PRELIMINARY STUDIES ON THE BOTTOM BIOTA OF PULICAT LAKE

ABSTRACT

Based on the nature of substratum, the bottom of the Pulicat Lake has been divided into three zones—a zone characterised by predominance of sand in the substratum with little admixture of mud ; a second zone having sand and mud in equal proportions with patches of weeds ; and a third zone consisting entirely of mud. Of these, the second zone was observed to harbour a rich fauna, with amphipods as the dominant element. The first zone was characterised by dominance of polychaetes while the third zone was faunistically poor.

STUDIES on benthic communities have assumed greater importance in recent years in view of their significant role in the trophic cycle. In India such studies have been

on the taxonomy of bottom fauna and some observations on their distribution in time and space (Panikkar and Aiyar, 1937 ; Desai and Kutty, 1967 and Rajan, 1969). Since a number of species of fishes inhabiting the Pulicat Lake were found to be dependent on the benthos for their food, the present study was undertaken.

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General Topography of the Lake and nature of substratum : The lake is connected to the Bay of Bengal by a narrow channel near Pulicat (Fig. 1) and is about 461 km^2

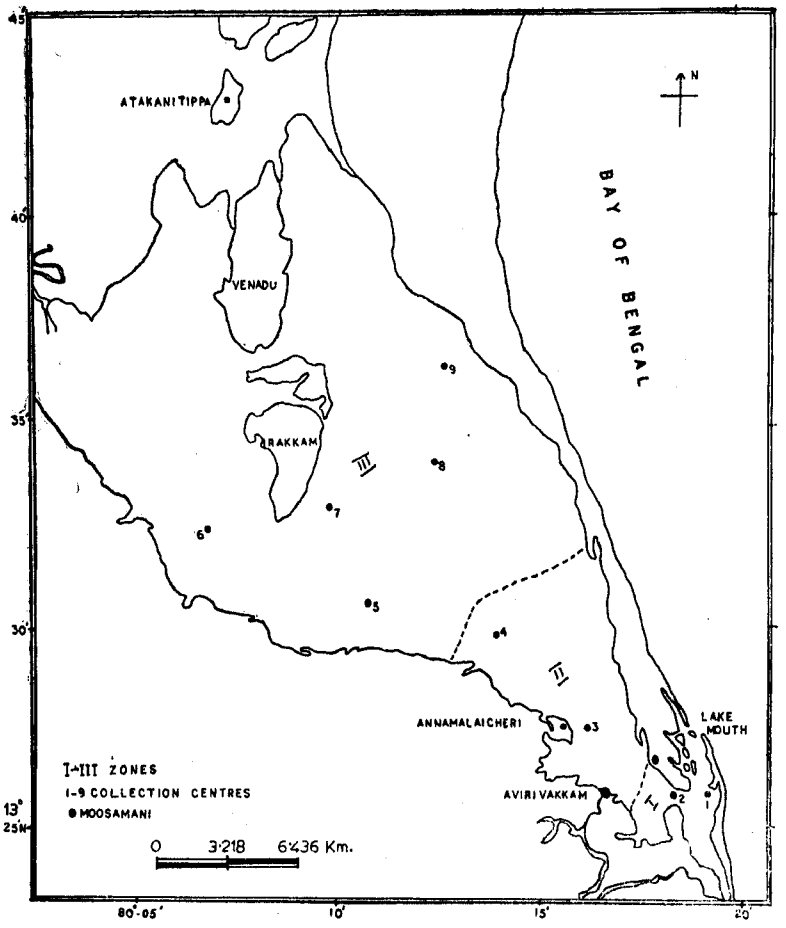

Fig. 1. Map of Pulicat lake showing collection centres.

in area. The tidal amplitude is felt upto Annamalaicheri and ranges from 20 to 25 cm. A small seasonal rivulet drains (Kalingi River) into the lake along its north-western part. Normally the fresh water incursion into the Lake is not much except due to heavy rains during the North-East monsoon. The depth of the lake varies

from one to five metres, the deepest areas being the narrow strip between Moosamani and lakemouth and the average depth is 1.5 m. The nature of substratum at stations 1 and 2 is mainly fine sand with an admixture of mud ; at stations 3 and 4, it is composed of fine sand and clay in more or less equal proportions with submerged weeds in patches all along the bottom. At stations 5 to 9 the main constituent of the substratum is fine clay with a meagre quantity of sand interspersed with broken bivalve shells.

Methods of collection and analysis : Fortnightly collection from the nine stations (Fig. 1) were made by an Ekman dredge. The samples were sieved through a No. 60 sieve and the animals were sorted, counted and identified upto group level and wherever possible upto species level. For comparison of values, the number of animals per haul were converted into values per m^2. Hydrographic collections, besides records of depth, temperature, etc. were made simultaneously.

Composition and Distribution of the biota : The data on distribution of the bottom animals both zone-wise and month-wise are presented in Tables 1 and 2.

TABLE 1. *Zone-wise distribution of bottom biota*

(Av. No. of animals per sq. m)
(% in brackets)

	Zone I	*Zone II*	*Zone III*
Average depth (Cm) ..	182	175	110
Average bottom temperature (°C) ..	28.1	28.3	29.1
Dissolved Oxygen (ppm) ..	7.52	7.41	7.47
Salinity ‰ ..	32.02	33.05	32.00
Animal groups :			
Sea Anemones ..	10 (1.1)	10 (0.2)	8 (2.0)
Nematodes ..	—	691 (18.3)	2 (0.5)
Polychaetes ..	794 (83.0)	341 (9.0)	76 (20.0)
Isopods	—	29 (0.7)	3 (0.7)
Tanaids ..	67 (7.0)	164 (4.3)	112 (29.1)
Amphipods ..	59 (6.0)	2376 (63.7)	142 (36.8)
Other crustacea ..	18 (1.8)	29 (0.7)	15 (4.0)
Minor Phyla ..	—	10 (0.2)	2 (0.5)
Molluscs ..	1 (0.1)	104 (2.7)	24 (6.2)
Protochordates ..	—	2 (00·4)	1 (0.2)
Fish ..	9 (1.0)	11 (0.2)	—
Total ..	958	3767	385

All the nine stations were grouped into three zones depending upon the nature of substratum as described earlier.

TABLE 2. *Month-wise distribution of bottom biota*

(No. of animals per sq. m)

	Jan.	*Feb.*	*March*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
Zone—I												
Sea Anemone	..	..	..	..	..	120	..	..	..	..	..	..
Nematodes	..	..	..	..	..	..	..	..	..	..	..	..
Polychaetes	504	776	5860	..	182	504	118	..	108	96	169	1160
Tanaids	36	264	..	..	18	..	..	..	..	..	36	440
Amphipods	126	60	72	..	..	19	20	..	144	..	302	60
Other crustacea	..	28	144	..	54	..	20	..	..	..	..	..
Minor groups	..	10	..	..	..	..	..	..	..	..	..	..
Molluscs	..	..	..	..	..	..	10	..	..	..	..	..
Gobiids	36	..	..	..	54	..	..	..	..	..	17	..
Zone II												
Sea Anemones	16	..	60	14	..	4	..	..	..	..	24	..
Nematodes	3544	2100	2064	..	..	540	..	..	..	..	40	..
Polychaetes	336	1698	852	34	..	60	32	224	12	336	504	..
Tanaids	168	142	196	183	..	..	132	564	150	96	336	..
Amphipods	7922	2844	3042	233	..	272	424	840	146	..	584	..
Other crustacea	184	142	270	34	..	28	32	..	..	..	144	..
Minor groups	48	112	24	..	..	..	..	72	..	..	48	..
Molluscs	252	388	408	10	..	20	64	36	..	32	44	..
Gobiids	128	..	..	10	..	..	..	..	..	..	..	..
Zone III												
Sea Anemones	..	..	121	104	..	..	..	16	6	..	..	..
Nematodes	..	..	..	..	..	..	..	..	..	..	19	..
Polychaetes	253	..	366	221	..	..	31	15	36	67	98	..
Tanaids	417	..	195	345	..	..	45	162	233	94	134	..
Amphipods	423	..	316	258	..	..	75	86	389	152	336	..
Other crustacea	..	..	110	25	..	..	3	..	..	26	..	..
Minor groups	..	..	..	81	..	..	..	..	..	..	..	..
Molluscs	..	..	..	28	..	..	13	..	6		13	..
Gobiids	..	..	..	..	..	..	..	..	..	12	..	..

In Zone 1, the predominant element of the fauna was polychaetes, constituting 83% of the total. Tanaids represented mostly by *Apseudes gymnophobia* Barnard, and amphipods were next in importance. *Eriopisa chilkensis* (Chilton) was common among amphipods. In Zone II, amphipods were the dominant group represented by *Eriopisa chilkensis* (Chilton), *Maera* spp. and others. Tanaids, nematodes and molluscs contributed to a fair share in the composition of the fauna. The percentage of polychaetes in the biota was considerably reduced and they occupied only the third place in the order of importance. In Zone III, the number of animals per square metre was 385 only as compared to 958/m² in Zone I and 3767/m² in Zone II. Though the concentration of animals was sparse in Zone III, the major groups continued to be amphipods, tanaids and polychaetes. *Eriopisa chilkensis*, and *Apseudes gymnophobia* were available throughout the lake.

Discussion : Various factors are generally attributed to influence the qualitative and quantitative aspects of the bottom fauna. During the present study the water temperature was found to range between 25.22°C in January in Zone II and 32.14°C in May in Zone III ; and the dissolved oxygen values were from 5.17 ppm in October (Zone I) to 9.61 ppm in July (Zone I). There was an appreciable difference in salinity in Zone III from 14.35‰ in January to 42.85‰ in August ; and in Zone II from 16.62‰ in January to 36.50‰ in July. At Zone I, the salinity range was 21.57‰ in January to 35.96‰ in May. Zone I is proximal to the sea and is more subjected to tidal influence, while Zones II and III are influenced by freshwater inlets during the rainy season.

In the three zones, though some differences of the numerical abundance of the benthos could be correlated with differences in salinity no definite trend could be established. Thus in Zone I in January, when the salinity was 21.57‰, being the minimum recorded during the period of observation, 702 animals per m² were recorded, while at a maximum value of 35.96‰, only 298/m² were observed ; but at an intermediate value like 34.16‰ in March, 6076 nos./m² were recorded. From the above, though the importance of salinity as a factor is evident, it also shows that the optimal values and limits of tolerance for different species calls for a more detailed study. Desai and Kutty (*op. cit.*) and Seshappa (1953) observed that wide fluctuations in salinity resulted in considerable variations in the abundance and the species composition of the fauna in Cochin Backwater, and in the inshore areas of the Malabar Coast respectively. The relationship between temperature and dissolved oxygen and the distribution of fauna is not clear from the data so far available.

Nature of substratum was found to be an important factor in influencing the bottom fauna. It was seen that the Zone with a substratum of sand and mud in more or less equal proportions with weedy areas at irregular intervals, supported a dense and varied population of bottom animals with amphipods being the dominant element. Areas where the substratum was composed of fine clay supported a poor faunal element. Regions close to the sea with a substratum of fine sand and mud and subjected to tidal influence supported a rich polychaete fauna. In a substratum of clean sand bottom the fauna were rare. Greater abundance of fauna in loose substratum has been observed, while they were rare in a bottom of thick clay.

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