AUGUST KROGH. Über die Bedeutung von gelösten organischen Substanzen bei der Ernährung von Wassertieren. Zeitschrift für vergleich. Physiologie. Bd. 12, H. 3/4, S. 668—681. Berlin, 1930.

Whether dissolved organic substances in natural waters can or can not be used as a source of food by aquatic animals, has been a much debated question during the past two decades. Several attempts to prove or disprove the theory have been made, but the present investigation by KROGH is by far the most careful study of the problem that has yet been made. He has employed much more accurate apparatus and methods than his predecessors, and his results are, therefore, correspondingly much more reliable. Great care was exercised in reducing bacterial contamination to a minimum and his results were checked by two methods.

The experiments fall into two groups, namely (a) those in which grape sugar was employed and (b) those in which the dissolved organic substances found in natural waters were used. The latter experiments were performed for the purpose of avoiding the criticism that such substances as grape sugar are not present in natural waters, and therefore have no bearing on the problem. (In this connection it may be remarked that Wisconsin lake waters do not contain any sugars and only a very small percentage of the carbohydrate material that is present can be readily hydrolised into sugar.) In the grape sugar experiments, it was found that Daphnias, fish and tadpoles actually took up small amounts of the sugar in solutions of 5, 20 and 40 milligrams per litre, but the amounts absorbed were equivalent to only about a quarter of the gas exchange. At the same time organic substances in corresponding or larger amounts were given off to the water by the organisms. In the experiments with natural waters containing about 10 milligrams of organic matter per litre, the mollusk Dreissensia and a species of Leuciscus gave off more oxidisable matter to the water than was eventually taken up by them. These results seem to indicate that very little use can be made of the organic substances dissolved in natural waters. The experiments are being continued by the author and his final conclusions will be awaited with very great interest.

C. JUDAY.

J. LE GALL. Statistique biologique et considérations sur la population harenguière de la Manche orientale et du sud de la Mer du Nord (matériel prélevé en 1929). Rev. d. Trav. de l'Off. des Pêches Mar. Tome III, fasc. 2, no. 10. Paris, 1930.

The leader of the biological laboratory at Boulogne s/m has for a series of years devoted a great deal of attention to the study of the autumn and winter herring in the transitional area between the Channel and the North Sea, and such continuous observations are of course the more useful the longer they are carried on. Here, after a rapid definition of the three herring "provinces" to be distinguished (Gris-Nez to mouth of the Somme, group I; mouth of the Somme to Cape Antifer, group II; and the Dijck-Sandettie region, off the Belgian coast, group III), the author proceeds to discuss the material collected during the autumn of 1929. Herrings were measured, scales taken for age reading and vertebrae counted, and in this way charac-

teristics for the herrings of the three areas mentioned have been obtained. From the measurements it was possible to calculate the average length of each year class of herrings.

Racial investigations. It appears from continuous studies that only the population of area II, south of the Somme, can be regarded as a pure, unmixed one; the average number of vertebrae and the frequency curve distinctly point to the characteristics of the East Channel herring ("type Manche") extending sometimes (winter 1928/29) along the Sussex and Kent shores. On the other hand, the area between the Channel and the North Sea is inhabited by a herring population, made up partly by a true North Sea race ("type sud de la Mer du Nord"), partly by a mixture of North Sea herring and Channel herring. The mixed population naturally occupies the boundary region between the two types, and as the southern North Sea type invades to a greater or less degree the transitional area between the Channel and the North Sea, probably according to hydrographic conditions, we get in different winters (1928/29 and 1929/30) different distributions. The present reviewer is glad to see confirmed his own hypothesis as to racial origin of herrings caught in the southern entrances to Dutch waters.

Year Classes. From a practical point of view we may, however, take the whole herring population in the regions named as homogeneous, for, apart from racial differences, it becomes more and more clear, as other investigators on the same subject also show, that certain predominant year classes and other deficient ones are generally the same, whether we take herrings (in a sufficiently large sample) from the waters south of the Somme or from Belgian waters. The continuity of the predominance of these year classes in consecutive years is indeed remarkable. So it is proved that in the winter 1929/30 the year classes 1921, 1922 and 1924 were everywhere predominant, to which the comparatively poor broods of 1923 and 1925 form a sharp contrast. Both herring types thus seem to vary in productiveness (or survival of larvae) to the same extent and in the same year and if this is perhaps to be expected in two races impinging on each other, the fact becomes of much greater consequence when we realise that, broadly speaking, the whole North Sea herring race shows the same fluctuations from year to year as its southern branch. Taking into account the obstacles connected with sampling the homogeneity of these results lends support to our belief that control over the yearly additions to the stock of herrings (be it some years afterwards) and, in this way, prediction of yield of the fisheries is indeed possible and trustworthy.

Growth. Comparing the average length of the year classes it is also to be noted that in all three regions investigated by the French author the growth of herrings at the same age is somewhat less than it had been in the previous winter. This also points necessarily to a more universal cause, probably to be sought for in hydrographic conditions acting either directly or indirectly. As Dr. CARRUTHERS recently (this Journal, Vol. V, No. 2) drew attention to the greatly strengthened flow of the residual current from the Channel to the North Sea during the period from November 1929 to January 1930 (incl.), followed by a no less remarkable reversal of this current in February, we shall await with great interest the possible

effects of these unusual water movements on the productiveness of year classes of fish born in that winter, not only as regards the herring, but perhaps to a greater degree the plaice. This influence, if any, will become apparent two or three years hence.

M. Le Gall does not conclude his useful paper with any prediction about the future composition of year classes of herring in the winter 1930/31, but his results, tallying so well with those of other authors as Hodgson, Lissner, *inter alia*, are certainly something to be grateful for.

J. J. T.

W. C. Schroeder. Migrations and other phases in the life history of the Cod off Southern New England. U. S. Dept. of Commerce. Bur. Fish. Doc. 1081. Washington 1930.

In this important paper Schroeder is mainly concerned with the results of marking no less than 40,000 cod (in 1923—1929), but he also uses statistics of catch, observations of length-frequency and observations of scale structure. The choice of Nantucket Shoals, for marking some 18,000 of the specimens, enabled interesting and definite results to be obtained about the stock there, which is estimated to number from 3 to $4^1/_2$ million well-grown fish during the summer months. The stock of cod living on the Nantucket Shoals was found to be distinct from that living to the North and East of Cape Cod, only a very small percentage of the Nantucket Shoals cod straying to the North and East, and only a few cod marked to the North and East straying to the Nantucket Shoals. On the other hand a large proportion of the Nantucket Shoals cod were found to winter along the American coast to the South and West, as far as 200 to 300 miles. (Actually 2 specimens were recovered from a place in Virginia, at about 400 miles from the position of liberation). Of fish marked on Nantucket Shoals, the percentage recaptured North and East of Cape Cod was about 0.1, as compared with about 2.0 on other grounds, and about 1.0 on the Nantucket Shoals themselves. (A comparison made from the information of pp. 16—21, 31, 41, 42. Some of the cod from the North and East of Cape Cod also winter in the South, with those of the Nantucket Shoals, but these are shewn to be only a small proportion of the population wintering on the southern grounds.) Of the possible factors causing this migration, temperature appears to be the most likely, but the *incidence* of migration is not controlled by any particular temperature. The distinction of the stock North and East of Cape Cod from the Southern New England stock, is supported by a significant difference in the number of sclerite bands in the first zone of the scales.

There is also a summer migration from the Nantucket Shoals to the neighbourhood of the adjoining mainland (the "Chatham—South Channel" region), but this is less regular and only affects the larger fish (say >65 cms.). The fact that, during the summer, most of the cod on the Nantucket Shoals remain more or less stationary, was demonstrated from recaptures of marked fish, also the stability of the length-frequency curves and of the catch per unit of effort. It seems that the stock of cod on the Nantucket Shoals is mainly recruited by immigration, rather than by the settling of pelagic