

ZOOGEOGRAPHY OF THE INDIAN OCEAN ZOOPLANKTON : CONCEPTS AND CONSTRAINTS

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INTRODUCTION

The Indian Ocean is cut off in the north by the Asiatic land mass. This coupled with the monsoonal reversal of surface gyres (see Nair, this volume) results in the distribution of physical and chemical properties typifying the northern Indian Ocean. Known zooplankton distribution patterns and possible zoogeographic zonation were reviewed by Rao (1979) and in the atlas of Van der Spoel & Heyman (1983). In the present contribution knowledge of pattern in the distribution of Indian Ocean zooplankton is briefly reviewed on a within and between ocean basis.

WITHIN OCEAN PATTERNS

There exists little evidence of biogeographic difference between the Bay of Bengal and the Arabian sea. This is despite the fact of known differences in physical and chemical parameters (Sengupta & Naqvi, 1984; Wyrтки, 1973) and in the strength of the SW monsoon, which is stronger in the Arabian Sea, (see Nair, this volume). Despite delimitation of the eastern/western distributional limits of the copepods *Labidocera pectina* and *L.rotunda* (Fleminger et al., 1982) in the Andaman Sea and the apparent absence of the cephalopod *Onychia carribea* in the Arabian Sea (Van der Spoel & Heyman, 1983), present knowledge indicates that the epipelagic region of the entire northern Indian Ocean is a single biogeographic unit.

Despite evidence that the hydrochemical front at 10°S (Wyrтки, 1973) acts as a barrier in the case of certain pteropod (Sakthivel, 1973) and euphausiid species (Brinton & Gopalakrishnan, 1973), this is not the case for oceanic chaetognath or ostracod species (Nair & Madhupratap, 1984), which show southern

distributional limits between 28°S and 42°S. There appears to be a decrease in abundance south of 10°S for species that occur on either side of the supposed boundary, presumably related to the demarcation by the front of nutrient-enrichened waters of the monsoonal gyre from nutrient-depleted waters of the subtropical gyre (Vinogradov & Voronina, 1961; Timonin, 1971; Lawson, 1977).

BETWEEN OCEAN PATTERNS

Differences in species composition between oceans (tropical and subtropical) may depend in part on depth of occurrence. Thus for calanoid copepods there appears to be much higher overlap between the Atlantic and Indian Oceans for deep-living species (92% overlap between North Atlantic and Arabian Sea, Grice & Hulsemann, 1967) than for surface-living oceanic forms (60% overlap between Atlantic and Indian, 91% overlap between Indian and Pacific). Similar patterns are seen in epipelagic chaetognaths (Nair & Madhupratap, 1984). The differences may be related to the greater effectiveness of the barrier (Africa) between the Atlantic and Indian than that of the barrier (Australasian seaway) between the Indian and Pacific Oceans.

Although biomass equitability among calanoid copepod species is higher in the open ocean than in estuarine or neritic situations (Madhupratap, 1983), studies on epipelagic calanoid copepods (Madhupratap & Haridas, in the press) show the dominance of relatively few species in the open ocean. Dominance is sometimes considered an index of ability to disperse effectively (Briggs, 1974). Of the 22 dominant (those consistently >1% of the total copepod fraction) epipelagic copepod species occurring in the northern Indian

Ocean, 13 have circumglobal distributions and all the rest are Indo-Pacific.

CONCLUSIONS

It is obvious from these studies that knowledge of distribution patterns is limited to species within a quite restricted sort of groups, among them Copepoda, Chaetognatha, Pteropoda and Euphausiacea. Even within these groups knowledge for most species is typically sketchy, with few studies approaching the completeness of that on *Pontellina* by Fleminger & Hulsemann (1974). Much more basic, synoptic systematic work is prerequisite to discussion of current and past distribution patterns of zooplankton of the Indian Ocean.

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