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The Continuous Plankton Recorder Survey: plankton in the ICNAF area in 1974

by

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INTRODUCTION

The survey by the Continuous Plankton Recorder (Hardy, 1939) was continued on the same basis as in other years. A bibliography of the survey (1931 to 1972) is given in the Plankton Atlas of the North Atlantic and North Sea (Edinburgh, Oceanographic Laboratory, 1973). An annual commentary on the plankton has been published every year since 1946 in Annales Biologiques of ICES, dealing with the waters round the British Isles and the Irminger Sea. This is the fourth annual report on the results from the ICNAF area. An inventory of the survey for 1974, incorporating the results from the automated data processing procedures is available on request.

METHODS

Continuous Plankton Recorders are towed at a depth of 10m by merchant ships and Ocean Weather Ships once in each month, when possible, along a number of standard routes (Figure 1). The rolls of silk are cut into sections representing 10 miles of tow and alternate sections, bearing the plankton from $3m^3$ of water, are analysed. The methods of analysis have been described by Rae (1952) and Colebrook (1960). The area of the survey has been subdivided into a grid of rectangles (each 1^o of latitude by 2^o of longitude) which are then grouped into larger areas; in this paper these larger areas correspond with ICNAF areas 1 - 5.

The abandonment of Ocean Weather Stations BRAVO and DELTA and a break in sampling on the D and E routes (Figure 1) has seriously affected results in the ICNAF area in 1974. The mileage sampled in ICNAF areas in 1974 was as follows:

Sub area	Mileage	Notes
1	925	No sampling from January to May
2	1316	No sampling from February to May
3	4704	No sampling in November
4	533	Sampled only in May and September
5	685	Sampled from April to June only

The results for a few of the common species in the best-sampled area (3) are given in the form of contoured matrices showing the seasonal and annual fluctuations in abundance from January 1961 to December 1974.

Information from other areas, and for species not illustrated here, will be supplied on application to the Director, Institute for Marine Environmental Research, Oceanographic Laboratory, Craighall Road, Edinburgh, EH6 4RQ, Scotland.

RESULTS

An estimate of phytoplankton (Figure 2) was obtained from a visual assessment of the green coloration of the filtering silks. The time of the spring outbreak of phytoplankton in sub-area 3 has varied considerably over the years and it has occurred progressively later since 1968; it was very late in 1974, with maximum numbers in June and July. In the autumn, phytoplankton was scarce from 1961 to 1967 (with the exception of 1964) but, from 1968 onwards there has been a pronounced bloom during the last four or five months of the year although the duration of this autumnal bloom was short in 1974. Thalassiosira spp. were abundant in June, together with Phaeoceros spp. and Thalassiothrix longissima both of which were also much above average in July. In the less well-sampled areas, phytoplankton was close to the long-term mean in sub-area 1 but slightly above average in sub-area 2, with Hyalochaete spp. and T. longissima the dominant species.

The distribution of phytoplankton and total copepods (Figure 2) should be compared. Copepods were abundant during the second half of the year from 1961 to 1966, when phytoplankton was scarce. Moreover, the spring increase of copepods (like the bloom of phytoplankton) has tended to appear progressively later since 1969. In 1974, the highest numbers were found in August, i.e. much later than it has been for nine years. There has been a general decline in numbers of copepods in sub-area 3 from 1961 to 1974.

The diagrams for copepodite stages V-VI and I-IV of Calanus finmarchicus (Figure 3) should also be compared. At the sampling depth of 10m, the over-wintering adult stages usually appear in February or even earlier. Small numbers appeared in February 1974 but the major peaks came much later than usual, in June, August and September; this was quite unusual as high numbers had never been observed previously for such a long period from June onwards. The same shift in timing was apparent in stages I-IV of Calanus which were most abundant in July and August, at least a month later than usual.

In sub-area 3 there has been a trend of increasing numbers of Euchaeta norvegica and Euphausiacea from 1961 to 1974 (Figure 4). Euchaeta was very abundant for an unusually long period in 1974, although its appearance in the spring was slightly later than usual. It was also much above average in sub-area 1. Euphausiids have made their first appearance at progressively earlier dates during the past 10 years; the initial peak in April 1974 consisted of over-wintering adults which rise to the surface at this time (mostly Thysanoessa longicaudata). Numbers were high again from August to October and continued, indeed, at a high level to the end of the year. They were also above average in sub-areas 1 and 2.

However, some of the common species of copepods were less abundant than usual in 1974 in sub-area 3. The seasonal peaks of Paracalanus spp., Pseudocalanus elongatus and Temora longicornis were late and all three species have shown a trend of declining abundance since 1961.

Numbers of young fish were very low in 1974. There has been a period of low numbers of both Sebastes spp. and Ammodytidae (Figure 5) in sub-area 3 since 1968. Numbers of Sebastes were above average in July in sub-area 1, that is later than usual and there was a large patch of Ammodytidae in sub-area 4 in May. There were no records of Mallotus villosus of Clupeidae in CPR samples in 1974.

CONCLUSIONS

The spring outbreaks of phytoplankton, and copepods (especially Calanus finmarchicus) were much later than usual in 1974; this seasonal trend has been apparent from 1968 onwards. The seasonal cycle of C. finmarchicus was most unusual; there were two major peaks of adults in the second half of the year and only one peak of stages I-IV.

There has been a general decline in the abundance of all copepods except adult Calanus and Euchaeta norvegica in sub-area 3 since 1961. However, these two species, together with Euphausiacea, which has shown a trend of increasing numbers, form the major part of the biomass of this area so that there has not been a decrease in zooplankton biomass.

Young fish were scarce for most of the year in most areas and Clupeidae were absent from all samples.

ACKNOWLEDGEMENTS

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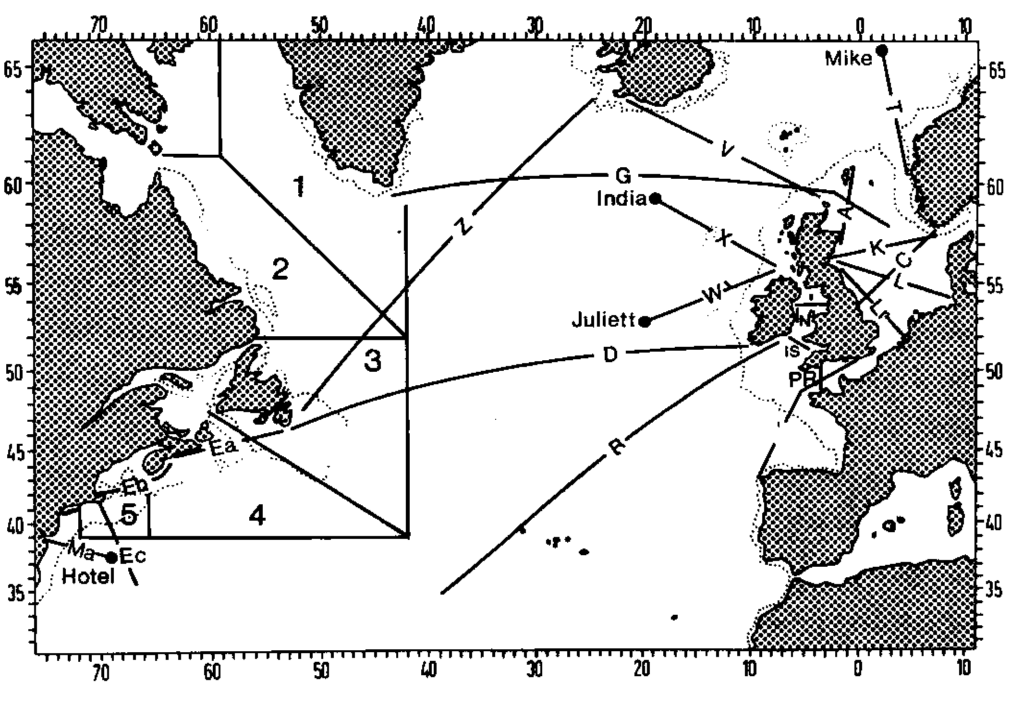

FIGURE 1. The Continous Plankton Recorder Survey during 1974. The routes are identified by code letters and the Ocean Weather Stations by their international names. The boundaries of ICNAF sub areas 1-5 are outlined.

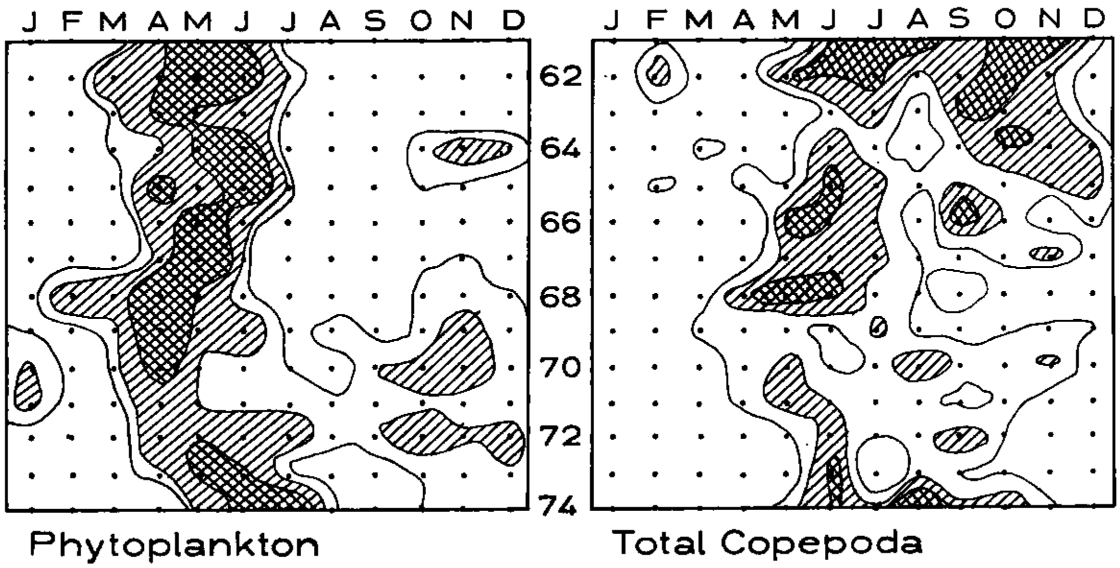

FIGURE 2. Contour diagrams of the annual and seasonal fluctuations in abundance of phytoplankton (left) and total copepods (right) in ICNAF sub area 3. Contour levels for phytoplankton (green colour of silks) are shown on an arbitrary scale of 4, 6 and 13. Contour levels for total copepods are drawn at 120, 180 and 280.

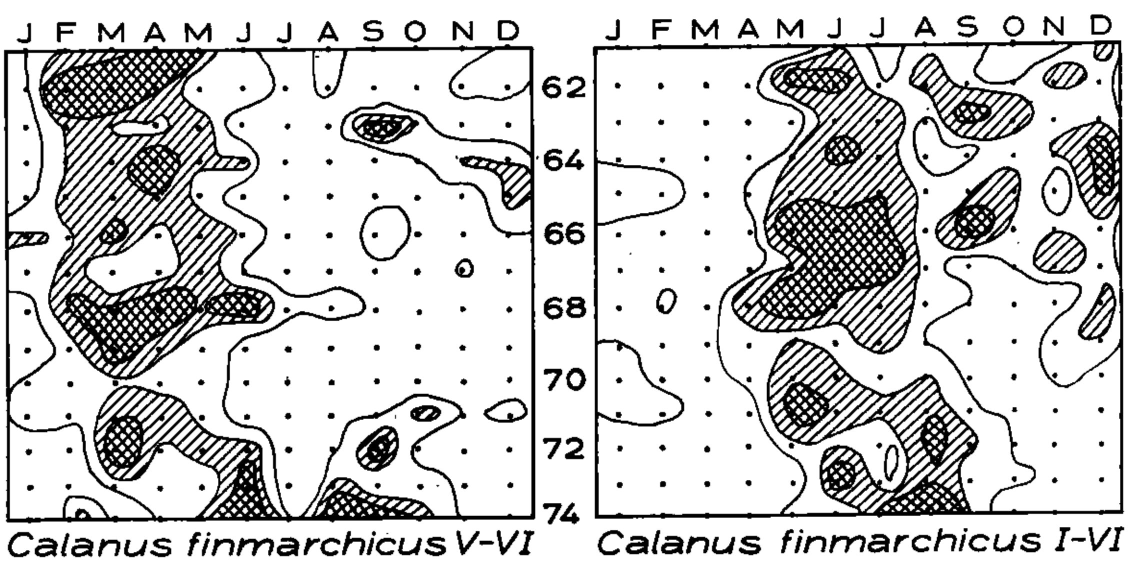

FIGURE 3. Contour diagrams of the annual and seasonal fluctuations in abundance of copepodite stages V-VI (left) and I-IV (right) of Calanus finmarchicus in ICNAF sub area 3. Contour levels are drawn at 5, 10 and 15 for C. finmarchicus V-VI and 20, 35 and 50 for C. finmarchicus I-IV.

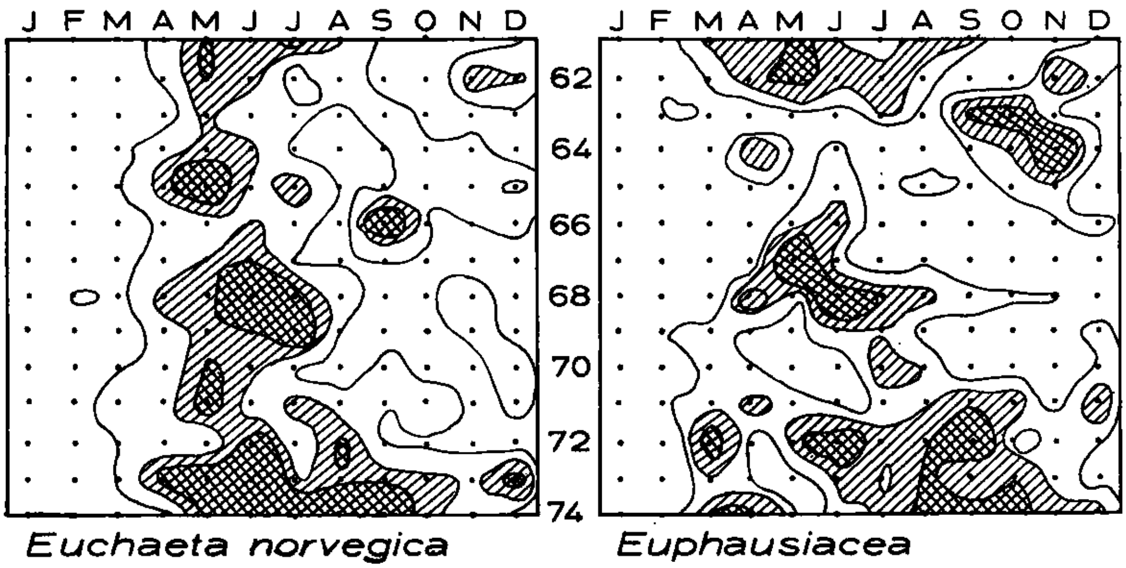

FIGURE 4. Contour diagrams of the annual and seasonal fluctuations in abundance of Euchaeta norvegica (left) and Euphausiacea (right) in ICNAF sub area 3. Contour levels are drawn at 0.5, 1.0 and 1.5 for E. norvegica and 1.5, 2.5 and 4.0 for Euphausiacea.

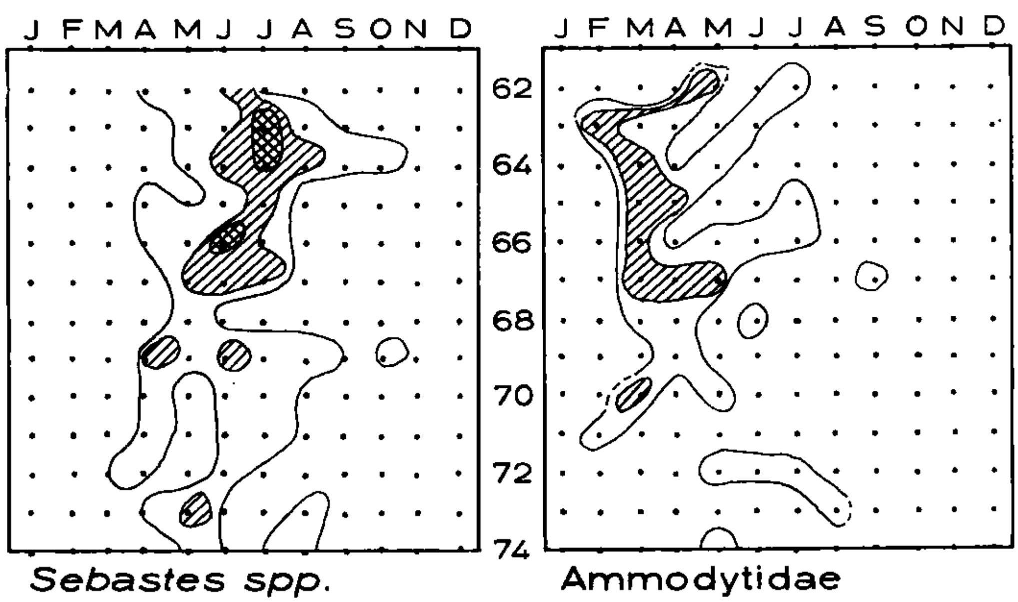

FIGURE 5. Contour levels of the annual and seasonal distribution of young stages of Sebastes spp. (left) and Ammodytidae (right) in sub area 3. Contour levels are drawn at 0.0 and 0.16 for Sebastes and 0.0 and 0.38 for Ammodytidae.