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DISTRIBUTION AND SPECIES DIVERSITY OF RECENT BENTHIC OSTRACODA FROM THE GULF OF MANNAR, OFF TUTICORIN, TAMIL NADU

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ABSTRACT

Fifty two ostracod species were encountered in the forty eight sediment samples collected in the Gulf of Mannar, off Tuticorin, Tamil Nadu. Sediment and water samples were collected from 12 sampling stations, once in every 3 months, for a period of one year, representing the four seasons. Among the 52 species, 3 belong to Platycopa and remaining 49 belong to Podocopa. The distribution of the fauna reveals that the population size is at a maximum in the Summer season, when temperature, dissolved oxygen content and salinity values are all at their highest when compared with other seasons. The species diversity value (V) is found to be at a maximum during the Southwest monsoon months. In general, the diversity curves show higher inclination in the intermediate and later half of the stations.

INTRODUCTION

The area under investigation is off the coast of Tuticorin (between 78° 10′ to 78° 25′ E and 8° 47′ N) in the Gulf of Mannar, east coast of India, and forms a part of toposheet numbers 58 L/1 and L/5 of the Survey of India. This region is influenced by the Northeast monsoon (September-November) and the Southwest monsoon (June-August). In the Gulf of Mannar, Pearl and chank beds occur roughly in the line parallel with and at a distance of 11 Km from the land (Freda Chandrasekaran *et at.*, 1968), and at a depth of about 14 m. The surface of these beds consists of sediments formed by the consolidation of sand and dead corals *in situ*. Many species of marine algae flourish in the shallower regions.

MATERIALS AND METHODS

The sediment samples were collected in the inner shelf of the Gulf of Mannar at 12 stations (Fig.1) ranging in depth from less than a metre to about 20 m. Starting in January 1985, samples were collected once in 3 months for a period of one year, representing the four seasons of the year (Winter, Summer, Southwest monsoon and Northeast monsoon). All the 48 sediment samples were collected using a Petersen grab. At each station, a water sample was collected from the sediment-water interface, using a Nansen reversing water sampler. At the time of collection, the temperature of the bottom water was recorded using the thermometer built in to the water sampler. Dissolved oxygen and salinity content of the water samples and sand-silt-clay fractions in the sediment were estimated by standard methods. Trefethen's (1950) textural nomenclature was used to describe the sediments.

A unit volume of 25 ml wet sediment taken from the top 1cm was preserved immediately in a 10% neutralised formaldehyde solution to study the living ostracods. Walton's (1952) Rose-Bengal staining techni-

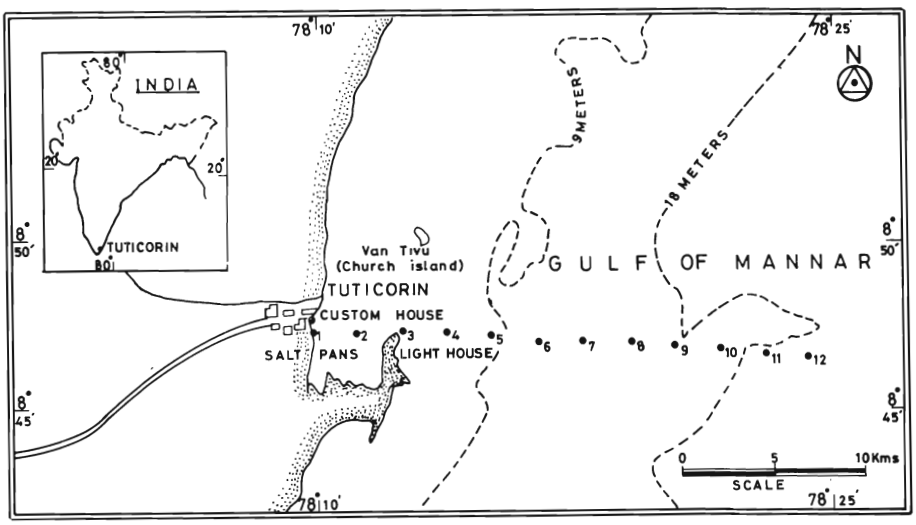

Fig. 1. Location of sampling stations in the Gulf of Mannar, off Tuticorin.

que was followed for indentifying the living forms. The preserved sediment samples were washed over an ASTM 230 mesh sieve (opening 0.063 μm) to remove finer particles. The ostracod specimens were then separated from the residue under a stereomicroscope. After identification of the species, the specimens belonging to different species were counted.

SPECIFIC COMPOSITION OF THE OSTRACOD FAUNA

A study of ostracod fauna from the present area has led to the recognition of 52 species consisting of both living and dead forms. They belong to 41 genera, 20 families, 3 superfamilies and 2 suborders of the order Podocopida. In the present work, the classification proposed by Hartmann and Puri (1974) is followed. Of all the species identified, 3 species belong to Cytherellidae, 5 to Bairdiacea, 40 to Cytheracea and the remaining 4 species belong to Cypridacea. These Taxa have been recognized from 11, 812 specimens of ostracods recovered from all sediment samples collected and studied. Out of these, 92.8% belong to Cytheracea, 2.8% to Cytherellidae, 2.5% Bairdiacea and 1.9% to Cypridacea.

Among the species recognized in the study area, the following 7 were recorded for the first time from Indian waters: *Bradleya (Quasibradleya) plicocarinata* Benson, *Cytherella dictyon* Malz and Jellinek, *Hemicytherura subulata* Ahmad, Neale and Siddiqui, *Miocyprideis spinulosa* (Brady), *Neocytheretta murilineata* Zhao and Whatley, *Neomonoceratina porocostata* Howe and McKenzie and *Propontocypris (Propontocypris) crocata* Maddocks. The under mentioned 13 species were recorded for the first time from the east coast of India. *Actinocythereis scutigera* (Brady), *Alocopocythere reticulata indoaustralica* Hartmann, *Bairdoppilata (Bairdoppilata) alcyonicola* Maddocks, *Bythoceratina mandviensis* Jain, *Callistocythere* sp. cf. *C. flavidofusca intricatoides* (Ruggieri), *Carinocythereis (Carinocythereis) hamata* (Kingma), *Hemikrithe peterseni* Jain, *Keijella karwarensis* (Bhatia and Kumar), *K. reticulata* Whatley and Quanhong, *Lankacythere coralloides* (Brady), *Macrocyprina decora* (Brady), *Paijenborchellina indoarabica* Jain and *Paracytheroma ventrosinuosa* Zhao and Whatley.

OSTRACOD POPULATION AND DISTRIBUTION

The ostracod study reveals that the population size ranges between 12 and 1295 (Table 1), with the minimum at station 2 during NE monsoon and the maximum at station 5 of Summer. In general, a minimum population has been recorded in the first three stations of the transect, irrespective of seasons. The population of ostracods in each season (all the 12 samples put together) ranges from 1726 during Northeast monsoon (October) to 3982 in the Summer (April). The ostracod population size is found to be maximum, in the middle segment of the transect (Stations 5 to 8), in all seasons. Due to the concentration of pearl and chank beds, the sediments in the middle section of the traverse always had the highest percentage of dissolved $CaCO_3$ in all seasons.

Table 1: Living and total (living + dead) ostracod population, off Tuticorin (Actual number of specimens per 25 ml wet sediment).

Station Number	Month (Season)							
	January (Winter)		April (Summer)		July (SW Monsoon)		October (NE Monsoon)	
	Living Population	Total Population	Living Population	Total Population	Living Population	Total Population	Living Population	Total Population
1	5	70	6	38	8	111	5	49
2	14	123	6	61	9	124	2	12
3	6	47	5	59	12	166	9	79
4	4	22	22	228	32	352	12	98
5	73	310	184	1295	30	418	22	273
6	99	439	105	934	27	431	45	469
7	28	442	96	668	18	283	8	95
8	18	207	17	220	34	415	24	245
9	15	280	8	81	16	208	10	64
10	18	232	20	167	25	369	7	130
11	27	257	20	116	32	334	9	66
12	27	285	19	115	19	179	9	146
Total	334	2714	508	3982	262	3390	162	1726

In the Gulf of Mannar, out of 52 species recorded, 8 were never found in living condition. Here, such species are collectively referred as 'dead species'. They are, *Actinocythereis scutigera* (Brady), *Cytherella dictyon* Malz and Jellinek, *Cytheretta* sp. cf. *C. trifurcata* Lubimova and Guha, *Keijella reticulata* Whatley and Quanhong, *Miocyprideis spinulosa (Brady)*, *Ornatoleberis morkhoveni* Keij, *O. quilonensis* Khosla and Nagori and *Triebelina* sp. Among these, *A. scutigera, C. dictyon, C. cf. trifurcata, O. morkhoveni, O. quilonensis and Triebelina* sp., occur rarely, where ever they are present. The remaining 44 species are represented by living specimens also. Among these, the following 8 are considered to be widespread and abundant, as they are found to occur in 75% and more number of samples collected and studied: *Carinocythereis (Carinocythereis) hamata* (Kingma), *Cytherelloidea leroyi* Keij, *Loxocorniculum lilljeborgii* (Brady), *Neocytheretta murilineata* Zhao and Whatley, *Neomonoceratina iniqua* (Brady), *Quadracythere* sp., *Tanella gracilis* Kingma and *Xestoleberis variegata* Brady.

SPECIES DIVERSITY

Species diversity is an useful indicator of maturity of communities (higher densities being related to higher maturity) and of ecological trends, because it can be assumed that areas supporting diverse species have generally better life conditions. From a study of the species diversity, we can compare the sediment samples in terms of the number of species they contain and the distribution of their abundance (in their respective sampling stations). According to Walton (1964), faunal variability, also called faunal diveristy, is obtained by ranking the percentage occurrence of each species, cumulating the percentages, and plotting a curve of number of species against cumulative percents. The variability value (V) is calculated from the curve by taking the difference between the number of species at one hundred percentile (NS100) and at five percentile (NS5). These values have the same environmental significance as the total number of species, but are not affected by those species occurring rarely, that constitute only a fractional percentage of the total populations.

In order to find out the species diversity of the ostracod fauna of the study area during the four seasons, the relative abundance of the ostracoda (living + dead) in terms of genera for the 12 sampling station were calculated. The diversity curves relating to the number of species with cumulative percentage of genera for 12 stations, for all seasons were plotted. The diversity values were cumputed (Table 2).

Table 2: Diversity value of total (living + dead) ostracod assemblage for each season, off Tuticorin.

Sampling station	Diversity valve			
	Winter (January)	Summer (April)	SW Monson (July)	NE Monsoon (October)
1	14	11	16	11
2	18	10	15	7
3	10	9	20	19
4	6	22	20	13
5	13	24	22	22
6	18	25	29	10
7	20	26	17	14
8	12	21	19	21
9	18	13	25	19
10	20	12	23	18
11	18	10	19	13
12	20	12	27	13

An analysis of the species diversity of the ostracod assemblage of the study area reveals that: (a) The diversity values are found to be minimum during NE monsoon and Winter and maximum during SW monsoon and Summer, show a range from 7 to 29, the minimum in the station 2 of NE monsoon and the maximum in the station 6 of SW monsoon; (b) The minimum diversity values seen during October and January may be due to low temperature (27.8°-28.6°C in October, 26.0°C-27.1°C in January), low dissolved oxygen content (2.6 ml/l - 3.4 ml/l) and low salinity (32.2^{x10-3} -33.1^{x10-3} in October, 30.0^{x10-3}- 30.5^{x10-3} in January). The higher diversity values found during July and April may be related to higher temperature (29.0°C-29.4°C July; 31.8°C-33.5°C April), optimum dissolved oxygen content (4.6 ml/1 -6.1ml/l July; 6.1 ml-l-7.1 ml/l April) as well as salinity (34.3^{x10-3}-36.1^{x10-3} July; 33.7^{x10-3}-34.9^{x10-3} April); (c) Out of the 12 possible sediment types of Trefethen (1950), the substrate off Tuticorin was represented by only the following 4 types: Sand (27 samples), silty-sand (15 samples), sandy-silty-clay (4 samples) and claysand (2 samples). It has also been observed that the silty-sand and sandy substrate are favourable for the thriving and abundance of the fauna; (d) Depth is assumed to be an another factor which affect the distribution of species, particularly in the middle and last segment of the transect.

CONCLUSION

Out of the 52 benthic ostracod taxa encountered, 3 belong to Platycopa and the rest 49 belong to Podocopa. The Ostracod population is found to be maximum in Summer. The species diversity values (V) are found to be more during Southwest monsoon. The first three stations, during all the four seasons recorded lesser diversity values and this may be attributed to minimum depth, surf-action and agitation.

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