

Note

Fishery of sand lobster *Thenus orientalis* (Lund) along Chennai coast

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ABSTRACT

The sand lobster *Thenus orientalis* formed a minor fishery supplementing the trawl catches along Chennai coast. The annual landings of the species during 1982-1999 varied between 6.7 and 114.6t, with the catch trend showing gradual progress leading to sharp rise in 1991-95 followed by moderate decline. Main fishery season extended over September-February, with peak abundance in monsoon months, October-November. Females were slightly larger among population, as the mean-size was 156.9 mm, against 153.6 mm for male. The L^{∞} was 298.25 mm and K , 0.2967/yr for female and 288.91 mm and 0.3216/yr for males, which worked out the growth performance of 4.422 and 4.426 for the respective sex. The overall sex-ratio of M:F was 46.3:53.7 and the minimum size at maturity of female was 105.5 mm. The species showed two major spawning spells around February-March and June-August and peak recruitments appeared during January-February and May-July.

The sand lobster, *Thenus orientalis* (Lund), a by-catch of trawl fishing, has good demand for export. The species is reported to have a wide geographical distribution over Indo-Pacific area from Japan through Philippines to Gulf countries and Australia (Motoh, 1972) and occurs in minor concentrations along either coast of India. The information available in literature for Indian waters are very few, notable accounts among which belonged to Kagwade and Kabli (1991) and Kagwade and Kabli (1996a, 1996b) for Bombay waters on the west-coast and Hossain *et al.* (1975) and Hossain (1978) on the east-coast. The paper discusses out the abundance of the species along Chennai coast, added with the catch trend over the years and the salient features on population biology.

The study was based on landings of trawlers operating from Chennai as the

base for the period 1982-1999. Details on catch of *T.orientalis* and other items along with particulars on effort in hauling hours were collected for about 10% of the trawlers on each day of weekly observation. The average catch and effort for the observed units were raised to obtain the total values for the trawlers operated on the day and then further calculated similarly from the observed days for the month and year. Monthly and annual catch was divided by the effort to obtain the CPUE in kg/hr to express the relative abundance of the species. Samples collected at random on each day of observation were analysed for sex, length and maturity stages including berried condition of females.

Observation for 1982-83 to 1998-99 (Fig.1) revealed that the species formed a minor fishery, with the catch trend through the years showing gradual

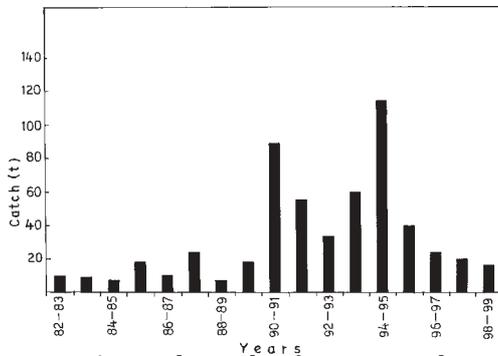


Fig.1. Annual catch of *T.orientalis* at Chennai during 1982-1999.

increase, sharp rise and moderate fall. The catch, which hovered initially around 10t during 1982-85, increased moderately to around 20t during 1986-1990, except a dip deeply to the record minimum catch of 6.7t in 1988-89. The succeeding five years, 1991-95, marked significant rise in abundance with the catch leaping over 60t and the maximum of 114.6t in 1994-95. Subsequently, there was gradual decline to end with a moderate catch of 20t during the last few years, 1996-98. Further catch details for 1993-94 to 1996-97 (Table1) revealed that the species formed between 0.03% of annual total trawl landings in 1996-97 and 0.23% in 1994-95 and the monthly landings during the period ranged between 0.15t for April 1993 and 27.5t for October 1994. The main fishery season appeared to coincide the wet periods, September-February, with peak abundance in October-November and lean fishery generally occurred during the warmer months, March-May.

Size-distribution of the population included multiple size-modes of different age-groups. Females were slightly larger with the overall size-range of 71-275 mm, the effective range being 91-240 mm, as compared to males measuring between 71 and 265 mm size, with effective limit of 91-220 mm. Several age-groups, distinct as size-modes, could be traced through months as size-mode-chains and

continuity of some modes beyond two years was evident. The growth parameters of Bertalanffy growth equation computed using selected mode-chains of different size-range (Table 2) gave the asymptotic length (L_{∞}) at 298.91 mm, with the rate of change growth (K) as 0.2967/year for females and 288.91 mm and 0.3192/year for males, the initial age (t_0) being considered 0 for both sexes. The growth performance calculated by Pauly and Munro (1984) equation was very close between the sexes, being 4.422 for females and 4.426 for males. Further estimate gave that the females of the species would attain 76.6, 175.8 and 230.6 mm sizes in 1.0, 3.0 and 5.0 years, respectively and the corresponding lengths for males were 78.9, 178.0 and 230.4 mm. Age and growth curve also would reveal that the fresh recruits of the species would enter the fishery around the age of 1-1.5 years and support the catch until the age of 4-5 years, beyond which only less than 5 percent were seen to be present.

The sex-ratio (Table 3) was not significantly deviating from 1:1 although slightly tilted in favour of females, with the average annual ratio of 52.7% in 1995-96 and 55.8% in 1996-97. Either sex could be in majority during some months as seen from the female ratio varying between 44.2 % in August 1995 and 68.7% in December 1995. Sex-ratio specific to size showed that females outnumbered in most of the size-classes, but the difference was often very small, except increasingly wider margins among the largest size-groups above 220 mm size. Smallest female either with 'maturing' and 'spent' ovary or in 'berried' conditions measured 93.5 mm size, but substantial numbers of such females belonged to 101-110 mm size-group and above, based on which the minimum size at maturity of the species could be fixed at 105.5 mm. Females above 130 mm size were mostly mature. Seasonal abundance of berried females

TABLE 1. Catch (t) and CPUE (kg/hr) of *T.orientalis* landed at Chennai during 1993-'97.

Month	93-94	94-95	95-96	96-97
April	0.15	2.50	1.86	1.12
May	0.16	1.75	0.63	0.07
June	0.15	4.15	0.51	0.46
July	2.12	4.73	4.98	0.96
August	2.25	6.64	3.63	2.86
September	1.54	14.40	3.31	2.25
October	8.94	27.50	7.30	2.89
November	11.11	17.30	3.18	4.46
December	9.86	9.60	6.01	1.58
January	7.45	9.50	1.55	3.06
February	10.07	8.75	1.75	3.83
March	5.76	7.74	1.22	0.72
Total	59.56	114.56	35.93	24.26
Kg/hr	0.14	0.23	0.05	0.03
% in total catch	0.14	0.27	0.11	0.10

TABLE 2. Selected size-mode -chains used in calculation of growth parameters by Gulland and Holt plot for *T.orientalis* landed at Chennai during 1995-'97

Month	Initial-mode size (mm)	Final-mode Month	Final-mode size (mm)	Month-interval	size-increase	Mean size (mm)	Growth rate (mm/month)
Female							
Jun-Jul/96	95.5	Oct-Nov/96	115.5	4	20.0	105.5	5.00
Apl-May/95	95.5	Dec-Jan/97	175.5	20	80.0	135.5	4.00
Oct-Nov/95	145.5	Feb-Mar/97	190.0	16	44.5	170.5	2.78
Jun-Jul/95	185.5	Dec-Jan/97	225.5	18	40.5	205.5	2.22
Apl-May/95	235.5	Oct-Nov/96	245.5	6	10.0	240.5	1.67
Male							
Jun-Jul/96	85.5	Dec-Jan/97	115.5	6	30.0	105.5	5.00
Dec-Jan/96	105.5	Aug-Sep/96	145.5	8	40.0	125.5	4.00
Jun-Jul/95	145.5	Dec-Jan/97	205.5	18	60.0	175.5	3.33
Oct-Nov/95	195.5	Feb-Mar/97	225.5	16	30.0	210.0	1.88
Apl-May/95	215.5	Dec-Jan/97	245.5	20	30.0	230.5	1.50

TABLE 3. Sex-ratio (month-wise and size-wise) of *T.orientalis* landed at Chennai during the years 1995-97

Month	Month-wise		Pooled M : F	Size-wise	
	1995-96 M : F	1996-97 M : F		Size-group	M : F
				71-80	52.9 : 47.1
				81-90	47.2 : 52.8
April	44.4 : 55.6	48.9 : 51.1	46.4 : 53.6	91-100	45.3 : 54.7
May	53.7 : 46.3	48.1 : 51.9	50.9 : 49.1	101-110	44.5 : 55.5
June	48.1 : 51.9	46.3 : 53.7	47.3 : 52.7	111-120	51.5 : 48.5
July	40.7 : 59.3	44.2 : 55.8	43.3 : 56.6	121-130	43.9 : 56.1
Aug.	55.5 : 44.5	43.5 : 57.6	50.5 : 49.5	131-140	37.1 : 62.9
Sep.	48.2 : 51.8	51.2 : 48.8	49.5 : 50.5	141-150	47.5 : 52.5
Oct.	45.3 : 54.7	50.1 : 49.9	49.6 : 50.4	151-160	53.6 : 46.4
Nov.	46.9 : 53.1	50.1 : 48.9	49.6 : 50.4	161-170	51.3 : 48.7
Dec.	31.3 : 68.7	44.4 : 55.6	37.6 : 62.4	171-180	47.1 : 52.9
Jan.	54.5 : 45.5	56.8 : 43.2	52.4 : 47.6	181-190	45.8 : 54.2
Feb.	54.5 : 45.5	50.9 : 49.1	51.8 : 48.2	191-200	48.6 : 51.4
Mar.	53.2 : 46.8	53.3 : 46.7	51.1 : 48.9	201-210	54.1 : 45.9
				211-220	47.7 : 52.3
				221-230	39.9 : 60.1
				231-240	26.7 : 73.3
				241-250	30.0 : 70.0
				251-260	25.0 : 75.0
				261-270	20.0 : 80.0
				271-280	- : 100

of the species (Fig. 2) showed two annual spawning spells during June-August and February-March, the latter revealing more sharp peak. Females in berried condition were virtually not seen in catch during the peak monsoon months, October-December. Monthly abundance of young population, measuring less than 110 mm size, marked (Fig. 2) intensive recruitments around May-July and January-February.

A slow transformation in abundance of *T.orientalis*, which formed a minor fishery supplementing remunerative value of the trawl catch, was thus evident during 1982-1999, as the catch trend revealed gradual progress during initial years until climbing sharply during early half of 1990s, before declining again moderately during the last few years.

The transformation was apparently associated with the extension of fishing area during the period towards deeper grounds up to 100 m depth, the deeper limit of distribution for the species (Motoh, 1980). Considering such presence of the species over deeper areas, frequented less by commercial trawling, the population could be assumed to be not fully exposed to exploitation. The young population entering the fishery around 110 mm size at the age of 1.5 years, could contribute to the catch in substantial strength through another 3-4 years reaching about 220 mm length. However, large proportion of the population would be caught within 1-2 years since recruitments, as calculated from the mean-size of the overall population around 155 mm attainable at

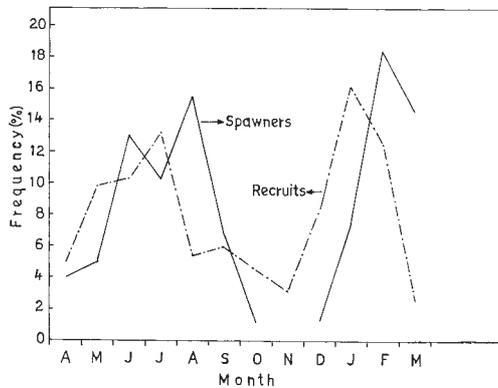


Fig.2. Seasonal abundance of fresh recruits (110 mm size) and spawners (berried females) of *T.orientalis* landed at Chennai during 1995-'97.

the age of about 2.5 years.

The value of L^* at 298.25 mm for females and 288.91 mm for males appeared to be more reasonable estimates considering the L_{max} belonging to 271-280 and 261-270 mm size-classes for the respective sex. Kagwade and Kabli (1996a) had computed the L^* at 300 mm for females of the species, which is comparable to the present one, but a value of 368 mm for males obtained by them is too large as compared to the L_{max} and to that of females, which generally belong to larger size-range among the population. Sex-ratio was not significantly deviating from 1:1 suggesting that the species was not showing any exaggerated unisexual segregation. Peak recruitments into fishery were noted during May-July and January-February, respectively followed with a gap of a month or two, by intensive spawning spells in June-August and February-March, chronological sequences of which would support to view that the fresh recruits entered active reproductive phase shortly on moving into the fishing arena. Unlike two peak spawning seasons here, the species is reported to reveal a single extended season during September-April

in Bombay waters on the west coast (Kagwade and Kabli, 1996b).

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