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Taxonomic Survey of Gastropods from Uran Coastal Waters, India

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Abstract: *The present study was carried out to investigate the diversity of gastropod molluscs inhabiting different coastal habitats of Uran, located on the west coast of India. The study was conducted from November 2013 to October 2014 in various ecological niches including muddy, sandy, rocky substrata and mangrove ecosystems. Monthly surveys were undertaken at selected sites namely Sheva Creek and Karanja Creek for the collection and identification of gastropod species. During the investigation, several gastropod species such as Nerita oyrzyrum, Nerita grayana, Trochus radiatus, Umbonium vestarium, Turbo bruneus, Littorina scabra, Bursa spinosa, Tibia curta, Thais blanfordi, and Turritella duplicata were recorded. The identified gastropods belonged to 6 orders and 18 families, indicating considerable species richness in the study area.*

The results revealed that the coastal habitats of Uran provide suitable environmental conditions for the survival and distribution of diverse gastropod fauna. Rocky shores and mangrove habitats particularly supported higher diversity due to the availability of food resources, shelter, and breeding grounds. Gastropods play an important ecological role in maintaining the balance of coastal ecosystems and also contribute significantly to fisheries and local livelihoods.

The present findings suggest that the coastal environment of Uran is currently capable of supporting healthy gastropod diversity and does not exhibit severe signs of pollution stress. However, rapid industrialization, urbanization, port development activities, and increasing maritime operations in and around Uran may exert considerable pressure on the coastal ecosystem in the future. Therefore, continuous ecological monitoring and conservation measures are essential for the protection and sustainable management of the coastal biodiversity of Uran.

Keywords: Gastropods, biodiversity, mangrove ecosystem, coastal ecology, Uran coast, west coast of India.

I. INTRODUCTION

Marine molluscs constitute one of the most diverse and ecologically important groups of invertebrates inhabiting coastal and marine ecosystems. Among them, gastropods represent a dominant and highly adaptable class that occupies a wide range of ecological habitats including rocky shores, sandy beaches, mudflats, mangroves, coral reefs, and seagrass beds. Gastropods play a vital role in the marine food web by serving as grazers, scavengers, detritivores, and prey organisms for higher trophic levels such as fishes, crabs, and birds. Thus, they contribute significantly to maintaining ecological balance and productivity in marine ecosystems. In addition to their ecological importance, molluscs are economically valuable as a source of food, ornamental shells, pharmaceutical compounds, lime production, and raw materials for various industries.

India possesses a long coastline with diverse coastal habitats that support rich marine biodiversity. Marine molluscs are widely distributed along the Indian coast and occur abundantly in mangrove ecosystems, rocky intertidal zones, sandy beaches, mudflats, estuaries, and coral reef environments. Previous studies have reported that India harbors nearly 5070 species of molluscs, of which approximately 3370 species are marine forms. Among these, gastropods constitute a

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major proportion due to their high adaptability to varying environmental conditions. Rocky intertidal regions and mangrove ecosystems are particularly favorable habitats for gastropods because they provide food availability, shelter, suitable substrata, and breeding grounds.

Mangrove ecosystems are considered highly productive coastal habitats and support a wide range of marine organisms including molluscs. Gastropods associated with mangroves are important indicators of ecosystem health and environmental quality. They contribute to nutrient recycling, decomposition of organic matter, and energy transfer within the food chain. However, anthropogenic pressures such as industrialization, urbanization, dredging, land reclamation, pollution, and port development have resulted in habitat destruction, loss of biodiversity, and ecological imbalance in many coastal regions. Coastal ecosystems near urban and industrial areas are particularly vulnerable to environmental degradation.

Uran, situated along the eastern shore of Mumbai Harbour on the west coast of India, is an ecologically important coastal region characterized by creeks, mudflats, rocky shores, and mangrove vegetation. The establishment of Jawaharlal Nehru Port Trust (JNPT), industrial complexes, container freight stations, oil and gas installations, and increasing maritime activities have significantly transformed the coastal environment of Uran over the past few decades. Such developmental activities may adversely affect marine biodiversity, especially sensitive organisms like gastropods. Despite the ecological significance of the region, very limited information is available regarding the diversity and distribution of gastropods along the Uran coast.

Although several studies on marine molluscan diversity have been conducted along different parts of the west coast of India, comprehensive data on gastropod diversity from Uran, District Raigad, Maharashtra are scarce. Therefore, the present study was undertaken to document the diversity of gastropod molluscs from different coastal habitats of Uran and to assess the present ecological condition of the region. The study also aims to provide baseline information for future biodiversity monitoring and conservation planning in this rapidly developing coastal area.

II. MATERIALS AND METHODS

Study Area

Uran is situated along the eastern shore of Mumbai Harbour on the west coast of India and lies opposite to Colaba. The region is surrounded by the Arabian Sea on its western side and is characterized by an extensive network of creeks, mudflats, rocky shores, and mangrove ecosystems. Sheva Creek (Lat. 18°50′20″ N and Long. 72°57′5″ E) borders Uran on the northern side and is connected with Panvel Creek and Thane Creek. Dharamtar Creek (Lat. 18°50′5″ N and Long. 72°57′10″ E) extends along the southern side and is connected with Karanja Creek and Pen–Khopoli Creek. The seaward portions of these creeks mainly consist of rocky shores, while the inner regions are marshy in nature with mudflats and moderate mangrove vegetation. These varied habitats provide suitable ecological conditions for diverse gastropod fauna.

Over the past few decades, Uran has undergone rapid industrial and infrastructural development. The establishment of the Jawaharlal Nehru Port Trust (JNPT) in 1989 near Sheva Creek, along with the Nhava-Sheva International Container Terminal (NSICT), Container Freight Stations (CFS), and other port-related activities, has considerably increased maritime transportation and hauling operations in the region. Furthermore, the presence of industries such as Oil and Natural Gas Corporation (ONGC), MSEB Gas Turbine Power Station, Bharat Petroleum, and several allied industries has intensified anthropogenic pressure on the coastal ecosystem of Uran. These developmental and industrial activities may directly or indirectly affect the biodiversity and ecological balance of the coastal habitats. Therefore, the present investigation was undertaken to study the diversity of gastropod molluscs in this ecologically significant region.

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Sampling and Collection of Specimens

For the present study, two sampling sites namely Sheva Creek and Karanja Creek were selected along the coastal region of Uran. Regular field surveys were conducted monthly from November 2013 to October 2014 to assess the diversity and distribution of gastropod species in different habitats such as rocky shores, sandy substrata, muddy areas, intertidal zones, subtidal zones, and mangrove fringes.

Gastropod specimens were collected manually by hand-picking during low tide conditions from intertidal and subtidal regions as well as from the seaward edges of mangrove habitats. The collected specimens were carefully transferred to the laboratory in ice boxes to avoid damage and decomposition. In the laboratory, the specimens were narcotized using powdered menthol to allow full extension of the body parts for proper examination. They were then killed using 1% chloral hydrate solution and subsequently preserved in 5% seawater buffered formalin for further taxonomic studies.

Identification of gastropod species was carried out using standard taxonomic keys and reference literature provided by Menon et al. [5] and Apte [6]. The identified specimens were systematically classified based on their morphological characteristics and shell features.

III. RESULTS AND DISCUSSION

Table 1: List of gastropods recorded at Uran, west coast, India, were from 6 order and 18 family as follows:

Table 1. Checklist of Gastropod Species Recorded from Uran Coast, West Coast of India

Sr. No.	Order	Family	Species Recorded
1	Hypsogastropoda	Bursidae	*Bursa spinosa* (Lamarck, 1816)
2			*Bursa lissostroma* (Smith, 1914)
3			*Bursa tuberculata* (Brodrip, 1833)
4			*Bursa elegans* (Sowerby, 1835)
5	Hypogastropoda	Naticidae	*Natica maculosa* (Lamarck, 1799)
6			*Natica picta* (Recluz, 1844)
7	Hypogastropoda	Potamididae	*Telescopium telescopium* (Linnaeus, 1758)
8	Neritimorpha	Neritidae	*Nerita oryzarum* (Recluz, 1841)
9			*Nerita squamulata* (Le Guillou, 1841)
10			*Nerita planospira* (Anton, 1839)
11			*Nerita grayana* (Recluz, 1843)
12			*Nerita albicilla* (Linnaeus, 1758)
13	Caenogastropoda	Strombidae	*Tibia curta* (Sowerby, 1842)
14	Caenogastropoda	Ficidae	*Ficus gracilis* (Sowerby, 1825)
15	Caenogastropoda	Nassariidae	*Nassarius stolatus* (Gmelin, 1791)
16			*Nassarius pullus* (Linnaeus, 1758)
17			*Nassarius jacksonianus* (Quoy & Gaimard, 1833)
18			*Nassarius vittatus* (Linnaeus, 1767)
19	Pulmonata	Siphonariidae	*Siphonaria laciniosa* (Linnaeus, 1758)
20	Neogastropoda	Buccinidae	*Engina zebra* (Melvill)
21			*Babylonia spirata* (Linnaeus, 1758)
22			*Cantharus spiralis* (Gray, 1846)
23			*Cancellaria costifera* (Sowerby, 1835)
24	Neogastropoda	Conidae	*Conus mutabilis* (Reeve, 1844)
25	Neogastropoda	Cypraeidae	*Erosaria lamarcki* (Gray, 1825)
26	Neogastropoda	Muricidae	*Murex adustus* (Lamarck, 1799)
27			*Murex tribulus* (Linnaeus, 1758)
28			*Ocinebra bombayana* (Melvill, 1893)
29			*Thais lacera* (Born, 1778)

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30			*Thais tissoti* (Petit, 1852)
31			*Thais carinifera* (Lamarck, 1822)
32			*Thais sacellum* (Gmelin, 1791)
33	Neogastropoda	Onchidiidae	*Onchidium tigrinum* (Stoliczka, 1869)
34			*Onchidium tenerum* (Stoliczka, 1869)
35	Neogastropoda	Turridae	*Surcula javana* (Linnaeus, 1758)
36			*Surcula amicta* (Smith, 1877)
37			*Clavus crassus* (Smith, 1888)
38	Neogastropoda	Littorinidae	*Littorina scabra* (Linnaeus, 1758)
39			*Littoraria undulata* (Gray, 1839)
40	Archeogastropoda	Trochidae	*Trochus radiatus* (Gmelin, 1791)
41			*Trochus stellatus* (Gmelin, 1791)
42			*Umbonium vestiarium* (Linnaeus)
43			*Trochus tentorium* (Gmelin, 1791)
44			*Euchelus atratus* (Gmelin, 1791)
45	Archeogastropoda	Turbinidae	*Turbo brunneus* (Roeding)
46			*Astrea stellata* (Gmelin, 1791)

Summary of Taxonomic Composition

- **Total Orders Recorded:** 8
- **Total Families Recorded:** 18
- **Total Species Recorded:** 46 species of gastropods.

IV. DISCUSSION

The present investigation revealed considerable diversity of gastropod fauna along the Uran coast of Raigad district on the west coast of India. During the study period from November 2013 to October 2014, a total of 49 gastropod species belonging to 6 orders and 18 families were recorded from the selected sites, namely Sheva Creek and Karanja Creek. The variation in species composition and abundance observed at the two study sites may be attributed to differences in habitat characteristics, substratum type, tidal influence, and environmental conditions.

The coastal ecosystems of Uran are characterized by shallow water regions, relatively high temperature, low wave action, and semi-enclosed creek habitats, which provide favorable conditions for the growth and survival of gastropod communities. Mangrove vegetation, mudflats, rocky shores, and sandy substrata create diverse ecological niches that support a wide range of molluscan fauna. The decomposition of mangrove leaf litter and organic matter, particularly after the monsoon season, contributes significantly to nutrient cycling within the ecosystem and enhances the availability of food resources for gastropods and other benthic organisms. Such nutrient-rich conditions support higher species diversity and population density in coastal wetlands.

Seasonal fluctuations had a marked influence on the abundance and distribution of gastropods. The lowest population density was observed during July, corresponding to the peak monsoon season. Heavy rainfall during this period resulted in a decline in salinity and water temperature, creating unfavorable environmental conditions for many molluscan species. Gastropods are highly sensitive to sudden fluctuations in osmotic balance, and therefore increased mortality was recorded during periods of reduced salinity. Following the monsoon season, environmental conditions gradually stabilized, resulting in reduced mortality and an increase in gastropod density. The highest population density was recorded during November 2013, representing the post-monsoon period when salinity, temperature, and nutrient availability became favorable for the growth and reproduction of gastropods.

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The coastal regions of Mumbai and Navi Mumbai are increasingly subjected to anthropogenic disturbances due to rapid industrialization, urbanization, port activities, and maritime transportation. Disposal of industrial effluents, untreated domestic sewage, oil spills, dredging activities, and encroachment along the coastal line have adversely affected the water quality and ecological health of many creeks in the region. Since gastropods are benthic organisms with limited mobility and close association with sediments, they are highly sensitive to environmental changes and pollution. Therefore, gastropod communities are widely regarded as reliable bioindicators of aquatic ecosystem health and environmental quality.

The present findings indicate that despite increasing developmental activities around Uran, the coastal ecosystem still supports substantial gastropod diversity. However, continued industrial expansion and habitat modification may pose serious threats to the long-term survival of these ecologically important organisms. Regular ecological monitoring and conservation measures are therefore essential for maintaining the biodiversity and ecological stability of the Uran coastal ecosystem.

V. CONCLUSION

The present study demonstrated a rich diversity of gastropod species along the Uran coast at both Sheva Creek and Karanja Creek. The high species diversity observed in the study area may be attributed to healthy sediment conditions, suitable habitat availability, and regular tidal flushing, which collectively maintain favorable ecological conditions for gastropod survival and growth.

The study revealed that all the recorded gastropod species are indigenous to the region and possess significant ecological, commercial, and biodiversity value. Gastropods contribute importantly to nutrient cycling, food chains, and ecological balance in coastal ecosystems, while several species are also economically valuable as edible and ornamental resources. The diversity and distribution of gastropods appear to be strongly influenced by habitat characteristics, environmental conditions, and geographical features of the coastal region.

The Uran coast provides a suitable environment for sustaining a wide variety of edible, commercially important, and ecologically significant gastropod species. However, increasing industrialization, urbanization, port development, and other anthropogenic activities may threaten the ecological health of these coastal habitats in the future. Therefore, there is an urgent need for effective conservation strategies, continuous ecological monitoring, and sustainable utilization of gastropod resources to preserve the biodiversity and ecological integrity of the Uran coastal ecosystem.

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