

B. SCHULZ und A. WULFF. Hydrographie und Oberflächenplankton des westlichen Barentsmeeres im Sommer 1927. Berichte der deutschen Wiss. Komm. f. Meeresforschung. N. F., Bd. IV. Heft 5. Berlin, 1929.

Data regarding the temperature, salinity, dissolved oxygen, hydrogen ion concentration, transparency and colour of the sea collected by the "Poseidon" during the summer of 1927 are tabulated and their distribution in the western part of the Barents Sea discussed and illustrated with diagrams and sections by Dr. BRUNO SCHULZ. Five lines of stations running North (true) to beyond latitude 76° N. roughly equidistant and starting between Tromsø and the Sem Islands were worked. The middle line of stations (along the meridian 30° E.) was worked twice, early in August and again at the end of the month. At three positions in the open ocean, observations were made throughout a day and night, showing changes in the temperature and salinity, most marked in midwater layers, and having a 12 hours periodicity.

Dr. ALFRED WULFF in the same publication (C. Ergebnisse der Untersuchung des Oberflächenplanktons) investigates the surface microplankton taken in August and September 1927, and here there is much that is of interest. In his former work (1926) on similar lines in connexion with the Barents Sea plankton collected by the "Zieten" this investigation was begun, and it is now taken up in greater detail, the more exact hydrographical data of the present voyage in the "Poseidon" being available. The most important part of this research is the critical work on the distribution of the tintinnids which seem to show distinctly that their characters are affected by their environment, and a variety of forms in a single species are described from the Barents Sea with its many sided and every changing conditions. These tintinnids have all been accurately measured and curves of their distribution given, with hydrographical data, besides elaborate diagrammatic drawings of the various forms. Two species of Favella are predominant, *Favella edentata* and *Favella denticulata*. The first is a small species, which is the principal form in the southern part of the Atlantic stream and especially in the Murman stream, the last has a small form var. *typica*, which comes from the East and inhabits the coastal waters, mixing in places with *F. edentata*. Larger forms of *F. denticulata* inhabit the mixed waters further from the coast and many of them have been separated into definite varieties, each occupying a special area.

A comparison with viscosity curves shows that there is a certain definite distribution, the stumpy and thicker forms living near the coast in the region of greater viscosity, the longer and thinner forms being found more in the open where the viscosity is less. This last relation also naturally depends upon temperature.

Other plankton organisms are also investigated, including peridinians, diatoms and flagellates. Amongst the peridinians *Ceratium longipes* and *C. arcticum* come from waters of different origins, *C. arcticum* from the East, *C. longipes* from the West and North. Peridinium is important, *P. depressum* and *P. ovatum* are abundant in the coastal waters but many other species depend on the currents both from East and West. Diatoms may occur in numbers both near the coast and in the outer waters, their mass development depending on hydrographical conditions. Certain species

of Chaetoceros are of special interest (*Ch. criophilum* and its form *volans*, *Ch. boreale*), in some cases intermediate forms between two species being observed. Rhizosolenia, especially *Rh. styliformis* and *Rh. semispina*, was also important. Of other groups, *Globigerina bulloides* is an Atlantic immigrant and *Halosphaera viridis* comes from the West, being wafted in masses between Faroe and Shetland into the Norwegian Sea, but, judging from researches into its life history, it probably breeds in the Barents Sea.

The whole of this investigation is very suggestive and is an important contribution to the knowledge of the minute life in these regions.

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RALPH C. LEWIS. The Food Habits of the California Sardine in Relation to the Seasonal Distribution of Microplankton. Bull. Scripps Inst. of Oceanogr., La Jolla, California. Technical Series. Vol. 2, No. 3. Berkeley, California. 1929.

*Sardinia coerulea*, the California Sardine, is readily obtainable throughout the year and is used by Mr. LEWIS for his researches into the correlation of fish food with the distribution of microplankton. The California Sardine is a plankton feeder and its chief food consists of diatoms, dinoflagellates, copepods and other small crustacea, with an occasional fish.

Whenever possible surface plankton samples were taken where the fishes were caught and at the same time, the number of organisms in the samples being estimated as well as those from the stomachs of the fishes. The results show that the quality and quantity of the food varies with the season and depends on the amount and character of the prevailing microplankton. If diatoms be predominant, they form the chief food, if dinoflagellates or copepods, these are chiefly eaten. On one occasion only in winter some of the pilchards in a catch had the stomach full of *Euphausia pacifica*. This crustacean is known to frequent depths between 200 and 400 metres in the daytime, probably coming up nearer the surface at night. Copepods form a large part of the food at almost any time of year. Dinoflagellates occur in considerable numbers generally at the same time or rather later than the diatoms. In winter few diatoms and dinoflagellates were taken in February, but more in March, and only a few copepods. In spring diatoms and dinoflagellates were predominant with a general decrease in June, copepods abundant. In summer there were few diatoms until September, and a fair number of dinoflagellates, except in August; whilst copepods were fairly abundant. In autumn, when fewer samples were available, diatoms were abundant until November when their numbers decreased substantially, dinoflagellates in less numbers in the plankton than in the stomachs of the fishes, copepods fairly abundant.

In all these cases the numbers in the stomachs of the fishes almost always corresponded with the numbers in the plankton samples, and it seems a likely conclusion that the fishes go to those places where there is most food; also that the seasonal distribution of the microplankton can be correlated with the abundance of fishes which feed upon it. Temperature fluctuation apparently affects the presence of sardines indirectly, a low temperature being associated with the favourable growth of diatoms.