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Introduction to the Hydrography Section of Annales Biologiques Vol.36 (for 1979)

The section starts with a number of contributions describing the hydrographic situation on the Atlantic shelf and slope of the United States throughout the year. On the basis of XBT transects Hughes and Cook follow, in text and figures, the thermal structure across the shelf and slope southeast of Sandy Hook month by month. The major oceanic features sampled are presented in a table.

Also on the basis of XBT transects Crist and Chamberlin describe the seasonal and transient variability of bottom temperatures on the shelf and slope south of New England during the year. At bottom depths less than 80 m minimum temperatures as low as in the two preceding years (i.e., less than 2°) were obtained. At bottom depths of 80m-150m minimum temperatures as low as those in 1979 were previously observed only in 1977. In the warm slope water band bottom temperatures in 1979 ranged from greater than 13° to about 11.5°. At depths between 200 m and 400 m bottom temperatures during 1979 were similar to those recorded in 1977, but about 1° higher than in 1978.

The temperature structure and surface salinity in the Gulf of Maine during the year are discussed by Cain on the basis of observations on three transects. The hydrographic conditions are illustrated by sections and graphs.

Variation during the year in the position of the shelf water front from Georges Bank to Cape Romain is discussed by Hilland on the basis of weekly charts produced by the NOAA National Environmental Satellite Service (NESS) from thermal infrared imagery available from NOAA satellites. The mean position of the front during 1979 was further off-shore than normal along the whole stretch considered. However, the front seemed to be returning to its more usual location, as its position from Cape Henry northward was not as far off-shore as in 1978.

A report by Fitzgerald and Chamberlin summarizes the movements of anticyclonic warm core Gulf Stream eddies in the slope water region off the New England and Mid-Atlantic coasts during 1979. The analysis is based principally on the eddy positions shown in the weekly satellite-derived Gulf Stream analysis charts issued by NOAA NESS. Charts showing tracklines

for each of the twelve warm core Gulf Stream eddies occurring in the region during 1979 are presented. Eleven of these eddies were formed during the year which means a greater eddy production in 1979 than in any of the previous five years. It appears that strong Gulf Stream meandering was responsible for this high rate of eddy production. The strong meandering also explains the short lifespan of four of the eddies: they were reabsorbed by the meandering stream. Other eddies had travelled southwest into the Mid-Atlantic Bight before the strongest meandering and thus obtained long lifespans. One of them, formed in 1978, survived for a total of 401 days — the longest-lived eddy met with during the six years of analysis.

On the basis of observations by merchant vessels McLain and Ingham calculated monthly means of sea surface temperature (SST) in 1°-squares of the northwestern North Atlantic in 1979. The results are presented as monthly maps in which also the anomalies (from 1948-1967 means) are shown. The map for February, and to some degree that for March, show an area of cold water throughout the western section from Cape Hatteras to Nova Scotia, a consequence of the meteorological conditions reigning in the area during these months. More unusual was the development of a band of warmer than normal water between 38°N and 40°N in the western section in May. In order to characterize the SST of the entire area (35°N-46°N, 60°W-76°W) by a single number the authors computed for each month the mean of all the mapped anomalies. The resulting means show a strongly negative value in February, strongly positive values in May and June. An investigation of the spatial distribution of these anomalies showed that while the negative anomalies in February were very widespread the warmer than usual water in late spring and early summer occurred in the north only.

The hydrographic situation in Icelandic waters during late spring and early summer is described in the "Report on joint Soviet-Icelandic investigations on hydrobiological conditions in the Norwegian Sea and Icelandic waters in May-June 1979". Charts show the distribution of temperature at 20 m and 50 m. Temperature of the Atlantic water south and west of Iceland was about 1° below the long-term mean whereas salinity was normal or slightly above. In the North Icelandic waters conditions were most unfavourable, and the same applies to the oceanic area northeast of Iceland. Temperatures were up to 5° below normal, and salinities below the critical value 34.70‰ occurred. Arctic conditions dominated in the whole water column even to a greater extent than during some of the "ice years" 1965-1971. Also the East Icelandic current had an unusually wide extent both to the east and south.

The severe arctic conditions in North Icelandic waters were still reigning in August, at least east of 18°W, as stated in the "Report on the 0-group fish survey in Icelandic and East Greenland waters, August-September 1979". This report on investigations by Icelandic research vessels presents charts showing the distribution of temperature at 20 m, 50 m and 100 m. They indicate that in Icelandic waters the temperatures at 50 m and 100 m were about 1° below normal south and west of Iceland, 2°-3° below normal north and east of Iceland. At 20 m however, the negative anomalies were less pronounced than in spring. In the Irminger Sea the temperature of the surface layer was about normal. A conspicuous feature of the temperature charts is the intrusion of tongues of warm water into the shelf area of East Greenland.

A detailed description of the hydrographic conditions in the Norwegian Sea during 1979 is given by Solonitsyna. During winter the temperature of the North Atlantic Current in the Faroe-Shetland Channel area was about 1° below normal. In the eastern branch of the Norwegian Current temperatures were from 0.5° below normal in the central part to nearly 2° below normal in the northern part. In spring temperature of the western branch of the current was about normal in the southern part of the Norwegian Sea, 0.5° to 1° above in the central part. During summer temperature in the southern and central parts of the Norwegian Sea was about 1° below normal, in the northern part however it was normal to 1° above. In the East-Icelandic Current temperatures in summer were about 0.5° below normal, i.e., about 1° lower than in 1977 and 1978. In the northern part of the Norwegian Sea temperatures in autumn were 1° above normal in the western branch of the Norwegian Current, about 0.5° below normal in the eastern branch and even slightly more below east of Bear Island.

As in 1977 and 1978 the salinity of the Norwegian Current was generally about 0.1‰ below normal. In some minor areas salinity was a little higher than in 1978, but still below the long-term mean. The salinity of the East Icelandic Current on the Langanes-Jan Mayen section was slightly below normal. Also to the south-east of Iceland the salinity of the water of this current was below normal, but was about 0.1‰ higher than in 1977 and 1978.

Since 1959 temperature and salinity on a number of standard sections in the boundary area of the Norwegian and Barents Seas have been monitored each spring at nearly fixed dates by scientists from PINRO (Murmansk). The hydrographic conditions in spring 1979 are described by Mukhin and Dvinina. Tables give for five sections and several depth intervals the temperatures and salinities in 1979 as well as their deviations from the long-term means.

In the section across the eastern branch of the Norwegian Current at 67°30'N temperatures were about normal; at 71°10'N they were below normal by 0.5° to 1°, and at 72°50'N 0.5° or slightly more below normal. In the North Cape Current (the North Cape-Bear Island section) temperatures were below normal by about 0.5°, in the Murmansk Current (the Kola section) by about 1°. Salinities were below normal in the whole area investigated, the anomalies varying between -0.05‰ and -0.15‰. The greatest negative anomalies were obtained in the North Cape section and in the northernmost section across the Norwegian Current.

An 0-group fish survey was as usual carried out in the Barents Sea and adjacent waters in August-September, by two Norwegian and two U.S.S.R. vessels. On the basis of the hydrographic observations made in connexion with the survey the report presents charts showing the temperature distribution over the area at 0, 50, 100 and 200 m depth. The temperature distribution on four standard sections is also shown, and the average temperatures on these sections are given in tables. The cooling of the Kola section in recent years was in 1979 replaced by a slight warming; however, the temperature was still 0.7° below the long-term mean. On the section northward from Cape Kanin (43°15'E) a slight decrease was observed from 1978 to 1979 in the southern part of the section whereas no essential change was noted in the northern part; compared with the long-term means anomalies on the section were from -1.5° to -2.2°. In the North Cape-Bear Island section temperature increased by 0.3°, but was still 0.3° below normal. Also on the section westward from Bear Island along 74°30'N temperature rose by 0.3°, reaching the long-term mean.

On the basis of observations by PINRO research vessels Sarynina discusses the temperature conditions in the southern part of the Barents Sea during 1979. In winter the temperature on the North Cape-Bear Island section was below normal by more than 1°, and by nearly 2° on the Kola section. Such low February temperatures were never recorded before during these investigations. The strongly negative temperature anomalies continued during spring in the central and eastern parts of the area, whereas in the western part (on the North Cape-Bear Island section) the anomalies in the 0-200 m layer in May were about -0.5° only. In June surface temperatures were still low, below normal by about 1° in the west (North Cape Current) and by about 1.5° in the Murmansk Current (Kola section). In July a strong temperature increase in a shallow surface layer was observed, temperatures reaching values more than 1° above normal; temperatures in deeper layers,

however, were still below normal. After September surface temperatures were again below normal. In December the temperature of the 0-200 m layer was below normal by about 0.5° both on the Kola meridian and in the coastal branch of the Murmansk Current. Generally, for the Barents Sea water masses 1979 was one of the coldest years on record. During the first half of the year temperatures of the 0-200 m layer in the central and eastern part of the area, as represented by the observations on the Kola section, were below normal by about 1.5°, in the second half of the year below normal by a little less than 1°. In the western part the anomalies, averaged over the year, were about -0.5°. Compared with the year before, 1979 was warmer in the western part of the Barents Sea, colder in the eastern part.

The hydrographic conditions in the West Spitsbergen Current during the summers of 1978 and 1979 are dealt with in a report by Verch, Schulz and Dumke, on the basis of observations in a section from Bear Island westwards (along 74°30'N) and (in 1978 only) a section along 76°N. Figures showing the distribution of temperature and salinity on the sections are presented, as are tables showing mean values over the Bear Island section of temperature and salinity of various water layers. Values are also presented for the years 1974 and 1976. The tables show a very considerable decrease (2.5°) of temperature, and some decrease of salinity, of the 200-500 m layer from 1974 over 1976 to 1978, followed by an increase in both temperature (0.5°) and salinity from 1978 to 1979.

Monthly anomalies in 1979 of sea surface temperature at the four North Atlantic Ocean Weather stations (Smed) compared to those of 1978 show, averaged over the year, no change at station R, an increase of 0.3° at L, and a decrease of 0.3° at C and M. After 1976 the annual mean temperature at M has been steadily decreasing and in 1979 was 1° below the 1961-1970 mean.

On the hydrographic conditions in the central Rockall Channel in 1979 is reported by Edelsten and Ellett. Surface observations, which in the January to March period represent conditions in the upper 500 m or so, show temperatures slightly above the 1961-1970 means. Salinities were still well below the means for this period, but the upward trend that began in 1977 continued. The authors suggest that this rise is an indication of lesser eddy activity in the European Basin in recent years. Residual currents, calculated from records at three sites (channel, slope and shelf) in the area are also presented.

Scottish research vessels made thirtythree hydrographic traverses of the Faroe-Shetland Channel during the 1970s. On the basis of these investigations Martin reports a progressively stronger influence of water of northerly origin in the area throughout the decade, such as an increase of the amount of Arctic Intermediate Water present in the Channel. The salinity of the North Atlantic water in the Channel showed only little variation during the first years of the 1970s; in 1975 however, the salinity of the upper 200 m layer dropped below 35.30‰ for the first time since the period 1909-1913, the temperature of the layer at the same time falling about 0.5°, and these low values of temperature and salinity have persisted since then. The author presumes that the changes were caused by a decline in the temperature and salinity of the waters of the North Atlantic Drift. In contrast to these changes the temperature and salinity of the bottom Norwegian Sea water in the Channel showed no change.

In connexion with the international 0-group survey inFaroese waters in May 1979, by Faroe Islands and France, temperature observations were carried out from RV "Thalassa". The report on the survey presents a chart showing the distribution of surface temperature. A comparison with the temperature conditions in May 1978 indicates that temperatures in 1979 were lower by 0.5°.

Tables of monthly anomalies of surface temperature and salinity in areas of the Celtic Sea for the years 1959-1973 are presented by Smed. These time series now cover the period 1903-1973; graphs of the annual anomalies are shown.

Sea temperatures at 10 m depth are available from CPR tows during 1979 in the North Sea, the Irish Sea and the English Channel. Average temperatures in the standard areas, together with the dates of records, are reported by Halliday. Temperatures were generally below the long-term mean, in the northern North Sea even well below average in the winter months.

On the basis of data from surface temperature recorders and XBTs worked in the Orkney-Shetland region late August-early September 1979 Wegner presents charts of surface and bottom temperature, and graphs showing vertical temperature distribution. Surface temperatures were about 1° below normal. Because of the vertical mixing of the water the same applies to the bottom temperature over the Orkney-Shetland threshold and in the coastal waters. Also in the area east of the threshold bottom temperatures were about 1° below the long-term means.

From observations made in connexion with the ICES Young Fish Survey in the North Sea Smed prepared charts showing anomalies of bottom temperature and bottom salinity in the North Sea in February 1979. The charts show that bottom temperature was below normal in the whole North Sea. While the anomalies did not exceed -1° in the northwestern half of the North Sea they were from -1° to -3° in the southeastern part, in the German Bight even between -3° and -4°. The low water temperatures were obviously a result of the low air temperatures in the region during the winter 1978/79. Bottom salinities too were below normal in practically the whole North Sea, a consequence of the strong convection caused by the intense cold. A conspicuous exception was a tongue of water of above normal salinity stretching towards west from the inner German Bight.

For three areas of the North Sea the time series of monthly anomalies of sea surface temperature, published in earlier volumes, have been extended and now cover the period 1902-1973 (Smed). Great fluctuations are obvious in post-war years, showing the same picture in all three areas.

The hydrographic situation in the Southern Bight in 1979 is represented by the monthly means and anomalies of surface temperature and salinity at LV "Noord Hinder" (Wiggers). The most conspicuous feature was the great positive temperature anomaly in December. Averaged over the year both temperature and salinity were normal.

The hydrographic conditions in the German Bight during 1979 are described by Prahm-Rodewald on the basis of temperature and salinity observations at four lightvessels. Both surface and bottom temperatures were below the 1961-1970 means throughout the year except in December. The greatest anomalies, -2° or more, were obtained at surface in February and March, at bottom in March. A characteristic feature of the salinity was the above normal values in the beginning of the year. Especially great anomalies were obtained at LV "Elbe 1": more than 2‰ at the surface in February and March, about 1.5‰ at the bottom in February. These high bottom salinities fit well into the February chart of bottom salinity anomalies in the North Sea mentioned above, which was based upon cruise data.

The surface conditions in the German Bight in August 1979 are also discussed by Prahm-Rodewald, on the basis of a dense system of crossings on which surface temperature and salinity were recorded continuously. Quasi-synoptic charts showing isotherms and isohalines are presented. The salinity charts indicate a sort of frontal zone between the low salinity Elbe and coastal water and the more saline water of the open North Sea. One of the

charts shows a distinct meandering of this frontal zone. Compared to the long-term means (1905-1954) the surface temperatures in August 1979 were lower by 0.5° to 1°, the surface salinities lower by 0.5‰ to 1‰.

The variation of the hydrographic situation in the deep layers of Skagerrak is reported by Svansson on the basis of observations four times during the year. The increase of oxygen values would seem to indicate some renewal of the bottom layer in the interval between end of January and mid-March, while a renewal of a much thicker layer obviously took place in the interval between mid-March and mid-May, as shown by the lower temperatures and higher oxygen values in May. At the Bornö station temperatures were below the long-term means (1931-1960) during most of the year, and in the layer below about 15 m depth the same applies to the salinities. A table showing oxygen saturation throughout the year in the northern Kattegat is presented.

The hydrographic conditions in the western Baltic during 1979 is described by Prahm-Rodewald on the basis of the daily observations of temperature and salinity at various depths at LV "Fehmarnbelt". Compared to the long-term means (1961-1970) the surface water was colder in all months except December, and the bottom water in all months except August and September, the negative anomalies exceeding -2° in some months or even -3° for bottom temperature in January. Surface salinity was above normal during most of the year, the anomaly reaching nearly 4‰ in July. Bottom salinity on the contrary was mainly below normal, the anomaly exceeding -4‰ in January and -5‰ in September.

The observations throughout the year in four deeps of the Baltic proper (Arkona, Bornholm, Gotland, Landsort) are presented in tables by Engström and Fonselius. After a strong amelioration by the end of 1978 of the oxygen conditions hydrogen sulfide was in early 1979 found in the Gotland and Norrköping Deeps only, and in low concentrations. During winter and spring smaller inflows of Kattegat water, rich in oxygen, took place, further improving the oxygen conditions in the southern Baltic, whereas not much change was recorded in the bottom water of the northern Baltic. During summer and autumn the areas with low oxygen content increased. In late autumn hydrogen sulfide occurred over great areas and the concentration had risen considerably. In the Gotland Deep the hydrogen sulfide layer began already at a depth of 150 m.

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