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CHANGES IN PHYTOPLANKTON OF THE SOUTHERN BALTIC IN 1979–1988

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The paper presented contains results of phytoplankton monitoring carried out in the Southern Baltic (Bornholm Basin, Gdańsk and Gotland Deeps) in 1977–1988. No repeated trend in the phytoplankton dynamics over the period of study was observed. A significant increase in abundance of flagellates was characteristic of 1983–1988.

INTRODUCTION

Regular monitoring of different groups of organisms including phytoplankton is very important for a proper assessment of the present state of marine environment.

MATERIALS AND METHODS

Monitoring of phytoplankton abundance was carried out at three stations located in the Gdańsk Deep (BMP L–1), southern part of the Gotland Deep (BMP K–1), and in the Bornholm Basin (BMP K–2) in 1978–1988 (Fig. 1). Studies on phytoplankton biomass were initiated in 1984. Materials were collected and the abundance and biomass of phytoplankton estimated following recommendations given by the Helsinki Commission (Anonymus 1980, 1984).

RESULTS

Spatial distribution of phytoplankton

Average values calculated for the entire period of study were considered in order to analyse the spatial distribution of the phytoplankton (Figs. 2 and 3). Although differences between the three areas of study were slight, a more intensive growth of phytoplankton in terms of its abundance and biomass was observed in the Gdańsk

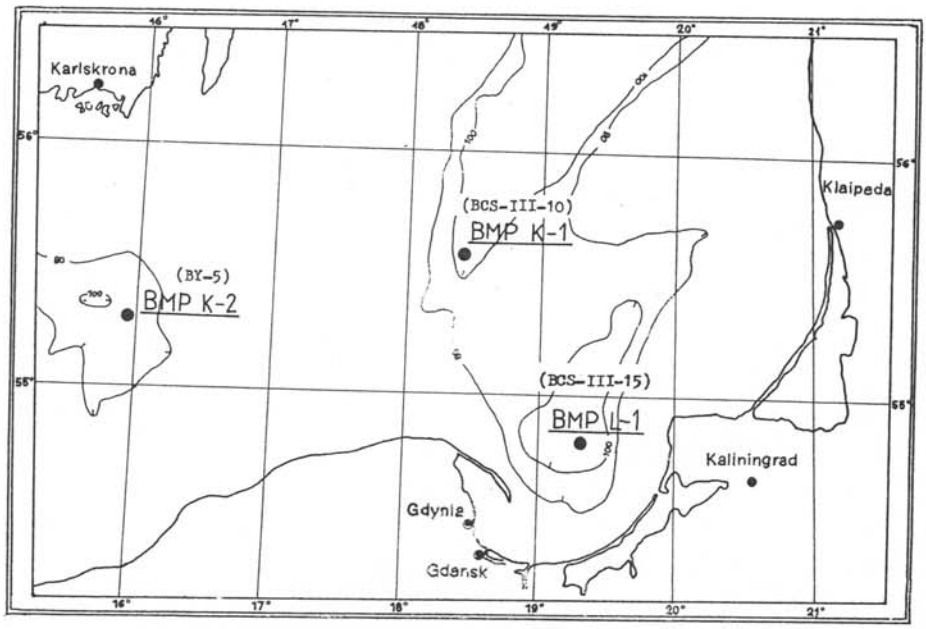

Fig. 1. Location of sampling stations visited in 1979–1988

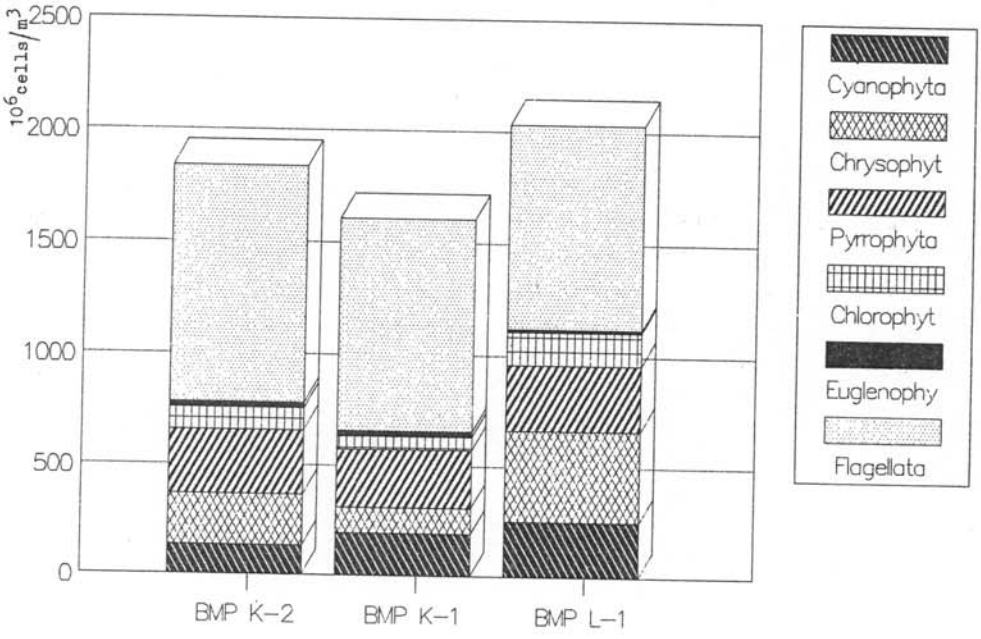

Fig. 2. Distribution of phytoplankton abundance in 1979–1988

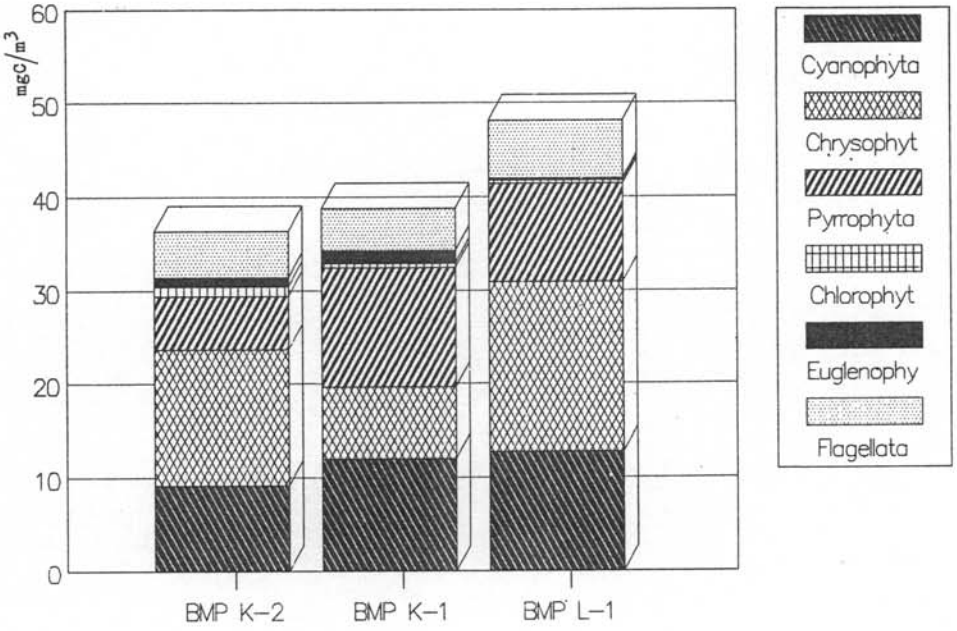

Fig. 3. Distribution of phytoplankton biomass in 1984–1988

Deep, compared with the other two areas. Moreover, diatom abundances were higher in the Gdańsk Deep than in the remaining two areas. Generally, the taxonomic structure of abundance and biomass was similar in the three areas investigated, the following taxa dominating: the *Flagellata* (in abundance), *Chrysophyta, Pyrrophyta*, and *Cyanophyta.*

Seasonal variability

Average values calculated for the three areas of study and for the entire period were used to assess the seasonal variability (Figs 4 and 5). The variability is concurrent with a pattern typical of water bodies experiencing intense blooms of diatoms in spring and autumn and of blue-green algae in summer. Flagellates are present, especially in warm seasons, in very large quantitites.

Multiannual variability

Analysis of phytoplankton abundances, based on average values calculated for all the stations and seasons, did not show any clear-cut trend in the phytoplankton dynamics which would be common for all the years during the 10-year period of monitoring. It can only be said that the abundances were considerably higher in

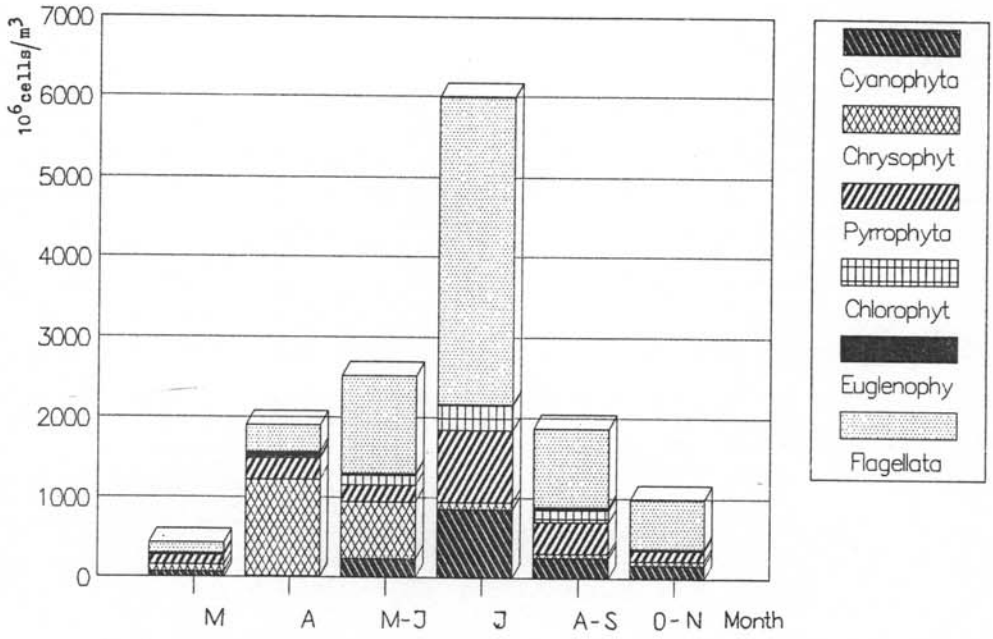

Fig. 4. Seasonal variations in phytoplankton abundance within the 10-year period of studies

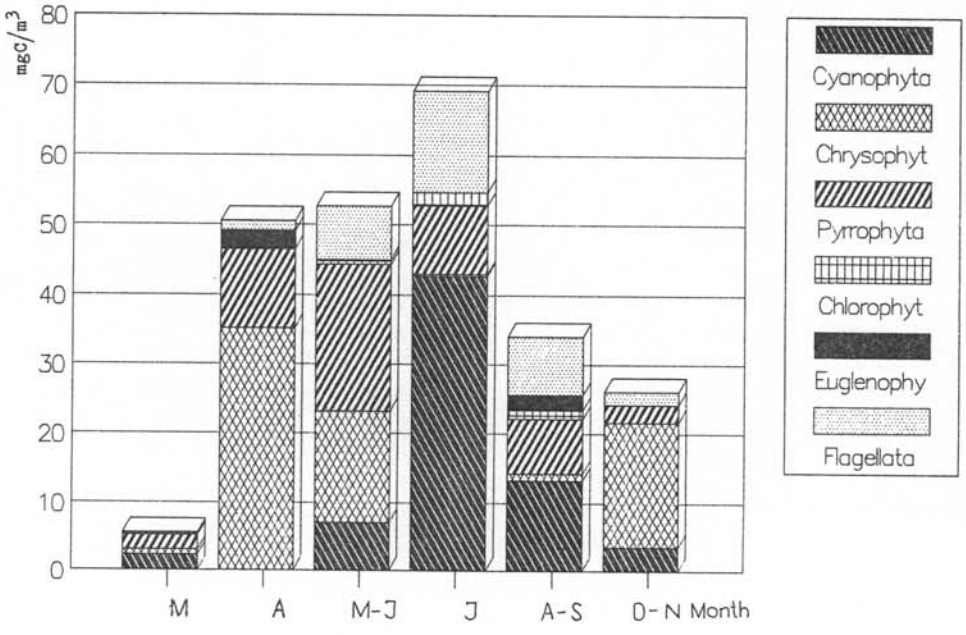

Fig. 5. Seasonal variations in phytoplankton biomass in 1984–1988

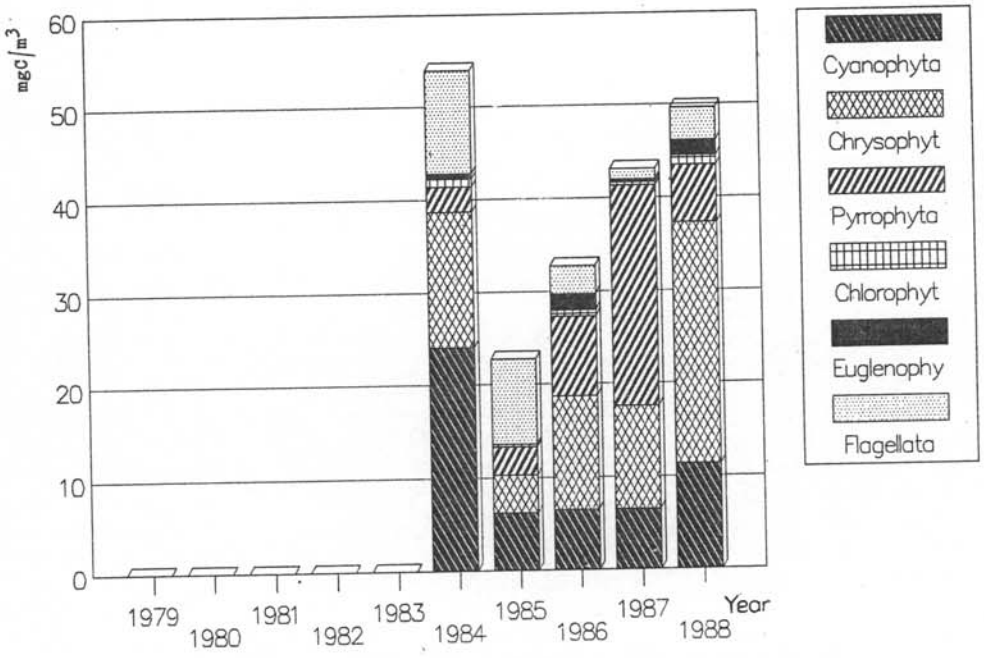

Fig. 6. Long-term changes in phytoplankton abundance and taxonomic structure

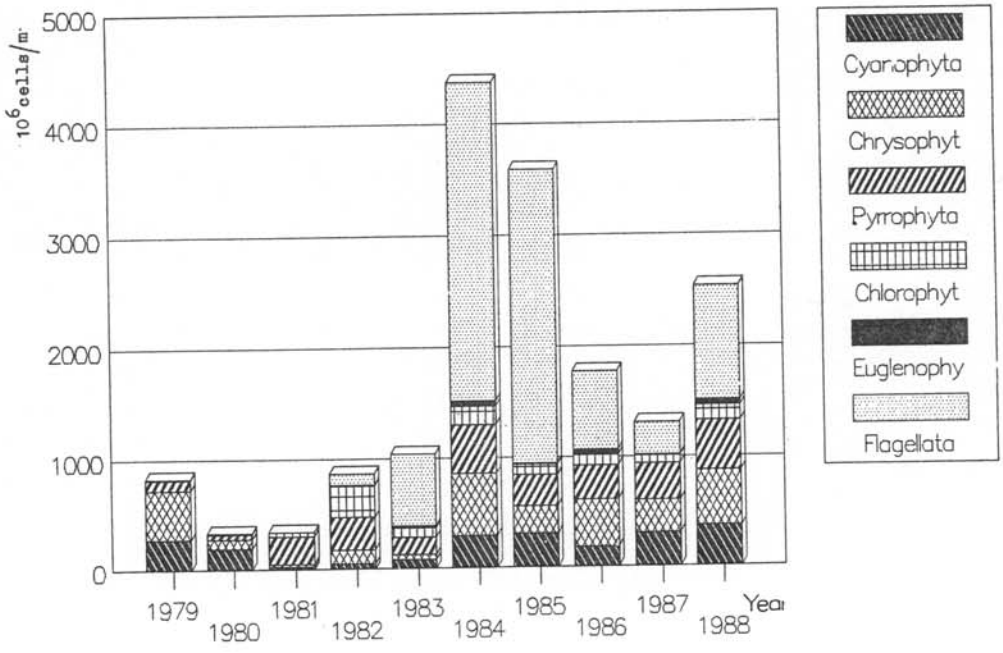

Fig. 7. Long-term changes in phytoplankton biomass

1984–1988 than in 1979–1984 (Figs. 6 and 7). The taxonomic structure of the abundance showed that dominants changed from year to year, particularly in 1979–1983. As of 1983, however, variations in the total abundance depended almost exclusively on the major dominants, i.e. flagellates. The remaining co-dominants (*Cyanophyta, Pyrrophyta,* and *Chrysophyta*) showed a certain stability of abundance.

DISCUSSION

The nature and structure of the phytoplankton species composition was very similar in all the areas of study. On the other hand, the pattern of quantitative aspects of phytoplankton in the Gdańsk Deep w s quite different than that found in other areas. Both the abundance and biomas were higher in the Gdańsk Deep, which is suggestive of a fertilizing influence ex rted by the River Vistula. Other workers (Kruk-Dowgiałło and Wiktor unpubl. da a; Pliński 1982; Ringer 1976; Wiktor 1982) found the phytoplankton in the area to contain freshwater species. However, the present study shows that in the Gdańsk Deep the freshwater inflows affected only the abundance, but not the species composition of phytoplankton.

Considering seasonal variability, the peak growth was observed in early summer. A similar phenomenon was described many times by workers who studied phytoplankton in lakes and in the Baltic lagoons (Kajak 1979; Pliński 1979). An increased contribution of the *Cyanophyta* evidences the nutrient overenrichment and thus could support the notion of the progressing eutrophication in the Southern Baltic. On the other hand, the abundance of blue-green algae which are able to fix molecular nitrogen can be typical of waters with nitrogen being a factor limiting the phytoplankton primary production in summer (Rinne et al. 1986). Taxonomic structure of the phytoplankton biomass observed in spring and autumn is typical of water bodies where adverse effects, arising from an increased eutrophication, are not observed. This may demonstrate that the process of eutrophication is not as advanced as one would be led to presume.

Analysis of multiannual variability did not show any distinct trend in the phytoplankton dynamics. Based on comparisons with the only available data set concerning phytoplankton abundance in the open Baltic over 1971–1973 (Ringer 1976), it can be concluded that the values observed in the Bornholm Deep were much lower than those found in the 70's; in the Gdańsk Deep, the highest values, observed in 1984–1985, were comparable with previous data. No declining trend in the overall phytoplankton dynamics was observed; phytoplankton abundances have most probably increased in the western part of the region of study.

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