A Comparative Study onSpecies Diversity of Marine Bivalves from Maungmagan and KyaukKaMaunkCoastals

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ABSTRACT

In the present study, survey of marine bivalves for species diversity was done along two coastals; Maungmagan and KyaukKaMaunkcoastals, of Tanintharyi Region. Marine bivalves were collected during low tides from intertidal region and shallow coastal waters from December 2017 to November 2018. Total 30 species of bivalves belonging to 19 genera, 10families and 6orders were recorded from Maungmakan coast and KyaukKaMaunkcoastals. Bivalves belonging to families Arcidae, Ostreidae, Cardiidae, Glymeridae, Mytilidae, Limidae, Semelidae, Tellinidae,Lucinidaeand Veneridae were recorded during the study. Number of species of bivalves distributed in each family revolves that 6 species to Arcidae, 5 species belongs to family Veneridae and Semelidae4 species to Ostreidae, 3 species to Cardiida, LucinidaeandTellinidae to 2 species.1 species each were reported from families Glymeridae, Mytilidae, Limidae,. Maximum species diversity of bivalves is recorded from KyaukKaMaunk coastal. The bivalves at Maungmagan coastal result from related establishments, sedimentation, disposal of domestic sewage, industrial wastes, habitat loss and tourism. This study reveals that bivalves from Maungmagan coastal are facing threat due to industrial pollution.

INTRODUCTION

The bivalvia is the second most species class in the phylum Mollusca. Bivalves are distinctive within the Mollusca.A bivalve shell is part of the body, the exoskeleton or shell, of a bivalvemolluck,Tabugo and Gopalsamy(2013).

Bivalves by definition possess two shells or *valves*, a "right valve" and a "left valve", that are joined by a ligament , Hamli (2012).This exoskeleton serves not only for muscle attachment, but also for protection from predators and from mechanical damage. Bivalves lack a head, radula and jaws. The bivalve foot is modified as a powerful digging tool,Sundaram and Deshmukh (2011). Molluscan proteins are rich in essential amino acids and they arerich in essential amino acid which is required for the maintenance of growth, reproduction and synthesis of vitamins,Santhiya (2013). In Myanmar, most commonly utilized bivalves for food includeclams (Veneridae), sea- mussels (Mytilidae), and edible oysters(Osteridae). Similarresults on nutritional status of marine bivalves were also reported by Voltsiadou(2009). Periyasamy(2012) reported that sea food is one of the most nutritionally balanced foods which helps to control weight and goes along way towards preventing heart diseases. Use of bivalve species for bioindication were also reported by Oehlmann(2002).Although many studies have been undertaken to evaluate the species diversity of marine bivalves in Myanmar, no scientific studies have been carried out on the species composition of marine bivalves of Maungmagan and KyaukKaMaunk, hence, the present study is undertaken. Objective of the study is to know the species composition, to observe species diversity and to record the relative abundance of marine bivalves with two costals.

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MATERRIALS AND METHODS

Study Area

Geographically, KyaukKaMaunk coastal (13º 38.179′North and 098º 21.164′ East)is located alongThayetChaung Township and the Maungmagan coastal14º 09.743′North and 098º 05. 633′ East) is located in Longlon Township, Dawei District, Tanintharyi Region. The two coastal average temperature range are 30- 36ºC, whereas the relative humidity remains between 30- 52%.

Sampling Strategy

The present study was carried out for a period of one year, i.e from December 2017 to November 2018. Two study sites namely KyaukKaMaunk coastal and Maungmagan coastal, separated approximately by 10Km were selected along the coastal.The study sites were surveyed three monthly during low tides and bivalves were collected by hand picking method. All bivalves specimens were brought to laboratoryfor taxonomic study.

Identification of Bivalves;

All collected bivalves were photographed with Cannon digital camera and were identified up to species level using standard taxonomic keys of Crothers(2003).Bowling and Marine Species Identification Portal website (http://species identification.Org). Scientific names and classification of bivalves were referred to the World Register of Marine Species (WRo. MS) website (http:// www.Marine species.org).

Data analysis

Species diversity of recorded species was calculated based on each species under 10 families;

$$\text{Relative abundance} = \frac{\text{Total number of particular species}}{\text{Total number of collected all species}} \times 100$$

Species diversity $H' = \sum Pi \ln Pi$

Maximum diversity possible = H max = ln(S)

Evenness = H/ H max

RESULTS AND DISCUSSION

Total 30species of bivalves belonging to 19genera, 10 families and 6orders were recorded from Maungmaganand KyaukKaMaunkcoastals (Table 1). In present study, bivalves belonging to families Arcidae, Ostreidae, Cardiidae, Glymeridae, Mytilidae, Limidae,Semelidae,Tellinidae,Lucinidae and Veneridae were recorded.Number of species of bivalves distributed in each family revolves that 6 species to Arcidae, 5 species belongs to family Veneridae and Semelidae, 4 species to Ostreidae, 3 species to Cardiida, Lucinidae and Tellinidae to 2 species. 1 species each were reported from families Glymeridae, Mytilidae, Limidae.Maximum species diversity of bivalves is recorded from KyaukKaMaunk coastal (Table 2, Plate 2).

Table 1.Checklist of bivalves from two coastals

Order	Family	Scientific Name	M & K
Arcoida	Arcidae	*Anadaraglobose* (Linnaeus,1758)	√√
Arcoida	Arcidae	*A.scapha* (Linnaeus,1758)	√

Order	Family	Scientific Name	M & K
Arcoida	Arcidae	*A. multicostata*(Linnaeus,1758)	√
Arcoida	Arcidae	*A. inaequivalvis*(Linnaeus,1758)	√
Arcoida	Arcidae	*Arcagranosa*(Linnaeus,1758)	√√
Arcoida	Arcidae	*A.ventricosa* (Linnaeus,1758)	√√
Arcoida	Glycymeridae	*Glycymeris gigantean*(Linnaeus,1758)	√
Veneroida	Semelidae	*D. exoleta*(Linnaeus,1758)	√
Mytiloida	Mytiloidae	*Mytilusedulis*(Linnaeus,1758)	√
Pteroida	Limidae	*Lima lima* (Linnaeus,1758)	√
Veneroida	Veneroidae	*Meretrixlamarokii*(Deshayes,1853)	√√
Veneroida	Veneroidae	*M. casta* (Gmelin,1791)	√√
Veneroida	Veneroidae	*M.meretrix*(Linnaeus,1758)	√√
Veneroida	Semelidae	*Abra alba* (Linnaeus,1758)	√
Veneroida	Semelidae	*A. prismatica*(Linnaeus,1758)	√
Veneroida	Semelidae	*Dosiniaalta*(Linnaeus,1758)	√
Veneroida	Semelidae	*D. caerulea*(Linnaeus,1758)	√
Ostreida	Ostreidae	*Crassostraglomerata*(Gould,1850)	√
Ostreida	Ostreidae	*Ostrealurida*(Linnaeus,1758)	√√
Ostreida	Ostreidae	*O. chilenis*(Linnaeus,1758)	√√
Ostreida	Ostreidae	*O. conchaphila*(Linnaeus,1758)	√√
Veneroida	Cardiidae	*Laevicardiumelatum*(Deshayes,1858)	√
Veneroida	Cardiidae	*Protathacalaciniata*(Linnaeus,1758)	√
Veneroida	Cardiidae	*Trachycardiumprocerum*(Linnaeus,1758)	√
Veneroida	Tellinidae	*Tellinascobinata*(Linnaeus,1758)	√
Veneroida	Tellinidae	*Siliquapulchella*(Linnaeus,1758)	√
Veneroida	Lucinidae	*Ctenaorbiculata*(Linnaeus,1758)	√
Veneroida	Lucinidae	*Codokia orbicularis*(Linnaeus,1758)	√
Veneroida	Veneroidae	*Spiculas sp.* (Linnaeus,1758)	√√
Veneroida	Veneroidae	*Protapes sp.* (Linnaeus,1758)	√

√√ = M & K = Maungmaganand KyaukKaMaunk,√= KyaukKaMaunk

Table 2.Composition ofcollected bivalves species

Order	Family	Genus	Species	Composition(%)
Arcoida	Arcidae	2	6	20
Cardiida	Veneroidae	3	5	16.66

Order	Family	Genus	Species	Composition(%)
Mytiloida	Mytilidae	1	1	3.33
Pteroida	Limidae	1	1	3.33
Veneroida	Semelidae	2	2	13.33
Ostreida	Ostreidae	2	5	13.33
	Tellinidae	2	2	6.66
	Cardiidae	3	3	6.66
	Lucinidae	2	2	10.00
	Glycymeridae	1	1	3.33
6	10	19	30	100

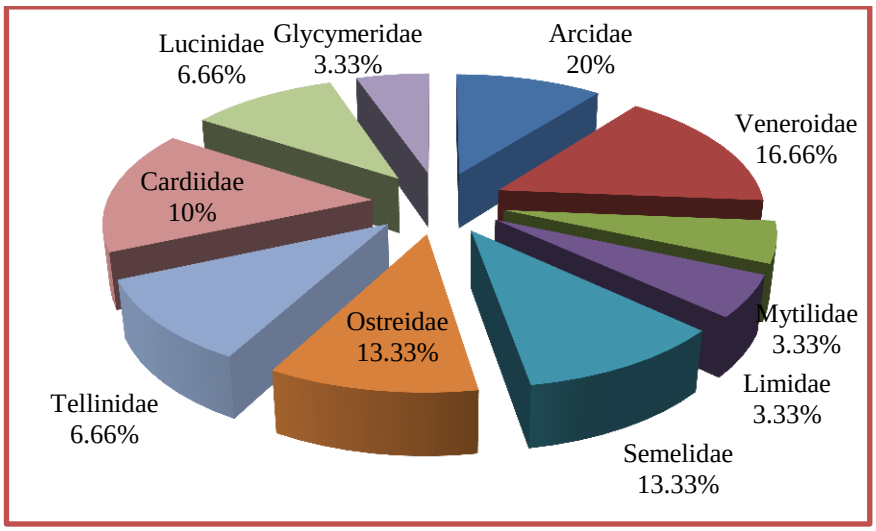


Fig. 2 Composition of collected bivalves species

Table 3.Species diversity of bivalves collected in each coastal

Collected area	Species Diversity	Evenness	Maximum diversity possible
KyaukKaMaunk	2.63	0.87	3.40
Maungmagan	1.74	0.75	2.30

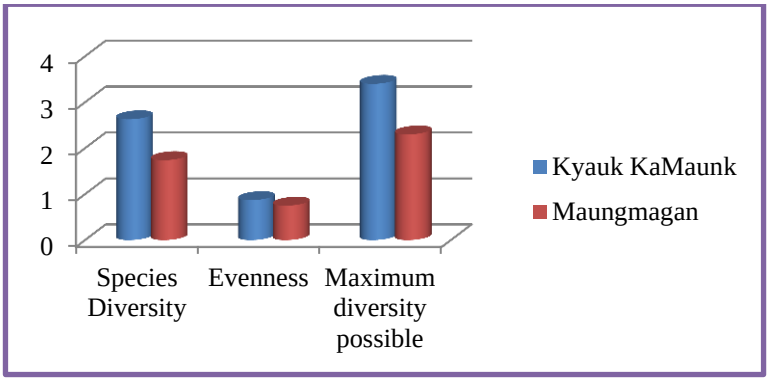


Fig. 3 Species diversity of bivalves collected in each coastal

According the data obtained, species diversity ofKyaukKaMaunkcostal observed 2.63, 0.87evenness and 3.40 maximum diversity possible compared with species diversityof Maungmagan costal observed1.74, 0.75 evenness and 2.30 maximum diversity possible. So KyaukKaMaunkcoastal observed better than Maungmagan costal. (Table 3 and Fig. 3)

During the study period, *Spicula* sp. (84 individuals) was the highest relative abundance (9.80%). *Anadarainaequivalvis* (8 individuals) was the lowest relative abundance (0.01%)were collected from KyaukKaMaunk coastal(Table 3). In Maungmagan costal,*Spicula* sp. (81 individuals) was the highest relative abundance (9.91%). *Arcagranosa* (10 individuals) was the lowest relative abundance (0.10%).

Anadaraglobose

A.scapha

A. Multicostata

A. inaequivalvis

Arcagranosa

A. ventricosa

Glycymeris gigantean

Mytilusedulis

Lima lima

Meretrixlamarokii

M. casta

M.meretrix

Abraalba

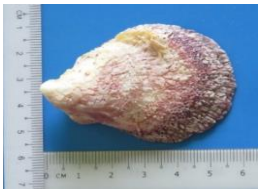
A. prismatica

Dosiniaalta

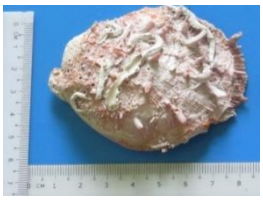
D. caerulea

D.exoleta

Crassostraglomerata



Ostrealurida



O. chilenis




O. conchaphila *Laevicardiumelatum* *Protathacalaciniata* *Tellinascobinata*

Plate 2.Recorded bivalves species in two costals




Codokia orbiculas *Siliquapulchella* *Ctenaorbiculata* *Trachycardiumprocerum*


Spicula sp. *Protapessp*

Plate2. Continued

Maximum species diversity of bivalves was recorded from KyaukKaMaunk coastal as compared to the Maungmagan coastal. Habitat degradation, improper waste disposal, plastic materials and broken bottles (of liquor) and oil pollution from boat discharge have threatened the marine bivalves from Maungmagan coastal.

The shoreline of Maungmagan was once populated with varied diversity of bivalves and other shellfish. It is not so now. There has been a steady decline in the shell population level and its diversity.

Since no earlier reports are available on species diversity of bivalves from Maungmagan coastal, data presented here can be taken as a baseline data in knowing the status of bivalves and effect on it and for a better management of marine bivalves.

CONCLUSION

In the present study, the results showed that the KyaukKaMaunk coastal harbors a diverse group of bivalves. Bivalvesspecies belonging to family Veneroidae and Arciidae were dominant followed by families Ostreoidae over all the families recorded in the study. The study also reveals that bivalves in close proximity to human populations consist of fewer species whereas the community at a site distant from human development shows more diverse assemblage of species. Activities like overharvesting, habitat loss, disposal of sewage, wastes and effluents, sedimentation and tourism will affect the coastal ecosystem. Present information on species diversity of bivalves would be helpful as a baseline data for bivalves from Maungmagan costal.

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REFERENCES

Balachandar, K., A. Sundaramanickam and S. Kumaresan, 2016.Southest Coast of India. Int.J. Curr. Microbiol.App.Sci.,5(10):33-49.doi: http://dx.doi.org/ 10.20546/ijcmas. 2016.510. 006.

Crothers, J.H., 2003. Rocky Shore Snails as Material for Projects (With a key for their identification). Field Studies, 10: 601-634.

HamliHadi, MohdHanafiIdris, Abu Hena Mustafa Kamal and Wong Sing King, 2012. Diversity of edible mollusc (Gastropoda and Bivalvia) at selected Divison of Sarawak, Malaysia. Int. J. Adv. Sci. Eng. Information Tech., 2(4): 5-7.

Oehlmann, Jorg and Ulrike Schulte-Oehlmann, 2002.Chapter 17 Molluscs as bioindicators. In B. A. Markert, A. M. Breure, H. G. Zechmeister (eds) Bioindicators and biomonitors. Eselvier Science B. V. pp: 577-635.

Sundaram, Sujit and Deshmukh, V.D., 2011. On the commercially exploited edible bivalves off Mumbai. FISHING CHIMES, 31(5): 23-24.

Esqueda-Gonalez, M.C., E. Rios-Jara, C.M. Galavan-Villa and F.A. Rodriguez-Zaragoza, 2014. Species composition, richness, and distribution of marine bivalve molluscs in Bahia de Mazatlan, Mexico. ZooKeys, 399: 49-69. doi: 10.3897/zookeys.399.6256.

Flores-Garza Rafael, Sergio García-Ibáñez, Pedro Flores-Rodríguez, Carmina Torreblanca-Ramírez, Lizeth Galeana-Rebolledo, Arcadio Valdés-González, Arquímedes Suástegui-Zárate and Juan Violante-González, 2012. Commercially Important Marine Mollusks for Human Consumption in Acapulco, Mexico. Natural Resources, 3: 11-17. http://dx.doi.org/10.4236/nr.2012.31003.

Flores-Garza, R., V. Lopez-Rojas, P. Flores-Rodriguez and C. Torreblanca-Ramirez, 2014. Diversity, Distribution and Composition of the Bivalvia Class on the Rocky Intertidal Zone of Marine Priority Region 32, Mexico. Open Journalof Ecology,4:961-973.http://dx. doi.org/10.4236/ Bio. 2014.415080.

Hamli Hadi, Mohd Hanafi Idris, Abu Hena Mustafa Kamal and Wong Sing King, 2012. Diversity of edible mollusc (Gastropoda and Bivalvia) at selected Divison of Sarawak, Malaysia. Int. J. Adv. Sci. Eng. Information Tech., 2(4): 5-7.

Subrahmanyam, T.V., K.R. Karandikar and N.N. Murti, 1949. The marine Pelecypoda of Bombay. Journal of University of Bombay, 17: 50-81.

Sundaram, Sujit and Deshmukh, V.D., 2011. On the commercially exploited edible bivalves off Mumbai. FISHING CHIMES, 31(5): 23-24.

Tabugo Sharon Rose M., Jocelyn O. Pattuinan, Nathanie Joy J. Sespene and Aldren J. Jamasali, 2013. Some Economically Important Bivalves and Gastropods found in the Island of Hadji Panglima Tahil, in the province of Sulu, Philippines. Int. Res. J. Biological Sci., 2(7): 30-36.