International Council for the
Exploration of the Sea

C.M. Doc. 1994/L:1
Report of Activities

BIOLOGICAL OCEANOGRAPHY

by

M. Reeve

1993

Belgium

(C. Heip and R. De Clerck)

Marine Biology Section, Zoology Institute, University of Gent, Belgium (Coordinator: M. Vincx)

The structure and function of benthic communities from a diversity of areas (North Sea and adjacent estuaries, Atlantic deep sea, Antarctic, East African coastal systems) are investigated. Special attention is given to the meiobenthos in relation to detailed environmental variables (such as nutrients, pigments, grain size) from vertical sediment profiles. Anthropogenic influences (eutrophication) are investigated in estuarine conditions, also in relation to the maximum turbidity zone of estuaries. Functional aspects of nematodes are investigated in lab conditions by means of grazing experiments on bacteria and diatoms and by culturing nematodes and characterizing their specific food items. Epifaunal-infaunal inter-relationships are investigated in mangroves in Kenya.

The structure of hyperbenthic communities from the North Sea and adjacent estuaries (mysids and other small crustaceans) are also investigated *e.g.* in relationship with the occurrence of the maximum turbidity zone in three European estuaries. Recently, the hyperbenthic communities of the North Sea (Belgian and Dutch waters) will be investigated on a monthly basis. In the tropics, fish and hyperbenthic research has been started. The fish fauna of the Westerschelde estuary and other related areas (*e.g.* salt marshes) are described both on structural and functional aspects.

Botany Laboratory, Department of Morphology, Systematics and Ecology, University of Gent.

1. The marine macro-algae of Northern France and Belgium: a flora of the Cyanophyta, Chlorophyta, Phaeophyta and Rhodophyta of the Northern French and Belgian coasts has been finalised and will be published summer 1994. It includes identification keys and descriptions of morphology, anatomy, reproductive structures and ecology of about 240 species. Each of these is richly illustrated (E. Coppejans)

2. Taxonomy and ecology of the microphytobenthos of the Westerschelde estuary: the aim of this research (started 1991) is twofold: a) a systematic study of the species composition of the intertidal, benthic micro-algal (mainly diatom) assemblages in the Westerschelde estuary (salinity 33-8‰) (Zeeland, The Netherlands). b) an ecological study of the seasonal and spatial distribution of the main diatom assemblages in the estuary plus the relation of this distribution to some selected environmental parameters (salinity, grain size, etc.).

The microphytobenthos in the Westerschelde estuary mainly consists of diatoms. Especially the smaller, epipsammic taxa, which pose some serious taxonomical problems, are very abundant. Most taxa have been reported from other European estuaries. During spring, blooms of benthic Cryptophyceae (*Chroomonas* sp.) and Dinophyceae (*Amphidinium* spp.) occurred in some stations in the brackish zone (18-10‰). Cyanophyceae were never very abundant. Multivariate techniques and multiple regression are used to study the distribution of the assemblages. Preliminary results indicate that this is mainly determined by grain size and weather conditions (insolation, wind). (K. Sabbe.)

3. Taxonomy and ecology of the phytoplankton of the Elbe, Schelde and Gironde estuaries. During spring 1993, within the framework of the MATURE project (biogeochemistry of the MAximum TURbidity zone (MTZ) in Estuaries, phytoplankton samples were collected along longitudinal transects encompassing the MTZ in the Elbe, Schelde and Gironde estuaries. The species composition and distribution of the planktonic micro-algal assemblages was studied; a comparison between the three estuaries was made. This research mainly focuses on the importance of the MTZ for the distribution of phytoplankton species.

A clear distinction between the assemblages of the brackish (mainly large diatoms) and freshwater (Chlorophyceae, small centric diatoms and coccoids) tidal zones could be made. Some taxa seem to be

confined to the MTZ; the association of micro-algae and flocs is investigated. A similar sampling campaign will be carried out in spring 1994.

Future research will mainly concentrate on the taxonomy and ecology of the phytoplankton of the Schelde estuary. Special attention will be paid to the freshwater and brackish tidal zones. The temporal fluctuations in assemblage composition will be investigated and related to environmental parameters. (K. Muylaert)

Groupe de Microbiologie des Milieux Aquatiques. Free University of Brussels

The general objectives of the research group are:

- short-term and long-term assessment of the eutrophication level of the continental coastal waters of the north Sea through the combined analysis of new field survey data at reference stations and existing data.

- development of an integrated approach of the eutrophication problem of the continental waters of the North Sea through numerical experimentation based on process oriented studies.

An annual survey of Phaeocystis blooms in the Belgian coastal waters is done at reference station N 52 26 05 and E 02 49 08. Temperature, salinity, suspended matter, inorganic nutrients (nitrate-nitrite, ammonium, silicate, phosphate) chlorophyll *a*, diatom and Phaeocystis cells and colonies concentrations are measured.

Management Unit of the Mathematical Model North Sea and Schelde estuary

1. Sampling of the water quality data requested by the Joint Monitoring Programme of the Oslo and Paris Conventions for the prevention of pollution of the sea are an important part of the monitoring effort initiated by MUMM in 1977. Normally 15 stations at sea and in the Schelde estuary are sampled about six times a year for water quality parameters and once a year for sediments with R.V. *Belgica.*

In relation to the concern caused by eutrophication the monitoring of nutrients has deserved a particular attention in the last decade. The emphasis is on research of winter patterns and normalisation to salinity plots in order to demonstrate possible temporal trends. Such an analysis, covering the period from 1982 to 1992, is currently being prepared by J.P. Mommaerts.

2. The modelling of ecosystem dynamics in response to nutrient inputs, with special emphasis on the blooming of Phaeocystis sp. in the coastal zones of the Channel and the North Sea, is a joint undertaking of MUMM and the Groupe de Microbiologie des Milieux Aquatiques of the Free University of Brussels and is funded by the CEC.

Laboratory of Ecotoxicology. Free University of Brussels

1. Ecology of seabirds and mammals; in 1993 we participated in three international expeditions: the two Polarstern expeditions in the Greenland Sea polynia ("NEW") from May 22 till August 4. Research was done on the influence of the polynia on the distribution of the higher trophic levels in connection with the whole ecology of the region. On board R.V. *Dalnie Zelentsy* (MMBI Murmansk) two researchers went to the Barents Sea.

2. Ecotoxicology: study of the contamination by stable pollutants (organochlorines and heavy metals) of seabirds and marine mammals found dead along the Belgian coast or found in the by-catch in the North Sea. This research is in collaboration with veterinarians (Prof Coignoil, University of Liège, and Dr Siebetr, Germany) and Prof. Bouquegneau from Liège.

RUSSIA

(Dr V. Krylov)

1. Hydrochemistry

Hydrochemical conditions in the North-East Atlantic were studied during nine research cruises in the Barents Sea, six in the Norwegian Sea, one cruise in the Irminger Sea and one in the area west of the British Isles.

Hydrochemical situations in the Barents Sea have developed by the type of warm years. In winter and spring, concentrations of dissolved oxygen were lower than the mean long-term ones, and seasonal maximum of water saturation with oxygen was observed a month later. In the second half of the year, water aeration in the western sea was close to the mean long-term one, and in the central sea the mean long-term level was exceeded.

In the areas west of the British Isles, from the end of January to the beginning of April, the character of the hydrochemical parameter distribution has corresponded to the winter one. From the second half of April to the beginning of May, an intensive phytoplankton bloom was observed in coastal waters south-west of Ireland and north of Scotland. In waters of the North-Atlantic Current, no intensive vegetation of phytoplankton were registered. For the whole area of investigation the rates of development of spring reproduction in 1993 were close to those in 1990 and considerably exceeded the ones for 1991 and 1992.

At the end of April - beginning of May, only a few areas with oxygen content above 100% in the photosynthesis layer have been observed. In the second ten day period of May an increase of oxygen concentration to 105-112% saturation has been observed in the surface layer of subarctic waters south of 58° north. Concentrations of deep water redfish larvae were observed to coincide with areas of higher oxygen content. When comparing data from previous years, the hydrochemical situation was similar to that in cold years.

In June large-scale investigations of the hydrochemical regime of the Norwegian Sea were carried out. In the upper 50 m layer of Atlantic waters the oxygen concentrations were lower than the norm, and maximum positive anomalies of oxygen saturation were observed in waters of the East Icelandic current along 63 ° north. Minimum oxygen content was observed in waters of the shelf and in the eastern branch of the Norwegian Current. In the 50-200 m and 200-500 m layers the water saturation with oxygen was near to the norm.

2. Plankton

In 1993 the traditional observations for the status of the plankton community of the Barents Sea were continued. Winter stock of euphausiids in the Barents Sea, spring-summer development of plankton in areas of Gadidae larvae drifting as well as in areas of blue whiting and capelin feeding were assessed. A total of 1,351 plankton samples were obtained during eight cruises. Based on the samples analysis, data on species composition, biological status of dominating species, and value of total plankton biomass were obtained.

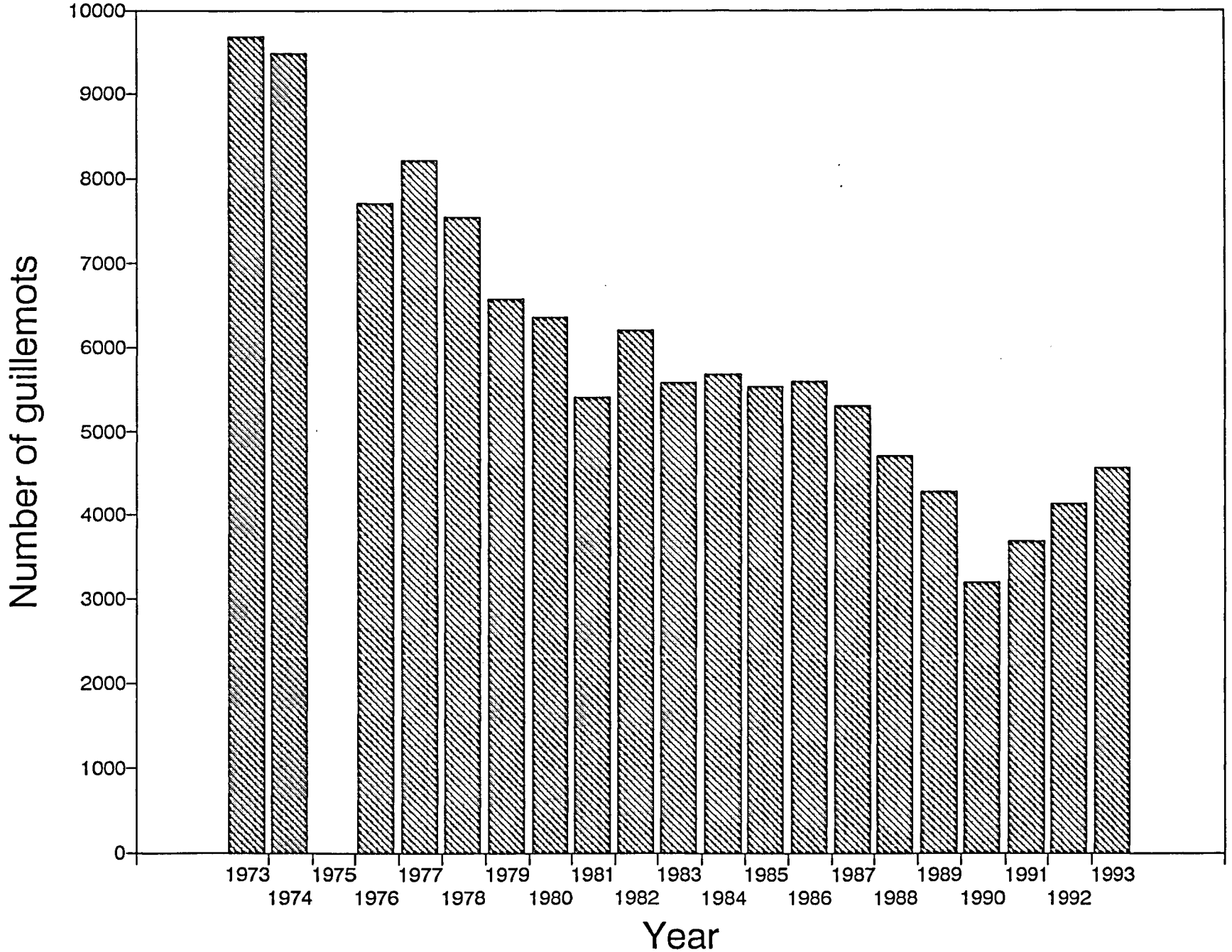
Earlier reproduction of plankton was ascertained in the south-western Barents Sea which can be considered as a biological after-effect of higher heat content of water in the previous winter-spring period. Spawning of *Calanus* and *euphausiids* in the coastal waters of Scandinavia started within the fist ten days of April, *i.e.* one to one and a half weeks earlier than the mean long-term data. Plankton biomass in spring on the ways of fish larvae drifting in the Barents Sea areas was estimated to be at the long-term level, that is to say, 234/m^3, and dominated by small zooplankters. Feeding conditions for fish larvae were good.

Young copepods appeared in April/May in the south-western Barents Sea, became adult at the end of June - beginning of July. Maximum biomass in this period was observed in the surface layer of 0-50 m in the coastal waters of Scandinavia, as well as in waters of the Norwegian, Spitsbergen and North Cape Currents.

In the central part of the southern Barents Sea the copepod biomass in the 0-50 m layer was not high in mid-July, because *Calanus* reached IV-V copepodite stages by that time, were then sinking and maximum biomass appeared in the 100-200 m layer.

In the Northern Sea (areas of capelin summer feeding) biomass of plankton in August 1993 was lower than in the corresponding period of 1992. Biomass reduction was influenced by a local spring reproduction which occurred later than in 1992. Copepod biomass in the North-Eastern Sea in August 1993 was dominated by young individuals.

Figure 4.6 Numbers of guillemots at a study plot in the Faroes, 1973-1993.



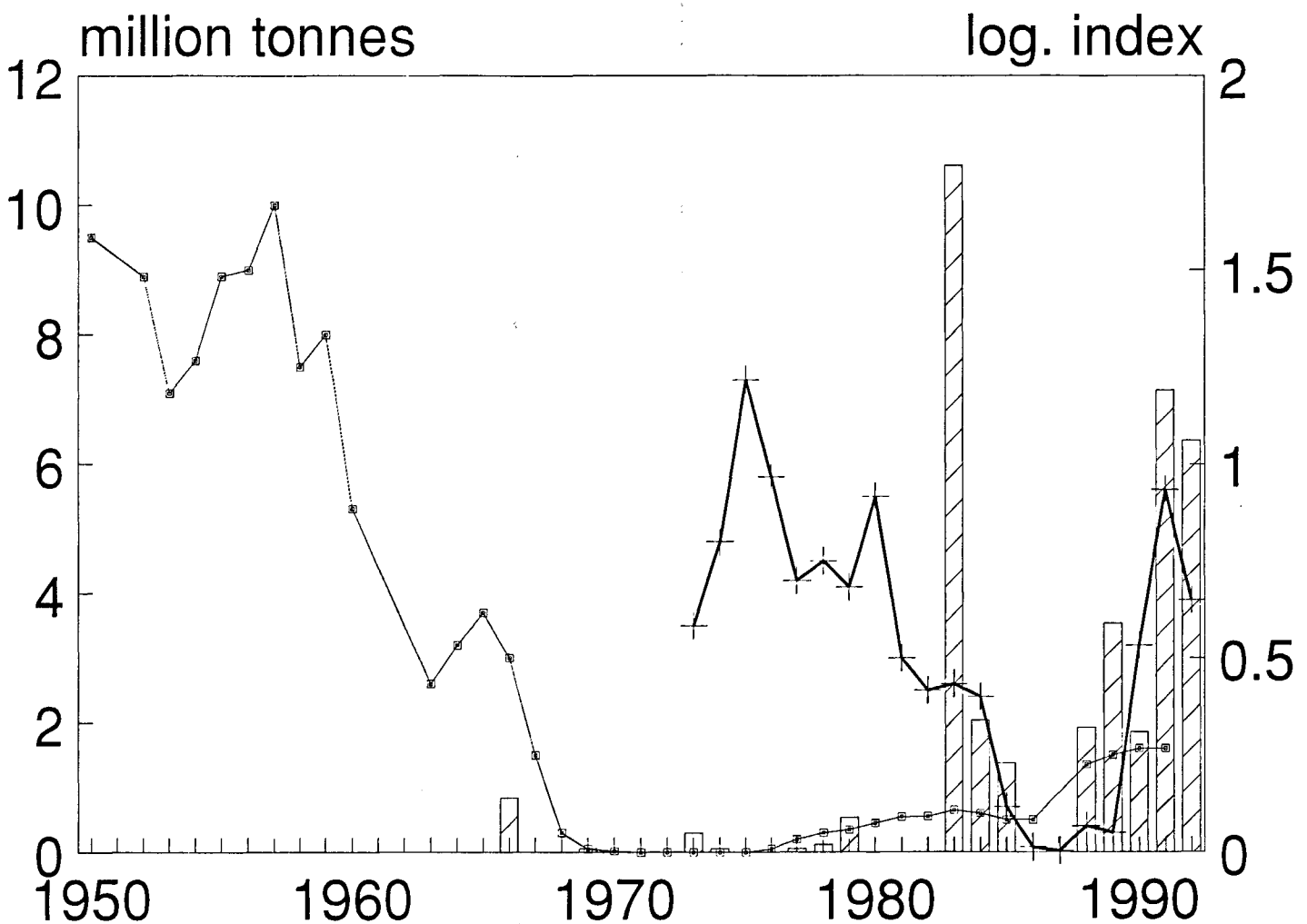


Figure 4.7 Estimates of spawning stock biomass of Norwegian spring spawning herring 1950-1991 (line giving squares), logarthimic indices of 0-group abundance (vertical bars) and an index of puffin fledging (line joining crosses).