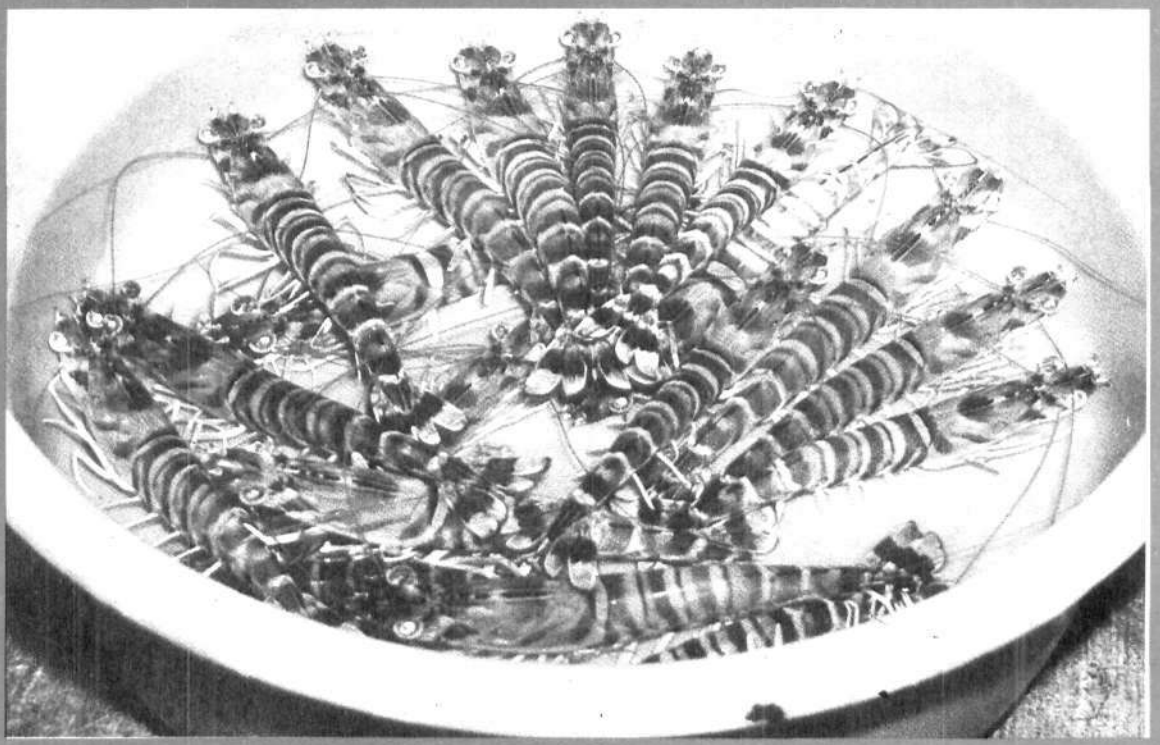
ISSN 0254-380 X

समुद्री मात्स्यिकी सूचना सेवा
MARINE FISHERIES INFORMATION SERVICE

No. 152

JANUARY 1998



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821 AN ASSESSMENT OF CRAB RESOURCES OFF CHENNAI (MADRAS)

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Introduction

Crabs, which form the bulk of bye-catch of trawl-fishing, have been increasingly experiencing heavy fishing mortality along the Chennai coast since the introduction of mechanised trawlers in the 1960s. High consumer demand coupled with easy availability of finance for fishing operations caused the additional pressure on the stock. The annual production of crabs thus shot-up from less than 10 t to more than 1,500 t within the last few decades. Such an exploitation on any limited stock raises the possibility of over-fishing. Expolitation has to be judicious and needs periodical monitoring of the stock size and remedial measures, in case of depletion. However, this line of investigation on the resources of crabs especially along the east coast is lacking. The available information pertains to Chennai, the leading centre of crab fishing and is limited to a passing description in a review on crab fishery of the country by Rao *et al.* (1973) and to some details on the estuarine crabs of the nearby Pulicat Lake (Thomas, 1972). Two taxonomical studies are, however, available which also highlight the rich resources of the pelagic (Premkumar, 1972) and benthic crabs (Krishnamoorthy, 1985) of the Chennai coast. The present article is directed to the commercial importance of crab fishery of this area, with an attempt to assess the current level of the stock, along with the permissible limit of catch and effort leading to rational exploitation.

Data base

Data on catch and effort were collected from commercial trawlers landing at Kasimedu, the only base used for trawler operations in Chennai. Adequate care was taken to cover both daily and long cruisers.

Fishing area and method

Trawlers are operated round the year at varying depths and distances from the base with

the target of capturing more remunerative prawns and fishes. Of late, the development of more powerful fishing vessels, coupled with improvements in gears and method of operations, have resulted in the expansion of fishing into the deeper offshore areas and also enabled distant fishing with 'chilling' facilities. The fishing grounds extend over 8-75 m depth, with major concentrations at 12-25 m depth for 'shrimp' trawlers and 30-45 m depth for 'fish' trawlers, in both of which crabs are caught in varying abundance. Away from the base along the coastal waters, the trawlers reach (Fig. 1)

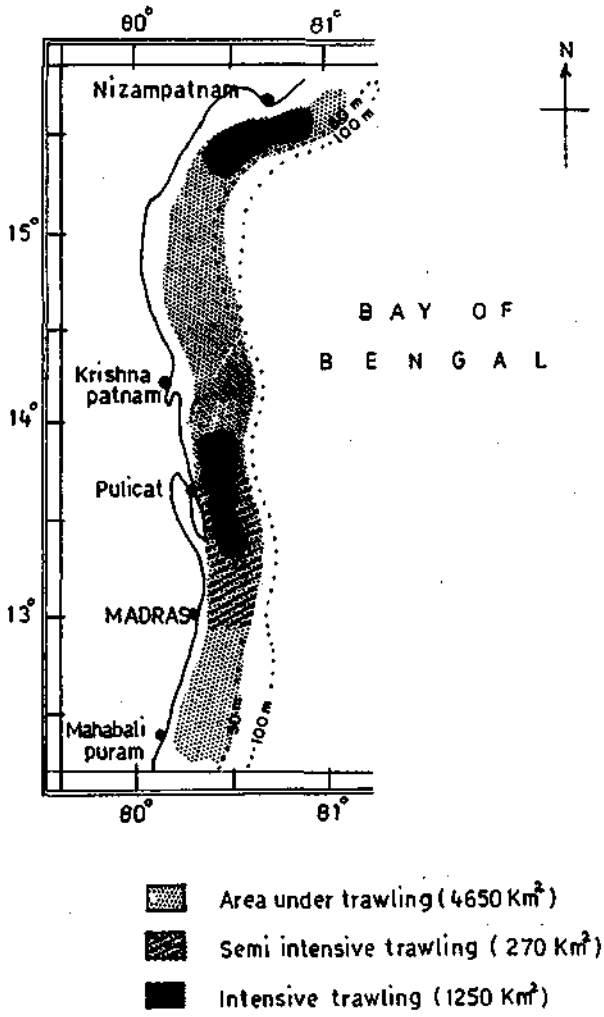

Fig. 1 Fishing area of trawler operations from Chennai base.

little beyond Mahabalipuram, 50 km in the south and Nizampatnam, 150 km in the north, altogether encompassing a fishable area of 4,650 sq.km. Intensive trawling is, however, restricted to two main pockets, one adjoining the Pulicat and the other off Nizampatnam covering an area of 1,250 sq.km.

Crabs are also caught relatively in small quantities by indigenous gear particularly, the gill-nets. More important among them is the FAO designed 'Trammel' net, which is generally operated during the wet season along the shallow waters closer to the shore and the main fishing grounds for operation stretch from the city upto Pulicat, covering an area of 270 sq.km. However, the production of crabs from these gear was less then 50 t, which is insignificant as compared to over 1,000 t by trawlers and hence these catches were ignored for calculations of stock size.

Fishing effort

Strong market demand for marine foods from the city and neighbourhoods has been the added incentive to keep trawl fishing busy round the year with slight seasonal variations in intensity of operation. The catch and effort for 10 years (1985-'95) are given in Table 1, from which it is observed that the effort increased three fold during the period and major increase occurred during the last five years. The effort which was estimated at 2,43,500 hrs in 1985-'86, showed small changes until 1988-'90 and shot-up sharply to 6,63,000 hrs in 1990-'91 and remained around 5,00,000 hrs for the next two years. Last two years 1993-'95, recorded an effort exceeding 6,00,000 hrs, the maximum effort of 6,84,000 hrs being in 1993-'94.

TABLE 1 *Catch and effort for crabs landed by mechanised trawlers at Madras during 1985-'95.*

Year	Effort ('000hr)	Catch (t)	CPUE (kg/hr)	% in total landings
1985-'86	243.5	329.0	1.35	3.65
1986-'87	265.4	330.4	1.25	2.04
1987-'88	284.0	322.0	1.13	3.18
1988-'89	283.0	327.6	1.16	1.57
1989-'90	237.5	375.5	1.58	1.68
1990-'91	663.0	421.8	0.64	1.81
1991-'92	511.6	1,401.0	2.74	4.06
1992-'93	499.5	796.4	1.59	2.70
1993-'94	684.0	709.5	1.04	0.99
1994-'95	617.0	1,512.5	2.45	3.63
Av.	428.8	652.6	1.52	2.10

The average monthly effort (Table 2) which had the least of 14,260 hrs in November and the maximum of 25,216 hrs in July, indicates increased fishing activities during June-August, when the weather conditions are calm, coupled with more remunerative catches. Two spells of effort were noted; one during November-December, due to interruptions by rough monsoon

TABLE 2. *Average monthly landings of commercial species of crabs for three years, 1992-95, at Madras*

Month	Effort (hrs)	Species composition (in tonnes)								Total	CPUE (kg/hr)
		1	2	3	4	5	6	7	8		
September	22,931	63.9	22.6	17.4	7.5	10.4	9.0	14.7	4.6	150.1	6.55
October	22,608	39.6	16.1	26.3	11.8	8.2	5.6	6.5	4.2	118.4	5.24
November	14,260	34.0	13.3	17.0	7.6	2.2	2.9	2.6	2.5	82.1	5.76
December	17,618	60.1	19.0	14.6	9.8	5.8	4.3	4.2	2.8	120.6	6.85
January	21,431	50.7	9.3	22.3	12.7	15.0	25.5	11.0	5.4	151.9	7.09
February	19,273	34.2	8.5	10.8	4.2	5.0	14.3	23.4	4.1	104.5	5.42
March	16,590	15.3	3.0	12.5	2.6	7.6	7.7	10.8	7.2	66.7	4.02
April	17,843	9.3	1.5	4.2	0.4	4.9	1.6	1.0	2.3	25.2	1.41
May	21,651	18.0	0.3	7.7	0.2	7.4	2.5	1.9	1.8	39.8	1.84
June	23,680	23.6	7.7	17.8	4.1	3.4	3.0	5.5	3.2	68.3	2.88
July	25,216	11.3	1.5	6.2	1.3	2.8	2.8	1.5	1.5	28.9	1.15
August	24,881	18.5	4.6	7.9	2.0	4.9	4.4	5.6	2.1	50.0	2.01
Total	2,47,982	378.5	107.5	164.7	64.2	77.6	83.6	88.7	41.7	1,006.5	–
Av.CPUE (kg/hr)		1.53	0.43	0.66	0.26	0.31	0.34	0.36	0.17	4.06	–
Percentage		37.6	10.7	16.4	6.4	7.7	8.3	8.8	4.1	–	–

1. *P. sanguinolentus*, 2. *P. pelagicus*, 3. *P. vigil*, 4. *C. cruciata*, 5. *C. natator*, 6. *C. lucifera*, 7. *C. smithii* and 8. Other species.

conditions and the other during March - April because of poor catches.

Fishery

The annual landings during the period 1985-'95 (Table 1) fluctuated between 325 t and 15,125 t , the average being 653 t, at the rate of 1.52 kg/hr to form 2.1 % of the trawl catches. With little increases in the initial few years, the catches were hovering around 325 t, with the catch-rate remaining less than 1.5 kg/hr and boosted sharply to 1,401 t at 2.74 kg/hr in 1991-'92. A moderate reversal then followed reducing the catches to 709 t in 1993-'94, but shot-up again to the maximum catch of 1,512 t at 2.45 kg/hr in 1994-'95, which remains still the record catch of crabs for this centre. Crabs contributed a maximum of 4.1 % to the overall trawl landings in 1991-'92 and exceeded 3.0 % at least in three other years during the period.

Seasonal abundance

An analysis of the monthly catches of crabs for three years, 1992-'95 (Table 2) showed that the fishery had a regular seasonal pattern of abundance, being largely influenced by the north-east monsoon rains. The landings during the first year 1992-'93, ranged between 0.2 t in April and 166.95 t in January and the main fishery extended from September to March, with two peak catches in September and January. The fishery during April-May the warmest months of the year, was very poor. During the next year 1993-'94, the monthly catches varied from 4.1 t in July to 148.0 t in September and the main fishery season of September-January period, extended moderately upto April. The fishery was dismal in May-August except an intervening strong spell in June. The following year 1994-'95 witnessed a bumper catch of crabs with the monthly landings fluctuating between 40.4 t in April and 228.6 t in January. Although the prime fishery season was during September-March, most of the other months also had relatively better catches as compared to the previous years.

The seasonal abundance is further supported by the average catches for the three years 1992-'95, that the main fishery season was consistent to occur during September-February with peak catches in September and January. Catches were moderate in March and August and poor during April-July with or without a secondary peak around June.

Species composition

The commercial crab fishery here is multispecies which includes two species of *Portunus*, viz., *P. sanguinolentus* and *P. pelagicus* together supporting nearly half of the crab catches; four species of *Charybdis* namely, *C. smithii*, *C. lucifera*, *C. natator* and *C. cruciata*, all forming around the third and another *Podopthalmus vigil* accounting for 17 % of crabs. The proportionate abundance of the species, however, varied slightly between the years.

P. sanguinolentus

The most abundant species which accounted for a third of the crab catches had an average annual production of 378 t at the rate of 1.5 kg/hr and its maximum landings were 579 t recorded in 1994-'95. The monthly catches varied widely between 1.0 t in July, 1993 and 112 t in December, 1994 and the major productive season stretched from September to February with two sharp peaks around September and December, the abundance being generally dull during the summer. The extend of prime season for fishery and the month of peak occurrence would also shift slightly from year to year.

P. pelagicus

This valuable species had a moderate fishery with an average annual landings of 108 t, that formed 10.5 % of the crabs and the least and the highest catches for the three year period were 72 and 156 t, respectively during 1992-'93 and 1994-'95. The fishery showed higher abundance during the monsoon months September-December which would extend even upto February in some years, and poor catches for a prolonged period March-August with slight increase in June.

P. vigil

The annual catches varied between 100.7 and 238.1 t to an average of 165 t, that supported 17 % of crabs. The monthly landings fluctuated between 0.1 t in April, 1993 and 43.4 t in January, 1995 during the three year period. Although wet season is generally favourable the bulk of the catches were obtained around October and January. Despite a dull fishery during the dry periods indication of a secondary peak around May-June was occasionally evident.

***Charybdis* spp.**

Another significant feature was the fishery of *C. smithii* which had an average annual landing of 88.7 t forming 9.0 % of crabs landings. The average monthly catch ranged between 0.9 t in May and 23.4 t in February and the maximum landings for any one month during the three years was 60 t recorded in February 1995. The increase in catches showed two spells, a strong one in January-March and another weak spell in September. Extreme wet season October-December, and dry period April-July, recorded poor catches. The species appeared in huge swarms on a few occasions lasting for less than a week, when most of the trawl-fishing were diverted to concentrate on them, since bulk catches fetched good demand from the fish-meal manufacturers. *C. cruciata*, a valuable edible variety had an average annual landings of 64.2 t and formed 6.5 % of crabs. The average monthly catch varied from 0.2 t in May to 12.7 t in January with the main fishery season during September-January. The catches were consistently poor during the warm period April-August. *C. natator* had the annual production widely varying between 14.3 t in 1992-'93 and 167.9 t in 1994-'95, with an average of 77.6 t to support 8.0 % of crabs. Average catches showed two annual peak catches around September and January.

Commercial utilization

Consumers have two types of uses for crabs. The larger and fleshy varieties namely, *P. sanguinolentus*, *P. pelagicus*, *P. vigil* and *C. cruciata* are edible and consumed fresh by the coastal population and a fraction is processed and exported. Usually the commercial crabs are sorted onboard and sold at the landing sites by auction or by prearranged agreements with the merchants, who sell them through an elaborate marketing system existing across the city and neighbouring areas. Smaller crabs mixed with the trash are used in fish-meal production. The trash is mainly dried and stocked for bulk sale to fish-meal plants located around the city.

Stock assessment

Surplus production models, which are based on the concept that yield is a function of stock

size and fishing effort, have been accepted in spite of their limitations to apply in stock assessment of the multiple species resources. The maximum sustainable yield was estimated as 681 t and optimum effort at 8,63,000 hrs by one method and as 671 t and 10,72,000 hrs by another method. The average catch and effort were 642 t and 6,15,000 hrs for the last five years 1991-'95. The figures indicate that the exploitation has nearly reached the maximum sustainable yield.

Remarks

The two minor rivers which pass through the metropolis into the Bay of Bengal are rainfed and water discharges are maintained only during the northeast nonsoon months and a little beyond. During the summer period when the bar-mouths are closed these rivers serve merely as reservoirs of city drainage. These conditions are found concurrent with the seasonal abundance of crabs. The enormous civic silts and sewages which are flushed with the monsoon discharges form ideal nourishment to promote production. The effect of effluent on production is further substantiated by the recurrence of the main fishery season with an explosive catch rate at the outbreak of monsoon rains around September, that bring down filth and dirt accumulated all over the city after a long spell of drought. Another possible cause which would contribute to the initial outburst of catches, is the upwelling process under premonsoon conditions, which would force the stocks dispersed in deeper grounds to move shoreward and assemble at the core area of fishing to be caught in bulk. Besides the hydrological conditions, have indicated increased level of nutrients and dissolved oxygen content during monsoon season along this coast.

The technical help received from Mr. K. Shahul Hameed, Shri P. Thirumulu and Shri. K.S. Krishnan of CMFRI are recorded with thanks.

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