at stations 7 and 33 was 20 hr. Direct current observations (ten in a period of 14 hr.) were then made within five metres of the bottom by means of a Carruthers' Pisa current indicator[1]. The preliminary analysis of the observations shows a residual current of 0·3 knot in a direction 250° true when the tidal current is eliminated.

Immediately the current observations were completed at 1300 hr. G.M.T. on August 17, the part of the section previously worked in the immediate vicinity of station 7 was repeated in an attempt to delimit the extent of the cold bottom water encountered at station 33 during the measurement of the current. Fig. 2*b* shows the results of this.

After this part of the section had been repeated, a bottom temperature survey on the fishing banks to the west and south of the section was commenced, during which the front of the advancing cold bottom water was identified as lying between stations 39 and 40, sixteen nautical miles apart, at 0430 hr. on August 18, as shown in Fig. 3. The rate of advance of the front of the cold water can be estimated between two limits from the knowledge of the interval of time during which it passed station 7 and the two positions between which it was situated at 0430 hr. on August 18, assuming the axis of flow to have been along the line joining stations 33, 39 and 40. The limits thus determined are 0·55 knot and 1·4 knots, and the line of the axis of flow thus assumed is approximately 255° true. This direction agrees almost exactly with that of the current measured at station 33 and, although both limits of the rate of advance of the cold water front exceed that of the observed current, the lower limit is of the same order of magnitude.

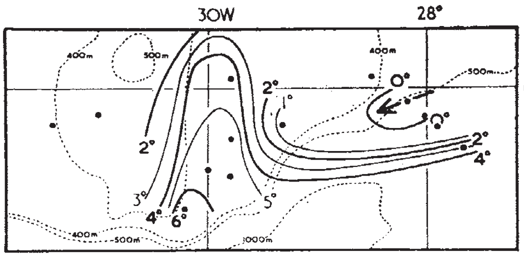

Fig. 3. Bottom temperature distribution (° C.) on the south-western side of the Iceland–Greenland Ridge (1300 hr. G.M.T. August 17–1600 hr. August 18)
Bottom residual current, ←●—; ●, station

An analysis of the salinity values in the deeper layers of stations 7 and 33 shows the sudden decrease in temperature to be the result of a renewal of the overflow of cold Norwegian Sea deep water across the Iceland–Greenland Ridge. This finding adds support to the hypothesis of Cooper[2] that the overflow is intermittent and takes the form of a series of discrete boluses. It is also in agreement with one of the findings of the Iceland–Faroe Ridge Survey of June 1960, namely, that the bottom temperature on the southern side of these ridges can change rapidly. It is perhaps of significance in a consideration of the factors controlling the overflow that the surface front between the warm Atlantic water and the cold southward-flowing East Greenland Current apparently shifted towards the south-east between the two occasions when the section was worked. As a result of this, on the first occasion when there was little evidence of any overflow, station 7 was located in the warm Atlantic water, but when the *Ernest Holt* returned to station 33 and found a strong overflow it was located in the cold East Greenland Current.

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LIMNOLOGY

A Second Lake with Old Sea-Water at its Bottom

FOUR years ago I directed attention to a Lake (Rørholtfjorden, part of Lake Tokke, in southern Norway) with trapped sea-water[1]. The surface altitude of that Lake is 60 m. above sea-level, and the estimated age of its bottom waters some 6,000 years, that is, of the marine salts contained in them; the present bottom waters probably possessing one-half of the salinity of those originally isolated.

While there are a large number of land-locked waters still having some communication with the sea, there are very few where bottom waters have been completely isolated, and not washed out through admixture with fresh water layers above. Until their discovery in Lake Tokke, salt bottom waters were known only from lakes near sea-level, where isolation through post-glacial land rise must have occurred but recently.

Since my communication, work in progress on Lake Tokke has led to some results, especially concerning isotope distribution in sediments.

Further research made it very desirable to find a second lake with old sea-water, and finally, my collaborator, Mr. H. V. Søvik, in January 1961, discovered such a lake, Botnvatn, in the district of Salten, northern Norway (67° N.), the altitude of the lake surface being 12 m.

Lake Øvrevatn, a land-locked fjord[2] near Botnvatn, with an average height of its water-level of about 2 m. above daily ebb, is at the point of being isolated from the sea. We can thus assume a land rise since the isolation of Botnvatn, of about 10 m., and that the isolation probably took place some 3,000 years ago.

Botnvatn is 113 m. deep, with salt waters from 102 m. downward. Hydrography is very similar to that of Lake Tokke, where salt waters extend from 134 m. to the bottom (147 m.). A comparison may be made between the salt-water layers of the two lakes:

	Tokke, 144 m.	Botnvatn, 111 m.
Chlorine (mgm/l.)	9·24	7·26
Salinity (gm./kgm.)	16·71	13·14
Temp. (° C.)	5·20	4·75

As is the case in Lake Tokke, the salt bottom waters contain enormous amounts of methane, and bubble violently when brought to the surface. We thus have to face the same problem as in Lake Tokke, that with decrease in pressure the release of methane, also within the sediments, makes it very difficult to secure undisturbed samples of the bottom deposits.

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