dividing cells cannot remain in the photic zone long enough to permit prolonged growth. Thus the two factors — high nutrient salt content and instability of surface water — are conflicting. These together with the increase in the depth illumination sufficient for photosynthesis as the season advances may account for the delay of the beginning of diatom growth until May. From May to June is the first large maximum, and a second still larger occurs from mid-July to mid-August, corresponding with rise of temperature of the sea. The growth was never dominated by one species but rather by a group of two to five species. *Chaetoceros compressus, C. debilis, C. radians,* and *Skeletonema costatum* were dominant in the first maximum, *C. debilis, C. didymus,* and *Skeletonema costatum* in the second. In East Sound, representing long narrow bays, the annual period of productivity began in early March and continued through spring and summer with a maximum in June; there the diatom species were much the same as in the San Juan Channel but there was a marked succession of dominant genera and species. This difference in season is probably due to the long bays being little disturbed by strong tidal currents, the surface waters having an opportunity to increase in temperature, favouring the beginning of plant growth early in spring when the water contains ample nutrient salts.

M. V. L.

J. D. Sømme. "Animal Plankton of the Norwegian Coast Waters and the Open Sea. I. Production of *Calanus finmarchicus* (Gunner) and *Calanus hyperboreus* (Kroyer) in the Lofoten Area." Fiskeridir. Skr., Ser. Havunders. Vol. IV, No. 9. Bergen, 1934.

In this treatise the conclusions, which after a brief discussion are set out in the earlier pages, are considered more or less exhaustively from almost every bearing. These conclusions are, shortly, as follows: — In the Lofoten area *Calanus finmarchicus* and *C. hyperboreus,* mainly in the penultimate stage of development, spend the winter in the deep water of the fjords. In the early part of the year *C. finmarchicus* migrates to the surface shortly before reaching maturity and is carried outwards by the surface current of cold and less saline water derived from the shore area. Spawning takes place a little later when the species is widely distributed over the coastal banks, and is continued through several generations during the summer. *Calanus hyperboreus,* in contrast to this, reaches maturity before the end of winter but delays its upward migration till its single annual spawning period is imminent or actually in progress, with the result that the spawning area is restricted to the localities where depths suitable for the shelter of the species during the winter are present.

In working towards these conclusions the author has been led to explore many paths leading up to them. In order to distinguish between the young stages of the two species he has worked out anew the morphology of the various stages from the egg to the adult and has pointed out some omissions in Dr. Lebour's earlier descriptions of *C. finmarchicus.* It seems, however, an exaggeration to refer to these differences, as Mr. Sømme does, as many and great discrepancies. Some of the apparent differences are due to the use of a different terminology; for example, in the account of the swimming feet Mr. Sømme enumerates without distinction both the articulated spines and the non-articulated tooth-like projections while Dr. Lebour does not refer to the latter. These morphological researches did

not disclose any significant differences which would distinguish the younger stages of the two species but a series of careful measurements showed that, in the area investigated, size could be used as a distinguishing character. It is suggested in the paper that in future the nauplius and copepodite stages of the Copepoda should be designated successively I—XII instead of the more generally used notation of nauplii I—VI and copepodites I—VI, a proposal which may be logical but which does not seem to have any other advantage.

The last half of the paper is given up to showing how the tow-nettings taken at various times, mainly in the Lofoten area, have led to the conclusions outlined above. One point is still not clear in the account of the annual life cycle. There is no suggestion as to how or from what source the wintering stock is constituted, whether by the gathering together of the inhabitants of a large area into the deepest part of the area or by the survival *in situ* of a portion of the stock in the winter habitat.

The basic idea underlying the whole paper is the proposition that the summer or young stage distribution is traceable back each year to the area in which the breeding stock-to-be has spent the winter, and from this it follows that the extent of the distribution depends more on the distributing agency than on the suitability of the region occupied.

G. P. F.

B. G. Bogorov. "Seasonal Changes in Biomass of *Calanus finmarchicus*" in the Plymouth Area in 1930." Journ. Mar. Biol. Assoc. N. S., Vol. XIX, No. 2. Plymouth, 1934.

It is a great pity that neither the lengths nor the weights of the *Calanus* from the Plymouth area, which form the subject of this interesting paper, are directly comparable with those of *Calanus* from Loch Striven (J. M. B. A., Vol. XIX, p. 793.) Bogorov's lengths are measured from the front edge of the cephalothorax to the end of the caudal furcae, caudal setae being excluded; the median lengths for the Loch Striven *Calanus* are from measurements of the cephalothorax only. Bogorov's dry weights are those of formalin-preserved specimens dried over calcium chloride in a desiccator for two or three days; the Loch Striven dry weights are those of fresh specimens dried to a constant weight at 110° C. It is sincerely to be hoped that, in future, observers in different localities will employ identical methods, and the question is one on which a pronouncement from the International Council would be welcomed.

According to Orr (J. M. B. A., XIX, p. 260), lengths as determined by Bogorov are about 20 % greater than the cephalothorax measurements of the L. Striven material. Accepting this correction, but bearing in mind that Bogorov's measurements are of preserved specimens, comparisons of length between Plymouth and L. Striven *Calanus* are as follows: —

	Autumn-Winter			Spring			Late Summer		
	V	♂	♀	V	♂	♀	V	♂	♀
Plymouth[1])	2.72	3.00	2.96	3.07	3.57	3.57	2.87	3.26	3.28
L. Striven	2.54	2.81	2.83[2])	2.87	3.02	3.18[3])	2.72	2.76	2.74[4])

[1]) p. 594, Table IV.
[2]) Mean of 17. I. to 27. III.
[3]) Mean of 4. IV. to 29. V.
[4]) Mean of 28. VIII to 2. X.