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Survey of Marine Molluscan diversity along the coasts of Shreewardhan (M.S.)

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ABSTRACT

The preliminary survey of marine molluscs at 5 coasts of Shreewardhan namely Shreewardhan coast, Shekhadi coast, Dive Agar coast, Sarva coast and Harihareshwar coast were carried out. The occurrence of 65 species belonging to 52 genera, 35 families, 8 orders and 3 classes was noted. The Class- Gastropoda was diverse and represented by 3 orders, 24 families, 32 genera and 42 species. Class- Scaphopoda was represented by single order, family, genus and species whereas Class- Bivalvia was represented by 4orders, 10 families, 19 genera and 22 species of molluscs. Among these 65% of the species are gastropods, 34% are bivalvia and only 1% is Scaphopoda were noted. The present survey indicates that Sarva coast and Shekhadi coast are diversity rich followed by Shreewardhan coast, Harihareshwar coast and Dive Agar coast as far as molluscan diversity is concerned.

Introduction

Sea shells play an important role in geological as well as biological processes (Soni and Thakur,2015). Molluscs constitute one of the largest Phyla in the animal kingdom having more than 1, 20,000 living species (Sharon *et. al.*, 2013; Apte, 1998). Molluscs are grouped into sedentary filter feeder (Class-Bivalvia), Slugs (Class- Gastropoda), Predators (Class- Cephalopoda), and Burrowers (Class- Scaphopoda). Some molluscs are edible and are important food source, some produce pearls.

The existence of first mollusc was noticed in Cambrian period about 500million years ago (Apte, 1998). The morphology and shell pattern differs from species to species (Harasewych and Moretzsohn 2010). Molluscs generally occur in three oceanic zones .viz, benthic, pelagic and littoral. The maximum number of species occurs in the littoral zone. Very few are benthic or pelagic. The littoral zone is again subdivided into various zones such as the, supra littoral (strip of beach above the high tidemark), meso littoral zone (intertidal zone), infra littoral zone (slope of beach which always remains submerged under water), and circle littoral zone (lowest level down to which green algae survive).

Each species has a specific pattern of distribution. Depending upon the various habitats where shells occur can be classified as sandy beaches, rocky shores, mud-flats, mangroves and coral reefs.

Abbott *et. al.*, (1962, 1976) conducted molluscan shell study. David (2013) observed the molluscan diversity in pre and post monsoon season. Apte, (1988,1992,1993,2014), studied molluscan diversity from Mumbai and from other coast of India. Vanmali and Jadhav (2015) studied diversity of mollusc from Palghar. Melvil and Abercrombie, (1892) conducted study of marine gastropods of Bombay. Similarly, Syba. *et. al.*, (1984) studied Indian marine molluscs.

Area of Research

Shrivardhan is located in Raigad District of State of Maharashtra. Coordinates 18°02′00″N 73°01′00″E/ 18.0333°N 73.0167°E / 18.0333; 73.0167.

It is Hot in summer. Shrivardhan summer highest day temperature is in between 29°C- 39°C. Average temperatures of January is 24 ° C , February is 26 ° C , March is 29 ° C , April is 29 ° C , May is 30 ° C . Wind Speed is 15 km/h, Wind Direction is NW, Humidity is 60-65. The average tide height is in between 3.0-4.5 m.

Satellite image of Study area of Shreewardhan coast.

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Table 1. shows checklist of marine molluscs of Shreewardhan coast.

Sr. No.	Class	Order	Family	Scientific Name	Status
1	Gastropoda	Archaeogastropoda	Trochidae	Trochus radiatus (Gmelin)	Common
2				Euchelus asper (Gmelin)	Common
3				Umbonium vestiarium (Linne)	Common
4			Turbinidae	Turbo brunneus (Röding)	Common
5				Astraea stellata (Gmelin)	Common
6			Neritidae	Nerita oryzarum (Recluz)	Common
7				Nerita albicilla (Linne)	Common
8			Architectonidae	Architectoniea levigata (Lamarck)	Common
9			Patellidae	Cellana radiata (Born)	Common
10				Clypidina notata (Linne)	Common
11			Fissurellidae	Scutus unguis (Linne)	Common
12		Mesogastropoda	Cypraeidae	Erosaria lamarcki (Gray)	Common
13			Strombidae	Tibia curta (Sowerby)	Common
14			Bursidae	Bursa spinosa (Lamarck)	Common
15				Bursa tuberculata (Brodrip)	Common
16			Naticidae	Natica picta (Recluz)	Common
17				Natica maculosa (Lamarck)	Common
18				Natica rufa (Born)	Common
19			Planaxidae	Planaxis sulcatus (Born)	Common
20				Planaxis similis (Smith)	Common
21			Potamididae	Telescopium telescopium (Linne)	Common
22				Potamides cingulatus (Gmelin)	Common
23			Cerithidae	Cerithium rubus (Deshyeshes)	Common
24				Cerithium morus (Lamarck)	Common
25			Mitridae	Mitra obeliscus (Reeve)	Common
26				Mitra scutulata (Gmelin)	Common
27			Turritellidae	Turrillela terebra (Linne)	Common
28			Littorinidae	Tectrius malaccanus (Philippi)	Common
29		Neogastropoda	Muricidae	Thais carinifera (Lamarck)	Common
30				Thias bufo (Lamarck)	Common
31				Thais rudolphi (Lamarck)	Common
32				Thais tissoti (Petit)	Common
33				Drupa konkanensis (Lamarck)	Common
34				Ocinebra bombyana (Melvill)	Common
35			Conidae	Conus mutabilis (Reeve)	Common
36			Terebridae	Calvus crrasa (Smith)	Common
37			Buccinidae	Babylonia spirata (Linne)	Common
38				Cantharus spiralis (Gray)	Common
39			Olividae	Oliva nebulosa (Lamarck)	Common
40			Nassariidae	Nassa ornatus (Kiener)	Common
41			Turbinellidae	Turbinella pyrum (Linne)	Common
42			Volemidae	Hemifusus conchlidium (Linne)	Common
43	Scaphopoda	Pleurocoela	Dentalidae	Dentalium elph (Winckworth)	Common
44	Bivalvia	Arcoida	Arcidae	Arca granosa (Lamarck)	Common
45		Mytiloida	Mytilidae	Perna viridis (Linne)	Common
46				Brachyodontes karachinensis (Melvill)	Common
47		Pteroida	Pectinidae	Chlamystranquebaricus (Gmelin)	Common
48			Carditiidae	Cadita antiquata (Lamarck)	Common
49		Veneroida	Cardiidae	Cardium flavum (Linne)	Common
50				Cardium asiaticum (Bruguiere)	Common
51				Cardium setosum (Redfern)	Common
52			Veneridae	Gafrium divaricata (Chemnitz)	Common
53				Meretrix meretrix (Linne)	Common
54				Pitar erycina (Linne)	Common
55				Suneta donacina (Gmelin)	Common
56				Dosinia prostrata (Linne)	Common
57				Venus reticulata (Linne)	Common
58				Catelysia opima (Gmelin)	Common
59				Paphia malbarica (Chemnitz)	Common
60			Mactridae	Mactra cornea (Deshayes)	Common
61			Donacidae	Donax scortum (Linne)	Common
62				Donax incarnatus (Chemnitz)	Common
63			Tellinidae	Gastrana polygona (Hanley)	Common
64			Solenidae	Solen truncatus (Wood)	Common
65				Siliqua radiata (Linne)	Common

Materials and methods

For research study surveys, sampling method were used. Five coasts sites were selected, namely Shreewardhan coast, Shekhadi coast, Dive Agar coast, Sarva coast and Harihareshwar coast. The Live species are observed without disturbance or destructions. The dead molluscan shells were collected from the study area and brought to the laboratory and after washing and cleaning they are then identified by using reference literature.

After bringing to the experimental laboratory, the specimens were washed with a mixture of tap water, detergent, and disinfectant, air-dried and later were identified using authentic bibliographic sources including species identification field guides (Hyman, 1993; Harasewych and Moretzsohn, 2010; Dholakia, 2013; Apte, 2014; Chavan, 2016).

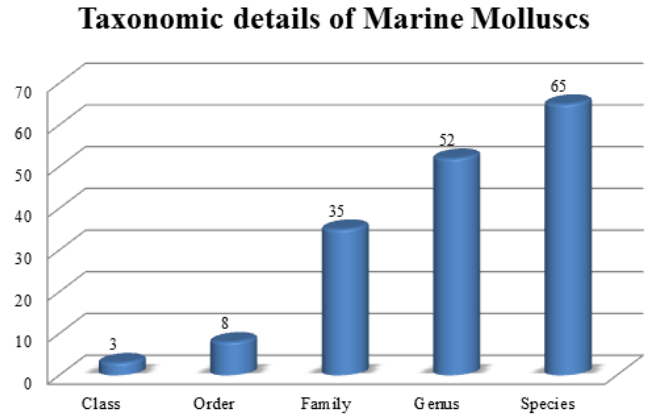
The identified shells are then sorted according to the family for further detail study—

Classification is done on the basis of structures. Radula or the tongue is ribbon like membrane wit transverse rows of denticle on the upper side. Different molluscs have different feeding habits, namely herbivores, omnivores, scavengers, detritus feeders etc. The change in the structure of radula gives clear evidence of evolution from the lower algal scrapers or herbivores to predatory molluscs (Apte, 1998).

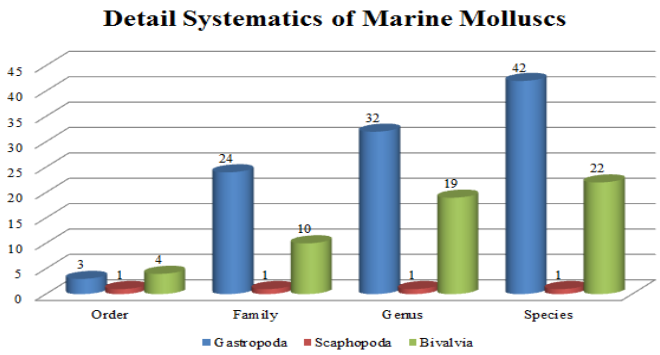
Each and every species of molluscs has its unique habitat. Only practice can tell where and how to search for the shell. The availability of species is noted at each site and accordingly diversity of species was estimated.

Result

During the present survey 65 species of molluscs were observed and identified of 52 genera, 35 families, 8 orders and 3 classes.



Graph 1. Shows taxonomic details of marine molluscs of Shreewardhan coast.



Graph 2. shows taxonomic detail systematics of marine molluscs of Shreewardhan coast.

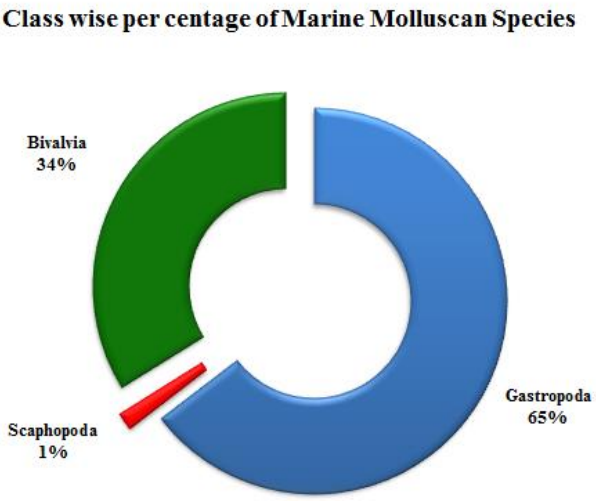


Chart 1 showing Class wise percentage of marine molluscan species.

Order	%
Archeo gastropoda	17.14
Meso gastropoda	28.57
Neogastropoda	22.86
Pleurocoela	2.86
Arcoida	2.86
Mytiloida	2.86
Pteroida	5.71
Veneroida	17.14

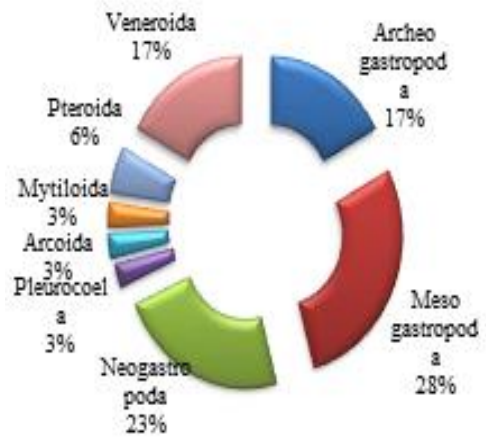
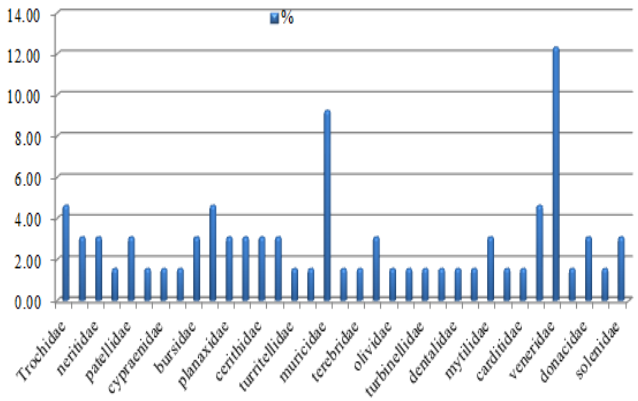


Table 2. and Chart 2 Showing Order wise percentage of Marine Molluscan species.



Graph 3. showing Family wise percentage of Marine Molluscan species.

Table 3. showing availability of the molluscan species at selected sites.

Sl.no	Class	Order	Family	Scientific Name	Station-1	Station-2	Station-3	Station-4	Station-5
1		Archaeogastropoda	Trochidae	Trochus ratiatus (Gmelin)	Y	Y	N	Y	Y
2				Euchelus asper (Gmelin)	Y	Y	N	Y	Y
3				Umbonium Vestiartium (linne)	Y	Y	Y	Y	Y
4			Turbinidae	Turbo Brunnes (Roding))	N	Y	N	Y	N
5				Astraea Stellata (Gmelin)	N	Y	N	Y	N
6			Neritidae	Nerita Oryzarum (Linne)	N	Y	N	Y	N
7				Nerita Albicilla (Linne)	Y	Y	Y	Y	Y
8			Architectonidae	Architectonidae Levigata (Lamarck)	N	Y	N	Y	N
9			Patellidae	Cellana radiata (Bron)	N	Y	N	Y	N
10				Clypidina notota (Linne)	N	Y	N	Y	N
11			Fissurellidae	S cutus unguis (Linne)	Y	Y	Y	Y	N
12		Mesogastropoda	Cypraeidae	Erosaria lamarcki (Gray)	N	Y	N	Y	N
13			S trombidae	Tibia Cutra (S ow erby)	N	Y	N	Y	N
14			Bursidae	Bursa spinos (Lamarck)	N	Y	N	Y	N
15				Bursa tuberculata (Brodrip)	N	Y	N	Y	N
16			Naticidae	Natica picta (Reculuz)	N	Y	N	Y	N
17				Natica maculosa (Lamarck)	N	N	N	Y	N
18				Natica rufa (Born)	N	N	N	Y	N
19			Planaxidea	Planaxis sulcatus (Born)	Y	N	N	Y	N
20				Planaxis similis (smith)	Y	Y	N	Y	N
21			Potamididae	Telescopium telescopium (Linne)	Y	Y	N	Y	Y
22				Potamides similis (smith)	Y	Y	Y	Y	Y
23			Cerithidae	Cerithium rubus (Deshyeshes)	N	Y	N	Y	Y
24				Cerithium morus (Lamarck)	N	Y	N	Y	N
25			Mitridae	Mitra Obeliscus (Reeve)	N	Y	N	Y	N
26				Mitra scutulata (Gmelin)	N	Y	N	Y	N
27			Turritelldae	Turrilleta terebra (Linne)	N	Y	N	Y	Y
28			Littorinidae	Turrilleta malaccanus (philippi)	N	N	N	Y	N
29		Neogastropoda	Muricidae	Thais carnifera (Lamarck)	N	Y	N	Y	Y
30				Thais bufo (Lamarck)	N	Y	N	Y	N
31				Thais rudolphi (Lamarck)	N	Y	N	Y	N
32				Thais tissoti (Lamarck)	N	Y	N	Y	N
33				Durpa konkanensis (Lamarck)	Y	Y	N	Y	Y
34				Ocinebra bombyana (Melvill)	N	N	N	Y	N
35			Conidae	Conus mutabilis (Reeve)	Y	Y	Y	Y	Y
36			Terebrides	Calvus crras (Smith)	N	Y	N	Y	N
37			Buccinidae	Babylonia Spirata (Linne)	Y	Y	N	Y	Y
38				Cantharus Sprialis (Gray)	Y	Y	N	Y	Y
39			Olividae	Olividae nebulosa (Lamarck)	Y	Y	Y	Y	Y
40			Nassariidae	Nassa ornatus (Kiener)	Y	Y	Y	Y	Y
41			Turbinellidae	Turbinella pyrum (Linne)	N	Y	Y	N	N
42			Volemidae	Hemifusus conchlidium (Linne)	N	Y	N	N	N
43		Pleurocoela	Dentalidae	Dentalium elph (winckworth)	N	Y	N	Y	N
44	Scaph apoda	Arcoida	Arcidae	Arca granosa (Lamarck)	Y	Y	N	Y	N
45			Mytilidae	Perna viridas (Linne)	N	Y	N	Y	Y
46		Mytiloida		Brachyodontes karachinensis (Melvill)	N	Y	N	Y	N
47			Peatinidae	Chlamystranquebarius (Gmelin)	N	Y	N	Y	Y
48		Pteroida	Carditiidae	Cardita antiquate	N	Y	N	Y	N

				(Lamarck)					
49		Veneroida	Cardiidae	Cardium flavum asiatium (Bruguiere)	Y	Y	N	Y	N
50				Cardium aciatium (Bruguiere)	N	Y	N	Y	N
51				Cardium setosum (Redfern)	N	N	N	Y	N
52			Veneridae	Gafrium devaricata (Chemnitz)	Y	Y	Y	Y	N
53				Meretix meretix (Linne)	Y	Y	N	Y	Y
54				Pitar erycina (Linne)	Y	Y	Y	Y	N
55				Suneta dinaina (Gmelin)	N	Y	N	Y	N
56				Dosinia prostrate (Linne)	Y	Y	N	Y	N
57				Venus reticulate (Linne)	N	Y	N	N	N
58				Catelysia obima (Gmelin)	Y	Y	N	Y	N
59				Paphis malbrica (chemnitz)	Y	Y	Y	Y	N
60			Mactridae	Mactra Cornea (Deshayes)	N	Y	N	Y	Y
61			Donacidae	Donax scortum (Linne)	Y	Y	Y	Y	Y
62				Donax incaratus (Chemnitz)	Y	Y	Y	Y	Y
63			Tellnidae	Gastrana polygana (Henly)	N	Y	N	N	N
64			Slenidae	Solen turncatus (wood)	Y	Y	N	Y	N
65				Siliqua radiata (Linne)	Y	Y	Y	Y	Y

Sites	Site-1	Site-2	Site-3	Site-4	Site-5
Y	30	58	17	61	26
N	35	7	48	4	39
Sites	Site-1	Site-2	Site-3	Site-4	Site-5
% Y	46%	89%	26%	93%	40%

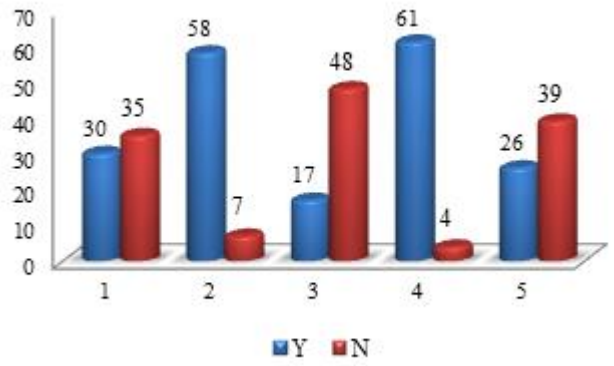


Table 4. and Graph 4 Showing availability of Molluscan species at different sites and respective %.

Discussion

The primary investigation was undertaken to study molluscan diversity along Shreewardhan coast. The findings of this taxonomic study show the occurrence of 65 species of molluscs were observed and identified of 52 genera, 35 families, 8 orders and 3 classes of Molluscs at Shreewardhan Coast. Among these 65% of the species are gastropods, 34% are bivalvia and only 1% is Scaphopoda.

Order wise, species belonging to Order- Mesogastropoda are maximum i.e. 29%, followed by Order- Neogastropoda i.e. 23%.

Family wise, Species belonging to Family- Veneridae are maximum i.e. 12%, followed by Family- Muricidae i.e. 9%. Of the 65 species 12 species (18%) are very common and observed at all the sites. Maximum diversity of Molluscan species was observed at site 4-Sarva coast. 61 species (93%) were observed, followed by Site 2- Shekhadi coast. 58 species (89%) were observed at this site. 30 species (46%) at site 1- Shreewardhan and 26 species (40%) at site 5- Harihareshwar coast were observed. Whereas very less molluscan species i.e. 17 (26%) were observed at site 3- Dive Agar coast.

All the species are common, Most of them are edible (Apte, 1998, 2014). Some species are collected and eaten locally but are rarely bought and sold (Soni, and Thakur, 2015; Vanmali and Jadhav, 2015). The occurrences of these species are influenced by physico-chemical condition (Peterson. 1991; Reise, 1985). Marine molluscs are among the most diverse group of macrobenthos.

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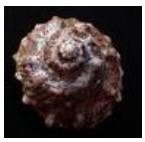
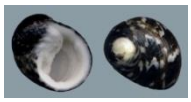
Trochus radiatus Euchelus asper Umbonium vestiarium Turbo brunneus Astraea stellata Nerita oryzarum

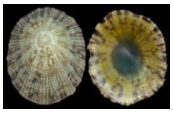
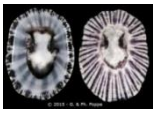




Nerita albicilla Architectoniea levigata Cellana radiata Clypidina notata Scutus unguis Erosaria lamarcki



Tibia curta Bursa spinosa Bursa tuberculata Natica picta Natica maculosa Natica rufa






Planaxis sulcatus Planaxis similis Telescopium telescopium Potamides cingulatus Cerithium rubus Cerithium morus

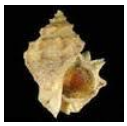





Mitra obeliscus Mitra Scutulata Turrillela terebra Tectrius malaccanus Thais carinifera Thias bufo








Thais rudolphi Thais tissoti Drupa konkanensis Ocinebra bombyana Conus mutabilis Calvus crrasa






Babylonia Spirata Cantharus spiralis Oliva nebulosa Nassa ornatus Turbinella pyrum Hemifusus conchlidium




Dentalium elph Arca granosa Perna viridis Brachyodontes sp. Chlamys tranquebaricus Cardita antiquata

Cardium flavum Cardium asiaticum Cardium setosum Gafrium divaricata Meretrix meretrix Pitar erycina

Suneta donacina Dosinia prostrate Venus reticulata Katelysia opima Paphia malbarica Mactra cornea

Donax scortum Donax incarnatus Gastrana polygona Solen truncates Siliqua radiata