

Clupeoids, small *C. sprattus* and *C. pilchardus*, show an immense increase of numbers by night, due evidently to migration below the depths fished (35 m.) during daylight. How close to the bottom they go is still not known. *Gobius* sp. also showed a well marked increase in the catches during the night. The Gadoids, mainly whiting, especially those of over 12 mm., are correlated with the presence or absence of the medusa *Cyanea capillata* and the vertical movement towards the surface which they show at dusk is a joint one. Specimens under 11 mm. in length have an irregular distribution and are apparently not associated with *Cyanea*. *Scophthalmus norvegicus* occurred in satisfactory numbers and measurement of the specimens showed that a nocturnal increase in the upper layers was due to the presence of specimens over 8 mm. in length, the numbers of the smaller sizes remaining constant. *Scophthalmus* also showed a clearly indicated concentration at about 4 metres at daylight on the morning of June 4th, as did also *Callionymus*. This at first sight seems to be irregular, but the suggestion is made that the presence of a very dense swarm of *Calanus*, which was observed at the time, may have caused a shading which stimulated the rise. None of the other species taken showed any evident increase of the numbers in the upper layers or in the total catch by night.

The author points out that in order to get a true picture of the distribution of Clupeoid larvae it would be advisable to make collections by night. For the other species, except *Gobius* and *Callionymus*, which are not of great economic importance, daylight hauls would seem to be sufficient.

G. P. F.

J. H. ORTON. Observations on *Patella vulgata*. Part I. Sex-Phenomena, Breeding and Shell-Growth. Part II. Rate of Growth of Shell. Journal of the Marine Biological Association, New Series. Vol. XV, No. 3. pp. 851—874. Plymouth 1928.

In these two papers Dr. ORTON has gathered together a number of detailed observations made on the Common Limpet, which throw some light on its life history. From examination of a very large number of specimens he finds that in the young stages, up to 20 mm. in length, the proportion of males is very high, in some samples as high as 81 per cent., with a considerable number of undifferentiated sex and the proportion of females sometimes as low as 3.1 per cent. In the older stages of large size this state of affairs is partially reversed, 64 to 68 per cent. of females being present. The author cites observations of Gemmill and Pelseener which confirm his own and he considers that the Limpet is mainly a protandric hermaphrodite, explaining the presence of so many males of large size by the suggestion that there may be two types of Limpet of different genetic constitution, one a pure male which never becomes a female, the other a hermaphrodite which starts life as a male.

The building of a new concrete wharf at Plymouth offered an opportunity of observing the rate of growth. It is well known that *Patella*, being a sluggish animal, rarely wanders far from the spot on which it first settles, and as the date of the construction of each pile of the wharf was known, the maximal age of the limpets on it could be determined and the rate

of growth of the produce of two successive breeding periods estimated with considerable accuracy. It was found that in 1912 the growth in length of limpets in their first year amounted to 26—35 mm., and in 1913 to 11—27 mm. At an age of two years the two broods measured respectively 53 mm. and 47—49 mm. This is regarded as an exceptionally high rate of growth, the climatic conditions being favourable and the position such as to induce a flat form of shell in which increase in length and breadth are made at the expense of height. It was found by observations in other localities that the greater the degree of exposure to dessication the higher the shell is in proportion to its length and breadth. The breeding season of the Plymouth limpets is recorded as from August to March with a maximum in January and February.

Other points touched on in the paper are the indications of a check in the growth rate at midsummer and the change of shell shape at a size when the female first attains sexual maturity, and the need for further observations on these points is alluded to.

G. P. F.

ERIK M. POULSEN. The Haddock in the Belt Sea and the Western Baltic during the Years 1926—1928. 34th Report of the Danish Biological Station, VI. pp. 99—125. Copenhagen, 1928.

This paper, a sequel to that of JOHANSEN¹), describes in detail the most recent biological work on the Haddock of the Western Baltic. There the waters are unsuitable for the rearing and sustentation of an indigenous Haddock stock, but occasionally, at what the author of the paper thinks are long intervals of years, an unusually pronounced inflow of Atlantic (high-salinity) water in spring brings with it sufficient larvae to provide later a season or two of lucrative fishing for sizeable adolescent fish. Such an inflow occurred in 1923, and, as is conclusively shown, gave rise to a very successful Haddock fishery three years later, in winter, 1926. Table I gives the yield by weight of the Belt Sea catches from 1909—1928. In ten of these years the yield was nil. Indeed for the years prior to 1923 positive results were obtained in only four years, when the influence of the 1909 and 1913 broods was at work. Thereafter a further period of nil returns is recorded for the years 1917—1922, followed by a period showing increasing yields up till 1926, when abnormally large weights of Haddock of the 1923 year class were landed. Since the departure of this brood (or rather the maturing portion of it, which JOHANSEN correctly anticipated would form about 90 per cent. of the total) to spawning grounds outside the Western Baltic the weight of Haddock caught has declined, although in 1927 and 1928 it was still well above the average. The author notes that larvae of the 1926 brood were scarce in these waters but that a good few larvae and early bottom stages of the 1927 and 1928 broods were found. He therefore anticipates catches of the more moderate sort in the next few years. It is of importance to note that the 1928 brood

¹) A. C. JOHANSEN: — On the Remarkable Quantities of Haddock in the Belt Sea during the winter of 1925—1926, and the Causes leading to the same (*Journal du Conseil*, Vol. I., No. 2, 1926).