

## STUDIES ON FISHERY AND FOOD AND FEEDING OF STOMATOPOD *ORATOSQUILLA NEPA* ON MANGALORE COAST

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(Received 27 June 2021, Revised 27 August 2021, Accepted 2 September 2021)

**ABSTRACT :** *Oratosquilla nepa* is important Stomatopod species, which landed abundant quantity in Mangalore coast. Availability of Stomatopods begins from September to May. During study period the catch was high in January and CPUE per day per boat was 73kgs. This species spawns from December to May, with the peak during January to April. Females were dominant in all the months during the study. Along Dakshina Kannada coast even though trawling commences in September, Stomatopods start appearing in the catch only in November and lasts till May or early June. Food and feeding habit was confirmed that detritus is major food items in all season and all size groups.

**Key words :** Stomatopod, *Oratosquilla nepa*, Mangalore coast, CPUE.

**How to cite :** M. Puneeth Rai, S. R. Somashekar, C. Kishor, Manjulesh Pai, Umesh Arun Suryawanshi and Adarsh K. (2022) Studies on fishery and food and feeding of Stomatopod *Oratosquilla nepa* on Mangalore coast. *J. Exp. Zool. India* **25**, 1401-1408. DocID: <https://connectjournals.com/03895.2022.25.1401>

### INTRODUCTION

A large quantity of fishes that are landed in Mangaluru harbours in non-edible form are condemned as trash fish and sold at lower price for fish meal preparation and for fertilizers. Stomatopods when caught in small quantity are discarded and if they are caught in good quantity were brought to the shore as a low value bycatch. Stomatopods comes under the family Squillidae. Throughout west coast of India, this shellfish is available in plenty in shrimp trawls. Study of Shanbhogue (1977) showed that *Oratosquilla nepa* is widely distributed and is reported from Arabian Sea and Bay of Bengal because of its magnitude of catch it is becoming popular species 23 in India and grows to about 14 cm in length. About 14784 tones (CMFRI Annual report, 2017-18) of Stomatopods landed in 2017-18. The highest landings of the Stomatopods have been observed from Karnataka where more than 50% of the crustacean landings are contributed by them. Squilla along with the 'trash' fish are a good raw material for fishmeal, poultry feed and manure. Since the landings of Squilla are considerably high at Mangalore and Malpe fishing harbour, a number of fishmeal plants have come up in the area in recent years for converting it into fishmeal and poultry feed.

Most of the Squilla landing at Mangalore are taken to the fishmeal plant at Ullal, a nearby fishing village, where they are converted into fish meal/poultry feed.

*Oratosquilla nepa* has a good flesh yield and asymptotic length. They form potential sources of food, generate by-products like chitin/chitosan and are popular in ornamental aquaria (Lakshmi and Thirumilu, 2008). The work of Kurup *et al* (1987) revealed that during 1980-81 and 1981-82, 34 the annual bycatch in trawl fishery of Karnataka was estimated as 85% of the total trawl catch, Stomatopods being the major constituent. Dinh *et al* (2010) revealed that Stomatopods are sometimes used as processed poultry food, or even as manure. Because most of the tropical Stomatopod catches originate from penaeid shrimp shallow-water fisheries, the reports on their by-catches do not tend to show the quality attained by the target species.

Abello and Macpherson (1990) observed that Stomatopods plays an important role both as predators and prey in many areas with other species, mainly in shallow-water penaeid shrimp and fish and Abdu Rahiman (2006) studies on food and feeding of marine demersal finfishes with special reference to trophic interactions

stated the importance of stomatopod in the diet of demersal fishery. At present this group is heavily exploited by the commercial trawlers, which may have an effect on demersal fishery and among Stomatopods, *Oratosquilla nepa* most dominant species along Mangalore coast.

## MATERIALS AND METHODS

### Study area

The experiment was conducted during 2013-14 at Mangalore fishing harbour and in Department of Fisheries Resources and Management shown in Fig. 1. The present study deals with fishery and some aspect of biology of the stomatopod *Oratosquilla nepa* based on the examination of the species from the commercial trawl

noted. Each individual was cut open and the nature of their fullness of their stomachs were examined. They were then preserved in 5% neutral formalin. The intensity of feeding was judged by the degree of the distension of the stomach. This was judged visually and classified as full, 3/4 full, 1/2 full, 1/4 full and empty. For the sake of convenience, specimens with full stomachs were considered as actively fed, 3/4 and 1/2 as moderately fed while stomachs with 1/4 and empty were treated as poorly fed. Month wise percentage of stomachs with different intensities of feeding were computed.

## RESULTS AND DISCUSSION

### Fishery of Stomatopod

Along Dakshina Kannada coast even though trawling



**Fig. 1 :** Study area, Mangalore fish landing centre (Jetty).

catches at Mangalore. *Oratosquilla nepa* is the important Stomatopod species, which landed abundant quantity in Mangalore. Random samples of *Oratosquilla nepa* were collected at fortnightly from the trawl catches at Mangalore Fishing Harbour, for a period of 9 month. On each sampling, about 10% of the trawl unit were observed at random to record the catch of *Oratosquilla nepa* in weight, from which the total catch for the day was computed. The total catch and effort data for different days of observation were pooled and raised for monthly estimates. The monthly fishing effort is expressed in terms of number of boat units, and catch per unit effort (CPUE) accordingly. Total of 180 specimen were 90 females and 90 males were examined for this purpose. Immediately after collection, the total length wet weight, sex were

commences in September, Stomatopods start appearing in the catch only in November and lasts till May or early June.

Table 1 shows the catch of *Oratosquilla nepa*, effort and CPUE by shrimp trawlers at Mangalore in various month during the study period. In Fig. 2, the minimum and the maximum catches of stomatopods were 4,021 kg (September) and 6,83,060 kg (January) respectively with an estimated total catch of 36, 88,437 kg forming 20% of total trawl landings. The monthly effort varied between 872 unit (September) and 6846 unit (February) with a monthly average of 4,585 units. The CPUE of *Squilla* ranged from 4.6 kg (September) to 127.9 kg (May) with average of 73.43 kg.

Along Dakshina Kannada coast Stomatopods make

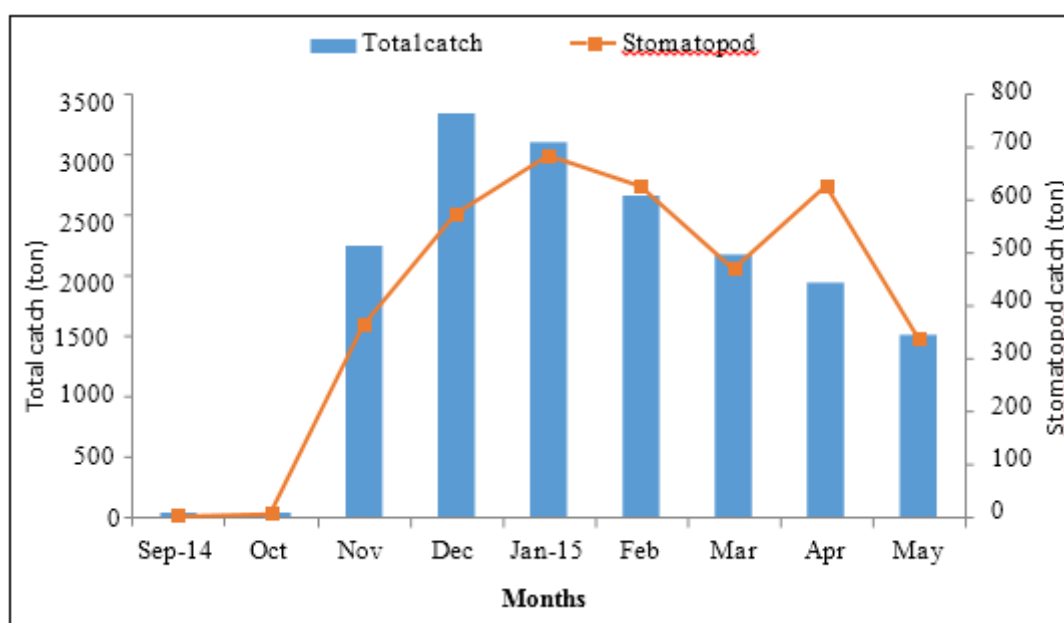


Fig. 2 : Total Trawl catch and stomatopod catch (Sep 14 - May 15).

Table 1 : Details on total catch (Kg), Squilla catch (Kg), effort (Units), CPUE, of trawl landings at Mangalore (Sept 2014 to May 2015).

Month	Total catch (Kg)	Squilla catch (Kg)	Effort	CPUE	CPUE (Squilla)	% of Squilla
Sep 2014	46941	4021	872	54	4.6	8.5660723
Oct	53767	8241	610	88	13.5	15.3272453
Nov	2236627	362644	5791	386	62.6	16.2138792
Dec	3329019	572998	6289	529	91.1	17.2122178
Jan 2015	3093075	683060	6279	493	108.7	22.0835253
Feb	2650938	624578	6846	387	91.2	23.5606416
Mar	2165522	469406	6068	357	77.3	21.6763441
Apr	1934546	625880	4890	396	127.9	32.3528104
May	1502280	337609	4019	374	84	22.4731075
Total	17012715	3688437	41664			19.9406493

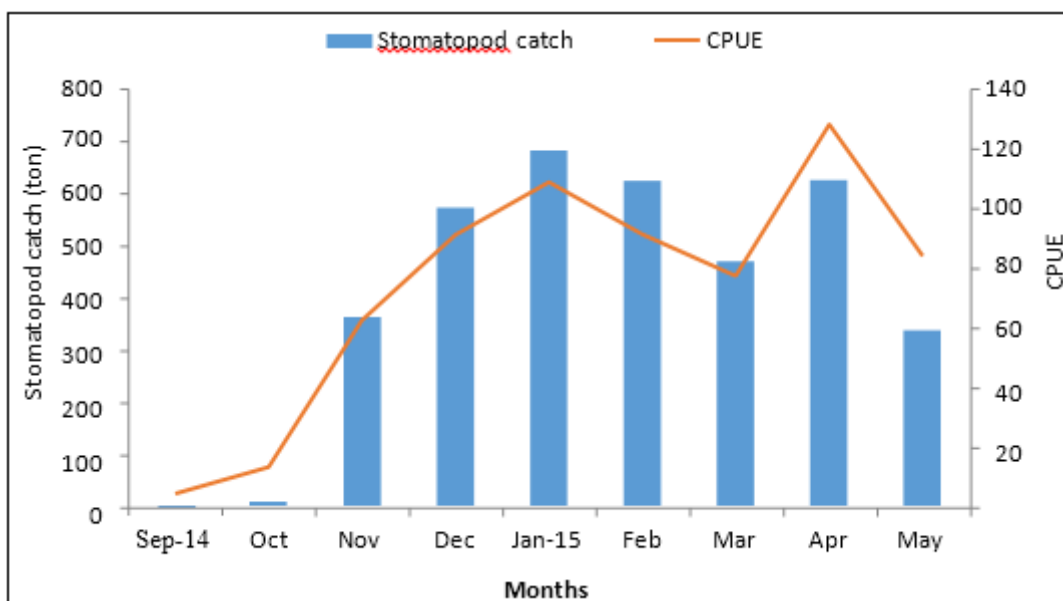
their appearance in the month of September and continues to be caught till May or early June. The period of occurrence is from December to May with peak during in April. Along Dakshina Kannada coast Stomatopods are exclusively supported by single species namely *Oratosquilla nepa*. The percentage composition of Stomatopods in the general catch varied considerably from 8.66 to 32.35% during study period. The estimated Stomatopod landing along Mangalore coast during September 2014 to May 2015 were 3688.43 tons. The CPUE of stomatopods was 73.43 kg per day during the study period presented in Fig 3. Sukumaran (1988) observed 100kg per boat per day during 1985-86 period. The percentage contribution of stomatopods was 20% of the trawl landing.

### Food and feeding

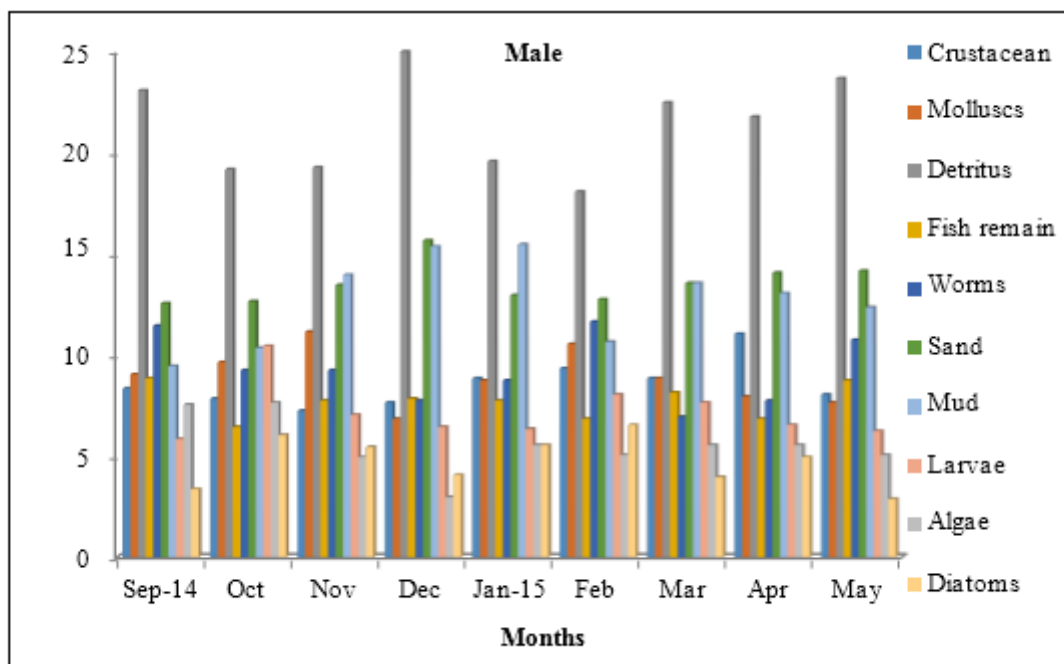
The percentage occurrence of stomachs in male and females in various degree of fullness is presented in Tables 2a & b. During study period the percentage occurrence

of fullstomachs were present almost in all the month and highest percentage of full stomach was found in month of September, October and November in both males and females. In case of male highest percentage of full stomach was found during October (52.17%) and lowest was during December (7.69%) were in case of females the highest percentage was occurred in the month of November (51.85%) and 101lowest was recorded during September and December (0%).

During the sampling period 3/4, 1/2, 1/4 were found almost in all the months. 3/4 stomach in males were ranged from 12.50% (November) to 25% (September), it was absent in October and in case of females, it was 11.48% (May) to 33.33% (September) was presented in Tables 4a & b. The presence of 1/2 stomach was seen throughout the year with the highest in the month of December (57.69%) and lowest was recorded in the month of March (7.14%) in males. In case of females, highest was observed during March (39.29%) and lowest



**Fig. 3 :** Total stomatopod catch and CPUE during Sep 2014 - May15.



**Fig. 4(a) :** Percentage of food items occurrence in male *O. nepe* in different months.

**Table 2a :** Frequency of occurrence of major food items in the stomach of male *Oratosquilla nepe* in different months.

Months	Crustaceans	Molluscs	Detritus	Fish Remains	Worms	Sand	Mud	Larvae	Algae	Diatoms
September 2014	8.40	9.10	23.10	8.90	11.50	12.60	9.50	5.90	7.60	3.40
October	7.90	9.70	19.20	6.50	9.30	12.70	10.40	10.50	7.70	6.10
November	7.30	11.20	19.30	7.80	9.30	13.50	14.00	7.10	5.00	5.50
December	7.70	6.90	25.00	7.90	7.80	15.70	15.40	6.50	3.00	4.10
January 2015	8.90	8.80	19.60	7.80	8.80	13.00	15.50	6.40	5.60	5.60
February	9.40	10.60	18.10	6.90	11.70	12.80	10.70	8.10	5.10	6.60
March	8.90	8.90	22.50	8.20	7.00	13.60	13.60	7.70	5.60	4.00
April	11.10	8.00	21.80	6.90	7.80	14.10	13.10	6.60	5.60	5.00
May	8.10	7.70	23.70	8.80	10.80	14.20	12.40	6.30	5.10	2.90

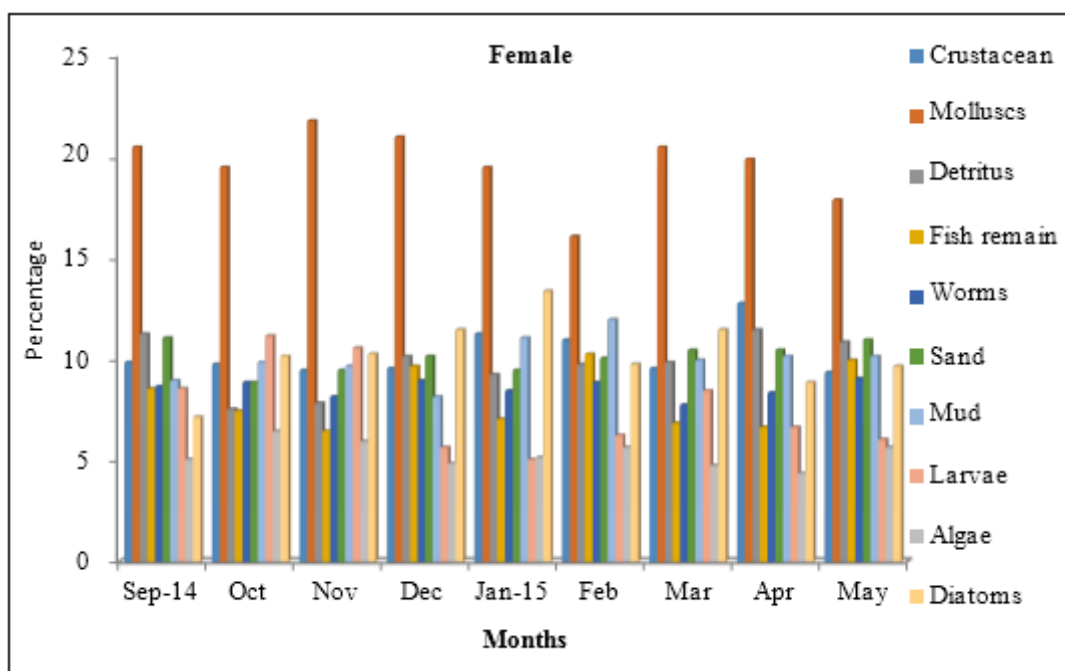


Fig. 4(b) : Percentage of food items occurrence in female *O. nepa* in different months.

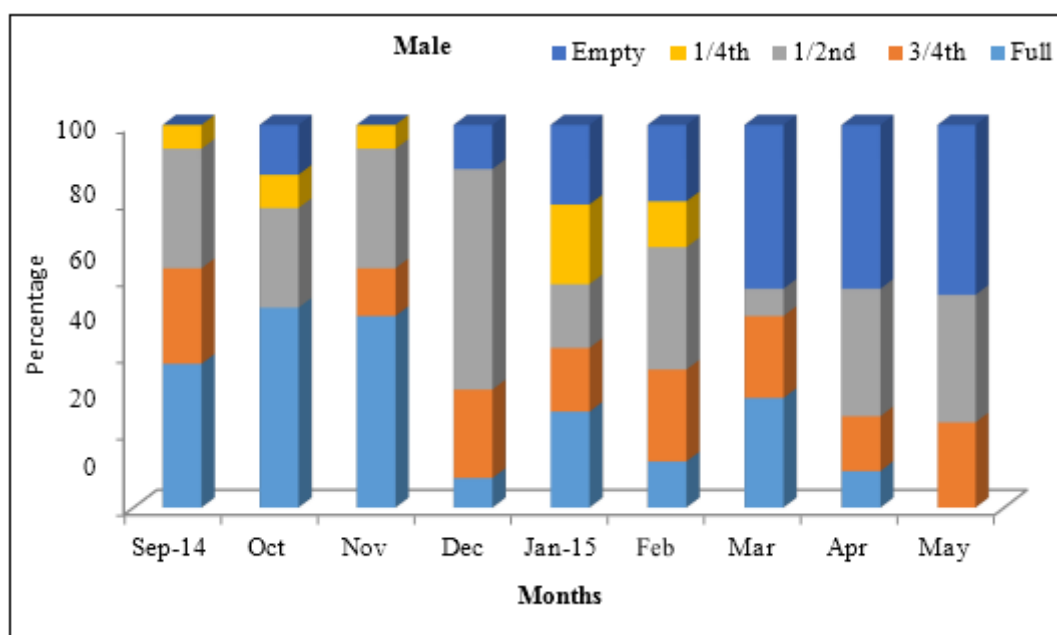


Fig. 5(a) : Degree of fullness in male *O. nepa* during Sep 2014 – May 2015.

Table 2b : Frequency of occurrence of major food items in the stomach of female *Oratosquilla nepa* in different months.

Months	Crustaceans	Molluscs	Detritus	Fish Remains	Worms	Sand	Mud	Larvae	Algae	Diatoms
September 2014	9.90	20.50	11.30	8.60	8.70	11.1	9.0	8.60	5.10	7.20
October	9.80	19.50	7.60	7.50	8.90	8.90	9.90	11.20	6.50	10.20
November	9.50	21.80	7.90	6.50	8.20	9.50	9.70	10.60	6.00	10.30
December	9.60	21.00	10.20	9.70	9.00	10.20	8.20	5.70	4.90	11.50
January 2015	11.30	19.50	9.30	7.10	8.50	9.50	11.10	5.10	5.20	13.40
February	11.00	16.10	9.80	10.30	8.90	10.10	12.00	6.30	5.70	9.80
March	9.60	20.50	9.90	6.90	7.80	10.50	10.00	8.50	4.80	11.50
April	12.80	19.90	11.50	6.70	8.40	10.50	10.20	6.70	4.40	8.90
May	9.40	17.90	10.90	10.00	9.10	11.00	10.20	6.10	5.70	9.70

**Table 3a :** Frequency of occurrence of major food items in the stomach of male *Oratosquilla nepa* in different size groups.

Size group	Crustaceans	Molluscs	Detritus	Fish Remain	Worms	Sand	Mud	Larvae	Algae	Diatoms
10-30mm	15.78947	7.894737	15.78947	13.15789	7.894737	13.15789	11.84211	3.947368	2.631579	7.894737
30-50mm	15.38462	9.89011	17.58242	12.08791	8.791209	13.18681	9.89011	7.692308	1.098901	4.395604
50-70mm	18.09524	10.47619	20	8.571429	2.857143	17.14286	10.47619	5.714286	3.809524	2.857143
70-90mm	19.81132	11.32075	26.41509	6.603774	4.716981	12.26415	9.433962	1.886792	2.830189	4.716981
90-110mm	1.282051	0	29.48718	10.25641	11.53846	17.94872	10.25641	7.692308	6.410256	5.128205
110-130mm	4.054054	0	25.67568	8.108108	9.459459	14.86486	14.86486	12.16216	2.702703	8.108108

**Table 3b :** Frequency of occurrence of major food items in the stomach of female *Oratosquilla nepa* in different size groups.

Size group	Crustaceans	Molluscs	Detritus	Fish Remain	Worms	Sand	Mud	Larvae	Algae	Diatoms
10-30mm	0	4.615385	16.92308	13.84615	13.84615	18.46154	15.38462	1.538462	4.615385	10.76923
30-50mm	0	10.9375	14.0625	10.9375	9.375	23.4375	15.625	7.8125	3.125	4.6875
50-70mm	12.2449	13.26531	20.40816	3.061224	5.102041	19.38776	11.22449	7.142857	4.081633	4.081633
70-90mm	17.97753	19.10112	14.60674	6.741573	2.247191	10.11236	14.60674	10.11236	2.247191	2.247191
90-110mm	0	0	28.33333	13.33333	13.33333	11.66667	15	11.66667	5	1.666667
110-130mm	2.985075	0	22.38806	14.92537	13.43284	16.41791	13.43284	4.477612	7.462687	4.477612



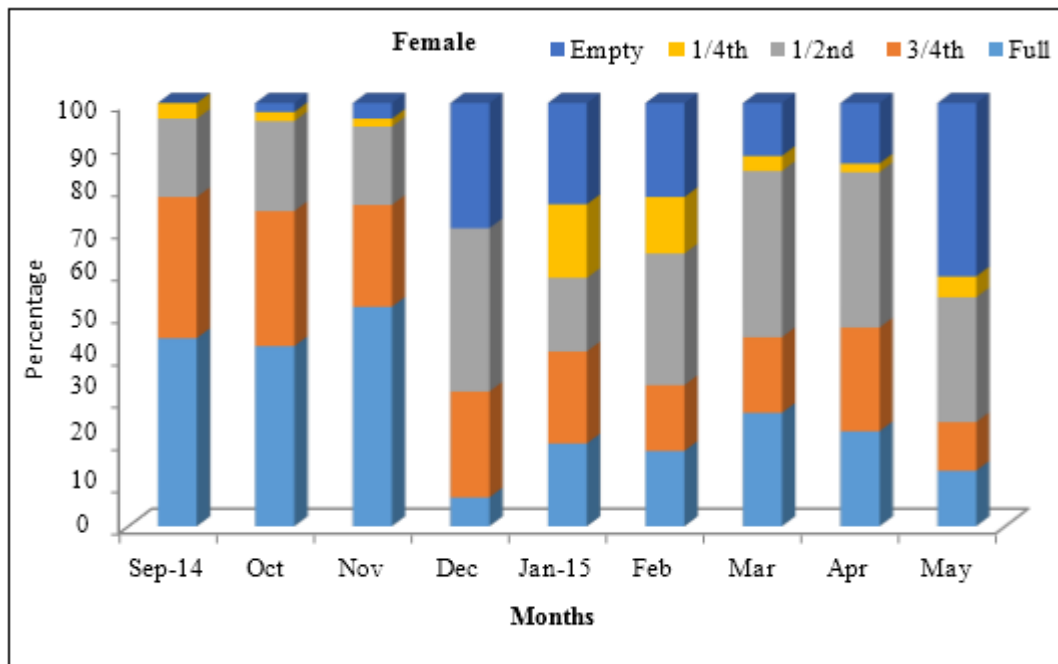


Fig. 5(b) : Degree of fullness in female *O. nepa* during Sep 2014 – May 2015.

Table 4a : Percentage occurrence of stomach of male *Oratosquilla nepa* in various degree of fullness.

Categories	September	October	November	December	January	February	March	April	May
Full	37.50	52.17	50.00	7.69	25.00	12.00	28.57	9.52	0.00
3/4th	25.00	0.00	12.50	23.08	16.67	24.00	21.43	14.29	22.22
1/2 nd	31.25	26.09	31.25	57.69	16.67	32.00	7.14	33.33	33.33
1/4th	6.25	8.70	6.25	0.00	20.83	12.00	0.00	0.00	0.00
Empty	0.00	13.04	0.00	11.54	20.83	20.00	42.86	42.86	44.44

Table 4b : Percentage occurrence of stomach of female *Oratosquilla nepa* in various degree of fullness.

Categories	September	October	November	December	January	February	March	April	May
Full	44.44	42.55	51.85	6.82	19.57	17.78	26.79	22.45	13.11
3/4th	33.33	31.91	24.07	25	21.74	15.56	17.86	24.49	11.48
1/2 nd	18.52	21.28	18.52	38.64	17.39	31.11	39.29	36.73	29.51
1/4th	3.71	2.13	1.85	0	17.39	13.33	3.56	2.04	4.92
Empty	0	2.13	3.71	29.55	23.91	22.22	12.5	14.29	40.98

was recorded in September and November (18.52%).

In case of males and females, it was observed that the highest feeding was in the month of September and December (62.5%) in males and September (77.72%) in females. Tables 3a & b shows food consumption of males and females. There was not much variation in the occurrence of the crustacean in the stomach content of both the sexes. The molluscs were, more in the females when compared to the males. In Figure 4a and 4b presented that the males fed more on detritus than the females. In the present study *Oratosquilla nepa* of Mangalore coast detritus formed the chief constituent of its diet and also observed the gut contents of both males

and females of this species is similar revealed by Shanbhogue (1986) in Mangalore coast. Hamano and Matsuura (1986), while studying the food habits of *Oratosquilla oratoria*, confirmed that it is a predator, which consumes mainly Crustacea and Mollusca in the Hakata Bay. In addition, the other items in its diet were fish scales, fin rays, shell fragments, portions of crusts of some invertebrates and body parts of crustaceans. In the present study, fish scales and bones were classified under the category fish remains. Also fish larvae represented mainly by anchovies formed a portion of their stomach contents. The presence of empty stomachs in certain months could also be an indication of the breeding

period. The increase in demand for the maturing gonads for space could be the probable reason for avoiding feeding. The presence of full, 3/4, 1/2 stomachs were in some months of the year will indicate the immature state or early period of maturing shown in Figure 5a and 5b.

### CONCLUSION

Karnataka contributes around 50% of the estimated landing of stomatopods in India. The result of present study indicated that stomatopods of Mangalore coast contributed more than 4-5% of the estimated stomatopods landing in India. Mangalore reported a catch of nearly 1 to 1.5 tons of stomatopods daily during two seasons November – December and February- March. During period of study it was observed that females preferred more animal matters (mollusc, worms, fish remains and larvae's). When compared to males, females had more diatoms too. Polychaeta worms were seen in the stomach of males in comparatively high number. Detritus was found in highest percentage in all the size group in both the sex when compare to other food items. So it's clear that detritus form the major food item. Sand and mud were also found in considerable level in all the size group in both the sexes. Other food items like fish remains, worms, algae, larvae, diatoms were not showed much variation in size groups in both male and females.

### REFERENCES

- CMFRI (2017) *Annual Report*. Centre Marine Fisheries Research Institute, Cochin, pp. 121
- Dinh T D, Moreau J, Van M V, Phuong N T and Toan V T (2010) Population dynamics of shrimps in littoral marine waters of the Mekong Delta, South of Vietnam. *Pak. J. Biolo. Sci.* **13**, 683-690.
- Hamano T and Matsuura S (1986) Food habits of the Japanese mantis shrimp in the benthic community of Hakata bay. *Bull. Japanese Soc. Scient. Fish.* **52**, 787-794.
- Kurup K N, Nair G K K, Annam V P, Kant A, Beena M R and Khambadkar L (1987) An appraisal of the marine fisheries of Karnataka and Goa. *Central Marine Fisheries Research Institute* **36**, 1-104.
- Lakshmi P S and Thirumilu P (2008) Potential of ornamental marine stomatopods, Tamilnadu. *Fishing Chimes* **28**, 34-36.
- Nasima M T and Qudusi B K (1984) A Handbook on a Pakistani Mantis shrimp *Oratosquilla*. Centre of Excellence, University of Karachi, pp. 101.
- Shanbhogue S L (1975) Descriptions of stomatopod larvae from Arabian sea with a list of stomatopod larvae and adults from the Indian ocean and a key for their identification. *Mar. Biolo. Assoc. India* **17**(2), 196-237.
- Shanbhogue S L (1986) Studies on stomatopod Crustacea from the seas around India. *Res. Adv. Mar. Biol.* pp. 515-568.
- Sukumaran K K (1988) Study on the fishery and biology of the mantis shrimp *Oratosquilla nepa* (Latreille) of South Kanara coast during 1979 -87. *Indian J. Fish.* **34**(3), 292-305.