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ENVIRONMENTAL FACTORS FOR GEOGRAPHICAL DISTRIBUTION OF *EUPHAUSIA SUPERBA* DANA (EXTENDED ABSTRACT)

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On the geographical distribution of *Euphausia superba*, NAGANOBU and HIRANO (1982) made a fresh development after the report by MARR (1962). The basic concept is that accumulation of *E. superba* by the flow is an essential factor in the geographical distribution, because of its poor swimming ability (VORONINA, 1974; NASU, 1979; MASLENNIKOV and SOLIANKIN, 1980; LUBIMOVA *et al.*, 1980; AMOS, 1984). In fact, when we compare the distribution of *E. superba* and the north-south gradient of geostrophic flow velocity in the Indian Ocean sector, the high distribution density of *E. superba* coincides with the areas where the water flows slowly (Fig. 1).

However, as can be seen from Fig. 2, living organisms which seem to have poorer swimming ability than *E. superba* can be found in relatively rapidly flowing offshore areas. If *E. superba* is accumulated because of the flow, other species also should be accumulated in areas where the density of *E. superba* is high, and a variety of those species should all exist together. However, the observed facts do not necessarily support this hypothesis. Although high density areas of *E. superba* and slow flowing areas are overlapping, it is hard to prove that the flow itself determines the distribution of *E. superba*.

When considering the factors influencing geographical distribution of marine organisms, one should not consider only the relation between the distribution and the oceanic structure, but it is also essential to consider the history of the living organisms themselves–or how that species has come to occupy its present geographical distribution. The structure of the geographical distribution of species closely related to *E. superba*, as seen in Fig. 3, is considered to be the result of adaptive radiation. Therefore, in the scale of geographical distribution, the distribution area of *E. superba* should not be considered simply as the result of mechanical accumulation due to the flow, but the condition in which species adjusts itself to the habitat must be taken into account.

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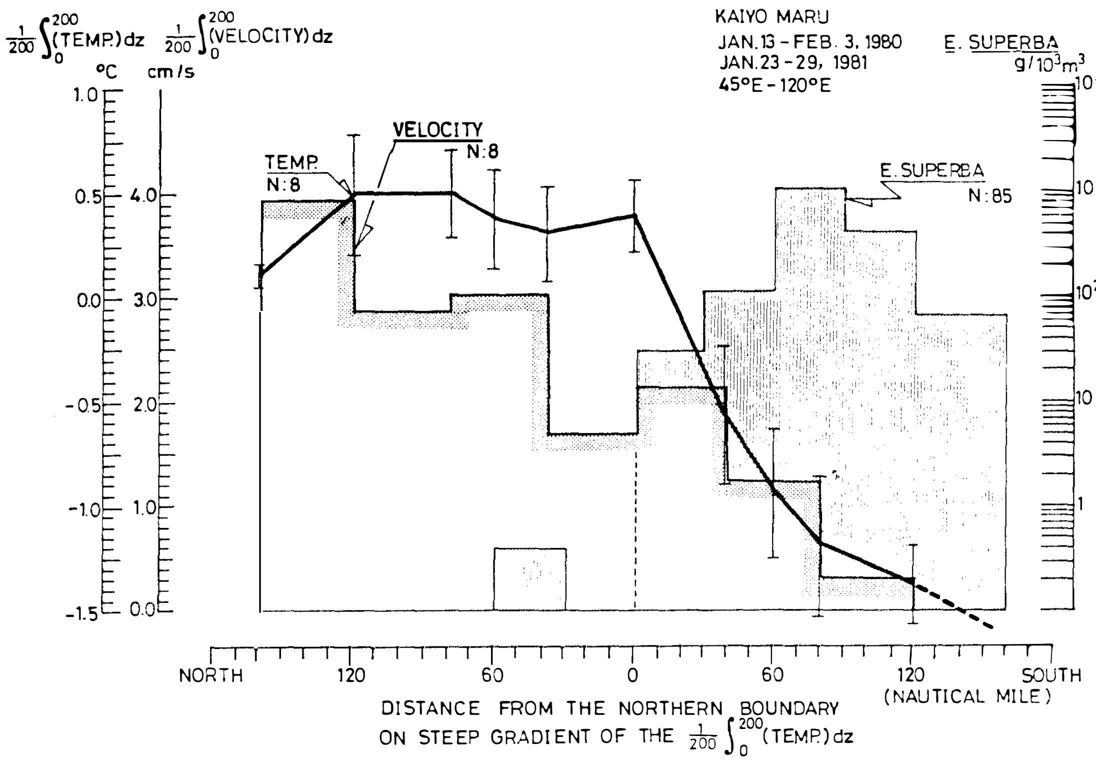

Fig. 1. Average meridional distribution of E. superba *in relation with temperature and velocity in the Antarctic Ocean between 45° and 120° E. The mean line adjusted on 8 north-south lines is taken from the gradient of environmental index* $\overline{Q}_{200}$ $\left[1/200 \int_0^{200} (temperature)\, dz\right]$. *And the corresponding mean value of the velocity of geostrophic flow from the surface to 200 m, and the mean value of sampled catch of* E. superba. E. superba *is densely distributed in the low flowing areas of the southern low-temperature region with the steep gradient of* $\overline{Q}_{200}$.

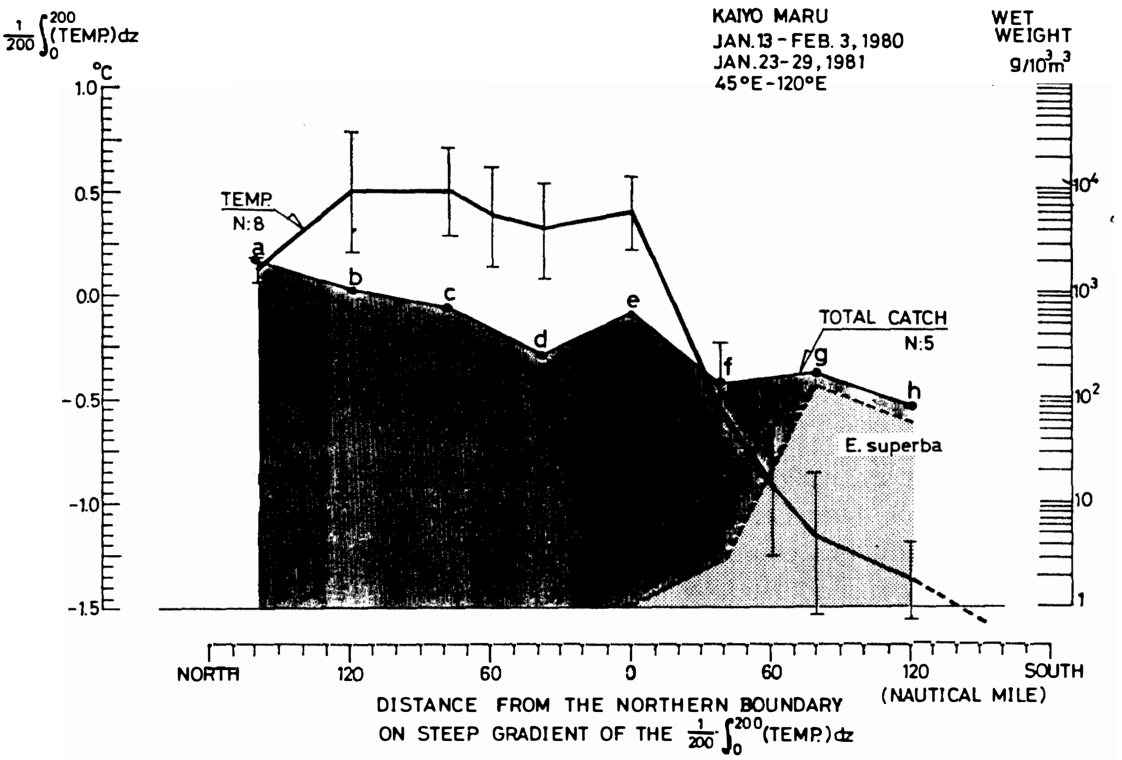

Fig. 2. *The total wet weight of the living organisms and the dominant species corresponding to the north-south gradient of the environmental index* $\bar{Q}_{200}$. *The dominant species in points a to f is Thaliacea, and in addition to Copepoda,* Thysanoessa macrura *and* E. triacantha *were present. Apart from* E. superba, *Copepoda and Medusa were present at point G, and* E. crystallorophias *was present at point h.*

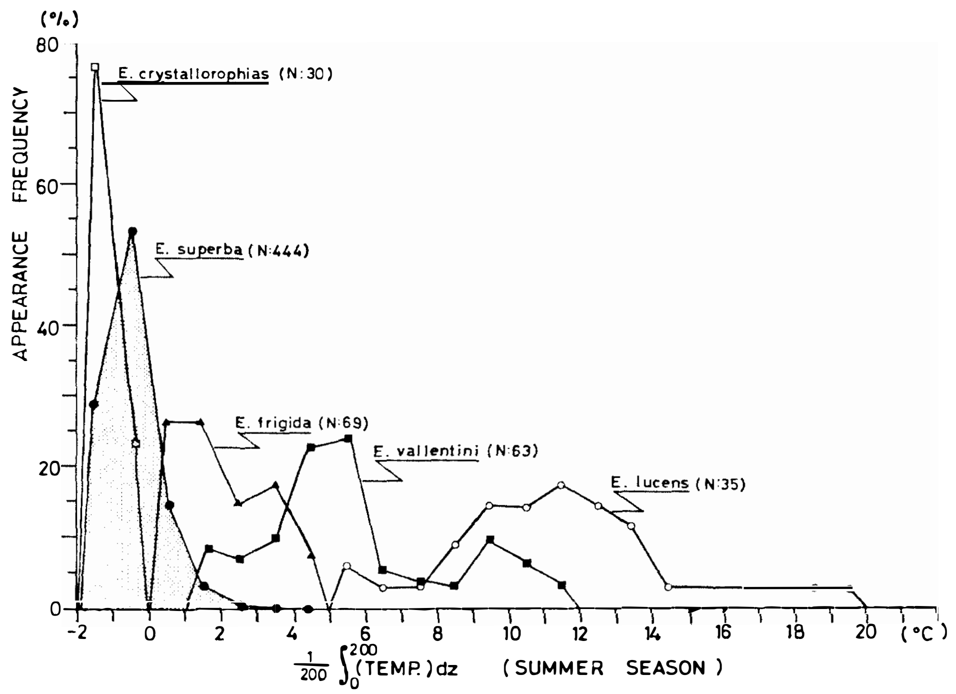

Fig. 3. *The frequency of appearance of* E. superba *and closely related species* E. crystallorophias, E. frigida, E. vallentini, *and* E. lucens *corresponding to the environmental index* $\bar{Q}_{200}$, *in the whole scale of the Southern Ocean. It is based on the material by* JOHN *(1936),* MARR *(1962), and* LUBIMOVA *et al. (1980). The species in the low temperature area tend to have a narrower range of* $\bar{Q}_{200}$.