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A study on species diversity of gastropods and bivalves in Kannur, South-West Coastal Area, Kerala

Malavika V
Student, Department of Biology, The Gandhigram Rural Institute, Deemed to be University, Tamil Nadu, India

Abstract
The study was conducted on the diversity and distribution of bivalves and gastropods in South-West coastal area precisely Kannur district of Kerala, carried out in three different sites namely Thalassery (11.7533°N, 75.4929°E), Dharmadam, (11.7775°N, 75.4703°E) and Muzhappilangadu (11.7972°N, 75.4470°E) during low tide and moderate sunny morning of November 2020. A total of 11 species of marine gastropods and 13 species of marine bivalves representing 9 and 7 families respectively were identified in relation with the shell obtained, colour, pattern, types of coiling and other morphological aspects of shells. A set of gastropods and bivalves were identified from the study based on their species diversity and features. A solid understanding of mollusc is now more relevant and timely than ever before. This is because human are beginning to fully appreciate that the marine environment and the organisms that live in that environment are critical to well-being and survival of the flora and fauna.

Keywords: South West Coast, bivalves, gastropods, marine environment, flora and fauna

Introduction

Phylum Mollusca includes soft bodied animals with numerous colour and style of patterns typically coated by a shell. Of all the mollusk categories the gastropods and bivalves area are those that attract most human interest as a result of shells used for each industrial, commercial and domestic functions. The coloration on the shells provides visual attractiveness and as a result utilizes in creating decorative and decoration things. The biological remains of invertebrates and vertebrates embrace shells, carapace, skeletons, bones etc. Among these the mollusc shell remains for a protracted time as sediments in water interface as a result of sturdiness or durability. Therefore the sturdy shells area unit is used within the ornament business additionally as utilized in amateur collections.

Animal scientist area unit of the opinion that categories phylum Mollusca don't exhibit homogeneity, solely internal anatomical options shows similarity with interrelationships (Hegner., 1933) [19]. These area unit in all probability one hundred thousand living and a decent variety of fossil species (35,000) in phylum Mollusca (Kotpal., 1976) [27]. Molluscs are extremely reconciling and occur in each aquatic and terrestrial environment. But most of the species are marine forms, fresh (snails and clams) and land species (slungs and snails) happens solely to the category bivalve and univalve severally. An oversized variety of evolutionarily flourishing molluscs are nonetheless while not a scientific name and plenty of molluscs are also dominant in habitats. The giant squid with a length of regarding fifty feet is that the largest of all invertebrates (Apte., 2015) [1].

The mantle cavity and associated organs along with the buccal mass and also the radula are the fundamental molluscan options though every of these have been lost in sure lineages (Brandt, 1974). The main developments of molluscs together with section shifts in several coastal and body of water scheme is dominated by suspension feeding bivalves (Richard, 2016).

The mollusc shell is secreted by its mantle. The abnormalities and disruption of mantle are often the rationale for amendment in form, kind and color of shell. Because the organism faces unfavorable condition the mantle ceases to provide shell. The shell formation is additionally associated with the secretion of ammonia originated from organic compound mostly the urea. The ammonia particle will increase the pH of additional pallial fluid flavoring the carbonate deposition. Most of the shells of marine molluscs inflexible rather simply, and fossil mollusc shells date all the means back to the Cambrian period. Giant amounts of shell typically forms sediment, and over an earth science timespan will become compressed into sedimentary rock deposits.

Gastropods are in all probability are the foremost flourishing category of molluscs. It includes quite thirty five thousand species of the microscopic forms to some marine snails that reach a length in way over a pair of feet. Majority of the species are herbivores, some carnivores and few parasites additionally (Cockrum, et.al, 1965) [8] and are found in aquatic additionally as terrestrial home ground.

Class bivalvia includes solely aquatic organisms. This category contains a long history and there are fossil records that chemical analysis back to Cambrian era. The members of this category get pleasure from wide distribution in habitats like mangroves, salt marshes, coral reefs, rocky coasts, sandy beaches, estuaries and sea-grass bed (Gosling, 2003) [15]. Bivalves comprise of just about fifteen thousand species, and are unit tailored to the benthal home ground, and safe from predators.

Gastropods and bivalves play a vital role in ecology and economy. For instance, the univalve *Biomphalaria glabrata* is associate degree host for parasitic flatworms which will cause infestation schistosomiasis in humans (Fneich, 2013)

[11]. Gastropods additionally play a vital role as bio-indicators for trace metal pollution since the flexibility to accumulate metals to high concentrations (Gupta and Singh, 2011) [16]. For instance, *Cerithium scabridum* are used as a bio-indicator for a study of the Kuwait coast (Bu-Olayan and Thomas, 2001). Bivalves are filter feeders that contribute to the organic turnover within the seacoast zones of marine and freshwater ecosystem (Newell, 2004) [33].

Besides, gastropods and bivalve contribute macromolecule or protein supply for humans (Hamli, 2012) [17]. As a result of the aesthetic and cuisine appeals, marine molluscs receive a lot of attention than alternative molluscs (Subba Rao, 1993). Numerous species are used for several functions besides nutrient sources. For instance, marine bivalves inside the Indian marine home ground are reportable as potential sources of antiviral medicine (Chatterji, 2002). Moreover, bivalves contribute to the globe economy like oyster farming that is a vital business in Japan and plenty of alternative countries bordering the Indian and Pacific Oceans (Chellam, 1991) [7].

According to Robert.W.Hegner, all categories of molluscs don't seem to be uniform however solely internal anatomy shows similarity. The Phylum molluscs comprise of large choice of species during which gastropods and bivalves exhibits distinctive options. The current study aims at determination of the taxonomy and variety in Kannur coastal space. The expedition results a motivating array of field skills and keen observation in invertebrate discovery of south geographical region. The marine gastropods typically exposes to fluctuation and environmental factors. The most chemical property of aquatic medium is salinity. They are principally diffusion or osmotic conformers. This conformity is expressed as a parallel amendment in blood particle concentration (Kilburn., 1994). The most significant and the biggest home ground in earth is marine setting that covers seventy one percent of planet's surface, ninety nine percent of living way, largest repository of living matter, primary production, numerous array of living forms from microscopic virus to largest living animal (Philip. V. Mladenov, 2013) [32]. The marine system of our planet provides wealthy supply of food and stabilize climate. It provides with a large vary of biomolecules that is vital in medicative and engineering field. Marine scheme supports the recreation and also the improvement in tourism and business field. Human activities like disposal of sewage, over fishing, coastal developments, nutrients pollution, unfold of exotic species and also the greenhouse gases cause severe impact on marine scheme.

An invertebrate shell is maintained by the formation of its mantle. The abnormalities and disruption of mantle causes the amendment in form, kind and color of shell. When the organism faces unfavorable condition the mantle ceases to supply shell. Once things become favorable, the mantle is back to operate, a “growth line” is made. The shell secreting space is detected in early embryonic stage. The associate degree germ layer space or the ectodermal area increases its thickness and invalidates to make “shell gland". The form of the organ depends to the structure of adult shell in gastropods and in bivalves it forms the groove and later to hinge line between two shells, wherever connected by a ligament. The invagination of the glands can bring the assembly of external shell. Within the thick, a peristrocum, a scaffold for shell development is made. It permits in depositing shell in everted kind. Enzymes like carbonous anhydrase, alkalescent enzyme aminoalkanoic acid oxy-oxidase etc. square measure concerned within the formation of shell.

Exoskeleton, within the type of chalky or calcareous shell, is seen in most of them except Aplacophorans, Nudibranchs and most Octopuses. Most of the organisms bear external shell and few have internal. Cephalization is well occupied in gastropods. The visceral mass is closed by a pallium that secretes spicules that may be a distinctive feature of molluscs.

Molluscan shells kind a very important staple for several calcium carbonate based mostly industries. Lime burning business is common in Kerala, Tamil Nadu, province, province and lots of different states in Republic of India. The burned shells square measure used for the assembly of lime hydrate and poultry feed. In Kerala, shells play a very important role within the economy of the native fishermen living around certain lakes that are heavily inhabited by clams.

The shells of chank (*Xancus*) and abalone (*Haliotis*) measure thick and sturdy and might be delve any desired form and polished. The thick shells of molluscs are used for the manufacture of bangles, buttons, ornamentals articles, etc. The shells are utilized in shell craft business for the assembly of the many decorative things and curios. The shells contribute mostly to menage implements like trumpets, vases, lamps, dishes, and different receptacles. The operculum is employed as associate degree adhesive in creating incense sticks. The cuttlefish bones, washed onto land are collected and used for sprucing wood and glass. Some shells acknowledge for shell, normally referred to as mother of pearl, employed in ornamental inlay work. Chank has spiritual importance and is wide used as a trumpet in temples.

Sinistral Chanks (shells with anticlockwise coiling) are thought-about as a harbinger of fortune to its human.

Molluscan shells, by virtue of bright colors, marvelous shapes and styles, and abundance on shore, have long been used for ornaments, tools, and coins. The rarest, the foremost valuable, and therefore the most stunning shells square measure those of some molluscs inhabiting the tropical and subtropic waters of the Indo-Pacific, Carribian and Mediterranean regions.

Outstanding among them square measure some members of the families mollusk family (cowrie shells), Conidae (cone shells), Volutidae (volute shells), Nautilidae (Nautilus) and Muricidae (rock shells). The rarest and therefore the most fascinating species in Indian waters embody *Conus gloriamaris* (‘glory of the sea’) and *Conus milneedwardsi* (‘glory of India’). Cowries are meant to thought-about as jewels of the ocean. They were used as decorative things in addition as cash in past days.

The ‘osmena pearl’ is obtained from Nautilus shell. Decorative ocean shells measure wide exported from Republic of India; India includes a share of concerning five % in world shell market (Baskaran, 2015).

However, a vital understanding of mollusk and malacology is now more relevant and timely than ever before. This is because human are beginning to fully appreciate that the marine environment and the organisms that live in that environment are critical to well-being and survival. The present study aims to determine the taxonomy and diversity of molluscs, especially gastropods and bivalves, in the coastal areas of Kannur.

Materials and Methods

1. Study Area

For the present study, different sites such as Thalassery (11.7533°N, 75.4929°E), Dharmadam, (11.7775°N, 75.4703°E), Muzhappilangadu (11.7972°N, 75.4470°E) were selected in Kannur, South West coastal area, Kerala.

2. Sample Collection and Method

The molluscs shell was collected in the month of November 2020 during low tide and moderate sunny morning from three different sites in Kannur, namely Thalassery seabridge, Dharmadam beach and Muzhappilangadu beach. Samples were collected by hand picking from all the three spots in separate plastic bags with clear labeling. The collected samples were then cleaned, dried and stored. The samples were then separated on the basis of their class, Gastropoda and Bivalavia. The species were identified with the aid of books and journals. Then the species were classified according to above mentioned morphological characters to get a conclusion about the diversity of molluscs and their importance.

Results

The name, class and family of gastropods and bivalves collected from the Kannur coastal area were presented in table 1 and 2. Distribution of bivalves and gastropods and Diversity of species distribution were presented in Fig.1 and 2. Family wise species diversity of Gastropods and bivalves were presented in Fig.3 and 4.

Table 1: Gastropods collected from the Kannur coastal area

Sl. No	Name of Species	Class	Family
1	*Olivia ouini*	Gastropoda	Olividae
2	*Entemnotrochus rumphii*	Gastropoda	Pleurotomaraiidae
3	*Subulina octona*	Gastropoda	Achatinid
4	*Telescopium telescopium*	Gastropoda	Potamididae
5	*Naria erosa*	Gastropoda	Cypraeidae
6	*Hexaplex trunclus*	Gastropoda	Muricidae
7	*Turritella attenuate*	Gastropoda	Turritellidae
8	*Entemnotrochus adansonianus*	Gastropoda	Pleurotomariidae
9	*Urosalpinx cinera*	Gastropoda	Muricidae
10	*Gyrineum natator*	Gastropoda	Cymatiidae
11	*Littorina littorea*	Gastropoda	Littorinidae

Table 2: Bivalves collected from the Kannur coastal area

Sl.no	Name of species	Class	Family
1	*Dosinia discus*	Bivalvia	Veneridae
2	*Donax trunculus*	Bivalvia	Donacidae
3	*Placuna placenta*	Bivalvia	Placunidae
4	*Anadara transversa*	Bivalvia	Arcidae
5	*Dosinia exolata*	Bivalvia	Veneridae
6	*Perna viridis*	Bivalvia	Mytilidae
7	*Circe scripta*	Bivalvia	Veneridae
8	*Vepricardium asiaticum*	Bivalvia	Cardioidae
9	*Perna indica*	Bivalvia	Mytilidae
10	*Donax fossor*	Bivalvia	Donacidae
11	*Mactra stultorum*	Bivalvia	Mactridae
12	*Donax variabilis*	Bivalvia	Donacidae
13	*Cevastoderma galucum*	Bivalvia	Cardioidae

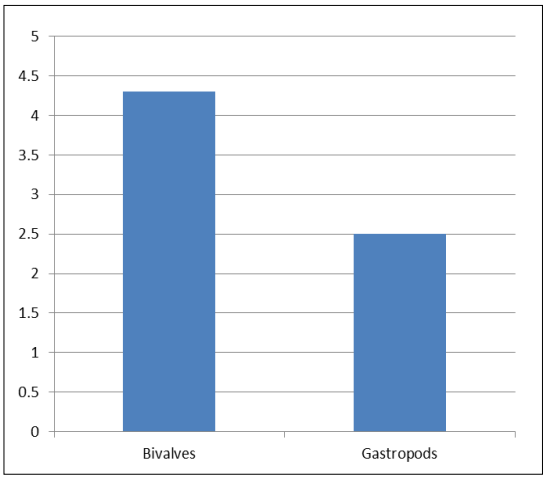

Fig 1: Distribution of bivalves and gastropods

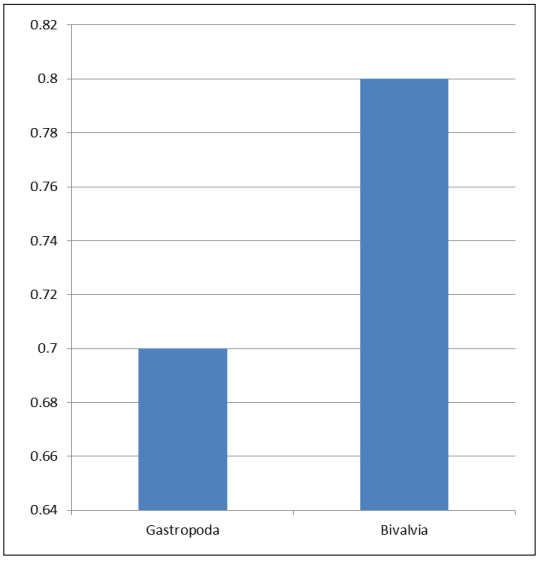

Fig 2: Diversity of species distribution

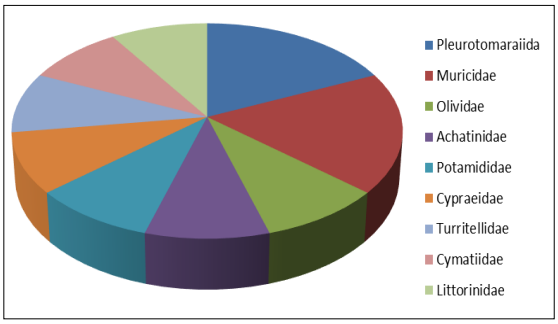

Fig 3: Species diversity of Gastropods (Family wise)

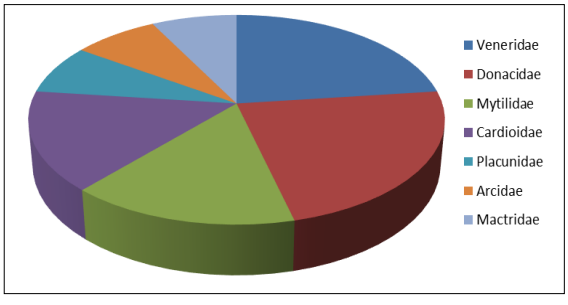

Fig 4: Species diversity of Bivalves (Family wise)

Conclusion

The present study documented 11 species of marine gastropods and 13 species of marine bivalves that are represented in 9 and 7 families respectively. The family Veneridae and Donacidae comprises of 3 species each and family of Mytilidae and Cardioidae comprises of 2 species each. Present study shows that the family Veneridae appeared to be the most abundant order. The most available quantity of bivalve species obtained from Kannur coastal area is *Dosinia discus.* In case of Gastropod, the families Pleurotomaraiidae and Muricidae consist of two species each and *Entemnotrochus rumphii* is the gastropod obtained in large number.

As per the whole study, it is clearly evident that the coastal area of Kannur district of Kerala is rich in bivalve species in terms of species diversity and number of species than that of gastropods. The study was very effective in recognizing wide range of mollusc species, in relation with the shells obtained. The molluscs with diverse colour patterns, number of ribs, type of coiling and other morphological characters. Bivalves and Gastropods are economically and ecologically important components of marine biology and are used as cultivable resource, healthy food source, source of lime, pearl, dyes, antiviral drugs, decorative shells, ornamentals, models of understanding deep sea diversification. The morphological compositions of these species are bivalves and gastropods gives information on habit, habitat and distribution along three different localities of the shoreline. The species were on sandy, shallow beaches and molluscs were mostly seen in these coastal tropical environments.

The current information deals with the species of bivalves and gastropods found in the most represented environments of south-west coastal area of Kannur. This list is an attempt to provide a more complete inventory of molluscs fauna of this region and binomial names.

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