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# Molluscan Shell Diversity of Ennore Creek, Chennai, India

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**Abstract:** Molluscs are the soft bodied invertebrates, which are protected by calcium carbonate shells. The shells are coated mostly with calcium carbonate and protein matrix in a process called bio-mineralization. Apart from playing a major role in the aquatic ecosystem, they are considered to be best bio-indicators of environmental pollution, as their soft tissues, and their shells are known to accumulate the pollutants. The divers patterns and different shell morphologies of the clams, snails and oysters, seem to be influenced by the solar radiation, predator stress and various environmental factors, which seem to regulate the gene expression patterns of the shell formation. In the present study, different molluscan shells were collected and studied for their diverse patterns. They were collected from Ennore, creek of Tamil Nadu, India as it is known to be a lagoon type of ecosystem and plays an important role in maintenance of the aquatic ecosystem surrounding it. The present study showed a diverse shell patterns mostly with reference to clam shells. A few, oyster shells, cerithiid shells and potaminind shells were also observed. A detailed analysis of the shell patterns under the influence of various external environmental cues may be investigated in future.

**Keywords:** Molluscan shells, Bio-mineralization, Bio-indicators, Ennore Creek, Clam shells

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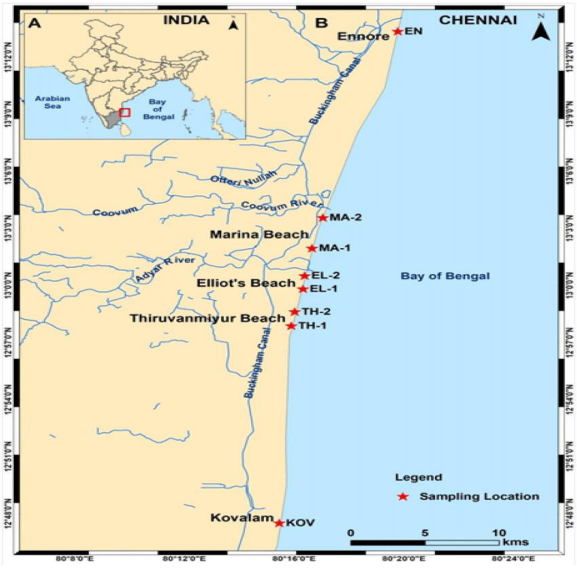
## Introduction

Molluscs are the 2nd largest invertebrate group and are quite successful in evolution. These are soft bodied invertebrates which are effectively protected inside a shell which is secreted by the mantle cavity. The shell is ideally made of calcium carbonate, which helps the animal not only to support its body but also shields them from predators (Marin and Luquet, 2004). Molluscs which are shelled are referred to as conchiferans. These shelled molluscs are plentiful and comprise of most divergent group of invertebrates, which represent extant and extinct groups (Jackson *et al.*, 2007; Caze *et al.*, 2011, 2015). Molluscs are also known, as contributors for aquatic and terrestrial ecosystems, as for litter decomposition, contribute as biomass at different trophic levels. A number of primary and secondary consumers such as echinoderms, fish, birds and mammals feed upon these molluscs (Jörg and Ulrike, 2002). Besides playing an important role in ecosystems, molluscs are also known to accumulate pollutants, in their bodies and also in their shells, and therefore considered to be the best bio-indicators to track the environmental pollution

changes. The advantage of molluscs acting as bio-indicators is that, though they are soft bodied, they seems to show less consist body changes in response to pollutants and these changes can be recorded all through their life time and can also be preserved even after their perish (Carriker *et al.*, 1982; Thorn*etal.*,1995; Huanxin *et al.*, 2000; Yasoshima and Takano, 2001). Based upon these instances, it is obvious that molluscan body and their shells seem to play an important role in the maintenance of aquatic ecosystem and also as bio-indicators of environmental pollution and therefore the present study, was undertaken to understand the biodiversity of molluscs in Ennore Creek of Tamil Nadu, India. Molluscan shells were collected from the Ennore Creek, the back waters present in Tiruvallur district, which is bound by Pulicat lake on the north and Manali marshlands in the south. Ennore Creek, is a type of lagoon ecosystem and plays an important role in maintenance of aquatic ecosystem.

## Materials and Methods

Molluscan shells, belonging to different classes were collected from the shore of Ennore creek, Tiruvallur district of Tamil Nadu, India. The following map depicts the location of Ennore lake in Tamil Nadu, India:




The shells were handpicked and cleaned of sand and were brought to the laboratory at Department of Zoology, University College for Women, (UCW), Hyderabad, Telangana, India. The shells were thoroughly cleaned using 70% ethanol and were placed in Ziploc covers and preserved for further study. Shells mostly belonging to bivalvia and clam shells were collected as they were present in large numbers. Photographs were taken using a high resolution camera. Dorsal and ventral views of the shells have been pictured.

## Results and Discussion

The present study showed that there was diversity in the shells collected and preserved. In the present study following molluscan shells were collected:

*Cerastoderma edule* Cardidae bivalve shell (Fig. 1); Naticids (Moon shell) Bivalve shell (Fig. 2); *Tridacna gigas* (Linnaeus, 1758) Clam shell (Fig. 3); Cerithiid shell (Fig. 4); *Pinna nobilis* Clam Shell (Fig. 5); Potamidid shell (Fig. 6); *Crassostrea madrasensis* Preston, Oyester Shell (Fig. 7); *Donax variabilis* Wedge Calm Shell (Fig. 8); *Venerupis pullastra* (Montagu,1803) Pullet carpet shell (Fig. 9).

Fig.1: *Cerastoderma edule* Cardidae bivalve shell.

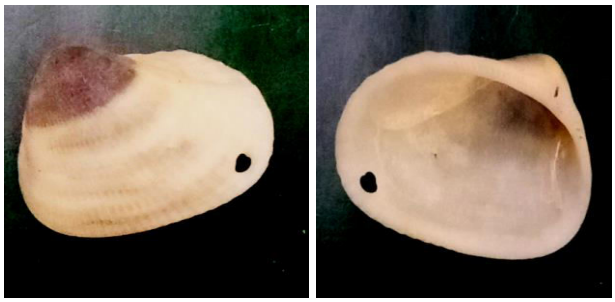


Fig. 2: Naticids (Moon shell) Bivalve shell.

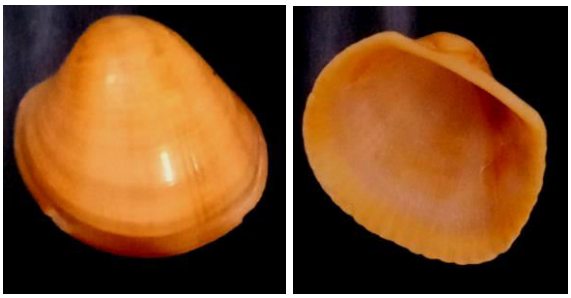


Fig.3: *Tridacna gigas* (Linnaeus, 1758) Clam shell.

Fig.4: Cerithiid shell.

Fig. 5: *Pinna nobilis* Clam Shell.

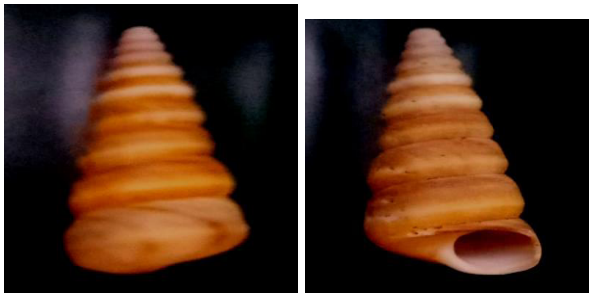


Fig. 6: Potamidid shell.

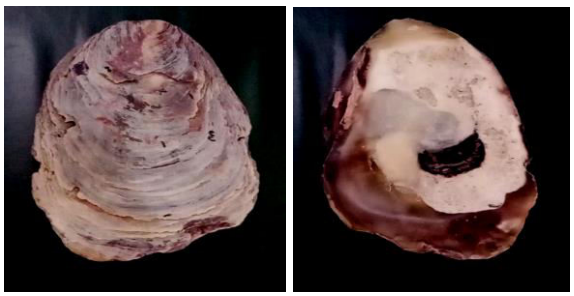


Fig. 7: *Crassostrea madrasensis* Preston, Oyester Shell.

Fig. 8: *Donax variabilis* Wedge Calm Shell.

Fig. 9: *Venerupis pullastra* (Montagu,1803) Pullet carpet shell.

In the present study about the molluscan shells, a distinct diversity of shell patterns were observed. Of the different shells collected, bivalve shells were most common and they presented distinct growth lines on their surface. The general composition of molluscan shell is mostly calcium carbonate (95-99%) and the rest 1-5% is made of organic matrix (Saleuddin and Petit, 1993) consisting of proteins such as nacrein and peralin. The different shell structures and their diverse morphological patterns, reveal a intricately designed and orderly arranged combinations of bio-minerals, which seem to have a phylogenetic and functional significance as suggested by Taylor *et al.* (1969) and Taylor *et al.* (1973). It is interesting to note that, several biotic and abiotic factors are known to influence the molluscan shell structures. Additionally the periodic changes in emersion and desiccation patterns of the intertidal zone and also the intense heat from solar radiation seem to cause changes in the shell patterns of mollusks (Clark *et al.,* 2020). Timmins *et al.* (2014) and Wei *et al*. (2015) have observed that shell proteins of mollusks are known to drastically change in response to the environmental changes. These changes which are observed in the shell structures, are not similar and uniform across

species. The changes in the shell patterns seem to be driven by specific external stimulus or may be due to a predation threat perceived by chemical cues (Appleton and Palmer, 1988; Freeman *et al.*, 2009) and there seems to be a underlying tightly regulated gene function in the process of mineralization of molluscan shells, as opined by Clark *et al.* (2020). In the present study, diverse changes in the shell patterns have been observed. These different patterns observed in the bivalve shells and calm shell seem to be under influence of various environmental factors, predatory stress and also atmospheric pollutants which may indirectly affect the gene expression pattern and transform the process of bio-mineralization. A detailed analysis of different shell patterns and their ecological and physiological functional significance may be undertaken in detail in future .

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