International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; SP-8(3): 486-491
www.biochemjournal.com
Received: 25-01-2024
Accepted: 28-02-2024

NA Pargi
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

DT Vaghela
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

Rutvik Tandel
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

PV Taral
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

Kishan Kishorchandra Kalaria
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

Modi KP
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

Neelmani
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

Corresponding Author:
NA Pargi
College of Fisheries Science, Junagadh Agricultural University, Veraval, Gujarat, India

Food and feeding habit and fecundity of crab, *Portunus sanguinolentus* (Herbst, 1783) landed at Veraval coast, Gujarat

NA Pargi, DT Vaghela, Rutvik Tandel, PV Taral, Kishan Kishorchandra Kalaria, Modi KP and Neelmani

DOI: https://doi.org/10.33545/26174693.2024.v8.i3Sf.796

Abstract
The present study will be very useful by providing baseline data to the policy makers and managers affliated with various government and non-governmental organizations in fisheries sector for making strategies that can be used in future. The assessment of *Portunus sanguinolentus* crab was carried out in Veraval coast of Gujarat. The favorite food of *P. sanguinolentus* was crustaceans and fish. Crustacean contributes 30% and fish contributes 22% than other food content. Other food items found was molluscan, miscellaneous and debris. The gastrosometic index (GaSI) of the male and female was higher in October and November while lower in September. The percentage of empty stomachs was highest in August and lowest in February. The stomach containing with the rate of feeding intensity i.e. trace, three fourth and quarter stomach were in lower rate. The study revealed that spawning percentage was higher during August, September, December and January months. The absolute fecundity of *P. sanguinolentus* ranged from 7,44,900 to 6,02,910. The annual average ova diameter was 317 µm (ranged from 229 to 406 µm).

Keywords: *Portunus sanguinolentus*, food and feeding, spawning, fecundity, ova diameter, veraval

Introduction
The crabs are hard shell animals belonging from phylum Arthropoda, subphylum Crustacea and order Decapoda (Sukumaran, 1995) [17]. *Portunus sanguinolentus* known as “Blood - Spotted Swimming Crab" or "Three - Spotted Swimming Crab” which exists from Portunidae family. The carapace of *Portunus sanguinolentus* has 3 large reddish round spots, of which 1 is median and 2 laterals, each spot encircled by a ring which is whitish in color. It is dark gray in colouration and much broader than its length. Nine spines are present on anterolateral border, of which the posterior most is the longest. The crab has no spine found on the posterior border of the arm of the cheliped. Behind the chelipeds, the last pair is oar – like for swimming and the three pairs of legs are normal. The anterior pair of abdominal appendages is slender and straight with marginal spines at the tip (Soundarapandian *et al*. 2013) [11].

P. sanguinolentus breeds throughout the year and is fished from the inshore waters. It grows very fast and attains 100-140 mm in carapace width in the year from 1973 to 1978 (Radhakrishnan and Samuel, 1980) [8]. *P. sanguinolentus* mainly prefer cructaceans, fishes, mollusks and large quantity of unidentified matter and debris in its diet. The crab is primarily predator of sessile and slow-moving benthic macro invertebrates (Sukumaran and Neelakantan, 1997a) [14]. In India, the crab fishery is gaining importance and there is a wide scope for the crab meat in national and international markets. After shrimps and lobsters, the crab rank at third position for their delicacy and value of fishery they support. The economically important portuid crabs like *Scylla serrata*, *S. tranquebarica*, *P. sanguinolentus*, *P. pelagicus*, *Charybdis feriata*, *C. lucifera* and *C. truncate* are found in India (Dinakaran and Soundarapandian, 2009) [2].

The total marine fish production of India was 3.83 million tonnes during the year 2017. Among the four regions of the Indian peninsular coast line, the catch contribution of Gujarat Kerala and Tamil Nadu was maximum. The catch contribution of Gujarat Kerala and Tamil Nadu was 20.5% of the total landings (7.86 lakh tonne), 17.1% of the total landings (6.55

Lakh tonne) and 15.3% of the total landings (5.48 lakh tonne) respectively. The share of pelagic finfish resources, Demersal finfish resources, crustacean resources and molluscan resources was 54%, 26.8%, 12.6% and 6.6% respectively of the total landings. Crabs contributed 53,476 tonne of the total landings (Anon, 2018) [1].

Materials and Methods

Study area

The samples were collected from a multi-day trawler during August 2018 to March 2019 of Veraval coast landing centre in Gujarat. The trawlers employed for *P. sanguinolebtus* measured more than 35 ft long wooden boat. Mid - water and bottom trawl gear was used for fishing of crab in the depth of 30-200 m and the duration of 3 to 20 days of fishing in water (Srinath *et al*. (2005) [12]. The randomized collection method was used for collecting of *P. sanguinolentus* crab from various trawlers for the purpose of biological studies.

Gastrosomatic Index (GsSI)

The Gastrosomatic index was measured by plotting the total weight of gut contents against to the crab`s body weight (Sivareddy and Babu, 1989) [10].

Feeding intensity

The feeding intensity was assessed based on the distension of their stomach and the volume of food contained in it and classified as full, ¾ full, ½ full, ¼ full, trace and empty (Josileen, 2011) [5].

Index of Relative Importance (IRI)

The relative importance of various food items in the stomach was determined by calculating the Index of Relative Importance (Pinkas *et al*. 1971) [7]. The IRI was determined as given below formula:

IRI = (%N + % V) x % F

Where, N = number, V = volume and F = frequency of occurrence.

The IRI was used as it takes into account the frequency of occurrence as well as the number and volume of each food item providing a definite and measurable basis for grading different food items.

Spawning

The spawning was observed based on maturity studies of crab by observing different maturity stages (Soundarapandian *et al*. (2013) [11].

Fecundity

Ovaries of female samples were collected and preserved in 5% formalin. Gonad was assessed by recording gonad weight (gm.) and status (stage III and above). Moreover, three pieces of ovary weighing 1 g each from the anterior, middle and posterior portions of the ovary was taken and examined for the number of ova present in them to obtain the fecundity (James *et al*. 1978).

Ova diameter

The ova diameter (mm) in every sub - sample of the ovary was determined by the use of a trinocular microscope using calibrated ocular micrometer (Narasimham, 1994) [6].

Result

Gastrosomatic Index (GaSI)

Present studies of *P. sanguinolentus* noticed that the higher peak in gastro - sometic index (GaSI) for both males and females were observed during the month of October and November with 2.06 and 2.1 respectively. The increase in the GaSI during the post spawning period may due to recovered feeding nature from prolonged starvation during spawning season, reproductive stress and availability of prey items in feed. The minimum GaSI value in crab was recorded during September (0.74) (Figure 1).

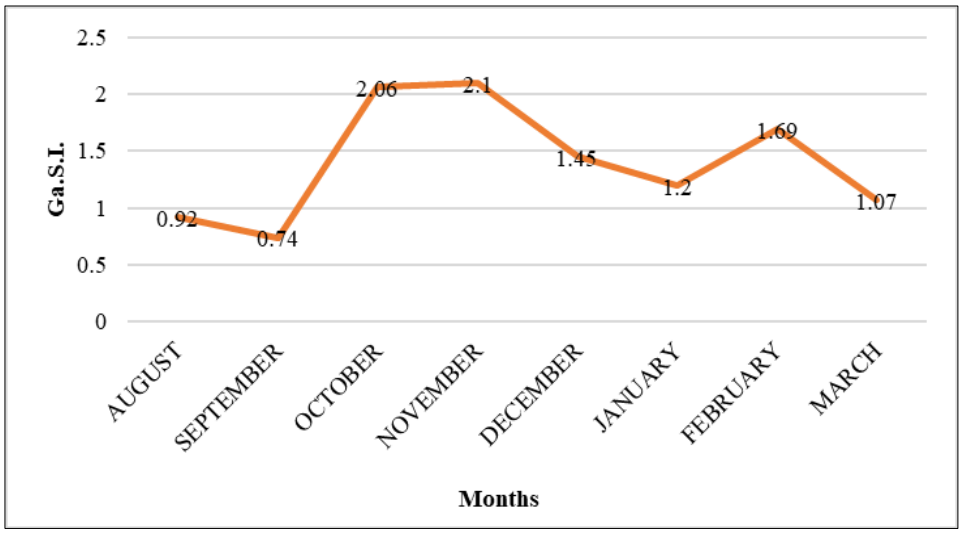

Fig 1: Monthly variation in Gastrosomatic Index of *P. sanguinolentus*

Feeding intensity

A total of 240 stomachs of *P. sanguinolentus* ranged in size from 34.6 to 270.2 mm total length were examined during the study. Month wise feeding intensity depending on numbers. Mostly all of the examined specimens were with empty stomachs. The highest proportion of empty stomachs was observed in August month. The stomach with trace, three fourth and quarter stomach contents were very low. The results indicated that the presence of empty, full, quarter, half, three fourth and trace observed were in the percentage ratio of 42, 18, 11, 18, 10 and 1 respectively (Figure 2).

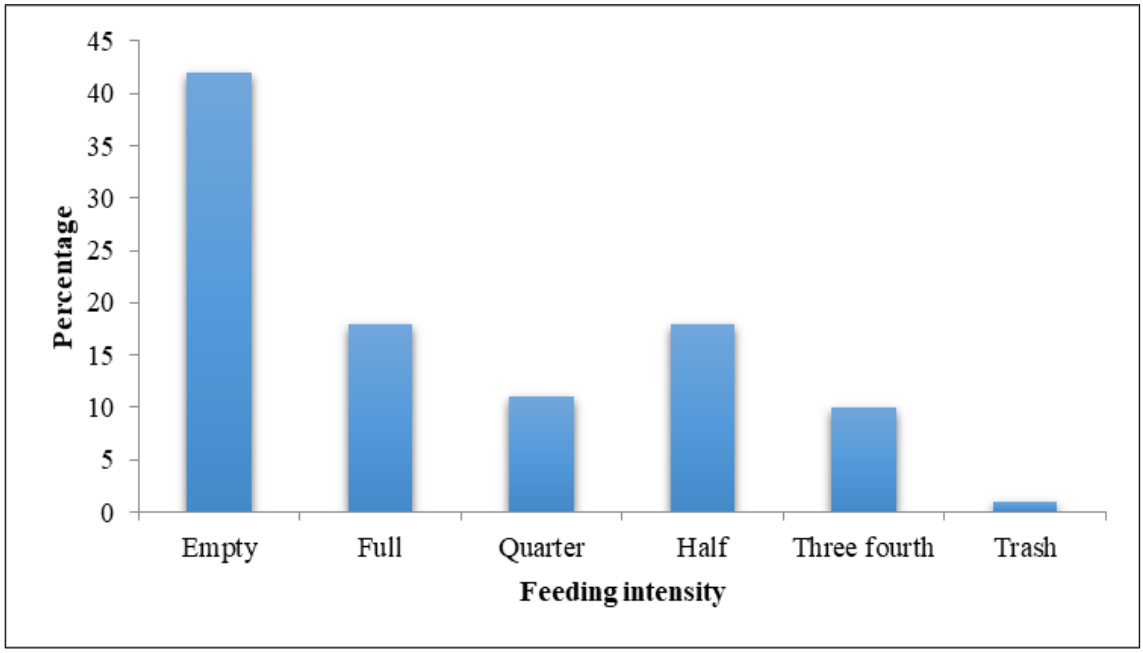

Fig 2: Variation in feeding intensity of *P. sanguinolentus* in percentage

Index of Relative Importance

Variation in the Index of Relative Importance (IRI) of food items ingested by *P. sanguinolentus* during different months indicated that the percentage composition of different food items varied in different months according to their availability and preference of food items (Figure 3 & Figure 4).

Fish remains: It represented 22% of the annual average of food composition. The percentage was highest (28.61%) in October and lowest (14.91%) in March.

Crustacean remains: As a dietary component, it occurred in all the months and contributed more than all the other items in food material. The percentage was highest in March (36.32%) and lowest in December (23.19%). The annual average of food composition of this group contributed by 30%.

Molluscan remains: It contributed about 17.00% to the annual average food composition. The percentage was highest in January (21.38%) and lowest in September (13.57%).

Miscellaneous

It contributed about 14% of the annual average food composition and was found in almost all the months. The percentage was highest in September (21.82%) and lowest in October (6.77%).

Debris

The percentage of debris was found highest in December (24.84%) and lowest in February (8.72%), with an annual average food composition of 17%.

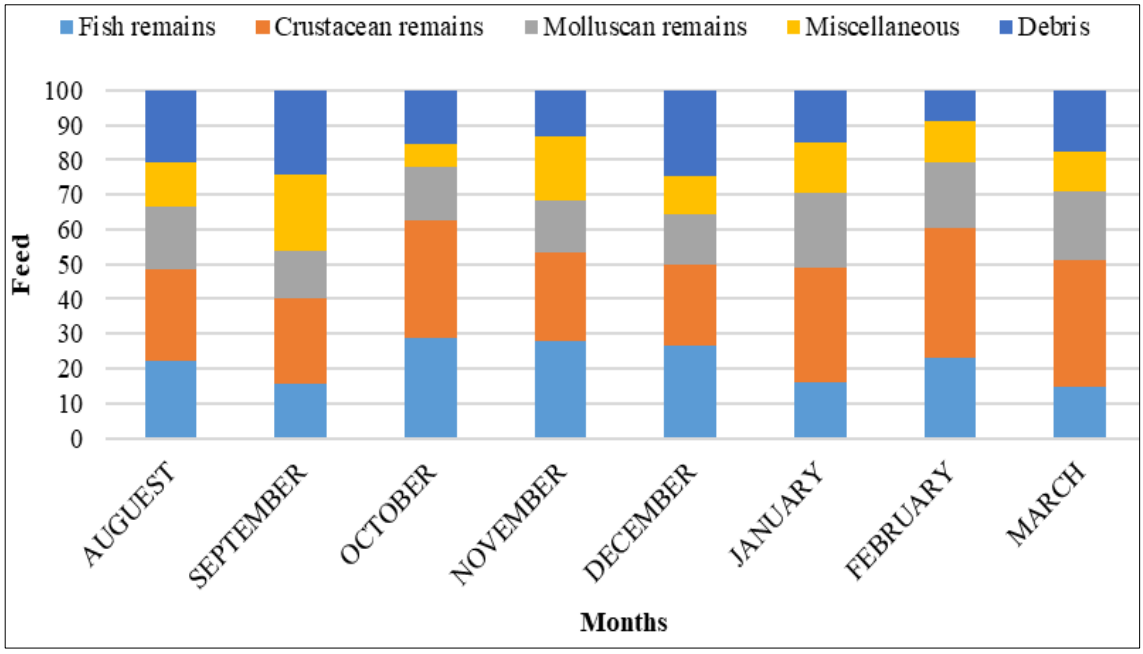

Fig 3: Monthly variations of IRI in dietary components of *P. sanguinolentus*

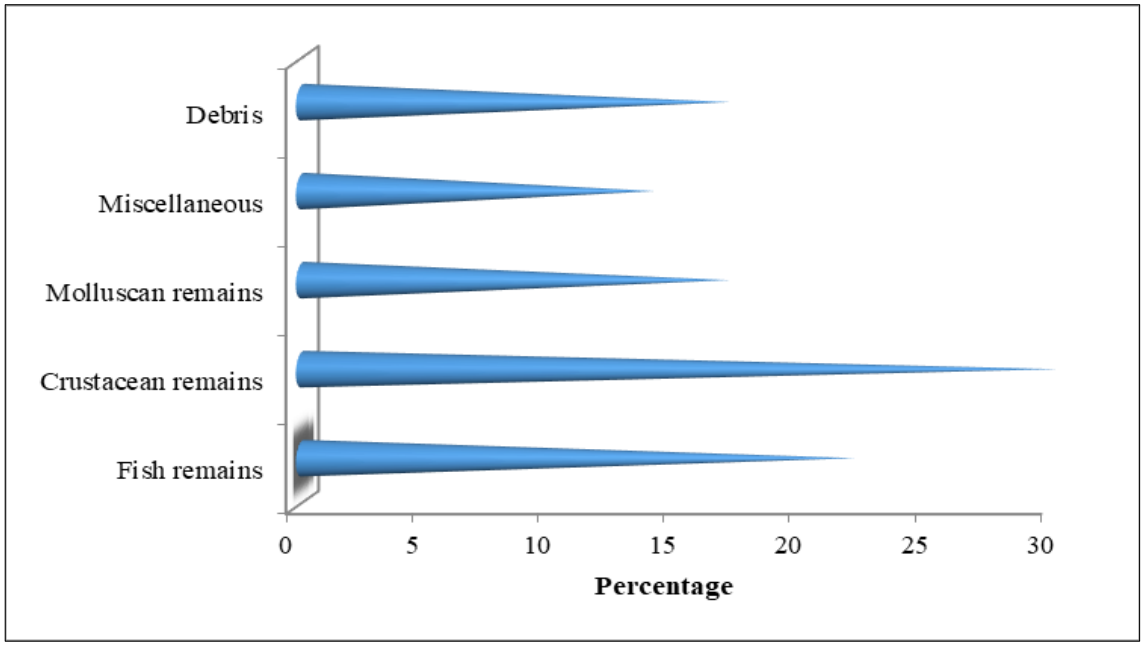

Fig 4: Annual variations of IRI in dietary components of *P. sanguinolentus*

Spawning

During the study, it was observed that *P. sanguinolentus* spawned throughout the year with the peak in August and September (Figure 5). It can be supported from the observations that the spawning percentage was higher during August, September, December and January, whereas, it was the least in March.

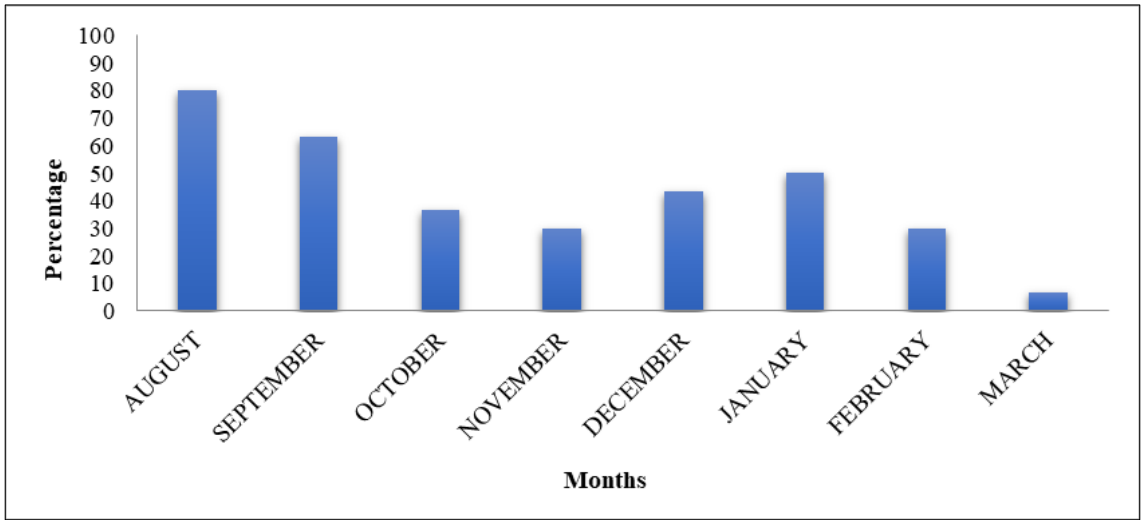

Fig 5: Monthly variations in spawning percentage of *P. sanguinolentus*

Fecundity

Absolute fecundity of *P. sanguinolentus* ranged from 7,44,900 to 6,02,910 during August to February. The fecundity per gram of body weight was highest in August (3658) and least in January (1460). The annual relative average fecundity per gram body weight was 2476. The annual average absolute fecundity determined during the study period was 3,71,251. There were two peaks in the fecundity, the first in August and the second in February (Table 1).

Table 1: Monthly variation in average fecundity and fecundity per gram body weight of *P. sanguinolentus*

Month	Monthly average absolute fecundity	Relative fecundity/g body weight
August	744900	3658
September	319904	1593
October	395640	3519
November	144500	2159
December	167040	1680
January	223860	1460
February	602910	3262
March	-	-
Average	371251	2476

Ova Diameter

The size of the ova of *P. sanguinolentus* ranged from 229 to 406 µm. The mean size of the ova was higher in November (406 µm) and December (394 µm) and the least in August (229 µm) (Table 2).

Table 2: Monthly variations in average diameter of ova of *P. sanguinolentus*

Month	Mean ova diameter (µm)	Monthly range of ova diameter (µm)
August	370	229-390
September	316	240-376
October	291	287-381
November	374	321-406
December	382	347-394
January	249	271-345
February	238	279-334
March	-	-
Average	317	282-375

Discussion

Saroj Rana (2018) [9] reported the gastrosamatic index of freshwater crab *Barytelphusa lugubris* from Kathmandu in Nepal. The study revealed the average value of gastrosomatic index ranging from 2.29 to 3.70.

Josileen (2011) [5] assessed the feeding intensity of *P. pelagicus* along the Mandapam coast, Tamil Nadu. He examined 452 stomachs. Out of that 3.54% were 100% full, 19.91% were 75% full, 25.66% were 50% full, 26.77% were 25% full and 24.1% were empty.

Sukumaran and Neelakantan (1997a [14]) examined the feeding study of *P. sanguinolentus* along the Karnataka coast. They described that the crustaceans were the most favoured food group among all the food groups in the crab, contributing 80.4% in average food composition. The fish remained second important item of food. It contained 67.4%. The third favoured food group was mollusc which mainly consisted of bivalves and gastropods. It contained 3.2% in 120 -140 mm carapace width group of crab and 16.9% in 80 - 100 mm carapace width of crab. The miscellaneous group contained polychaetes of *Neris* sp. and *Glycera* sp. and other materials. It was contributed by 13.3%. The debris contributed 4.9% among all the food groups.

Sukumaran and Neelakantan (1999) [18] assessed the spawning biology of *P. sanguinolentus* from the Karnataka coast. They observed the spawning season from November to May with spawning peak activity during December to February. This had been also supported from high occurance of maturing and fully mature ovaries in several females observed during December to February.

Sukumaran and Neelakantan (1997b) [15] reported the fecundity of *P. sanguinolentus* along the Karnataka coast. The result showed that as per increase in the size of crab there was increase in the number of eggs with some variations found at certain sizes. The fecundity observed was 44,000 to 11,90,000 eggs.

Ikhwanuddin *et al*. (2012) [3] reported egg size of *P. pelagicus* from coastal waters of Johor, Malaysia. They observed the mean egg size during embryonic development at stage 1 as 0.307±0.037 mm, for stage 2 as 0.386±0.039 and 0.396±0.033 for stage 3.

Conclusion

The current study suggested the variations in food and feeding related parameters and fecundity in *P. sanguinolentus* crab. *P. sanguinolentus* showed a greater peak in the gastro-sometic index (GaSI) in the months of October and November for both males and females. In August, the highest percentage of empty stomachs was recorded. Crustaceans contributed the highest annual average of dietary composition. *P. sanguinolentus* was found to spawn all year long, with August and September marking the peak months throughout the study. August had the most fecundity per gram of body weight, whereas January had the lowest. The ova's mean size was greatest in August and lowest in November.

Acknowledgements

I give my sincere thanks to Dr. A. Y. Desai, Dean and Principal, College of Fisheries, Junagadh Agricultural University, Veraval for providing me an opportunity and required facility during my study period. I also very thankful to Scientists of CMFRI Veraval Shri Vinay Kumar Vase and Shri Rajan Kumar for their suggestions.

References

1. Anonymous. Annual report of CMFRI; 2017 - 2018. Published by Central Marine Fisheries Research Institute, Government of India, Cochin; c2018. p. 1-301.
2. Dinakaran GK, Soundarapandian P. Mating behaviour and broodstock development of commercially important blue swimming crab, *Portunus sanguinolentus* (Herbst). Indian Journal of Science and Technology. 2009 Apr 1:71-5.
3. Ikhwanuddin M, Azra MN, Siti-Aimuni H, Abol-Munafi AB. Fecundity, embryonic and ovarian development of blue swimming crab, *Portunus* pelagicus (Linnaeus, 1758) in coastal water of Johor, Malaysia. Pakistan Journal of Biological Sciences. 2012 Aug 1;15(15):720-728.
4. James PS, Gupta TC, Shanbhogue SL. Some aspects of the biology of ribbon fish, *Trichiurus lepturus* (Linnaeus). J Mar. Biol. Ass. India. 1978;290(1-2):120-137.
5. Josileen J. Food and feeding of the blue swimmer crab, *Portunus* pelagicus (Linnaeus, 1758) (Decapoda, Brachyura) along the coast of Mandapam, Tamil Nadu, India. Crustaceana. 2011;84(10):1169-1180.
6. Narasimham, K. A. Mortality, spawning and sex ration of the ribbonfish *Trichiurus lepturus* (Linnaeus) off Kakinada. Journal of Marine Biology Association of India. 1994;36(1 & 2):199-204.

7. Pinkas L. Food habits of albacore, bluefin tuna, and bonito in California waters. Fish. Bull. US. 1971;152:1-39.
8. Radhakrishnan, C.K. and Samuel, C. T. Prospect of fishery, utilisation and culture of crabs in India. Journal of Fishery Technology. 1980;17(2):67-69.
9. Rana S. Eyestalk ablation of freshwater crab, Barytelphusa lugubris: An alternative approach of hormonal induced breeding. Int. J Pure Appl. Zool. 2018;6(3):30-34.
10. Sivareddy, Y. and Babu, Rao M. Studies on the feeding biology of an airbreathing fish *Heteropneustes fossilis* (Bloch). Journal of the Indian Fisheries Association. 1989;19:1-36.
11. Soundarapandian P, Varadharajan D, Boopathi A. Reproductive biology of the commercially important portunid crab, *Portunus sanguinolentus* (Herbst). Journal of Marine Science: Research & Development. 2013;3(2):1-9.
12. Srinath M, Kuriakose S, Mini KG. Methodology for the estimation of marine fish landings in India. CMFRI Special publication. 2005;86:1-57.
13. Sukumaran KK. Fishery, biology and population dynamics of the marine crabs, *Portunus* (*Portunus*) *sanguinolentus* (Herbst) and *Portunus* (*Portunus*) pelagicus (Linnaeus) along the Karnataka Coast (Doctoral dissertation, Karnatak University).
14. Sukumaran KK, Neelakantan B. Food and feeding of *Portunus* (*Portunus*) *sanguinolentus* (Herbst) and *Portunus* (*Portunus*) pelagicus (Linnaeus) (Brachyura: Portunidae) along Karnataka coast. Indian Journal of Marine Sciences. 1997a;26(1):35-8.
15. Sukumaran KK, Neelakantan B. Length-weight relationship in two marine portunid crabs, *Portunus* (*Portunus*) *sanguinolentus* (Herbst) and *Portunus* (*Portunus*) pelagicus (Linnaeus) from the Karnataka coast. Indian Journal of Marine Sciences. 1997b;26(1):39-42.
16. Sukumaran KK, Neelakantan B. Spawning biology of two marine portunid crabs, *Portunus* (*Portunus*) *sanguinolentus* (Herbst) and *Portunus* (*Portunus*) pelagicus (Linnaeus) from the Karnataka Coast.
17. Anto RJ, Sukumaran K, Kuttan G, Rao MN, Subbaraju V, Kuttan R. Anticancer and antioxidant activity of synthetic chalcones and related compounds. Cancer letters. 1995 Oct 20;97(1):33-37.
18. Sukumaran KK, Neelakantan B. Spawning biology of two marine portunid crabs, *Portunus* (Portunus) sanguinolentus (Herbst) and *Portunus* (Portunus) pelagicus (Linnaeus) from the Karnataka Coast; c1999. p. 35-38.