this is not the case, the reason may be either that the number of bottom samples in many places is too low (the low number of stations in several of his squares suggests this), or that there is a lack of comprehension in combining a great number of individual observations into an entirety.

It seems almost ridiculous when Stephen (p. 782) reproaches Dr. Petersen with the incorrectness of his hypothetical chart of the North Sea communities (in Rep. Dan. Biol. Stat. XXII) and, amongst other matters, for not having predicted Stephen's *Thyasira* + *Foraminifera* Zone! How could he have done so? When Petersen published his chart in 1914, no bottom samples were taken in the North Sea apart from a few close to the Danish coast. The fauna lists of the literature were his only material, but they gave no information as to *quantitative distribution*, a necessary qualification for setting up communities. Dr. Petersen issued his chart with the express reservation that it was hypothetical only, the purpose being to interest other biologists in investigating its correctness. Nothing would have pleased him better than the proof by other investigators that his chart was absolutely wrong, as long as they provided a *new* one!

It is quite another question whether it is a happy choice to use the name of one or a few characteristic species for indicating an animal community as Dr. Petersen did. This often leads to communities being met with, the species combination of which clearly shows which community we are dealing with, though the characteristic species may be poorly represented or even missing. Especially does this happen where the fauna is poor, as is the case in many parts of the North Sea. It is also a fact that some of the characteristic species may appear locally in highly variable numbers from year to year; in a single year they may even be absent, although previously present in plenty. For this reason the essential character of the community cannot be said to have changed, new characteristic species, numerically predominant, not having appeared and the combination of the other species still being the same. In such cases it would be preferable to characterize the communities by a large series of characteristic species and to name them by other means. The *Macoma* community might be named the "Baltic community" (C. G. Joh. Petersen, Rep. Dan. Biol. Stat. XXV, p. 12) the *Abra* community possibly the "Coastal soft-bottom community", the *Venus* community the "Sandbottom community" etc.

The name, however, is of minor importance; but it should be remembered that it cannot be expected that one characteristic animal at least should always occur in every sample taken, such is evidently Stephen's requirement; and for this reason he has failed to obtain a real survey of the conditions.

H. Blegvad.

L. Fage. "Pêches planctoniques à la lumière, effectuées à Banyuls-sur-Mer et à Concarneau. III. Crustacés." Arch. Zool. Expér. et Gén., T. 76, Fasc. 3, pp. 105—248. Paris, 1933.

The present paper dealing with the Crustacea is the continuation of a series of studies on the littoral fauna of the Mediterranean and Atlantic seabords of France. Two such accounts, the first dealing with the Annelids the second with the Pycnogonids, have already appeared. (Arch. de Zool. Expér. et Gén., T. 67, 1927 and *Ibid*, T. 74, 1932.). Details of the method, times of collection, etc. were given in the earlier papers, but it may be as

well to mention here that at Concarneau, on the Atlantic coast, collections were made regularly at the same place and, so far as weather permitted, at weekly intervals for some 17 months from April, 1923 to September, 1924. (There exist, too, additional data from 1922 and also from 1925 and 1926.) All collections were made in the littoral zone, over soundings of 3—4 metres, with a sandy bottom, partially covered by Zostera and Laminaria. The early hours of darkness were selected for sampling, and the source of illumination here was an acetylene lamp mounted on a buoy. The area illuminated would be about 300 square metres and the light was sufficiently strong to enable stones on the bottom to be clearly seen. Dredge hauls, by day, provided a basis of comparison and served to elucidate the behaviour during the daytime.

At Banyuls, on the Mediterranean cost, sampling was carried out spasmodically and in the summer only on various occasions from July, 1909 to June, 1914. At both places surface nettings were taken in the dark on the outward and inward journeys to and from the collecting stations.

In the case of the majority of the Amphipods, the Ostracods, the Cumaceans and the Mysids the number of specimens in these hauls was usually less than that in the collections from the illuminated zone. This question is considered in some detail for some of the Cumaceae, (p. 181). It is recorded that during the day the males of a number of species, e.g. *Nannastacus unguiculatus, Cumella pygmaea,* etc. are strongly negatively phototropic. By night, however, they will swim towards a source of light, particularly in those cases where the animal is already moving actively.

The list of species is a long one, and reveals the presence, often in considerable numbers, of a great variety of forms which had hitherto escaped notice or been considered rarities. There exist for some 50 species detailed accounts of their seasonal numerical variations, breeding periods and migrations. Whilst by day the bulk of the fauna is either on or in the bottom or amongst the algae as soon as darkness is established the surface waters are invaded by immense swarms *(une foule grouillante)* of many species. Such upward migrations took place in all months of the year, but for any one particular species were seasonal, occurring once (in many Amphipods) or twice a year (in some Cumaceans and Mysids). Only exceptionally are these diurnal migrations shewn by one and the same species at all times of the year.

In the Ostracods, Cumacae and many of the Amphipods the bulk of all collections was composed of males. In this connexion a point of considerable interest arises, the females being found to have the eyes very poorly developed in comparison with the males. In the Ostracod *Philomedes interpunctata,* for instance, the eyes in the female are practically absent. In the Amphipod *Dexamine spinosa,* on the other hand, the eyes in the female are large and although the discrepancy between the numbers of the two sexes taken in the nets is still large, the catches do not consist almost exclusively of males as in the case of *Metaphoxus pectinatus,* for instance, the female of which has greatly reduced eyes: (Fig. X, p. 206.)

In the Mysids, certain Isopods (Idotea) and some few Amphipods both sexes took part in the nightly migrations. Such forms were found to have the eyes equally developed in the two sexes.

In those cases where the females occurred but rarely in the collections it was found that as a rule they were sexually mature, bearing eggs newly deposited in the brood pouch.

Turning to the causes of the periodicity of these migrations, temperature,

whilst undeniably exerting a considerable influence, probably does not act directly. Amongst the Mysids, the males of the Ostracods and of Cumella, for instance, there would seem to be no direct connexion, but in *Urothoë spp.* no swarming at the surface took place when the temperature was below 11° C. The appearance of females in the surface waters (never so common as that af the males) would seem to be more dependent upon temperature. Whether, however, this acts directly in modifying the phototropic response or whether this altered response is primarily due to changes in the animals themselves, connected with periods of reproduction, is difficult to decide. The latter, however, is probably the more potent.

Both for this and the two earlier papers a short summary will be found in Rapport et Procès-Verbaux des Réunions du Conseil Permanent International pour l'Exploration de la Mer, Vol. LXXXV, July, 1933, pp. 60—69 and may usefully be consulted.

A. C. G.

O. Sund. "Torskebestanden." Fiskeridirek. Skr., Ser. Havunders. Vol. IV, No. 7. Bergen 1934. English Review.

G. Rollefsen. "Skreiens alder." Ibidem. English Review by Sund.

J. Eggvin. "Vestfjorden." Ibidem. English Review by Sund.

T. Iversen. "Some Observations on Cod in Northern Waters. Preliminary Report." Ibidem. Vol. IV, No. 8. In English.

It is convenient to review these papers together, although, for their importance, each would deserve separate notice.

Sund describes the stock of cod in the principal Norwegian fisheries in 1933 and compares it with the fisheries since 1913. The technique, as is well known, is a census of length of the fish by very many measurements. Summaries of the results are presented by Sund's graphical methods. The technique provides: (1) A simple description of the stock in the fishery in any year, (2) An emphatic presentation of the effect of new broods, (3) A basis for forecast of the skrei fishery in general terms.

Rollefsen pursues his studies of the otoliths, assigning the catch to brood years and pointing out the surprising feature of the coincidence of good broods both at Norway and Iceland. This is perforce attributed to some common climatic cause, since the stocks are most certainly mainly separate. This author also shows excellent photographs of three otoliths, one of which is from a coastal cod and has different ring formation from the offshore cod. In a fifteen-year-old otolith he points out the small zones held to correspond with years of sexual maturity.

Eggvin describes the remarkable hydrological condition in the Lofoten fishery of 1933. The bottom water was warmer than had before been recorded, that is, certainly warmer than ever since 1896, and the air was so warm that daisies were in flower in Lofoten and Tromsö at New Year 1933. There was an abnormally strong Atlantic inflow, probably in January. The upper layers of water were also abnormally fresh. On the fishing grounds the corresponding hydrological observation was the relative thinness of the transition layer, ascribed to reduction of usual mixing by convection. From 1930—1933 it is shown that the yield of the fishery has