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Morphology, Biochemistry and Distribution of *Villorita cyprinoides* and *Meretrix casta* (Bivalve) Shells in Vembanad Estuary, Kerala, India

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Abstract

Estuaries are among the most commercially significant ecosystems on the earth, and they provide different habitats for numerous bivalve species. The Clams are one of the most widely distributed and used aquatic bivalves, providing much more protein-rich food than mussels and oysters. The Vembanad Estuary is one of the richest clam fisheries coastal wetland in Kerala. The present study focusing on comparatives ofmorphology and biochemistry of *Villorita cyprinoides* and *Meretrix casta* shells in Vembanad Estuary. It also attempts to understand the variations in clam distribution caused by salinity fluctuations and sediment texture. According to the morphological and morphometric analysis, medium size shells were found in greater abundance in both species. A total of 306 shells of *V. cyprinoides* and 169 shells of *M. casta* were obtained from the ten sample locations of Vembanad Estuary. The density of *V. cyprinoides* shells (192) was higher in the southern part while the northern portion of Vembanad Estuary represented by *M. casta* shells (108) with comparatively lower density. *V. cyprinoides* has a negative linear correlation with salinity, as indicated by R^2 of 0.96. *M. casta*, on the other hand, exhibits a positive correlation with salinity, with 0.94 linear coefficient. *V. cyprinoides* was more prevalent in clayey and silty sediments, while *M. casta* was more common in sandy sediments. The X-ray Fluorescence (XRF) analysis showed that the Calcium Oxide percentage of *V. cyprinoides* and *M. casta* shells were 39.47% and 38.72%, respectively, while all other metal oxides were present only in trace amount.

Keywords: Bivalves, *Villorita cyprinoides, Meretrix casta,* Major Oxides,Vembanad Estuary

Introduction

Estuaries are among the most commercially important environments on the planet and provide a variety of habitats for various bivalve species (Costanza *et al.*, 1997). The living forms of bivalves are entirely aquatic, with the highest abundance in both seawater and freshwater (estuarine or backwater). The organisms in this class have lived since the Cambrian period and continue to Present day. The bivalves are also known as Pelecypods or Lamellibranchiata, are the second largest class of Mollusca. Linnaeus (1758) was the first to give this group the name "bivalvia". Bivalvia consist of two valves (shells) that are normally identical, equal in size, but mostly inequilateral. Valves are located laterally on either side of the organism and are held together by a strong muscle. The right and left valves are identical and shows bilateral symmetry by passing the symmetry plane parallel to the ventral margin of the shell (Senthil, 2019). Many environmental factors, including latitude (Beukema and Meehan, 1985), depth and type of bottom (Wie *et al.*, 2020), tidal level (Tran *et al.*, 2020), sediment type (Kanaya *et al.*, 2005), and burrowing behaviour (Knaust, 2015), are known to influence shell morphology, size, shape and selective proportions of bivalve species. The hard calcareous shells are the result of a mineralization process that is physiologically and genetically designed by the species. The shells consist diverse types of $CaCO_3$ such as aragonite, calcite *etc.* Aragonite is found in prismatic, nacreous, crossed lamellar, complex crossed lamellar, and homogenous structures. Calcite is commonly found in prismatic or foliated structures (Adarsh and Senthil, 2018). For bivalves, growth increments or rings in shells are used to record the time. Because development rate of animals are mostly determined by environmental factors, alterations in skeleton biochemistry provide a dependable archive of environmental variables encountered by species (Kennish and Olsson, 1975). Shells are thus exploited as biological archives for paleo-environmental and paleo-climatic conditions. Additionally,the nutritional value of edible molluscs can be estimated using biochemical composition (Celik *et al.*, 2014). All the biochemical conditions of shells are influenced by various factors like salinity, sediment composition, temperature, water flow, larval transport and chemical pollutants (Mckeon *et al.*, 2015; Galtsoff, 1947; Korringa and Postma, 1957).

Clams, scallops, mussels, oysters, and shipworms are among the most common bivalve species. Among them clams are one of the most widely distributed and used aquatic molluscs, offering

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