BIODIVERSITY OF MARINE MOLLUSCAN SPECIES in Mumbai and Palghar Beaches, Maharashtra

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ABSTRACT

The present paper deals with the study of the diversity of marine molluscan species in Mumbai and Palghar districts. The study was carried out collecting the different species of shells on selected beaches in both monsoon and post-monsoon season. According to the observation about 50% of species belonged to the family Veneridae. The number of fossil species is estimated between 60,000 and 100,000 additional species. Shell is a hard, protective outer layer also called as exoskeleton created by an animal that lives in the sea. Shell shows great variation among themselves in the case of texture, size, shape, and colouration. A total of 8 beaches are chosen, out of which 4 are situated in Mumbai district and 4 are from Palghar district. Selected beaches of the Mumbai district include Juhu, Girgoan, Aksa and Madh island. Selected beaches of Palghar district include Kalamb, Kelva, Suruchi and Arnala. The collection of the species was carried out on each selected beach twice i.e (monsoon and post-monsoon) during low tide. After the identification of each species, all the information of respective species was compiled in a tabular form. The highest population of the molluscan species was found in the monsoon season of Palghar district. The post-monsoon season of the Mumbai district showed a greater abundance of species as compared to the post-monsoon season of Palghar district. The highest population density is in the post-monsoon period may be due to optimum water salinity and temperature. The availability of species goes down lowest in the monsoon period mainly in the month of July due to the lowest water salinity. Most of these species were found indigenous. Some of the recorded species have greater commercial value and biodiversity importance. The study proved that the abundance and status of molluscan shells of different beaches of Mumbai and Palghar district should be improved by taking various measures for conservation.

Key Words: Molluscan, Beaches, Monsoon, Post-Monsoon, Conservation.

Introduction:

Mollusca is a large phylum of invertebrate animals.Around 85,000 extant species of molluscs are recognized.[2] The number of fossil species is estimated between 60,000 and 100,000 additional species. Molluscs are the largest marine phylum, comprising about 23% of all the named marine organisms.[1] Numerous molluscs also live in freshwater and terrestrial habitats. They are highly diverse, not just in size and in anatomical structure, but also in behaviour and in habitat. The phylum is typically divided into 9 or 10 taxonomic classes, of which two are entirely extinct. Cephalopod molluscs, such as squid, cuttlefish and octopus, are among the most neurologically advanced of all invertebrates—and either the giant squid or the colossal squid is the largest known invertebrate species. The gastropods (snails and slugs) are by far the most numerous molluscs in terms of classified species, and account for 80% of the totalMolluscs of commercial importance are all essentially marine and broadly come under two major categories, viz., (i) edible and (ii) ornamental. Squids, mussels, oysters, clams,etc., which are used for human consumption come under the edible molluscan fisheries. The marine molluscs are very important since many of them are used as food, they also have other uses such as crafts making, to dye cotton, yarn and clothes, etc., so it is that they have received special attention and become a natural resource of economic importance. The edible oysters contain glycogen, lipids, protein, vitamins, especially A, B, and D and several essential minerals. Some coastal dwellers use oyster as food and fish bait. The shells are also used to make lime.The clams are highly valued as food. Most of the edible molluscs are consumed by the poor class of people along the coastal areas. Special reference is made regarding the scope for the development of the mussel fishery in certain parts of India. In addition to the dead shells and shell products are used for a variety of purposes including manufacture of lime and cement.[16] Molluscs (Sea Shells) are abundant and hence important in food chains in many habitats. A large number are herbivores or grazers, especially the chitons and many gastropods.[3] Tusk shells and some other Molluscs like Quahog (Sea Shells) feed on matter deposited on the bottom, whereas most bivalves filter suspended materials from the water.The present paper deals with the study of total 8 beaches, out of which 4 are situated in Mumbai district and 4 are from Palghar district. Selected beaches of Mumbai district include Juhu, Girgoan, Aksa and Madh island. Selected beaches of Palghar district include Kalamb, Kelva, Suruchi and Arnala.

Methodology:

Each and every species of molluscs has its unique habitat. Only practice can tell where and how to search for the shell. For example, some species of shell always present near the low- tide mark and is attached to rocks. The methodology include collection of shells, cleaning and

drying, varnishing and identification.

COLLECTION OF SHELLS-

Collection of the shells include visit of each selected beach twice in period of project (monsoon and post monsoon) during low tide. The project is mainly based on the shells found on the sandy beach. It usually preferred dead shells which were collected as they were washed ashore, rather than live shells which requires mostly night and also precaution while collecting, preservation etc. become little difficult in case of live species. Hence most of the shells collected are in the broken form. Number of shells having living organisms inside them was very low. The pointed forcep was used while collecting the small size specimen.
The specimen were collected in plastic bags.

Sandy Beaches

The sandy beach is one of the most rigorous habitats for organisms on Earth. The main reason is that the constantly shifting sand lacks any type of stability. This sand movement is caused by the waves that constantly break along coasts. Every wave shifts the sand and changes in the size of the waves and the direction of the waves increases or decreases the intensity of this sand movement. There is a large community of organisms inhabiting most sandy beaches, however the number of species represented is limited. The shifting sands and rapidly changing conditions makes it difficult to live in this habitat. Only a few species have been successful. Those that have successfully adapted to this habitat, enjoy lower levels of competition and can grow to larger populations. Most waves reach a coastline from either an upcoast or downcoast direction. Rarely do waves come directly straight in (although they may appear to), waves bend as they enter shallow water and break in a more or less parallel direction to the shoreline. Each wave usually breaks starting from either a downcoast or upcoast direction.

The main feature is the high degree of mobility displayed by all species. The animal may vary from a few mm to 20 cm in length. Water movement is important parameter controlling macro fauna of sandy beaches. In this habitat shells are adapted for burrowing. It may difficult to collect live shells from sandy beaches as the shells remain buried most of the time. The molluscan diversity of sandy shore varies significantly from place to place. This is mainly due to the composition of substrate (sand profile).

PRECAUTION WHILE COLLECTION-

It is necessary to take precaution while collecting shell. All the cones process a harpoon type radula which can inject venom. In some species, the venom is to potent that it can be fatal to humans. Several deaths have been reported due to this. So while collection forceps were used to pick up the shell.

Cleaning and Drying-

Proper preservation of the collected species is very essential. After collection the species were collected in a plastic bag and washed with water to remove sand and other minute particles and kept them for drying. Collection mostly preferred dead shells as preservation of dead shell is little easy, but for live species it is little bit difficult because most of the animal when caught retract into their shells. There are various method to remove this animal from their shells. The simplest way is to keep the shell in a bottle of fresh water and close the mouth of the bottle tightly, after few hours the animal will be asphyxiated and then remove the animal from the shell.

Varnishing-

The seashells were allowed to dry for at least one full day and then varnish is applied on the shell. Varnish not only restores the shine of the shell, but helps to preserve the shell.

IDENTIFICATION-

The drying and varnishing on shell species helped to regain enough colouration for identification. Putting varnish on shell made identification part very easy. It gave that glossy appearance back to the shell. For identification texture/colour/shape/size/position and umbo body whorl, umbilicus/teeth were observed and compared with standard literature for identification. After identification each and every specimen in an individual kept in plastic bag with the information on the bag such as date of each collection with locality and name of specimen etc.

Result and Discussions:

The most important part of study or research is result and discussion this will form the outcome of the research and study. The result is interpreted only after the complete gathering of data and proper analysis technique. The molluscan diversity of Mumbai and Palghar district was studied both from Monsoon (June- July- August: Monsoon) to post monsoon season (September- October- November: Post Monsoon).

The study revealed total 62 Identified molluscan species observed.Mumbai district reported 47 varieties of species whereas Palghar district reported 36 varieties of species. The details of the species found in both the areas are as delineated below:**-SPECIESWISE ABUNDANCE OF**

Table No. 1

Species	JUHU		GIRGOAN		AKSA		MADH ISLAND	
Duration	Monsoon	Post monsoon	Monsoon	Post monsoon	Monsoon	Post monsoon	Monsoon	Post monsoon
Telescopium telescopium	1	1	0	0	0	0	0	0
Siliqua radiata	2	25	0	0	0	0	0	0
Turbo brunneus	19	29	0	0	0	0	0	0
Nerita oryzarum	6	14	6	6	12	15	10	7
Paphia Textile	2	2	30	40	4	7	8	8
Cardium flavum	1	0	0	1	5	3	7	3
Cardium asiaticum	27	34	34	49	7	3	5	8
Oliva caerulea	8	0	0	0	4	7	6	5
Umbonium vastiarium	14	13	0	0	0	0	0	0
Donax incarnatus	34	25	0	0	4	7	5	9
Arca bistrigata	3	12	4	2	7	6	9	3
Donax Scortum	14	58	9	8	5	8	5	3
Pitar erycina	2	0	0	2	2	7	6	3
Donax prostrata	10	115	5	20	0	0	0	0
Cardita antiquata	2	1	45	232	6	4	3	2
Gastrana polygona	12	164	3	5	2	7	1	0
Trochus radiatus	2	0	0	0	7	5	2	9
Cantharus spiralis	12	3	0	0	1	2	8	3
Potamides cingulatus	2	0	0	0	0	0	0	0
Conus planorbis	1	0	0	0	0	0	0	0
Venus reticulata	2	0	0	0	0	0	0	0
Tapes radiatus	2	0	0	0	0	0	0	0
Pyrene atrata	3	0	0	0	0	0	0	0
Catelysia opima	1	0	0	0	0	0	0	0
Sunetta donacina	0	5	0	0	0	0	0	0
Conus piperatus	0	1	0	0	4	6	3	3
Arca granosa	0	3	0	0	0	1	7	3
Babylonia spirata	0	2	0	0	5	5	8	3
Spisula voyi	6	20	5	0	0	0	0	0
Fusinus nicobaricus	0	1	0	0	7	5	3	5
Bursa tuberculata	33	68	4	0	5	3	4	1
Donax faba	66	119	4	2	0	0	0	0
Angulus sinuata	1	2	0	5	3	2	4	8
Sepia	17	6	3	0	2	1	9	15
Babylonia zeylanica	0	0	2	20	0	0	0	0
Paphia malabarica	0	0	6	8	0	0	0	0
Turritella duplicata	0	0	0	3	0	0	0	0
Meretrix meretix	0	0	1	0	0	0	0	0
Turritella terebra	0	0	1	3	0	0	0	0
Natica maculosa	0	0	1	0	2	3	5	2
Natica lineata	0	0	1	0	0	0	0	0
Surcula amicta	0	0	2	0	0	0	0	0
Surcula fulminata	0	2	2	0	0	0	0	0
Nassa ornatus	1	1	3	5	0	0	0	0
Cassidula nucleus	0	0	0	0	4	2	3	6
Sunetta effossa	0	0	0	0	5	7	1	2
Mactra cornea	0	0	0	0	4	3	6	7

SPECIESWISE ABUNDAMCE OF MOLLUSCS OF PALGHAR BEACHES

Table No. 02

Species	Kalamb		Kelwa		Suruchi		Arnala	
Duration	Mansoon	Post monsoon	Monsoon	Post monsoon	Monsoon	Post monsoon	Monsoon	Post monsoon
Diodora lima	0	1	0	0	0	0	0	1

Clypidina notata	2	1	0	0	0	0	1	1
Bursa elegans	1	1	0	0	4	3	2	1
Nerita oryzarum	10	5	51	34	13	5	18	14
Mystoponda vitellus	1	5	0	0	3	7	2	2
Cardium flavum	0	0	2	6	3	6	1	0
Cardium asiaticum	2	3	6	88	3	0	1	1
Oliva caerulea	1	3	0	0	0	0	3	6
Umbonium vastiarium	67	60	311	131	1	2	40	33
Donax incarnatus	20	9	1	0	9	3	22	10
Arca bistrigata	50	80	29	17	16	6	58	40
Ocinebra bombayana	11	4	0	0	0	0	0	0
Pitar erycina	1	0	0	0	0	0	0	0
Donax prostrata	4	6	1	0	0	0	3	2
Natica picta	4	6	0	0	2	1	3	3
Nassarius nodifera	5	7	4	3	7	3	8	5
Trochus radiatus	3	0	58	4	1	1	9	7
Cantharus spiralis	0	5	14	88	10	1	2	2
Potamides cingulatus	0	1	286	21	0	0	38	22
Natica ala-papilionis	0	0	0	0	0	1	1	2
Placenta placenta	4	8	5	1	1	4	3	2
Dosinia gibba	3	6	2	6	52	44	2	5
Barnea candida	5	7	7	4	16	10	3	2
Thais carinifera	0	0	4	4	7	13	2	6
Sunetta donacina	2	4	0	0	6	7	6	2
Conus piperatus	4	4	1	4	0	0	2	0
Oliva gibbosa	0	0	6	3	0	0	2	2
Oliva nebulosa	0	0	9	4	0	0	2	2
Spisula voyi	0	0	0	0	6	3	1	1
Bursa tuberculata	6	2	4	2	1	1	4	3
Donax faba	0	0	1	0	8	3	20	25
Angulus sinuata	4	1	0	0	5	15	2	3
Sepia	1	0	5	0	0	1	2	1
Meretrix meretix	0	0	0	0	3	1	0	0
Natica maculosa	2	0	1	2	2	1	0	0
Mactra cornea	0	0	0	0	5	16	0	0

Conclusion and Recommendation:

This study has critically engaged with the concept of biodiversity of molluscan species in Mumbai and Palghar district with respect to monsoon and post monsoon season. The study revealed that there is a good diversity of molluscs in both Mumbai and Palghar districts. Though these beaches in Mumbai and Palghar are not far from each other, each beach showed presence of different kinds of shells. Girgoan, Aksa and Madh island are basically sandy beaches of Mumbai. Juhu is also a sandy beach but it also contains rocky patch and it is also biggest beach in compared to other selected beaches of Mumbai. Hence Juhu beach showed the great variation in molluscan shells as compared to other selected beaches of Mumbai. The Juhu beach also showed higher abundance of species in post monsoon season than monsoon. Girgoan is relatively cleaner beach. Since it is smaller than Juhu not much varieties of shells were found. Girgoan is the most famous beach for "Ganpati Visarjan" in Mumbai. During this festival the beach was cleaned or rather we can say it was prepared for visarjan. Hence very few species were collected during monsoon season than post monsoon season of Girgoan beach. Aksa and Madh island beaches are the most famous tourist attraction because they are isolated from the actual city. But the abundance of molluscan shells was found very low in these two beaches. This may be due to continuous tourist activities on the beaches for fun. *Cardita antiquta* and *Gastrana polygona* were found to be dominating species in Mumbai district. In Palghar district, Kelwa beach showed greatest abundance and diversities of the species in both monsoon and post monsoon season.

This may be due to the beach is far from the actual city and located in village place name as kelwe village. After the Kelwa beach the Kalamb and Arnala beaches were provide the high abundance and diversities of the molluscan shells in both season. But the diversity of these beaches were found low than that of Kelwa beach. These beaches are always crowded by people and hence due to more human activity these beaches were found to be more polluted than other selected beaches for study. People throw garbage, food wrappers etc. at sea side, so all these very dirty. So this indirectly affect the marine ecosystem. Suruchi beach showed a less number of species in both season but considered as most diversified beach of Palghar district. The fluctuation in number of species may occur due to hide tide during collection time. *Umbonium vestiarium* and *Potamides cingulatus* were found to be dominating species in Palghar district. Most of these species were found indigenous. Some of the recorded species have greater commercial value and biodiversity importance. Molluscan species are good indicators of localized conditions. Gastropods and bivalves are generally benthos organisms and they are regularly used as bio indicators of aquatic health. According to the observation about 50% species was belong to the family Veneridiae. The study proved that the abundance and status of molluscan shells of different beaches of Mumbai and Palghar district should be improved by taking various measures for conservation.

Conservation of marine molluscan species diversity is considered to be one of the major goals for sustainable management of marine renewable resources. The species diversity has a good relationship with species richness and evenness and diversity index is maximum with high number of species and minimum with low number of species. Hence, it is recommended for future studies to evaluate the harvesting policy of these economically important marine bivalves and gastropods as well as to help implement laws for the conservation of natural marine resources.

High diversity of molluscan shells in the beaches of Mumbai and Palghar need to be protected and prevented by formulating effective management strategies like research and development activities such as Ecology, Qualitative studies of organic production, Species inventory, Periodical survey of the population and its seasonal abundance and changes.

The following are the measures which can be considered in order conserve the biodiversity of molluscan species of beaches:

- Cleaning processes should be taken up by the BMC and VVCMC on regular basis to improve and maintain the quality of beaches.
- Avoid the use of thermocol and plastic decorative material in beach area
- To create awareness among people to keep the beaches clean in order to protect environment

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