

both the abundant dead shells in that area and the records of the valves of that species in the Irish Trawling Report were open to the same interpretation as the records of the shells of *C. edule* in the North and Irish Seas.

Dr. PRATJE himself stresses the need for caution when he writes "there only remains the great probability as regards these shallow water forms as relicts of the subsidence period.... The shells of *Cardium edule* in the first place, then also of *Lutraria elliptica* on the Dogger and *Tellina Baltica* in the southern water must therefore in the majority of cases be classed as subfossil and as a link bridging over between the post-diluvian submarine marshes and the present day communities of fauna."

RICHARD ELMHIRST.

Å. VEDEL TÅNING. Plaice Investigations in Icelandic Waters. Cons. Perm. Int. pour l'Explor. de la Mer. Rapp. et Proc.-Verb. Vol. LVII. Sci. Rep. of the North-Western Area Com. for 1926—27. Copenhagen. 1929.

The difficulties of carrying out a detailed investigation of a fish in waters so remote from a marine biological station such as those of Iceland are so great that Dr. TÅNING is much to be congratulated on his comprehensive survey of the Icelandic plaice. No aspect of the life history and general economy of the plaice has been omitted, although some points could not be considered fully owing to the inevitable lack of continuous work.

Dr. TÅNING traces the history of the Icelandic plaice fisheries from their inception in 1891 when the first English steam trawler started fishing in those waters — the plaice for some reason having been entirely neglected by the Icelanders — and by means of the International and English statistics he shows how the yield of a very rich virgin ground was reduced to about half the quantity in the course of some eight years. When, as in the North Sea, the stock was replenished owing to the partial cessation of fishing during the war, the reduction owing to the post-war fishing was even more rapid than before, no doubt due to improved vessels and gear. The decline in actual abundance was not perhaps quite so rapid as shown in Table (1) which gives the total yield of the plaice fishing according to International statistics. The yield fell by over four thousand tons (42 %) between 1920 and 1921. Since, however, as Dr. TÅNING says, the greater part of the plaice are taken by English vessels, the effect of the coal strike in England in the spring of 1921 would be to depress the total yield, as the English fishery was restricted for some months. The catch per day's absence from port of English steam trawlers gives a truer picture of actual abundance and shows that the decline was more gradual:—

Catch per Day's Absence from Port of English 1st Class Steam Trawlers in the Region of Iceland.

Year.....	1906	1907	1908	1909	1910	1911	1912	1913
Cwts. ....	5.3	5.1	3.9	3.7	3.1	3.3	3.9	2.6
Year.....	1920	1921	1922	1923	1924	1925	1926	
Cwts. ....	4.9	3.6	3.0	3.0	2.4	2.5	2.4	

The difference in the sorting of plaice on the English market in pre- and post-war years, is quite sufficient to account for the apparent scarcity of "Large" plaice after the war, as Dr. TĀNING suggests. The present sorting will account also for the great increase of "Small", since this category now includes much of the fish previously classified as "Medium".

The study of the general conditions of life show the importance of the great variation of hydrographical conditions off the different coasts of the Island. Briefly stated the conditions are as follows. The South and West coasts are bathed by warm Atlantic water and the North and East coasts by Arctic water, causing a marked difference in temperature. At 50 metres depth, it ranges from 7° C. in the South to below 1° C. in the North-East during the winter and early spring. In summer the warm water is carried round the western to the North and East coasts by the anticyclonic current, losing heat as it passes. The water of the eastern side is therefore the coldest.

Dr. TĀNING shows how the hydrographical factors affect the plaice stock. First in regard to the racial characteristics. The plaice of Icelandic waters may all be considered as one stock since the young fish are distributed by the currents and by migration from the South to the East coasts, but there is as great an increase between the numbers of vertebrae and numbers of the dorsal and anal fin rays of the plaice from the South and the North of the island as there is between the numbers of the vertebrae and fin rays of the Icelandic and Baltic-North Sea plaice. These variations he regards as purely phaenotypical.

The time and place of spawning again depend on temperature. The main spawning takes place in the warmer waters of the South and West in March and April, and the larvae are carried North by the currents, but there is also a later spawning off the East coast in May and June. Bottom stages of the 0-group were not found till July 1st on the South-West coast, a fortnight later on the North and still later on the East coast. As might be expected the growth of the 0-group is least on the East coast and greatest on the South. This difference in growth rate is evident throughout life. The plaice from the western side of the South coast grow very rapidly, indeed are larger for their age than those of the North Sea and the growth rate shows a decline as the stock is sampled round by the West to the North and reaches its minimum on the eastern side of the island. Dr. TĀNING relates the difference in growth rate to temperature and suggests that the importance of temperature and length of summer have been underestimated when the rate of growth of plaice have been studied. While the effect of such great differences in temperature as are found round Iceland may well have a marked effect, it is doubtful, in the reviewer's opinion, whether the difference in growth, for example, between the plaice off the Danish seaboard and the western Dutch coast can be due to the small variations in temperature of the two localities. Moreover, if the part played by a slight increase or decrease in temperature has a significant effect, a higher growth rate might be expected after a long hot summer than after a cold one, but the reviewer's own researches give no evidence that such is the case in the North sea at any rate.

While the material at Dr. TĀNING's disposal is perhaps hardly adequate

for the conclusions drawn in the regard to the density of plaice in different localities and for estimating the proportions of the different sexes, no such criticism can be made of the magnificent collection of 10,000 otoliths which were read — a work that must have entailed tremendous labour since the majority had to be ground down. The section upon fluctuations of year-groups is of great interest to the investigators who are studying the subject in the North Sea. It is to be hoped that such work will produce evidence into the causes of these phenomena. The case of the abundance of the 1922 and the scarcity of the 1923 brood years which was common both to the North Sea and to Icelandic waters cannot be without significance. It is to be hoped that this work will be continued.

The problem of the Icelandic fisheries is a different one from that of the North Sea. In the latter the decline is mainly one of the abundance of the more valuable sizes of plaice, due probably in a large measure to the destruction of vast numbers of fish before they have reached a marketable size. In Icelandic waters, according to the measurements given in the Appendix, but few unmarketable plaice are taken by the trawl in extra-territorial waters; nevertheless there is a very serious decline in abundance during the last few years. If it be assumed that the war period accumulations were removed by the first five years of post-war fishing, it might be expected that the abundance would remain at about the same level afterwards if the balance between production and fishing were maintained, since the oncoming stock has so great a chance of avoiding capture while still too small for the market. But it is evident that this balance has not been maintained; the catch per 100 hours fishing of English steam trawlers, according to the most recent figures, has fallen from 48 cwts. to 30 cwts. between 1925 and 1928. In fact, the stock is being removed at a quicker rate than it can be replaced. It is difficult to see how measures can be taken in order to conserve the stock since trawling for other fish will continue whether the plaice are abundant or scarce. At the same time it is obvious that a careful watch should be kept by the Danish authorities on the effect of any fishing that may be carried on in intra-territorial waters.

D. E. THURSBY-PELHAM.

E. FORD. Herring Investigations at Plymouth. V—VII. *Journal Marine Biol. Assoc. N. S.* Vol. XVI. No. 1. Plymouth 1929.

In this new series of papers on Herring Investigations Mr. FORD is continuing the observations on the Channel Herrings which he began in 1924. For four seasons the age and length composition of the Plymouth shoals have been studied and it has been found that herrings join the shoals in their third year and become most abundant in the catches when five years of age, thus exhibiting the same properties as the herrings of the East Anglian Autumn Shoals.

During the period of time dealt with in these papers, the 1920 year-class was the most important and there is a striking similarity between the variations of the percentage abundance of the year-class and the average weight of fish per landing.

The average weight was high in the season 1924—25 when the 1920