

in any one stage indicates the number of setose pleopods in the stage immediately following. The author sweeps away altogether the cyrtopia (intermediate between furcilia and young) and arranges the various stages into furcilia groups, characterized by the developmental state of the pleopods and telson. The term "post-larval" for the stages succeeding the cyrtopia, or, in the present work, late furcilia, has already been abandoned by some workers, for these stages gradually merge into the adult, and the term "adolescent" is substituted. It is to be remembered, however, that euphausian development is very gradual, moults being frequent and the change in each moult slight.

Length of body is discussed in detail, and it is a curious fact that some of the larvae in the second season are much larger than the majority, and this occurs simultaneously in the same locality and also in different localities at approximately similar times. There is no definite conclusion, but a suggestion as to correlation of early larvae with abundant plankton. Growth is not regular but slows down in winter.

Study of the distribution demonstrates clearly that breeding takes place in the deep water rather than in the shallow, and eggs, nauplii, and metanauplii are found in the deep water of the far south, calyptopis and early furcilia stages in warm deep water and in the immediate vicinity of Antarctic surface water, but the late furcilia stages and adolescents persistently occur at the surface and are distributed at the ice edge. The early stages have a well-defined diurnal vertical migration and the adolescents remain continually at the surface. With advancing development there is a lengthening of time of occurrence, an important fact, as thus a constant supply of food is ensured for the whalebone whale in the south.

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D. D. John. "The Southern Species of the Genus *Euphausia*." Discovery Rep. Vol. XIV, pp. 192—324. Cambridge, 1936.

The adult characters of ten species of *Euphausia* are described in this work and the development of five of them. *Euphausia superba* is included in the adult description, its development having been described already by Fraser (see above). It is curious that whilst Fraser, following Rustad and others, abandons the term "post-larva" in favour of "adolescent" for those forms which are intermediate between the cyrtopia (here regarded as late furcilia) and adult, the present author should revive it. Although the name given to such stages is unimportant so long as it is well defined, it seems a pity that two important works, based on closely related material, published almost simultaneously and in the same publication, should not agree in such small matters.

The southern species of *Euphausia* described here fall into two natural groups and their distribution is very interesting, showing that, if it be supposed that the genus arose in warm water, colonization took place along two distinct lines, one very complete and reaching to the far south, the other not so complete and not breeding so successfully. In the latter group consisting of *Euphausia hanseni*, *E. spinifera*, *E. longirostris*, and *E. triacantha* it is shown that each of the four species occupies one of four successive zones of water from north to south, *E. hanseni* being the most northerly, *E. triacantha* the most southerly. *E. spinifera* and *E. triacantha* are much alike and the larvae of *E. longirostris*, *E. spinifera*, and *E. triacantha* are closely similar, especially the first two. In the second group, the so-called Southern Group, comprising *E. lucens*, *E. vallentini*, *E. frigida*, *E. superba* and *E. crystallorophias*, all the species are circumpolar in range, and the author believes from

structural evidence that they form a series representing colonization in the order given, *E. frigida* possibly giving rise to both *E. superba* and *E. crystallorophias*, the latter being neritic. The chief morphological characters relied on are the male pleopods which appear to be of extreme importance in this connexion.

The developmental stages described are of interest and show that *E. frigida* and *E. vallentini* are closely related and are, with *E. superba*, of a different type from the other three described which belong to the Southern Group. In both groups dominant furcilia stages are much in evidence and there are few, in some cases no, intermediate variations, a distinct tendency to a shortening of the life history being shown.

This paper and Mr. Fraser's form an important contribution to the study of the Euphausiaceae.

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F. Bernard et L. Fage. "Recherches quantitatives sur le plancton méditerranéen. Note préliminaire." Bull. de l'Inst. Océanogr. No. 701, pp. 1—20, 1 Fig. Monaco, 1936.

The authors are studying the nannoplankton in three localities, the stations chosen being at Monaco, Villefranche, and Banyuls, all varying much as regards coast, sea bottom, and currents. Samples are taken at each station at 10, 50, and 350 metres, the last reaching the zone rich in nutritive substances. Phosphates, nitrates, and silicates are sampled at the same time. The methods employed for collecting and estimating the plankton consist of a water-bottle (Richard) which samples at known depths, and a reversed microscope as used by Steemann Nielsen (1933) for counting the organisms brought down by sedimentation. The fresh samples are fixed rapidly in neutral formol and preserved in beer bottles. This method of counting the nannoplankton is very effective and retains a very large number of the smallest plants and animals.

In agreement with other workers in the Mediterranean (especially Schiller and Lohmann at Syracuse and in the Adriatic) it is found that there is an enormous quantity of flagellates throughout the year, especially coccolithophorides. The flagellates altogether may represent at least a quarter and sometimes half of the total protists.

As a preliminary some of the results at Monaco are given, taken in the spring of 1936. In comparison with the northern seas, sampled by Steemann Nielsen in the same way, there is a great poverty of diatoms and of Peridinales (*Peridinium* and its close relatives), but the phytoflagellates, Thecatales (*Exuviaella* and *Prorocentrum*) and Gymnodinales appear to be at least as abundant as in the open seas.

It is very interesting that the density of the Coccolithophorids and Thecatales is so uniform from the upper to the deeper water layers. The authors suggest that a good number of the phytoflagellates are capable of living a non-autotrophic life in the absence of light, for *Coccolithus pelagicus* and *Acanthoica* abound even at 1000 metres depth.

The figure showing the distribution in depth of the microplankton on March 31st 1936 between the stations II and III at Monaco is very instructive, and there are two tables recording the composition of the plankton in February—March and April—May at Station II.

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