

Study on diversity of selected Carangidae species (Trevally) in Tuticorin coastal region at Gulf of Mannar, Tamil Nadu

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Abstract:

A detailed investigation was undertaken to study the biodiversity and stock assessment of selected Carangidae species of Thoothukudi coast. Specimens for the present investigation were collected from the gill net and trawl net catches of two landing centers thoothukudi fishing harbor and threshpuram fish landing center of Thoothukudi district of southern Tamil Nadu was carried out for a period of six months from August 2018 to January 2019. Among the 3 genera, the genus, Carangoides with 2 species, Caranx with 2 species, Pseudocaranx with 1 species.

Keywords: Carangidae, Stock assessment, Biodiversity, indices.

INTRODUCTION

The Gulf of Mannar, the first marine Biosphere Reserve in the South and South East Asia, running down from Rameshwaram to Kanyakumari in Tamil Nadu. This Marine Biosphere Reserve encompasses a chain of 21 islands and adjoining coral reefs the coasts of the Ramanathapuram and the Tuticorin districts forming the core zone; the Marine National Park. With its rich biodiversity of about 4,223 species of various flora and fauna, part of this Gulf of Mannar has been declared as a Marine National Park in 1986 by the Government of Tamil Nadu and later as the first Marine Biosphere Reserve of India in 1989 by the Government of India. Biodiversity plays a vital role in maintaining the health and stability of earth's environment. Biodiversity issues have become increasingly important as the human population grows and the demand for natural resources increases as it represents an important economic resource. More than 4,223 species of flora and fauna have been identified in the Gulf of Mannar area and the publication titled "Coastal and Marine Biodiversity of Gulf of Mannar, Southeastern India – a comprehensive updated species list" by Gulf of Mannar Biosphere Reserve trust in 2012 provides the updated species list on the biodiversity of Gulf of Mannar (Mallehappa, 2015). The Gulf of Mannar region supports a variety of habitats within the main ecosystems of coastal lagoons, sea grass beds and coral reefs. Due the high productivity of the area, it is an important fishing both for India and Sri Lanka. (Ganesh,K and Geetha,B *et al.*, 2018). Prior to and during their return migration, they cease to eat, drawing on their fatty energy reserves to survive. (Grubb TC *et al.*, 2003). Fish utilize a variety of mating systems. Familial relationships vary in importance from species that recognize and reduce aggression toward those with whom they are related to those that do not. The Carangidae family of fish contains approximately 200 different species of trevallies, jacks and scads distributed in all oceans (Murugesan,V, Ganesh,K. *et.al.*, 2019).

REVIEW OF LITERATURE

Diversity in the species complex, typical of tropical waters and co-existence of different fish and shellfish species in the same ground are important features of Indian Marine Biodiversity. Past studies on the biological and fishery characteristics of the important groups shown that most of the species supporting the fishery are short lived with an average life span up to 3-5 years, but the fishery being mainly supported by under an year olds and one year old. They are highly fecund and spawn over longer periods mostly with fractional spawning and show wide annual variation in recommitment. (Ganesh,K. and Geetha,B. *et.al.*, 2017) Several issues in the captive fisheries sector adversely affect the marine biodiversity of the country especially in the fish as ecosystem good to human beings (Joshi *et al.*, 2015). The seawater surrounding east west coasts of the country with salinity more than 30 ppt is designated as marine water. Mariner fisheries resources of the Bay of Bengal, Arabian Sea and Indian Ocean including coastal, (Nazerath Nisha, Ganesh,K. *et.al.*, 2018) offshore and deep sea as well as islands comprising 1,370 taxa including the commercially important species like sharks, rays, Bombay Malabare sole, parrot fish, perches, white fish, silver bellies seer fish, mackerel, tuna, carangids, polynemids, pomfrets, basracuds, red mullet, ribbon fishes, anchovies shellfishes (Ayyapan *et al.*, 2006). According to Department of fisheries Government of Tamil Nadu – 2002, Fishing is the single way of employment to 8,65,033 fisher-folk populations. Fishes are one of the important elements in the economy of many nations as they have been a stable item in the diet of several people. Biodiversity is the life sustaining system and its components have ecological, social economic, scientific education culture and aesthetic value. India being the mega diversity country has a vast coastal line 8,500 kms encompassed with estuaries, backwater, sandy beaches near shore environmental seagrass, meadows, algal communities mangrove forest and many small island has the huge potential of marine biodiversity (Rajasekar *et al.*, 2009). Fishery occurred round the year, with peak during April-August (Ranjiga Anjali,A. Ganesh,K. *et.al.*,2018). Catch rate was also high during this period. Carangids of the genera *Caranx* have good consumer acceptability due to their quality flesh without inter muscular bones.

MATERIALS AND METHODS:

The data collection and specimens were collected from two major fish landing centers are Thoothukudi, Threshpuram. Sampling was done monthly four times in the above landing centres. The specimens were collected from the catches of trawl net, bottom set gill nets and hook and lines. The trawl net is operated with trawler and the other gears are operated with plank built boat locally called as 'Vallam' on an average of fifty boats per sampling day. The data collected were station-wise as well as season-wise for calculation of various biodiversity indices. To study the species-wise distribution, Trevally specimens were collected and identified in every week from the above said landing centres during August 2018 to January 2019.

Preparation of check list

A by-catch assessment and biodiversity check list of trevally species recorded in the two landing centre in Thoothukudi district for Gulf of Mannar Coastal region during the present study was prepared including their systematic position.

Species diversity (H')

Species diversity is a measure of comparing diversity between various habitats. The diversity of trevally was calculated for each station following Shannon - Wiener index using the formula.

$$H' = (N \log - \sum ni - \log ni) / N$$

Where, H' is the species diversity in bits of information per individual, n_i is the proportion of the sample belonging to i^{th} species (number of individuals of i^{th} species) and N is the total number of individuals in the collection and \sum is the summation.

Species richness (d)

Species richness is a measure of the total number of the species present, making some allowances for the number of individuals. Species richness for each station was calculated following Margalef index (d) using the formula,

$$d = (S-1) / \log_e N$$

Where, S is the total number of species in each sample i.e. species with non-zero counts and N , the total number of individuals in each sample.

Species evenness (j')

This is measure of equitability and a measure of how evenly the individuals are distributed among the species. Evenness was calculated for each station following Pielou's evenness (j') using the formula,

$$J' = H' / \log_2 S \text{ or } H' / \ln_2 S$$

Where, H' is the diversity in bits of information per individual and S , the total number of species.

Simpson's diversity index (D)

Simpson's index (D) is a measure of diversity, which takes into account both species richness, and an evenness of abundance among the species present. In essence it measures the probability that two individuals randomly selected from an area will belong to the same species. The formula for calculating D is presented as:

$$D = \frac{\sum n_i (n_i - 1)}{N (N - 1)}$$

Where n_i is the total number of organisms of each individual species, N is the total number of organisms of all species. The value D ranges from 0 to 1.

Shannon Index (H)

The Shannon index is an information statistic index, which means it assumes all species are represented in a sample and that they are randomly sampled.

$$H = \sum_{i=1}^s P_i \ln P_i$$

Where P is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N), \ln is the natural log, \sum is the sum of the calculations, and s is the number of species.

RESULTS

An intensive study was taken up for six months (August 2018 - January 2019) to assess the by-catch of trevallies along the Gulf of Mannar Southeast coastal region at Thoothukudi district. The study area was two fish landing stations namely Thoothukudi fishing harbor and Threshpuram landing centre trevally species are available in large numbers (Table - 2). The total number of species identified was 5 from the above two fish landing centre. A checklist of trevally species recorded was prepared with their systematic position (Table - 1). In the present study, 5 species of trevallies belonging to one order, one family and 3 genera were recorded in Gulf of Mannar, Tamil Nadu, Southeast coast of India (Fig-1). Among the 3 genera, the genus, *Carangoides* with 2 species, *Caranx* with 2 species, *Pseudocaranx* with 1 species (Plate - I).

Spatial variations in Shannon –Wiener diversity index (H')

The Shannon – Wiener diversity index (H') (\log_2) was calculated to be ranges of 0.7001 – 1.313 for Thoothukudi fishing harbour. The index was in the ranges of 0.6226 – 0.9351 for Threshpuram fish landing centre. The spatial variations in ' H ' among different stations was in the following ascending order.

Thoothukudi fishing harbour > Threshpuram fish landing centre

Spatial variations in Simpson's diversity index (D)

The Spatial variations in Simpson's diversity index (D) was calculated to be ranges of 0.4603 – 0.6883 for Thoothukudi fishing harbour. The index was in the ranges of 0.3635 – 0.6921 for Threshpuram fish landing centre. The spatial variations in ' D ' among different stations was in the following ascending order.

Thoothukudi fishing harbour > Threshpuram fish landing centre

Spatial variations in Margalef Species richness (d)

The Spatial variations in Margalef Species richness (d) was calculated to be ranges of 0.2682-0.5131 for Thoothukudi fishing harbour. The index was in the ranges of 0.3203-0.6229 for Threshpuram landing centre. The spatial variations in ' d ' among different stations was in the following ascending order.

Threshpuram fish landing centre > Thoothukudi fishing centre

Spatial variations in Pielou's evenness index (J')

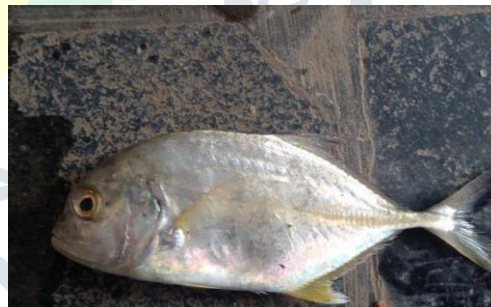
The Spatial variations in Pielou's evenness index (J') was estimated to be ranges of 0.5886-0.7759 for Thoothukudi fishing harbour. The index was in the ranges of 0.5749-0.7379 for Threshpuram fish landing centre. The spatial variations in ' d ' among different stations was in the following ascending order.

Thoothukudi fishing harbour > Threshpuram fish landing centre

Plate - I



Giant trevally (*Carnax ignobilis*)



Malabar trevally (*Carangoides malabaricus*)



Yellow trevally (*Carangoides fulvoguttatus*)



White trevally (*Pseudocaranx dentex*)



Big eye trevally (*Caranx sexfasciatus*)

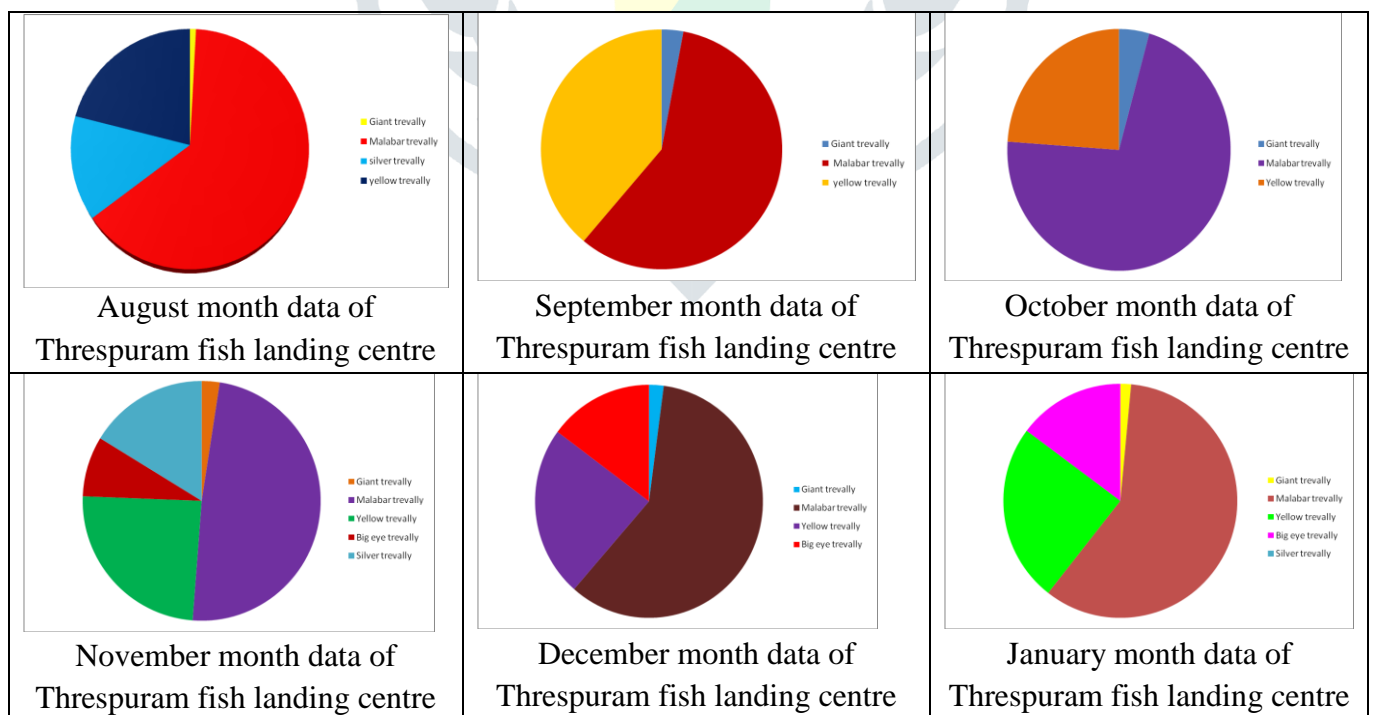
Table 1 : Various diversity indices

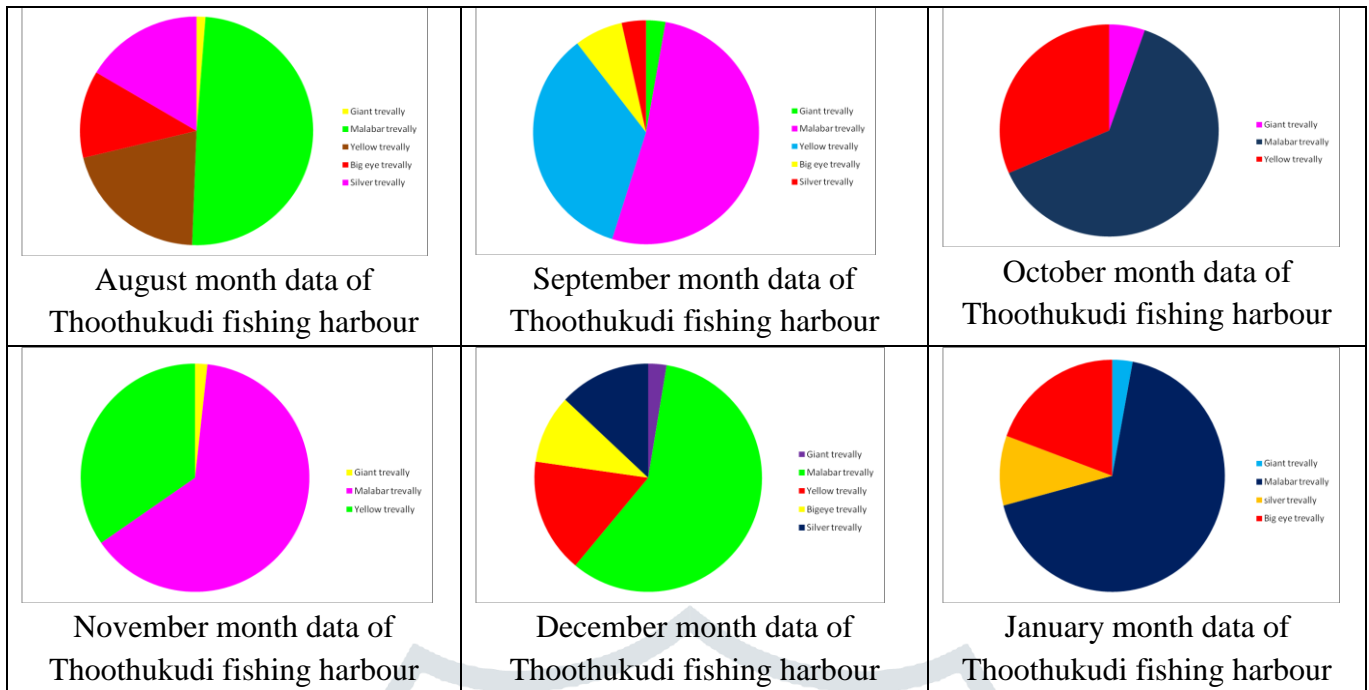
Stations	Shannon –Wiener diversity index [$H' (\log_2)]$	Simpson’s diversity index (D)	Margalef Species richness (d)	Pielou’s evenness (J')
Thoothukudi Fishing Harbor	1.067733	0.587572	0.430783	0.691639
Threshpuram Fish Landing Centre	0.936967	0.529583	0.459667	0.678861

Table 2 : Number of Carangidae species dominance in Gulf of Mannar

Scientific Name	Tuticorin	Threshpuram
<i>Caranx ignobilis</i>	240	69
<i>Carangoides malabaricus</i>	6400	1785
<i>Carangoids fulvoguttatus</i>	3400	640
<i>Pseudocaranx dentex</i>	1300	250
<i>Caranx sexfasciatus</i>	1100	200

Figure: 1 – Month wise data for two landing centers.





CONCLUSION

From this study we can concluded that the Carangidae family species were abundant in Tuticorin coastal region at Gulf of Mannar. The study was carried out for six months from August-January. The Carangidae family species were abundant in all seasons except November due to the boats does not go to the sea during rain and because of storm. This study gives a important information to fisherman to know about the diversity of Carangidae family fishes (Trevally) in tuticorin coastal region.

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