

DIVERSITY OF CORAL REEF FISHES OF AMINI ISLAND, LAKSHADWEEP ARCHIPELAGO

Thayyiba P.¹, Bijoy C.²

1. Government College of Arts and Science, Andrott Island, UT of Lakshadweep., thayyiba313@gmail.com.

2. Christ College (Autonomous), Irinjalakuda, Thrissur, Kerala

ABSTRACT

The present study recorded the diversity of coral reef fishes from the Amini Island of Lakshadweep archipelago during 2019-2020 period, using different gears such as baited trap, cast net, and seine net. This study documented eighty-four species of fishes belonging to twenty-eight families, of which two species were listed under the IUCN Red list. Among the 28 families, two families such as Acanthuridae and Labridae are the species-rich families (11 species each). This study revealed the high diversity of coral reef fishes on Amini Island and showed the importance of the need for ecosystem conservation.

Keywords- Lakshadweep, Amini Island, Coral reefs, Diversity, Fishes.

INTRODUCTION

India is one of the 17 mega-biodiversity countries harbouring a variety of species-rich ecosystems including marine habitats (Ajith Kumar *et al.*, 2012). It has a coastline of more than 800 km, with an Exclusive Economic Zone (EEZ) of 2.02 million km² and a continental shelf area of 4,68,000 km² (Ajith Kumar *et al.*, 2012). The coral reef areas spread across the mainland and the islands of Andaman & Nicobar and Lakshadweep. There are four major coral reef regions in India such as the Gulf of Mannar, the Gulf of Kutch, the Andaman & Nicobar islands and Lakshadweep. The lagoons and reef flats in the Lakshadweep group of islands are the richest both in regard to the number of species and their numerical

abundance (Murty *et al.* 1989; Vijayanand and Vargheese, 1990.)

The union territory of Lakshadweep is an archipelago situated in the Arabian sea between 80° 00' N and 12° 30' N latitude and 71° 00' E and 74° 00' E longitude. The length of the coastline is 132 km. which is approximately 1.6% of Indian's total coastline. The islands have a lagoon area of around 4000 km², territorial waters cover with 20000 km², continental shelf of 4000 km², and an Exclusive Economic Zone (EEZ) of 0.4 million km². It is the largest atoll system in the world with 12 atolls (Jones, 1986). The islands consist of coral formations built on submarine ridges (Laccadive-Chagos ridge) steeply from a depth of about 1500 m to 4000 m off the west coast of the mainland of India (Jones, 1986). These islands are formed by the accumulation of coral sand in the form of sand bars with the action of wind, waves and currents.

Lakshadweep is known for its rich marine ecosystem. This consists of coral reefs, sea-grass, and diverse organisms including diverse types of fishes. The lagoons and reef flats of the Lakshadweep are rich in corals represented by 104 species belonging to 37 genera (Pillai *et al.*, 1989). About 78 species of echinoderms are also reported from these islands (James, 1989). Thomas (1989) reported 91 species of sponges from the region. Kaliaperumal *et al.*, (1989) reported 114 species of seaweeds and 6 species of seagrasses from the region. Moreover, there are wide ranges of other invertebrate fauna like ornamental and edible molluscs, the hermit crabs known from the

lagoons (Appukuttan *et al.*, 1989). This abundance and diversity of flora and fauna in the lagoon offer a wide variety of habitats for a multiplicity in the range of fishes which are smaller in length, brightly coloured and well-suited for aquarium purposes, offering great potential for developing a fishery for these fishes which have great demand in the export market as live fishes. Murty *et al.*, (1989) reported 138 species of ornamental fishes (reef fishes) belonging to 33 families from the Lakshadweep. Murty (2002) Jones and Kumaran (1980) published a comprehensive account describing 603 fishes from Lakshadweep. Sixteen more species were added by Venkateswarlu and Ilango (1982) to the ichthyofauna of Lakshadweep. In addition, Balachandran and Nizar (1989) included three more species to the list. In 1991, Rao documented 740 fishes from Lakshadweep archipelago.

The present study was conducted on Amini Island of Lakshadweep. Amini island is at a distance of 407 km (220 nautical miles) from Kochi and is located between Kavaratti Island in the south and Kadmat island in the north. This island has an oval shape with a width of 1.20 km at the broadest point and a length of 2.70 km. It lies between 11° 06' and 11° 08' N latitude and 72° 42' and 72° 45' E longitude, having a land area of 2.60 sq. km and a lagoon area of 1.50 sq. km. The island is 2-3 m above the mean sea level, with a depression at the centre. There are 37 species of corals under 15 genera in Amini island (Pillai and Jasmine., 1989). Murty (2002),

observed eight families in Amini island. Suresh (1997), reported 57 species of fishes belonging to 19 families from Amini Island and argued that Amini island is rich in Labrid fishes (wrasses) (over 80% of the total population in the lagoon) particularly in the intertidal region along the eastern side. However, Murty (2002), focused on fishes having ornamental value.

In the present scenario, the fragile ecosystem of Lakshadweep falls into severe changes. This

includes death of corals due to bleaching and other unfavourable changes in sea and massive destruction in the sea-grass bed. Moreover, anthropogenic activities in the intertidal area also affect the ecosystem of Lakshadweep. Thus, this work was carried out with the aim of understanding the current status of the ichthyofauna of Lakshadweep with special reference to Amini island. So far studies have been taken the case of Lakshadweep in its entirety, hence this study narrow it down to Amini island.

METHODOLOGY

The methodology employee's quantitative study is based on the data collected from Amini Island. Data were collected on seasonal basis from September 2019 to August 2020, . Fishes were captured at the beginning of low tide and the beginning of high tide (intertidal condition) for the ease of locating fishes. Reef fishes were caught by using different gears. Baited-trap (BT), Cast net (CN) and Seine net (SN) are used. The net was operated by three or four people. The net was placed vertically in the water by two people, the other persons scare the fish school/shoal and drive them into the vertically held net. After encircling the school/shoal, the net was hauled up. Fishes identified by local names, and numbers were counted and noted in the datasheet.

However, Fishes were processed for a thorough cleaning, immediately after capturing them. The fins were spread and specimens were placed on a clean flat surface. The photographs of the species were collected through the mobile phone. The photographs were taken in lateral view, for the identification of fishes. The identification of coral fishes was prepared on the basis of photographs and with the help of scientists of the biodiversity wing of CMFRI. The colour of the fish, the shape and position of the mouth, shape and size of the fins were some of the morphological characteristics used for primary identification.

AMINI ISLAND
INTEGRATED ISLAND MANAGEMENT PLAN
1:5,000

Existing Beach Marks

- Sandy Shores
- Paleosollic Stone
- Reef Corals Reef
- Light House
- Beach
- Island Boundary
- High Tide Line
- Shore Protection
- Coastal Vegetative Protection
- Island Boundary
- Crocker Area

Regulated Development Zones (RDZ)

Landmark and Proposed Landmarks

- Landmark
- Proposed Landmark
- Governmental/Industrial

Proposed Development Schemes

- Governmental Development Schemes
- Road
- Beach Tourism Facility
- Durable Shelter
- Cyclone Shelter (Designated)

Conservation Area

- Forest
- Agriculture/Green House Farm

Preservation/Conservation Zone

- No new construction in the zone
- Beach/Coral Interconnecting ground
- Sand Dune
- Sandy Beach
- Sandy Area/Path
- Vegetation
- Beach Area Road
- Reef Crest
- Reef Flat (Lime Corals)
- Reef Front
- Coralline Reef
- Conservation Zone
- Stationary Light
- Beach Area (RDZ)

Other

- No new structure installation
- Spill (Structure)
- Beach Jolly
- Footpath
- No new structure area
- Mission
- Mainline

WIDER MAP

Preservation Zone
RZD

Source: Jan Earth Science Institute, Bhutan, PhotoMap V3 Photocontribution - 24

A photograph showing a rocky shoreline. In the foreground, there are large, light-colored, irregularly shaped rocks. A narrow, light-colored path or stream bed winds through the rocks towards the ocean. The ocean is visible in the background, with white waves breaking against the shore under a clear blue sky.

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RESULTS

This study documented a total of 84 species of reef/reef-associated fishes coming under 28 families. Among these; some members of families, Pomacentridae, Carangidae, Scaridae, Pempheridae, Chaetodontidae and Caesionidae could be observed during all three collections from this island. Families of wrasses (Labridae), surgeon fishes and unicorn fishes (Acanthuridae) were the most abundant. They were followed by Serranidae, Carangidae, Lutjanidae, Mullidae, and Pomacentridae. *Anampses* sp. in the Labridae family was the predominant coral fish species on Amini island. Diodontidae, Tetraodontidae, Fistularidae, Sphyrnidae, Synaceiidae, Kyphosidae, Pempheridae, Haemulidae, Pinguipedidae, Mugilidae were the least abundant families. Bigeye barracuda, *Sphyrna forsteri* Cuvier of the family Sphyrnidae and red cornet fish, *Fistularia petimba* Jordan and Seale of the family Fistularidae were rarely seen in the catches from the lagoon of Amini Island.

After the first collection, (post-monsoon) around 79 species of fishes were obtained of which 26 species were coming under the category of solitary fishes and the rest of 53 species were gregarious. During the second collection, (winter) a total of 56 species were obtained of which 15 were solitary and 41 were gregarious. The third sample collection (pre-monsoon) resulted in a total of 52 species of which 13 species were solitary and 39 were gregarious in nature.

Out of the collected 84 samples of fish species, **2 were scheduled in the Red list** of the International Union for the Conservation of Nature and Natural Resources (IUCN). Arabian carpet shark, *Chiloscyllium arabicum* (Gubanov), is in the category of “Near threatened species” (NT) within the IUCN scheduled red list. The dusky grouper, *Epinephelus marginatus* (Lowe) is the Vulnerable Species (VU) stated as per the report of IUCN. Though, the levels of fishing in the islands are very small scale, the fishermen and public need to be made aware of the state of the species’.



Picture 4: Arabian carpet shark (*Chiloscyllium arabicum* Gubanov)

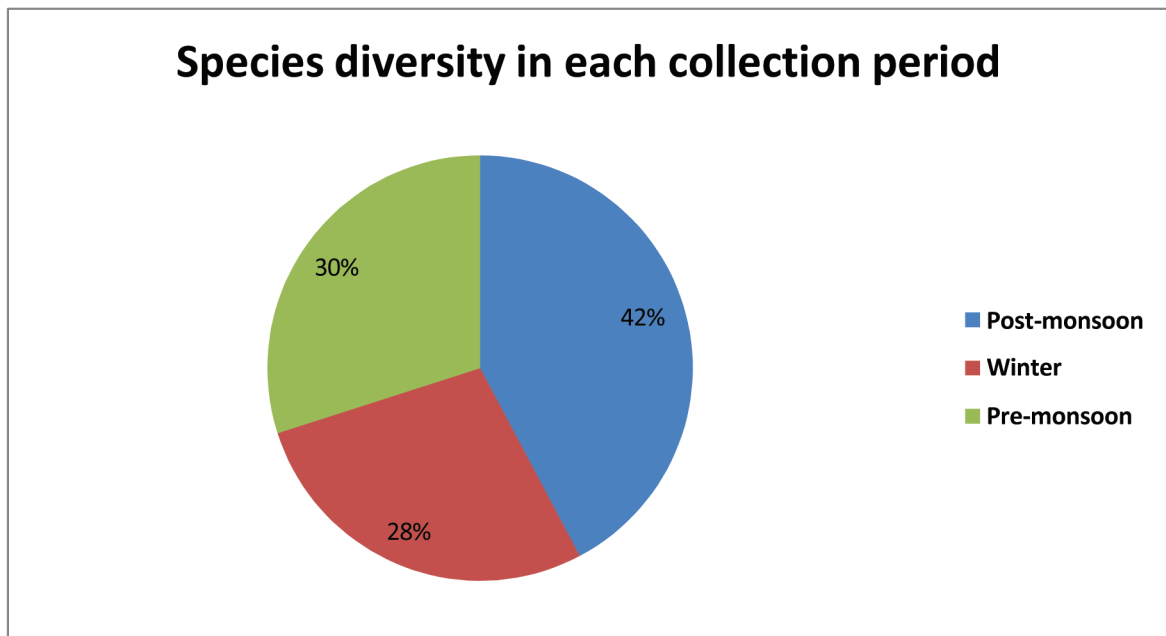
Table. 1: Species diversity of Coral-fishes belonging to different families in Amini island, Lakshadweep

Sl. No.	FAMILY	SPECIES
I	Hemiscyllidae	<i>Chiliscyllium arabicum</i>
II	Muraenidae	<i>Gymnothorax undulates</i>
III	Synanciidae	<i>Synaceia verrucosa</i>
IV	Mugilidae	<i>Chelon parsia</i>
V	Hemiramphidae	<i>Rhynchorhamphus malabaricus</i>
		<i>Hyporhamphus dussumieri</i>
VI	Belonidae	<i>Tylosurus crocodilus</i>
VII	Holocentridae	<i>Myripristis seychellensis</i>
		<i>Myripristis berndti</i>
		<i>Sargocentron macrosquamis</i>
VIII	Pomacentridae	<i>Abudefduf sordidus</i>
		<i>Abudefduf saxatilis</i>
		<i>Abudefduf vaigiensis</i>
		<i>Chrysiptera biocellatus</i>
		<i>Chrysiptera</i> sp.
IX	Carangidae	<i>Caranx ignobilis</i>
		<i>Giant trevally</i>
		<i>Trachinotus baillonii</i>
		<i>Trachinotus</i> sp.
		<i>Decapterus russelli</i>
		<i>Caranx sexfasciatus</i>
		<i>Elegatis bipinnulata</i>
X	Sphyraenidae	<i>Sphyraena forsteri</i>
XI	Fistularidae	<i>Fistularia petimba</i>
XII	Pinguipedidae	<i>Parapercis millipunctata</i>
XIII	Labridae	<i>Thalassoma Hardwicke</i>
		<i>Thalassoma janseni</i>
		<i>Halichoeres scapularis</i>
		<i>Stethojulis balteata</i>
		<i>Anampses</i> sp.
		<i>Halichoeres hortulanus</i>
		<i>Coris Formosa</i>
		<i>Stethojulis trilineatus</i>

		<i>Anampses caeruleopunctatus</i>
		<i>Halichoeres melas</i>
		<i>Novaculichthys taeniorus</i>
XIV	Scaridae	<i>Scarus frenatus</i>
		<i>Scarus viridifucatus</i>
		<i>Chlororus</i> sp.
XV	Mullidae	<i>Parupeneus barberinus</i>
		<i>Upeneus quadrilineatus</i>
		<i>Parupeneus trifasciatus</i>
		<i>Parupeneus macronemus</i>
		<i>Mulloidichthys flavolineatus</i>
XVI	Pempheridae	<i>Pempheris vanicolensis</i>
XVII	Kyphosidae	<i>Kyphosus vaigiensis</i>
XVIII	Serranidae	<i>Cephalopholis argus</i>
		<i>Variola louti</i>
		<i>Epinephelus marginatus</i>
		<i>Aetheloperca rogaa</i>
		<i>Epinephelus fasciatus</i>
		<i>Epinephelus macrospilos</i>
		<i>Epinephelus longispinis</i>
		<i>Epinephelus spilotoceps</i>
XIX	Chaetodontidae	<i>Chaetodon citrinellus</i>
		<i>Chaetodon auriga</i>
XX	Haemulidae	<i>Plectorhinchus gibbosus</i>
XXI	Lutjanidae	<i>Lutjanus kasmira</i>
		<i>Lutjanus fulviflemma</i>
		<i>Lutjanus bohar</i>
		<i>Lutjanus rivulatus</i>
		<i>Lutjanus gibbus</i>
XXII	Caesionidae	<i>Caesio varilineata</i>
		<i>Caesio xanthonota</i>
		<i>Dipterygonotus balteatus</i>
XXIII	Siganidae	<i>Siganus lineatus</i>
		<i>Siganus canaliculatus</i>
XXIV	Acanthuridae	<i>Acanthurus lineatus</i>
		<i>Acanthurus dussumieri</i>

		<i>Acanthurus gahhm</i>
		<i>Acanthurus triostegus</i>
		<i>Acanthurus mata</i>
		<i>Naso elegans</i>
		<i>Naso tuberosus</i>
		<i>Naso brevirostris</i>
		<i>Naso vlamingii</i>
		<i>Naso unicornis</i>
		<i>Acanthurus xanthopterus</i>
XXV	Monacanthidae	<i>Cantherinus</i> sp.
XXVI	Balistidae	<i>Rhinecanthus aculeatus</i>
		<i>Pseudobalistes flavimarginatus</i>
		<i>Melichthys niger</i>
XXVII	Tetrodontidae	<i>Canthigaster solandri</i>
XXVIII	Diodontidae	<i>Diodon hystrix</i>

Figure 1: Pie Diagram of Species Diversity in each collection period in Amini island.



The diagram reveals that, during the post-monsoon period, number of species is comparatively higher than the winter and pre-monsoon period. The species diversity was found to be low in the pre-monsoon season.



Picture 5: Dusky grouper (*Epinephelus marginatus* Lowe)

DISCUSSION

The present study shows that 28 families occurred on Amini Island. Among these, Wrasses (Labridae), Surgeon fishes, and Unicorn fishes (Acanthuridae) are the most abundant. They were followed by Serranidae, Carangidae, Lutjanidae, Mullidae, and Pomacentridae. According to Murty *et al.* (1986), Labridae is the most abundant family in Amini followed by Mullidae, Pomacentridae, Acanthuridae, and Scaridae. The present work could record 20 more families from Amini island as against only 8 observed by Murty (2002). However, Murty (2002) targeted only fishes of ornamental value. Jones and Kumaran (1980) recorded that Acanthuridae and Labridae are the most dominant families in Lakshadweep Island. Suresh (1997) reported 57 species of fishes

belonging to 19 families from Amini island. Whereas, this study finds that diversity of coral and coral-associated fishes in Amini island shows 84 species belonging to 28 families. Therefore, Amini Island is having a wide variety of coral-and coral-associated fishes that evolved over a period of time.

CONCLUSION

Eighty-four species of fishes under 28 families were recorded from Amini island among which *Chiloscyllium arabicum* Gubanov and *Epinephelus marginatus* Lowe are listed in IUCN Red list. Diversity and abundance of fishes were considerably different in various collections carried out over different time/season. The first sampling carried out during September yielded maximum species diversity and

abundance in the study site over the other two samplings (December and May). Rough weather of monsoon provides the lagoon a respite from fishing and other recreational use facilitating fishes to migrate to the lagoon in large numbers. Hence, generally, fish production from such places will be increased during the post-monsoon time. This study revealed the high diversity of coral reef fishes on Amini Island and showed the importance of the need for ecosystem conservation.

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