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Species diversity and community structure of ichthyofauna in the seagrass ecosystem of Minicoy Atoll, Lakshadweep, India

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Present study consists the species diversity, abundance and community structure of ichthyofauna in the seagrass meadow of Minicoy Atoll, Lakshadweep Islands. Two hundred and three species of fishes were recorded during the study, from four stations in the Atoll. They belonged to 2 classes, 11orders, 43 families and 93 genera. Six species belonged to the class Chondreichthyes and 197 species to Osteichthyes. Family Pomacentridae showed maximum abundance of species (22%). Station I, having close proximity to the coral reefs, observed the maximum number of families (37) and species (129) and that with minimum number was in station II (23 families and 52 species). Bray-Curtis similarity plot showed a similarity range of 22 to 52%, seasonally. Station I showed highest Shannon-Wiener diversity index (H'$\log_2$) (4.22) during August and the lowest (2.91) during June. Stations I and III showed comparatively higher abundance and diversity of fishes. Variability in seagrass habitat structure and the interaction with coral reefs influenced the species composition and diversity of fishes in Minicoy Atoll. The findings of the present investigation can be used as baseline information for the fishery resource management of the region.

[**Keywords:** Ichthyofauna, seagrass, species diversity, Minicoy Atoll, Lakshadweep]

Introduction

The seagrass meadow supports large populations of juvenile and adult fishes, including permanent residents such as pipe fishes, eels, wrasses and sprats, which find both food and shelter in the grass[1]. Several studies have documented the importance of seagrass beds as habitats for fishes[2,3,4,5]. Seagrass habitat enhances the survival and growth of juvenile fishes because they provide high food availability, low predation risk and protection from adverse weather conditions[8,9,10]. Research on the ecology and community structure of fishes in seagrass beds has mostly taken place in temperate to warm temperate and Caribbean areas[5,11,12,13,14,15].

Detailed studies on the species composition, distribution, and abundance of fishes in seagrass beds of Lakshadweep atolls were lacking. Only the details of survey on fishes of the atoll and surrounding waters were available[6,7] concerned with the seagrass meadow of India. Present study is an attempt for studying the distribution, species composition and abundance of ichthyofauna in seagrass meadow of Minicoy Atoll.

Materials and Methods

Area selected for study was Minicoy Island (8°17'N and 73°04'E) of Lakshadweep group of islands in the eastern Arabian Sea (EEZ of India). It is the southern most island of the group, having an area of 4.4 km^2 with an elevation of 1.8 m from the mean sea level and is located 215 nautical miles south west off Kochi. This island lies in the north south direction and the atoll in the western side. It has the largest atoll among the group, with an area of 25 km^2. Average depth is 4 m, with a maximum depth of 15 m and is connected to the sea by the *Saleh Magu* Channel in the northeast. The atoll, which is oval in shape and elongated in the northeast – southwest direction. It has two distinct habitats - the coral shoals which occupy about 75% of the area and the sand flats in the southern parts of the atoll. The atoll has a rich vegetation of seagrasses and seaweeds in the intertidal zone[16], which extends to an area of 2.2 km^2.

Four stations were selected (Fig. 1) in the atoll along the length of the island, based on a preliminary survey. The criteria for the selection of stations are, i) distribution of seagrasses, ii) abundance of different

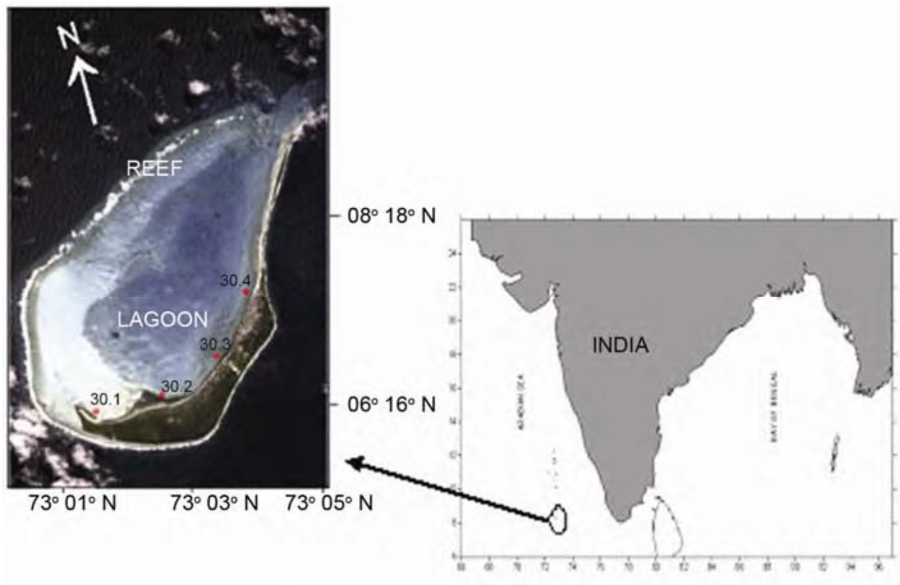

Fig. 1—Study area showing sampling stations at Minicoy Atoll, Lakshadweep

species of seagrasses and iii) geography of the Island. The whole seagrass meadow in the Minicoy atoll is divided into 4 sampling stations (Zones). Station I is located in the south end, which is characterized by the interaction of coral reefs, mangroves and seagrass ecosystems and has a direct influence of the open sea waters. The area is characterized by the patchy seagrass meadow and the presence of corals. Strong tidal currents prevailed here. Station II is located near to the lighthouse area. This station has a wider seagrass area with thick meadow near to the coast and has less abundant growth in the outer areas. Station III is a typical seagrass meadow with abundant growth of different species of seagrasses and is located near to the middle of the island. This area is away from the direct influence of tidal currents. Station IV is located at the northern part of the island having comparatively less abundant seagrass meadow with patchy coral reefs. The seaward side of this area is characterized by the presence of a large coral, *Goniastrea retiformis* and the top of adjacent ones being fused into an almost level platform. Highly populated areas are located in between Station III and Station IV. Sewage input, fishing activities and the alteration of coastal zone destroyed a major part of the seagrass vegetation of this region.

Monthly samplings for two years were conducted in the all the stations. For the collection of fishes a beach seine net, having the length of 30m, a width of 2 m and a mesh size of 9 mm was used[17,18]. All the samplings were done in the morning hours with the tidal amplitude ranging between 0.26 and 0.68 m. The collection was made in the seagrass meadow with an average extend of 100 m from the coastline. The net was deployed as swiftly and quietly as possible along a set measured transect between shore and the edge of seagrass meadow. Care should be taken not to lift the lead line when the seine was pulled when the line is observed to leave the bottom. The collected samples were sorted and counted. The density was expressed as indls./haul. Species identification was done at maximum possible level using standard references[6,19] . ***PRIMER v6*** (Clarke and Gorley, 2006) was used[20] for the analysis of community structure. Similarity indices were found out by using seasonal scale data. For finding out the similarities between seasonal and spatial aspects, ***Bray-Curtis*** Similarity plots were made for the seasonal abundance and families of fishes, using PRIMER v6. Corresponding to the sampling of fishes, temperature and salinity of the surrounding water were also noted.

Results

Atmospheric temperature varied from 25.2 to 31.2°C (av. 28.2 ± 4.24°C). Water temperature was in the range of 26°C to 31.2°C (28.6 ± 3.68°C) and the salinity, in the range of 31.15 to 35.48 ppt (33.32 ± 3.06 ppt). Lowest temperature was observed in August and October months and highest during April and May. Lowest salinity was observed in

Table 1—Average values of environmental parameters in Minicoy Atoll

Atmospheric Temperature (°C)	28.20±4.24
Water Temperature (°C)	28.60±3.68
Salinity (ppt)	33.32±3.06
pH	7.65±0.49
Dissolved Oxygen (ml/l)	3.54±2.94

March and the highest during November (Table 1). The average values for ***pH*** was 7.65 ± 0.49 and that for dissolved oxygen was 3.54 ± 2.94 mL/L.

During the study period, a total of 203 species of fishes were obtained from the seagrass meadow of Minicoy atoll, by using beach seine. They belong to 2 classes, 11orders, 43 families and 93 genera. Out of this, 6 species belong to the class Chondreichthyes and 197 species belong to Osteichthyes (Table 2). In the Station I, 129 species of fishes were recorded and they were included in 74 genera, 37 families, 10 orders and 2 classes. 52 species of fishes were obtained from the station II, which belong to 34 genera, 23 families, 8 orders and 2 classes. In the station III, 83 species, which constitute 53 genera, 31 families, 8 orders and 2 classes were recorded. 72 species of fishes were obtained from the station IV, which belong to 46 genera, 30 families, 8 orders and 2 classes. Numbers of species in the dominant families, having the species number 5 and above were shown in the Fig. 2. Percentage composition of the number of species in dominant families, having the percentage of species number higher than 10 were represented in Fig. 3.

The monthly mean density of fishes was represented in the Fig. 4 Spatial and seasonal variations in mean density were given in the Figs. 5 and 6. The dominant families of fishes, having more than 5% contribution to the total abundance in each station were given in the Fig. 7.

Mean density of fishes in this stationI was 33 indls./haul. Highest density of fishes re(54 indls./haul) was recorded during December, followed by 53 indls./haul in March and 46 indls./haul in October. Lowest density of 13 indls./haul was observed in May.

Total mean density of fishes in this station II was 31 indls./haul. Highest mean density of 53 indls./haul was recorded in February, followed by 49 indls./haul in January and 48 indls./haul in April. 12 indls./haul was the lowest density recorded in this station in May.

In station III, the density was comparatively high, having the total mean density 95 indls./haul. Maximum density of 197 indls./haul was recorded in October, followed by 137 indls./haul in December and 130 indls./haul in June. Lowest density of 41 indls./haul was recorded in November.

The total mean density recorded in this station IV was 23 indls./haul. Highest density of 39 indls./haul was recorded in Jun, followed by 33 indls./haul in August and 29 indls./haul in February. Lowest density of 14 indls./haul, in May.

In the station I, highest mean density was recorded during post monsoon (39 indls. /haul) and lowest (25 indls./haul) during monsoon. During pre monsoon it was 34 indls. /haul. In the station II, highest mean density was 34 indls./haul, which was recorded during pre monsoon. It was 29 indls. /haul during post monsoon and 28 indls./haul during monsoon. 112 indls./haul was the highest seasonal mean density in the station III, which was observed during post monsoon, followed by 99 indls./haul during monsoon and 75 indls./haul during pre monsoon. Highest seasonal mean density (29 indls./haul) in the station IV was recorded during monsoon. 20 indls./haul were recorded during pre- and post monsoon.

The present investigation provides a basis on seagrass fish community organizations with reference to the abundance, similarity, species composition, richness, dominance, evenness and diversity. The indices found out in the analysis of ichthyofaunal community include Margalef species richness (d), Peiolou's evenness (J'), Shannon-Wiener diversity (H'$\log_2$) and Simpson's dominance (Lambda). Similarity indices for seasons were represented in the Figs. 8. The results of the community structure analysis were given in the Table 2a to 2d. and the mean spatial variations were represented in the Fig. 9.

In the ***Bray-Curtis*** similarity plot 11 clusters were formed. In the seasonal aspects, 22 to 52% similarity ranges were observed. The similarities between families range from 6 to100%.

Station I shows the highest richness of 7.47 was recorded in August and lowest, 4.41 was in November. Evenness was highest (0.94) in July and lowest (0.66) in December. Highest species diversity of 4.22 was recorded in August and lowest, 2.91, in June. Dominance value was highest (0.97) in July and low in December.

Table 2—Systematic list of fishes obtained from the four stations in Minicoy Atoll

Class: Chondreichthyes
Order: Rajiformes
Family: Dasyatidae
Dasyatis uarnak
Dasyatis sp.
Family: Carcharinidae
Carcharinus melanopterus
***Carcharinus* sp.**
Order: Lamniformes
Family: Lamnidae
Alopius vulpinus
Isurus glaucus
Class: Osteichthyes
Order: Perciformes
Family: Apogonidae
Apogon leptacanthus
A. coccineus
A. nigrosfasciatus
A. bandanensis
A. quadrifasciatus
A. apogonides
A. exostigma
A. sp.
Apogonichthyes ocellatus
Archaemia fucata
A. sp.
Pristiapogon snyderi
Ostorhynchus savayensis
O. endekataenia
O. sp.
Family: Pomacentridae
Amphiprion nigripes
Dascyllus trimaculatus
D. aruanus
Chromis dimidiatus
C. opercularis
C. ternatensis
Pomacentrus lividus
P. nigricans
P. sp.
P. albicaudatus
P. taeniurus
Abudefduf sexfasciatus
A. bengalensis
A. septemfasciatus
A. zonatus
A. glaucus
A. sp.
A. lacrymatus
A. saxatilis
Family: Serranidae
Cephalopholis argus
C. miniata
C. pachycentron
Epinephelus areolatus
E. fuscoguttatus
E. miliaris
E. flavocaeruleus
E. hexagonatus
E. elongatus
E. malabaricus
E. melanostigma
E. caeruleopunctatus
Gnathodentex aurolineatus
Monotaxis grandoculis
M. sp.
Family: Lethrinidae
Lethrinus harak
L. mahsena
L. conchyliatus
L. elongatus
Lethrinella microdon
Family: Labridae
Thalassoma purpureus
T. hardwickii
T. janseni
T. lunare
T. quinquevittatus
Halichoerus marginatus
H. kawarin
H. argus
H. scapularis
H. sp.
Labroides dimidiatus
Gomphosus caeruleus
Chelinus trilobatus
C. undulatus
Stethojulis sp.
S. strigiventer
Coris Formosa
Family: Carangidae
Caranx sexfasciatus
C. ignobilis
C. ferdau
Carangoides malabaricus
C. chrysophrys
Selar crumenothalmus
Trachinotus sp.
Family: Lutjanidae
Lutjanus kasmira
L. gibbus
L.fulviflammus
L. ruselli
L. bohar
L. fulvus
L. sp.
L. quinquelineatus
Family: Mullidae
Upeneus tragula
U. vittatus
U. arge
Parupeneus indicus
P. barberinus
P. pleurostigma
P. macronemus
P. bifasciatus
Mulloides samoensis
M. vanicolensis
Family: Chaetodontidae
Chaetodon lunula
C. melannotus
C. collare
C. bennetti
C. xanthocephalus
C. auriga
C. vagabundus
C. unimaculatus
C. decussatus
Heniochus acuminatus
H. monoceros
Family: Caesionidae
Caesio xanthonotus
C. caerulaureus
C. sp.
C. lunaris
Pterocaesio tile
Family: Theraponidae
Therapon jarbua
T. puta
T. theraps
Family: Kuhlidae
Kuhlia mugil
Family: Gerreidae
Gerres oblongus
G. lucidus
Family: Kyphosidae
Kyphosus cinerascens
Family: Acanthuridae
Acanthurus triostegus
A. nigricans
A. mata
A. sp.
A. leucosternon
Ctenochaetus sp.
Paracanthus heptatus
Acanthurus lineolatus
Naso lituratus
Family: Ephippidae
Platax orbicularis
P. teira
Family: Blennidae
Petroscrites pindae
Cirripectus sebae
Entomacorodus straitus
Salarius fasciatus
Family: Siganidae
Siganus rostratus
S. javus
Family: Scorpaenidae
Pterois volitans
Scorpaena sp.
Family: Zanclidae
Zanclus cornuatus
Family: Leognathidae
Leiognathus sp.
Family: Pempheridae
Pempheris sp.
Family: Haemulidae
Plectorhinchus albovittatus
P. pictus
P. polytaenia
P. orientalis
Family: Grammistidae
Grammistes sexlineatus
Diploprion bifasciatus
Order: Clupeiformes
Family: Clupeidae
Spratelloides delicatulus
S. gracilis
S. japonicus
Sardinella sp.
S. melanura
Dussumeira sp.
Amblygaster sp.
Herklotsichthyes quadrimaculatus
Family: Albulide
Albula vulpes
Family: Engrulidae
Engaulis japonicus
Order: Anguilliformes
Family: Muraenidae
Gymnothorax pictus
G. sp.
G. flavimarginatus
G. javanicus
G. meleagris
Echidna delicatula
Order: Beloniformes
Family: Belonidae
Albennes hians
Thalassosteus sp.
Family: Hemiramphidae
Hyporhampus unifasciatus
H. dussumieri
Order: Beryciformes
Family: Holocentridae
Sargocentron diadema
Myripristis murdjan
Neoniphon samara
Holocentrus lacteoguttaus
Order: Mugiliformes
Family: Sphyraenidae
Sphyraenia barracuda
S. fosteri
S. obtusata
Family: Atherinidae
Atherina forskalii
A.duodecimalis

Order: Pleuronectiformes
Family: Bothidae
Bothus pantherinus
B. sp.
Order: Tetradontiformes
Family: Balistidae
Odonus niger
Canthidermis rotundatus
Balistoides viridescens
Psuedobalistes flavimarginatus
Rhinecanthus aculeatus
R. sp.
Sufflamen chrysopterus
Family: Diodontidae
Diodon hystrix
Lophodiodon calori
Family: Ostraciidae
Ostracion tuberculatus
O. mileagris
Rhynchostracion nasus
Canthigaster margarittatus
C. janthinuropterus
Family: Tetraodontidae
Arothron nigropunctatus
A. stellatus
Order: Sygnathifomes
Family: Fistularidae
Fistularia commersoni
F. petimba
Family: Sygnathidae
Hippocampus kuda
Hippocampus sp.

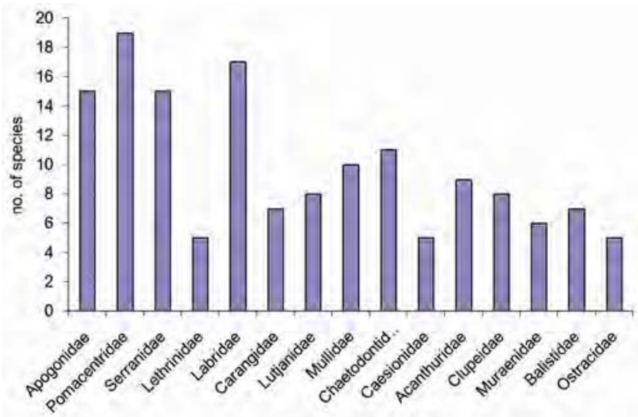

Fig. 2—Number of species in the families observed in all the stations in Minicoy Atoll

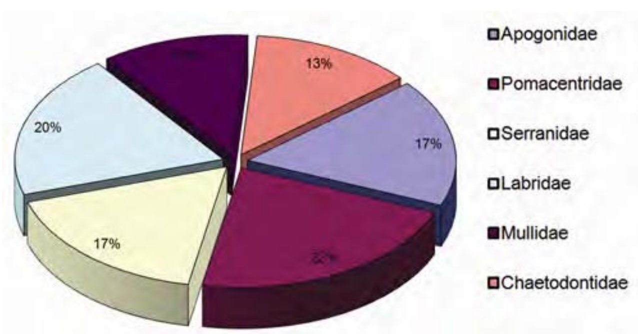

Fig. 3—Percentage composition of number of species of dominant families

In Station II the richness value was highest (4.82) in July and lowest (2.17) in March. Highest evenness value of 0.94 was recorded in September and lowest, 0.58 was recorded in October. Species diversity was highest (3.7) in July and lowest (1.80) in November. Highest dominance value was recorded in May (0.96) and lowest in November (0.62).

In Station III species richness was highest (4.31) in April and lowest (1.35) in November. Evenness was highest in April (0.99) and lowest (0.84) in November. Species diversity was highest in April and lowest in November, which were 4.33 and 2.16 respectively. Highest dominance value was 0.96 in April and lowest, 0.74 in November.

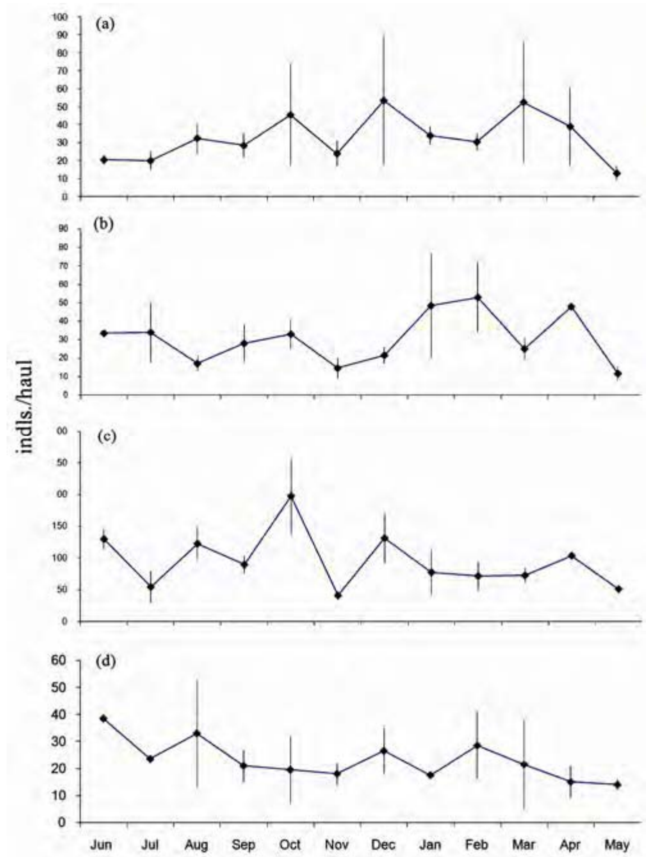

Fig. 4—Monthly variations in fish density (indls./haul) in (a) station I (b) station II (c) station III and (d) station IV

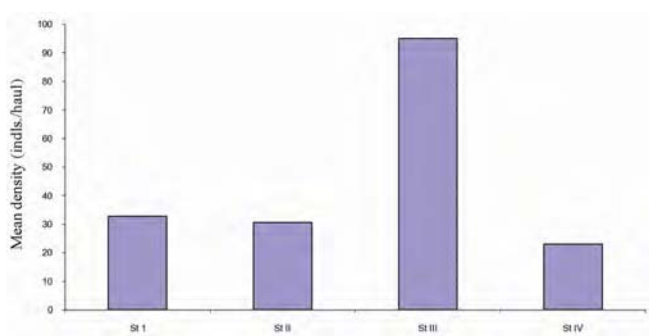

Fig. 5—Spatial variations in mean fish density (indls./haul) at four stations of Minicoy Atoll

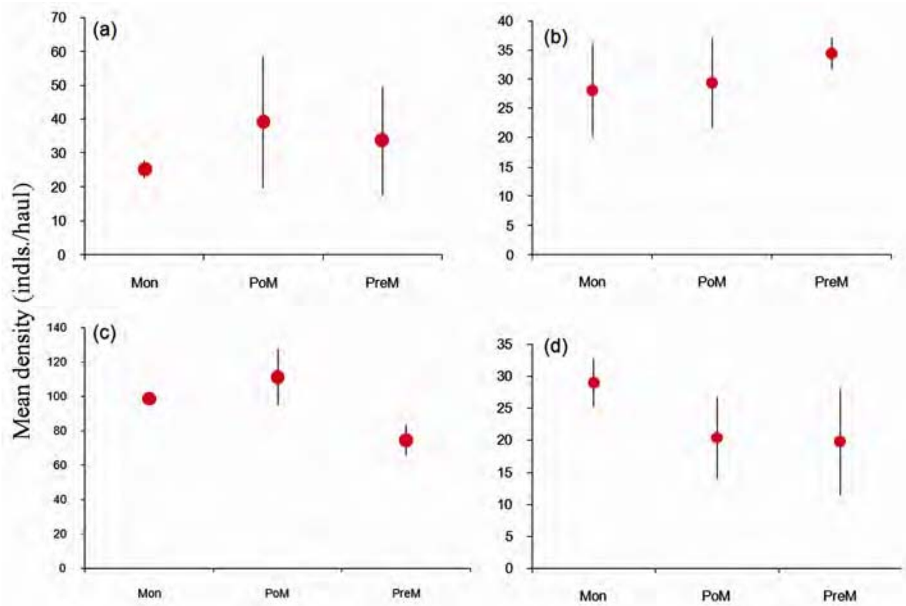

Fig. 6—Seasonal variations in mean fish density (indls./haul) in four stations of Minicoy Atoll

In Station IV Species richness value was highest in January, which was 5.24 and lowest, 2.22 in July. Highest value for evenness, 0.97 was recorded in May and lowest value of 0.64 in August. Species diversity was high (3.74) in January and low (2.26) in September. Highest dominance value of 0.97 was recorded in January and lowest value of 0.66 in August.

Discussion

The study area was characterized by tropical conditions as evidenced from the environmental conditions existed in the region. The atoll water was comparatively high saline. Highly productive waters around the islands, the submerged banks and the crevices of coral boulders, reefs and seagrass beds of Minicoy Atoll are ideal habitats for a large number of fishes[6]. Valuable information on the fishery resources of the water around Lakshadweep were collected during the surveys conducted by British naturalists[21], erstwhile Madras Fisheries Department, Fisheries Department of Lakshadweep Administration and Central Marine Fisheries Research Institute[22,23,7]. Later, Vijayanand and Pillai studied the community structure of reef fishes of Kavaratti Atoll[24]. There is no detailed study on the ichthyofauna of the seagrass ecosystem of Minicoy Atoll.

A number of commercially important species have been linked to seagrass at some stage of their life cycle. Non-commercial species within seagrass meadows may be an important food source for commercial species, forming trophic linkages[25]. Many fish species show ontogenic shifts in habitat utilization and migrate from their nursery grounds to an intermediate life stage habitat, or to the coral reef[26,27,28]. The ichthyofaunal composition in the sampling sites of Minicoy Atoll varies according to the interactions with the adjacent systems. Stations I and IV are directly interact with open sea and coral reef systems; station II interact with mangroves and station III is away from the direct influence of these systems.

In the present study, a total of 203 species of fishes were recorded from the four stations. Both Chondrichthyes and Osteichthyes represented the ichthyofaunal community, dominant being the Osteichthyes in all the stations. Highest number of species was belonging to the family Pomacentridae (19 species), which constitute 22% of the total population. Other dominant families having more number of species are Labridae (17 species), Apogonidae (15 species) and Serranidae (15 species). In the station I, which is near to the coral reefs, observed maximum number of families (37 families) and species (129 species) and minimum number in the station II (23 families and 52 species). The highest number of species in station I can be attributed to the proximity to reef. This highly mobile group moves between reef or mangrove habitats and seagrass beds often in a diel cycle. Chief among these are surgeon

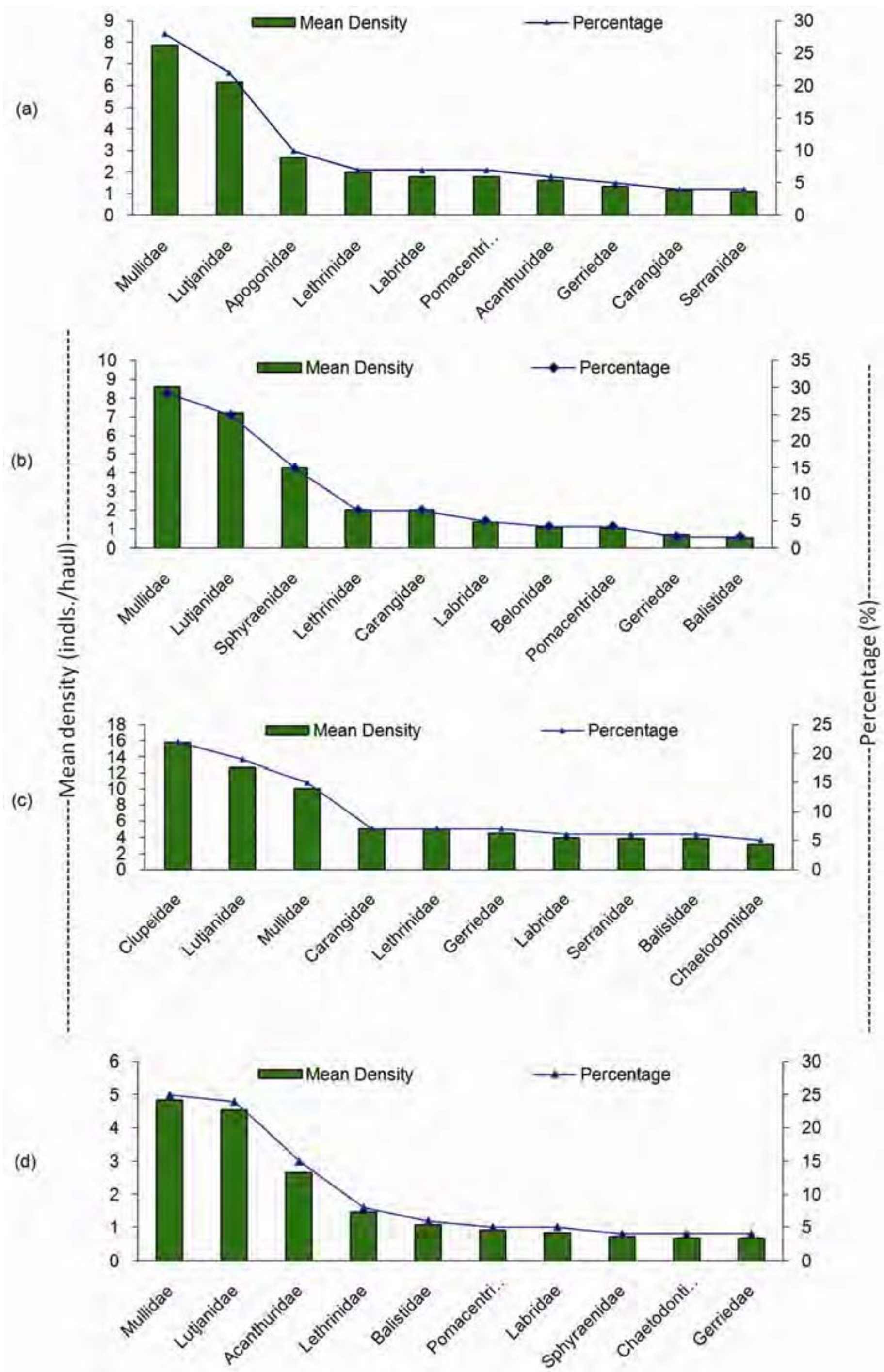

Fig. 7—Mean densities (indls./haul) and the percentage composition of dominant families of fishes in (a) Station I (b) Station II (c) Station III and (d) Station IV

fishes (Acanthuridae), which feeds directly on the seagrasses and epiphytes. Many fishes, such as surgeon fishes, puffers and snappers present in grass beds as juveniles taking both food and shelter from the dense leaf canopy. In station II, seagrass canopy height was comparatively less as observed during the study and this created a least successful habitat for many fishes. The predator fishes like sharks (*Carcharinus* sp.) and rays (*Dasyatis* sp.) were commonly found in this station, due to easy availability of prey in the less dense meadow. Clupeiform fishes (*Clupeidae, Engraulide and Albulidae*) are completely

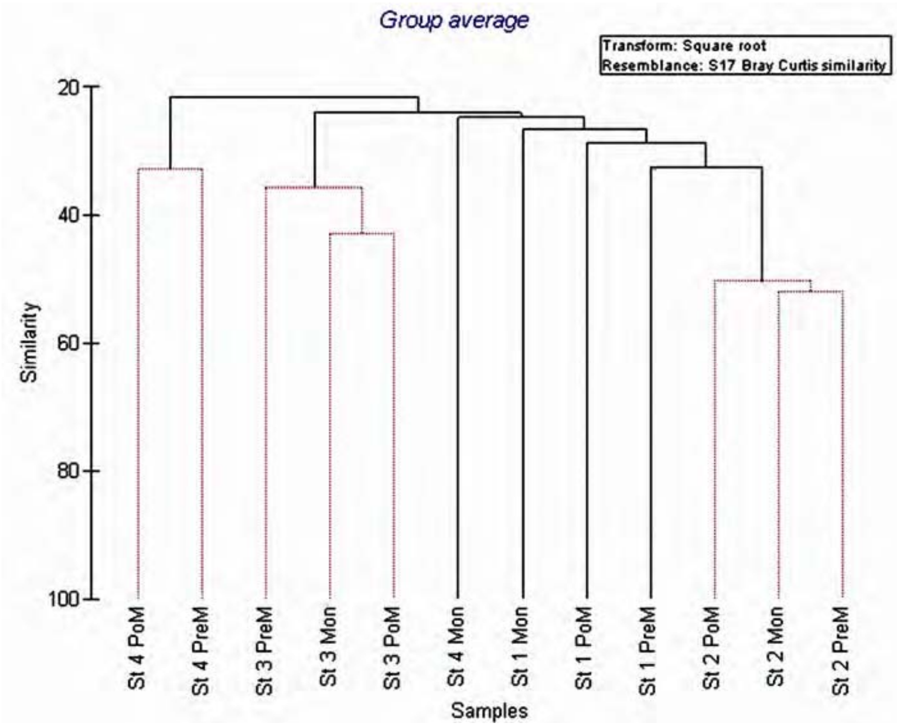

Fig. 8—Dendrogram of fish density (indls./haul) showing the seasonal similarities in the four stations (Solid lines represent significant delineation of groupings by SIMPROF test)

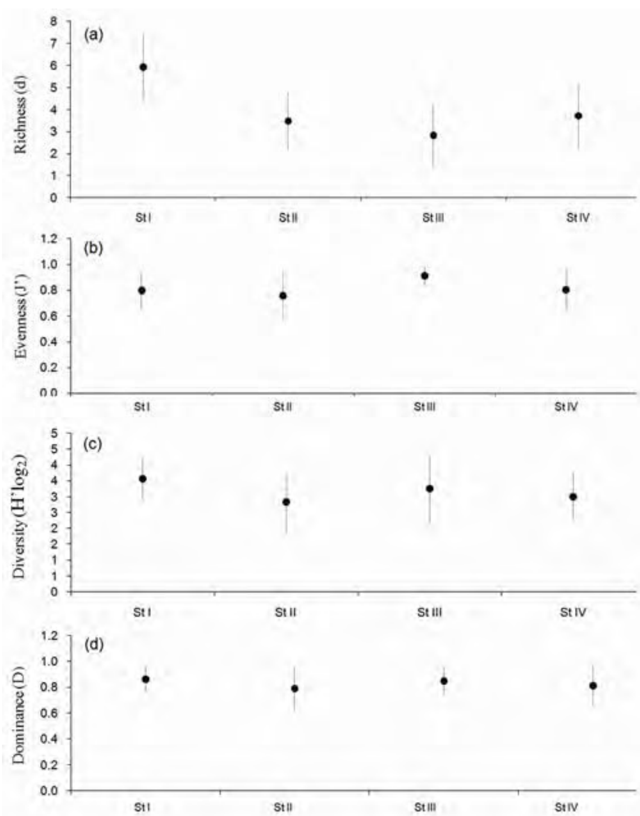

Fig. 9—Diversity indices (a) Margalef richness (d) (b) Simpson's evenness (J') (c) Shannon diversity (H'$\log_2$) and (d) Dominance (D) in the four stations of Minicoy Atoll

absent from station I, which is highly influenced by the open sea and reef systems. Important among these are the permanent residents of dense mixed seagrass meadow, which include *Spratelloides delicatulus, S. gracilis, Sardinella melanura, Albula vulpes* and *Engraulis japonicus.* Dense meadow of mixed seagrass communities in station III supports high densities of these fishes, which form the baits for tuna fishing. Major live baits of atoll belong to the families Clupeidae, Apogonidae and Atherinidae [29].

Migrating schools especially that of Pomacentridae, Lutjanidae and Holocentridae, breakup and the fishes feed individually on seagrass associated invertebrates throughout night, gathering and returning to the reef on same pathways at dawn[30]. The station I, which lies near to the reef, more number of families was represented than other stations. Out of 43 families only six families–Lamnidae, Siganidae, Leiognathidae, Clupeidae, Albulidae and Engraulidae – were not recorded during the study period. In the station II, which has lowest number of families, 22 families were absent. They include Lamnidae, Apogonidae, Chaetodontidae, Theraponidae, Gerriedae, Kyphosidae, Acanthuridae, Ephippidae, Blennidae, Scopaenidae, Zanclidae, Leiognathidae, Pempheridae, Haemulidae, Grammistidae, Albulidae, Muraenidae, Holocentridae, Acanthuridae, Ostraciidae, Tetraodontidae and Sygnathidae. In the station III, Apogonidae, Caesionidae, Ephippidae, Blennidae, Zanclidae, Leiognathidae, Pempheridae, Grammistidae, Muraenidae, Atherinidae, Bothidae and Fistularidae were not recorded. In the station IV, Caesionidae, Kuhlidae, Siganidae, Zanclidae, Pempheridae, Engraulidae, Belonidae, Hemiramphidae, Atheirnidae, Diodontidae, Fistularidae and Sygnathidae were not represented.

Highest mean density of fishes (95 indls./haul) was found in station III and lowest in station IV. This highest density in station III could be due to the high abundance of seagrass shoot density. In stations I, II, and IV, Mullidae family contributed major share in the abundance of fishes of the seagrass meadow, where as in the station III, Clupeidae contributed the major share. In all the stations, Lutjanidae formed the second dominant contributor of abundance of fishes. Seasonally, in the station I and III, highest mean density was recorded during post monsoon, while in the station II, it was during pre monsoon and in the station IV, during monsoon. The bright calm weather conditions and abundant availability of food (as epiphytic algae, seagrasses and invertebrates) during post and pre monsoon periods will increase the number of occasional visitors of fishes, which forms a major part of the ichthyofauna of the seagrass ecosystem. The abundant growth of massive corals, having crevices as observed during the field study, in station IV, gives a calm shelter for fishes during the stormy weather conditions of monsoon season. This favourable condition leads to comparatively higher abundance of fishes in the station IV during monsoon. Other stations are highly disturbed by monsoon winds and waves during this season and the shelter, which can reduce these effects, are less in these stations. On monthly aspects same trend was also noticed, having highest density in the month of December and October in stations I and III respectively. In station II, maximum density was recorded in February, while in station IV, it was in June. The number of fishes in a sea grass bed fluctuates both diurnally and seasonally[31]. The movement out of beds during day time permitted the fish, particularly large individuals, to avoid potentially stressful temperatures. On a seasonal basis, densities of fishes are highest in the summer, when the waters are warm. So, the temperature seems to be the key factor regulating the movement of fish into and out of beds. Some fishes are permanent residents, some reside there only seasonally, and for some, seagrass bed is only a part of their daily foraging area. Mobile fauna or nekton are not randomly distributed in seagrass habitats; the abundances of most species are correlated with macrophytic biomass[32,33,34], and abundances of different species also vary markedly between adjacent patches with different microhabitat structure[35]. These variations are mainly attributed to the physical structure of the habitat rather than food source, life cycle or predation.

Although the study of ecology and community structure of fishes in coral reefs have made[36,24] earlier, the community structure of fishes of seagrass meadow was not yet made in the atolls of Lakshadweep. Bray-Curtis similarity indices calculated by using seasonal abundance data for each station revealed that highest similarity of 97% occurs between pre monsoon and post monsoon in station I (St 1 PreM and St 1 PoM). 96% similarity occurred between the post monsoon and pre monsoon in station II (St 2 PoM and St 2 PreM) and 95% similarity between the monsoon and post monsoon in station III (St 3 Mon and St 3 PoM). As a general trend, from these indices, it can be assumed that the highest similarities occurred between different seasons of the same station and showed the differences in clustering between stations. These indices calculated for families present in all the stations showed that, 100% similarity recorded between families Clupeidae, Engraulidae and Albulidae. These families belong to same order Clupeiformes and share same habitat, which made similarities highest. The families, Scorpaenidae and Pempheridae showed 97% similarity both belongs to the order Perciformes. Other families showed similarities above 80% are Siganidae and Leiognathidae (89%).

In the seagrass meadow of Minicoy Atoll, highest ichthyofaunal species richness of 7.47 was found in station I. This high species richness was due to the proximity to reef system, as many fishes migrate between reef and seagrass beds. Lowest species richness (4.31) in station III, attributed to its distance from adjacent systems, but high abundance of some species especially that of Clupeiformes reduced the species richness, in addition to the homogeneity of habitat. The evenness in the species distribution was also associated with habitat structure. Highest value for Pielou's index (J') index was recorded in the Station III, which have low species richness. High species richness is likely to be correlated with a greater performance by the community, hence the functional system present within the community increases with increasing species richness. The degree to which dominance is concentrated in one or several species can be expressed by the index of dominance (Simpson's Lambda). The dominance value showed least variations among four stations. This means that there were not much variations in the composition of ichthyofauna, which influence the total community structure.

The functioning of mixed seagrass meadows leads to the conclusion that the link between species richness and ecosystem functions and services is not a direct one. The reason is that functional performance of the community is a property of the species present therein and not of their number. Eventhough, the seagrasses are less in species level, their role in increasing the faunal diversity are well known, and dense communities increase the species richness and diversity of fishes, which utilize meadow as the source of food, shelter and nursery ground. Highest species diversity was recorded in the station III, which is characterized by the abundant growth of seagrasses and provides a suitable habitat for both herbivorous and carnivorous fishes.

Sub-tidal seagrass habitat often reveals a higher biodiversity of individuals compared to adjacent substrate without vegetation[37,38]. Hundreds of species are found living epiphytic on the leaves at any one meadow, and there is a large number of species that live in the refuge offered by the plant's canopies. Hence seagrass meadows are important habitats for ichthyofauna, thereby contributing to maintain marine biodiversity and the production of potential food for humans.

With the aid of these indices, it can be assured that the station III, which is away from the direct effect of other ecosystems, showed the influence of seagrass meadow on the species diversity and the community structure of fishes and as a whole, to the total functioning of the seagrass ecosystem. The physical factors responsible for spatial or temporal differences in seagrass structure are directly responsible for the abundance and distribution patterns of fishes. Further research is needed to understand the role of macro consumers such as fishes both in structuring the seagrass community and the higher trophic levels. The close association of the three major tropical communities–coral reefs, mangroves and seagrasses–can be seen as part of the dynamics of the ecosystem. These links will further illuminate the close dependence of these and their central role in the composition of ichthyofauna of tropical coastal zone.

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