International Journal of Zoology Studies
www.zoologyjournals.com
ISSN: 2455-7269
Received: 21-05-2022, Accepted: 06-06-2022, Published: 22-06-2022
Volume 7, Issue 1, 2022, Page No. 74-79

Checklist of intertidal fauna in muddy-rocky ecosystem, gopnath coast, gulf of Khambhat, India

Nayana Dabhi, Bharatsinh Gohil
Department of Life Sciences, Maharaja Krishnakumarsinhji Bhavnagar University, Bhavnagar, Gujarat, India

Abstract
The aim of the study is to evaluate intertidal diversity of Gopnath coast. The present study deals with investigation of macro as well as mega fauna reported in Gopnath coast, Gulf of Khambhat, India. Total 100 Intertidal fauna were reported, 25 avifauna from 19 family, 09 species of Arthropoda recorded from 07 family, 61 species of Molluscs were recorded from 23 family and Single species of Mudskipper was recorded of Oxudercinae-gobies, Single species of Emplectonematidae family and Two different species of Cnidarian from same ecosystem of Gopnath coast.

Keywords: intertidal diversity, intertidal ecology, muddy-rocky ecosystem, avifauna, gopnath coast, gulf of khambhat

Introduction
In this age of shrinking natural habitats and an unprecedented extinction crisis (Ehrlich, 1995) [6], biodiversity has become a buzzword of grant applications and conservation programs. The baseline for aIl biodiversity studies is an inventory of the species that inhabit this planet and where they live, a goal that has been championed by projects such as Systematic Agenda 2000 (Anonymous, 1994) [1]. Biodiversity plays an important role in maintaining ecosystem services and possible losses of biodiversity can certainly interrupt key ecological processes (Harrison *et al*., 2014) [8]. Ecological consequences of biodiversity loss on the efficient functioning of ecosystem are now firmly established (Loreau *et al*., 2001; Danovaro *et al*., 2008) [10, 4]. Gulf of Khambhat covers an amount of about 3120 km^2 chiefly of mudflats with some rocky (sandstones) intertidal area and a volume of 62,400 million m^3, The beaches are common from Mahuva to Gopnath, reducing towards Ghogha and Bhavnagar and few sandy patches are also observed intermittently [Ramnathan et. al., 2002] [13]. Mollusca are second to Arthropoda in context to extant species. Diversity of Molluscs fauna recorded from coastline of India is 5,169 species (MoEF. India's fifth national report to the convention on biological diversity, 2014). The Shoreline of the coast between Bhavnagar and Gopnath provides an assemblage of erosional and depositional features related to tectonic eustatic factors resulting in gaining of land in between Bhavnagar and Mahuva.

Materials and Method
Study Area
The Gulf of Khambhat is a south to north penetration of the Arabian sea on the western shelf of India between the Saurashtra peninsula and mainland of Gujarat state, at its northern end between the Sabarmati and Mahi mouths, the gulf is barely 5 km wide and it opens out southwards like a funnel, reaching its maximum width south of Gopnath point (Government of India, Department of Ocean Development, Integrated coastal and Marine area management-May-2002). The Gulf of Khambhat at Gujarat has very high turbidity owing to high tidal amplitude and the heavy load of suspended sediments channelized through the perennial rivers emptying into the Gulf (Raghunathan *et al*., 2003). Gopnath coast is major rocky habitat having scanty mud patches on rocks and within Tide pools and Puddles which is situated 21o 21’03”44 N, 72o.10’94”36 E. Mangroves are also present at the coastal area. Tide pools and puddles are distributed in scattered manner of various size and shape with own characteristics in rocky habitat. Gopnath is unique habitat itself on the bases of presence of Mud and Variation in Rock surfaces.

Sampling Method Follows
Sampling was conducted on the Gopnath coast from January 2020 to December 2021. Majority of identification has been done, spot identification with extensive photography and by literature available. Samples were collected by hand picking method as well as purchased from fishermen e.g., Crabs, shrimp, Lobster, Mollusks, mudskippers during both at low tide and at high tide. Specimens were cleaned and arranged, placed in 4-10% formalin, the preserved species were identified by the standard keys provided by Chhapgar, 1957 [3], Dholakiya, 2013, Murdy, 1989 [12], Apte, 2006. The snakes encountered were photographed with a digital camera and

identified using the Neelimkumar Khaire, 2014 book. Birds were observed with 7x10 Nikon binoculars, photographed with a Canon D5300 DSLR camera, and identified using a standard book of Indian birds in the Indian subcontinent by Grimmette *et al*., 2011 [7].

Result

Table 1: Checklist of Intertidal Diversity at Gopnath Coast

Phylum	Family	No.	Scientific Name of Species
Mollusca	Tellinidae	1	*Tellina planata*(Linnaeus, 1978)
	Laternulidae	2	*Laternula anatina* (Linnaeus, 1758)
	Ostreoidea	3	*Saccostreacucullat*a (Born, 1778)
	Arcidae	4	*Arcagranosa* (Linnaeus, 1758)
	Donacidae	5	*Donaxfaba,Plebidonax deltoids (Lamarck, 1818)*
	Cerithidae	6	*Cerithiumsp -I*
		7	*Cerithiumsp. II*
		8	*Cerithiumcaeruleum*(G.B.Sowerby II, 1855)
		9	*Cerithiumscabridum*
		10	*Cerithiumlutosum*(Menke, 1828)
		11	*Cerithiumvulgatum*(Bruguiere, 1792)
		12	*Cerithiumatratum* (Born, 1778)
		13	*Cerethiumenchinatum*(Lamarck, 1822)
		14	*Cerithiumlividulum*(Risso, 1826)
		15	*Cerithiumcoralium*(Kiener, 1841)
		16	*Clypemorus pellucida* (Hombron & Jacquinot, 1848)
		17	*Clypeomorusbifaciata*(Sowerby, 1855)
		18	*Clypeomorusbatillariaeformis*(Habe & Kosuge, 1966)
		19	*Nassariuslivescens*(Philippi, 1849)
		20	*Nassariusdorsatus*(Roding, 1798)
	Nassaridae	21	*Nasaariusstolatus*(Gmelin, 1791)
		22	*Nassarius sp.*
	Tegulidae	23	*Tectusconus*(Gmelin, 1791)
	Trochidae	24	*Halistyluscolumna*(Dall, 1890)
		25	*Calliotrochusmarmoreus*(Pease, 1861)
		26	*Trochusniloticus* (Linnaeus, 1758
		27	*Umboniumvestiarium*(Linnaeus, C., 1758)
		28	*Calliostomazizyphinum (Linnaeus, 1758)*
		29	*Trochus radiatus* (Gmelin, 1791)
	Muricidae	30	*Indothaislacera*(von Born, 1778)
		31	*Muricopsisbombayensis* (Melvill, 1893)
		32	*Semiricinulatissoti*(Petit de la saussaye, 1852)
		33	*Thais luteostoma*(Holton, 1803)
		34	*Chicoreusbrunneus*(Link, 1807)
	Turridae	35	*Lophiotoma indica*(*Roding, 1798)*
		36	*Turricula javana*(Linnaeus, 1767)
	Assimineidae	37	Assiminea *sp*.
	Naticidae	38	*Nerita sp.*
		39	*Nerita undata* (Linnaeus, 1758)
		40	*Nerita chamaeleon* (Linnaeus, 1758)
	Haminoeidae	41	*Haminoea galba* (Pease, 1861)
	Buccinidae	42	*Cantharus spiralis* (Gray,1839)
	Onchidiidae	43	*Onchidium verruculatam (Cuvier, 1830)*
		44	*Onchidium sp.*
	Turbinidae	45	*Turritella terebra (linnaeus, 1758)*
		46	*Astralium rhodostomum (Lamarck, 1822)*
		47	*Astralium semicostatum* (Kiener, 1850)
		48	*Astralium stellare*(Gmelin, 1791)
		49	*Turbo brunneus*(Roding,1791)
	Ranellidae	50	*Gyrineum natator*(Roding, 1798)
		51	*Planxis sulcatus*(Born, 1778)

	Littorinidae	52	*Littoraria scabra*(Linnaeus, 1758)
		53	*Littoraria undulata*(Gray, 1839)
		54	*Littoraria intermedia*(Philippi, 1846)
		55	*Littorariaarticulata*(Philippi, 1846)
	Nacellidae	56	*Cellana rota*(Gmelin, 1791)
		57	*Cellana karachiensis*(Winckworth, 1930)
	Potamididae	58	*Pirenella cingulata* (Gmelin, 1791)
	Chitonidae	59	Chiton peregrinus (Thiele, 1909)
		60	Ui
	Octopodidae	61	*Octopus vulgaris (*Cuvier, 1797)
	Nereidae	62	*Nereis sp.*
Annelida			
Nemartea	Emplectonematidae	63	*Emplectonema Sp.*
Cnidaria		64	Ui (Sea anemone)
		65	Ui (Sea anemone)
Arthropoda	Chthamalidae	66	*Euraphia withersi* (Pilsbry, 1916)
	Balanidae	67	*Amphibalanus amphitrite* (Darwin, 1854)
	Macrophthalmidae	68	*Macrophthalmus sulcatus* (H. Milne Edwards, 1852)
		69	*Macrophthalmus laevis* A. (Milne-Edwards, 1867)
	Portunidae	70	*Scylla serrata* (Forsskal, 1775)
		71	*Charybdis annulata*(Fabricus, 1798)
	Chelonibiidae	72	*Chelonibia testudinaria* (Linnaeus, 1758)
	Palinuridae	73	*Panulirus polyphagus (Herbst, 1793)*
	Xanthidae	74	*Etisus laevimanus* (Randall,1840)

Table 2: Recorded Mudskipper and Checklist of Avifauna at Gopnath Coast.

Class	family	Sr. No.	Common name	Scientific Name
Actinopterygii	Gobiidae Sub family: Oxudercinae	01	Mudskipper	*Boleophthalmus dussumieri* (Valenciénnes, 1837)

Table 3

No.	Common Name	Family	Scientific Name
1.	Painted stork	Ciconiidae	*Mycteria leucocephala (Pennant,1769)*
2.	Black Headed Ibis	Threskiornithidae	*Threskiornis melanocephalus (Latham, 1790)*
3.	Glossy ibis		*Plegadis falcinellum (Linnaeus, 1766)*
4	Indian pond heron	Ardeidae	*Arrdeola grayii (Sykes,1832)*
5.	Little egret		*Egretta garzetta (Linnaeus, 1766)*
6.	Western reef egret		*Egretta gularis (Bosc, 1792)*
7.	Indian cormorant	Phalacrocoracidae	*Phalacrocorax fuscicollis (Stephens, 1826)*
8.	Crab plover	Dromadidae	*Dromas ardeola (Paykull, 1805)*
9.	Black winged stilt	Recurviostridae	*Himantopus himantopus (Linnaeus, 1758)*
10.	Grey plover	Charadriidae	*Pluvialis squatorola (Linnaeus, 1758)*
11.	Kentish plover		*Charadrius alexandrines (Linnaeus, 1758)*
12.	Lesser sand Plover		*Charadius mongolus (Pallas,1758)*
13.	Eurasian Whimbrel	Scolopacidae	*Numenius phaeopus (Linnaeus, 1758)*
14.	Common Green shank		*Tringa nebularis (Gunnerus, 1767)*
15.	Gull billed tern	Laridae	*Gelochelidon nilotica (Gmelin, 1789)*
16.	White Throated Kingfisher	Alcedinidae	*Halcyon smyrnensis (Linnaeus, 1758)*
17.	Green bee eater	Meropidae	*Merops orientails (Latham, 1801)*
18.	Black drongo	Dieruridae	*Dierurus macrocercus (Vieillot,1817)*
19.	House crow	Corvidae	*Corvus splendens (Vieillot, 1817)*
20.	Red vented bulbul	Pycnonotidae	*Pycnonotus cafer (Linnaeus 1766)*
21.	Common babbler	Leiothrichidae	*Argya caudate (Dumont, 1823)*
22.	Purple Sunbird	Nectariniidae	*Cinnyris asiaticus (Latham,1790)*
23.	House sparrow	Passeridae	*Passer domesticus (Linnaeus,1758)*
24.	Indian golden oriole	Oriolidae	*Oriolus kundoo (Sykes, 1832)*
25.	Indian rock Pigeon	Columbidae	*Columba livia domestica (Gmelin,1789)*

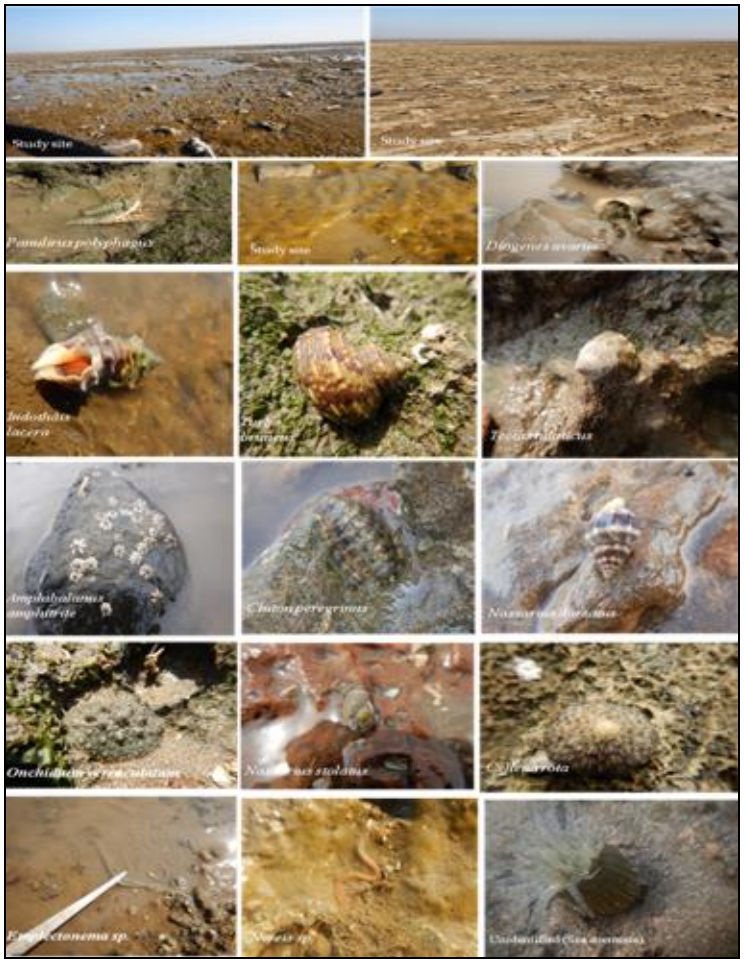

Fig 1: Glimpse of Macrofaunal Diversity at Gopnath Coast

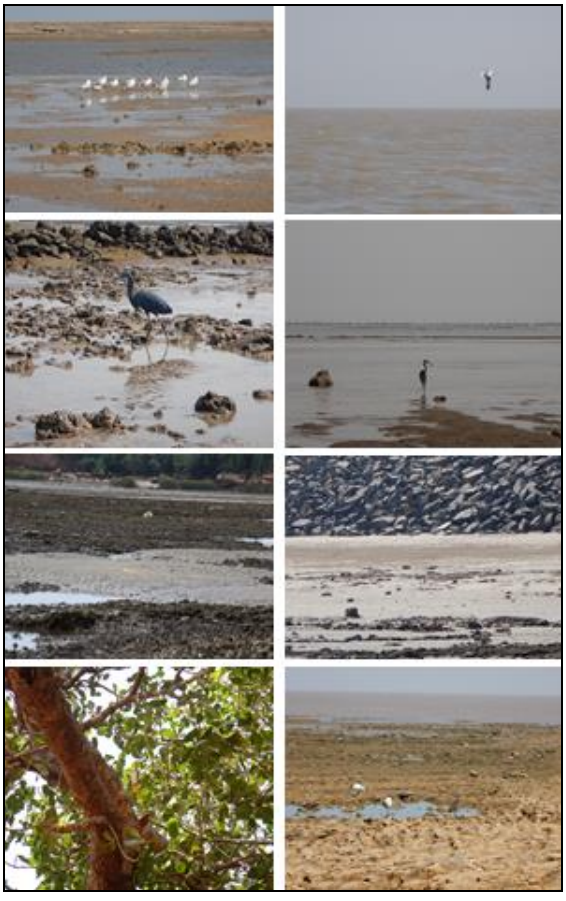

Fig 2: Glimpse of avifauna at Gopnath coastal area.

The Gopnath coast is exclusively rocky intertidal zone havingy supratidal region and scanty mud patches on middle and lower intertidal zone which contain magnificent faunal diversity of Arthropoda, Mollusca and mega faunal diversity like birds. Total 100 Macrofaunal species (Table.1 and Table.2) have been recorded from the Gopnath coastal area including shoreline birds, among them 61 species from 23 family of molluscs, 09 species from 07 family of Arthropoda, 02 cnidarians, a single species from annelida and nemartea. Total 25 species from 19 family have been recorded of shoreline birds and nearby area which directly or indirectly related with coastal ecosystem of Gopnath. A single species of family gobiidae has been recorded during study period. 61% of Molluscs have been recorded which is highest divers group at selected site, Shoreline birds are very next to the molluscs with 25% of the total macrofaunal diversity. Arthropoda, Cnidaria, Annelida and Nemartea are 9%, 2% 1%, 1% and 1% respectively of the total recorded macrofaunal diversity. (Fig.3). In molluscs, Trochidae and Cerithidae families are most established group in all three zones of the coast. Threskiornithidae, Ardeidae, Phalacrocoracidae, Dromadidae, Recurviostridae, Charadriidae, Scolopacidae, Alcedinidae, Meropidae, Pycnonotidae, Nectariniidae, Passeridae, Oriolidae and Columbidae familes are common at the Gopnath coast. Arthropods are conventionally settled as the Gopnath coast is highly rocky. A single species from Emplectonematidae, Nereidae families have noticeable numbers within the whole intertidal zone.

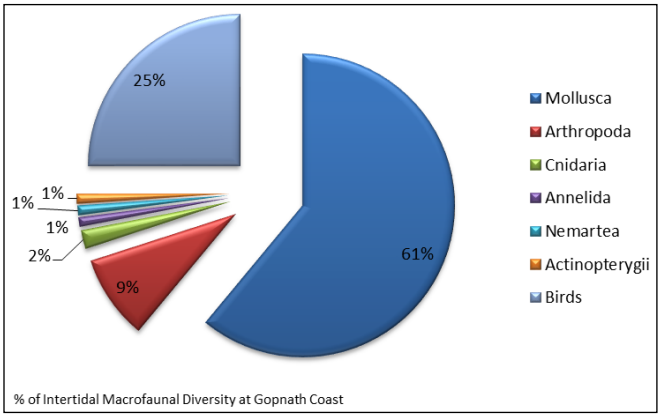

Fig 3

Conclusion

The highly rocky habitat of Gopnath is rich in diversity of macro-fauna and shoreline birds, it provides rocky substratum to majority groups of macrofauna inhabit in tidepools and puddles. Gastropods being herbivores, carnivores, scavengers, and filter feeder play a key role in this unique ecosystems. Fig.3 reflecting highest diversity of molluscs. The whole diversity are inter and intra related in terms of food chain and food web. Tide pools, puddles and mudflats offers feeding floor for the large numbers of shoreline birds like herons, egrets, storks, ibises, sandpipers, plovers, Gulls and turns. Indian rock pigeons have been offered seeds from pilgrims as the Gopnath has spiritual significance of Lord shiva.

Acknowledgement

Author is thankful to Head, Department of Life Sciences, for providing lab facilities. We are heartily thanks to Dr. Krushnakant Baxi for their valuable guidance. First author is thankful for SHODH scheme- State government fellowship Programme for financial assistance during the study period.

References

1. Anonymous. Systematics Agenda 2000: Charùng the Biosphere. Technical report. Society of Systematic Biologists: New York, 1994, 34.
2. Apte D. The Book of Indian Shells. Oxford University Press, Mumbai,1998:115:25.
3. Chhapgar BF. On the marine crabs (Decapoda: Brachyura) of Bombay State. Part 1. Journal of Bombay Natural History Society,1957:54(2):399-439.
4. Danovaro R, Gambi C, Dell'Anno A, Corinaldesi C, Fraschetti S, Vanreusel A *et al*. Exponential decline of deep-sea ecosystem functioning linked to benthic biodiversity loss. Curr. Biol,2008:18:1-8. doi: 10. 1016/j.cub.2007.11.056
5. Dholakia AD. Identification of prawns/shrimps of India and their culture; Daya Publication house, New Delhi; 106 Prawn and shrimp spp, 2013, 1-366.
6. EHRLICH PR. The scale of the human enterprise and biodiversity loss. J. H. Lawton & R. M. May (eds.), Extinction Rates. Oxford University Press: Oxford, 1995, 214-226.
7. Grimmette R, Inskipp T, Inskipp C, Birds of the Indian subcontinent, 2011, 1300.
8. Harrison PA, Berry PM, Simpson G, Haslett JR, Blicharska M, Bucur M. Linkages between biodiversity attributes and ecosystem services: a systematic review. Ecosyst. Serv,2014:9:191-203. doi: 10.1016/j.ecoser.2014.05.006
9. Khaire Neelimkumar. Indian snakes, a field guide: Jyotsna Prakshan, 2014.

10. Loreau M, Naeem S, Inchausti P, Bengtsson J, Grime JP, Hector A. Biodiversity and ecosystem functioning: current knowledge and future challenges. Science,2001:294:804-808. doi: 10.1126/science.1064088
11. MoEF. India's fifth national report to the convention on biological diversity. Ministry of Environment and Forests, New Delhi, 2014, 100.
12. Murdy EO. A Taxonomic revision and cladistic analysis of the Oxudercinae Gobies (Gobiidae: Oxudercinae). Records of the Australian museum,1989:11:1-93:24.
13. Ramnathan V, Vincent D, Sundrmoorthy S, Shunmungraj T. Critical habitat information system for Gulf of Khambhat-Gujarat; Govt. of India: Department of Ocean development, 2002.