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Continuous Plankton Records: The Sampling Program
of the U.S. National Marine Fisheries Service

by

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In 1972 the U.S. National Marine Fisheries Service (NMFS) began a program of cooperation with the Oceanographic Laboratory, Edinburgh, Scotland (now part of the Institute for Marine Environmental Research (IMER)) for the extension of their long term Continuous Plankton Recorder (CPR) survey (Glover, 1967) into additional areas of the western North Atlantic. This cooperation has led to a modest expansion by NMFS of the two monthly sampling routes shown in Figure 1.

Route MC extends from the vicinity of Boston, Massachusetts across the Gulf of Maine to near Cape Sable, Nova Scotia. It was first sampled using CPR's in the mid 1950's (Marak and Colton, 1961; Marak, Colton, and Foster, 1962; Marak, Colton, Foster, and Miller, 1962; Colton and Marak, 1962; and Colton and Stoddard, unpublished). Monitoring on a regular basis by the British took place from 1961-1974, and was resumed by the NMFS in 1977, continuing to the present time. Route MB extends from New York harbor towards Bermuda for a distance of approximately 500 km (270 nm). Attempted monthly sampling began in 1976 (Smith and Marrero, 1976; Smith and Jossi, 1979). Table 1 lists the months for which sampling was accomplished on these two routes.

The NMFS has accompanied the CPR sampling with expendable bathythermograph casts and surface salinity measurements at approximately 18.5 km intervals, and has, since 1980, taken continuous measurements of temperature at 10 m (the CPR sampling depth) along each route. Methods of collection, examination, and calculation of plankton numbers per sample

are identical to those used by the British (Colebrook, 1960). However, we take a final step of converting these values to numbers per cubic meter in order to facilitate the sometimes appropriate comparison with plankton data from other sources.

The data from this monitoring program at the NMFS are used in ecological studies with the emphasis on multi-year variations of seasonal cycles and on long-term trends of abundance and composition as they relate to living marine resources.

This report, therefore, is intended as an introduction to our program and as a presentation of the resulting phytoplankton and zooplankton variations during 1981. Because of the seasonal changes in species composition and in the effect of water column structure and water mass changes, these summary presentations can be misleading in some respects. A complete list of taxa from the 1981 samples is given in Tables 2 and 3. Figures 2-4 show the variation of diatoms, dinoflagellates, total phytoplankton, and total zooplankton along the two routes during 1981. These abundances are expressed as the mean number per cubic meter over the entire length of the route each month.

REFERENCES

- Colebrook, J. M. 1960. Continuous plankton records: Methods of analysis 1950-59. *Bull. Mar. Ecol.*, 5:51-64.
- Colton, J. B., Jr. and R. R. Marak. 1962. Use of the Hardy Continuous Plankton Recorder in a fishery research programme. *Bull. Mar. Ecol.*, 5:231-246.
- Colton, J. B., Jr. and R. R. Stoddard. _____. Observations on the time-space variability in the abundance, distribution, and breeding of Calanus finmarchicus (Gunn.) in the Gulf of Maine. Unpublished manuscript. Available from: U.S. Dept. of Commerce, NOAA/NMFS, Atlantic Environmental Group, Narragansett, RI., USA.
- Glover, R. S. 1967. The Continuous Plankton Recorder survey of the North Atlantic. *Symp. Zool. Soc. Lond.*, 19:189-210.
- Marak, R. R. and J. B. Colton, Jr. 1961. Distribution of fish eggs and larvae, temperature, and salinity in the Georges Bank-Gulf of Maine area, 1953. *U.S. Fish and Wildl. Serv.*, SSR-F 398, 1-61.

- Marak, R. R., J. B. Colton, Jr., and D. B. Foster. 1962. Distribution of fish eggs and larvae, temperature, and salinity in the Georges Bank-Gulf of Maine area, 1955. U.S. Fish and Wildl. Serv., SSR-F 411, 1-66.
- Marak, R. R., J. B. Colton, Jr., D. B. Foster, and D. Miller. 1962. Distribution of fish eggs and larvae, temperature, and salinity in the Georges Bank-Gulf of Maine area, 1956. U.S. Fish and Wildl. Serv. SSR-F 412, 1-95.
- Smith, D. E. and R. Marrero. 1976. Continuous plankton records: The 1976 Ceratium tripos bloom in the Mid-Atlantic Bight. Presented at the "Interagency Plankton Workshop concerning the Oxygen Depletion and associated Environmental Disturbances in the Middle Atlantic Bight in 1976". Lamont Doherty Geological Observatory, Columbia University, Palisades, NY, 19 November 1976.
- Smith, D. E. and J. W. Jossi. 1979. Continuous plankton records: Zooplankton and net phytoplankton in the Mid-Atlantic Bight, 1976. In: Ocean variability in the U.S. Fishery Conservation Zone, 1976, Paper No. 20. NOAA Tech. Rep., NMFS CIRC. No. 427:337-348.

Table 2. List of Phytoplankton Taxa sampled by the Hardy Continuous Plankton Recorder along Routes MB and MC during 1981

Amphidinium spp.	Exuviaella compressa
Bacteriastrum spp.	Gonyaulax spp.
Biddulphia alternans	Gymnodinium spp.
Biddulphia spp.	Hyalochaete spp.
Ceratium arcticum	Nitzschia closterium
Ceratium belone	Nitzschia seriata
Ceratium carriense	Ornithocercus spp.
Ceratium concilians	Oscillatoria spp.
Ceratium declinatum	Oxytoxum spp.
Ceratium extensum	Peridinium cerasus
Ceratium furca	Peridinium depressum
Ceratium fusus	Peridinium spp.
Ceratium gallicum	Phaeoceros spp.
Ceratium hexacanthum	Pleurosigma spp.
Ceratium humile	Podolampus spinifer
Ceratium inflatum	Prorocentrum spp.
Ceratium karstenii	Rhizosolenia alata alata
Ceratium lineatum	Rhizosolenia alata gracillima
Ceratium longipes	Rhizosolenia calcar-avis
Ceratium longirostrum	Rhizosolenia delicatula
Ceratium lumula	Rhizosolenia hebetata semispina
Ceratium macroceros	Rhizosolenia imbricata shrobsolei
Ceratium massiliense	Rhizosolenia setigera
Ceratium minutum	Rhizosolenia spp.
Ceratium trichoceros	Rhizosolenia stouterfothii
Ceratium tripos	Rhizosolenia styliformis
Ceratocorys horrida	Silicoflagellatae
Cladophyxis spp.	Skeletonema costatum
Corethron criophilum	Thalassionema nitzschioides
Coscinodiscus spp.	Thalassiosira spp.
Dinophysis spp.	Thalassiothrix longissima
Ditylum brightwellii	Trichodesmium spp.

Table 3. List of Zooplankton Taxa sampled by the Hardy Continuous Plankton Recorder along Routes MB and MC during 1981

Acartia danae	Harbacticoid spp.
Acartia spp.	Heteropoda
Amphipoda	Hyperiidea
Anomura	Isopoda
Appendicularia (Larvacea)	Labidocera aestiva
Brachyura	Lucicutia spp.
Bryozoa	Lucifer spp.
Calanus finmarchicus	Macrosetella gracilis
Calanus glacialis	Mecynocera clausi
Calanus helgolandicus	Metridia longa
Cananus minor (Nannocalanus minor)	Metridia lucens
Calanus spp.	Metridia spp.
Caligoida	Mycidacea
Calocalanus pavo	Natantia
Calocalanus spp.	Oithona spp.
Candacia armata	Oncaea spp.
Candacia pacydactyla	Ostracoda
Candacia paenelongimana	Paracalanus or Pseudocalanus
Candacia spp.	Paracalanus spp.
Centropages bradyi	Pasiphaea
Centropages furcatus	Pelecypoda
Centropages spp.	Penaeidea
Centropages typicus	Penilia spp.
Chaetognatha	Pleuromamma abdominalis
Cirripedia	Pleuromamma borealis
Clausocalanus spp.	Pleuromamma gracilis
Clytemnestra scutellata	Pleuromamma peseki
Clytemnestra spp.	Podon spp.
Coelenterata (Cnidaria)	Polychaeta
Copepoda	Pontellina plumata
Copilia mirabilis	Pseudocalanus spp.
Copilia spp.	Rhincalanus cornutus
Corycaeus spp.	Rhincalanus nasutus
Decapoda-arthropoda	Rhincalanus spp.
Eucalanidae	Sapphirina spp.
Eucalanus attenuatus	Scolecithrix danae
Eucalanus crassus	Sergestidae
Eucalanus monachus	Siphonophora
Eucalanus mucronatus	Spiratella spp. (Limacina spp.)
Eucalanus spp.	Stomatopoda
Euchaeta marina	Temora longicornis
Euchaeta norvegica	Temora stylifera
Euchaeta spp.	Temora turbinata
Euphausiacea	Thalia democratica
Evadne spp.	Thaliacea (Salpa)
Farranula gracilis	Thecosomata (Pteropods, shelled)
Farranula spp.	Thecosomata unknown #1 "AEG"
Fish	Tintinnidae
Foraminifera	Tomopteris spp.
Gammaridea	Undinula vulgaris
Gastropoda	

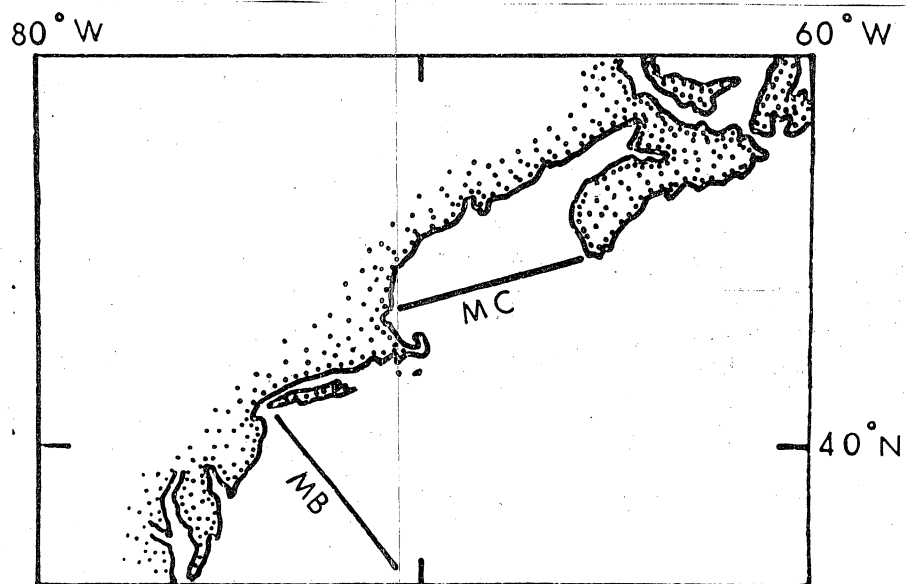


Figure 1. Two routes along which monthly sampling of phytoplankton and zooplankton was attempted in 1981 using the Hardy Continuous Plankton Recorder.

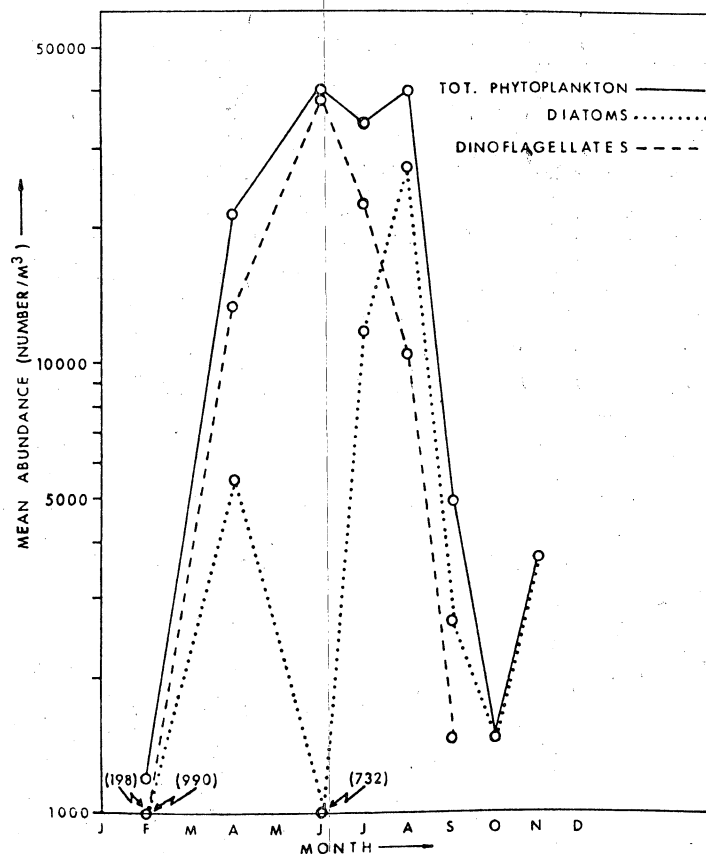


Figure 2. Monthly mean abundance (number of cells or chains/m³) of phytoplankton organisms sampled at 10 meters along route MB during 1981. Values of 0-1000/m³ are plotted as 1000 with the actual values appearing within parentheses. In February dinoflagellate abundance was 198/m³ and diatom abundance was 990/m³.

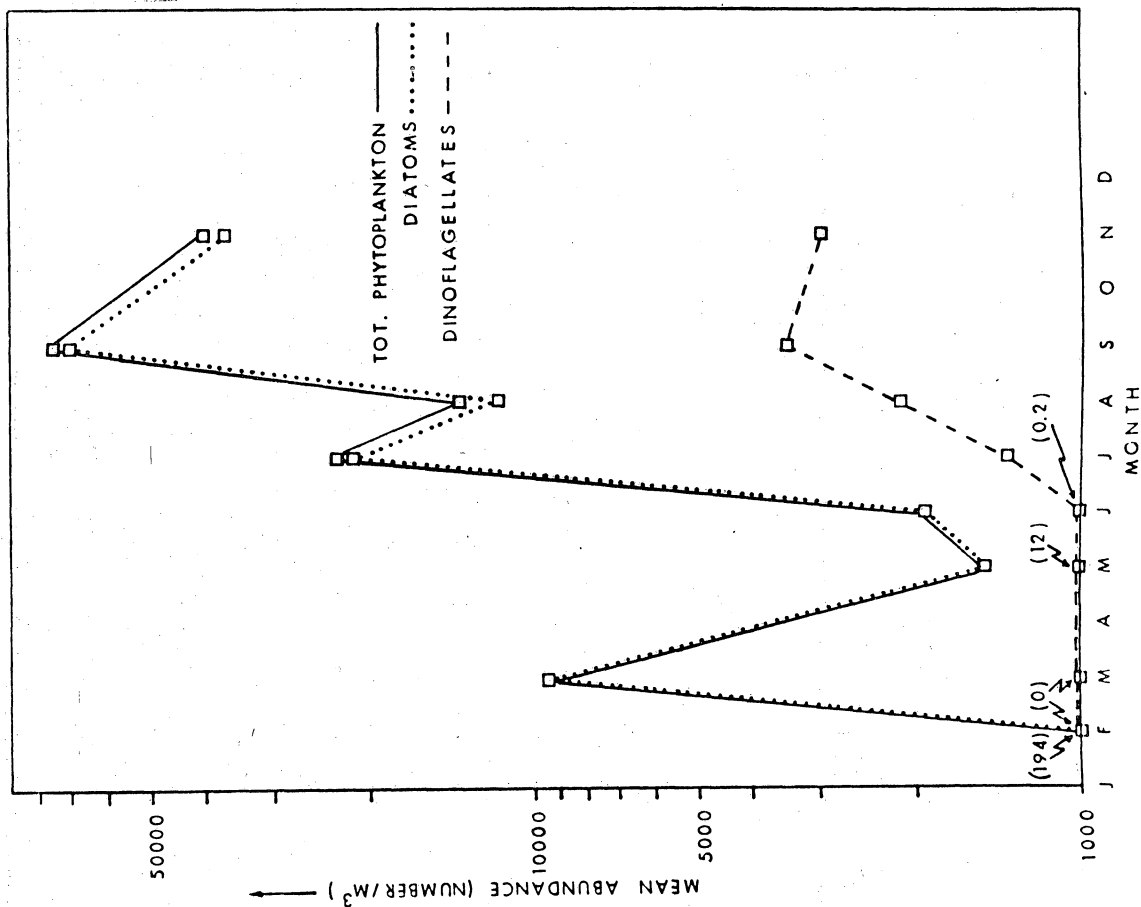


Figure 3. Monthly mean abundance (number of cells or chains/m³) of phytoplankton organisms sampled at 10 meters along route MC during 1981. Values of 0-1000/m³ are plotted as 1000 with the actual values appearing within parentheses. In February dinoflagellate abundance was zero and diatoms were the sole contributor to a total phytoplankton abundance of 195/m³.

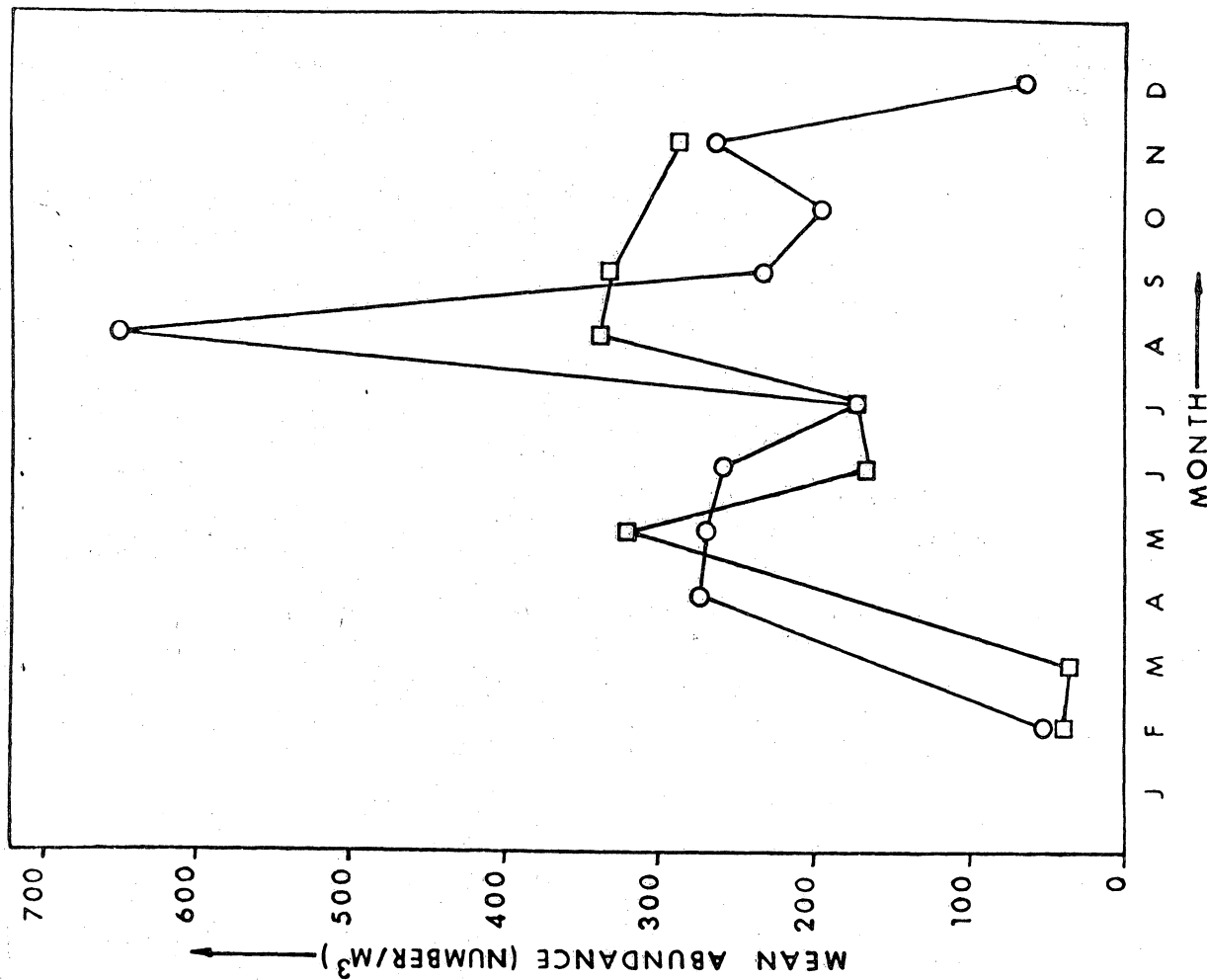


Figure 4. Monthly mean abundance (numbers/m³) of all zooplankton organisms sampled at 10 meters along route MB (□) and route MC (○) during 1981.