Diversity of Molluscan Fauna along the Chennai Coast

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Introduction

The largest and most diverse Phylum in the tropical seas is Mollusca. The molluscs are soft - bodied, heterogenous group of animals with great antiquity and diversity. Out of the 80,000 to 100,000 species of molluscs recorded from various parts of the world, from India a total of 3271 numbers of the molluscs are known to occur belonging to 220 families and 591 genera, of which 1900 are gastropods, 1100 are bivalves, 210 are cephalopods, 41 are polyplacophores and 20 are scaphopods. The majority of molluscs inhabit marine biotopes and they occur from the backwater zone, mangroves, intertidal, shelf and down to deeper waters. The *Tsunami* of December 2004 has created newer ecological opportunities for species that have been dispersed by the waves in Indian coast.

The fauna of Chennai coast was investigated by many workers either in particular reference to this region or the work included this region as part of their work. The pioneering work on gastropod molluscs of Chennai coast was made by Melvill and Standen (1878) and Preston (1911), which was followed by Crichton (1940, 1941) and Gravely (1941, 1942). Recent work by Subba Rao (2003) and Subba Rao and Dey (2000) dealt with distribution of most of the molluscan fauna occurring in Indian coast. The only major investigation on the bivalves is by Crichton (1941), Gravely (1941) and Preston (1916). Except Jothinayagam (1985, 1987) no other worker directly dealt with the Cephalopoda of Chennai coast. In general, Cephalopods of India were studied by Goodrich (1896), Massy (1916) and Winckworth (1936).

The study conducted by Marine Biological Station, Zoological Survey of India, Chennai on the fauna of Chennai coast (from Ennore Port to Thiruvanmiyur) revealed the occurrence of a total of 1270 species belonging to 820 genera including all the invertebrate and vertebrate groups. Among the various faunal groups recorded from the Chennai Coast, fish fauna display a maximum diversity with 493 species belonging to 268 genera. Next to fishes, molluscs occur with 273

species belonging to 144 genera. The recorded species diversity of marine faunal groups of the world is 2, 41,563 of which India has a total number of 23,960 (both terrestrial and marine). Out of the total species occurring in India, only 12,244 species (51.10%) are recorded from marine regions of India. Neverthless, Chennai coast has little over 10% of marine fauna recorded from India. The total percentage of faunal occurrence will increase if an intensive survey and study of all the groups especially the micro and meio benthos are made.

The study was conducted at Chennai coast which is lying at 13° 06'N and 80° 18'E and comprises more than 60 coastal villages involved in active fishing. The Coast extends from Pulicat Lake to Kalpakkam and stretches for about 120 kms. In Chennai Coast, the Kasimedu is the largest fish-landing centre. The Chennai harbour is a protected area with placid waters. Effluents from the ships and docks pollute the seawater in and around the harbour area.

Material and Methods

During July-December 2011, the Kasimedu fishing harbour (North Chennai), Marina beach (Srinivasa-puram), Thiruvanmiyur and Beasant Nagar beach was visited fortnightly. Gastropods and bivalves were collected from the fishing nets and washed ashore in shoreline. The animals were then buried in the ground in a shallow pit of dimensions 100cm length, 50 cm width and 25cm depth or kept buried in a plastic bucket within layers of soil. The fleshy remains of the snails and hermit crabs were allowed to decompose for about one week. After this, the shells were washed in water and with diluted hydrochloric acid to remove the hard outer coat and to reveal the natural colours. Collected specimens were preserved in 90% ethyl alcohol. The shells thus processed have been identified with the available keys, guides, and comparing with the collections of Marine Biology Regional Centre, Zoological Survey of India, Chennai, and Center for Advanced Studies in Marine Biology, Porto Novo, and CMFRI Chennai.

Results

Diversity of gastropods

A total of 47 species of molluscs were collected and identified and given in the Table-1. 26 species were gastropods while 21 were bivalves. Among the four stations, Kasimedu has maximum species richness in terms of gastropods. 26 gastropod species were recorded in kasimedu followed by 16 species in marina. Remaining two stations have low species richness i.e., 6 and 5 respectively. *Turritella attenuata, Babylonia spirata, Chicoreus virgineus, Murex trapa,* and *Bullia vittata* found all the sampling stations. Sixteen gastropod species were found new to this study. Seven species which is recorded earlier also observed in this study. 26 species were not observed from the earlier survey.

Diversity of bivalves

Among the four stations, Kasimedu has maximum species richness in terms of bivalves. 21 bivalve species were recorded in Kasimedu followed by 20 species in marina. Remaining two stations has low species richness *i.e.*, 13 and 11 respectively. *Arca symmetrica, Arca tortuosa, Cardita bicolor, Lucina ovum, Cardium setosum, Sunetta scripta, Mactra turgida, Donax cuneatus, Tellina angulata* and *Laternula anatina* found common to all the stations. Three bivalve species were found new to this study. Eighteen species were recorded earlier also observed in this study. 58 species were not observed from the earlier survey. The absence of species reported earlier could be due to impact of tsunami or changes in the marine ecosystem or due to insufficient effort. The distribution and seasonality is influenced by various parametres such as salinity, temperature and depth.

Of the 47 species collected during the study, 54 % were obtained in a live condition. The rest were all dead and empty or occupied by hermit crabs. Of all 41.56% *Babylonia spirata* and 45.45% *B. zeylanica* shells were occupied by hermit crabs; the rest were found alive. As the two species are the most numerous shells on the Chennai coast (together 176 shells), it has to be tested whether the hermit crabs do show some preference for these shells or it is a matter of mere availability. However, as all individuals collected of the 3 species of Turritella (a genus represented by just 20 shells) were also occupied by hermit crabs. It does appear that hermit crabs apparently prefer shells that belong to *Babylonia* and *Turritella* species.

List of Gastropods recorded during study period

Name of the species	Kasimedu	Marina	Besant Nagar	Thiruvanmiyur
Phalium glaucum	+	-	-	-
Ficus subintermidus	+	-+	-	-
Natica gulateriana	+	-	-	-
Lambis lambis	+	-	-	-
Srtombus marginatus	+	-	-	-
Cypraea	+	+	+	-
Tibia delicatuala	+	-	-	-
Turritella attenuate	+	+	+	+
Babylonia spirata	+	+	+	+
Cantharus tranquebaricus	+	+	-	-
Conus betulinus	+	+	-	-
Conus figulinus	+	+	-	-
Conus loroisii	+	+	-	-
Pleuroploca trapezium	+	+	-	-
Pugilina conchlidium	+	+	-	-
Chicoreus brunneus	+	-	-	-
Chicoreus virgineus	+	+	+	+
Murex trapa	+	+	+	+
Rapana rapiformis	+	+	-	-
Thias bufo	+	-	-	-
Bullia vittata	+	+	+	+
Nassarius albescens	+	+	-	-
Nassarius luridus	+	+	-	-
Olivancillaria gibbosa	+	-	-	-
Oliva vidua	+	+	-	-
Turbinella pyrum	+	-	-	-
Total	**26**	**16**	**6**	**5**

List of bivalves recorded during study period

Name of the species	Kasimedu	Marina	Besant Nagar	Thiruvanmiyur
Anadara rhombea	+	-	-	-
Arca symmetrica	+	+	+	+
Arca tortuosa	+	+	+	+
Trisodos tortuosa	+	+	+	-
Pecten tranquebaricus	+	+	-	-
Cardita bicolor	+	+	+	+
Lucina vesiculata	+	+	-	-
Lucina ovum	+	+	+	+
Cardium flavum	+	+	-	-
Cardium setosum	+	+	+	+
Sunetta mero	+	+	+	+
Sunetta scripta	+	+	+	+
Mactra turgida	+	+	+	+
Donax cuneatus	+	+	+	+
Donax scortum	+	+	-	-
Tellina ala	+	+	-	-
Tellina angulata	+	+	+	+
Laternula anatina	+	+	+	+
Crucibulum extinctorium	+	+	-	-
Callista nivea	+	+	-	-
Semele crenulata	+	+	+	-
Total	**21**	**20**	**13**	**11**

Threats

Since marine ecosystems have been given lesser importance when compared to terrestrial ecosystem, these are poorly represented among world's protected areas. In India, only 5 out of the 533 protected areas (National Parks-85, Sancturaries-466, Biosphere Reserve-10 and Ramsar sites-16) are marine ecosystems, out of which Pulicat Lake has become one of the Ramsar sites in India very recently. In general, marine resources of the EEZ are considered open access to public. Coastal Zone Management, ICMAM and conservation of marine diversity are of recent origin. However, the following threats of problems still exist along the Chennai coast.

1. Sedimentation: The construction of Ennore Port and dredging operations deposit large quantities of silt, which increase the turbidity in water causing damage to marine life. There are also reports available on the erosion of some areas in the North Chennai due to the construction of Ennore Port. In general, siltation and sedimentation due to erosion reduces the productivity in the shallow areas.

2. Disposal of domestic sewage: Demographic pressure in the Chennai city has resulted in the production of enormous amount of domestic waste materials. These materials reach the marine environment directly through Coovum and Adayar River. These domestic wastes are discharged mostly in partially

Plate 1 : Mesogastropada

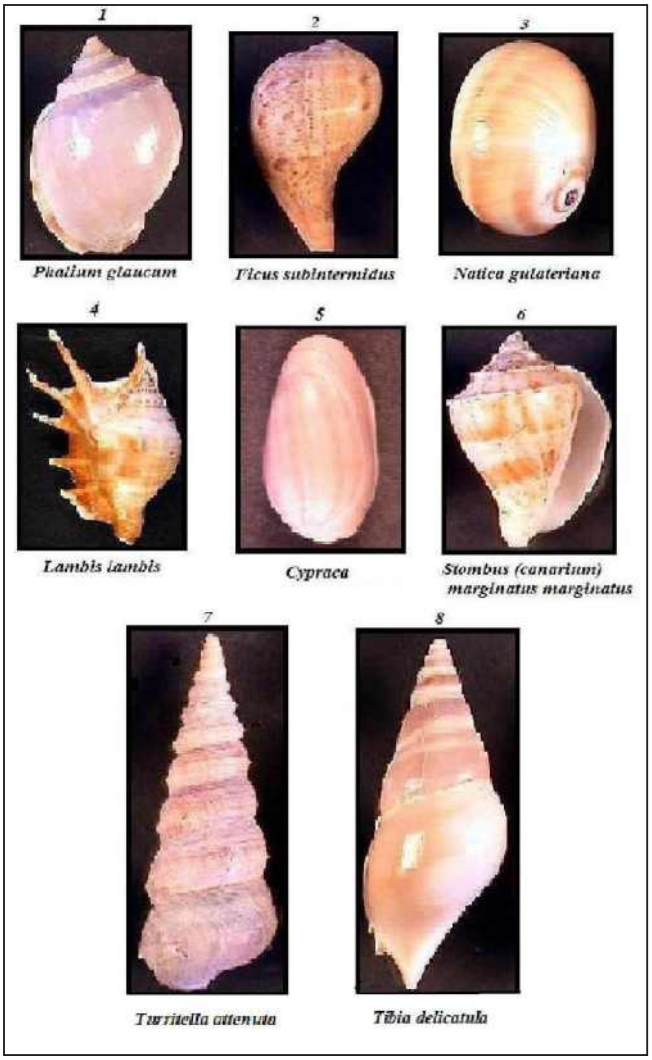


Plate 2 : **Mesogastropada**

treated or untreated conditions. The capacity of the sewage treatment plants is not adequate to treat the total waste generated in the Chennai city. This always results in the reduction of biodiversity in the Chennai coast. The sewage also causes diseases to many organisms living in the coastal areas. This results in reduced growth rate and reproduction, which in turn affects the biodiversity.

3. Industrial waste: Chennai is one of the largest industrial cities in India. The enactment of Water Pollution Act in 1974 and Environment (Protection) Act, 1986 have helped in regulating the disposal of wastes from the industries. Most of the major industries treat their effluents and comply with the standards set for each type of industry. However, the problem of wastes generated by medium and small-scale industries are not dealt with effectively. Common treatment plants for small and medium scale industries have been set up in Chennai. These measures have resulted in reduction of pollution loads of the coastal waters to certain extent. Major industries like fertilizer, petro and agrochemical and chemicals are mainly located at Chennai, Ennore and Cuddalore. Besides, industrial and municipal wastes, port related operations such as continuous movement of marine vessels at Chennai including oil transport as also the wastes of aquaculture and agriculture farms (near Kovalam) are increasingly posing threats to the coastal water quality and to the biodiversity.

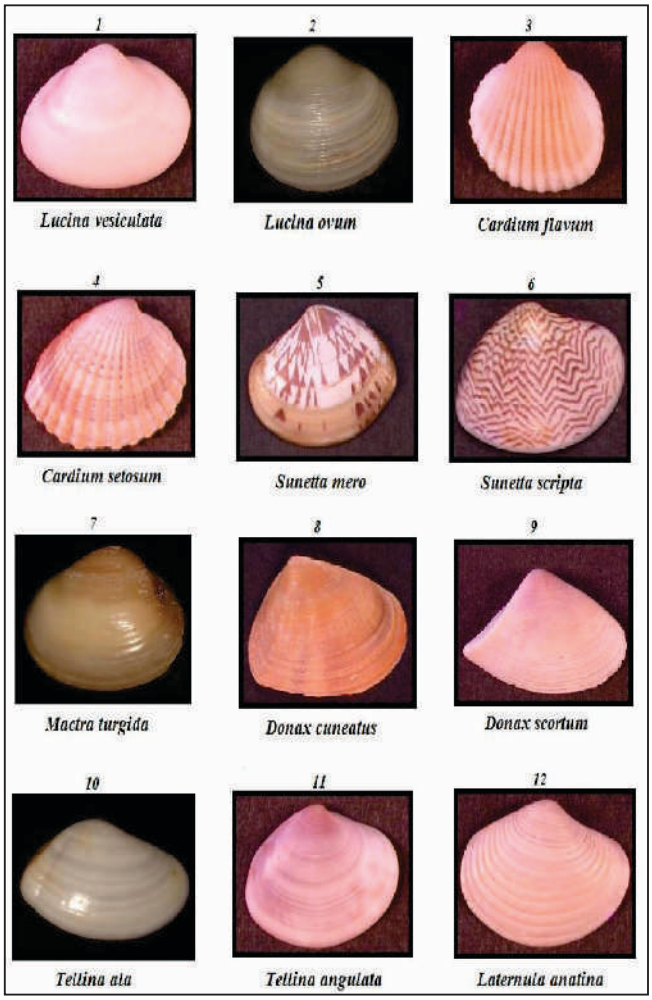
Plate 3 : **Mesogastropada**

4. Over fishing: The variation in the production in marine fisheries in the past 50 years and in particular the drop in production after 1997 indicates a series of crisis this sector is facing today. The status of fishing industry cannot be assessed based on catches alone. Even when the catches are on the increase in India, the following indication of the adverse changes could be diagnosed:

(i) Of the total landings of 2.7 m t during 1997, about 2.2 m t was from the inshore waters (<50 m depth) and the test from 50 to 100 m depth. The catcheable potential in the shore areas is estimated at 2.2 mt (Anon, 1991), which has been achieved by the commercial fisheries.

Plate 4 : **Class : Bivalvia**

Plate 5 : **Class : Bivalvia**



(ii) The catch rate of trawlers in several fishing harbours is on the decline. The annual effort of the trawlers based at Chennai (south east coast), has increased from 175,000 fishing hours in 1984 to 895,000 h in 1997. In other words, the catch has declined considerably against the trawl effort of 263,000 h (Vivekanandan, 1999).

Fishing operations with latest technologies are causing damage to the marine living resources. Along with increase in the targeted catch, a number of untargeted fish another biota are removed from their habitat and discarded as waste. It has been estimated that worldwide shrimp fishermen discard up to 15 million tones and other fishermen up to five million tons per year. Shrimp trawlers probably have the highest rate of immature fish and other non-targeted marine species. Gill nets used to catch fish bring in a host of other animals such as Dolphins, Turtles etc.

5. Tourism: Sandy beaches are the main attraction for tourists. Trampling of the beach sand and litter has changed the complexion of the Marina and other beaches along Chennai coast. The beaches along the Chennai coast have been attracting more and more number of tourists as well as locals. Other than the major beach Marina, there are many new beaches being used for recreation, which include some of the amusement parks and private beaches with hotels along the East Coast Road up to Mahabalipuram. These beaches along the Chennai Coast are under tremendous pressure from tourism and garbage accumulation. Many of these areas previously earmarked for turtle nesting grounds now accumulate a lot of garbage and waste materials discarded by the visitors.

Chennai coast is known for its rich biodiversity. It is also the zone of maximum human concentration. The problems in the zone are due to conflicting sectorial interests. There are several stakeholders representing both, the Government Departments and NGOs. The traditional fishermen and trawler operators exploit the living resources along the Chennai coast to the maximum. There is no proof to show that the existing catches have exceeded the maximum sustainable yield. Nevertheless, one thing is certain, coastal biodiversity is threatened by pollution especially from domestic sewage and run off from agricultural land. Destruction of habitat is another serious problem along the Chennai coast. The traditional users of the Chennai Coast feel that they are marginalized. Many fishermen living along the Chennai Coast are ignorant of the Wildlife (Protection) Act 1972 and Coastal Regulation Zone Notification. Socio-economic evaluation of coastal resources and public involvement in the management are the two aspects, which may have to be considered for conservation and management of faunal resources of Chennai coast.

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