



## Density of Girdled Horn Shell in Kyaikkhami Coastal Area of Mon State in Myanmar

**Naung Naung OO\***

Lecturer, Department of Marine Science, Sittway University, Rakhine State, Myanmar

\*Corresponding Author: Naung Naung OO, Lecturer, Department of Marine Science, Sittway University, Rakhine State, Myanmar.

**Received:** December 23, 2019

**Published:** January 11, 2020

© All rights are reserved by **Naung Naung OO**.

### Abstract

Assessment of species density, relative density and population density of girdled horn shell *Cerithidea cingulata* (Gmelin, 1791) were analyzed by quadrat-transect method in mudflat and mangrove swamp of Kyaikkhami coastal area (Lat. 16° 04' N, Long. 97° 33' E), Thanbyuzayat Township, Mon State from January-December 2018. A total of 24335 individuals of species composition, shell density of 405.59 shells/m<sup>2</sup>, total relative density of 100% and population density of 30.44 individuals/m<sup>2</sup> were recorded in study period. Monthly systematic analysis were recorded in the range of 2853-1344 individuals in shell composition, 47.55-22.40 shells/m<sup>2</sup> in density, 11.72-5.52% in relative density and 0.24-0.11 individuals/m<sup>2</sup> in population density, respectively. High species densities were recorded in early monsoon month of June and low species densities were found at late premonsoon month of May. This paper represents part of ongoing efforts to revise and document the ecology of malacofauna in Myanmar.

**Keywords:** Girdled Horn Shell; Kyaikkhami Coastal Area; *Cerithidea cingulata*

### Introduction

Kyaikkhami coastal area is one of the brackish water estuarine system in Mon coastal area where a thick mudflat, disperse rocky fringe and moderately productive in mangrove swamps provided natural beds for estuarine gastropods and bivalves. Girdled Horn Shell *Cerithidea cingulata* (Gmelin, 1791) dense populates on muddy-sandy substrata of intertidal estuarine habitats in Kyaikkhami coastal area. The ecological aspects of species density is great importance and comparative study in any group of organisms is a promising field of investigation. The gastropod molluscs are particularly interesting for studies of species density and are also very suitable material. In recent years some important contributions have been made on the ecology of seashells, in particular distribution, occurrence, composition, abundance, density and biodiversity. The latter has been studied by more than one investigator both neighbouring countries and Myanmar.

Dey, Jamadar and Mitra [1] studied distribution of intertidal malacofauna at Sagar Island, India. Sri-aroon, Lohachit and Harada [2] studied percentage composition and species frequency of brackish-water mollusks of Surat Thani Province, southern Thailand. Sanpanich and Duangdee [3] reviewed the biodiversity of marine gastropods along the Chonburi to Trad coastline of Thailand in the late decade. David [4] studied the biodiversity and distribution of marine gastropods (Mollusca) during pre- and post-monsoon seasons along the Goa coastline, India. Rajasekaran, Elaiyaraja and Sekar [5] reported on check list and occurrence of marine gastropods along the Palk bay region, southeast coast of India. Joseph Uday Ranjan and Ramesh Babu [6] studied molluscan diversity of Bhavanapadu mangroves, Northeast coast of Andhra Pradesh, India. Picardal and Dolorosa [7] investigated the mollus-

can fauna (gastropods and bivalves) and notes on environmental conditions of two adjoining protected bays in Puerto Princesa City, Palawan, Philippines. Pawar and Al-Tawaha [8] investigated biodiversity of marine gastropods along the Uran coast, Navi Mumbai, west coast of India. Viswanathan [9] studied gastropods of the Gujarat coast, India: an updated species checklist with two new records indicators. Darwin and Padmavathi [10] studied diversity of malacofauna from the Paleru and Moosy backwaters of Prakasam district, Andhra Pradesh, India. Baharuddin, Basri and Syawal [11] investigated marine gastropods diversity and distribution on intertidal rocky shores of Terengganu, Peninsular Malaysia. Khade [12] studied marine gastropods molluscan diversity from west coast of India. Baharuddin and Zakaria [13] investigated the biodiversity and conservation status of the marine gastropod in Pulau Bidong, Terengganu, Malaysia.

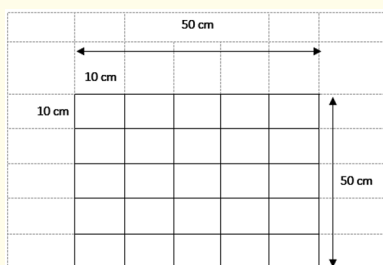
Sanpanich and Duangdee [14] surveyed on marine mollusc diversity in the southern Mergui Archipelago, Myanmar. From 2012 to 2019, Naung Naung Oo., *et al.* [15-24] studied the ecology of marine gastropods in some coastal areas of Myanmar water such as biodiversity of the rock shells from Mon coastal areas in 2012; diversity and distribution of the family Neritidae, the olive and cone shells from Mon coastal areas in 2014; and, distribution of the family Nassariidae and shell diversity of some marine ceriths from Mon coastal areas in 2015, respectively. Some ecological aspects of molluscan fauna such as diversity of silver-mouth turban in Mon coastal areas; top shells of Andrew Bay in Rakhine coastal region of Myanmar with notes on habitat, local distribution and utilization; and, distribution of the genus *Strombus* Linnaeus 1758 in some coastal areas of Myanmar were recorded in 2018. In 2019, turban shells and cowry shells of Andrew Bay in Rakhine coastal region of Myanmar were also studied.

The present paper records the results of a preliminary study of species density in *Cerithidea cingulata* (Gmelin, 1791) based on systematic sampling data for a period of one year.

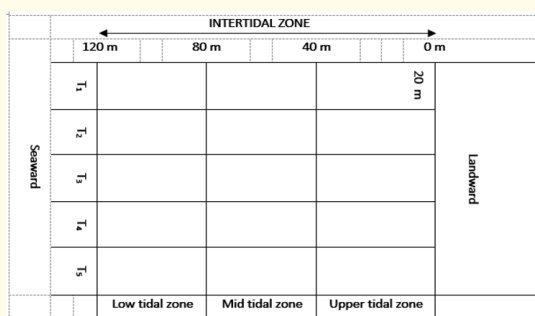
## Materials and Methods

### Systematic sampling

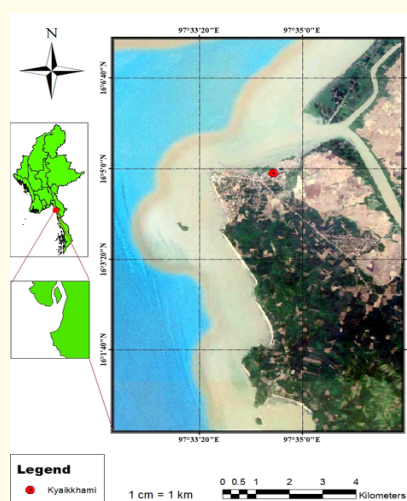
In this study was used the quadrat (50 cm × 50 cm) which divided into a (10 cm × 10 cm) grid made of brass or aluminium for light and durable (Figure 1). For each site, at least 5 transects of 40 meters length and 20 meters width are lined (Figure 2). Samples of the girdled horn shells *Cerithidea cingulata* (Gmelin, 1791) collected from the upper tidal level to lower tidal level within the intertidal zones along the Kyaikkhami coastal area (Lat. 16° 04' N, Long. 97° 33' E), Mon State during January-December 2018 (Figure 3).



**Figure 1:** Sampling quadrat (50 cm × 50 cm) with (10 cm × 10 cm) grid.



**Figure 2:** Systematic sampling of girdled horn shells in Kyaikkhami coastal area.



**Figure 3:** Map showing the sampling site of girdled horn shell in Kyaikkhami coastal area.

### Ecological calculation

Density, relative density and population density of girdled horn shells can be calculated by using the following formulas.

#### Density (D) shells/m<sup>2</sup>

Density = Total no. of individuals of the species/Total no. of quadrats × quadrat area (m<sup>2</sup>).

#### Relative Density (RD) %

Relative Density = Density of a given month/Total densities of all studied months × 100%.

#### Population Density (PD) individuals/m<sup>2</sup>

Population Density = Total no. of individuals of the species/Total studied area (m<sup>2</sup>).

## Results and Discussion

Girdled horn shells are high-conical, with many spire whorls. Sculptures are generally coarse. Aperture is relatively small, with a short siphonal canal. Outer lip is often flaring. Operculum is rounded, corneous, with many spiral coils (Figure 4).



**Figure 4:** Habit of girdled horn shell *C. cingulata* (Gmelin, 1791) in Kyaikkhami coastal area.

Phylum: Mollusca Linnaeus, 1758

Class: Gastropoda Cuvier, 1798

Order: Mesogastropoda Thiele 1929

Family: Potamididae Adams, 1854

Genus: *Cerithidea* Swainson 1840

Species: *C. cingulata* (Gmelin, 1791).

### Length

Maximum shell length 4.5 cm, commonly to 3.5 cm.

### Diagnostic characters

Shell is thick and solid, tapering, high-conical, with many flattened or slightly convex spire whorls. Sculpture generally coarse, with spiral grooves or cords and often axial ribs, giving a reticulated to nodular aspect. Axial varices sometimes present. Periostracum usually well developed, brownish to corneous. Aperture relatively small, with a short and deep anterior siphonal canal. Outer lip often thickened and more or less flaring. Operculum rounded, corneous, with many spiral coils and a subcentral nucleus. Head with a pair of tentacles, abruptly narrowing distally and bearing

eyes at or above their thickened bases. Foot rounded in front and obtuse behind (Figure 4).

**Habitat**

Abundant in brackish-water environments, on mud flats of estuaries and in mangrove swamps near high tide line. Locally, numbers of about 500 individuals per square meter can occur. Usually living in the upper bottom layer of mud which is almost liquid. Extensively collected for food and to make lime in the Philippines [25]. *C. cingulata* are extensively used as food in the study area, and their shell is mainly utilized for making lime. In Myanmar, they appear quite often in local markets. They are consumed steamed or boiled, and a somewhat piquant taste increases the desire for drinking. Basson, et al. [26] found dense aggregations of *C. cingulata* on the tidal flats of the western Persian Gulf. These populations were not associated with mangroves. Berry [27] noted that *C. cingulata* was common on the soil surface of mangrove swamps in west Malaysia. In Singapore, Vohra [28,29] noted that this species was not limited by particle size in its distribution but that it avoided clean, well-drained sand and was confined to regions of low salinity and pH. Vohra [28] found no evidence for vertical migration with the tide but observed a seasonal migration, controlled perhaps by internal physiological rhythms. *Cerithidea cingulata* also showed segrega-

tion by size in relation to tidal levels, the largest, oldest individuals occurring upshore.

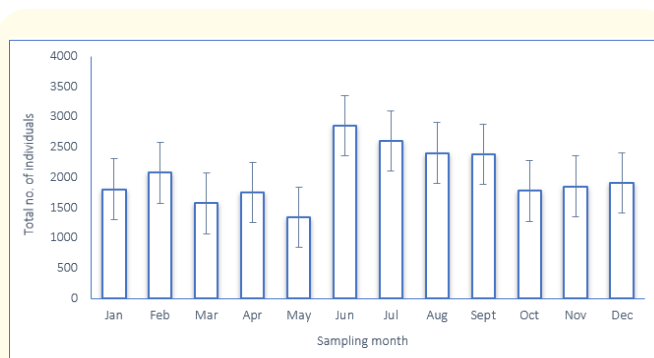
A total of 24335 individuals of girdled horn shells were collected from mud flat and mangrove area of Kyaikkhami coastal area (Table 1). The maximum and minimum shell composition was recorded 2853 and 1344 individuals in June and May (Figure 5). The lowest number of shells 30 individuals were found at low tidal zone of transect 5 in May and the highest number of shells 259 individuals were found at upper tidal zone of transect 3 in September. Total shell density, total relative density and total population density of girdled horn shell was recorded as 405.59 shells/m<sup>2</sup>, 100.0% and 2.03 individuals/m<sup>2</sup> in Kyaikkhami coastal area (Table 2 and figure 6). Marine gastropod resources are exploited throughout the coastal states of Myanmar mainly for the purpose of manufacturing ornaments, curios and numerous artifacts of commercial value rather than consumption. Lack of a comprehensive checklist of gastropods for the coastal states of Myanmar drives the need for systematic biodiversity documentation for conservation and management. This study made an attempt to provide an up-to-date shell diversity as well as to study decadal changes on marine gastropods of the Kyaikkhami coast based on rapid field surveys and existing datasets.

Sampling month	Transect 1			Transect 2			Transect 3			Transect 4			Transect 5			Total individuals
	U	M	L	U	M	L	U	M	L	U	M	L	U	M	L	
	Number of individuals in each quadrat															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Jan	112	118	119	129	132	123	125	121	115	114	117	120	133	111	115	1804
Feb	147	172	187	142	106	152	124	126	105	171	113	198	120	110	105	2078
Mar	120	125	122	124	126	122	127	120	126	120	75	125	40	45	55	1572
Apr	150	120	130	120	110	100	105	105	105	100	100	120	130	120	140	1755
May	78	65	43	172	66	40	70	150	125	80	135	100	120	70	30	1344
Jun	176	171	164	168	170	189	177	198	221	215	222	218	196	202	166	2853
Jul	166	178	171	196	193	167	155	188	218	184	172	222	187	107	101	2605
Aug	139	162	168	133	108	173	176	164	142	128	234	238	192	125	120	2402
Sept	212	160	212	111	140	145	259	210	108	100	167	196	105	144	114	2383
Oct	103	116	181	142	114	122	100	105	110	140	129	104	100	103	107	1776
Nov	128	140	109	102	150	143	145	110	107	110	100	118	102	149	141	1854
Dec	149	114	117	128	100	160	120	128	105	140	123	125	169	100	131	1909
Total																24335

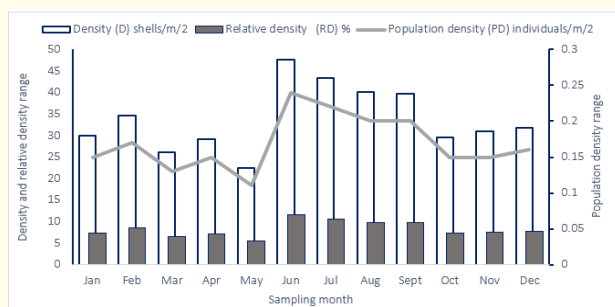
**Table 1:** Systematic sampling of girdled horn shell in Kyaikkhami coastal area.

Sampling month	Density (D) shells/m <sup>2</sup>	Relative density (RD) %	Population density (PD) individuals/m <sup>2</sup>
Jan	30.07	7.41	0.15
Feb	34.63	8.54	0.17
Mar	26.20	6.46	0.13
Apr	29.25	7.21	0.15
May	22.40	5.52	0.11
Jun	47.55	11.72	0.24
Jul	43.42	10.71	0.22
Aug	40.03	9.87	0.20
Sept	39.72	9.79	0.20
Oct	29.60	7.30	0.15
Nov	30.90	7.62	0.15
Dec	31.82	7.85	0.16
Total	405.59	100.00	2.03

**Table 2:** Monthly shell density, relative density and population density of girdled horn shell in Kyaikkhami coastal area.



**Figure 5:** Monthly shell composition of girdled horn shell in Kyaikkhami coastal area.



**Figure 6:** Monthly shell density, relative density and population density of girdled horn shell in Kyaikkhami coastal area.

## Conclusion

This study shows the need of inventories for *Cerithidea cingulata* that will help in preparation of shell biodiversity. These ecological studies can be updated regularly for easy understanding of species distribution, density, their availability and for the preparation of conservation and management plans. The variation in density of species could result from anthropogenic activities of Kyaikkhami coastal area. Activities like overharvesting, habitat loss, disposal of sewage, wastes and effluents, sedimentation and tourism will affect the coastal ecosystem. Present information on species density of girdled horn shell would be helpful as a baseline data for further monitoring of anthropogenic inputs on gastropods from Myanmar coast.

## Acknowledgements

I am indebted to Dr Win Naing, Rector of Sittway University and Dr Khin Maung Zaw, Pro-Rector of Sittway University, for their encouragement and supports in preparing this work. I am very grateful to Dr Mya Kyawt Wai, Associate Professor and Head of the Department of Marine Science, Sittway University, for her valuable suggestions and constructive criticisms on this study. I would like to express my sincere thanks to colleagues of Field Observation Group, Department of Marine Science, Mawlamyine University, for their kindly help me in many ways during field trips. Many thanks go to Daw Lwin Lwin, Retired Lecturer of the Department of Marine Science, Mawlamyine University, for her assistance in preparations of the manuscript. I would like to thank my beloved parent, U Win Maung and Daw Than Than Aye, for their physical, moral and financial supports throughout this study.

## Bibliography

- Dey M., et al. "Distribution of Intertidal Malacofauna at Sagar Island". *Records of the Zoological Survey of India* 105 (2005): 25-35.
- Sri-aroon P., et al. "Brackish-water Mollusks of Surat Thani Province, Southern Thailand". *Southeast Asian Journal of Tropical Medicine and Public Health* 36 (2005): 180-188.
- Sanpanich K and Duangdee T. "The Biodiversity of Marine Gastropods of Thailand in the Late Decade". *Malaysian Journal of Science* 32 (2013): 47-64.
- David A. "Biodiversity and distribution of marine gastropods (Mollusca) during pre and post-monsoon seasons along the Goa coastline". *Journal of the Marine Biological Association of India* 55.1 (2013): 17-24.
- Rajasekaran R., et al. "Check list and occurrence of marine gastropoda along the Palk bay region, southeast coast of India". *Advances in Applied Science Research* 4.1 (2013): 195-199.
- Joseph Uday Ranjan T and Ramesh Babu K. "Molluscan Diversity of Bhavanapadu Mangroves, Northeast Coast of Andhra Pradesh, India". *Bulletin of Environment, Pharmacology and Life Sciences* 4 (2014): 73-79.
- Picardal RM and Dolorosa RG. "The molluscan fauna (gastropods and bivalves) and notes on environmental conditions of two adjoining protected bays in Puerto Princesa City, Palawan, Philippines". *Journal of Entomology and Zoology Studies* 2.4 (2014): 72-90.
- Pawar PR and Al-Tawaha ARMS. "Biodiversity of marine gastropods along the Uran coast, Navi Mumbai, west coast of India". *American-Eurasian Journal of Sustainable Agriculture* 11.2 (2017): 19-30.
- Viswanathan C., et al. "Gastropods of the Gujarat Coast, India: An Updated Species Checklist with Two New Records". Fourth Indian Biodiversity Congress (IBC 2017): Book of Abstracts.
- Darwin Ch and Padmavathi P. "Diversity of Malacofauna from the Paleru and Moosy backwaters of Prakasam District, Andhra Pradesh, India". *Journal of Entomology and Zoology Studies* 5.4 (2017): 881-887.
- Baharuddin N., et al. "Marine gastropods (Gastropoda: Mollusca) diversity and distribution on intertidal rocky shores of Terengganu, Peninsular Malaysia". *AAFL Bioflux* 11.4 (2018): 1144-1154.
- Khade SN. "Marine gastropods molluscan diversity from west coast of India". *International Journal of Zoology Studies* 3.2 (2018): 116-119.
- Baharuddin N and Zakaria NA. "The biodiversity and conservation status of the marine gastropod (Mollusca; Gastropoda) in Pulau Bidong, Terengganu, Malaysia". *AAFL Bioflux* 11.4 (2018): 988-1000.
- Sanpanich K and Duangdee T. "A Survey of Marine Mollusc Diversity in the Southern Mergui Archipelago, Myanmar". *Phuket Marine Biological Center Research Bulletin* 75 (2018): 45-60.
- Naung Naung Oo and Lwin Lwin. "The biodiversity of the rock shells (Family Muricidae) from Mon coastal areas". *Mawlamyine University Research Journal* 4.1 (2012): 203-214.
- Naung Naung Oo and Lwin Lwin. "Notes on the Diversity and Distribution of the Family Neritidae (Archaeogastropoda, Mollusca) from Mon coastal areas". *Mawlamyine University Research Journal* 6.1 (2014): 202-212.
- Naung Naung Oo and Lwin Lwin. "The diversity and distribution of the olive and cone shells in Mon coastal areas". *Universities Research Journal* 6 (2014): 47-64.



18. Naung Naung Oo. "Notes on the Distribution of the Family Nassariidae (Neogastropoda, Mollusca) from Mon coastal areas". *Mawlamyine University Research Journal* 7.1 (2015): 161-172.
19. Naung Naung Oo. "Shell Diversity of Some Marine Ceriths in Mon Coastal Areas". *Universities Research Journal* 8.4 (2015): 37-51.
20. Naung Naung Oo. "Diversity of Silver mouth Turban in Mon Coastal Areas". *Mawlamyine University Research Journal* 10.1 (2018): 306-315.
21. Naung Naung Oo. "Top shells of Andrew Bay in Rakhine coastal region of Myanmar with notes on habitat, local distribution and utilization". *Journal of Aquaculture and Marine Biology* 7 (2018): 127-133.
22. Naung Naung Oo. "Distribution of the genus Strombus Linnaeus 1758 (Gastropoda: Strombidae) in some coastal areas of Myanmar". *Journal of Aquaculture and Marine Biology* 7 (2018): 258-263.
23. Naung Naung Oo. "Turban shells of Andrew Bay in Rakhine coastal region of Myanmar". *Journal of Aquaculture and Marine Biology* 8.2 (2019): 63-67.
24. Naung Naung Oo. "Cowry shells of Andrew Bay in Rakhine coastal region of Myanmar". *Journal of Aquaculture and Marine Biology* 8 (2019): 130-137.
25. Poutiers JM. "Gastropods". In: Carpenter, K. E. and Niem, V. H. (Eds.), *FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. Volume 1. Seaweeds, Corals, Bivalves and Gastropods. Food and Agriculture Organization, Rome: (1998): 363-649.*
26. Basson PW, et al. "Biotopes of the Western Arabian Gulf". *Arabian American Oil Co* (1977): 284.
27. Berry AJ. "The natural history of west Malaysian mangrove faunas". *Malayan Nature Journal* 25.2 (1972): 135-162.
28. Vohra FC. "Some studies on Cerithidea cingulata (Gmelin, 1791) on a Singapore sandy shore". *Proceedings of the Malacological Society of London* 39 (1970): 187-201.
29. Vohra FC. "Zonation on a tropical sandy shore". *Journal of Animal Ecology* 40 (1971): 679-708.

#### Assets from publication with us

- Prompt Acknowledgement after receiving the article
- Thorough Double blinded peer review
- Rapid Publication
- Issue of Publication Certificate
- High visibility of your Published work

**Website:** [www.actascientific.com/](http://www.actascientific.com/)

**Submit Article:** [www.actascientific.com/submission.php](http://www.actascientific.com/submission.php)

**Email us:** [editor@actascientific.com](mailto:editor@actascientific.com)

**Contact us:** +91 9182824667