*Available online at* www.scholarsresearchlibrary.com

Scholars Research Library

**Scholars Research Library**

**Annals of Biological Research, 2012, 3 (12):5718-5723**
*(http://scholarsresearchlibrary.com/archive.html)*

Annals of Biological Research
Scholars Research Library
**ISSN 0976-1233**
**CODEN (USA): ABRNBW**

# Diversity and Seasonal distribution of the turrids (Gastropoda: Turridae) among the four landing centers of Southeast coast of India

**Chinnaiyan Elaiyaraja*, Veeramuth Sekar, Ramadoss Rajasekaran, Olivia. J. Fernando**

*Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai - 608 502, Tamil Nadu, India.*

---

**ABSTRACT**

*Marine gastropods of the family turridae encompass the largest living group of venomous snails. The taxonomy of this group is generally derelict along the southeast coast of India. The present study was carried out to observe the abundance and seasonal distribution of the turrids assemblage and this survey evaluated turrids from the by catch recourses from Kasimedu, Cuddalore, Mudasalodai and Pazhayar along the Tamilnadu coastline. Totally 1753 individuals belonging to 16 species of turrids were collected. The highest abundance of 16 species of turrids present in Pazhayar, whereas 13 species were in Mudasalodai 10 in Kasimedu and 6 in Cuddalore. Among these, Turricula javana, Lophiotoma indica and T. tornata were maximum abundant at all the four stations. The Shannon diversity index (H'log2) of turrids was varied from 1.94 – 0.68 and the species richness was varied from 2.21 to 0.31 where as seasonal contribution of turrids are maximum in pre-monsoon at Pazhayar and minimum in summer at Cuddalore. The species evenness was varied from 0.9 to 0.6 in Mudasalodai. The information regarding the diversity of turrid would assist the researchers to isolate the peptide from the turrid venom.*

**Key words**: *Turricula javana*, season wise, Mudasalodai, trash fish, dendogram

---

## INTRODUCTION

Mollusca are one of the most significant groups contributing to the biodiversity in Shallow water marine environments. Morphological diversity is arguably one of the most intuitive measures of biological variety [19, 18]. Turrids is the large taxonomic marine mollusks family of turridae and distribution of this species spread over through temperate waters to the tropics level. The sizes varied from 2 to 116 mm in length. They constitute more than half of the predatory gastropods in some parts of the world [16]. Still the taxonomic classification of the Turridae is confused, and has been in a constant state of revision. Turrids comprise the largest family of deep-sea gastropods [13] and account for the vast majority of conoidean biodiversity [1].

From the Indian waters, there are few reports on the quantity and quality of by-catch due to trawling operations [15, 12, 7]. The present survey was documented to know the seasonal distribution of turrids among the trash fish from four economically important landing centers along the Tamil Nadu coastline, southeast coast of India. Here the diversity status of the family turridae to assess the species composition within the species assemblage with respect to season as well as stations.

## MATERIALS AND METHODS

### Study area

Season wise sampling was carried out on-board commercial trawlers for the period of one year (April 2011 to March 2012) at the four important landing centers of Tamil Nadu. The samples were collected from fish landing centers of

Kasimedu (13°7'36"N, 80°17'52"E) Cuddalore (11°8'42"N, 79°8'46"E), Mudasalodai (11°8'29"N, 79°8'46"E) and Pazhayar (11º 21'32"N, 79º 50'24"E). More than 457 trawlers engaged in Kasimedu, whereas 275 trawler in Cuddalore, 200 trawlers in Mudasalodai and more than 215 trawlers in Pazhayar for the daily fishing activities.

**Sampling Methods**

The sampling was done randomly from five heaps contributing 100 kg (20 kg/ heap) at all stations. The collected specimens were brought to the laboratory, cleaned with a brush and identified using appropriate literatures [14, 11, 5] and after identification the sample were stored at 95 % ethanol for further studies. The data were collected fortnightly, pooled seasonally and this was repeated throughout the period.

**Data analysis**

Univariate measures (Margalef's species richness d, Shannon Wiener diversity H' log2, and Pielou's evenness J' Simpson dominance index D), graphical tools (K-dominance Curve) and multivariate tools (Cluster) were used for treating the data with PRIMER (Version 6.1.12).

## RESULTS

**Abundance**

Totally 1753 turrids individuals were collected and identified 16 different species of 8 genera from all the four stations (Fig. 1). Among them, 39 % collected from Kasimedu, 28 % from Pazhayar, 25 % from Mudasal odai and 6 % from Cuddalore. Maximum number of species was collected in the post monsoon at Kasimedu and least numbers of individuals were collected in the premonsoon at Cuddalore landing center (Fig. 2).


**Figure 1: Map showing the study area**

In order of abundance, the species were listed viz. *Turricula javana, Lophiotoma indica, L. tayabasensis, Xenuroturris millepunctata, Lophiotoma acuta, Turris assyria, Funa tayloriana, Funa Sp. F. laterculoides, Brachyotoma Sp, Gemmula speciosa, Gemmula Sp, Tomopleura sp. T. tornata* and *Drilla umblicata*. Most abundant species was *Turricula javana* which was contributed by 32.80 % followed by *Lophiotoma indica* (35.82 %) and *Turricula tornata* (12.92 %) and the least number of species were *L. tayabasensis, Brachyotoma Sp, Gemmula Speciosa, Tomopleura sp* and *Drilla umblicata*. Table 1 shows the analysis of variance revealed that the species variance and diversity patterns were significant at 0.05 levels (P > 0.05) between the seasons and stations.

**Table 1: ANOVA (two-way) for the differences in values of turrids distribution between species and station**

| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Species | 39435.87 | 14 | 2816.848 | 14.45172 | 2.9E-09 | 2.063541 |
| Stations | 2757.733 | 2 | 1378.867 | 7.074221 | 0.00326 | 3.340386 |
| Error | 5457.6 | 28 | 194.9143 | | | |
| Total | 47651.2 | 44 | | | | |

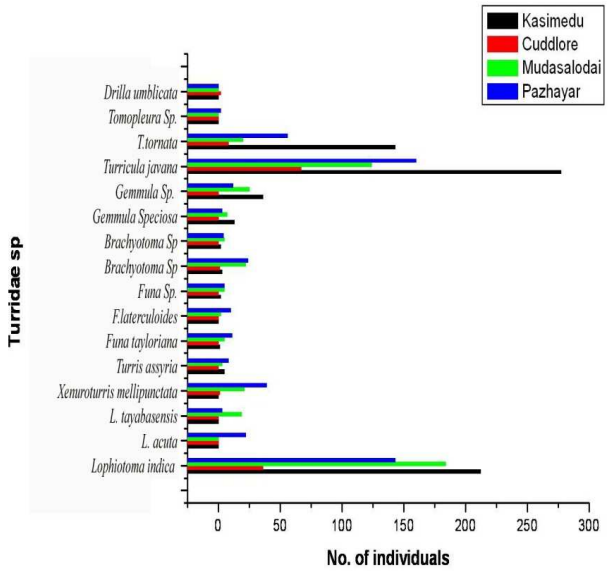


**Figure 2: Represented the numbers of individuals in all the station**

## Diversity indices

In the present investigation, 6 to 14 of species were recorded at all landing centers; the diversity values are shown in the Table 2.

**TABLE 2: Diversity value of turrids during the present study**

| Stations | S | N | d | J' | H'(loge) | 1-Lambda' |
|---|---|---|---|---|---|---|
| Pom - Ka | 8 | 189 | 1.335 | 0.7426 | 1.544 | 0.7469 |
| Sum - Ka | 7 | 143 | 1.209 | 0.7423 | 1.444 | 0.7273 |
| Prem - Ka | 4 | 203 | 0.5646 | 0.9014 | 1.25 | 0.6918 |
| Mon - Ka | 5 | 94 | 0.8804 | 0.8581 | 1.381 | 0.7351 |
| Pom - Cu | 3 | 39 | 0.5459 | 0.9539 | 1.048 | 0.6505 |
| Sum - Cu | 2 | 25 | 0.3107 | 0.9896 | 0.6859 | 0.5133 |
| Prem - Cu | 3 | 41 | 0.5386 | 0.7155 | 0.786 | 0.5317 |
| Mon - Cu | 4 | 21 | 0.9854 | 0.79 | 1.095 | 0.6524 |
| Pom - Mu | 8 | 124 | 1.452 | 0.7733 | 1.608 | 0.7634 |
| Sum - Mu | 7 | 93 | 1.324 | 0.6768 | 1.317 | 0.6632 |
| Prem - Mu | 7 | 136 | 1.221 | 0.821 | 1.598 | 0.7552 |
| Mon - Mu | 6 | 82 | 1.135 | 0.7875 | 1.411 | 0.7013 |
| Pom - Pz | 6 | 121 | 1.043 | 0.7197 | 1.289 | 0.6689 |
| Sum - Pz | 10 | 162 | 1.769 | 0.8639 | 1.989 | 0.83 |
| Prem - Pz | 13 | 225 | 2.216 | 0.7775 | 1.994 | 0.8254 |
| Mon - Pz | 2 | 66 | 0.2387 | 0.9993 | 0.6927 | 0.5072 |

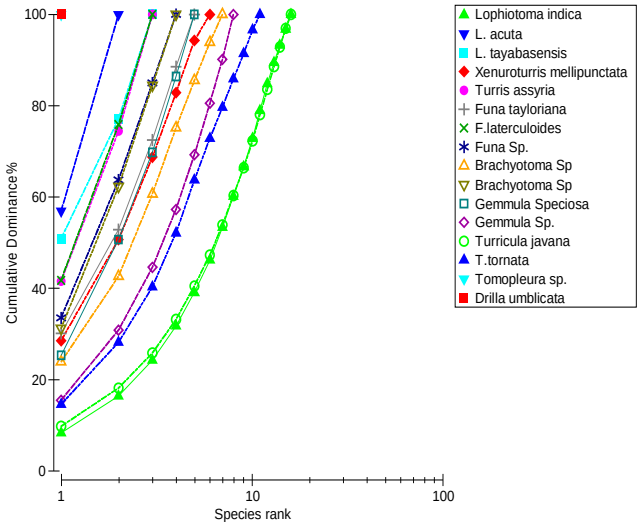


**Figure 3: K - Dominace curves for all the tuddids species**

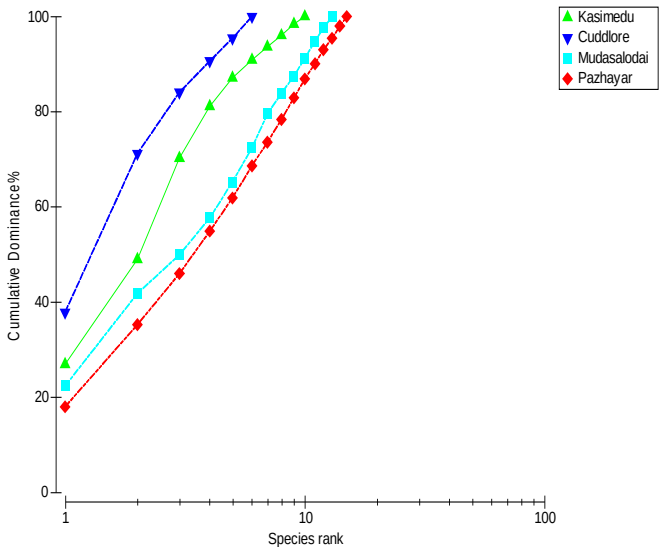


**Figure 4: K - Dominace curves for all the stations**

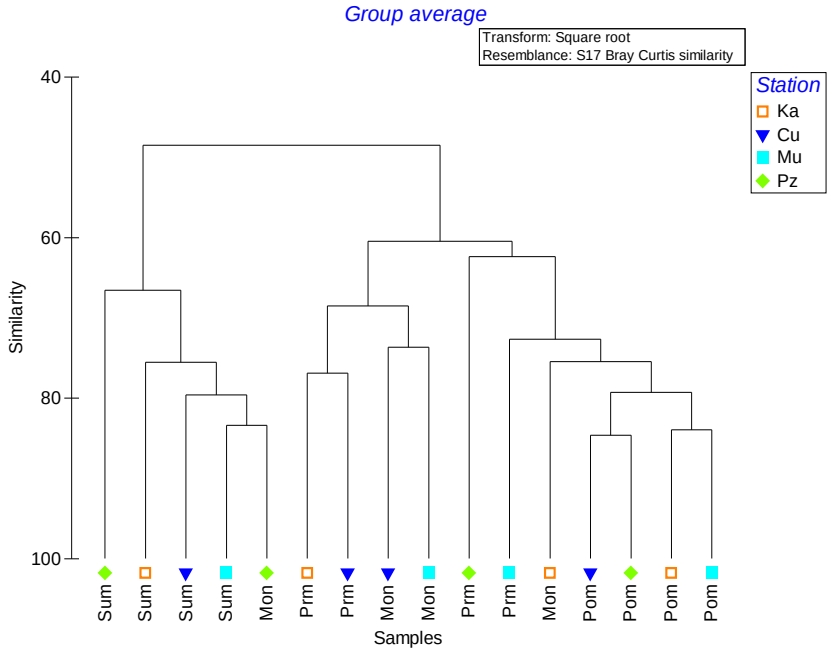


**Figure 5: Dendogram showing the similarity between the seasons and stations**

The diversity index was minimum at Pazhayar (1.99) during pre-monsoon and least (0.68) in Cuddalore. It was varied during monsoon (1.25) and post monsoon (1.54) in Kasimedu followed by Cuddalore during pre-monsoon (0.68) and summer (1.09). Mudasalodai had great diversity of 1.60 (Post monsoon) and 1.37 (summer), followed by Pazhayar 0.69 (monsoon) and 1.99 (pre monsoon).Whereas the species richness varied from 2.21 to 0.31 and it was minimum at Cuddalore during summer and maximum at Pazhayar during pre-monsoon seasons. Species evenness was varied during the study period as 0.67 in Mudasalodai (summer) and 0.99 in Pazhayar (pre monsoon). The K-dominance plots the percentage cumulative abundance against species rank k on a logarithmic scale. The plot drawn for all seasons showed maximum turridae diversity (15 species) at Pazhayar and minimum (6 species) at Cuddalore (Fig. 3). The K-dominance plot drawn for the four different seasons showed much difference. However for all the seasons, the curve for the pre monsoon was deceitful at the season, indicating little higher diversity than others (Fig. 4). The result showing *Turricula javana*, *Lophiotoma indica* and *T. tornata* species were indicating greatest abundance than other species in all the station and seasons.

Figure 5 shows cluster analysis is a technique in which entities are sequentially linked together according to their similarity (or dissimilarity) producing a two dimensional hierarchical structure (Dendogram). The hierarchical clustering, using the group average linking on the turridae species abundance data for all the four stations during the

four seasons is depicted. Bray-Curtis similarities were calculated on the 4th root transformed data. It was observed that maximum similarity (84.65%) was found between post-monsoon season of Kasimedu and Cuddalore. In same seasons, Mudasalodai and Pazhayar formed a group at 83.95 levels. In summer, Mudasalodai and Pazhayar (79.6) joined with another level to Cuddalore in summer at 76.87 similarity level. Another group joined with Kasimedu and Cuddalore at 75.44 levels, remain level the Dendogram was represented the pre-monsoon and summer was larger group.

## DISCUSSION

During the trawl catch, nearly 70 % of total catch was discarded as by-catch [4]. In India, majority of the by-catch constitute the molluscan resources which have been utilized for food and other purposes since ancient times. Recent days, gastropods are of sustenance nature and are used for the various pharmacological and other compounds which were discovering from the toxic marine animals. Results of the present study showed that the biodiversity of southeast coast of India was increased than earlier studies in three stations namely Pazhayar [6], Cuddalore [10, 2] and Mudasalodai [2].

In taxonomical point of view turrids are the most diverse group of marine mollusks, with almost 700 recent and fossil nominal genera and 10,000 species, and current estimates of about 340 recent valid genera and subgenera and 4000 named living species [17]. However, turrids are unique in being a species guild that is diversified on soft bottoms as well as on hard bottoms, in shallow as well as in deep water, and in polar as well as tropical waters [3]. Subba rao (2003) had recorded 80 species of turrids from the east and west coasts of India and Lakshadweep, Andaman and Nicobar Islands. .

Present study indicated that the seasonal contribution of trash was found to be high in the post monsoon and summer and less in monsoon which was similarly reported by Babu et al. (2010). Due to the rough weather during the northeast monsoon along the southeast coast, the fishing activity was not conducted and it may be a reason for poor trash fish landing. During the previous studies, *Turricula javana* (32.80 %) and *Lophiotoma indica* (35.82%) are the most abundant species along southeast coast of Tamilnadu [9, 8]. Previously 80 species were reported and 23 species of turridae had been identified in Indian waters, among them 7 species such as *Turricula javana, Lophiotoma indica, T. tornata, Tomopleura sp.* and *Funa Sp,* were identified in southeast coast of India [14]. In the present study, 9 species were newly recorded in Tamil Nadu waters in all the 4 landing centers.

The results indicated that the seasonal distribution of turrids were abundant during pre-monsoon and least in summer and monsoon. In Kasimedu and Pazhayar, the species distribution and number of individuals are high due to the mass usage of trawler and massive fishing practices and thus trash fish discard was also more. Kasimedu is one of the major fish landing center in Chennai, about 678 species were collected belonging to 11 species and in Pazhayar, around 15 species of turrids were collected followed by Mudasalodai and Cuddalore.

## CONCLUSION

The information regarding the diversity of turrid would assist the researchers to help the taxonomy and towards better understanding utilization of bio resources and peptide from the turrid venom. In biodiversity conservation point of view, million tons of trash fish have been discarded every day. It is a foremost disaster in marine ecosystems, suggest the fishermen that catch the targeted species only. After harvesting the trash, they will be utilized for drug discovery from low value source.

**Acknowledgement**
The authors are thankful to the Dean, CAS in Marine Biology and Annamalai University for providing the necessary facilities. Help rendered by renowned taxonomist Dr. Antony Fernando, CAS in Marine Biology, Annamalai University and Dr. Frank Heralde, Department of Biochemistry and Molecular Biology, University of the Philippines-Manila for the identification of mollusks is acknowledged.

## REFERENCES

[1] P Bouchet, P Lozouet, P Maestrati, V Heros, *Biol J Linn Soc*, **2002,** 75, 421-436.
[2] A Babu, K Kesavan, D Annadurai, S Rajagopal, *Ma Bio Ass UK*, **2010**, 3, 1-5.
[3] P Bouchet, PKL Ng, D Largo, SH Tan, *Raffles Bul Zool*, **2009**, 20, 1-19.
[4] BJ Hill, TJ Wassenberg, *Aus J Mar Fres Res*, **1990**, 41, 53-64.
[5] RN Kilburn, *Annals Natal Museum*, **1988**, 29, 167-320.
[6] VR Mansingh, MSc dissertation, Annamalai University (Parangipettai, India, **1994**).

[7] NG Menon, In: NG Menon and CSS Pillai (Eds.) Marine Biodiversity, Conservation and Management, Central Marine Fisheries Research Institute, Cochin (India, **1996**), 97–102.
[8] A Babu, 2009 MPhil thesis, Annamalai University (Parangipettai, India, **2009**).
[9] J Mohanasundaram, MSc dissertation, Annamalai University (Parangipettai, India, **1993**).
[10] S Murugan, MSc dissertation, Annamalai University (Parangipettai, India, **1998**).
[11] BM Olivera, *Sci Diliman*, **2004,** 16, 1-28.
[12] KS Rao, *J Fish Assoc*, **1988,** 18, 239–244.
[13] MA Rex, CT Stuart, G Coyne, *Pr Nat Acad Sci*, **2009,** 7, 4082-4085.
[14] NV Subba rao, Indian sea shells Polyplacophora and gastropods, Zoological Survey of India, Kolkata, **2003**, 1-337.
[15] KK Sukumaran, KY Telang, O Thippeswamy, *Mar Fish Inf Serv Tech Ext Ser*, **1982**, 44, 8–14.
[16] FW Taylor, BL Isacks, C Jouannic, AL Bloom, J Dubois, *J Geophys Res*, **1980**, 85, 5367–5381.
[17] JK Tucker, *Zootaxa*, **2004**, 682, 1-12.
[18] PH Williams, CJ Humphries, *Bl Sci*, **1996,** 54-76.
[19] PH Williams, KJ Gaston, CJ Humphries, *Biodiv Lett*, **1994,** 2, 67-78.