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On the oceanological conditions
in the Baltic during 1969 - 1975

D. MEHRING and E. FRANCKE
Institute of Marine Research
Rostock-Warnemünde (GDR)

The winters of the last 3 years were very mild. In 1974/75 the mildest winter ruled over Central Europe since about 300 years. Because the temperatures of the upper layers of the Baltic are affected first of all by the meteorological conditions, the surface water cooled off less than in other years. In the deep water the conditions of temperature and other oceanological features are mainly decided by the advective water exchange between the Baltic and the North Sea. These conditions were discussed already in another connection (FRANCKE, MEHRING, ROHDE, 1975). In this paper we intend to investigate the variations of selected oceanological features in the surface layers, which are caused by the mild winters 1972/73, 1973/74 and 1974/75. For this purpose 3 standard stations, situated in the Arcona, Bornholm and Gotland Basin, were used. In fig. 1 - 3 the temperatures near the sea surface are represented together with values from deeper water layers. The last depths agree with the minimum of temperature in the cold intermediate layer, in which the low winter temperatures are "conserved" during the warm season. In the Arcona Basin this intermediate layer is not formed during the summer, because this basin is relatively shallow. Therefore the temperature near the bottom was taken for our investigations.

From fig. 1 - 3 we can see besides the obviously seasonal variations that the temperatures in the cold season since 1972/73 are about 2 - 3 °C higher than in the 4 winters before. With advance of the year the differences disappear not only at the surface but are also reduced in the intermediate layer. In the deep water of the Arcona Basin (fig. 1) this process is overlaid by vertical mixing and by the inflow of water from the North Sea.

For one station in the Gotland and in the Landsort Deep MATTHÄUS (1973) calculated the mean course of the temperature during the year, using own and the international Baltic data material of 1902 - 1970. In fig. 4 the deviations from these mean values are demonstrated for the international station 15 A in the Gotland Deep by means of the opposite years 1970 and 1973. In 1970 a weak negative anomaly at the beginning of the year and a strong negative anomaly during the summer was observed near the sea surface. Because of the relative cold summer 1970 the negative anomaly in the cold intermediate layer was strengthened in the course of the year. 1973 the strong positive anomaly of the winter temperatures disappeared completely near the surface, whereas it was hardly reduced in the intermediate layer during this year.

The oxygen saturation depends on the water temperature and the salinity and has a strong seasonal rhythm in the Baltic. In connection with this temperature dependence we have at the sea surface somewhat lower oxygen concentrations in the mild winters (fig. 1 - 3). But this has no significant effect on the deeper layers, although at station 15 A the oxygen content seems to be a little higher in summers which succeed to mild winters (fig. 3). In the near bottom layer of station 113 (fig. 1) the oxygen distribution is decided by vertical water exchange and by stagnation periods.

The distribution of the micro nutrients (fig. 1 - 3) is not affected by the temperature conditions of the winter and shows only variations, mainly depending on the phytoplankton production.

References

- FRANCKE, E., MEHRING, D., ROHDE, K.-H. (1975):
Zur Verschlechterung der Sauerstoffverhältnisse im Tiefenwasser der Ostsee.
Beitr.Meeresk. 1975 (in press).
- MATTHÄUS, W. (1973):
Zur Hydrographie der Gotlandsee II. Der mittlere Jahresgang der Temperatur in Oberflächennähe.
Beitr.Meeresk. 32 (1973), 105 - 114.

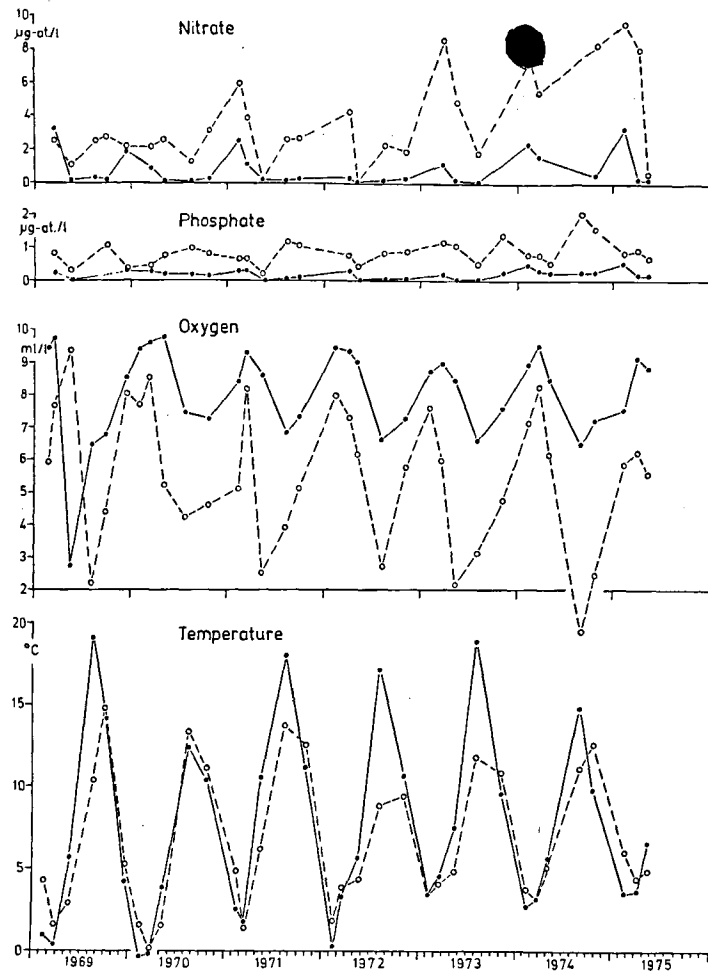


Fig. 1 Distribution of selected oceanological features in the surface layer of station 113 ($54^{\circ}55,5'N$, $13^{\circ}30'E$) in the Arcona Basin (— 1 m, - - - 45 m depth)

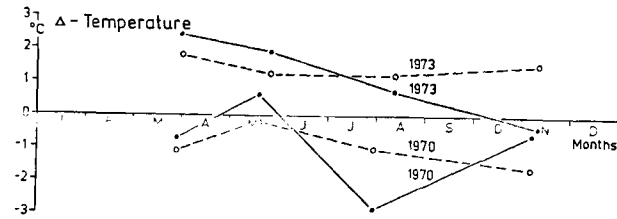


Fig. 4 Deviations from the mean temperature distribution at station 15 A ($57^{\circ}13,3'N$, $20^{\circ}4,6'E$) in the eastern Gotland Basin (— 1 m, - - - 70 m depth)

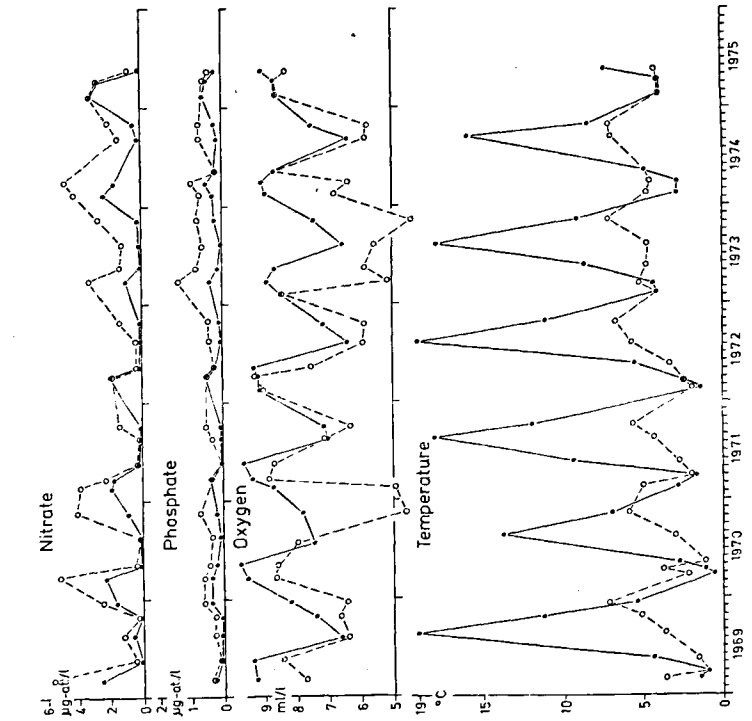


Fig. 2 Distribution of selected oceanological features in the surface layer of station 5 A ($55^{\circ}15'N$, $15^{\circ}59'E$) in the Bornholm Basin (— 1 m, - - - 60 m depth)

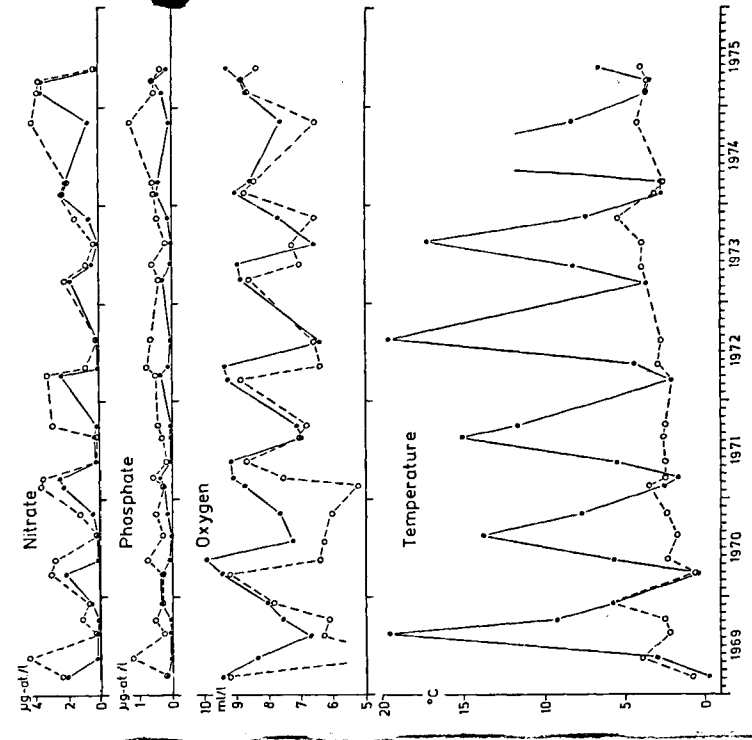


Fig. 3 Distribution of selected oceanological features in the surface layer of station 15 A ($57^{\circ}18,3'N$, $20^{\circ}4,6'E$) in the eastern Gotland Basin (— 1 m, - - - 70 m depth)