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Research Article

MALACOFAUNA DIVERSITY OF BAHUDA ESTUARY OF GANJAM, ODISHA

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ABSTRACT

Bahuda estuary is a small estuary situated in the Ganjam district at the extreme south of Odisha. The estuary covers an area of 15 km^2 within average depth of 2.6 meter. An initial study was undertaken by me to explore the malacofauna diversity of this estuary. The duration of the study was 6 months. Studies were conducted by hand picking method, digging the substratum, collection by net & photographic capture. The study yielded 44 molluscan species belonging to 2 Classes, 9 Orders, 26 families and 35 genera. It was concluded Bahuda is rich in Gastropods and Bivalvia. 26 species of Gastropods and 18 species of Bivalvia were collected. Neogastropoda &Veneroida were reported to be the most spacious order of Gastropoda and Bivalvia respectively. *Oliva oliva* was the most abundant molluscan species present in the estuary. 18 new species were added to the previous checklist of mollusc diversity of Bahuda estuary.

INTRODUCTION

An estuary is a partly enclosed coastal body of brackish water with one or more rivers or streams flowing into it, and with a free connection to the open sea (Pritchard, 1967). Estuaries provide habitats for many organisms and support very high productivity (Raju *et al,* 2015)

The phylum Mollusca is the 2nd largest phylum, among the invertebrates after Arthropods. The molluscs are soft bodied animals with a long evolutionary history and diversity (Chiba, 2007; Benkendorff and Przeslawski, 2008; Bogan, 2008).The hypothetical primitive molluscs have appeared in Precambrian seas (Khanna and Yadav, 2004). These are highly successful invertebrates in terms of ecology and adaptation and are found nearly in all habitats ranging from deepest ocean trenches to the intertidal zones, and freshwater to land occupying a wide range of habitats (Patil *et al*, 2012).

The phylum Mollusca is divided into 8 classes, namely Aplacophora, Polyplacophora Monoplacophora, Gastropoda, Bivalvia, Scapopoda and Cephalopoda (Vaught, 1989). There are more than 100,000 species of Molluscs present worldwide (Bominathan *et al,* 2008). Phylum Mollusca has 586 Families out of which 290 Families are present in India. In India till today 5070 species of molluscs have been recorded of which 3,370 are from marine habitats (Subba Rao *et al,* 1991).

Molluscans play a critical role in maintaining the aquatic ecosystem by recycling the nutrients. They are very abundant and form an important link in the food chains. Amongst marine products, molluscs constitute an edible group next to fish and crustacea (Vaghela, 2009).They also serve as the source of nutrition for many aquatic organisms (Parikh and Mankodi, 2009). Many molluscs have consumptive and productive uses. They are used for commercial valuable products like pearl, raw materials for shell craft, shell lime, cement, lime industries and calcium resources in the poultry feed (Raju *et al,* 2015).

Extensive scientific study on molluscan diversity has been carried out in India, by various researchers. In Odisha also many work has been done accurately. Suba Rao *et al,* 1995 reported 129 molluscs species from Chilika Lake of Odisha. Surya Rao and Maitra, 1998 enlisted a total of 149 molluscan species from the Mahanadi Estuarine System of Odisha. 48 molluscan species have been reported by Rama Rao *et al*, 1992 from the Rushikulya Estuary, Odisha. Behera and Nayak, 2013 reported only 16 molluscs from Bahuda Estuary, Ganjam, Odisha. Pati *et al*, 2009 enlisted 26 molluscan species from Bahuda Estuary, Odisha.

A study was performed by me to explore the malacofauna diversity of Bahuda Estuary of Odisha and it yielded a remarkable outcome.

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MATERIAL AND METHODS

Study Area

Ganjam is one of the major coastal district of Odisha which is known for its biodiversity. Bahuda is one of the major river in Odisha. It originates from Andanda which is located in between Ramgiri and Mahendragiri hills of Gajapati District of the state (Rath and Roy, 2011). Bahuda estuary is a small estuary situated at the extreme south of Odisha, originates from the Eastern Ghats, meanders through several valleys or plains and finally empties into a shallow lagoon that opens into the Bay of Bengal through a channel of about 5 km in length and 250 metres width. While the banks of the estuary are sandy, those of the lagoon are muddy with no natural hard substratum around. Bahuda estuary (Fig. 1) is situated between latitude 19°3'N- 19°10' N and 84°E. The estuary covers an area of 15 km2 within average depth of 2.6 meter.

Figure 1 Map showing Bahuda Estuary, originated from Bay of Bengal

Bahuda estuary is surrounded by the villages namely, Sorala, Sonapur, Keuta Sonapur and Pata Sonapur. Neighbouring beaches to Bahuda Estuary are Sonapur beach and Ramyapatna beach. This estuary is an amazing place present in the hands of scenic beauty and nature. It is the recreation place for many far and local people. Sonapur beach adds a scenic enhance to this estuary. Bahuda estuary is an excellent habitat on many fauna resources like crustaceans, fish, Mollusca, polychates etc.

Figure 2 Mouth area Bahuda Estuary

METHODOLOGY

A field study was conducted for 6 months, from November 2016 to April 2017. The molluscs were collected thrice a month. The shells were collected from the mouth area, upper reaches and connecting channels of Bahuda estuary. The method that was implemented for the collection of samples were hand picking method, digging the substratum and collection of living sample with the help of a net fitted with a bamboo pole. The equipment used in this project were net, polythene bag, gloves, collection bottle, forceps and a DSLR camera. Samples were hand-picked from the muddy areas during the low tide period. Thereafter, the collected specimens were thoroughly washed with brackish water to study their morphological characteristics. The live specimens were preserved and fixed in 4% formaldehyde solution. Washed shells were pocketed and preserved in a polythene bag with its respected identification tag. Each collected specimen was photographed before preservation. The preserved organisms were identified with standard keys to Indian amphibia (Ramesh *et al*. 1996; Subba Rao, 1989, 2003; Ramakrishna and Dey, 2007).

RESULTS AND DISCUSSION

Figure 3 *Umbonium vestiarium*

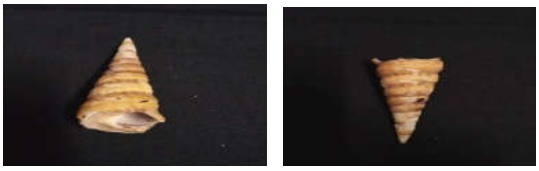

Figure 4 *Turritella duplicata*

Figure 5 *Cerethidea(Cerithideopsilla) cingulata*

Figure 6 *Telescopium(Telescopium) telescopium*

Figure 7 *Nassarius(Plicarcularia) pullus*

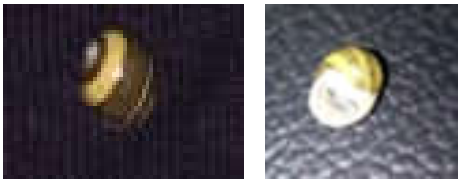

Figure 8 *Theodoxus (Clithon) oualaniensis*

Figure 9 *Pila globosa*

Figure 10 *Bursa rana*

Figure 11 *Polinices(Glossaulax) dydima*

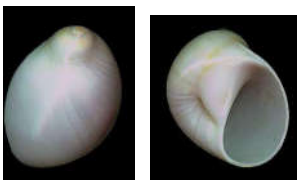

Figure 12 *Polinices tumidus*

Figure 13 *Natica gualteriana*

Figure 14 *Natica vitellus*

Figure 15 *Littoraria undulate*

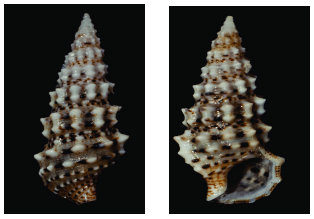

Figure 16 *Cerethium scabridum*

Figure 17 *Tonna dolium*

Figure 18 Thais lacera

Figure 19 *Bullia vittata*

Figure 20 *Murex tribulus*

Figure 21 *Pugilina(Hemifusus) cochlidium*

Figure 22 *Oliva olive*

Figure 23 *Oliva caerulea*

Figure 24 *Olivancillaria gibbosa*

Figure 25 *Babylona spirata*

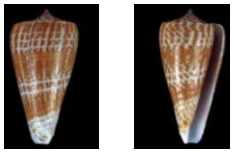

Figure 26 *Conus inscriptus*

Figure 27 *Terebra commaculata*

Figure 28: *Architectonica laevigata*

Figure 29 *Anadara granosa*

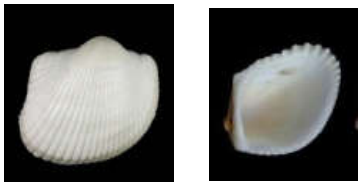

Figure 30 *Anadara antiquata*

Figure 31 *Anadara rhombea*

Figure 32 *Anadara inaequivalvis*

Figure 33 *Cardites bicolor*

Figure 34 *Sunetta meroe*

Figure 35 *Sunetta scripta*

Figure 36 *Paphia exarata*

Figure 37 *Paphia undulata*

Figure 38 *Meretrix casta*

Figure 39 *Meretrix meretrix*

Figure 40 *Marcia pinguis*

Figure 41 *Mactra symmetria*

Figure 42 *Siliqua radiata*

Figure 43 *Donax scrotum*

Figure 44 *Perna viridis*

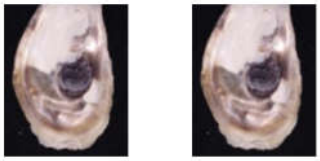

Figure 45 *Crassostrea cuttackensis*

Figure 46 *Nucula(Leionucula) convexa*

The study yielded 44 molluscan species belonging to 2 Classes, 9 Orders, 26 families and 35 genera (Table 1). Molluscs belonging to class Gastropoda and Bivalvia were found.

26 species of Class Gastropoda were recorded belonging to 4 different orders and 18 families. Out of the total Gastropods, Neogastropoda dominates with 10 species followed by Mesogastropoda with 9 species, Archeogastropoda with 6 species and Allogastropoda with a single species. Naticidae was the most specious family of Order Gastropoda with total 4 species, followed by Muricidae and Olividae with 3 species each. The number of molluscs belonging to different gastropod Family is given in Figure 49.

18 molluscs of Class Bivalvia were found belonging to 4 different Orders and 8 families. Order Veneroida dominated with 10 species followed by Arcoida (5 species), Mytiloida (1 species), Pterioida (1 species) and Order Nuculoida (1 species). Among Bivalvia Veneridae was the dominant family with 7 species followed by with Arcidae with 4 species. The number of molluscs belonging to different Bivalvia Family is given in Figure 50.

Umbonium vestiarium, Cerithidea cingulata and *Theodoxus oualaniensis* were the most abundant Gastropod while *Architectonica laevigata* and *Oliva oliva* were the most abundant bivalvia species reported from Bahuda estuary. Most of the molluscs were found as dead shells and few living specimens were collected.

Table 1 Systematic position of Molluscs Reported from Bahuda Estuary.

Class	Order	Family	Genus	Species
Gastropoda	Archeogastropoda	Trochidae	*Umbonium*	*vestiarium*
		Turritellidae	*Turritella*	*duplicata*
		Potamiddae	*Cerithidea*	*cingulata*
			Telescopium	*telescopium*
		Nassaridae	*Nassarius*	*pullus*
		Neritidae	*Theodoxus*	*oualaniensis*
		Ampullaridae	*Pila*	*globosa*
		Bursidae	*Bursa*	*rana*
	Mesogastropoda	Naticidae	*Polinices*	*didyma*
				tumidus
			Natica	*gualteriana*
				vitellus
		Littorinidae	*Littoraria*	*undulata*
		Cerethidae	*Cerethium*	*scabridum*
		Tonnidae	*Tonna*	*dolium*
		Muricidae	*Thais*	*lacera*
			Bullia	*vittata*
			Murex	*tribulus*
		Melongenidae	*Pugilina*	*cochlidium*
	Neogastropoda	Olividae	*Oliva*	*oliva*
				caerulea
			Olivancillaria	*gibbosa*
		Buccinidae	*Babylona*	*spirata*
		Conidae	*Conus*	*inscriptus*
		Terebridae	*Terebra*	*commaculata*
	Allogastropoda	Architectonicidae	*Architectonica*	*laevigata*
Bivalvia	Arcoida	Arcidae	*Anadara*	*granosa*
				antiquata
				rhombea
				inaequivalvis
		Carditidae	*Cardites*	*bicolor*
	Veneroida	Veneridae	*Sunetta*	*meroe*
				scripta
			Paphia	*exarata*
				undulata
			Meretrix	*casta*
				meretrix
			Marcia	*pinguis*
		Mactridae	*Mactra*	*symmetria*
			Siliqua	*radiata*
		Donacidae	*Donax*	*scrotum*
	Mytiloida	Mytilidae	*Perna*	*viridis*
	Pterioida	Ostreidae	*Crassostrea*	*cuttackensis*
	Nuculoida	Nuculidae	*Nucula*	*convexa*

Table 2 List of Molluscs along with their taxonomic authorities and English name.

SL NO	Name of The Mollusc	Taxonomic Authority	English Name
1	*Umbonium vestiarium*	Linnaeus (1758)	Button tops
2	*Turritella duplicata*	Linnaeus (1758)	Screw shell
3	*Cerithidea cingulata*	Gmelin (1791)	Girdled horn shell
4	*Telescopium(Telescopium)telescopium*	Linnaeus(1758)	Horn shell
5	*Nassarius(Plicarcularia)pullus*	Linnaeus (1758)	Black nassa
6	*Theodoxus(Clithon) oualaniensis*	Lesson (1831)	Guamanian nerite
7	*Pila globosa*	Swainson (1822)	Apple snail
8	*Bursa rana*	Linnaeus (1758)	Frog shells

9	*Polinices(Glossaulax) didyma*	Röding (1798)	Bladder moon snail
10	*Polinices tumidus*	Swainson (1840)	Tumid moon snail
11	*Natica gualteriana*	Reclug (1844)	Common moon snail
12	*Natica vitellus*	Linnaeus (1758)	Calf moon snail
13	*Littoraria undulata*	Gray (1839)	Robust shell
14	*Cerethium scabridum*	Philippi (1848)	
15	*Tonna dolium*	Linnaeus (1758)	Spotted tun
16	*Thais lacera*	Born (1778)	Carine rock shell
17	*Bullia vittata*	Linnaeus (1767)	Ribbon bullia
18	*Murex tribulus*	Linnaeus (1758)	Caltrop murex
19	*Pugilina(Hemifusus) cochlidium*	Linnaeus (1758)	Spiral melongena
20	*Oliva oliva*	Linnaeus (1758)	Common olive
21	*Oliva caerulea*	Röding (1798)	Purple mouth olive
22	*Olivancillaria gibbosa*	Born (1778)	Gibbous olive
23	*Babylona spirata*	Linnaeus (1758)	Spiral Babylon
24	*Conus inscriptus*	Reeve (1843)	Engraved cone
25	*Terebra commaculata*	Gmelin (1791)	Spotted auger
26	*Architectonica laevigata*	Lamarck (1816)	Smooth sundial
27	*Anadara granosa*	Linnaeus (1758)	Blood cockle
28	*Anadara antiquata*	Linnaeus (1758)	Antique Ark
29	*Anadara rhombea*	Born (1778)	
30	*Anadara inaequivalvis*	Bruguiere (1789)	Inaequivalve Ark
31	*Cardites bicolor*	Lamarck (1816)	Twotoned cardita
32	*Sunetta meroe*	Linnaeus (1788)	Pure sunetta
33	*Sunetta scripta*	Linnaeus (1758)	
34	*Paphia exarata*	Philippi (1846)	
35	*Paphia undulata*	Born (1778)	Undulate venus
36	*Meretrix casta*	Gmelin (1791)	Back water clam
37	*Meretrix meretrix*	Linnaeus (1758)	Hard clam
38	*Marcia pinguis*	Schroeter (1788)	
39	*Mactra symmetria*	Linnaeus (1767), Deshayes	
40	*Siliqua radiata*	Linnaeus (1758)	Sunset siliqua
41	*Donax scrotum*	Linnaeus (1758)	
42	*Perna viridis*	Linnaeus (1758)	Asian green mussel
43	*Crassostrea cuttackensis*	Newton & Smith (1912)	Indian oyster
44	*Nucula(Leionucula) convexa*	G.B Sowerby I (1833)	

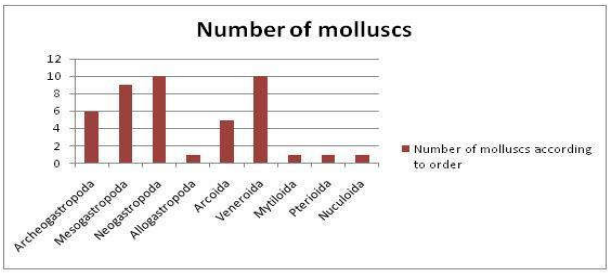

Figure 48 Bar chart showing the number of molluscs belonging to different orders

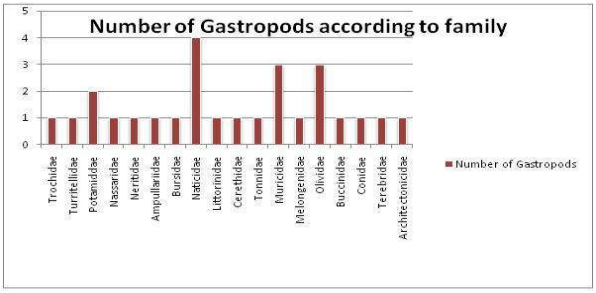

Figure 49 Bar chart showing the number of gastropods belonging to different families

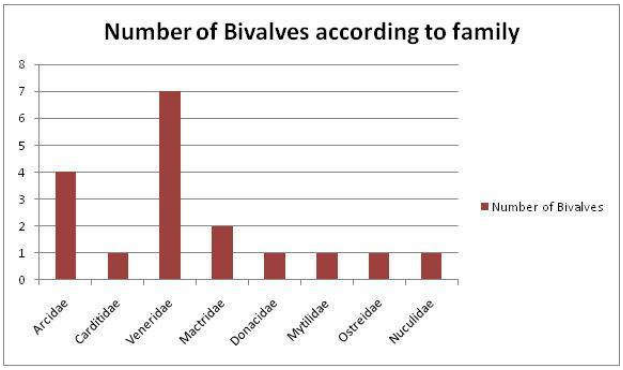

Figure 50 Bar chart showing the number of bivalvia belonging to different families

CONCLUSION

The relationship between Human and Molluscs is very strong. Molluscs have been widely used in various human welfare purposes. Some molluscs are also eaten by humans. Humans use shells for interior designing. Shells have played a central role in religion aspects of Hindu from pre-historic times. Molluscs also used for medicinal purposes. So, the demand for molluscs is more and right from the pre-historic times humans exploit molluscs badly. So, molluscs like other animal group are threatened. Clam shells deposits are exploited locally in Bahuda Estuary. There is large scale exploitation of *Meretrix meretrix* and *Meretrix casta* over the coastal area. Molluscs play an important role in the food chain of aquatic ecosystem. The depletion of molluscs will affect the entire biodiversity of the aquatic ecosystem of Bahuda estuary.

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References

Behera, D.P. and Nayak, L. 2013. A check list on Macrofaunal Diversity of Bahuda Estuary, Odisha, East Coast of India. *International journal of ecosystem*, 3 (6): 172-176.

Boominathan, M., Subash Chandran, M.D. and Ramachandra, T.V. 2008. Economic Valuation of Bivalves in the Aghanashini Estuary,West Coast, Karnataka. Sahyadri Conservation Series- 9.

Benkendorff, K. and R. Przeslawski. 2008. Multiple measures are necessary to assessrarity in macro-molluscs: a case study from southeastern Australia. *Biodiversity Conserv*., 17: 2455-2478.

Bogan, A.E. 2008. Global diversity of freshwater mussels (Mollusca, Bivalvia) infreshwater. *Hydrobiologia*, 595: 139-147.

Chiba, S. 2007. Species richness patterns along environmental gradients in island molluscan fauna. *Ecology*, 88 (7): 1738-1746.

Khanna, D.R. and Yadav, P.R. 2004. Biology of Mollusca, Discovery publishing House, Gavya Ganj, New Delhi-110002.

Patil, J. V., Ekhande, A. P. and Padate, G. S. 2012. A study of terrestrial molluscs with respect to their species richness, relative abundance and density in Toranmal Reserve Forest, North Maharashtra, India. *European Journal of Zoological Research*, 1 (2):26-30.

Raju, C., Gowthami, S. and Sridharan, G. 2015. Diversity of Molluscs in Vellaiyar Esturine from Vellankanni coast, Nagappattinum District. *International Journal of research in Zoology*. 5(2): 29-32.

Rama Rao, K.V., C.A. Nageswar Rao, S.C. Nahar, D.V. Rao &A. Mahapatra. 1992 Studies of the ecology and fauna of Rushikulya estuary (Ganjam), Orissa. In: Estuarine EcosystemSeries 1: 7-26. Zoological Survey of India.

Ramakrishna and A. Dey. Annotated checklist of Indian Marine Molluscs (Cephalopoda, Bivalve and Scaphopoda) Part-1.Rec.Zool.Surv.India, Occ. Paper no., 320:1-357.

Pritchard, D. W., 1967. Observations of circulation in coastal plain estuaries. In: Estuaries. Ed. G.H. Lauff. *Am. Ass. Adv. Sci.*, 83: 37-44.

Parikh, A.N. and Mankodi, P.C. 2009. Diversity of fresh water molluscs and their anthropogenic significance. *J. Bionano Frontier.*

Pati, S.K., Mahapatro, D. and Panigrahy, R.C. 2009. A preliminary note on the marine and esturine molluscs in and around Bahuda estuary, Odisha, East Coast of India. *Journal of Bombay Natural Society*, 106 (2): 222-224.

Rath, S. and Dev Roy, M.K. 2011. Crabs & Prawns: Crustacea: Decapoda of Bahuda Estuary, Ganjam, Odisha. *Rec. Zoological survey of India*. 111: 47-51.

Ramesh, D.S., Jeyabaskaran, R. and Pandian, A.L.P. 1996. Gastropods and Bivalves also cited with reef building corals, Palk Bay, South east coast of India, A phuket marine biological center special public. 16(2), 257-260.

Subba Rao N.V. and Dey (1989).Freshwater Molluscs in Aquaculture, pp 225-232. In:Handbook of Freshwater Molluscs of India. *Zoological Survey of India*, Calcutta.

Subba Rao, N.V., K.V. Surya Rao & R.N. Manna (1995): Mollusca.In: Fauna of Chilika Lake. Wetland Ecosystem Series 1:391-468. *Zoological Survey of India*.

Subba Rao, N.V., K.V. Surya Rao & S. Maitra (1991): Marine Molluscs.In: Fauna of Orissa. State Fauna Series 1(3): 1-175. *Zoological Survey of India*.

Subba Rao, N.V. (2003): Indian Seashells (Part-1): Polyplacophora and Gastropoda. Rec. zool. Surv. India, Occ. Pap. 192: i-x, 1-416.

Surya Rao, K.V. and S. Maitra. 1998. Fauna of Mahanadi estuary: Mollusca, Estuarine Ecosystem Series 3: 161-197. *Zoological Survey of India*.

Vaghela A.K., Bhadja, P.& Kundu, R. 2009. Diversity and distribution of intertidal Mollusca at Saurashtra coast of Arabian sea, India. *Global journal of Bio-science and Bio-technology*. Vol.2 (2): 154-158

Vaught, K. C. 1989. A classification of the living Mollusca: American Malacological Incorporation, Melbourne.

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