



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2020; 8(2): 1295-1299

© 2020 JEZS

Received: 22-01-2020

Accepted: 24-02-2020

NA Pargi

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

DT Vaghela

Associate Professor
College of Fisheries Science,
Junagadh Agricultural
University, Veraval, Gujarat,
India

Neelmani

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

Bhutti JK

Master of Fisheries Science
Scholar, Post Graduate Institute
of Fisheries Education and
Research, at Rajpur (Nava),
Himmatnagar, Gujarat, India

PV Taral

Doctor of Philosophy Scholar
College of Fisheries, Karnataka
Veterinary Animal and Fisheries
Science University, Manglore,
Karnataka, India

Vasava RJ

Doctor of Philosophy Scholar
College of Fisheries Science,
Junagadh Agricultural
University, Veraval, Gujarat,
India

Corresponding Author:**NA Pargi**

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

Study on some biological aspects of crab, *Portunus sanguinolentus* (Herbst, 1783) landed at Veraval coast, Gujarat

NA Pargi, DT Vaghela, Neelmani, Bhutti JK, PV Taral and Vasava RJ

Abstract

The present investigations will be helpful to fishers and policy makers for providing baseline data for the conservation and management aspects of the fishery resource for future purpose. The biological study on *Portunus sanguinolentus* (Herbst, 1783) was conducted at Veraval coast of Gujarat. It is exploited by the use of trawler throughout the year by the coast. The biological information of crab such as length composition, length - weight relationship, sex ratio, maturity and gonadosomatic index were collected from the multiday trawler operated along the coast. A total 480 crab specimens were studied in the size range from minimum 34.6 mm to maximum 270.2 mm carapace length comprising of 224 males and 256 females. The highest observed length of the crab was 270.2 mm with a mean length of 109 ± 26 mm. The overall sex ratio was 1:1.14. Gonadosomatic index was the highest during March. Sexual maturity indicated that maturation takes place all throughout the year. Gonadosomatic index was higher in the month of August, December, February and March.

Keywords: *Portunus sanguinolentus* (Herbst, 1783), length - weight relationship, sex ratio, maturity, Veraval

1. Introduction

Crabs member of Crustacea, belonging to phylum Arthropoda and order Decapoda includes animals with hard shell and five pairs of legs. The true crabs belonging to suborder Brachyura includes species with shortened flap-like abdomen or tail which is folded under the belly region. Crabs are filter feeders, sand cleaners, mud, plant and carrion feeders, predators, commensals and also parasites. Most of them are walking bottom dwellers whereas, some are temporary swimmers^[1]. The crabs have significant quantity of protein, vitamins and other nutrients, which are very important for human health. They are used as feed and feed additive and also for making medicinal valuable products. Crab meat is important for health and hence fetches good price in world market^[2].

Portunus sanguinolentus (Herbst, 1783) belonging to the family Portunidae is commonly known as "Three - Spotted Swimming Crab" or "Blood - Spotted Swimming Crab". This crab got its common name due to presence of three maroon spots on the posterior part of the carapace. It is a large crab with maximum length of 15 cm across the carapace, with grayish green colour and characterized by 3 red spots on posterior half^[3]. This oceanic crab is widely distributed in the oceanic waters and is found through East Africa, the Indo-Pacific region, to the Hawaiian islands. Adult males and juveniles typically inhabit muddy and sandy bottom in nearshore waters, about 10-30 m deep, whereas females are abundant in deep waters, of about 40-80 m^[4].

The total marine fish landings of Gujarat was 7,86,495 tonne during the year 2017. Gir-Somnath district contribution was higher with 3.87 lakh tonne. Major gears contributed for crustacean landing were dollnets (75.2%) and trawlers (22.3%). Crabs contributed 8,980 tonne of the total landings. *Charybdis fariata* (Linnaeus, 1758) contributed 15.9% followed by *Portunus pelagicus* (Linnaeus, 1758) (11.4%) and *Portunus sanguinolentus* (Herbst, 1783) (8.6%)^[5]. Major gear contributed for crab landing were multi day trawlers (73.39%) followed by dol netters (10.26%), gill netters (10.07%), single day trawlers (2.05%) and others (4.23%)^[6].

2. Materials and Methods

The samples were collected from a trawler (multi-day trawler) landed at Veraval coast, Gujarat. The trawlers employed for *P. sanguinolentus* (Herbst, 1783) measured more than 35 ft long wooden boat having more than 80 hp along Veraval coast. Multi-day trawlers conducted the fishing voyage lasting for 3 - 20 days in waters of 30 - 200 m depth and the major gears employed were mid - water and bottom trawl. Random sampling method was followed as per method adopted by [7] for collection of specimens on fortnightly intervals. In this method, *P. sanguinolentus* (Herbst, 1783) specimens were randomly collected from different trawlers for biological studies. The samples were collected of different size and weight groups.

Length - weight relationship was calculated separately for both the sexes as described by [8]. $W = aL^b$ where W = weight, a = constant, L = length, b = slope. The month wise sex ratio was determined and Chi-square test was performed to test the homogeneity of male and female distribution [9]. Maturity was observed based on the stages given by [3]. The three maturity stages (I - immature, II - maturing, III - mature) for males and Five stages (I - immature, II - early maturing, III - late matured, IV - ripe, V - spent) for females were observed. The gonado somatic index (GSI) was calculated by the formula given by [10]. It was statistically analyzed using standard methods as per the analysis of co-variance [11] and Chi - square test [8].

3. Results

3.1 Length composition

The present study was based on total 480 *Portunus sanguinolentus* (Herbst, 1783) specimens in the size range from 34.6 to 270.2 mm carapace length comprising of 224 males and 256 females. The mean total lengths of the species collected in the months of August (144 ± 27 mm) and September (127 ± 22 mm) were higher, while those collected in November (89 ± 11 mm) smaller. Their modal lengths were also higher in the months of August (150 mm) and September (149 mm), while it was lower in October (69 mm) and November (84 mm). The smallest specimen (*i.e.*, 34.6 mm) was observed in August, 2018. The specimen with the highest length (*i.e.*, 270.2 mm) was also recorded in August, 2018 (Table 1; Fig. 1).

3.2 Length - weight relationship

A total of 480 (224 males and 256 females) specimens in the length ranging from 39.2 - 191.5 mm were used for determining the length weight relationship separately for males (Fig.2), females (Fig. 3) and combined (Fig. 4). The equations arrived were:

Male: $BW = 5.92745 \times (FL)^{2.95}$ ($r = 0.88$)

Female: $BW = 0.00016 \times (FL)^{2.74}$ ($r = 0.84$)

Combined: $BW = 0.00010 \times (FL)^{2.85}$ ($r = 0.86$)

3.3 Sex Ratio

A total of 480 specimen were studied to determine sex ratio in *P. sanguinolentus* (Herbst, 1783). Out of 480 species examined, 224 were males and 256 were females with overall sex ratio of 1:1.14. Results indicated dominance of females in August, September, October, January and March months (Fig. 5 & Table. 2).

3.4 Maturity

Sexual maturity of individuals was studied by observing the different developmental stages of ova in the specimen, which were distinguished by microscopic and macroscopic stages of ovary. Matured specimens were observed in almost all the months with higher peak in August (24 specimen) and lower during March (2 specimen) indicating that maturation takes place all throughout the year (Table 3).

3.5 Gonadosomatic Index (GSI)

Monthly GSI values of *P. sanguinolentus* (Herbst, 1783) was found least in January and it was moderate in September, October and November (2.89 to 3.5). The value of GSI reached its peak in August (4.24) and December (4.4), February (4.1) and March (4.75) (Figure 6). This suggests that the ovaries were in stage IV, ripe condition and ready for spawning in August, December, February and March.

Table 1: Range, mean and mode length of *Portunus sanguinolentus* (Herbst, 1783)

| Month | No. of crabs observed | Body length (mm) | | |
|-----------|-----------------------|------------------|--------------|-----------|
| | | Range (mm) | Mean (mm) | Mode (mm) |
| August | 60 | 34.6 - 270.2 | 144 ± 27 | 150 |
| September | 60 | 91.5 - 191.5 | 127 ± 22 | 149 |
| October | 60 | 65.8 - 160.1 | 94 ± 23 | 69 |
| November | 60 | 58.2 - 122.7 | 89 ± 11 | 84 |
| December | 60 | 39.2 - 160.1 | 94 ± 19 | 89 |
| January | 60 | 72.6 - 151.5 | 115 ± 16 | 112 |
| February | 60 | 67.7 - 160.2 | 111 ± 24 | 118 |
| March | 60 | 72.3 - 136.6 | 99 ± 12 | 98 |
| Annual | 480 | 34.6 - 270.2 | 109 ± 26 | 85 |

Table 2: Monthly variations in the sex ratio of *Portunus sanguinolentus* (Herbst, 1783)

| Month | Number of individuals | | | Sex ratio (M:F) | Chi square value |
|-----------|-----------------------|------------|-------|-----------------|------------------|
| | Male (M) | Female (F) | Total | | |
| August | 28 | 32 | 60 | 1:1.14 | 0.27 |
| September | 28 | 32 | 60 | 1:1.14 | 0.27 |
| October | 25 | 35 | 60 | 1:1.4 | 1.67 |
| November | 32 | 28 | 60 | 1:0.87 | 0.27 |
| December | 30 | 30 | 60 | 1:1 | 0.00 |
| January | 25 | 35 | 60 | 1:1.4 | 1.67 |
| February | 30 | 30 | 60 | 1:1 | 0.00 |
| March | 26 | 34 | 60 | 1:1.3 | 1.07 |
| Annual | 224 | 256 | 480 | 1:1.14 | 2.13 |

Table 3: Monthly variations in the maturity of *Portunus sanguinolentus* (Herbst, 1783)

| z | No. of crabs | |
|-----------------|--------------|---------|
| | Observed | Matured |
| August | 30 | 24 |
| September | 30 | 19 |
| October | 30 | 11 |
| November | 30 | 9 |
| December | 30 | 13 |
| January | 30 | 15 |
| February | 30 | 9 |
| March | 30 | 2 |
| Total / Average | 240 | 102 |

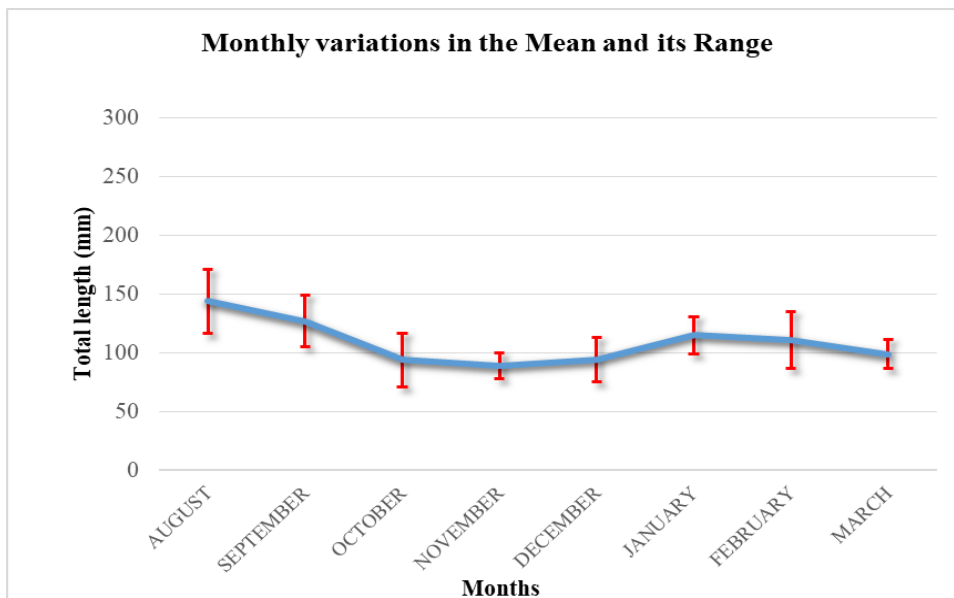


Fig 1: Monthly variations in the mean body length and its range. Length - weight relationship

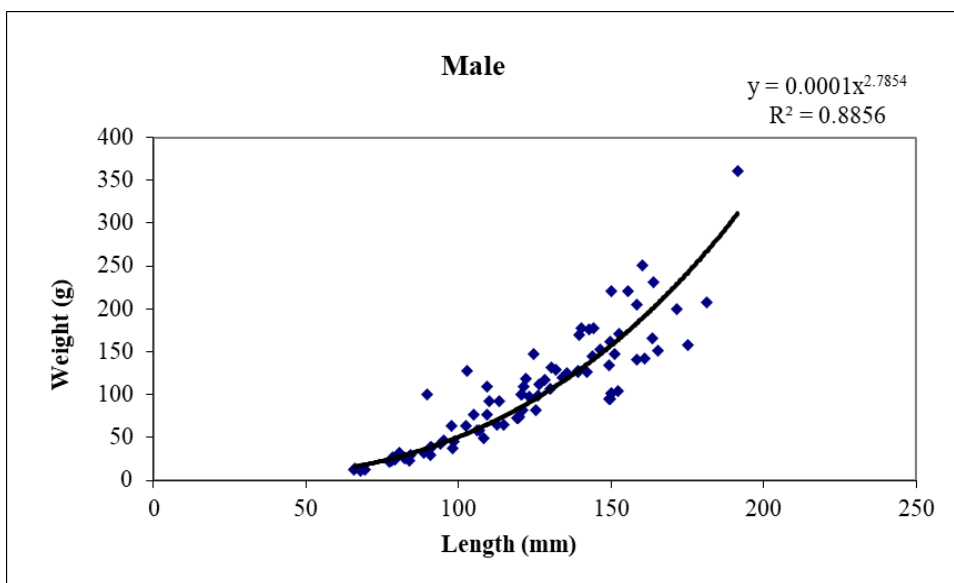


Fig 2: Relationship between length and weight in the males of *Portunus sanguinolentus* (Herbst, 1783)

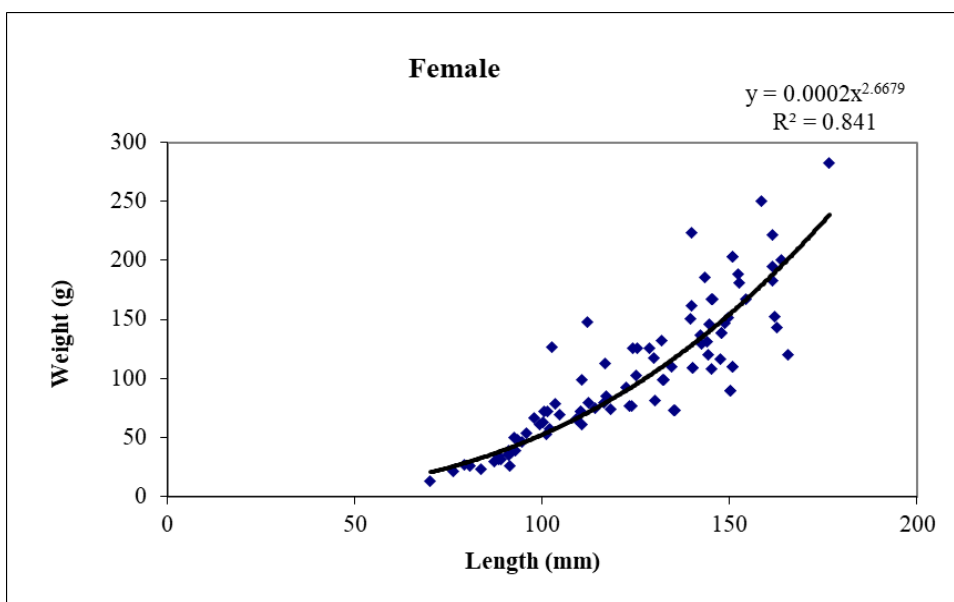


Fig 3: Relationship between length and weight in the females of *Portunus sanguinolentus* (Herbst, 1783)

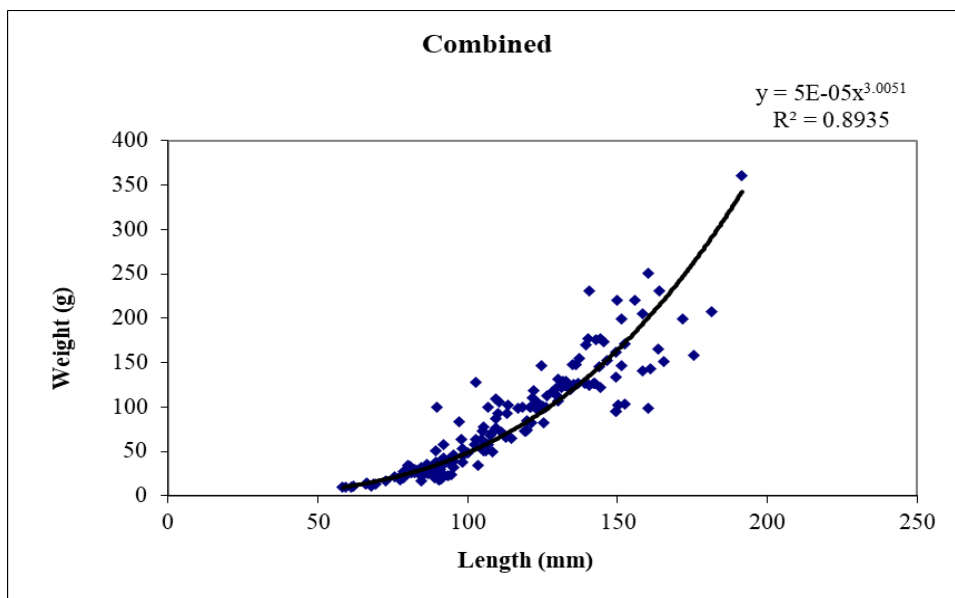


Fig 4: Combined relationship between length and weight of *Portunus sanguinolentus* (Herbst, 1783)

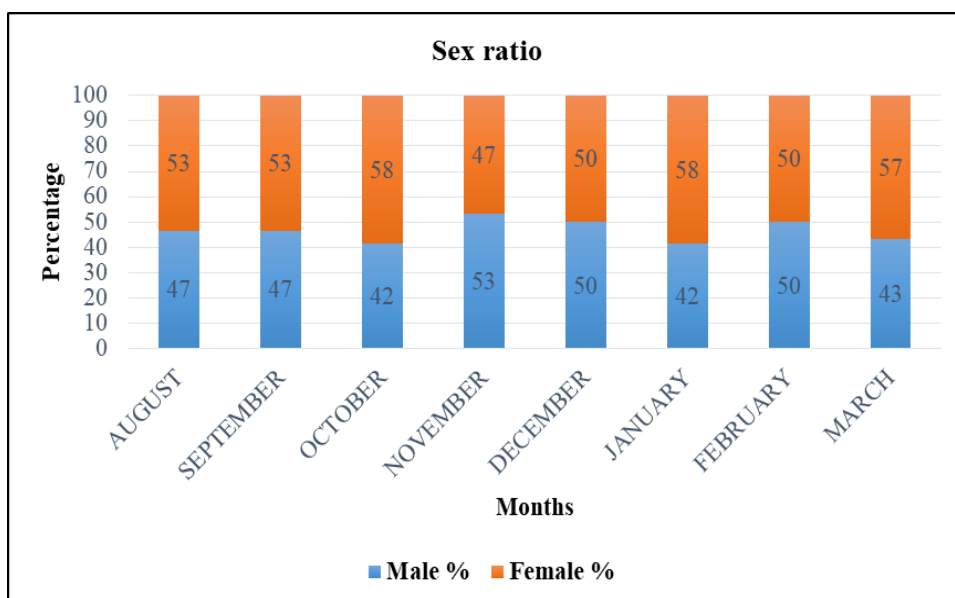


Fig 5: Monthly variations in sex ratio of *Portunus sanguinolentus* (Herbst, 1783)

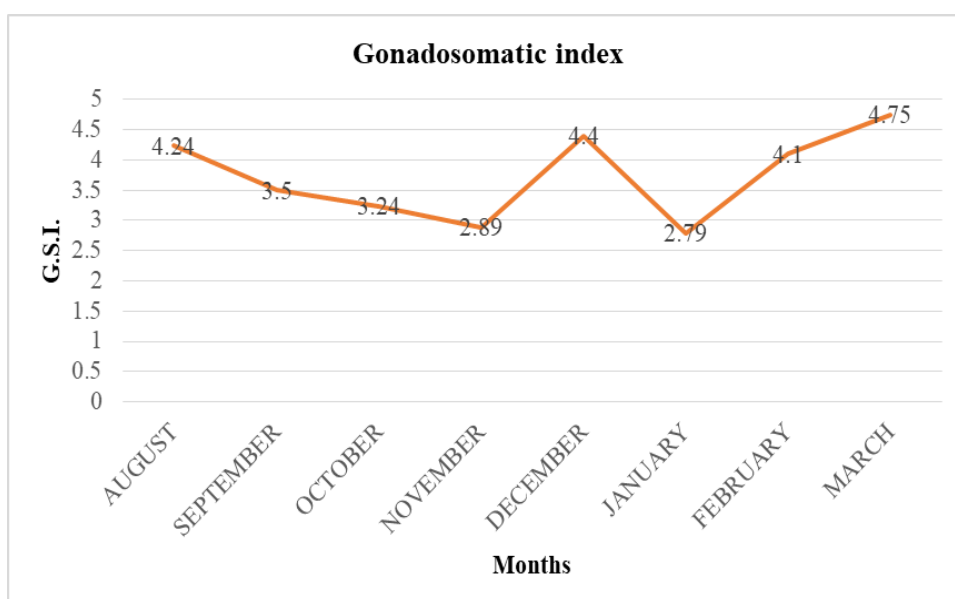


Fig 6: Monthly values of Gonadosomatic index in males and females of *Portunus sanguinolentus* (Herbst, 1783)

4. Discussion

Dash *et al* ^[12] also recorded similar observations in portunid crab, *Charybdis fariata* (Linnaeus, 1758). No significant difference was observed in between the mean carapace width of male (109.26 mm) and female (110.2 mm) populations. Minimum and maximum carapace width in males were 61.0 mm and 161.0 mm respectively. In females, minimum and maximum carapace width were 67.0 and 163.0 mm respectively. The sex pooled data of mean carapace width was found 109.8 mm. The length frequency distribution pattern showed maximum crab specimens in the range of 110.0 to 115.0 mm.

The length - weight relationship studies in *P. sanguinolentus* (Herbst, 1783) by ^[13] from the Karnataka coast have reported that the coefficient of correlation (r) was nearly equal to 1. The exponential values (b) indicated an isometric pattern of growth. Analysis of covariance between males and females revealed that there was no significant difference ($P = <0.05$).

^[14] Reported that in *P. sanguinolentus* (Herbst, 1783) males dominated females from studies conducted from Karwar coast with male to female ratio of 1.29:1, whereas at Mangalore coast females dominated males with the ratio of 0.93:1. Males and females were more or less distributed in the same ratio of 1.06:1 at Malpe coast. They also observed that there was variation in the sex ratio of crab within different months.

^[15] Reported that generally in males, the criterion of maturity is the vasa differentia which contains larger numbers of spermatophores. In females the maturity cannot be determined from the condition of gonads in contrast to males. They suggested that moult of puberty was well developed in females than in males.

The gonadosomatic index of *P. sanguinolentus* (Herbst, 1783) was studied according to size and weight of the crab of male and female species by ^[3]. The GSI values of male immature crab were 0.48 and for matured crab were 0.79. The GSI values in females were high during January and February which were similar as per our observations too.

5. Conclusion

The present investigations revealed that the individuals in the population mature throughout the year with high value of maturity in August, September, December and January. Length and weight of crab increases with increasing in size of the crab. The study thus indicated isometry growth in both male and female species. The overall sex ratio was almost equal with females slightly dominating in some months. Mostly, the immature crabs of male and female species were smaller in size while the mature crabs of male and female species were larger in size.

6. Acknowledgements

I express my sincere thanks to Dr. A. Y. Desai, Dean and Principal, College of Fisheries, Junagadh Agricultural University, Veraval for giving us an opportunity and facility. I also thankful to Scientist of CMFRI Veraval Shri Vinay Kumar Vase and Shri Rajan Kumar for their suggestion.

7. References

1. Sukumaran KK. Fishery, biology and population dynamics of the marine crabs, *Portunus sanguinolentus* (Herbst, 1783) and *Portunus pelagicus* (Linnaeus, 1758) along the Karnataka Coast. Msc. Thesis. School of Ocean Sciences, Karnataka University, Post Graduate and Research Centre, Kodibag, Karwar, India, 1995, 405.

2. Varadharajan D, Soundarapandian P. Portunid crab fishery resources from Nagapattinam coast, south east coast of India. Journal of Marine Science Research and Development. 2013; 3(3):1-3.
3. Soundarapandian P, Varadharajan D, Boopathi A. Reproductive biology of the commercially important portunid crab, *Portunus sanguinolentus* (Herbst, 1783). Journal of Marine Science Research and Development. 2013; 3(2):1-9.
4. Lee HH, Hsu CC. Population biology of the swimming crab *Portunus sanguinolentus* (Herbst, 1783) in the waters off northern Taiwan. Journal of Crustacean Biology. 2003; 23(3):691-699.
5. Anonymous. Annual report of CMFRI; 2017 - 2018. Published by Central Marine Fisheries Research Institute, Government of India, Cochin, 2018, 1-301.
6. Anonymous. Annual report of CMFRI; 2016 - 2017. Published by Central Marine Fisheries Research Institute, Government of India, Cochin, 2017, 1-292.
7. Srinath M, Kuriakose S, Mini KG. Methodology for the estimation of marine fish landings in India. CMFRI Special publication. 2005; 86(1):1-57.
8. Le Cren ED. The length-weight relationship and seasonal cycle in gonad weight and condition in the perch *Perca fluviatilis* (Linnaeus, 1758). The Journal of Animal Ecology. 1951; 20(2):201-219.
9. Narasimham KA. Mortality, spawning and sex ration of the ribbonfish *Trichiurus lepturus* (Linnaeus, 1758) off Kakinada. Journal of Marine Biology Association of India. 1994; 36(1 & 2):199 - 204.
10. Kume S, Joseph J. Size composition and sexual maturity of billfish caught by the Japanese longline fishery in the Pacific Ocean east of 130W. Far Seas Fisheries Research Laboratory. 1969; 130(2):115-162.
11. Snedecor GW, Cochran WG. Statistical methods. Iowa State University, Ames, 1967, 593.
12. Dash G, Dash SS, Koya M, Sreenath KR, Thangavelu R, Mojjada SK *et al*. Analysis of fishery and stock of the portunid crab, *Charybdis feriata* (Linnaeus, 1758) from Veraval waters, north-west coast of India. Indian Journal of Fisheries. 2014; 61(4):1-9.
13. Sukumaran KK, Neelakantan B. Length - weight relationship in two marine portunid crabs, *Portunus sanguinolentus* (Herbst, 1783) and *Portunus pelagicus* (Linnaeus, 1758) from the Karnataka coast. Indian Journal of Marine Sciences. 1997b; 26(1):39-42.
14. Sukumaran KK, Neelakantan B. Sex ratio, fecundity and reproductive potential in two marine portunid crabs, *Portunus sanguinolentus* (Herbst, 1783) and *Portunus pelagicus* (Linnaeus, 1758) along the Karnataka coast. Indian Journal of Marine Sciences. 1997c; 26(1):43-48.
15. Sukumaran KK, Neelakantan B. Relative growth and sexual maturity in the marine crabs, *Portunus sanguinolentus* (Herbst, 1783) and *Portunus pelagicus* (Linnaeus, 1758) along the southwest coast of India. Indian Journal of Fisheries. 1996a; 43(3):215-224.