

Hierarchical Analysis of Zooplankton Assemblages over Semidiel Pattern in the Lagoon of Kavaratti Atoll, Lakshadweep Archipelago, India

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Abstract: A hierarchical analysis of data concerning the zooplankton assemblages over a semidiel pattern were presented in the inside waters of Kavaratti lagoon. Gastropod larvae dominated in all time intervals throughout the study. The dendrogram matrix clearly indicated the community interrelationships expressed by this univalve molluscan group over semidiel pattern towards other groups of zooplanktons aggregated in the collections. Copepod varieties form a single separate cluster and showed its presence as an opportunistic invader to the lagoon ecosystem. In the lagoon the zooplankton assemblages and community structure seem to be clearly more balanced over the diel variation, which is clearly reflected in the cluster tree plotted.

Key words: Arabian Sea, hierarchical analysis, Kavaratti lagoon, semidiel pattern zooplankton assemblages

INTRODUCTION

Coral reef zooplankton is considered as an important trophic link between primary producers and higher trophic levels on reefs (Heidelberg, 2004). It has often been assumed that coral reef zooplankton largely came from surrounding oceanic water and their densities dramatically change from day and night in the water column (Roman *et al.*, 1990). However quantitative data on variations in the density of coral reef zooplankton with one to several hour intervals are scarce. (Goswami and Goswami, 1990; Madhupratap *et al.*, 1991). Since Goswami (1973) and Madhupratap *et al.*, 1977 classical work on the abundance and distribution of zooplankton, there has been no related comprehensive work on the Kavaratti lagoon of Lakshadweep archipelago. Besides these, however, no other published work seems to be available on zooplankton assemblages in a semidiel pattern using dendrogram matrix hierarchical cluster analysis in the inside lagoon of Kavaratti atoll.

The aim of this work is to study the semidiel variability of the zooplankton assemblages and their community wise interrelationship in sharing the same habitat at the Kavaratti lagoon of Lakshadweep archipelago using dendrogram matrix hierarchical cluster analysis.

MATERIALS AND METHODS

Study area: Union territory of Lakshadweep located in the Arabian Sea comprise a group of 11 inhabited islands,

17 uninhabited islands, 6 submerged sand banks and 3 coral reefs situated between 8° - 12° 30' N and 71° - 74° E. Kavaratti atoll is located along 10° 33' N 72° 36' E. The total area of Kavaratti lagoon is 4.96 Km² with an average depth of 2 m. The coral reef beaches of the lagoon are visible only during the low tide. The near shore lagoon bottom is flourishing by the macrophytes dominated by sea grasses and seaweeds.

Sampling details: Zooplankton sampling were made along the Kavaratti (Union territory of Lakshadweep) lagoon near shore (10° 33' 26" N 72° 37' 52" E), lagoon centre (10° 33' 46" N 72° 37' 49" E) and the reef region (10° 34' 00" N 72° 37' 42" E) (Fig. 1) during 23rd November 2009 in a semidiel cycle extending from 6.00 to 18.00 h. The sampling was carried out from surface lagoon waters by horizontal haul using a modified miniature bongo net (mouth diameter 0.2 m; overall length of 0.9 m and a mesh width of 50 microns) to avoid entangling and disturbances to the corals. The net was operated from the side of a fiber boat and a calibrated flow meter was equipped at the mouth to quantify the water filtered. The collected zooplankton were fixed in 4.0% seawater formaldehyde and counted using a Sedgewick rafter-counting chamber placed under a dissection microscope (Olympus SZ 60).

Statistical analysis: Cluster analysis was performed on zooplankton assemblage and the results are summarized by matrix dendrogram. Calculations were performed using the SYSTAT 8.0 version software.

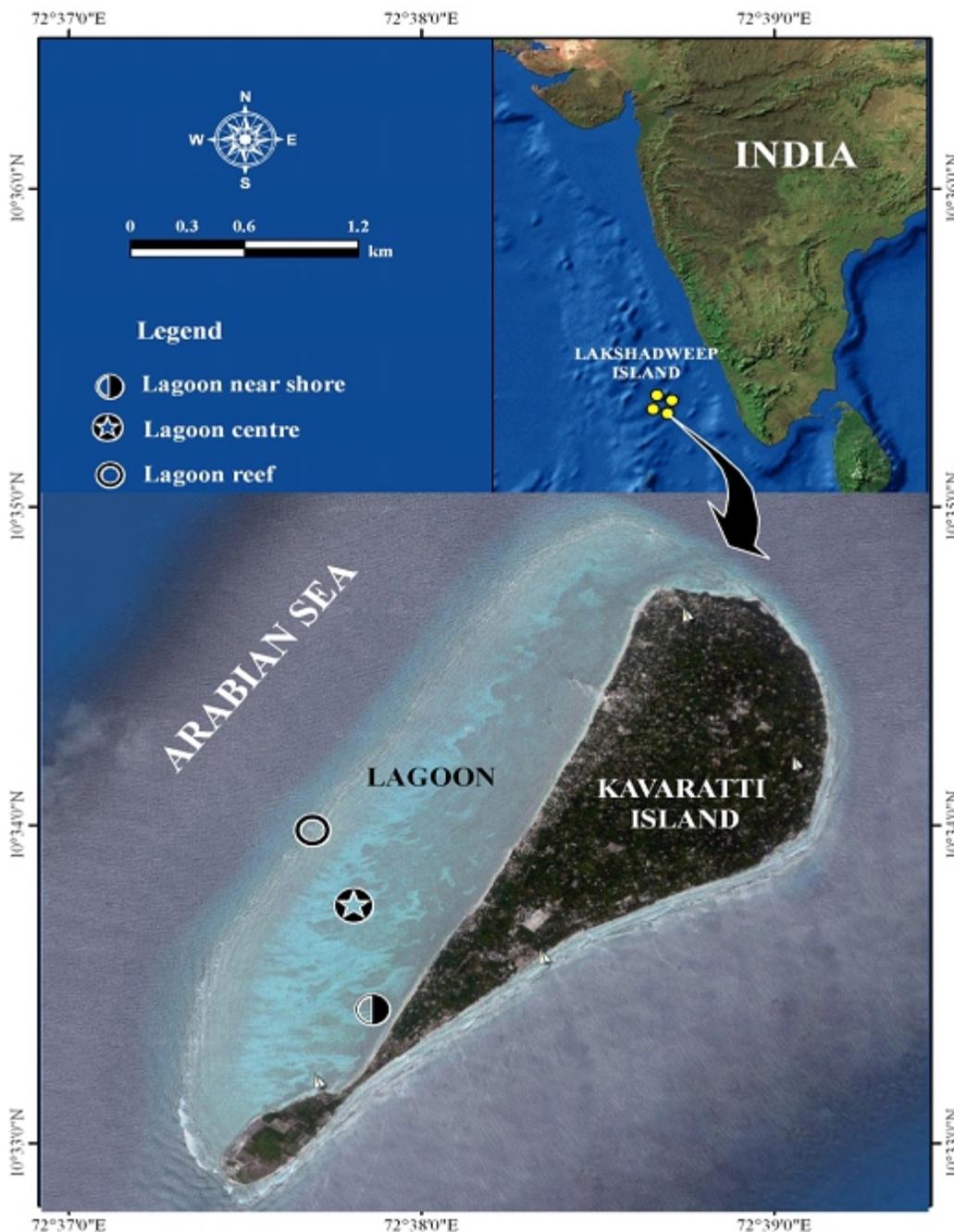


Fig. 1: Map showing the sampling points at Kavaratti lagoon, U.T. of Lakshadweep

RESULTS

The hierarchical dendrogram matrix tree shows that the zooplankton assemblages in the three studied sites in a site consisting of semidiel pattern dominated in majority by the molluscs, the gastropod larvae (Fig. 2 and 3). Figure 2(a-e) shows the time interval variation of zooplankton assemblages over a semidiel pattern in the

inside lagoon of Kavaratti atoll. The low Euclidean distance correlation exhibited in the form of a cluster by the dominant gastropod larval forms towards the other zooplankton groups such as hyperiids, cladocerans, euphausiids and tintinnids during 6.00, 12.00, 15.00 and 18.00 h was found prominent. However, in the Lagoon Centre and Lagoon Reef, higher assemblages of zooplankton and a cluster tree of four clusters showing

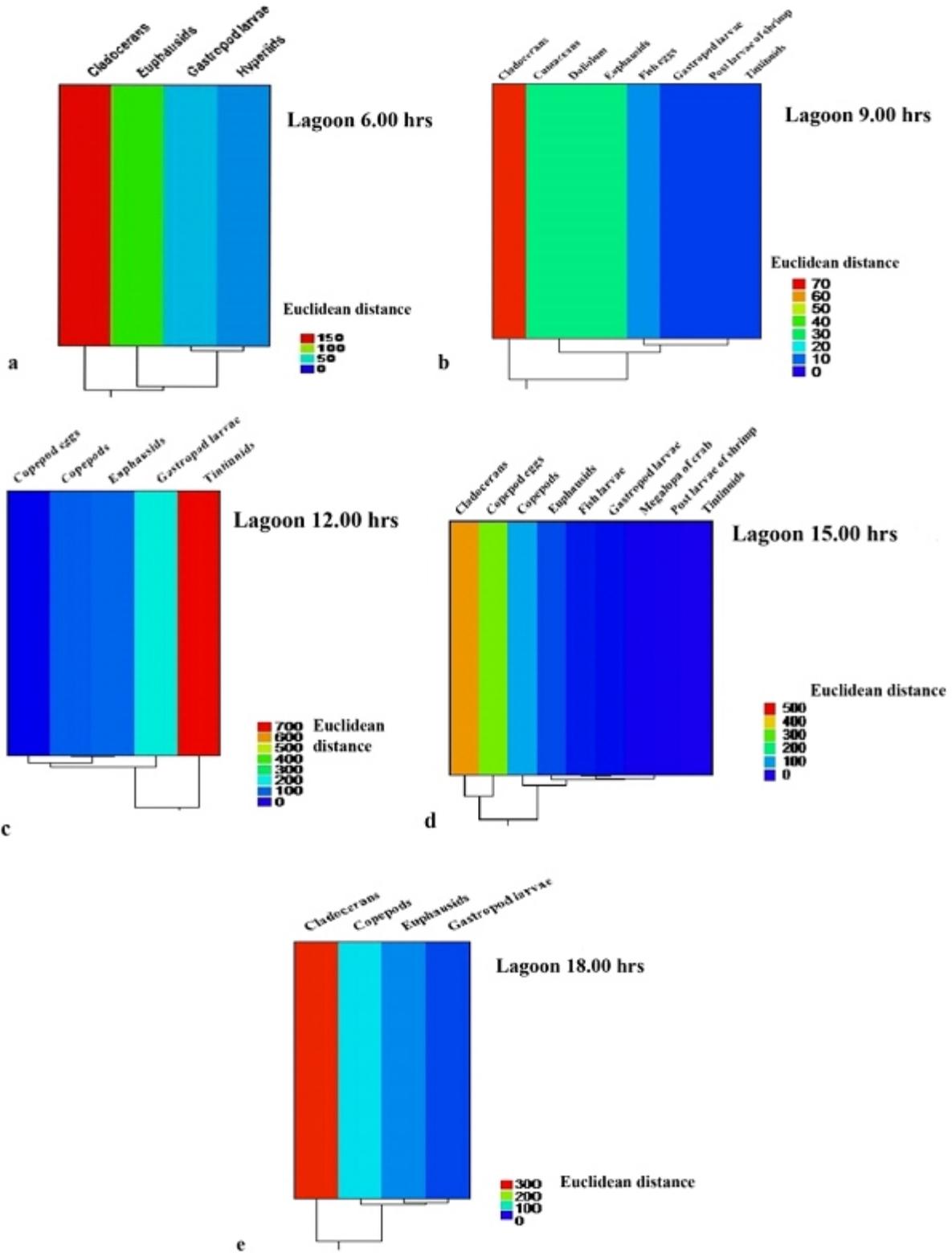


Fig. 2a-e: Dendrogram matrix resulting from classification analysis of zooplankton assemblages during semidiel cycle at Kavaratti lagoon nearshore

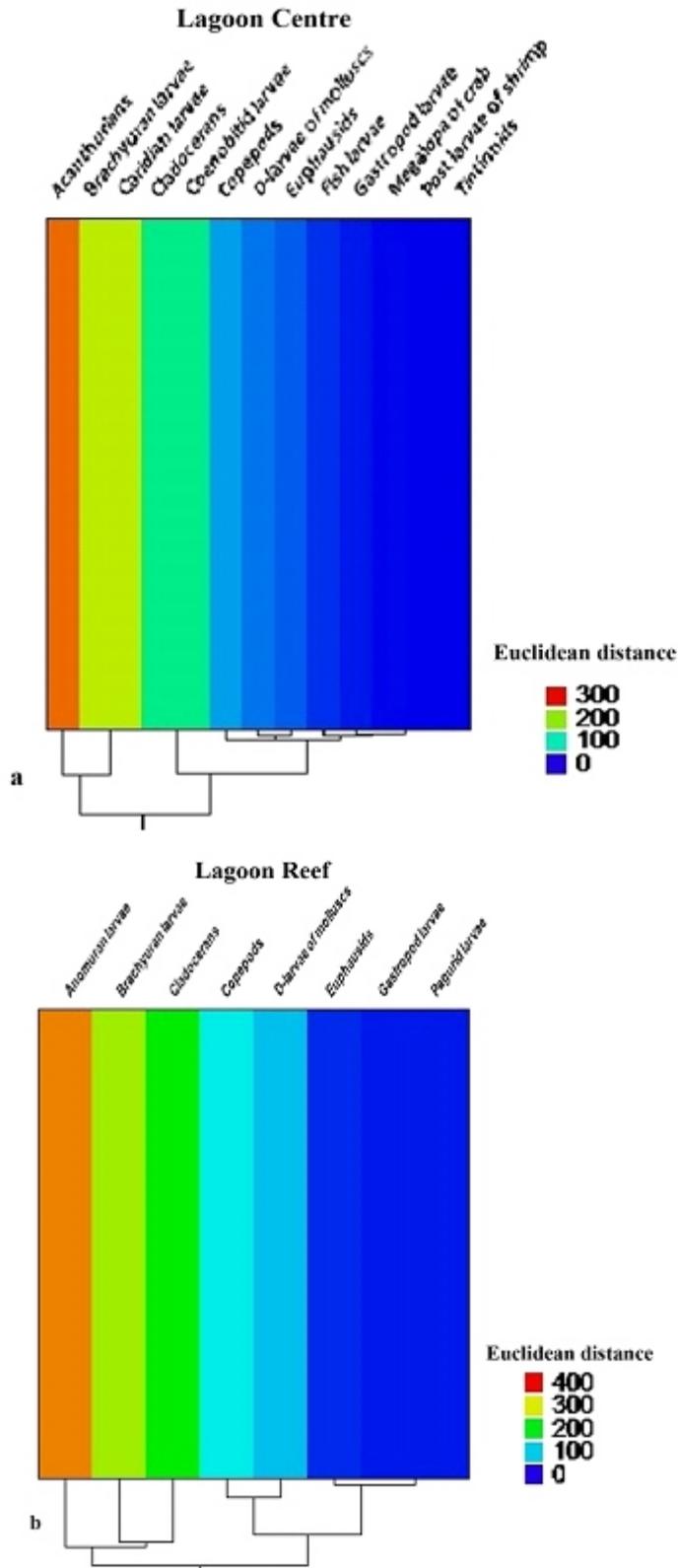


Fig. 3a, b: Dendrogram matrix resulting from classification analysis of zooplankton assemblages at Kavartti lagoon centre and reef

significant correlation was observed (Fig. 3a, b). The registered collection of copepods in the lagoon are represented from 12.00 to 18.00 h (Fig. 2c-e) which expresses its feeding regime in the inside lagoon waters. In general the copepod does not show any community wise inter correlation among other zooplankton groups except tintinnids and anomuran larvae inhabiting in the lagoon waters. This clearly indicates the copepod group as an opportunistic invader from surrounding sea and depending the lagoon for feeding purpose. In the lagoon the dendrogram matrix of correlation are more numerous and the trophic groups seem to be linked to semidiel patterns.

DISCUSSION

In the Kavaratti lagoon the hierarchical clustering of dendrogram matrix shows that the community wise balanced inter relationship was more significantly correlated. The study at 3 h interval in a semidiel cycle between 6.00 to 18.00 h clearly shows the abundance of gastropod larvae in all time intervals and their community relationships to other zooplankton assemblages. Similar abundance of molluscs has been reported for Kavaratti lagoon (MadhuPratap *et al.*, 1977). In the present observations the variations in zooplankton assemblages over time was evident. The composition of zooplankton in Kavaratti lagoon and at the surrounding sea varied both qualitatively and quantitatively during the day and at night (Goswami, 1973). The limited cluster matrix available for copepods revealed their presence as an invader depending the lagoon for feed and the diel pattern has showed the time of rush. The zooplankton population of copepods showed higher degree of abundance in species composition in the sea than in the lagoon of Kavaratti atoll (MadhuPratap *et al.*, 1977). In the Kavaratti lagoon the zooplankton assemblages seems higher and their community interactions through cluster matrix combinations are strong over semidiel pattern. This may be due to the circulatory pattern of current or luxuriant growth of sea grass or the more organic particulate matter in the lagoon (MadhuPratap *et al.*, 1977).

This research brings to the fore the importance of diel pattern in zooplankton assemblages, to reveal their identity as the lagoon inhabitants and their community

wise interactions in the Kavaratti lagoon of Lakshadweep archipelago by using a statistical hierarchical dendrogram cluster matrix.

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