INT. J. BIOL. BIOTECH., 4 (SPECIAL ISSUE): 89-96, 2007.

SOME OBSERVATIONS ON THE MICROMOLLUSC COMMUNITY FOUND AT RAS ZARRIN, PASNI, BALOCHISTAN

Naseem Moazzam and Mohammad Moazzam

Institute of Marine Sciences, University of Karachi, Karachi, 75270, Pakistan,
[1]Marine Fisheries Department, Government of Pakistan, Karachi

ABSTRACT

Micromolluscs constitute an important part of the biological communities that inhabit sandy shores. In order to determine health of a particular sandy beach, these micromolluscs can be used as a good indicator. Present paper, which form first of the series on the subject, describes micromollusc communities found on the sandy beach at Ras Zarrin which is located south of Pasni. Preponderance of bivalves was noticed on this high energy beach followed by gastropods and scaphopods. Amongst bivalves, *Chione imbricata* seems to be the most the dominant species followed by *Didimacar tenebrica*. Among gastropods *Turritella columnaria* seems to be dominant. Scaphopod was represented by *Dentalium octangulatum* and *Laevidentalium longitrorsum*, the former being dominant. The paper also describes size distribution of major taxa and enumerates micromolluscs being preyed upon by naticid and muricid gastropods.

INTRODUCTION

Micromolluscs, though ignored during casual observation, form an important part of the biological communities inhabiting the soft bottom habitats. They occur in sufficient numbers and can be analyzed for species composition and diversity and thus provide information on trophic and spatial relations in benthic communities. Micromolluscs include juveniles of larger gastropods and bivalves but mainly composed of those species which remain very small and does not grow to larger 'macromolluscs' forms. Although no exact limitation of the maximum size of such mollusks is agreed upon, however, usually molluscs smaller than 10 mm are considered as micromolluscs.

Although contribution of micromolluscs in the soft bottom habitat is not understood, however, they ought to play an important role in the food chain. Most of the micromolluscs seem to be detritus feeder, however, they may include predators such as member of Naticidae, Muricidae, Conidae and a number of other predatory mollusks. Micromolluscs are considered to be good indicator of the health of particular habitat and sometimes they are used to determine the level of pollution on such habitats (Kay and Kawamoto, 1983).

Despite their importance, no work on micromollucs communities was carried out in Pakistan. However, taxonomic work on the mollusks done on the collections made by F. W. Townsend from Northern Arabian Sea which included many micromolluscs. Melvill (1928) and Melvill and Standen (1901, 1906) summarized the work done on molluscan fauna of the area. Considering the lacuna in the knowledge of micromollusc community present work was started and deals with the micromollusc communities inhabiting Ras Zarrin, Pasni Balochistan.

MATERIALS AND METHODS

Ras Zarrin, located about 5 km south of Pasni town, is primarily a rocky outcrop extending in the sea (Fig. 1). It has a crescent shape sandy beach with rocky areas at both ends on its northern side. Southern part of the beach at Ras Zarrin is a long stretch of high energy sandy shore. The shore, especially along the extreme high water marks, is littered with seashells. In order to study the ecology of the micromollucs collection was made in January 2001 from sandy shore. Present study deals with the micromolluscs collected randomly from various part of the sandy beach behind the Ras Zarrin outcrop only.

Sample collected from the area was filtered through wire mesh of 2 mm to remove sand particles. Debris, predominated by shell fragments, was manually removed. In addition, micromolluscs were also collected from beach directly where in some isolated pockets they get concentrated due to winnowing action of waves. About 250 g of sample, in duplicate, was weighed and analyzed to determine percentage composition of dominant species. Length frequency of some dominant species was recorded. The paper also includes information collected upon the predation of naticids and muricids on dominant micromolluscs.

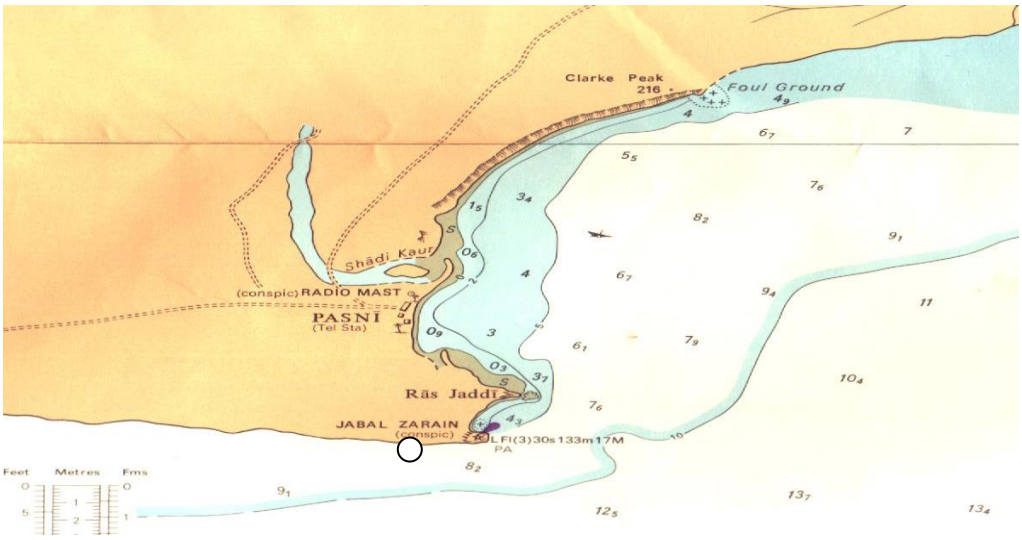

Fig. 1. Study area at Ras Zarrin, Pasni Bay.

RESULTS AND DISCUSSION

Species Composition:

Among the micromolluscs, bivalves were observed to be dominating followed by gastropods and scaphopods. By weight bivalves constitute about 97.3 % of the total micromollucs whereas contribution of gastropods was about 2.2 % whereas scaphopods contributed about 0.5 %. Among bivalves *Chione imbricata* seems to be dominating species followed by Didimacar *tenebrica*. Among gastropods, *Turritella columnaria* followed by *Pupa affinis* seems to be the dominating species

Bivalvia

***Chione imbricata* (Sowerby, 1853) (Fig.2):**

This species belongs to family Veneridae and primarily an important constituent of the infaunal communities of the sandy and sandy cum muddy beaches. From Pakistani waters it was reported by Melvill and Standen (1906). According to them this species was dredged from 10 m depth on muddy or pure sand bottom at Karachi. Also they reported this species from Mumbai and observed it to be the most dominating especially single valves were observed to be strewing on the shore at many places. Similar observations were made by Subrahmanyam *et al* (1949) from Mumbai. At Ras Zarrin, *Chione imbricata* was mostly observed to be in form of single valve. Their size ranges between 2.5 mm to 12.5 mm with modal group 5.0 mm to be dominating (Fig. 3). The histogram of the size frequency is negatively skewed indicating that smaller sized specimens seems to more abundant than the larger specimens.

Fig. 2. *Chione imbricate*

Fig. 4. *Didimacar tenebrica*

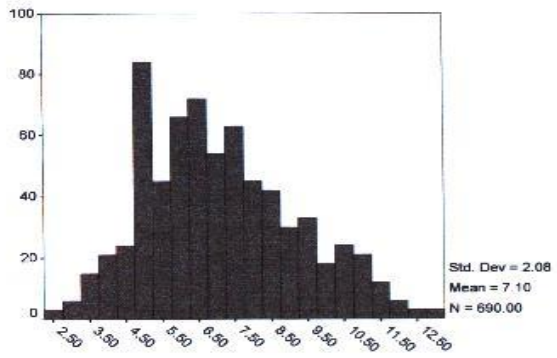

Fig. 3. Size frequency distribution of *Chione imbricate*

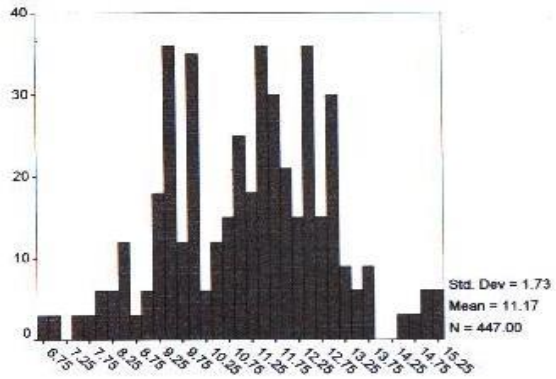

Fig. 5. Size frequency distribution of *Didimacar tenebrica*

***Didimacar tenebrica* (Reeve, 1844) (Fig. 4):**

This species (as *Barbatia (Acar) tenebrica*) was recorded from Karachi and Mumbai by Melvill and Standen (1906). According to Oliver (1995) this species inhabits under stones in lower shore and areas below. Because of proximity of rocky shore which continues subtidally in Ras Zarrin area, there is a possibility that this species may be occurring in such habitat and the shells are drifted to sandy shores after the animals die. Almost all the specimens collected from the sandy shores lack periostracum indicating that the shells have been dead for a while and thus lost the soft periostracum. *Didimacar tenebrica* at Ras Zarrin was mostly observed to be in form of single valves. Their size ranges between 6.75 mm and 15.25 mm with a multimodal distribution (Fig. 5). The histogram of the size frequency is not skewed indicating that a wide range of shells occur on the sandy beach.

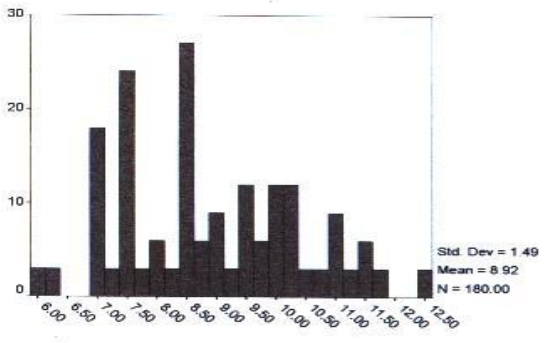

Fig. 6. Size frequency distribution of *Donax nitidus*

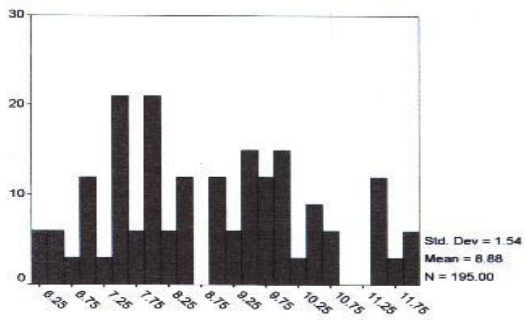

Fig. 8. Size frequency distribution of *Tellina sp.*

***Donax scalpellum* Gray, 1823 (Fig. 7):**

This species was reported from Karachi by Melvill (1928) and Melvill and Standen (1906). It was abundantly found on the sandy beaches especially inhabiting lower littoral zone. Most specimens were found to be in form of single valve, however, a few shells joined together were also found. Their size ranges between 9.2 mm and 18.6 mm with 13.9 modal group to be dominating.

***Tellina sp.*:**

This species was observed to be similar to *Tellina sp.* described from Oman by Oliver (1995), however, not named. It was found to be common at the sandy beach at Ras Zarrin. Their size ranges between 6.2 mm and 12.0 mm with 7.5 mm and 7.75 mm modal groups to be dominating (Fig. 8).

Fig. 7. *Donax scalpellum*

Fig. 9. *Donax townsendi*

Fig. 10. *Irus macrophyllum*

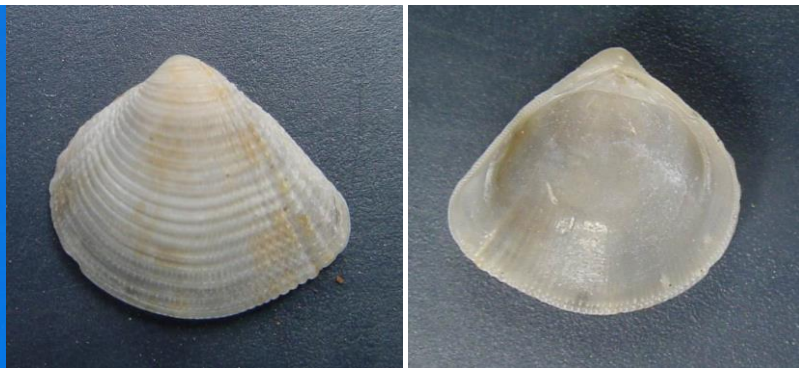

Fig. 11. *Timoclea arakana*

Fig. 12. *Heliacus (Torinista) cerdaleus*

Fig. 13 *Tornatina townsendi*

***Mactra lilacea* Lamarck, 1818:**

Known to inhabit sandy shore both in intertidal and infralittoral zone, this species seems to be present in fewer numbers. Although it can grow up to 6.5 to 7 cm in length, most specimens collected from micromolluscs assemblage ranges between 9.0 to 11.5 mm.

***Donax townsendi* Sowerby, 1895 (Fig. 9):**

This species was reported from Karachi by Khan and Dastgir (1972) and Melvill and Standen (1906) and from Pasni, Balochistan by Khan and Dastgair (1972). Most specimens had both valves attached together, however, a few single valves were also observed. The maximum size of the specimens collected from Ras Zarrin was 9.8 mm whereas the smallest specimen was observed to be 6.5 mm.

***Pandora flexuosa* Sowerby, 1820:**

This species was reported from Karachi and Mekran coast by Melvill and Standen (1906) who obtained them thorough dredging at a depth of 10 to 20 m on sandy bottom. This species inhabits muddy sand as well as gravel bottom in offshore areas (Oliver, 1995). Specimens of this species having a size range between 5.7 mm to 11.2 mm were collected from Ras Zarrin.

***Corbula erythraeensis* H. Adams, 1871:**

This species was reported from Karachi and Cape Monz by Melvill and Standen (1906) which was dredged from 120 m. A few specimens of this species were found at Ras Zarrin having a size range between 6.6 and 9.2 mm.

***Irus macrophyllus* (Deshayes, 1853) (Fig. 10):**

This species was previously reported from beach and off Manora, Karachi by Khan and Dastagir (1972) and Melvill and Standen (1906). This species is known to occur in crevices in rocks and other solid substrates in intertidal and offshore waters (Oliver, 1995). A number of specimens were found at Ras Zarrin having a size range between 5.6 and 9.2 mm.

***Dosinia alta* (Dunker, 1848):**

This species is known to inhabit lower intertidal and subtidal areas. From Pakistan, it was reported from Karachi by Melvill and Standen (1906). Ranjha (1960) also reported this species from the area. At Ras Zarrin this species having a size range between 5.6 and 9.8 mm were encountered frequently.

***Timoclea arakana* (Nevill, 1871) (Fig. 11):**

This species was previously reported from Karachi by Melvill and Standen (1906). A few specimens of this species were found at Ras Zarrin having sizes between 6.4 and 9.6 mm. Oliver (1995) opined that *T. forsiana*, *T. macfadyeni*, *T. mekranica* and *T. layardi* may be variations of this species.

***Tellina nitens* Deshayes, 1854:**

This species is known to inhabit muddy sand in offshore waters. This thin and translucent species was found at Ras Zarrin in appreciable quantities having a size range of 6.2 to 9.8 mm.

Scaphopoda

***Dentalium octangulatum* Donovan, 1803:**

This species was previously reported from Sindh and Mekran coasts by Melvill and Standen (1901) who pointed out that this species was found at 5 to 15 m depth on mud and muddy sand bottom. At Ras Zarrin a large number of specimens of this species were found ranging a size of 8.5 mm to 16.2 mm.

***Laevidentalium longitrorsum* (Reeve, 1843):**

A few specimens of this species having a size range between 7.3 and 18.2 mm were observed at Ras Zarrin.

Gastropods

***Turritella columnaria* Kiener, 1844:**

This species is known to inhabit intertidal muddy cum sandy beaches. At Ras Zarrin juveniles of this species was found to be common. Their sizes range from 7.9 to 21.6 mm with 10.1 mm size group to be dominating.

***Cyclostrema solariellum* Melvill, 1893:**

This species was reported from Karachi by Melvill and Standen (1901). The size of the specimens collected form Ras Zarrin ranges between 1.2 and 2.7 mm. This species seems to be rare in the area.

***Umbonium vestiarium* (Linnaeus, 1758):**

This species was reported from Karachi and Mekran coasts by Melvill and Standen (1901). It was also reported from West Wharf and Manora, Karachi by Khan and Dastagir (1971). The species is known to inhabit intertidal sandy beaches (Oliver, 1995). The size of the species from Ras Zarrin ranged between 7.0 and 15.0 mm.

***Triphora acuta* (Kiner, 1841):**

This sinister gastropod was previously reported from Karachi by Melvill (1918) and Melvill and Standen (1901). A few specimens of this species were found at Ras Zarrin having sizes ranging between 2.5 to 5.6 mm.

***Mitrella blanda* (Sowerby, 1844):**

This species was reported previously from Karachi, Gwadar and Ormara by Melvill and Standen (1901) where it was known to inhabit midlittoral zone to about 20 m depth. The specimens of this species from Ras Zarrin ranged between 3.8 and 11.1 mm.

***Costellaria daedala* (Reeve, 1845):**

This species was previously reported from Mekran coast by Melvill and Standen (1901) where it was reported to be found at 6 m depth on sand and mud. A few specimens of this species ranging from 7.2 to 9.1 mm were observed at Ras Zarrin.

***Calyptraea pellucida* (Reeve, 1859):**

A substantial number of the shells of this species were found at Ras Zarrin. This species was previously reported from Ras Shumal Bundar by Melvill (1928). At Ras Zarrin this species was observed to have a size range of 1.2 to 8.8 mm.

***Heliacus (Torinista) cerdaleus* (Melvill and Standen, 1903) (Fig. 12):**

A few specimen of this species ranging between 2.5 and 4.7 mm were observed at Ras Zarrin.

***Pupa affinis* (A. Adams, 1855):**

This species was previously reported from 5 to 15 m depth on muddy sand at Karachi and Mekran coasts by Melvill and Standen (1901). A few specimens of this species ranging between 3.1 to 10.6 mm were found at Ras Zarrin.

***Ringicula propinquans* Hinds, 1844:**

This is one of the commonest gastropod found at Ras Zarrin having a size range between 3.1 to 3.9 mm. It was previously reported from Sindh and Mekran coasts by Melvill and Standen (1901). This species is known to inhabit offshore deep waters and beached (Oliver, 1995).

***Tornatina townsendi* Melvill, 1898 (Fig. 13):**

This was another common gastropod found on sandy shore at Ras Zarrin having a size range between 2.1 to 4.2 mm. This species was previously reported from Karachi by Melvill (1898) and from Manora and Mekran coasts by Melvill and Standen (1901).

In addition, a number of mollusks belonging to families Fissurellidae, Trochidae, Cyclostrematidae, Iravadiidae, Rissoidae, Litiopidae, Olividae (Ancillinae), Costellariidae, Pyramidellidae and Siphonariidae among gastropods and Arcidae, Lucinidae, Ungulinidae, Mactridae, Tellinidae, Donacidae, and Veneridae among bivalves were also observed but their identification upto generic and specific levels could not be done . However, their number does not exceed more than ten in the analyzed sample.

DRILLING PREDATION

It was observed during the present study that some micromolluscs had distinct holes on their shells which were drilled by predatory gastropods i.e. naticids and muricids. A quantitative analysis suggests that *Chione imbricata* was heavily fed upon by antacids. About 14.78 % of the shells of this bivalve were observed to have bores made by predatory gastropods (Table-I). Out of total bored shells 13.47 % were bored by naticid gastropods whereas only 1.30 % was observed to have muricid holes. Most of the holes by naticids were observed to be restricted to in the umbonal area whereas few shells (about 2.18 %) were observed to have holes on other parts of the valves. None of the muricid bores were found on the umbonal area of valves. No shell of *Didimacar tenebrica* was observed to have any sign of predation by muricids or naticids.

Table 1. Frequency of bores made by predatory gastropods on shells of three common bivalves.

Species	No Bores	With Naticid Bores		With Muricid Bores
		Umbonal Area	Other Shell Parts	
Chione imbricata	588 (89.22%)	78 (11.30 %)	15 (2.17 %)	9 (1.30 %)
Donax nitidus	162 (90.00 %)	-	18 (10.00%)	-
Tellina sp.	177 (90.77%)	-	18 (9.23%)	-

Other species which was observed to have holes made by gastropods were *Donax nitidus*, *Corbula erythraeensis*, *Dosinia alta*, *Timoclea arakana* and *Tellina nitens*. In these species only a few shells were observed to have typical naticids bore, however, these holes were mainly found in main body of the valve and umbo was not the preferred site for drilling by predatory gastropods. No gastropod or scaphopod shell was observed to have any predation signs.

Although no micro-molluscan naticid or muricid was collected during the present study, however, a number of species of such predatory species are known from the area. *Eunaticina papilla, Eunaticina pomatiella, Glyphepithema marochiensis, Natica (Tanea) lineata, Natica (Natica) tigrina, Natica (Natica) tigrina maculosa, Natica (Natica) ponsonbyi, Natica (Natica) pulicaris, Natica (Natica) queketti, Natica (Natica) vitellus, Polinices (Glossaulax) didyma, Polinices (Mamilla) mamilla Polinices (Mammilla) fibrosa,, Polinices (Polinices) pyriformis, Sinum cuvierianus, Sinum haliotoideum, Sinum neritoideum* and *Sinum planulatum*, are known to occur in coastal and offshore waters of Pakistan and are known to prey upon bivalves and other mollusks (unpublished data). *Polinices (Glossaulax) didyma* and *Polinices (Mamilla) mamilla* seem to be more common on sandy beaches and nearshore sandy/sandy cum muddy bottom and are considered to be voracious predators. Although a large number of muricids also known to occur in the area, however, it seems impossible to indicate any species or genus that specifically feed upon bivalves of sandy shore and similar habitat in the area.

CONCLUSION

The study which forms first on the series of articles on the micro-molluscan communities occurring on the shore of Pakistan, reveals a well diversified community of bivalves, gastropods and scaphopods occurring on sandy beaches. It also indicates that predation by naticids was one of the important causes of the mortality of the bivalves occurring in the area, thus, and micromolluscs form an important link in the food chain of the sandy shores. The study also tends to suggest that shells of a number of bivalves and gastropods that inhabit rocky substrates, after their death and decay found their way to sandy shores and help in beach development mechanism.

REFERENCES

Kay E.A. and K. Kawamoto (1983). *Micromolluscan assemblages in Mamala Bay, O'ahu, 1974-1982.* Water Resources Research Center, University of Hawaii at Manoa. Tech Rep. 158:1-73.

Kay E.A and K. Kawamoto (1987). *Micromollusk monitoring at Barbers Pt. sewage outfall O'ahu, Hawai'i.* Water Resources Research Center. University of Hawaii at Manoa Tech Rep. 162:1-47.

Khan M.D and S.G. Dastagir (1971). On Mollusca: Gastropod-fauna of Pakistan. *Rec. Zool. Surv. Pak.* 2:17-129.

Khan M.D and S.G. Dastagir (1972). *On the mollusca pelecypod fauna of Pakistan*. The Agricultural Research Council Pakistan. Islamabad. 40 pp.

Melvill J.C (1898). Further investigations into the molluscan fauna of the Arabian Sea, Persian Gulf and Gulf of Oman with descriptions of forty species (mostly dredged by F. W. Townsend Esq.). *Mem. Proc. Manch. Lit. Phil. Soc.* 42: 1-40.

Melvill J.C (1928). The marine Mollusca of the Persian Gulf, Gulf of Oman and North Arabian Sea, as evidenced mainly through the collection of F. W. Townsend 1893-1914, Addenda, corrigenda and amendeda *Proc. Malacol. Soc. Lond*. 18: 93-117.

Melvill J.C and R. Standen (1901). The Mollusca of the Persian Gulf, Gulf of Oman and Arabian sea, as evidenced mainly through the collection of Mr. F. W. Townsend 1893-1900 with descriptions of new species. *Proc. Zool. Soc. Lond.* 2: 327-460.

Melvill J.C and R. Standen (1906). The Mollusca of the Persian Gulf, Gulf of Oman and Arabian Sea, evidenced mainly through the collections of Mr. F. W. Townsend, 1893-1906; with descriptions of new species. Part. II. Pelecypoda. *Proc. Zool. Soc. Lond.* (1906): 783-848.

Oliver P.G (1995). Bivalves. *In:* Dance SP. ed. *Seashells of Eastern Arabia.* Motivate Publishing, Dubai, UAE. 194-281.

Ranjha A.R (1960). Edible molluscs of Pakistan. *Proc. 4th Pan Indian Ocean. Congr. Ser. B*: 167-171.

Subrahmanyam T.V, K.R. Karandikar and N.N. Murti (1949). The marine Pelecypoda of Bombay. J. Univ. Bombay 17: 50-81.

(*Accepted for publication February 2007*)