Status Of Intertidal Biodiversity In And Around Mumbai: Study With Reference To West Coast Of India

Dr.Lalana Khot

Department of Zoology

R.D.&S.H.National College & S.W.A.Science College , Bandra (West),Mumbai 400050.

Abstract

Girgaon Chowpatty, Marine Drive, Haji Ali, and Gorai Creek in Mumbai were chosen for biodiversity evaluation using a strategy for natural geography in coastal regions during the current inquiry. At these locations, 59 macrobenthic mollusks, arthropods, coelenterates, and echinoderms were discovered. The Marine Drive coastline has the highest number of gastropods and clams. There were plenty of Telescopium telescopium, Potamidus cingulatis, mudskipper, and fiddler crabs near Gorai Creek. According to studies, the biodiversity level of the chosen locations varies depending on location, substratum type, and season. At the Girgaon Chowpatty shore, pollution was discovered to have a considerable impact on clams, with many Paphia cloth shells filled with dirt and coated with a black colour.

Keywords: mollusc, macrobenthic, echinoderms, arthropods

1. Introduction

The pace of change on the planet earth may be determined by comparing time series data of ecological units with the current state of particular species or groups. Individual species or groups are also affected by climate change and strive to adapt to their new surroundings. Overexploitation of marine resources, such as fishing, which removes many invertebrates and plant stocks, industrialization and chemical pollution, which is the main cause of eutrophication, coastal land reclamation, invasion of exotic species, transportation and tourism, global warming, which alters many nutrients levels in the ocean, and increased temperature are all factors in the current scenario. All of these variables contribute to changes in marine ecosystems and biodiversity, and different pressures have had an impact on the marine environment from the intertidal zone to the deep sea. Intertidal rocky beaches offer a diverse range of habitats that sustain a wide range of life forms since they

are a heterogeneous environment. The link between species richness and geographical size has long piqued ecological experts' curiosity.

Changes in spatial size are often thought to impact diversity patterns, in the sense that larger scales may supply more resources to species, resulting in more variety. Molluscs are the second biggest category of invertebrates on the planet. Intertidal molluscan communities serve as bridges between geographically and temporally separated groups to explore morphological and ecological convergence. Molluscs are soft-bodied creatures that have a lengthy evolutionary history and a wide range of species. Molluscs are divided into two groups based on their habitat: terrestrial and aquatic. The organisation of molluscan communities and their diversity are indicators of ecological health. The intertidal habitat is very useful for studying the link between biodiversity and ecological function. Intertidal species are constantly stressed due to environmental and human factors, which may be better understood by examining their reactions. The benefits of choosing these species are their abundance, accessibility, sluggish movement, ease of collection, and suitability for experimental modification. Biodiversity is a reflection of the habitat's ecological quality. Flora and wildlife are threatened in the present context due to rising interference from man-made activities in coastal areas. As a result, regular monitoring and recording through diversity studies is critical.

Biodiversity is mostly a reflection of habitat ecological quality. The intertidal zone, which is the interface between the sea and the terrestrial environment, is one of the most active zones in the marine ecosystem. The occurrence of waves and the length of exposure to sunlight are the most significant physical factors that impact the lives and activity of creatures in the intertidal zone. Effluent flows from cities and industrial towns continue to endanger the Indian coast. This causes major environmental issues, such as degradation of water quality and a decrease in flora and wildlife. The intertidal ecosystem surrounding Mumbai used to be clean and diverse in terms of faunal composition, but it has become disrupted and unbalanced as a result of the city's ever-increasing human wastes. Anthropogenic disruptions may alter an animal's physiological condition, resulting in changes in growth rate, recruitment, and mortality. Industrial discharges of up to 230 million l d-1 (MLD) and residential wastes of over 2,200 MLD, of which 1800 MLD is untreated, are discharged into Mumbai's coastal waterways. As a result of the deteriorated coastal ecology, the current inquiry was done to analyze the current condition of intertidal biodiversity of Mumbai's Girgaon chowpatty, Marine Drive, Haji Ali & Gorai beaches.

2. Review of Literature

Biodiversity is mostly a reflection of habitat ecological quality (Vladica and Snezana, 1999). The intertidal zone, which is the interface between the sea and the terrestrial environment, is one of the most active zones in the marine ecosystem. The occurrence of waves and the length of exposure to sunlight are the most significant physical factors that impact the lives and activity of creatures in the intertidal zone. Effluent flows from cities and industrial towns continue to endanger the Indian coast. The intertidal ecosystem surrounding Mumbai used to be clean and diverse in terms of faunal composition (Rai, 1931; Subramanyam et al., 1952), but it has become disturbed and unbalanced as anthropogenic discharges from the city have increased (Govindan and Desai, 1980). Anthropogenic disruptions may alter an animal's physiological condition, resulting in changes in growth rate, recruitment, and mortality (Tablado et al., 1994; Johnston and Keough, 2002; Ng and Keough, 2003). Industrial discharges of up to 230 million l d-1 (MLD) and residential wastes of over 2,200 MLD, of which 1800 MLD is untreated, are discharged into Mumbai's coastal waterways. This has harmed the intertidal marine biodiversity by affecting the water and sediment quality (Zingde and Govindan, 2000). As a result of the deteriorated coastal ecology, the present study was conducted to determine the current condition of intertidal biodiversity at the Girgaon Chowpatty, Marine Drive, Haji Ali, and Gorai Creek beaches in Mumbai, India.

3. Research Methodology

Intertidal zones in Girgaon, Marine Drive, Haji Ali in the south, and Gorai Creek in the north of Mumbai were chosen for this research. The Girgaon Chowpatty Intertidal Area is a renowned tourist destination in south Mumbai since it is part of the Queen's Necklace coastline. It is a sandy region that is one of Mumbai's most popular leisure places. Despite the presence of a wide pool of coarse sand, the majority of the highest area is clogged with food and snack shops. Thousands of people visit there every day, and it is where the majority of human activity occurs. As a consequence, the shoreline is rapidly degrading.

Domestic garbage comprising large amounts of particulate matter is being released in large quantities along the Girgaon Chowpatty seashore. On a sandy beach, this particle debris settles and produces a murky substratum. Furthermore, following the Ganpati celebration, a significant number of Ganpati idols are drowned here. All of these idols are made of Plaster of Paris and clay, which disintegrate in sea water to generate a fine-grained material that, when combined with sand, produces a muddy foundation. This kind of mud may be found in the middle intertidal zone. On the muddy beach, where the slope is gradual and the region is known as a Mudflat, wave activity is modest. At low tide, the water content of this location is rather high. The coastlines of Marine Drive and Haji Ali are rocky. At Girgaon Chopatty's beach end, the Marine Drive coast sector is three kilometres long. It's also a component of the Queen's Necklace coastline. Both Marine Drive and Haji Ali, like Girgaon Chowpatty, are major tourist neighbor hoods with a plethora of

hotels around the Marine Drive sector. The rubbish dumped here mixes with fine-grained debris from dissolving idols at Girgaon Chowpatty, having a significant impact on the water's physiochemical properties and, as a result, on the biodiversity of the Marine Drive seashore. Large cement tetrapod form blocks and a road wall are used to artificially reclaim the higher intertidal zone. The Mahalaxmi-Haji-Ali beach is in South Mumbai. In the higher intertidal levels, basalt boulders predominate, with rare patches of sand. Nevertheless, the upper and somewhat middle zones are murky and littered with large rocks. There is a constant process of muddy base building since household discharges are discharged here. Gorai Creek, which runs through the northwest part of Mumbai, stretches 12 kilometres inland, passing through large mangrove mudflats and low-lying marshy regions. Semi-diurnal tides have an impact on Gorai's tiny stream. The discharge of residential sewage in the creek's inner reaches has an impact on the environment.

4. Results and Discussion

Table 1 shows the variety of microbenthic species found in several shore sectors in and around Mumbai. The findings show that gastropods and bivalves dominate the macrobenthic fauna. The benthos was also found to have a shore-specific distribution. Plastic bottles, food wrappers, and polyethylene bags were also found in the surface water up to 100 metres within the stations' coasts.

Girgaon Chopatty shore: Clams and gastropods dominate the Girgaon substrate, which is sandy-muddy in character. Paphia textile and the blood clam Arca sp. were the most numerous clam species. Babilonia spirata dominated the gastropod family. Nonetheless, additional macrobenthic species were few, especially when compared to other research locations. There is a lot of silt and organic waste deposited, which helps the local detritus-feeding species. Nonetheless, particle breakdown results in the detection of oxygen, resulting in the creation of a Sulphite black layer. This layer varies in different parts of the beach, and the interaction between alluvium and lead bacteria causes the formation of hydrogen sulphite. This black layer was discovered here, and the shells of most gastropods living in this location were determined to be blackish in colour.

Marine Drive shore: In the Marine Drive rocky beach region, 34 macrobenthos species were sampled. Molluscs (24 species) and bivalves were dominant in the macrobenthos (eight species). Euchelus asper (8-78%) was the most common plant, followed by Gafrarium divaricatum (8-21%) and Pyrene atrara (8-21%). (0-28 percent). In this research region, the dominance of gastropods and clams was identical to that described by Jaiswar and Kulkarni (2005). Four crab species (Eriphia sp. (Red eye reef crab), Petrolisthes sp. (Red porcelain crab), Schizophrys aspera (spider crab), and Charybdis japonicas (Asian paddle crab)) were found in and on the boulders and rocks of the Marine Drive shore, as well as two pistol shrimp species (Alpheus euphrosyne, Alpheus heterochaelis) were found in the intermediate zone. During the study period, a juvenile octopus and a Moray eel were also sampled from the lower intertidal region. Cement terapods were

discovered to offer a substratum for the colonisation of Neretidae, oysters, and Balanus species. There are also several crab species hidden behind the blocks.

Table 1: Macrobenthos species diversity in Mumbai's Girgaon Chopatty (GIC), Marine Drive Coast (MD), Haji Ali shore (HA), and Gorai Creek (GC) from the period May 2019-June 2019.

Pelecypoda

Family	Species	Occurrence	Place
Mytilidae	*Modiolus emerginatus* (Benson, 1858) *Perna viridis* (Linnaeus, 1758)	Rare Common	GIC MD,GC,HA
Veneridae	*Katelysia opima* (Gmelin, 1791) *Gafrarium divaricatum* (Gmelin, 1791) *Gastrena polygona* (Gmelin, 1791) *Venerupis microphylla* (Deshayes, 1853) *Dosinia gibo* (Gmelin, 1791) *Cardita antiquata* (Linnaeus, 1758)	Common Common Common Common Common Common	GC HA HA GIC MD, GIC, HA MD, GIC, HA
Ostreidae	*Crassostrea cucullata* (Born, 1778) *C. gryphoides* (Schlotheim, 1813) *Saccostrea cucullata* Ignaz von Born 1778	Common Common Common	MD, HA, GC HA GC, HA, GRC

Gastropoda

Trochidae	*Trochus stellatus* (Gmelin, 1791) *T. tentorium* (Gmelin, 1791) *T. radiatus* (Gmelin, 1791) *Clancules ceylonicus* (Nevill, 1869) *Euchelus asper* (Gmelin, 1791)	Common Common Common Common Common	HA MD, HA MD, HA HA, MD, HA
Neritidae	*Nerita oryzarum* (Recluz, 1841) *N. albicilla* (Linnaeus, 1758) *Nerita crepidularia* (Lamarck, 1822) *N. pulchella* (Recluz, 1843)	Plentiful Common Common Common	MD, HA MD, HA HA HA
Planaxidae	*Planaxis sulcatus* (Born, 1778)	Plentiful	MD, HA
Potimididae	*Potamides cingulatus* (Gmelin, 1791) *Telescopium telescopium* (Linnaeus, 1758)	Plentiful Plentiful	GC, HA GC
Bursidae	*Bursa tuberculata* (Broderip, 1833) *B. spinosa* (Schumacher, 1817) *B. granulose* (Roding, 1798) *Bursa elegans* (Sowerby, 1835)	Plentiful Common Common Plentiful	MD, GIC, HA, GC MD, HA GC, HA GC, HA
Muricidae	*Thais bufo* (Lamarck, 1822) *Drupa tuberculata* (Blainville, 1832)	Common Common	MD, HA, GC HA
Buccinidae	*Babylonia spirata* (Linnaeus, 1758) *Pyrene atrata* (Gould, 1860)	Common Common	MD, GIC, HA MD
Volemoidae	*Hemifusus pugilinus* (Born, 1778)	Common	MD, GIC, HA, GC
Cypraeidae	*Cypraea arabica* (Linnaeus, 1758)	Rare	MD
Fissurellidae	*Scutus unguis* (Linnaeus, 1758)	Common	MD, HA
Onchidiidae	*Onchidium peronii* (Cuvier, 1804)	Common	MD

Cephalopoda			
Octopodiformes	*Octopus vulgaris* (Lamarck, 1798)	Common	MD
Crustacea			
Xanthidae	*Epixanthus frontalis* (H. Milne Edwards, 1834) *Leptodius exaratus* (H. Milne Edwards, 1834)	Common Common	GC GC
Eriphiidae	*Eriphia* sp.	Common	MD, HA
Majidae	*Schizophrys aspera* (H. Milne Edwards, 1834)	Common	MD, HA
Porcellanidae	*Petrolisthes boscii* (Audouin, 1826)	Common	MD, HA, GC
Portunidae	*Charybdis japonica* (A. Milne-Edwards, 1861)	Common	MD, HA, GC
Ocypodidae	*Uca annulipes* (H. Milne Edwards, 1837) *U. vocans* (Linnaeus, 1758) *Uca dussumieri* (H. Milne Edwards, 1852)	Common Common Common	HA, GC HA, GC GRC
Balanidae	*Balanus variegatus* (Darwin, 1854) *Balanus amphitrite* (Darwin, 1854)	Common Common	GRC, HA MD
Paguridea	*Eupagurus prideauxi* (Leach, 1815)	Common	GRC, HA
Alpheidae	*Alpheus euphrosyne* (de Man, 1897) *Alpheus heterochaelis* (Say, 1818)	Common Common	MD, HA MD, HA
Porifera			
Lecosolenidae	*Leucosolenia complicata* (Montagu, 1814) *Tetilla dactyloidea* (Ridley, 1884) *Tethya lyncurium* (Linnaeus, 1767)	Common Common Common	MD, HA MD, HA MD, HA
Coelentelata			
Actinidae	*Metridium marginatum* (H. Milne-Edwards, 1834)	Common	MD, HA, GIC
Fish			
Gobiidae	*Boleophthalmus boddaerti* (Pallas, 1770) *B. viridis* (Hamilton, 1822)	Plentiful Plentiful	MD, HA, GRC, GC GRC
Muraenidae	Maoray eel	Threatened	MD, HA

Haji-Ali shore: During the surveys, a total of 30 macrobenthos species were discovered. The coasts of this area were dominated by gastropods of seven genera, four bivalve species, and a large colony of sea anemones in certain areas. Euchelus asper (17-42%) dominates the Haji-Ali seashore, followed by Bursa tuberculata (9-22%) and Trochus radius (9-22%). (5-21 percent). The bivalve Gastrena polygona was found in a one-of-a-kind location. G. polygona was not found in any other Mumbai coast intertidal location. In the Middle and Lower Zones, G. polygona was discovered in the muddy substratum. The long red syphon of G. polygona was discovered to sprinkle water at low tide, which was utilized to locate it. The edible bivalve G. divaricatum, Dosinia gibba, and Crassostrea cucullata were also found in substantial quantities.

Gorai Creek shore: Five algae species were sampled in Gorai Creek. Sargassum, Gracilaria, Ulva, Entermorpha, and Chaetomorpha species were found here, but in small numbers. In terms of colouring and leaf condition, all of the species were judged to be in good health. Boleophthalmus boddaerti and B. viridis were found in huge numbers in the mud of the Gorai beach. In addition, mollusks and arthropods were mostly found in Gorai Creek. Telescopium telescopium and P. cingulata were numerous among the gastropods present. In compared to these gastropods, bivalve species were more scattered and sparsely distributed. For the first time, the Venerupsis microphylla species was sampled and recorded in the creek's coastal sections. Crabs from 14 species and 10 genera made up the majority of the arthropod fauna discovered. The fiddler or dhobi crabs of three species were discovered in abundance in marshy areas in mangrove swamps. These crabs were spotted swarming out of their tunnels at ebb tides. Thalamita crenata was only discovered a few times. A Grapsidae species was found in abundance in human-made stone buildings and craks in timber bridge components. Many earlier researchers studied the biodiversity of India's east and west coastlines on a regular basis. The monitoring of biodiversity patterns throughout the Indian coast is lacking, and detailed data on biota dispersion for a number of sites along the coast is unavailable. Abercrombie (1892) and Melvill and Standen (1910) studied the molluscan diversity of gastropods and bivalves in the Bombay Presidency's intertidal zones. Chhapgar (1957, 1958) investigated the condition of crabs in Bombay's intertidal zones. In 1986, the National Institute of Oceanography (NIO) completed the first comprehensive evaluation of the Uran coast. Similarly, Babu (1999) studied the Uran coast's mangroves and accompanying species. Given this data incoherency and inconsistency, the data given in this research of macro-benthic fauna can represent a base line for future comparisons.

Conclusion

This research established the intertidal macrobenthic species baseline in the Mumbai region. It suggests that intertidal macrobenthic species are diminishing, and that rising human pressures on this ecosystem are putting them at risk. Finally, a comprehensive assessment of Mumbai and the surrounding coastal regions is required to provide a more precise understanding of the area's biodiversity state and to allow for continued monitoring of the issue. If macrobenthic species and habitats are to recover, it will also be necessary to address ongoing issues such as the release of untreated waste water from domestic and industrial sources.

References

1. Vladica, M.S. and S. Snezana: Use of river macrobenthos of Siberia to formulate a biotic index. Hydrobiologia, 392, 263-272 (1999).
2. Rai, H.S.: The shell fisheries of Bombay presidency. Report of Bombay Natural History Society‘s Survey. pp. 826-847 (1931).
3. Subramanyam, T.V., K.R. Karandikar and N.N. Murthi: Marine gastropods of Bombay. Part II. J. Univ. Bombay, 21, 21-34 (1952).
4. Govindan, K. and B.N. Desai: Mahim bay, a polluted environment of Bombay. J. Ind. Fish. Ass., 10&11, 5-10 (1980).
5. Tablado, A., J.J. Lopez Grappa and N.H. Magaldi: Growth of the pulmonate limpet Siphonaria lesson (Blainville) in a rocky intertidal area affected by sewage pollution. J. Exp. Mar. Biol. Ecol., 175, 211-226 (1994).
6. Johnston, E.L. and M.J. Keough: Direct and indirect effects of repeated pollution events on marine hard-substrate assemblages. Ecol. Appl., 12, 1212-1228 (2002).
7. Ng, T.Y.T. and M.J. Keough: Delayed effect of larval exposure to Cu in the bryozoan Watersipora subtorquata. Mar. Ecol. Progr. Ser., 257, 77-85 (2003).
8. Zingde, M.D. and K. Govindan: Health status of coastal waters of Mumbai and regions around. In: Environmental problems of coastal areas in India (Ed.: V.K. Sharma) Bookwell publ. New Delhi, India. pp. 119-132 (2000).
9. Jaiswar, A. K., and B. G. Kulkarni. "Conservation of molluscan biodiversity from intertidal area of Mumbai coast." *J. Natcon* 17, no. 1 (2005): 93-105.
10. Abercrombie, John, Alexander Maxwell Adams, Remarkable Career AM Adams Primus, Joseph Adams, William Pulteney Alison, and Benjamin Brodie. "Please note that this bibliography does not include material from nineteenth-century periodicals, manuscript sources, or electronic materials. Full references are given in the notes for these materials." (1852)
11. MELVIN, GW. "The" bulk" feeding of refuse destructors." *Journal of the Royal Institute of Public Health* 18, no. 7 (1910): 406-410.
12. Chhapgar, B. F. "On the Marine Crabs (Decapoda: Brachyura) of Bombay State Part 2." (1957).
13. Vassar, Robert, Brian D. Bennett, Safura Babu-Khan, Steve Kahn, Elizabeth A. Mendiaz, Paul Denis, David B. Teplow et al. "β-Secretase cleavage of Alzheimer's amyloid precursor protein by the transmembrane aspartic protease BACE." *science* 286, no. 5440 (1999): 735-741.