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REGULAR ARTICLE

# SEASONAL VARIATIONS AND DISTRIBUTION OF SEA GRASS ASSOCIATED MACROFAUNA IN UPPANAR ESTUARY, SOUTHEAST COAST OF INDIA

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## SUMMARY

The occurrence of sea grass in relation to the distribution, relative abundance and seasonal variations along with the Physio-chemical parameters influencing the growth and distribution of associated fauna in Uppanar estuary, have been studied for a period of one year from April 2005 to March 2006. Totally three species of sea grass were collected. The sea grass showed definite levels of zonation. They also showed seasonal changes in growth pattern in relation to the changes in Physio-chemical parameters. Totally about three major groups of organisms i.e. Polychaetes, Crustaceans and Molluscs were recorded. The Molluscans were the most dominant organisms amounting to 41% and between this, Polychaetes above contributed to the tune of 37%. Crustaceans 19% and others 3%. The study area water quality parameters are favorable for juvenile and existence of different biotic communities in the estuary.

**Keywords**: Distribution, Physico-chemical, Seagrass, Macro fauna.

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## 1. Introduction

Seagrasses typically occur in shallow estuarine and marine waters with muddy, sandy or rocky bottom in temperate and tropical climates [1]. Among the most highly productive habitats in the world, seagrass beds are important to many assemblages of animals in aquatic ecosystems and providing excellent nursery habitat, food shelter for many organisms [2]. Juveniles utilizing seagrasses as a nursery will occupy the beds at different life history stages for each species, while different species will also utilize different parts of the seagrass beds [3]. Generalist species appear to be less influenced by the matrix than are specialist species [4, 5].

Estuaries are highly productive systems containing a high diversity and density of fish and invertebrates [6]. Whereas subtidal seagrass beds are generally known to act as important refuges for several fishes and invertebrates, increasing faunal diversity and species richness [7, 8].

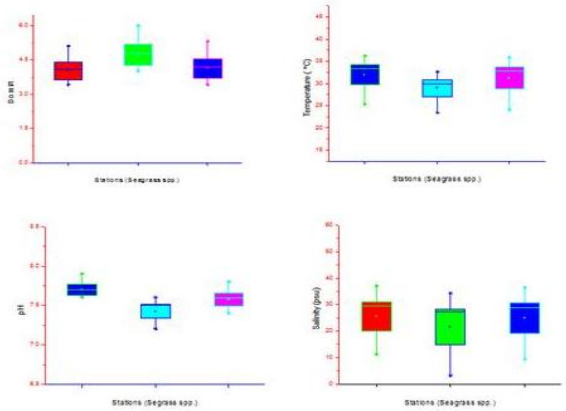
The faunal associations with plant communities have been receiving some attention

from various parts of the world. In India, the first comprehensive account of Indian ocean phytal fauna is from the rocky littoral zone of Vishakhapattinam coast [9]. There is very limited report on benthic fauna of seagrass communities from east coast. The main purpose of this study was to characterize a two dimensional macro faunal distribution its relationship with environmental parameters.

## 2. Materials and Methods

The present investigation was carried out at Uppanar estuary (Lat. 11o 42 N: Long. 79o49 E, Fig.1) covering stations 1, 2 and 3 at seasonal intervals for a period of one year from April 2005 to March 2006. For the estimation of various physico-chemical parameters such as, temperature was measured using a standard centigrade thermometer. Salinity was estimated with the help of a salino refractometer and pH was measured using on Elico pH meter (model L- 120). Dissolved oxygen was estimated by the modified Winkler's methods [10]. Seagrasses were collected from all the station at randomly placed quadrant (0.25m2) and three replicates were taken from each station sample was taken and transferred immediately in to a polythene bags. The samples were brought to the laboratory with polythene basins containing filtered seawater. Then the samples were fixed in 10% formaldehyde solution. Vigorous shakings in formalin solution dialoged most of the clinging animals. Small portion of the samples was taken in to Petri dish and carefully examined for every frond under a binocular microscope with strong incident illumination. The animal groups were sorted, counted and preserved for specific determination the quantitative data is expressed in terms of number of animals per unit weight of phytal fauna and analyze the diversity of associated faunal groups (species diversity, richness, evenness). The present study is focused in this line incorporating various hydrobiological and ecological parameters of the Uppanar estuary.

Figure 1 Showing the study area map

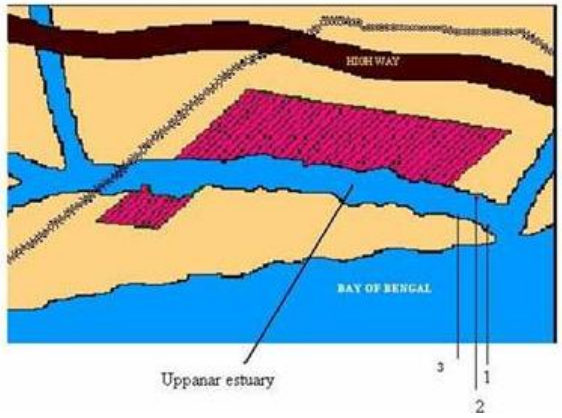


1. Station-I; 2. 1. Station –II: 3. Station -III

## 3. Results

The temperature varied from 23.4°C (monsoon-*Halophila ovalis*) to 36.2°C (summer-*Halophila beccarii*). The salinity ranged between 3.1psu (monsoon - *Halophila ovalis*) and 37 psu (summer-*Halophila beccarii*). The dissolved oxygen fluctuated from 3.4 (Post-monsoon - *Halophila beccarii* and summer *Halophila pinifolia*) to 6 ml/l (monsoon-*Halophila ovalis*) (Fig. 2).

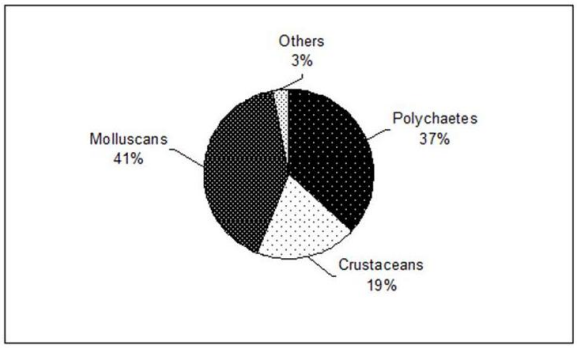
Fig. 2. Environmental parameters for three stations (Seagrass spp. wise). (a) Dissolved oxygen; (b) Temperature; (c) pH (d) Salinity (d), Data presented as mean (■) ±1 SE (boxes) and ±1 SD (whiskers). ▼: minimum; ▲: maximum



The pH fluctuated between 7.2 (Post-monsoon - *Halophila ovalis* ) and 7.9 (summer - *Halophila beccarii*). As many as 22 species of macrofauna were collected during the present study from all the stations. The overall percentage composition of macrofauna collected during various seasons is depicted in Fig.3. Molluscans were found to be the dominant group by constituting 40.92% of the total macrofauna recorded. Polychaetes formed the second dominant group with a percentage contribution of 36.7%. Crustaceans and "others" respectively with percentage contributions of 19.4% and 2.95% came next.

Among molluscans, species viz., Certhidea sp. *Umbonium vestiarium* and Littorina sp. were most dominant in the all seasons. Among polychaetes species as *Prionospio cirrobranchiata, Epidiopatra hupferina monrai* and *Capitella* species were leading in the all seasons. Among the crustaceans, the hermit crab species as Diogenes avarus showed consistency in their distribution during all the seasons.

Fig. 3. Overall sea grass associated macrofaunal percentage composition




Macrofaunal density varied markedly (4 to 60) in relation to seasons. While the minimum was recorded during post-monsoon season in *Halophila pinifolia*, the maximum was recorded during the summer season in *Halophila ovalis*. The number of species varied from 3 to 17. While the minimum was recorded during post-monsoon season in *Halophila pinifolia*, the maximum was recorded during the summer season in *Halophila ovalis*. The Shannon diversity ($log^2$) showed minimum value during post-monsoon (1.04 - *Halophila pinifolia*) and maximum in summer (2.645 - *Halophila ovalis*). With respect to Margalef richness (d), the minimum value was observed during (1.443-*Halophila pinifolia*) postmonsoon and maximum value (4.465-*Halophila ovalis*) in summer. In Pielou's evenness index (J'), the minimum value (0.8772–*Halophila ovalis*) was observed in premonsoon and maximum value (0.975–*Halophila beccarii* and *Halophila ovalis*) during monsoon.

## 4. Discussion

The physico- chemical parameters such as temperature, salinity, dissolved oxygen and pH showed different seasonal variations the bulk of rain falls was obtained during the north east monsoon and the pattern of rain fall influenced the physico–chemical and biological characters of the study area.

The recorded high temperature during summer at all the stations could be attributed to high solar radiation. The monsoonal low temperature could be due to strong land sea breeze, rainfall and cloudy sky. The high salinity values noticed during the summer season could be due to the solar radiation and neritic water dominance similar observation was recorded in Pitchavaram (India) mangrove, Kerala Coast and Thirumullvaram coast [11-13]. The pH was low during monsoon season due to the influence of fresh water, reduction of salinity, and decomposition of organic mater during premonsoon season pH was high because of the uptake of $CO_2$ by phytoplankton, similar observations were made in from Cuddalore (India) coast [14]. The high dissolved oxygen concentration was due to the sea grass photosynthesis and fresh water inflow in

monsoon season. Seagrasses form a unique habitat that is productive, faunally rich and ecologically important. So important are seagrass and adjacent habitats that up to 70% of commercial fish species are considered estuarine dependent and utilize these habitats at some time in the life cycle. These habitats may be the richest feeding grounds and nursery habitat in coastal waters.

In this investigation, seagrasses belong to the three species namely *Halophila ovalis, Halophila beccarii, Halophila pinifolia* were identified. The species composition as well as their seasonal occurrence is shown. These seagrass presented regular pattern of seasonal abundance in relation to changes in the physco-chemical parameters of the water over the estuary.

The relative abundance of seagrass maximum number of Halophila ovalis was seen in the monsoon and pre-monsoon periods. A sharp decline was observed in the subsequent month which represents a barren period of seagrass growth. The percentage occurrence of members of *Halophila ovalis, Halophila beccarii, Halophila pinifolia* increased during the monsoon due to regeneration of all the seagrass.

The faunal association noticed among the seagrass referred to as phytal fauna include polychaetes, crustaceans, molluscans and others. The distribution and abundance of phytal fauna appears to be influenced by biological as well as physical characteristics of phytal substratum and ambient medium [15, 16]. The faunal association, especially polychaetes was recorded more in the seagrass with good sediment retaining capacity. Among them, polychaetes were 37%, crustaceans 19%, molluscans 41% and others 3%.

Seagrass communities are functionally important as a living and productive habitat for large populations of fish and invertebrates, many of which are commercially important. Seagrasses are vital to the maintenance of the structurally compare ecosystem, where seagrass associated communities (benthos) are determined by seagrass species composition, abiotic condition and sea grass density.

Sea grass habitats support a diverse biotic community. Seagrass blacks are used for an epiphytic attachment, which contributes to overall seagrass primary production. Seagrasses provided numerous invertebrates with protection from predators by providing cover and interfering with predator feeding efficiency. Seagrass provided ideal nursery and feeding grounds for a diverse fish fauna. Diet movements of mobile fauna, primarily fish, occur between adjacent habitats and seagrasses bed.

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