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ON

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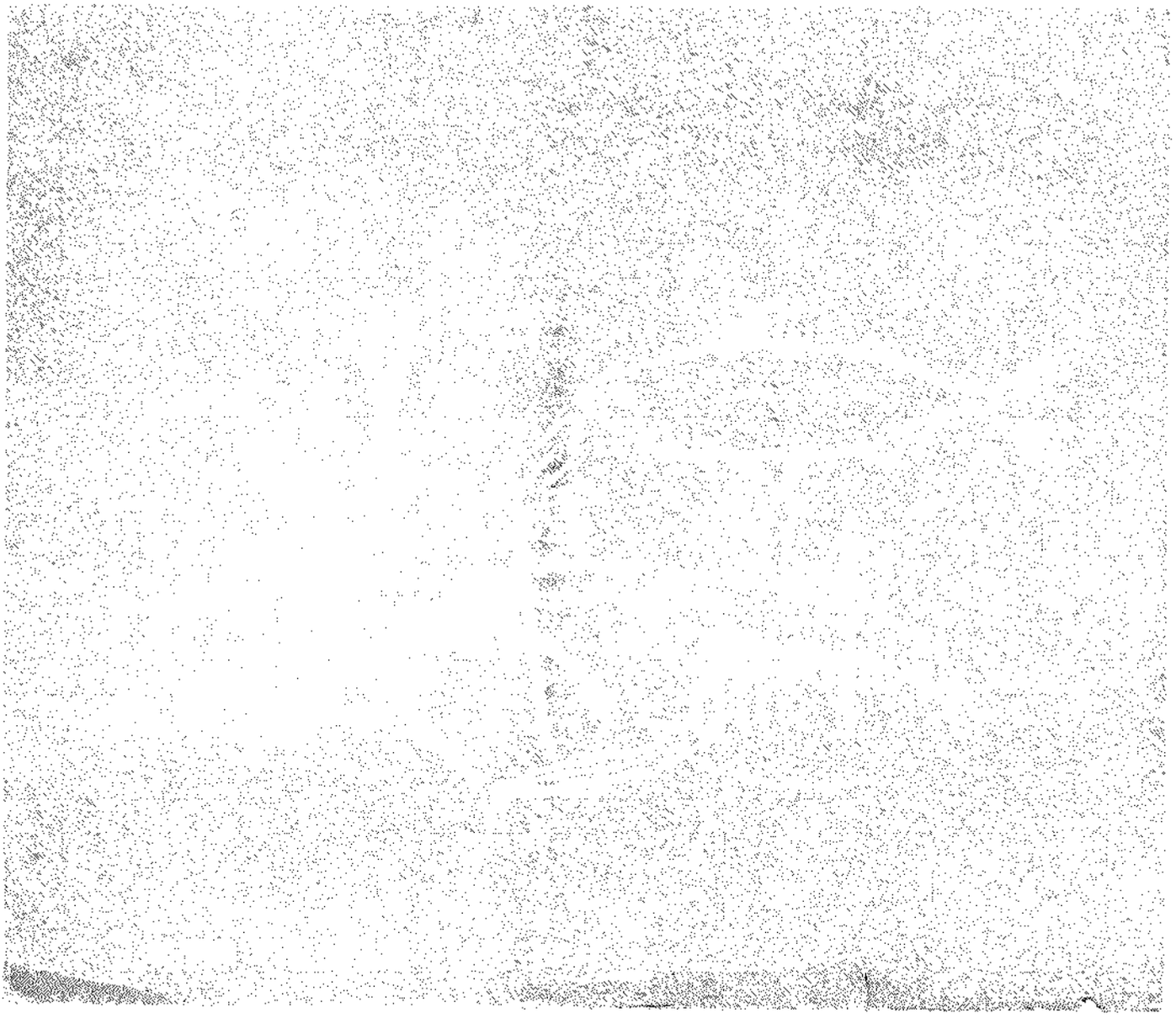

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SPECIAL PUBLICATION
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
COCHIN-11
1973

THE CRAB FISHERY RESOURCES OF INDIA

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ABSTRACT

Crabs support a sustenance fishery of appreciable importance, although, its present status is not comparable with that of those major crustacean fisheries such as prawns and lobsters. In addition to the marine fishery, large number of crabs are landed from the estuaries and brackish water lakes adjoining the coastal areas. To meet the increasing demand for frozen crab meat and to develop an organised crab fishing industry, an evaluation of the existing resources is quite essential.

The fishery at present is supported mostly by the edible crabs belonging to the family Portunidae and available information on the various aspects of the fishery show that the fishing is restricted to the inshore areas mostly by operations of small indigenous crafts and gears. In most of the places crabs form an ancillary catch along with other crustaceans and fishes, intensive fishing for crabs alone existing only in selected areas. The annual catch which is less than 4,000 tonnes is subject to marked fluctuations. However, the distribution of the species and the trend in production indicate scope for further expansion.

An attempt is made here to study the abundance and production of crabs from three general areas. *viz.*, west coast of India, Gulf of Mannar and Palk Bay and the northern part of the east coast from Point Calimere to Sunderbans with a view to understand the crab resources of the country. The estimation of the potential resources of the offshore waters as indicated by the trawler catches is also made. The need for biological investigations on factors governing yield and crab population is stressed.

INTRODUCTION

THE faunistic investigations carried out by Alcock (1895–1901, 1910), de Man (1908–09), Kemp (1915, 1919), Chopra and Das (1930), Chopra (1931, 1933 and 1935), Pillai (1951), Chhapgar (1957) and Sankarankutty (1961, 1965) have shown the richness and the variety of the marine crabs of the Indian waters. Although, these surveys have recorded above 640 species of crabs, only 8 species which are commonly referred to as ' edible crabs ' inhabiting the coastal waters and adjoining brackish water environments support localised sustenance fishery of some importance. In our country, crabs are generally considered as cheap food, consumed mostly by the coastal inhabitants and do not fetch high price as other edible crustaceans and fishes. This is one of the main reasons for the scattered and unorganised nature of the existing fishery.

The estimated landings of the marine crabs in India in 1966 amount to 3,315 tonnes which is about 4% of the total marine crustacean production. The catches are obtained largely from certain areas such as central Maharashtra, South Kanara, North Kerala and southern Madras coasts. In several areas, now they are also caught in large numbers in trawls operated by mechanised vessels. In addition to these marine fishery, the estuaries and brackish water lakes are known to yield considerable quantities of crabs annually. As the crab fishery is widely dispersed and crabs constitute only a fraction of the catches, neither a reliable estimation of crab production of the country nor a detailed study of the fishery of the entire coast is available. However, the fisheries of some region have been studied by Rai (1933), Hora (1933 and 1935), Chopra (1939), Jones and Sujansingani (1952), Menon (1952), Prasad and Tampi (1951, 1953), George and Nayak (1961), Chhapgar (1962f and also in the *Wealth of India* published by the Council of Scientific and Industrial Research o) India (1950). These accounts mainly deal with the bionomics, species composition, seasons, gears employed, methods of fishing and disposal. Investigations concerning resources are entirely lacking. With the increasing demand for protein food and for frozen crab meat for export, it has become

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necessary to understand the various aspects of the crab fishery and its resources for the proper development of this valuable fishery.

Edible Crabs

Most of the edible crabs caught in the marine and brackish water regions belong to the family Portunidae. The most important species contributing to the fishery are *Scylla serrata* (Forskal) *Portunus* (*Portunus*) *sanguinolentus* (Herbst), *P.* (*Portunus*) *Pelagicus* (*Linnaeus*), *Charybdis* (*Charybdis*) *cruciata* (Herbst), *C.* (*charybdis*) *annulata* (Fabricius), *C.* (*Charybdis*) *natator* (Herbst), *Matuta lunaris* (Forskal) (*Calappidae*) and *Varuna litterata* (Fabricius) (*Grapsidae*).

Scylla serrata (Forskal)

This is the largest crab of Indian waters growing to a size of 150–200 mm across carapace. It enjoys a wide distribution all over the Indo-Pacific region from east coast of Africa through Red Sea, coasts of India and Pakistan to Japan, Australia, Tahiti and New Zealand. It is mainly found in the estuaries and brackish water lakes and can withstand salinities ranging from almost freshwater to that of sea-water.

Portunus (*Portunus*) *sanguinolentus* (Herbst)

A slightly smaller species attaining a maximum length of 150 mm across carapace. It is distributed in Hong Kong, Andamans, Ceylon, coasts of India and Pakistan, Persian Gulf, Red Sea, east coast of Africa, Hawaii and Australia. It is a common species occurring both in the inshore and brackish water regions and breeds during February–April. Crabs measuring between 21–140 mm across carapace support the commercial fishery of the inshore waters.

P. (*Portunus*) *pelagicus* (Linn.)

Maximum size attained is about 180 mm across carapace. Its distribution ranges from Red Sea, Mediterranean, east coast of Africa, Persian Gulf, Pakistan, India, Ceylon, Mergui Archipelago, Singapore and Philippines to Australia, New Zealand, Tahiti, China Sea and Japan. Like *P. sanguinolentus*, it is very abundant along the entire coast and dominates the catches frequently. The species breeds from September to March and the inshore fishery is generally constituted by larger specimens measuring 100–150 mm.

Charybdis (*Charybdis*) *cruciata* (Herbst)

This is fished in large numbers from the offshore waters at depths of 15–40 metres and grows to about 150 mm across carapace. It is found in Indian Ocean, South Africa, Indian Archipelago, China Sea, Japan and Australia.

C. (*Charybdis*) *annulata* (Fabricius)

It is very common in the rocky regions of the coast, hiding in crevices and submerged rocks. It has a general distribution in Africa, India, Mergui and East Indies. It attains a size of about 60 mm across carapace.

C. (*Charybdis*) *natator* (Herbst)

This is occasionally caught in the inshore waters and as large as the above species. Its distribution ranges from Red Sea to Australia and Japan.

Matuta lunaris (Forskal)

It is a small crab measuring about 38 mm across carapace and very common in the inshore waters of Bombay region. Its distribution ranges from Polynesia in the east as far as the Red Sea and Cape region on the west. In India it occurs on both the coasts

Varuna litterata (Fabricins)

This species has a wide distribution from the east coast of Africa to Australia. In India it is very abundant in the Sunderbans of Bengal, estuarine regions of Hooghly and in Gulf of Mannar and Palk Bay. The species rarely exceeds 50 mm across carapace.

Marine Crab Fishery

The fishing grounds exploited by the indigenous gears are mostly restricted to shallow water regions of the coast at depths upto 15 metres, generally in the 3-5 metre area. During the monsoon period the fishing is done very close to the shore. The mud-banks on the south-west coast of India also support a good fishery for crabs. The trawl net fishery is carried out in deeper waters upto 40 metres depth. The fishing ground is generally characterised by muddy bottom, rarely sandy or sand mixed with mud.

The various types of gears in which crabs are caught in different maritime states and the main fishing seasons are given in Table I.

Table I

Showing the principal gears employed in crab fishing and fishery season in different maritime States of India

State	Name of Species	Gears employed	Fishery season
Gujarat ..	*Scylla serrata*	Stake net	July to September
	Portunus pelagicus	Cast net	
		Gill net	
		Drag net	
Mahanashtra ..	*S. serrata*	Seine net	August to October
	P. pelagicus	Hoop net	
	P. sanguinolentus	Hooked iron or steel rods	
	Matuta lunaris	Line with baits	
		Shore seine	
Mysore ..	*P. pelagicus*	Shore seine	December to January
	P. sanguinolentus	Cast net	
	S. serrata	Gill net	
Kerala ..	*P. sanguinolentus*	Shore seine	July to September
	P. pelagicus	Boat seine	
	S. serrata	Gill net	
	C. annulata	Cast net	
	C. natator	Drag net	
		Stake net	
Madras ..	*P. pelagicus*	Boat seine	March to June and October to December
	P. sanguinolentus	Shore seine	
	S. serrata	Gill net	
		Crab trap	
Andhra ..	*P. pelagicus*	Gill net	April-December
	S. serrata	Drag net	
	P. sanguinolentus		
Orissa and West Bengal ..	*S. serrta*	Line with baits	April to September
	P. pelagicus	Seine net	
	Varuna litterata	Hooked iron or steel rod	

In most of the indigenous gears such as seine nets, shore seines, cast nets and gill nets, which are chiefly used to catch inshore fishes, crabs form an ancillary catch, often in appreciable quantities. Gears used exclusively to catch crabs are employed at certain regions only. The different contrivances such as hoop nets, lines, various types of iron or steel rods used around Bombay area and their mode of operations have been described by Rai (1933) and Chhapgar (1962). Gill nets with minor modifications locally known as ' Aedi bale,' ' Nandu valai ' and ' Peethu valai ' are employed in Kanara, Gulf of Mannar and Palk Bay and Kakinada coasts respectively. Baited lines are also used to lure the crabs in Kakinada and in the lagoons and creeks of Sunderban area. Crabs are also caught in trawl nets used for shrimps and fishes, operated by the mechanised vessels.

Although, the crabs are caught throughout the year at various regions of the coast, the main season varies from place to place (Table I). On the west coast, the fishery is generally active in the latter half of the year. In the east coast, the peak season is observed in April–June and October–December.

In the trawl catches of Cochin, the crabs are found in large numbers during November–January, while in the trawlers of Kakinada area the peak season is observed during May–September.

The estimated crab landings in different maritime states of India for the year 1966 are given in Table II. In the northern section of the west coast comprising Gujarat and Maharashtra coast, higher catches are observed in Maharashtra, the majority of the catches being from Bombay and Ratnagiri coasts. In the southern section, formed by the coasts of Mysore, Kerala and west coast of Madras, 80% of the catches are accounted by the Kerala coast. A detailed zone-wise analysis of the catches has revealed that active fishery for crabs exists only in certain areas, *viz.*, Bombay, Ratnagiri, Cannanore-Calicut and Vizhingam Zones (Fig. 1).

TABLE II

Estimated crab landings in different maritime states of India for the year 1966

State	Estimated landings in tonnes				Total (tonnes)
	January-March	April-June	July-September	October-December	
Gujarat ..	..	..	1	..	1
Maharashtra ..	93	26	6	2	127
Mysore ..	..	..	2	..	2
Kerala and West coast of Madras ..	99	33	402	19	553
East coast of Madras ..	314	912	434	628	2.288
Andhra ..	3	75	64	20	162
Orissa and West Bengal ..	..	1	1	..	2

On the east coast about 91% of the catches are landed from the Madras State, the major portion being caught from a small area along Gulf of Mannar and Palk Bay, Nagapatnam and Pondichery (Fig. 1). Most of the catches landed in Andhra coast are realised from the northern section, the fishery of south Andhra coast is of only lesser magnitude.

Estimation of Resource

As there is no reliable data on the effort, catch rate, age, growth or mortality of these crabs, an assessment of the resource is possible only by using the area-density method. The presumptions are that the population is non-schooling and the areas of poor yield are not exploited fully at present. The coastline of each maritime state is divided into small sections (Fig. 1) and the annual

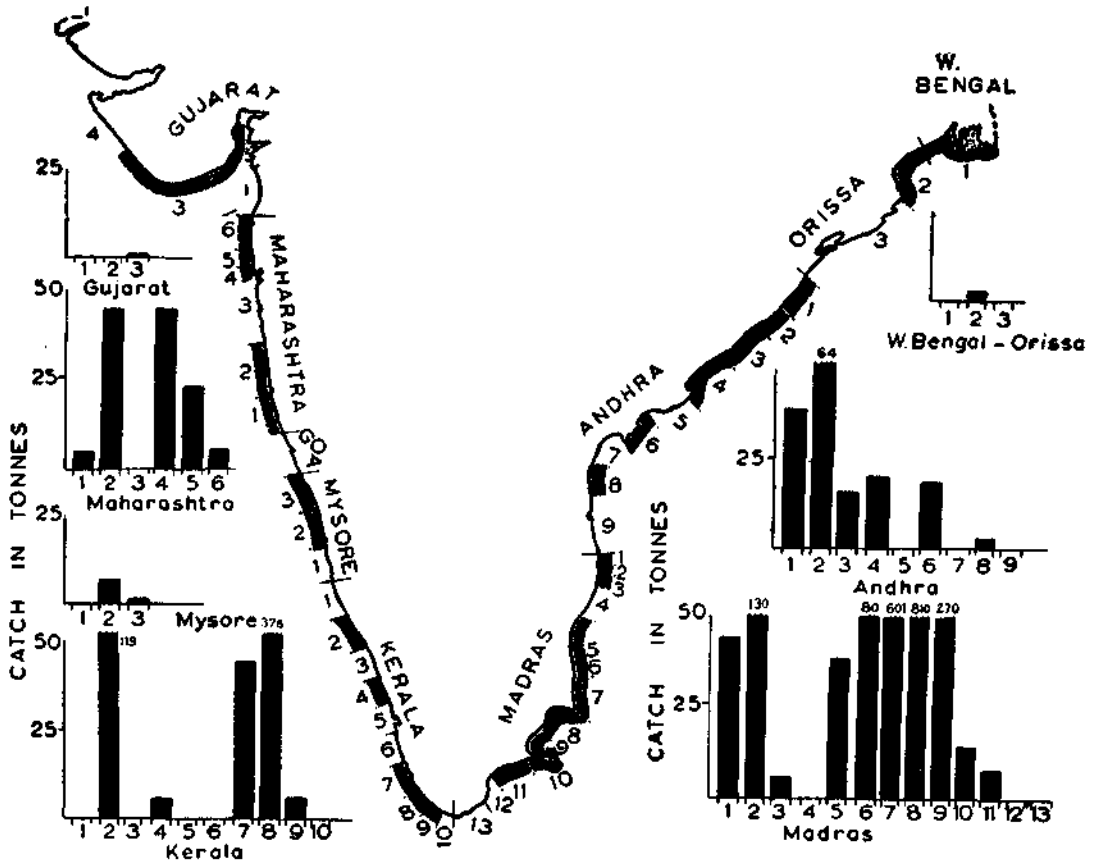

FIG. 1. Crab fishery, abundance and fishing zones in different maritime States of India—Shaded zones represent areas now exploited.

TABLE III

Estimated potential resources of crabs of the inshore waters at different regions of the coast

Region	Number of Section	Yield per sq. km. (kg.)		Total area between 0 and 15 metres (sq. km.)	Estimated potential resource in (tonnes)
		Minimum	Maximum		
Gujarat ..	5	..	1·9	10,155	19·294
Maharashtra and Goa ..	7	3·1	530·7	3,719	1,973·367
Mysore ..	3	3·1	19·9	. 1.897	37·750
Kerala and West coast of Madras ..	10	14·4	5,337·0	2,824	15,071·688
Madras (east coast) ..	13	104·5	556·5	12,770	7,106·500
Andhra ..	9	5·0	166·6	6,6	1,112·721
Orissa and West Bengal ..	2	..	1·6	16,208	25·933

production of each section is estimated. The total area of each section between 0 and 15 metres depth, where the present inshore crab fishery exists, is found out and the catch per one square kilometre area calculated. Assuming that the section with the maximum catch is the best exploited area and by extending the same rate of exploitation to regions with lesser catches, the potential resource of crabs for the entire state is calculated and the results are given in Table III.

The estimated potential crab resources of the inshore waters of the entire coast is 25,347 tonnes and it is apparent that the inshore fishing grounds of the southern part of the coasts are potentially richer than the northern part.

Assessment of the potential resource of the crabs available between 15 and 40 metres area is made based on the data of the exploratory fishing conducted by the fishing vessels during January 1966 to March 1968, in the offshore waters of the south-west coast of India. The estimated month-wise catches and the effort expended are given in Table IV.

TABLE IV

Estimated monthly crab landings in the offshore catches of the exploratory fishing vessel operating from Cochin, from January 1966 *to March* 1968

Month		Estimated catch in kg.	Total effort in hours
1966			
January	..	178·5	46·67
March	..	74·0	65·01
November	..	233·2	69·00
December	..	2·3	7·00
1967			
January	..	172·9	70·83
February	..	61·6	86·58
March	..	32·0	87·00
October	..	82·0	72·75
November	..	174·4	74·17
December	..	235·3	76·25
1968			
February	..	95·0	58·37
March	..	93·4	57·25

The gear used is 18·28 metre trawl which is generally operated for prawns and other bottom fishes. The operations were carried out at depths 15–40 metres. The average catch per hour of trawling is 1·8 kg. Taking the average speed of trawling as 2 knots per hour and the horizontal mouth opening of the net as 10·97 metres, it is calculated that an area of 0·040659 sq.km. is covered during one hour of trawling. Based on these figures and the assumption that the crabs are distributed throughout that area, the estimated potential resource of the west coast between 15–40 metres area (73,624·62 sq.km.) is calculated to be 3259·409 tonnes.

Although, crabs are landed in trawlers operating from the east coast, information on their occurrence and abundance are scanty. In Kakinada area, in fair season, about 50 trawlers are operated

daily Crabs are encountered in good quantities in depths below 20 metres, where the bottom is mostly sandy. The month-wise crab landings for the year 1967–68 are given in Table V.

TABLE V

Estimated monthly crab landings in the trawl catches of Kakinada area for the year 1967–68

Month		Estimated landings in kg.
1967		
October	..	1,042
November	..	519
December	..	296
1968		
January	..	270
February	..	417
March	..	525
April	..	1,238
May	..	1,596
June	..	2,688
July	..	3,060
August	..	4,256
September	..	4,480

The total estimated landing for the year is 20·97 tonnes. Since the mechanised vessel operate between 5 and 20 metres, the area covered by these trawlers has been estimated to be 470·34 sq.km. and the catch per one square kilometre area is calculated as 44·6 kg. This figure clearly represents the abundance of crabs in trawl catches of the area.

BRACKISH WATER CRAB FISHERIES

The numerous estuaries and brackish water lakes along the coast of India are rich in crabs. The estuaries of the rivers Ganges, Mahanadi, Godavary, Kistna and Cauvery and the brackish water lakes of Chilka and Pulicat on the east coast, and the estuaries of Narbada and Tapti and the backwaters of Kerala on the west coast are important from the point of view of crab production. *Scylla serrata* is the most important species contributing to the fishery. *Varuna litterata* also occurs in large numbers in the creeks and shallow banks. In addition to these species, *P. (Portunus) pelagicus*, *P. (Portunus) sanguinolentus* and *Sesarma tetragonum* are also caught occasionally.

Crabs are encountered throughout the year, but the peak season varies in different areas. The main season and the important gears employed for crab fishing in different brackish water areas are given in Table VI.

In most of the places, crabs are caught by lines baited with pieces of dead fishes like eels or rays or other bigger fishes. The mode of operation of this gear is described by Hora (1933) and Chopra (1939). Traps of different types (Jones and Sujansingani, 1952, Chacko, 1954) are also employed for catching crabs. In other types of gears mentioned in the above table, crabs form only a subsidiary catch along with other fishes and crustaceans.

TABLE VI

Showing the important gears employed in crab fishing and fishery season in different brackish water areas

Region	Name of Species	Gears employed	Fishery season
Lower Bengal ..	*Scylla serrata* *Varuna litterata* *Portunus pelagicus* *Sesarma tetragonum*	Lines with baits Hooked iron or steel rods	April to June
Chilka Lake ..	*S. serrata* *P. pelagicus* *V. litterata*	Gill net (*Noli jal*) Crab trap	August to October
Godavary estuary ..	*S. serrata* *P. pelagicus* *P. sanguinolentus*	Stake net Drag net Lines with baits	November to February
Vellar estuary ..	*P. pelagicus* *P. sanguinolentus*	Drag net Bag net, Crab trap	August to November
Ennur estuary ..	*P. pelagicus* *P. sanguinolentus*	Crab trap Drag net	April to November
Pulicat Lake ..	*S. serrata* *P. pelagicus* *P. sanguinolentus*	Drag net Stake net Lines with baits Crab trap	December to May
Vembanad Lake ..	*S. serrata* *P. pelagicus* *P. sanguinolentus*	Stake net Drag net	May to September

In the absence of a reliable statistics concerning the catches of crabs from all these backwater regions, the figures available for certain regions are analysed and compared to understand the abundance of crabs. In the Sunderban area, over 21 lakhs (approximately 33·6 tonnes) of crabs were landed in 1954 (Anon, 1960). The average annual production of crabs in Chilka Lake was estimated to be about 18 tonnes. Most of these catches were raised from the southern and central sectors of the lake from an area of about 158 sq. km.

The lower reaches of Godavary estuary with an area of about 211 sq. km. support a lucrative fishery for *Scylla serrata*, *P. pelagicus* and *P. sanguinolentus*. The estimated monthly landings by different gears for the year 1967–68 are given in Table VII and the total production of crabs amount to 337·456 tonnes.

In the Pulicat Lake, it is estimated that in an area of about 103·68 sq.km., in and around Pulicat village, 907·18 tonnes of crabs are landed yearly (Anon., 1960), while Chacko (1964) records a catch of 5·86 tonnes in the Ennur river estuary. Wide fluctuations in the annual landings of crabs from the Vembanad Lake having an area of about 260 sq.km. are observed. During 1964–65, the crab landings are estimated to be 17·902 tonnes, whereas, in 1965–66 the catch almost doubled to 35·3 tonnes. But during 1966–67 season, the catches decreased to 20·4 tonnes (Anon., 1964–65 to 1966–67).

Although, it is difficult at present to get a correct picture of the abundance of crabs from all the backwater regions, it is clear from the above that large quantities of crabs are produced from these environment and the magnitude of the fishery is comparable with that of the inshore waters.

TABLE VII

Crab landings (in kg.) by different types of gears from the Godavary estuary during the period October 1967 to September 1968

Months	*Thoka vala*	*Pakkadevú vala*	Lines with baits	Scoop net	Total
October ..	2,182	9,009	9,674	1,350	22,215
November ..	3,575	4,959	23,336	2,250	34,120
December ..	2,299	6,786	25,930	2,700	37,715
January ..	5,141	3,028	25,920	2,380	36,469
February ..	6,165	3,928	22,409	2,250	34,752
March ..	3,901	5,745	14,069	1,800	25,515
April ..	4,434	6,664	7,111	1,490	19,699
May ..	4,442	20,512	10,317	1,350	36,621
June ..	5,052	8,304	7,400	1,660	22,416
July ..	4,617	11,136	13,655	1,040	30,448
August ..	4,081	6,046	7,628	1,490	19,245
September ..	2,302	8,304	6,425	1,210	18,241
TOTAL ..	48,191	94,421	1,73,874	20,970	3,37,456

An analysis of the production of crabs in the areas mentioned earlier shows that the average yield per one square kilometre area varies from 0·1 tonnes to 8·7 tonnes, with an average of 1·7 tonnes. Considering this as an index of abundance, it is estimated that the potential resource of crabs from the estuaries and backwaters, having a total area of 7,770 sq. km. is 13,209 tonnes.

TOTAL RESOURCE

Eventhough, the existing crab fishery does not support a major industry in India, the present study shows that the crab resource of the country is substantial. The estimated potential resource from the various regions is as follows:

		tonnes
West coast of India—inshore region (upto 15 metres)	..	17,103
West coast of India—offshore region (upto 40 metres)	...	3,259
East coast of India—inshore region	..	8,245
East coast of India—offshore region	...	2,000
Brackish water regions	...	13,209
	TOTAL	43,816

A comparison of the total resources available and the present exploitation would show that only a small portion of the resource is utilised at present. Assuming that exploitation of 50% of the resource is not harmful to the fishery, it is possible to increase the present yield ten times more by intensive fishing for crabs.

In addition to these resources, recent exploratory cruises conducted in the Indian Ocean have brought to light the existence of certain deep water crabs in large quantities. The most common

species encountered are *Charybdis* (*Goniohellenus*) *edwardsi* Leene and Buitendijk and *Homola megalops* Alcock. Huge swarms of the former portunid crab have been reported from the western part of the Indian Ocean. On one occasion, "a great number of crabs (approximately 1 crab every 15 feet for 4 miles and stretching either side of ship's course as far as could be seen by binoculars floating on surface" was observed from an area 10° 43′ N, 59° 26′ E (Croce and Holthuis, 1964–65). This observation shows that there is great possibility of tapping such hitherto unknown oceanic resources of crabs in the Indian Ocean.

Remarks

The existing crab fishery of India is not commercially developed as in other countries. But from a comparison of the present exploitation and the evaluation of the potential crab resources of different regions, it would appear that there is scope for developing the fishery into a major industry. Prerequisites for such an expansion from the commercial point of view are the extensive use of the efficient tackles to catch crabs, the development of quick transportation facilities of this extremely perishable commodity to the consumer centres and the development of a taste for crab meat among the population. From the scientific point of view, it is essential that intensive investigations on improved fishing technique, on farming of suitable varieties of crabs and on various biological aspects are to be carried out not only to harvest crabs from unexploited inshore and offshore regions, but also to safeguard the stock from injudicious exploitation, as it is not uncommon to see females in berry being extensively fished and sold in the markets. In this context, it is worthwhile to note the development of the Alaksan king crab fishery which has grown from obscurity to world-wide importance during the past 18 years (Powell and Gray, 1967).

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