed towards experimental work on the effects of pollutants on phytoplankton and zooplankton and cultures of both phytoplankters and zooplankters will be set up. (ii) At Loch Thurnaig in Loch Ewe the water contained within a large plastic column of 100m<sup>2</sup> will be studied for a range of parameters and compared with the water column near by. (iii) The use of sediment traps to study energy transfer will be extended to deep water and experiments will be carried out during the ICES Overflow Expedition in September. (iv) The distribution, abundance and size composition of the microzooplankton will be investigated in relation to the numbers and condition factors of demersal fish larvae.

## 2. Oceanographic Laboratory, Edinburgh (IMER)

Continuous Plankton Recorder survey. The survey by the Continuous Plankton Recorder was continued in 1972 on the same basis as in previous years. Recorders are towed at a depth of ten metres at monthly intervals along the standard routes shown in Figure 1. (see page 20).

During the past year Recorders were towed for 124 750 miles by 35 ships of eight nations.

The present survey has been in operation since 1948 and the data have been processed in essentially the same way for the period 1948 onwards and since 1968 the process has been computerised. Full details of the system, together with examples of computer output, are given by Colebrook (Bull. mar. Ecol., in press)



The Continuous Plankton Recorder Survey during 1972. The routes are identified by code letters and the Ocean Weather Stations by their international names.

Figure 1.

Planktonic environment of the herring fisheries. Studies of the planktonic environment of the herring fisheries off the northeast coast of Scotland and the Minch were continued in 1972. Samples have been taken regularly by the fishermen and by the crews of ferries belonging to the MacBrayne fleet. The survey of the Minch herring fishery, which has now been in progress for 2½ years, was stopped at the end of 1972 for a detailed appraisal of the results. The study of the Buchan and Shetland herring fisheries, which has been in progress since 1947, will continue.

Studies at Ocean Weather Station India. An oceanic modelling experiment was maintained at Ocean Weather Station INDIA (59°00'N, 19°00'W) since March 1971. Scientists have worked on board Ocean Weather Ships on duty at INDIA from March to October 1971 and 1972. Measurements were made of :

- a) the vertical distribution of the zooplankton using Longhurst Hardy Plankton Recorders in the upper 500 metres.
- b) primary productivity (<sup>14</sup>C method), chlorophyll concentration and phytoplankton (species counts) in the upper 100 metres.
- c) salinity, temperature, nitrate and other chemicals in the upper 200 metres.
- d) organochlorines and heavy metals in the plankton.
- e) solar radiation and light attenuation in the surface waters.

All work is supported by the U.K. Natural Environment Research Council.

### 3. Dunstaffnage Marine Research Laboratory (SMBA)

Phytoplankton production and ecology (P. Tett and B.J. Wood (University of Strathclyde)).

In 1972 the primary production and phytoplankton standing crop at stations on Lochs Etive and Creran were measured at fortnightly intervals. During a six week period in the spring an intensive study was made of the growth of the phytoplankton population at one station in Loch Creran.

In 1973 it is planned to make routine observations of standing crop in Loch Creran and to carry out another investigation during the spring period. The aim is to construct a mathematical model of the growth of the phytoplankton population.

Western Aquaculture (partially aided by the HADB) are carrying out a programme of regular measurement of chlorophyll concentration at twelve sites between Loch Feochan and Loch Sween, in collaboration with Dr Tett.

Zooplankton. In addition to work on the relation between the size and depth distribution of pelagic organisms, Dr J. Mauchline has been studying the plankton of Loch Etive and the adjacent part of the Firth or Lorne, and in particular the biology of the large copepod Pareuchaeta norvegica.

### 4. Department of Biological Sciences, The University of Dundee

An essentially qualitative study is being initiated in the Tay estuary which is designed to identify periods of abundance of various planktonic species and to identify the periods of reproduction of benthic forms with planktonic larval stages. Mercury levels in planktonic organisms will also be determined (A.M. Jones).



U.S.S.R.

(A. F. Karpevich)

In 1972 the Laboratory of Marine Biology of PINRO continued complex investigations of fish food resources in the Barents and Norwegian Seas and the importance of plankton organisms for feeding of young cod.

Investigations of fish food resources included observations on summer development of heterotrophic micro-organisms, phyto- and zooplankton in the southwestern part of the Barents Sea where the spawning and the larvae development of the main commercial fish takes place. We collected about 2 000 samples. At the same time materials collected in 1959-1972 were mathematically treated. The effect of environmental conditions on abundance dynamics of Calanus finmarchicus was exposed.

Quantitative studies of Euphausiacea were conducted in the Southern Barents Sea. The rate of development of different species of Euphausiacea and the distribution of their main concentrations was exposed.

Studies of the importance of plankton organisms in feeding of young Barents Sea cod made it possible to evaluate their survival and calculate an index of the abundance of the 1971 year class which characterises the strength of recruitment of the commercial stock of cod in 1975.

Production of the Norwegian Sea plankton groups of 1971 was calculated in 1972. Sevenhundredandthirty samples were collected for subsequent treatment and determination of plankton production in 1972.

In future we plan to continue the control of the annual rate of plankton development in the Barents and Norwegian Seas in order to estimate feeding migration conditions of commercial fish.

Composition and distribution of the Baltic Sea zooplankton per seasons, areas and depth zones, Baltic herring food composition and ratios in the Gulf of Riga and eastern part of the Baltic Sea were studied. Ecology and abundance dynamics of Acartia bifilosa in the Gulf of Riga were investigated in order to work out methods for stock forecasting.

In 1973 the work in these directions will be continued.

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