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ORIGINAL RESEARCH ARTICLE

Crab Fishery Resources of *Podophthalmus vigil* (Fabricius) Along Parangipettai Coast, South East Coast of India

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ABSTRACT

The portunid crab, *P.vigil* is characterized as a delicacy throughout the coastal regions of India. The crab resources are need of the hour to prevent overexploitation and better management. In Saamiyarpettai the male, female and berried female crabs were uniformly landed maximum in the month of June and minimum in the month of March. In Pudukuppam the male, female and berried crabs were landed plenty during the month of June and minimum in the months of November and December. In Annankoil the male, female and berried crabs were abundant during the month of June. However, the males and berried females were minimum in the month of December and females were minimum in the month of January. In Mudasalodai the male, female and berried crabs were landed maximum in the month of June. However, males and females were landed minimum in the month of February and berried females were landed minimum in the month of October. Total crab landings of *P. vigil* in Parangipettai coast was 20920.27 Kg (nearly 21 tones). Among four stations in Parangipettai coast the overall total crabs landed was maximum in Mudasalodai and minimum in Pudukuppam. The total landings of the crabs were in the following order; Mudasalodai (6666.71 kg) < Annankoil (5269.62 kg) < Saamiyarpettai (5102.14 kg) < Pudukuppam (3881.85 kg). Total male crab landings; Mudasalodai was (3997 kg) standing first followed by Annankoil (3122 kg), Saamiyarpettai (3061kg) and Pudukuppam (2317kg). In female crab landings; Mudasalodai (1998.5 kg) was ranking first followed by Annankoil (1626.95kg), Saamiyarpettai (1531 kg) and Pudukuppam (1172.5 kg). The berried crabs were landed maximum in Mudasalodai (671.16 kg) followed by Annankoil (520.67 kg), Saamiyarpettai (510.14 kg) and Pudukuppam (392.35 kg). In general, male contributions were maximum followed by females and berried females irrespective of the stations of the present study.

Key words: Portunid crab, male, female, berried female, *P. vigil*.

INTRODUCTION

The crab fishery is today fast enough and there is a vast scope for the crab meat due to its delicacy and nutritional richness. The crab meat contains high nutrient substances like vitamins, carbohydrates, proteins, minerals and free amino acids. Crab meat is not only tasty but also have many therapeutic properties which are used to cure asthma and chronic fevers [1]. They are extensively fished and marketed in all the maritime states of India and abroad. More than 600 species of crabs known to occur in Indian waters, of which only about eight species form regular fishery along the entire stretch of peninsular India [2-4]. From the previous crab landing reports the crab population is declining every year. So crab fishery resource study is essential to improve the population of the respective areas [3, 4]. Parangipettai coast with its sheltered shoreline and brackish water systems support a lucrative fishery in Tamil Nadu, southeast coast of India. However, there is no comprehensive information on crab catches from Parangipettai region, as they are very much useful for the development of marketing, management, research, export and policy making. So in the present study, it is aimed to assess the *P. vigil* fishery resources in four landing centres (Saamiyarpettai, Pudukuppam, Annankoil and Mudasalodai) along Parangipettai coast, south east coast of India.

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MATERIALS AND METHODS

In Parangipettai (Lat. 11º 29'N; Long. 79º 46'E) coast, the fishery data was collected from 4 landing centres (Plate-1) *viz.*, Saamiyarpettai, Pudukuppam Annankoil and Mudasalodai. The study was made from April- 2009 to March- 2010. In this study, weight in 5 grams accuracy was taken individually for male, female and berried females (Plates- 2– 4) [3-5]. For the purpose of total 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. 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. Data was not collected during the end of the months like April and May. That period was declared as fishery holidays by the Government.

Statistical Analysis (SPSS Package)

One way analysis of variance was done for the pooled data to find out the variations in between the total fishing months and crab fishery of *P.vigil*. The level of significance was seen at 5% level ($p>0.05$).

RESULTS

For convenient, the study period was divided into 4 seasons *viz*., summer (April, May and June), premonsoon (July, August and September), monsoon (October, November and December) and post monsoon (January, February and March).The individual and total contributions of male, female and berried female crabs of *P. vigil* in different stations are presented in (Figs. 1-5).

Saamiyarpettai

In the present study, male, female and berried female crabs were uniformly landed maximum in the month of June and minimum in the month of March (Figs.1-3).

Pudukuppam

The male, female and berried female crabs were landed plenty during the month of June. But males, females and berried females were landed minimum in the months of November and December (Figs. 1-3).

Annankoil

The male, female and berried crabs were abundant during the month of June. However, the males and berried females were minimum in the month of December and females were minimum in the month of January (Figs 1-3).

Plate 1: Crabs landed in landing centre

Mudasalodai

Male, female and berried crabs were landed maximum in the month of June. However, males and females were landed minimum in the month of February and berried females were landed minimum in the month of February (Figs. 1-3).

Plate 2: Male crab of *P.vigil*

Plate 3: Female crab of *P.vigil*

Plate 4: Berried crab of *P.vigil*

Total crab landings

Total crab landings of *P. vigil* in Parangipettai coast was 20920.27 Kg (nearly 21 tones). Among four stations in Parangipettai coast the overall total crabs landed was maximum in Mudasalodai and minimum in Pudukuppam. The total landings of the crabs were in the following order; Mudasalodai (6666.71 kg) < Annankoil (5269.62 kg) < Saamiyarpettai (5102.14kg.) < Pudukuppam (3881.85kg) (Fig 4 & 5). Total male crab landings; Mudasalodai was (3997kg) standing first followed by Annankoil (3122kg), Saamiyarpettai (3061kg) and Pudukuppam (2317kg) (Fig. 1). In female crab landings; Mudasalodai (1998.5kg) was ranking first followed by Annankoil (1626.95kg), Saamiyarpettai (1531kg) and Pudukuppam(1172.5kg) (Fig. 2). The berried was landed maximum in Mudasalodai (671.16kg) followed by Annankoil (520.67 kg), Saamiyarpettai (510.14 kg) and Pudukuppam (392.35 kg) (Fig. 3). In general, male contributions were maximum followed by females and berried females irrespective of the stations of the present study (Fig. 5). The crabs landed in all landing centres showed significant variation (Table 1).

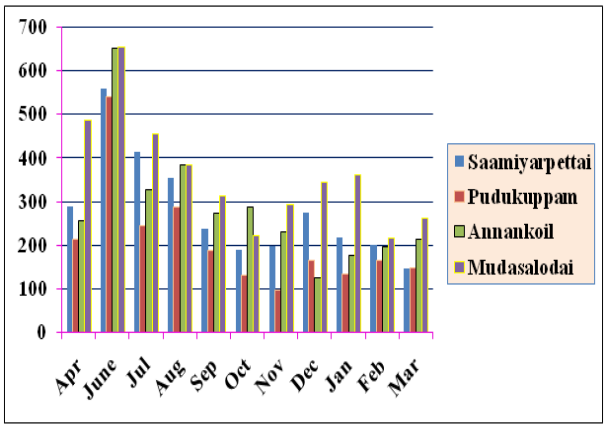

Fig 1: The male crab landings (Kg) of *P.vigil* in different landing centres from April-2009 to March-2010 along Parangipettai coast

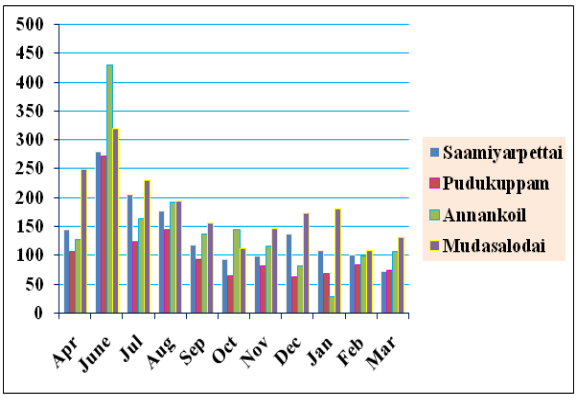

Fig 2: The female crab landings (Kg) of *P.vigil* in different landing centres from April-2009 to March-2010 along Parangipettai coast

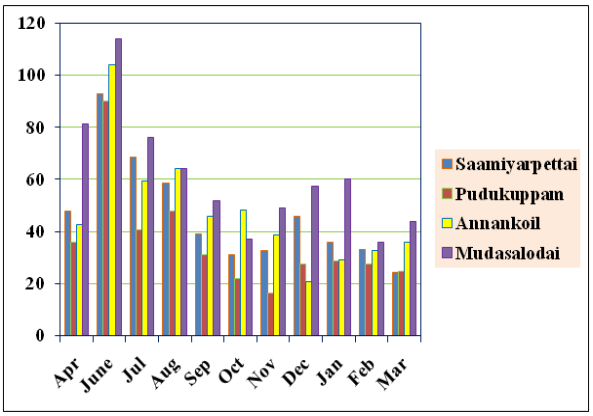

Fig 3: The berried landings (Kg) of *P.vigil* in different landing centres from April-2009 to March-2010 along Parangipettai coast

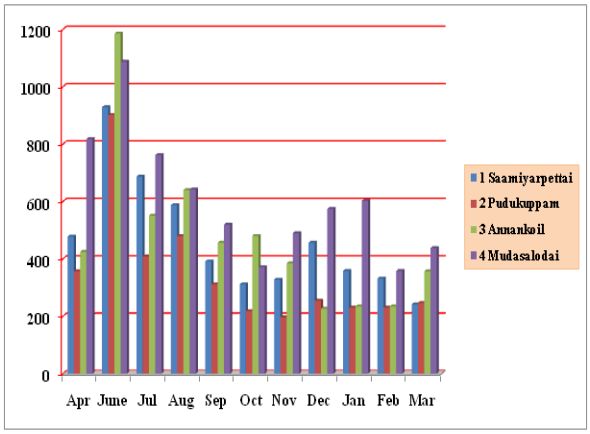

Fig 4:Total crab landings (Kg) of *P.vigil* in different landing centres from April-2009 to March-2010 along Parangipettai coast

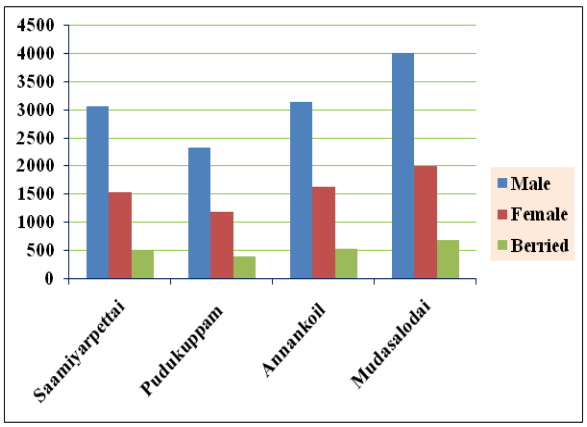

Fig 5: Total crab (male, female and berried females) landings (Kg) of *P.vigil* in different landing centres from April-2009 to March-2010 along Parangipettai coast

Table 1: One way analysis of variance for the crabs landed at different landing centres from April-2009 to March-2010 along Parangipettai coast

Source of Variation	SS	df	MS	F	P-value	F crit
Crab landed	1806365.754	10	180636.58	10.106266	1.693E-07	2.132504
Within Groups	589832.7768	33	17873.721			
Total	**2396195.531**	**43**				

DISCUSSION

Crab meat is the delicious meat for Americans and Europeans and they take the pasteurized crab meat as such or as value added products like crab cakes, crab cutlets and crab soups etc. The increasing demands 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. The increased demand for the crabs in different markets and the depletion of resources along the coast has necessitated an urgent need for promoting crab culture in India. In crab fisheries; majority was contributed by the members of the family Portunidae in the Indian waters [6- 9]. In India the best potentials of crab resources are seen in the coasts of Tamil Nadu, Kerala and Karnataka and to certain extend in Maharashtra 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 [4, 10].

Crab landings along the Parangipettai coast was already reported by [11]. [3] recorded 12 commercially important crabs *viz*., *Scylla serrata, S. tranquebarica, Portunus pelagicus, P. sanguinolentus, P. gladiator, P. vigil, Charbdis feriata, C. natator, C. lucifera, C. variegata, C. granulata* and *C. truncata.* The crab *P. vigil* was one among 12 crab species and it was recorded very minimum when compared to other species. The total annual *P.vigil* landings of the Parangipettai cost were 1349.9 kg [3]. *P. vigil* was recorded almost all the months of the study period (September 2002 to August 2003) by [3]. The total crabs landings of the *P. vigil* in Arukkattuthurai to Ayyampattinam was 6,466.kg [4] and it was recorded only certain months of the study period. In the present study it is 20920.27 kg. Unlike [4], *P. vigil* was recorded almost all the months of the year. In general the crab landings now are doubled ever before. The differences in the crab landings in the past two decades are due to many reasons, including the development of improved fishing craft and gear, importance of crab meat in the national and international markets and changes in the environmental parameters etc. The crab meat is not only used for the human consumption but recently most of the crabs are being fished as the source of fishmeal.

In general, *Podophthalmus* sp fishery is purely seasonal and contributes very less all along Indian coast. This result is in agreement to the studies of [3, 4, 11]. Among the four stations in Parangipettai coast the overall total crabs landed was maximum in Mudasalodai and minimum was Pudukuppam. The total *P. vigil* landings was in the following order; Mudasalodai (6666.71 kg) < Annankoil (5269.62 kg) < Saamiyarpettai (5102.14 kg) < Pudukuppam (3881.85 kg). [3] already reported that crab landings were tremendous in Mudasalodai and Annankoil landing centres along Parangipettai coast.

In the present investigation the male crabs contribution was maximum (12497 kg) along the Parangipettai coast of the present study than females (6328.95 kg) and berried females (2094.32 kg) irrespective of the stations. Even put females and berried females together the total was not exceeding the male populations. Similar trend was also noticed by [4]. In male crab landings, Mudasalodai (3997 kg) standing first followed by Annankoil (3122 kg), Saamiyarpettai (3061kg) and Pudukuppam (2317 kg). In female crab landings, Mudasalodai (1998.5kg) standing first followed by Annankoil (1626.95 kg), Saamiyarpettai (1531 kg) and Pudukuppam (1172.5 kg). In berried females were landed maximum in Mudasalodai (671.16 kg), followed by Annankoil (520.67 kg) Saamiyarpettai (510.14 kg) and Pudukuppam (392.35 kg). Mudasalodai and Annankoil landing centres are consider being biggest landing centre of all fishery including crabs. Maximum boats are operated to catch the crabs in these two landing centres. These two landing centre are recognized as biggest auction centres along Parangipettai coast. This may be the reason for maximum crabs are landed in Mudasalodai and Annankoil landing centres than other landing centres of the present study.

The male, female and berried female crabs were landed maximum in the months of June to August of the present study. Those three months falls on summer and premonsoon. In general the abundance of crabs is marked by the influence of factors such as temperature and salinity.

Premonsoon and summer seasons are marked by a luxuriant supply of phytoplankters and zooplankters in the Parangipettai coastal waters are attributed to the abundance of crabs during this period [12]. The peak seasons of berried crab availability of *P. sanguinolentus* are from May to August and October to December [5]. [11] 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. [13] emphasized the availability of berried portunid crabs along Vellar estuary - Killai backwater complex of Parangipettai coast. [3] accounted that the berried crab availability of *Portunus* spp. round the year with peak seasons from April to August and October to February. [14] were recorded the peak seasons of berried crabs *S. serrata* (January), *P. sanguinolentus* (November to March) and *C. feriata* (April to July) in southwest coast. [7] found that *C. feriata* breed throughout the year in south western Indian waters, although ovigerous females were more common during January and February. [15] 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. [16] reported that ovigerous females of *C. helleri* were present throughout the year, with the spawning activity during the winter along the Brazilian coast. In the Calicut coast, [17] recorded berried crabs of *P. sanguinolentus* from December to May and July to August. [18] registered *P. pelagicus* as a continuous breeder with maximum intensity during September – March near Mandapam on southeast coast of India. [19] 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. [20] estimated the preponderance of berried *S. serrata* and *P. pelagicus* during post monsoon and in the months from August to October. [21] 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 [13, 22]. [22] 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 large-scale destruction of young crabs would obviously have adverse effect on the crab resources; therefore a specific size for harvest is to be fixed. The fishing areas should be closed or the fishing effort should be minimized for certain period of time or seasonal banning of the shipment of crabs should be done. The conservation measures for catching young, undersized and berried crabs should be done by educating the fishermen through audiovisual aids. Sea ranching should be initiated to restore the over exploited species. And certain regulatory measures and laws should be enforced like, fixing legal minimum size (across the broadest part of carapace) and protection of berried crabs. The law breakers should be fined or punished.

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