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Fishery Potential of Commercially Important Crab *Portuns sanguinolentus* (Herbst) along Parangipettai Coast, South East Cost of India

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Abstract: Among the edible marine crustaceans of India, crabs ranks third by virtue of their importance as an esteemed gourmet and the value of fishery they support, while shrimps and lobsters occupy the first and second places respectively. Among the commercially important crabs, the genus *Scylla* ranks first followed by *Portunus* sp. (*P. pelagicus* and *P. sanguinolentus*). In the present investigation an attempt has been made to study the fishery potential of commercially important portunid crab along Parangipettai coast. The data showed that *P. sanguinolentus* appears to breed round the year. The total landings along with the ovigerous female crabs, during the study period were estimated as 31,817 kg (31.8 tons) from February 2004 to December 2004 and 26,588.1 kg (26.58 tons) from May 2005 to January 2006. The shortage of four fishing months (from January 2005 to April 2005) during the study period was due to the heavy destruction caused by tsunami on 26th December 2004. The Killer waves caused heavy damages to coastal livelihood. Fisherman loss their craft and gear very particularly along Nagapattinam and Cuddalore districts of Tamil Nadu coast where the study area is located. The berried crabs were recorded round the year with two seasonal peaks from February 2004 to May 2004 and from August 2004 to December 2004 for the first year. However, during the second year from May 2005 to June 2005 and the second peak is from August 2005 to December 2005. The ovigerous female crab landings were recorded as 5,193.7 kg (5.19 tons) from February 2004 to December 2004 and 4,337.6 kg (4.33 tons) during the second year from May 2005 to January 2006.

Key words: *Portunus sanguinolentus*, crab fishery resoruces, craft and gear, vigerous female, hatchery and crustaceans

INTRODUCTION

The crab fishery in India is fast developing and there is a vast scope for the crabmeat due to its delicacy and nutritional richness. They are extensively fished and marketed in all the maritime states of India and abroad (Rao *et al.,* 1973; Angell, 1992; CMFRI, 2000, 2001; John Samuel *et al.*, 2004). Crabmeat is the delicious meat for Americans and Europeans and they take the pasteurized crabmeat as such or as value added products like crab cakes, crab cutlets and crab soups etc (Sanil Kumar, 2000). Portunid crabs are one of the good fishery resources of South East Asian seas, out of which, swimming crabs, i.e., three spot crab (*P. sanguinolentus*) and blue swimming or flower crab (*P. pelagicus*) are of high commercial value along with mud crabs. Blue crabs are fished in large quantities mostly in all the seas of India, Bangladesh, Southeast Asian countries and Arab countries. In India, best potentials are seen in the coasts of Tamil Nadu, Kerala, and Karnataka and to a certain extent in Maharastra and Gujarat. In Tamil Nadu, bulks of the catches are landed from Gulf of Mannar and Palk Bay, Nagapattinam and Puducherry has contributed around 90% of the total crab landings along the east coast (Rao *et al.*, 1973). Swimming crabs breed throughout the year along the coast and fished extensively from the inshore waters. Fishery of ovigerous crabs was abundant throughout the year with two peaks of seasonal availability all along the coast. From the previous reports on crab landings, is revealed that the berried crabs of both *P. sanguinolentus* and *P. pelagicus* are under heavy fishing pressure, especially the earlier one. So, a study on crab fishery especially ovigerous crab fishery resource of *P. sanguinolentus* is essential to stabilize and improve the population and to start commercial hatcheries along the coast.

MATERIALS AND METHODS

Fishery of *P. sanguinolentus* was recorded, focusing on the availability of berried or ovigerous crabs along the Parangipettai (Lat. 11º 29'N and Long. 79º 46'E) coast in three landing centers, *viz*., Annankoil, Mudasalodai and Killai. The study was made in two phases from February 2004 to January 2006. The first phase was from February 2004 to December 2004 (Before tsunami) and the second phase was from May 2005 to January 2006 (after tsunami). During the study, carapace width (distance

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between the widest parts of the carapace), carapace length (distance between the anterior and posterior margin of carapace) and weight in 5 grams accuracy were taken for berried females (John Samuel *et al*., 2004).

For the purpose of total and ovigerous crab catch estimation; the observation of crab landings and counting of baskets were taken into consideration. Each station was visited twice in every week and observations were recorded for total catch and catch composition. On each sampling day, the ovigerous crab landings were recorded along with the total catch of *P. sanguinolentus* at every sampling station. Similarly, the details for non-sampling fishing days were collected from the merchant's diary (crab marketing agency) for as many days as possible. The average daily crab landing was worked out from the data thus obtained and raised to the number of fishing days to assess the monthly total crab landings of the centre.

Craft and Gear employed: The craft employed along the Parangipettai coast includes trawlers, rampani boats, dugout canoes and catamarans. Main gears employed in the crab fishery are cast net, crab traps, drag nets, gill net, hook and line, long line and stake nets etc.

Statistical Analysis (SPSS Package): Two-way analysis of variance (ANOVA with replication) was done for the pooled data to find out the variations in between the total fishing months and crab fishery of *P. sanguinolentus*. The level of significance was seen at 5% level ($p>0.05$) (SPSS, 2000).

RESULTS

The data showed that *P. sanguinolentus* appears to breed round the year since the ovigerous females could be obtained during all months of the year in varying percentages. The maximum and minimum sizes of the carapace width (CW), carapace length (CL) and total weight (in grams) of the individuals were presented in Table 1. The total landings along with the ovigerous female crabs, during the study period were estimated as 31,817 kg (31.8 tons) from February 2004 to December 2004 and 26,588.1 kg (26.58 tons) from May 2005 to January 2006 (Table 2 and Fig. 1). The shortage of four fishing months (from January 2005 to April 2005) during the study period was due to the heavy destruction caused by tsunami on 26th December 2004. The tsunami waves hit all along the Indian coast causing heavy damages to coastal livelihood those who are involved in the fishing activities and heavily damaged their craft and gear along the Tamil Nadu coast and very particularly along Nagapattinam and Cuddalore districts.

The berried crabs were recorded round the year with two seasonal peaks from February 2004 to May 2004 and from August 2004 to December 2004. However, during the second year from May 2005 to June 2005 and the second peak is from August 2005 to December 2005 (Fig. 2). The ovigerous female crab landings were recorded as 5,193.7 kg (5.19 tons) from February 2004 to December 2004 and 4,337.6 kg during the second year from May 2005 to January 2006. The percentage of berried crabs recorded in each month was also presented in Table 1.

The results from the two-way ANOVA (with replication) showed significant variations between total fishing months and the crab fishery (Table 3).

Table 1: Carapace width, carapace length and weight of non-ovigerous (both male & female) and ovigerous females of *P. sanguinolentus*

S.No	Particulars	Size range	
		Non-berried crab	Berried crab
1	Carapace width (cm)	5.0 – 15.2	7.6 - 15.2
2	Carapace length (cm)	2.0 – 6.1	3.1 - 6.1
3	Weight (g)	10 – 210	135 - 250

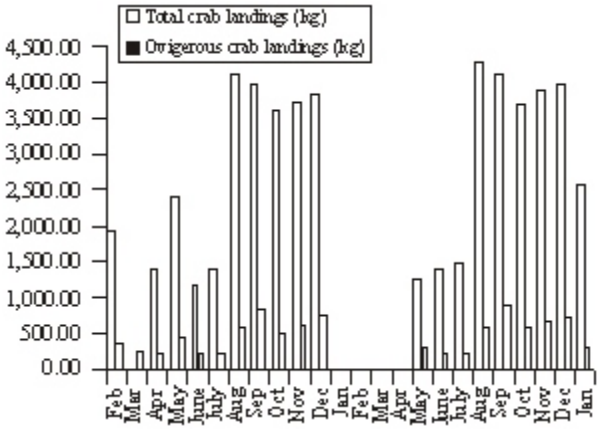

Fig. 1: Crab landings of *P. sanguinolentus* during February 2004 to January 2006

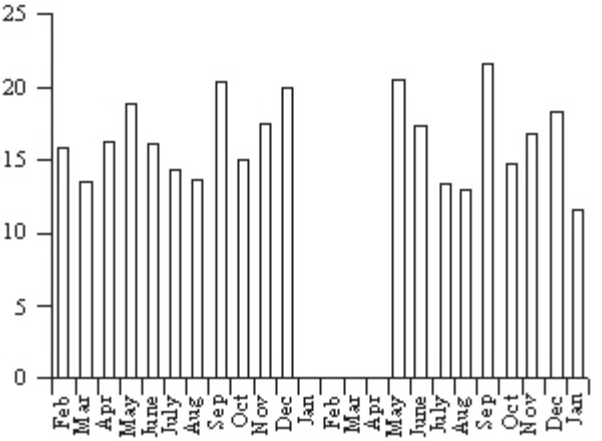

Fig. 2: Percentage of ovigerous females landed during February 2004 to January 2006

Table 2. Fishery potential of *P. sanguinolentus* along Parangipettai coast during February 2004 to January 2006

Year	Month	Total crab landings (kg)	Ovigerous crab landings (kg)	Ovigerous females (%)
I[st] year	February '04	1,927.4	306.4	15.9
	March	1,889.3	252.5	13.4
	April	1,402.6	228.6	16.3
	May	2,378.2	449.5	18.9
	June	1,165.5	187.6	16.1
	July	1,406.4	198.3	14.1
	August	4,112.8	559.3	13.6
	September	3,947.1	797.3	20.2
	October	3,529.7	536.5	15.2
	November	3,715.5	650.2	17.5
	December	3,820.4	752.6	19.7
	January '05	-	-	-
Total		31,817.0	5,193.7	-
II[nd] year	February '05	-	-	-
	March	-	-	-
	April	-	-	-
	May	1,263.5	259.0	20.5
	June	1,381.4	239.0	17.3
	July	1,458.2	196.6	13.5
	August	4,272.2	546.8	12.8
	September	4,098.5	877.1	21.4
	October	3,706.8	544.9	14.7
	November	3,887.1	653.0	16.8
	December	3,952.6	723.3	18.3
	January '06	2,567.8	297.9	11.6
Total		26,588.1	4,337.6	-
Grand Total		58,405.1	9531.3	-

Table 3: Two-way analysis of variance (ANOVA - with replication) for the period of two years (from February 2004 to January 2006) along the Parangipettai coast

Source of Variation	SS	df	MS	F	P-value	F crit
Seasons	30344593	11	2758599	6.166867	P<0.05	2.216311
Crab landings	43904498	1	43904498	98.1488	P<0.05	4.259675
Within	10735821	24	447325.9	-	-	-
Total	1.01E+08	47	-	-	-	-

DISCUSSION

Among the marine crustaceans, found along the Indian coast, crabs rank third after shrimps and lobsters by virtue of their esteemed seafood delicacy and also by the value of fishery they support (Savad and Raghavan, 2001). In the crab fisheries, majority was contributed by the members of the family Portunidae in the Indian waters (Prasad and Thampi, 1952; Pillai and Nair, 1973; CMFRI, 1998, 2000; John Samuel *et al*., 2004). In India the crab resources are seen in the coasts of Tamil Nadu, Kerala, Karnataka and to certain extend in Maharastra and Gujarat. Tamil Nadu tops the list in crab landing all over India and the coastal belt from Tuticorin to Mallipattinam has been proven as the strongest potential of edible sea crabs (Sanil Kumar, 2000).

Total landings of *P. sanguinolentus* were 31,817kg (from February 2004 to December 2004) and 26,588.1kg (from May 2005 to January 2006) respectively. They are major constituent in the fishery, forming around 40% of total crabs landings. Previous reports on the fishery of *P. sanguinolentus* along the Parangipettai coast was recorded a maximum catch of 8,677.4kg from the total annual landings of 28,507kg (28.5 tons) (Radhakrishnan, 1979). After that John Samuel *et al.* (2004) reported a major crab fishery of around 29.2 tons (37%) from the total landings of 79,445.6kg. The differences of crab landings in the past two decades are due to many reasons, including importance of crabmeat in the national and international markets, development of improved fishing craft and gear, and changes in the environmental parameters. The landings of *P. sanguinolentus* along Indian coast were already documented by various scientists (George and Nayak, 1961; Nandi and Ghatak, 1985; Joel and Sanjeeva Raj, 1987; Saradha, 1998; Sukumaran, 1999; Sanil Kumar, 2000; John Samuel *et al*., 2004).

During the study period, the devastating tsunami resulted in the shortage of four fishing months (from January 2005 to April 2005; one month at the end of the first year and three months at the beginning of the second year), which in turn showed a shortage in the entire fishery during the second year of the study period. The tsunami has dealt a severe blow to the coastal marine fisheries sector causing a huge loss of men and material. The livelihood security of lakhs of coastal fisher folk who are directly or indirectly dependant on marine fisheries has been shattered by destruction of their dwellings and

more importantly their only means of earnings, namely, the craft and gear (CMFRI, 2005). Among the coastal states, Tamil Nadu and Puducherry are reported to be suffered the worst damages.

The crab fishery before and after tsunami did not show any marked variation except some minor differences in the landings. But, Babu (2005) reported that the increased landings of red or mud crab, *S. serrata* again suffered a setback after December 2004 Tsunami, resulting in a significant fall in crab landings along Kakinada coast. It has been reported that coastal habitats and environment have been altered in various degrees due to the effect of tsunami. In some coastal areas, coral reefs were destroyed impacting on the fisheries and tourism resources and thus on livelihoods, directly and indirectly (Bueno, 2005).

From these total landings, berried crabs contributed around 5,193.7kg during the first year (from February 2004 to December 2004) and 4,337.6kg during the second year (from May 2005 to January 2006). The percentage of berried crabs landed during each month was given from the total crabs landed in the particular month. The possible reasons contributing to the decrease in the total catch of 856.1kg during the second year might be due to the shortening of three fishing months, less fishing effort due to the loss of livelihood of fisher folk after tsunami and might also be due to the decreasing natural stock because of over fishing of these crabs since past.

The *P. sanguinolentus* constitutes major part of crab landings along the coast and was found available throughout the year. This is attributed to their continuous breeding activity and the fecundity was calculated up to 0.5-2 million eggs (Radhakrishnan, 1979). It is found in profuse quantities all along the Tamil Nadu coast and the fishery is round the year (Sanil Kumar, 2000). Chhapgar (1962) already reported that *P. sanguinolentus* supports fishery throughout the year on both the coasts.

The average size of *P. sanguinolentus* in the present study was ranging around 7.6-15.2cm. John Samuel *et al.* (2004) already reported similar kind of size abundance of 7-14cm for the crab *P. sanguinolentus* along the Parangipettai coast. This suggests that the potential stock of berried crabs being harvested were in between or almost equals the size of 7-14cm. Since the crabs are highly cannibalistic and due to the aggressive behavior and preying of smaller crabs by the large crabs probably contributed to the increasing availability of crabs with the size range of 9-15 cm (Raymont, 1983; Robertson and Piper, 1991; Kyomo, 1999).

The peak seasons of berried crab availability of *P. sanguinolentus* are from May to August and October to December. Radhakrishnan (1979) reported that *P. sanguinolentus* had three distinct peaks during August, January and March where as *P. pelagicus* breeds round the year with peak in premonsoon along Parangipettai coast. Sethuramalingam (1983) emphasized the availability of berried Portunid crabs along Vellar estuary - Killai backwater complex of Parangipettai coast. John Samuel *et al.* (2004) accounted that the berried crab availability of *Portunus* spp. round the year with peak seasons from April to August and October to February. This supports the present study that all the portunid crabs, especially *Portunus* spp. breeds round the year. Pillai and Nair (1971) were recorded the peak seasons of berried crabs *S. serrata* (January), *P. sanguinolentus* (November to March) and *Charybdis ferriata* (April to July) in southwest coast. Pillai and Nair (1976) found that *Ch. feriatus* breed throughout the year in south western Indian waters, although ovigerous females were more common during January and February. Sumpton (1990) found two major spawning peaks for *C. natator* with a low percentage of ovigerous females during winter and a high proportion of females with undeveloped gonads that indicated that this species did not spawn year round in the subtropical waters of the Moreton Bay, Queensland. Mantellato and Garcia (2001) reported that ovigerous females of *C. helleri* were present throughout most of the year, with the spawning activity during the winter along the Brazilian coast. In the Calicut coast, Saradha (1998) recorded berried crabs of *P. sanguinolentus* from December to May and July to August. Prasad and Thampi (1952) registered *P. pelagicus* as a continuous breeder with maximum intensity during September – March near Mandapam on southeast coast of India. Ameerhamsa (1978) reported the occurrence of berried females of *P. pelagicus* throughout the year with pronounced abundance from January to March and September to December in Palk Bay and Gulf of Mannar. Joel and Raj (1982) estimated the preponderance of berried *S. serrata* and *P. pelagicus* during post monsoon and in the months from August to October. Rajamani and Manickaraja (1998) observed that the maximum breeding activity of *P. pelagicus* during June followed by a gradual decrease in consecutive months and maximum in December along the Tuticorin Bay. The changes in the seasons of berried crab availability in two coasts might be due to different monsoon periods, current patterns and environmental parameters. The peak breeding seasons might also depend on the wave action and the turbidity of the surrounding waters. Apart from breeding, the larval and juvenile abundance was at maximum level during late post monsoon and summer, and minimum during December in the Vellar estuary (Sethuramalingam, 1983; Raffi, 2003). Raffi (2003) also recorded higher densities of portunid larvae throughout the year than other families along Parangipettai coast. This reflects that, Portunid crabs breed throughout the year along the Parangipettai coast.

The Tsunami caused extensive damage in Southern regions of India and Andaman & Nicobar Islands affecting a total of 2,260 km of coastline. All thirteen coastal districts were affected. The fisheries sector in Tamil Nadu, Andhra Pradesh and Andaman & Nicobar

Islands has suffered major damages. Tamil Nadu was the worst affected state. Coastal habitats and environment have been altered in various degrees. In some coastal areas, coral reefs were destroyed impacting on the fisheries and tourism resources and thus on livelihoods, directly and indirectly. Preliminary assessment of fisheries resources of the Andaman coast in early January 2005 indicated that fisheries resources in some areas declined by half after the tsunami.

The demand has been increasing for live and whole cooked crabs in different Asian and continental markets which has resulted in indiscriminate fishing activity and hence most of the wild resources are under heavy exploitation now (Savad and Raghavan, 2001). This is evident from the gradual changes in the crab landings from 1997 to 2001 (CMFRI, 2001). Hence conservation measures should be made to avoid over exploitation of these commercial Portunid species.

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REFERENCES

Ameerhamsa, K.M.S., 1978. Fishery of the swimming crab *Portunus pelagicus* Linnaeus from Palk Bay and Gulf of Mannar. Indian J. Fish., 25(1-2): 229-232.

Angell, C.A., 1992. Report of the Seminar on Mud crab Culture and Trade held at Surat Thani, Thailand, November 5-8, 1991. BOBP/RE/51: 1-246.

Babu, D.E., 2005. Fishery of *Scylla serrata*. In: Seminar on sustainable utilizataion of Brackish water crab resources of Godavari Mangroves. Fishing Chimes, 25(5).

Bueno, P.B., 2005. Impacts of Tsunami on Fisheries, Coastal Resources and Human Environment in Thailand. In: 4th Regional Network of Local Governments Forum, Bali, 27 April, pp. 28.

CMFRI, 1998. Annual Report, Central Marine Fisheries Research Institute, Cochin, India. pp: 151.

CMFRI, 2000. Annual Report 1999-2000. Central Marine Fisheries Research Institute, Cochin, India. pp: 148.

CMFRI, 2001. Annual Report 2001-2002, Central Marine Fisheries Research Institute, Cochin, India. pp: 96-99.

CMFRI, 2005. Annual Report 2005-2006. Marine Fisheries Census 2005 Part-1, Central Marine Fisheries Research Institute, Cochin, India. pp: 97.

George, P.C and K.R. Nayak, 1961. Observations on the crab fishing of Mangalore coast. Indian J. Fish, 8(1): 44-53.

Joel, D.R. and P.J.S. Raj, 1987. Marine crab fisheries around Pulicat. Seafood Export J., 19(1-2): 18-21.

John Samuel, N., N. Thirunavukkarasu, P. Soundarapandian, A. Shanmugam and T. Kannupandi, 2004. Fishery potential of commercially important portunid crabs along Parangipettai coast. In: Proceedings of Ocean Life Food & Medicine Expo, pp: 165-173.

Kyomo, J., 1999. Distribution and abundance of crustaceans of commercial importance in Tanzania mainland coastal waters. Bull. Mar. Sci., 65(2): 321-335.

Mantellato, F.L.M. and R.B. Garcia, 2001. Hermit crab fauna from the infralittoral area of Anchieta Island (Ubatuba, Brazil). In: Modern Approaches to the study of Crustacea. E.E. Briones and F. Alwarez, (Eds.), pp: 137-144.

Nandi, N.C. and S. Ghatak, 1985. Crabs of commercial importance from coastal West Bengal. J. Indian Soc. Coastal Agric. Res., 3(2): 131-135.

Pillai, K.K and N.B. Nair, 1973. Observation on the breeding biology of some crabs from south west coast of India. J. Mar. Biol. Ass. India, 15(2): 574-770.

Pillai, K.K. and N.B. Nair, 1971. Observations on the breeding biology of some crabs from the southwest coast of India. J. Mar. Biol. Ass. India, 15(2): 754-770.

Pillai, K.K. and N.B. Nair, 1976. Observations on the breeding cycles of certain estuarine crustaceans of the southwest coast of India. In: Recent Advances in estuarine Biology. R. Natarajan, (Ed.). Hindustan Publ. Corpn., Delhi, pp: 127-136.

Prasad, R.R and P.R.S. Thampi, 1951. An account of the fishery and fishing methods for *Neptunus pelagicus* (L.) near Mandapam. J. Zool. Soc. India, 3(2): 335-339.

Prasad, R.R and P.R.S. Thampi, 1952. An account of the fishery and fishing methods for *Neptunus pelagicus* near Mandapam. J. Zool. Soc. India, 4(2): 335-339.

Raffi, S.M, 2003. Studies on decapod larvae of Parangipettai coastal waters, Southeast coast of India. Ph.D. Thesis, Annamalai University, India.

Rajamani, M and M. Manickaraja, 1998. A note on the fishery of the swimming crab *Portunus pelagicus* (Linnaeus) from Tuticorin bay. Indian J. Fish., 39(1-2): 185-188.

Rao, P.V., M.M. Thomas and G.S. Rao, 1973. Crab fishery resources of India. Proc. Symp. on Living Resources of the seas around India, pp: 581-591.

Robertson, W.D. and S.E. Piper, 1991. Population estimates of the crab *Scylla serrata* (FORSKAL, 1755) (DECAPODA: PORTUNIDAE) in two closed estuaries in Natal, South Africa, from Mark-recapture methods. S. Afr. J. Mar. Sci. 11: 193-202.

Sanil Kumar, S, 2000. New horizons in sea crab meat processing. Seafood Export J., 31(8): 41-43.

Saradha, P.T, 1998. Crab fishery of the Calicut coast with some aspects of the population characteristics of *Portunus sanguinolentus*, *P. pelagicus* and *Charybdis cruciata*. Indian J. Fish., 45(4): 375-386.

Savad, A.M. and P.R. Raghavan, 2001. Mud crab–culture and fattening techniques, status and prospects. Seafood Export J., 32(11): 25-29.

Sethuramalingam, S., 1983. Studies on Brachyuran crabs from Vellar estuary-Killai backwater complex of Porto Novo coast. Ph.D. Thesis, Annamalai University, India, pp: 226.

SPSS, 2000. SYSTAT for Windows, rel. 9.01. SPSS, Chicago.

Sukumaran, K.K., 1999. Marine crab fisheries of Karnataka state – A Retrospect. Fishing Chimes, 18(10): 75-77.

Sumpton, W., 1990. Biology of the rock crab Charybdis natator (Herbst) (Brachyura: Portunidae). Bull. Mar. Sci., 46: 425-431.