

# Macro - Benthos of Tidal Ponds at Kandalvan along Eastern Suburb of Mumbai

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**Abstract :** The tidal ponds in the midst of mangrove forest at Kandalvan located along Thane creek forms a good breeding and feeding ground for various marine life and migratory birds like flamingos. The study of macro-benthic organisms play an important role in deciding the ecological status of any aquatic body. The benthic macro-fauna collected from two sites of study area for a year on monthly basis has been studied to understand its importance to maintain the ecological balance of the area forming prime food for marine life and resident as well as migratory birds.

**Key words :** Mangrove forest, Tidal ponds, Macro-Benthos, Flamingos

## Introduction

In the last few decades the economic value and significance of wetland was recognized due to many direct and indirect benefits to the society. They support plant, animal, human life and preserve environmental balance. Still the wetlands are under constant threat. Environmentalists have begun showing their concern and have expressed anxieties about the damages being done to flora, fauna and the environment.

The Thane creek along eastern suburb coastline of Mumbai has a vast patch of diversified mangrove forest. The creek (Long. 72°55' to 73°00' E, Lat. 19°00' to 19°15' N) is 26 km long, connected to Arabian Sea on its South. The regular inundation of tidal waters from the creek in mangrove forests for years led to the formation of ponds in the midst of the habitat with variety of flora and fauna, which are utilized for fishing activities by local fishermen. Such tidal ponds exist in the mangrove forest along the eastern coast of Mumbai and in neighboring parts of Mumbai viz. Mulund, Nahur, Bhandup, Kanjur and Vikhroli along eastern suburbs coastline and neighbouring places like Thane, Vitava, Airoli, Diva, Gothavali, Ghansoli, Koparkhairane, Vashi, Mahul, Turbhe, Uran, Alibag and Shabaz. The establishment of tidal ponds at various places along the mangrove patches mentioned has been a good source of income for fishermen in the area. Thus tidal ponds in mangrove ecosystems turned out to be integral part of local fishermen's life and also form structural and functional unit of the entire mangrove ecosystems.

## Location

For the comprehensive study on fish farms located in the natural habitat of mangrove forest, the selected area is a part of the mangrove ecosystem, locally known as "**Kandalvan**" at **Mauze - Bhandup**, the Eastern suburb of Mumbai 400 042, lying along the Western bank of Thane

creek. It covers almost 94.92 hectares of mangrove area. (Survey No.1049). The map of Mumbai (Fig. - Plate 1) also gives the exact location of study area. Two distinct sites are demarcated in the area. The Site 1 is about 0.5 km. away from the creek shore line and the Site 2 is about 2.5 km. away from the creek. The total area covered by 17 Ponds at Site 1 is about 42.6 hectares and that by 6 Ponds at Site 2 is about 11.5 hectares. Out of total 23 Ponds in the vicinity, two such ponds have been selected for detailed studies representing two sites .Pond 1 and Pond 2 represent site 1 and site 2 respectively

Kandalvan at Mauze Bhandup is a tidal forest located at the interphase between land and creek, represents a typical "**Mangrove ecosystem**" having a tidal water source from Thane creek. It is an ideal place for the establishment of mangrove vegetation as the area receives water every fortnight from Arabian Sea due to tidal actions and the fresh water flow from Ulhas river as it joins Thane creek. The study area is a vast expanse of mangrove habitat, selected from creek bank towards terrestrial land up to Eastern Express Highway covering a distance of nearly 3 km.

## Benthos

Kandalvan produces large amount of litter in the form of falling leaves, branches, seeds etc. of mangrove trees. The decomposition of the fallen parts by the micro-organisms found in the muddy bottom contributes to the production of organic matter. The biomass of micro-organisms along with organic matter is known as '**detritus**'. Pond bottoms are thus enriched with detritus regularly brought in by the tidal water. During the process of formation of detritus the nutrients are regenerated and released which enrich the surrounding water and soil components of ponds.

Soil is a key factor regulating elementary cycles of an eco-system. Soil of this region is silty – clay type having good water retention capacity. The texture of soil at both

ponds was silty-clay, as it was more of silty nature. At Pond 1 the percentage of silt and clay was 61% and 35% respectively. But Pond 2 showed the 10% higher silt composition and lower clay composition than at Pond 1 may be due to its proximity to Express Highway.

Benthic organisms play an important role in regulating and maintaining the detritus food chain of pond eco system. Predominant species of macro benthos such as crustaceans, molluscs and annelids were studied in the area.

The green alga *Enteromorpha* growing in this region predominantly forms an important constituent of food for herbivores.

### Materials and Methods

The collection of mud samples were done randomly from five different areas of ponds with the help of metal scoop 10 cm. x 10 cm. x 5 cm. The general procedure followed for the collection and processing of macro-benthos was as per the recommendations of Holmes (1971). All samples were pooled together and 10% MgCl<sub>2</sub> was sprinkled to narcotize the macro fauna. The sample was drained through the fine mesh sieve of 0.4 mm to collect macro fauna. The fauna

collected was preserved in 10% formaldehyde isotonic solution. Other macro-benthic fauna was collected by hand net. The preserved fauna was then separated, identified and individual abundant species were counted and their density per m<sup>2</sup> was calculated. Identification of polychaetes was done from “**The Fauna of India including Pakistan, Ceylon, Burma and Malaya**” by Pierre Fauvel, Crabs from “**Marine Crabs of Bombay State**” by B. F. Chhapgar and Mollusks from “**Shells of Bombay**” by Deepak Apte.

### Result

#### Macro-benthic fauna of ponds

Benthic community of ponds was analysed to establish ecological status. The macro faunal composition included mainly 4 forms i.e. polychaete worm *Nereis chingrighattensis*, bivalves *Sphenia sowerbyi* and two gastropods belonging to family Potamididae namely *Potamides (Cerithidium) cingulatus* and *Telescopium telescopium*. Their population density in numbers/m<sup>2</sup> has been presented in Table 1. These species occur predominantly in the area throughout the year.

**Table 1: POPULATION DENSITY (no. /m<sup>2</sup>) OF MACRO-BENTHIC FAUNA AT POND 1 AND POND 2**

Seasonal Collection	Nereis chingrighattensis		Sphenia sowerbyi		Potamides cingulatus		Telescopium telescopium	
	Pond 1	Pond 2	Pond 1	Pond 2	Pond 1	Pond 2	Pond 1	Pond 2
Monsoon								
i	4	6	198	42	98	21	12	3
ii	3	5	210	58	122	19	15	5
iii	5	8	264	62	148	25	17	6
Monsoon Avg.	4	6.3	224	54	122.7	21.7	14.7	4.7
Post-monsoon								
i	9	11	416	92	196	37	26	8
ii	10	13	482	116	224	51	30	10
iii	8	10	512	142	272	48	34	7
Post-monsoon Avg.	9	11.3	470	116.7	230.7	45.3	30	8
Pre-monsoon								
i	7	10	380	124	202	35	24	6
ii	8	9	342	92	164	32	20	4
iii	5	7	208	74	128	27	18	1
Pre-monsoon Avg.	6.7	8.7	310	96.7	164.7	31.3	20.7	3.7
Yearly average	6.5	8.8	334.7	89.1	172.7	32.7	21.7	5.5
Percent Composition	1.2	6.5	62.5	65.5	32.2	24.0	4.1	4.0

Macro-benthos of pond soil was typically represented by bivalves and gastropods. They reproduced extensively as their juveniles were plentifully spread out in the substratum which provided favourable environment to grow. The density of tiny bivalve *Sphenia sowerbyi* ranged from 198 to 512 /m<sup>2</sup> at Pond 1 and 42 to 142/m<sup>2</sup> at Pond 2, their number being more in Pond 1 area. Similarly gastropod like *Potamides cingulatus*, showed high density ranged from 98 to 272 /m<sup>2</sup> in Pond 1 and 31 to 62 /m<sup>2</sup> in Pond 2. Both the above mentioned species were spread out more or less uniformly on the surface of the bottom, whereas *Telescopium* species was distributed in patches and in very few numbers along the embankment of the ponds. Its presence in very few numbers around Pond 2 in summer indicated that it was sensitive to both higher salinities and temperature. The polychaete worm *Nereis chingrighattensis* were seen in muddy bottom as blood red colour worms but in very few numbers ranging from only 3 to 11 No. /m<sup>2</sup> in both the representative ponds.

Occurrence of *Sphenia sowerbyi* in muddy shore line of Thane creek has been reported by Athalye (1988), *Potamides cingulatus* also occurred in high densities in these areas as reported by Deshmukh (1989). The occurrence of *Potamides* and *Telescopium* along West Coast of Mumbai has been recorded in mangroves of Versova where they were observed in large numbers (Pereira, *et al*, 2002). They have reported *Telescopium* species was particularly found in the areas where water content in the soil was high. Hence *Telescopium* was found in more numbers in Site 1 than Site 2 area because of proximity to the creek. As all these species are well adapted to both higher salinities, temperatures and available mangrove detritus, they grow in very high densities. In turn they form forage organisms for higher trophic level carnivores. *Sphaenia* measured from 6 to 8 mm. *Potamides* ranged from 9 to 17 mm. whereas *Telescopium* was seen as conical shells measuring 80 to 100 mms. The empty shells of these molluscs were seen scattered along the substratum and bunds where the water from ponds was drained out.

#### **Other macro-benthic faunal composition in and around the ponds**

##### **Arthropods**

**Crabs** – *Uca marionis*, *Scylla serrata*, *Sesarma quadrata*

**Prawns** – *Penaeus indicus*, *Penaeus monodon*, *Metapenaeus monoceros*

##### **Molluscs**

**Pelecypods** - *Katalysia opima*, *Arca granosa*, *Cardium species*, *Placenta placenta*

**Gastropods** - *Nerita sps.*, *Natica sps.*

##### **Pisces**

Family Gobiidae : *Boleophthalmus dussumieri*

##### **Fishery in the area**

Among crustacean benthos three species form the major fishery in the area namely *Metapenaeus monoceros*, *Indomysis annandalei* and *Scylla serrata*.

Out of these three Opossum shrimps *Indomysis annandalei* forms the popular small scale prawn\_ or mysid (kolim) fishery in the area. Fishermen harvest substantial biomass of mysids from the ponds using simple hand net during their peak period of occurrence from December till February. Kolim is the favorite sea food of fishing community and is consumed fresh and sun dried. Due to continuous exploitation the gradual reduction in the biomass of mysids has been noticed in this area since long.

It is very interesting to know why the migratory birds like flamingos regularly visit this green belt. They are selective in their diet and mangrove forest and the ponds provide them rich supply of food as well as shelter.

The appearance of mysid swarms of *Indomysis annandalei* in Thane creek and neighbouring tidal ponds particularly coincides with the presence of flamingos to visit these areas. Mysids undergo vertical migration in shallow pond waters during day time as they are sensitive to temperature so that their biomass is easily available for flamingos and other wading birds to strain through the muddy bottom. After the death and decay of mysids, they form an important part of organic ooze. In addition to rich organic ooze and green algae at the muddy bottom, the juveniles of gastropods like *Potamides cingulatus* and of bivalves like *Sphenia sowerbyi* are available in large numbers (Photo-plate).

##### **Conclusion**

The macro-benthic fauna of ponds were mainly contributed by the molluscan forms. Density of the bivalve *Sphenia sowerbyi* and that of gastropod *Potamides cingulatus* was the highest. The growing *Enteromorpha* on the substratum and the detritus of ponds was the suitable environment for these species to reproduce and grow. Hence both the species are proliferated in large numbers in this area forming a good food for resident as well as migratory birds. Particularly Opossum shrimps are also good attraction for migratory birds like flamingos. It is noteworthy to mention the number of nereid worms is minimal indicating good quality of water in ponds.

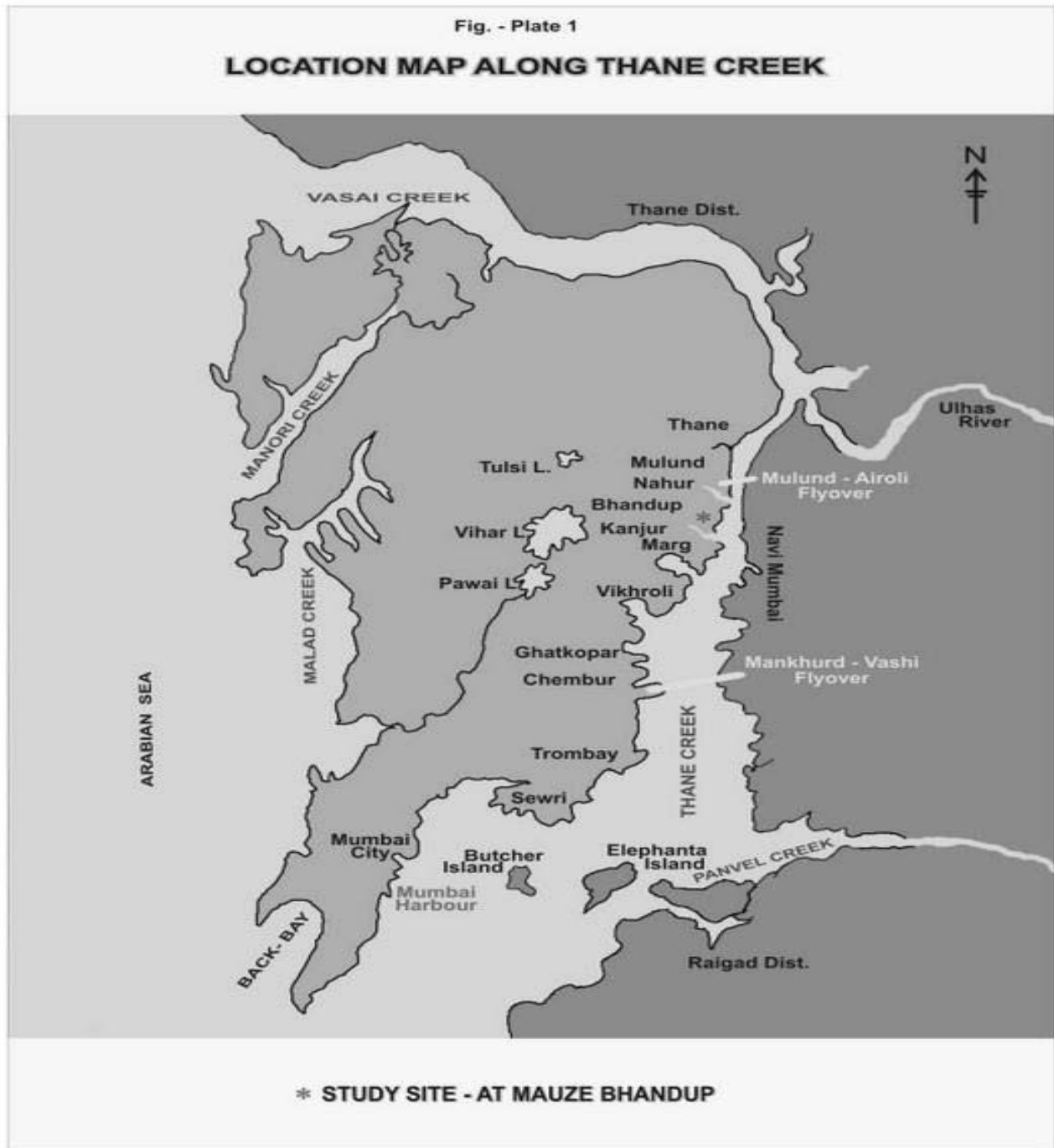


Photo - Plate

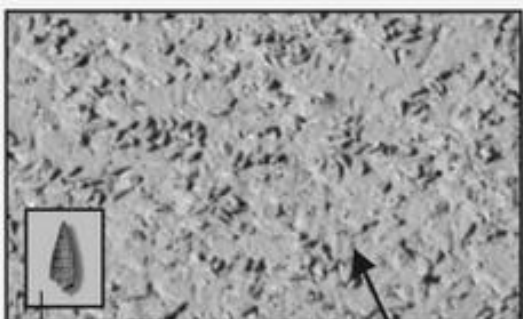
**BENTHIC FAUNA OF PONDS**



Polychaete worms – *Nereis chingrighattensis*

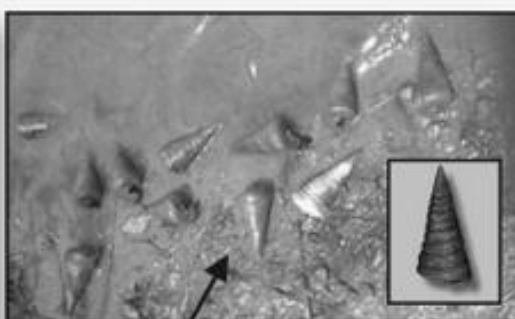


*Boleophthalmus dussumieri* 25mm

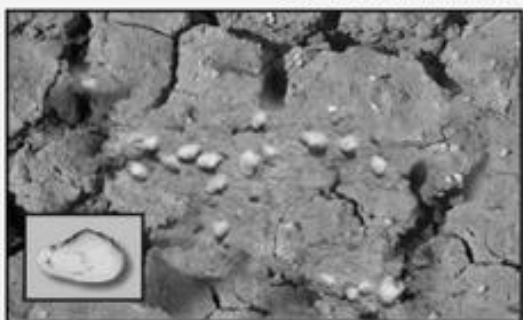


actual size

Gastropods  
Spread of *Potamides* & *Telescopium* along pond 1



50mm



Pelecypode actual size  
*Sphenia sowerbyi* (local name - Khubri)



*Metapenaeus monoceros* actual size



*Scylla serrata* 25mm



Iron bar used for collection of crabs



*Scylla serrata* collection

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