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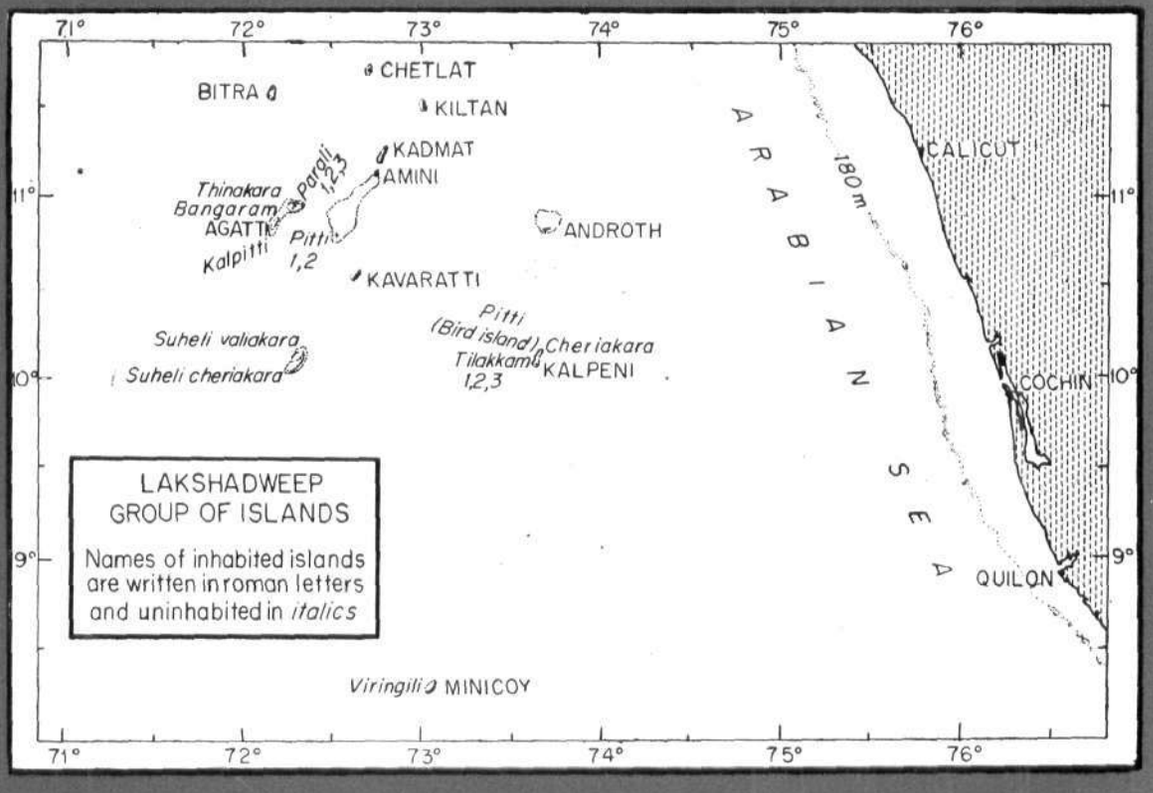

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PRODUCTIVITY OF THE SEAS AROUND LAKSHADWEEP

P. V. R. Nair, G. Subbaraju, K. J. Mathew, V. K. Pillai and V. K. Balachandran
Central Marine Fisheries Research Institute, Cochin

The seas around the Lakshadweep and the reef lagoons are of great ecological significance as they influence the fauna and flora associated with the coral reefs and the high sea resources to a great extent. The waters have been found to be highly productive at the primary and secondary levels.

The euphotic zone of the Lakshadweep Sea is almost over 90 m. Hence though the production per unit volume in the surface waters may not be of higher order, the integrated values are high. The unit volume production varies from 8 to 34 mgC/m^3/ day with the maximum rates at Minicoy where the skipjack tunas are abundant. The integrated value for the whole water column is of the range of about 300 mgC/m^2/day which is rather high for oceanic waters. The observations made by the scientists of the Central Marine Fisheries Research Institute have also revealed the existence of an oxygen minimum layer of several metres thickness with the upper layer at 150 m which is closely related to the high organic productivity. Besides, it has also been observed that the geostrophic circulation prevailing in this area helps to maintain the highly productive waters around the islands for considerable length of time. The influx of Antarctic bottom water has its influence on the organic productivity (Jayaraman *et al.*, 1960).

Satellite imageries from Landsat and Indian Remote Sensing Satellite and ocean colour sensing from Coastal Zone Colour Scanner (CZCS) of NIMBUS–7 can provide the general level of productivity as well as water masses in the area of Lakshadweep (Silas *et al.*, 1985).

Therefore remote sensing of this region will open up new frontiers in the marine fisheries and help in the proper exploitation and management of tuna and other oceanic resources.

The waters have been found to be highly productive at the secondary level too. The zooplankton washed across the reef from the sea into the lagoons provides a rich source of food for the reef building animals as well as for the communities associated with the reefs. In spite of the importance of the zooplankters in the reef ecology these organisms in the Lakshadweep marine environment have received very little attention. What little information available are due to the works of Gardiner (Ed.) (1906), Silas (1972), Tranter and George (1972), Goswami (1973), Nair and Rao (1973), Madhu Pratap (1977) and Mathew (MS).

Eversince the classical work of Wolfenden (1906) on the copepods of the Lakshadweep and Maldives the zooplankton of the Lakshadweep Sea has received no attention until the work of Silas (1972) on the standing crop of zooplankton and on the Deep Scattering Layer. According to him the estimated monthly mean standing crop of zooplankton varied between 26 and 144 ml per 1000 m^3 of water in the sea around Lakshadweep.

Silas (1972) conducted surveys on bioscattering in the shallower depths off Minicoy, Agatti, Pitti, Kavaratti Kalpeni and Androth islands and off Suhelipar. The surveys indicated definite concentrations of, zooplankton and micronekton in the DSL which evince characteristic vertical migration.

The samples collected by Silas (1972) from the DSL from the vicinity of the islands contained zooplankton groups in the numerical proportion of, copepods (65.1%), ostracods (11%), chaetognaths (8.9%), appendicularians (5.5%), euphausiids and decapods (2.5%) and siphonophores (1.6%).

When considered volumetrically it was the euphausiids, the staple food of the tunas and bill-fishes that dominated over all the other zooplankters. The euphausiid fauna is especially rich in the sea around Lakshadweep. These purely oceanic organisms which form an important constituent in the DSL occur in large quantities even very close to the islands owing to the absence of any freshwater outlets or brackishwaters (Mathew, MS).

Among the euphausiids the most abundant species found were *Thysanopoda monacantha, T. tricuspidata, Euphausia diomedeae, E. sibogae, Nematoscelis gracilis, Stylocheiron armatum* and *S. affine*. Of these the first named two species are relatively larger, growing to about 30 mm in length. On one occasion, 1830 specimens of *T. monacantha* per hour of trawling were caught from the DSL observed near Suhelipar. The other species of euphausiids that occurred in appreciable quantities in the epi-and meso-pelagic zones of the seas around Lakshadweep islands are *T. astylata, T. orientalis, E. pseudogibba, E. tenera, Pseudeuphausia latifrons, N. tenella, Nematobrachion flexipes, S. longicorne, S. suhmi, S. microphthalma, S. abbreviatum* and *S. maximum*. However, there has been no record of catching any of these species from the coral lagoons and atolls.

Pursuing the problems of coral reef nutrition Tranter and George (1972) studied the zooplankton abundance at Kavaratti and Kalpeni atolls during the October–December period in 1968. They observed higher biomass values at surface by night when dense swarms of ostracods swarmed at a rate of 1000 individuals per 1 m^3 of water. The biomass was greatest seaward of the western lagoon of Kavaratti. The biomass, they found, to be depleted enroute from ocean to lagoon. The coral reef commonly nourish from the oceanic plankton.

In April 1971, Goswamy (1973) made studies on the zooplankton of the lagoons and seas of the Lakshadweep. Contrary to the finding by Tranter and George (1972) he obtained high biomass of zooplankton in the lagoon than in the open sea. He got upto 178 ml of zooplankton per 1000 m^3 of water from the lagoon and in the sea it was 58 ml per 1000 m^3 of water. The major groups of zooplankton encountered during the studies were: copepods (52 sp.), chaetognaths (8 sp.), mysids (3 sp.), polychaetes (5 sp.), amphipods (2 sp.), decapods, and fish eggs and larvae. Certain harpacticoid copepods, gammarid amphipods and mysids were found to be endemic to the lagoons.

A specialised study on chaetognaths of the Kavaratti and Kalpeni atolls and of the adjoining sea was carried out during the October–December period of 1968 by Nair and Rao (1973). Thirteen species belonging to four genera namely *Sagitta, Krohnita, Pterosagitta* and *Spadella* were found to be present. In the Kavaratti lagoon an average catch of 1,540 chaetognaths per 1000 m^3 of water were obtained while the number was 31,210 per 1000 m^3 of water from the seaside. At Kalpeni the numbers were 10,680 and 31,750 per 1000 m^3 of water for the lagoon and sea respectively. Thus as far as the chaetognaths were concerned the biomass

was always high on the sea side. The reason for this has been attributed following Tranter and George (1972) to the feeding intensity of the coral polyps and the coral dwelling animal communities.

Madhu Pratap *et al.* (1977) have studied the composition and abundance of various groups and species of zooplankton at Kavaratti, Agatti and Suhelipar atolls and in the seas around Kavaratti and Agatti. They found that higher biomass and diversity occurred in the sea surrounding atolls than in the lagoons. A maximum of 6.2 ml per 10 mts surface haul with a square net of 0.0625 m^2 mouth area was obtained from the sea. While the plankton in the sea averaged to 3.5 ml, in the lagoon it was 1.6 ml per 10 mts haul. This confirmed the finding of Tranter and George (1972) that zooplankton was lost in transit across the reef into the lagoon and is probably utilised by the reef communities.

Madhu Pratap *et al.* (1977) found that among zooplankton the copepods dominated over the others except in Kavaratti lagoon where the planktonic molluscs were abundant forms. Their samples included eight species of siphonophores, five species of chaetognaths, zoea of crab, pagurid, sergestid and caridean larvae, mysids, gastropods, lamellibranchs, pteropods, polychaetes, appendicularians, amphipods, ostracods, salps, doliolids etc. The studies suggested the role of zooplankton in the nutrition of the coral reef community.

The studies so far made have revealed that the coral lagoons and the seas of the Lakshadweep islands are comparatively rich in their zooplankton assemblages. According to Silas (1972) several factors are responsible for the enrichment and subsequent abundance of zooplankton they being, terrigenous products that diffuse or carried by the currents from the islands, the presence of islands in the boundary zones of major oceanographic features, perturbations produced by the islands in adjacent waters and the accumulation of inorganic nutrients by the benthic algae from the passing water. Further studies on the quantitative distribution, seasonal variation and the role of environmental parameters on the occurrence and abundance of zooplankton in general and of various groups in particular are to be made in the lagoons and seas of the Lakshadweep to augment our present knowledge.