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ECOLOGY OF MUDBANKS — ZOOPLANKTON

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ABSTRACT

Zooplankton investigations carried out in the region of Alleppey mudbank, commencing with the formation of the mudbank of 1971 and continued through the mudbank of 1972, revealed that the mudbanks are richer in zooplankton in general. The fluctuations of the standing crop as well as of the major individual groups are discussed briefly to show the charateristic of the mudbank.

The stations at which the zooplankton collections were made, the frequency of collection and the duration of study are the same as those described in chapter 5. Plankton samplings were made with a half-meter nylo-bolt ring net of 0.3 mm mesh by making horizontal surface hauls of 10-min. duration. The samples were preserved in 3% formalin and, having brought to the laboratory, the total volume was determined by the displacement method. Numerical counts of individual groups were taken and estimates were made.

OBSERVATIONS AND RESULTS

Standing crop of zooplankton

The monthly mean values of displacement volume of zooplankton estimated for the Alleppey area, during the mudbank and non-mudbank seasons, are presented in fig. 1. In the mudbank of 1971 the biomass reached up to 4-06 ml/10 min, whereas the values never exceeded 2ml/10 min. in the mudbank of 1972. During the pre-mudbank and post-mudbank periods, the zooplankton biomass was extremely low (less than 1/ml/l.)

Altogether 19 groups of zooplankters were present, the important of which, in the order of their abundance, were copepods and copepodites, appendicularians, fish eggs and larvae, prawn larvae, lucifer and crab larvae. Others which were either rarely present or strictly seasonal in their occurrence were

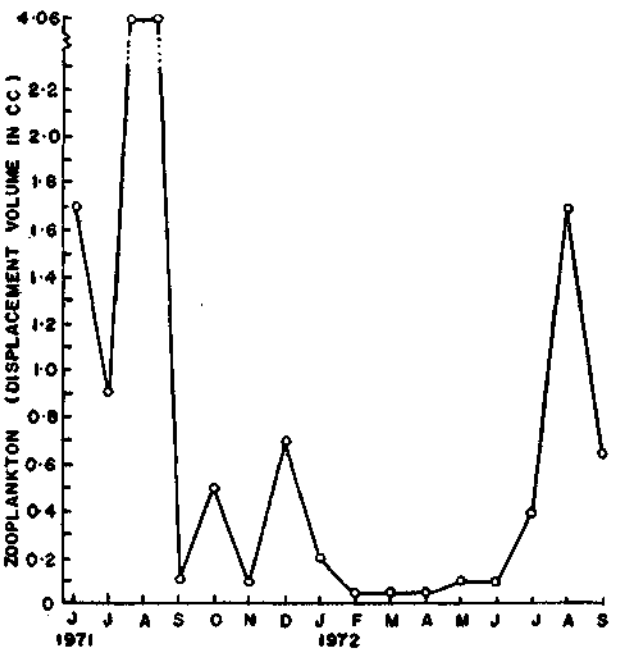

Fig. 1. Monthly mean variations in the displacement volume of zooplankton.

polychaete larvae, juveniles of *Barnea* sp. and tunicates. Ail these were present in the mudbank also.

Copepods and copepodites were extremely abundant almost throughout the year (Fig. 2a.). The months in which the copepods were less abundant were September 1971 and January, February and September 1972. But the copepods on the whole were comparatively more during the season of mudbank than during other seasons. As observed during both the years, September seems to be the lean month for copepods, and during September 1972 the copepodites were totally absent.

The appendicularians were present in all months and were fairly abundant throughout the mudbank as well as non-mudbauk seasons (Fig. 2h). The two months in which they

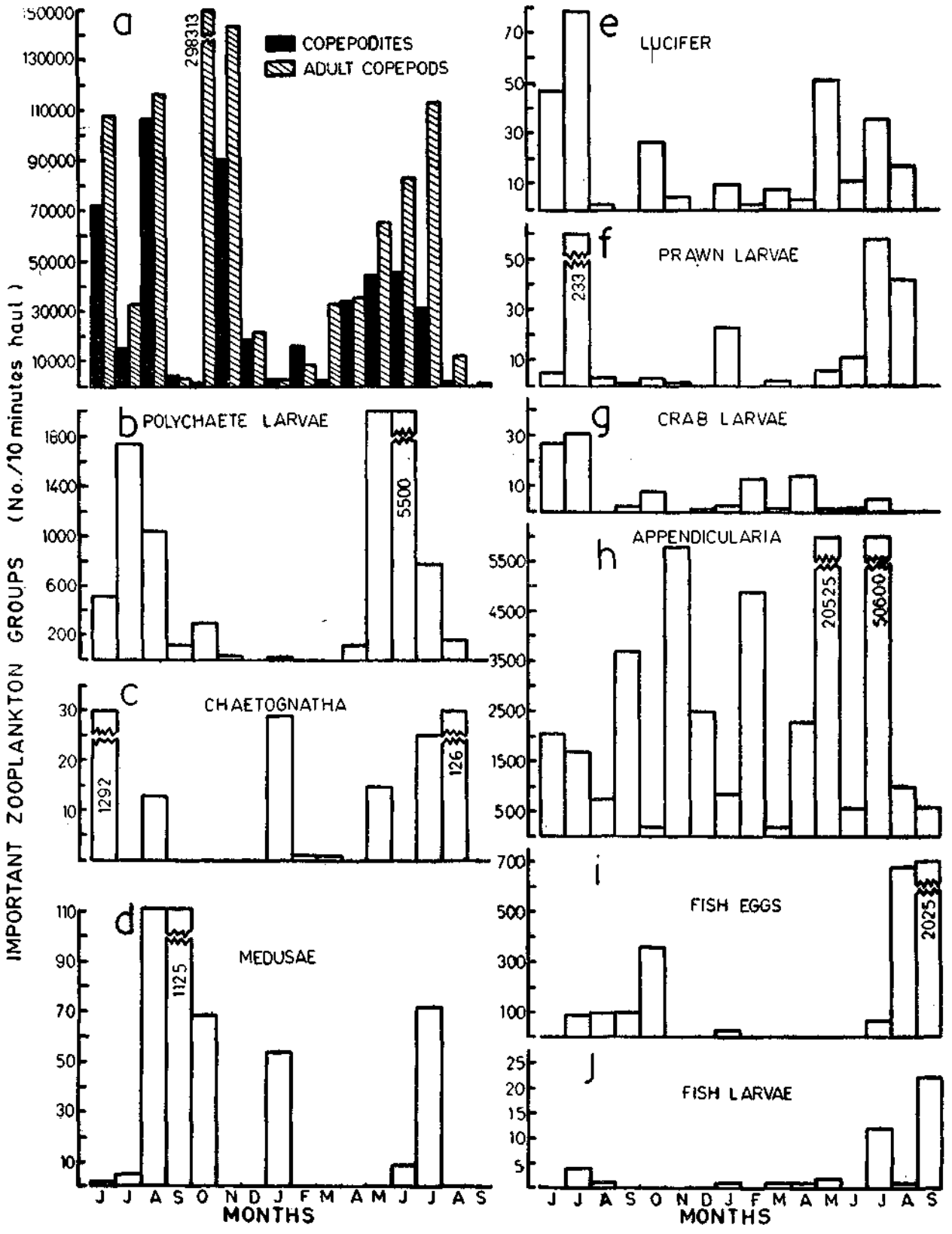

Fig. 2. Seasonal distribution of important zooplankton groups.

occurred in lesser numbers were October 1971 and March 1972. The polychaete larvae were abundant during the mudbank seasons of both the years (Fig. 2b.) During 1971, their maximum number was observed during the months of June, July and August, coinciding with the mudbank. During 1972 their abundance was in May, June and July. November 1971 to March 1972 was the lean period for polychaetes.

Pleurobrachia and cladocerans were found having an interesting trend. There was a swarming of pleurobrachia in August 1971,and afterwards they disappeared. Simultaneously with this was a swarming of cladocerans. However, unlike the pleurobrachians, the cladocerans did not make a sudden appearance but were present in moderate numbers during the previous 2 months. But from September 1971 to June 1972 the cladocerans were absent in the mudbank area. Again in July 1972, they swarmed the mudbank and disappeared afterwards.

The appearance of medusae was strictly seasonal (Fig. 2d.) They started appearing in June, during the first mudbank, but the peak was in September, when 1125 specimens were caught in a 10-mini. haul. By November, they totally disappeared and in January they again reappeared, but withdrew during the same month. Afterwards they were totally absent for the next 4 months until June-July 1972, when they were again present in the plankton.

The chaetognaths were quite sgnificant in that they were abundant in the mudbank (Fig. 2c.). While they were caught in good numbers in June and August 1971, the next year they showed their abundance in July and August. In January 1972 also a few of them were caught from the mudbank region. *Sagitta inflata* was the dominant species. During the period of observations the siphonophores were present during three months only, *viz.*, June and August 1971 and July 1972. Altogether five species of siphonophores were identified, which in the order of abundance were *Lensia subtiloides, Diphyes chamissonis, Bassia basseusis, Enneagonum hyalinum* and *Abylopsis tetragona.*

Post larvae of penaeid prawns of species *Penaeus indicus, Metapenaeus dobsoni* and *M. monoceros* were present in the plankton in varying numbers. Their maximum abundance was observed during the mudbank periods, especially during the month of July (Fig. 2f.). A second peak, of low intensity, was observed in the month of January. The two peak periods of occurrence of prawn larvae agree with the two peak breeding seasons of penaeid prawns on the southwest coast of India.

Good number of specimens of lucifer were present in almost all the months. But they were absent in September 1971 and September 1972, as well as in December 1971. As in the case of other zooplankton organisms, their peak period of occurrence was during the mudbank seasons (Fig. 2e.). The crab larvae constituted only a small portion of the total plankton. They occurred in varying proportions in all but four months, namely, August and November 1971 and August and September 1972. Two peak periods in their occurrence were noticed; one during the mudbank season and the other during the February-April pre-mudbank season, (Fig. 2g). Fish eggs though were encountered in the plankton in varying numbers in all except four months, they showed more abundance during and after the mudbank (Fig. 2 i.). In 1971, their maximum number was in October, while it was in August and September during the next year. Generally speaking, the lean months for the fish eggs were from November 1971 to June 1972.

The fish larvae did not contribute much to the plankton, probably because most of them escaped the net which was towed from the country craft with varying speeds, (Fig. 2j). The juveniles of *Barnea* sp. were extremely abundant in the plankton during July 1971 and July 1972. The occurrence of these juveniles is associated with the reproductive cycle of this species. Stray specimens of amphipods were collected during the monsoon period of both the years. The tunicates were also found in the samples collected in the monsoon months. A few stomatopod larvae were present during October 1971, January 1972 and April to August 1972. The adult ostracods never occurred in the plankton, but the larvae of one species, *Cyrrpidina dentata,* were numerically abundant in the plankton during June and July 1972, when 28125 and 130 specimens, respectively, per 10 minutes haul, were collected.

TABLE-1. *Relative Abundance of Zooplankton Groups*

Zooplankton Groups	June '71	July	Aug	Sept.	Oct.	Nov.	Dec.	Jan. '72	Feb.	Mar.	Apr.	May	June	Jul·	Aug.	Sept.
Meduse	0.001	0.010	0.042	9.053	0.023			1.048					0 006	0.036		
Siphonophores	0 009		0.040											0 007		
Pleurobrachia			0 115													
Chaetognaths	0.700	0.002	0.005					0.562	0.003	0.003		0.011	0.001	0.013	0.859	
Polychaete larvae	0.286	3.357	0.397	1.014	0.083	0.013		0.039			0.178	1.523	3.401	0.394	1.148	
Copepodites	39.179	27.812	40 236	33.298	0.478	37.335	43.425	40.043	45.515	5 719	47 431	33.258	27.670	15 561	2.658	
Copepodites	58.588	63.212	44.147	26.153	99.212	60 226	50.668	40.043	52.556	93.644	49.027	40.530	51.161	56.810	83 536	19.101
Cladocerans	0.100	0.604	14.690													
Amphipoda		0.002	0.001										0.001	0.001	0 007	
Lucifer	0.025	0.152	0.001		0.009		0.002	0.195	0.007	0.023	0.006	0.040	0.007	0.008	0.116	
Prawn larvae	0.003	0.449	0.001	0.008	0,001	0.001		0.449		0 006		0.005	0.007	0.026	0.286	
Crab larvae	0.015	0.060		0.026	0.003		0.002	0 039	0.045	0.003	0.020	0 001	0.001	0.003		
Stomatopod larvae						0.001		0.020			0.010	0.006	0.005	0.003	0.048	
Barnea ap.*		0.912					0.005							0.816		
Ostracod larvae													17.390	0.066		
Appendicularians	1.093	3.246	0.284	29 677	0.071	2.423	5.887	17.089	16.873	0.600	3.325	15.625	0.348	25 532	6 820	18.337
Tunicates	0.001		0.003											0.005		
Fish eggs		0.175	0.037	0.781	0.119	0 001	0.012	0.566			0 003		0.005	0.033	5.604	61.889
Fish larvae	0.007	0.001						0.020		0.007	0 001	0.002		0.006	0.007	0 672

*Iuveniles only

Relative abundance of zooplankters

The relative frequency of among various groups of zooplankters is given in the form of percentages in Table 1. It is observed that in all the months copepods dominated the plankton, forming more than 80% of the total biomass. The month of September in both 1971 and 1972 appeared to be the lean period for copepods when they formed about 60% and 19% respectively of the total plankton. The number of copepods was so enormus that the other groups were rarely represented by more than 1% numerically in the standing crop of zooplankton.

The abundance of fish eggs and appendicularians and the reduction in the number of copepods in September 1972 gave an unusual picture of relative occurrence of plankton, compared to other months. During this month, copepods, appendicularians, fish eggs and larvae alone were present as zooplankters.

DISCUSSION

The general picture which emerged from the study of zooplankton of the area, both quantitative and qualitative, is that zooplankton was more abundant during the mudbank. Incidentally, a correlation between the abundance of zooplankers and the ecological features has been observed. The environmental factors, such as nitrate, phosphates and silicates showed definite increase in the mudbank (ref: Chapter 6.) The standing crop of phytoplankton, which is directly linked up with these chemical properties, also showed a general increase during this period (Fig. 1.). The same trend was reflected in the case of zooplankton also. Mukundan (1967), based on material collected on the inshore plankton of Calicut from 1957 to 1965, found that August-November period was the peak period for the zooplankton, while February-July period registered moderate values, and in the months December and January, the zooplankton biomass was poor. The observed difference with regard to the seasonal variations in zooplankton abundance between Calicut and themudbank region may be attributed to the peculiar ecosystem that prevails in the mudbank area. However, the swarming of cladocerans during the monsoon period, when the water salinity was comparatively lower, was observed both at Calicut and in the area under present study.