ON THE FISHERY FOR THE CRAB *SCYLLA SERRATA* (FORSKAL) AT TUTICORIN DURING 1974-75

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ABSTRACT

Scylla serrata occurs in fairly good numbers at Tuticorin, throughout the year. In the northern part, it is usually caught from the shallow coastal waters by shore-seines and cast-nets, while in the backwaters and canals of the southern region by a simple trapping device. Apart from these, certain drag-nets, stakenets, baited hooks and hand-picking are also resorted to for the capture of this crab. The estimated yield of *S. serrata* during 1974-75 was 9,460.6 kg, of which 53.7% were by nets and 46.3% by traps. The combined annual size-frequency distribution of the crab has indicated the presence of three distinct age-groups, with modes at 115, 155 and 185/195 mm. Gross examination of gonadial conditions has shown three stages of maturity for both sexes, representing immature, maturing and mature conditions. Berried females showed two stages in the development of eggs. It appears that for improving the quality and quantity of the catches, the smallest size groups with dominant mode at 115 mm carapace width could be spared from the efforts of the fishery.

INTRODUCTION

Among the edible crabs occurring in the coastal waters, estuaries and backwaters of India, *Scylla serrata*, popularly called the 'green crab,' is the most valued species because of its large size and high-quality meat. In recent times, canning or freezing of its meat for export purposes is carried out. It supports a minor fishery in all the maritime states of India (Rao, Thomas and Rao 1973), in estuaries, backwaters and shallow coastal areas. It has a high range of tolerance to salinity and temperature and is cultured in some south-east Asian countries.

At Tuticorin, *S. serrata*, called 'Kali-Nandu' is brought to fish markets almost throughout the year; and, of late, demand for this crab has gone up considerably. At present, it fetches as high a price as any other esteemed variety of seafood, unlike a few years back. In view of the increasing importance of this crab, a study of its fishing methods and annual production during 1974-75 was carried out. These data, as well as notes made on its biology in the course of the above investigations are presented in this report.

Material and Methods

Data on catch statistics of the crab landed in Tuticorin North and South landing centres (Fig. 1) were collected once in ten days or a fortnight; and the monthly landings were estimated by the formula, $MY = \frac{oy}{od} \times nd$, where MY is the estimated monthly yield, oy is the total weight of crabs landed on the days of observation od; and nd is the number of fishing days in the month. The carapace width of the crabs in mm, extending between the last two thoracic spines, measured with the aid of a divider was used for determining the size. The sizes were grouped into 10 mm intervals for calculating frequencies.

The sample size used for observations on biology collected at random varied from 25 to 30 specimens on each day of observation. Sexes were separated based on the shape of the abdomen which was wider and globular in females and narrow in males. In younger females, the abdomen was invariably triangular in shape. Maturity stages of males and females were determined based on the colour of the gonads as well as their size in relation to the space occupied inside the body cavity (haemocoel); and, since the haemocoel is highly obliterated by the presence of muscles, the flat area of the cephalothorax was taken into consideration. Published literature on the maturity stages of crabs based on external examination of gonads is rather scanty; and hence, maturity stages adapted for other crustaceans by previous workers (Rao 1968) were used as a general guideline for determining various maturity stages. Mature and berried specimens of *S. serrata* were available for examination in the catches of the lobster gill-nets operated off Tuticorin New Harbour during April-July, 1974; and hence were also included in the present report.

Fishing Methods

S. serrata is caught along with fishes, prawns, lobsters, other crabs, etc, all along Tuticorin coast (Fig. 1), in shore-seines, gill-nets, crab-nets, cast-nets, etc. The catches made by these nets are usually brought to Tuticorin North fish landing centre, all mixed up. As such, it was possible to make a first-hand assessment of the relative importance of various gears in the annual production of *S. serrata*. In the southern region of Tuticorin, mangrove swamps and muddy areas submerged during high tide and traversed by backwaters, canals and ditches are present. The crabs available in these areas are usually caught by certain traps.

A gear specially designed for operation in shallow waters, called 'Kuthuvalai,' is also used in Tuticorin. It may be described as a kind of drag-net with a bag and with sticks attached perpendicularly for partially scrapping the muddy bottom while advancing forward (Hornell 1925). Operation of a temporary fixed net-barrier or stake-net for capturing *S. serrata* along with fishes and prawns is carried out in the shallow sheltered areas in the southern region of

Tuticorin, particularly during the new-moon and full-moon periods. This operation is called 'Kalam katti valai,' meaning fishing by cordoning of a portion of the land by net. During the neap tide, the net, about 30 to 50 m long and 3 to 5 m in height, is partly buried in the mud; and poles are planted at 5 to 7 m intervals so as to form a semicircular enclosed area. When the water rises during the high tide, fishes, prawns and crabs enter the area, brought in along with the tide. The height of the net is raised and adjusted with the prevailing level of the tide, thus trapping fishes, crabs, etc for capture.

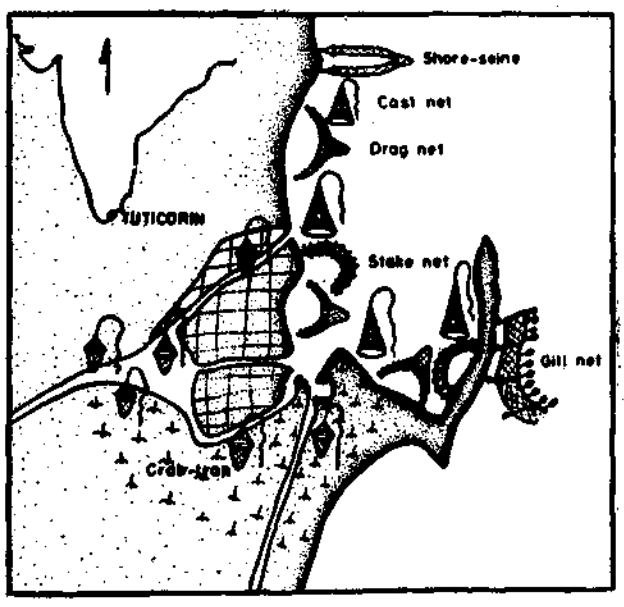

FIG. 1. Map of Tuticorin area where *Scylla serrata* is caught (adapted and redrawn from the District Map issued by the Central Survey Office, Madras, 1945.

The crab trap called 'Nandu-thattu,' a simple mobile device used for capturing *S. serrata* at Tuticorin is a circular iron ring of about 50-60 cm in diameter. Attached to the ring is a conical net bag below of about 50 to 75 cm in length and a long rope above, for operating the trap. In the middle of the ring, a twine is tied for attaching the bait. The bait consists of discarded gills or pieces of the intestine of fishes like perches, which in decaying condition is said to be the best bait for *S. serrata*. Each person may operate one or more traps on a day, mostly in the early morning hours.

Occasionally, a stationary type of trap called 'Nandu-koodu,' is also used for capturing *S. serrata* in swampy regions. It is a circular cage, shaped like a dome of about 50 cm in height and 100 cm in diameter at the bottom. It is made up of closely interwoven bamboo reepers or the mid ribs of palmyrah leaves; and has four feet for fixation at the substratum. On one side of the cage,

one or two semicircular doors with openings towards the interior and controlled by springs below are provided. The door for removing the crabs trapped with its opening towards the exterior is provided either at the top or at another side of the cage. The baits used are the meat of fish, prawns, gills and intestine of fishes, etc.

Another method of capturing *S. serrata*, usually during day time, is with the aid of baited hooks and floats, either singly or in a series attached to a long line, similar to those described by Hora (1935) and Chhapgar (1962).

From their holes in swampy or clayey areas, *S. serrata* is sometimes captured by excavating the holes and picking them up. A stick is used to probe the presence of the crab inside; and it is caught with the aid of a hand-net or by thrusting some used cloth to which it would cling with its chelipeds.

FISHERY

The estimated total catches of *S. serrata* in both Tuticorin North and South landing centres during 1974-75 were 9,460.6 kg. Out of this, 5,072.1 kg were estimated to be caught by nets and 4,388.5 kg were by traps in southern areas; forming 53.7% and 46.3% respectively. The monthly production in the two centres is shown in Fig. 2, from which it may be seen that the net catches usually varied between 300 and 400 kg with peak catch of 695 kg in October, 1974. This was followed by a sudden decline in the landings during November (175 kg), although recovering slightly in the succeeding months. In the trap catches, the peak was recorded during November.

The monthly size-frequency distribution of *S. serrata* caught by nets and traps during 1974-75 is illustrated in Fig. 3. It shows that the population accessible to the two types of gears exhibited some differences from one another in each month. For instance, in April 1974, although the smallest sized crabs in both the gears belonged to 110-119 mm carapace width size-group, the larger

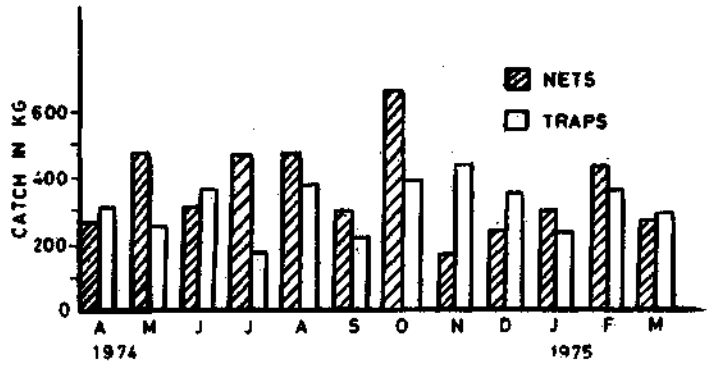

FIG. 2. Monthly production of *S. serrata* by nets and traps at Tuticorin from April 1974-March 1975.

ones in the net catches belonged to 180-189 mm group and in the trap catches to 190-199 mm group. In the succeeding month, specimens belonging to 200-209 mm group were available in the net catches, but absent in the trap catches. However, the dominant modal sizes in both the gears belonged to the same size group in most of the months. In April and May, 1974 there were two modes, a principal one at 115 mm and a subsidiary one at 185 mm. In the succeeding three months, the principal dominant mode continued to be at 115 mm in both the gears, but the secondary mode in the trap catches was at 195

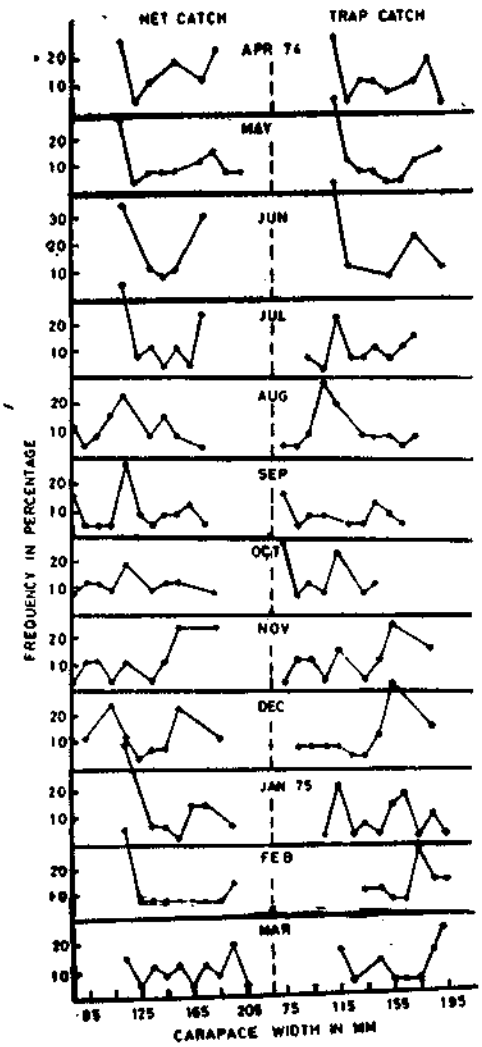

FIG. 3. Monthly size-frequency distribution of *S. serrata* population exploited by nets and traps at Tuticorin during 1974-75.

mm during. May. Apart from such minor differences, a more or less similar pattern of size-frequency distribution is seen in both the gears in all the months, indicating that the exploited population largely belonged to a homogeneous stock.

NOTES ON BIOLOGY

Dominant size groups: The annual combined size-frequencies of *S. serrata* caught in traps as well as nets, depicted in Fig. 4, shows that in both the gears three distinct size-groups were present, with dominant modes at 115 mm, 155 mm and 185 mm, designated as C, B and A respectively. Of these, the group A is obviously the oldest age-class, followed by B and C. Among the three groups, C constituted to the bulk of the catches in number; and the contributions of A and B were almost equal in the trap catches, but in the net catches B occurred more in number than A. With the data available as at present, it is rather hard to decide the actual ages of these three size groups, except pointing out the probability that these three groups could represent three distinct year-classes.

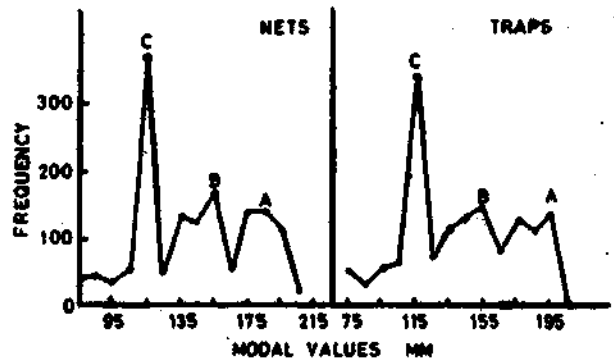

FIG. 4. Annual combined size frequencies of *S. serrata* exploited by nets and traps at Tuticorin during 74-75.

Sex-ratio: The sex-ratio of *S. serrata* in the present investigations (Fig. 5) was equal or nearly so during the months of May and September 1974; but in all the other months, the sexes were disproportionately distributed. Females were dominating during June and July 1974 and January to March, 1975; but, males formed higher proportions during August and October-December, 74.

Maturity conditions: The testes and ovaries of *S. serrata* are paired H-shaped organs lying below the carapace, their anterior wings extended anterio-laterally as in most of the portunid crabs described so far. Based on gross examination of the gonads in the present studies, three major stages of maturity could be distinguished for both males and females. Among males, Stage I represented immature condition in which the testes, if present, were either transparent or creamy in colouration adhering to the lobes of the hepato-pancreas and without

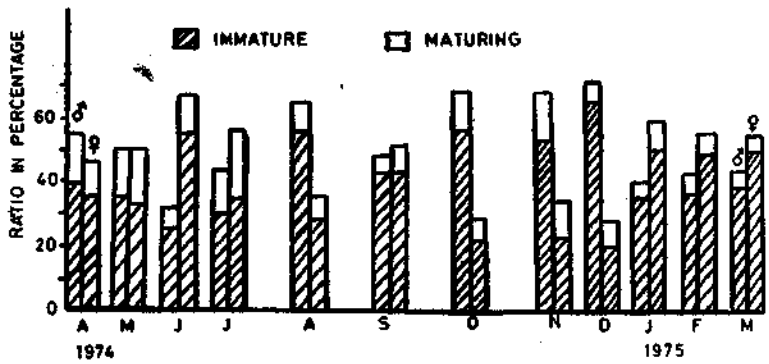

FIG. 5. Sex ratio and maturity proportions of *S. serrata* exploited by nets and traps (combined) at Tuticorin during 74-75.

a prominent vas deferens. The testes in this stage occupied about 1/6th or less of the body-cavity region. In Stage II condition of males, representing maturing condition, the testes were creamy whitish in colour and occupied about 1/4th to 1/3rd of the body-cavity region. In Stage III, mature condition, the testes were milky whitish with a thick vas deferens and occupying about 1/2 to full of the body cavity region.

Among females, Stage I, immature condition was represented by thin, transparent or yellowish gonads, occupying about 1/6th of the body cavity and without a prominent seminal receptacle. In younger females, the abdomen was somewhat triangular in shape and not quite globular. In Stage II females representing maturing condition, the ovarian lobes have become enlarged and occupied about 1/4th to 1/3rd of the body cavity region. Colouration of the ovaries in this stage has changed to pink. In Stage III females, denoting mature condition, the ovaries have occupied 1/2 to full of the body-cavity. They were orange or orange-red in colour, with prominent seminal receptacle. Among berried females, two stages in the development of the eggs could be recognized, one in which the eggs attached to the abdominal appendages were orange-red in colour; and the other in which they were greenish in colour, the latter representing the more advanced stage. The specimens which have recently shed their eggs appeared rather pale and unsturdy.

The entire population caught by traps and nets in the course of the present investigation was made up of immature and maturing specimens only, indicating that the inshore population is composed of such specimens only. Fully mature and/or berried specimens in the size range of 127 to 183 mm carapace width could be collected occasionally from the catches of the lobster gillnets which were operated off Tuticorin New Harbour at depths ranging from 15 to 20 m during April-July, 1974; but, from early August 74 onwards, this gear caesed operation there, thus making it difficult to find out as to whether mature and berried females would be available there throughout the year.

Immature and maturing specimens were present in all the size groups, including the larger ones. Among males, occurrence of immature specimens reached its maximum (Fig. 5) during December 74 (66%) and among females during June 74, January and March 75 (55%). Among maturing males, the largest proportion was recorded during November 74 (15.5%) and among maturing females during July 74 (21.5%). The present observations did not reveal any regularity in the occurrence of immature and maturing specimens in the inshore areas exploited.

Remarks

S. serrata is reported in the fish catches at Bombay (Rai 1933, Chhapgar 1962), Chilka Lake (Jones and Sujansingani 1952), Bengal (Hora 1935, Chopra 1939, Datta 1973) and Pulicat Lake (Thomas 1972). Rao, Thomas and Rao (1973) have dealt with the resources aspects of the various crab species in India and the methods of fishing in the sea and brackish water areas. They have also drawn attention to studying the fishery and biology of the various species for protecting the stocks from injudicious exploitation.

The trend of catches of *S. serrata* at Tuticorin in the course of the present investigations, shows that the species is available for exploitation in the shallow coastal waters and swampy areas throughout the year. From the annual combined size frequencies in both the net catches and traps, it is obvious that small specimens with dominant mode at 115 mm contributed to the bulk of the catches, indicating that the population in the inshore waters and backwater areas is exploited rather indiscriminately. It appears that in order to ensure a good fishery throughout the year as well as to improve the quality of the yield, only the size groups with dominant modes at 155 and 185/195 mm and above may be captured and the size group with mode at 115 mm could be left out for further growth and subsequent exploitation. As *S. serrata* is quite hardy and can live outside water for up to 12 hours, sorting of the small-sized crabs from net catches and releasing them back into the sea is easy. In the case of traps, an eye estimation of their size while they are inside the traps and releasing the smaller specimens can be accomplished, without much difficulty. In this way, it would be possible to protect the smaller crabs from indiscriminate exploitation and to improve the quality of the yield.

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