Seventeen plots arranged in the outermost part on the double-log paper were selected arbitrarily and to these plots the above parabolas were fitted by the method of least squares. Thus the coordinates of two apices and therefore the constants C_1, C_2, a^2 and b^2 in the equation (6) were obtained. In Fig. 4 the curve of the equation (6) is shown together with the ellipse. The characteristic values thus obtained for the dispersion pattern of bigeye snappers and red snappers are as follows,

Bigeye snappers: $\rho_0 = 270$, $\rho_{A1} = 3$, $a^2 = 4.500$,

Red snappers: $\kappa\rho_0 = 210$, $\rho_{B1} = 8$, $b^2 = 3.268$,

where the densities are given in kg/hour. Substituting the constants $a^2 = 4.500$, $b^2 = 3.268$, and $1/\kappa = 1.377$ into the equation (7), we have the following numerical relation between ξ and η :

$$\frac{\xi^2}{(0.2666)^2} - \frac{\eta^2}{(0.3127)^2} = 1 \qquad (7)$$

The above relation is hown in Fig. 5 and in the figure different levels of densities of fish schools are inserted. From the figure the radii of circular fish schools of bigeye snappers and red snappers on whose circumferences 100 kg/hour catch could be expected are 0.48 d and 0.47 d respectively, where d is the mean distance between the centers of fish schools for the two different species located adjacently, while the radii for 50 kg/hour are 0.62d and 0.65d respectively.

From Figs. 1 and 2, each distance between the centers of two adjacent circles occupied by the different species was measured and the mean d was calculated to be 8.0 nautical miles. The radii of the two different fish schools on whose circumferences 50 and 100 kg/hour catch could be expected were measured and their means were calculated. The theoretical and observed radii for the respective species are compared in Table 1.

Table 1. Comparison between estimated and observed radii of circular fish schools

Species	for 50 kg/hour		for 100 kg/hour	
	Estimated	Observed	Estimated	Observed
Bigeye snappers	5.0	5.7	3.8	4.1
Red snappers	5.2	5.5	3.8	4.4

Raddi are given in nautical miles

The theoretical values are lower than the observed ones but the difference between them are at most 15%. Such a degree of discrepancy may be permissible when the accuracy of field data is taken into account.

Conclusion

Using a simple mathematical model, some characteristic values on an averaged dispersion pattern of red snappers and bigeye snappers were estimated, and comparison was made between the theoretical and the observed ones. The agreement between them is satisfactory within a range of practical accuracy. Summarising, the radii of fish schools for both species on whose circumferences 50 kg/hour could be expected are almost the same, and are 5 to 6 nautical miles. The mean distance between the centers of the two fish schools located adjacently is about 8 nautical miles. The maximum catch of red snappers and bigeye snappers which could be expected at the centers of the respective fish schools are 210 and 270 kg/hour respectively.

SEAFDEC/SCS.73: S-8

Preliminary Observation on the Distribution and Catch of the Shovel-Nosed Lobster, *Thenus orientalis* Lund in South China Sea

by
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Abstract

The shovel-nosed lobster, *Thenus orientalis* lund, is a widely distibuted and a commercially important crustacean in the South China Sea. To study its habitat, distribution and catch the data obtained by trawl operations carried out by Thai research vessels in 1967–1968 and by R/V CHANGI in 1972 were analysed.

In the South China Sea it is most abundant in the coastal waters of the Malay Peninsula, South Vietnam and Sibu Bay of Sarawak at depth of less than 50 m. and relatively good catch has been obtained from waters with sandy rather than muddy bottom. The catch at night time is higher than that in the daytime. This phenomenon may be related to the feeding behaviour of this species as observed in the case of prawn.

1. Introduction

The shovel-nosed lobster, *Thenus orientalis* Lund, a commercially important crustacean, is commonly found in the tropical and subtropical waters. Although it is abundant and has become valuable in the Southeast Asian countries, very little is known about the species. In view of its importance the Marine Fisheries Research Department, Southeast Asian Fisheries Development Center (SEAFDEC), carried out preliminary studies on its habitat and distribution in the South China Sea.

2. Materials and methods

From April to June and in October 1972 samples of shovel-nosed lobster were collected in waters off Borneo and the Maly Peninsula by the research vessel CHANGI. For the studies of its habitat bottom samples were obtained by a SK mud collector and strained through a set of various mesh-sized nets. Some data from Thai research vessels obtained in 1967–1968 (Anon., 1967 and 1968) were also used in this study.

3. Results and discussion

The body length of *T. orientalis* collected by CHANGI in the South China Sea ranged from 5.8 cm. to 25.2 cm. with a mean length of 14.7 cm. and a mean weight of 76.0 g (range = 3.7 – 310.9 g). The relationship of carapace length (X) and body weight (Y) for both sexes is similar and is represented by Log Y = 2.99 Log X – 0.25. Body length of *T. orientalis* for the biological minimum is 10.85 cm. and sex ratio of male to female is approximately 2:1.

The distribution of *T. orientalis* in the South China Sea is shown in Table I and Fig. 1.

The mean catch of *T. orientalis* ranged from 0.14 kg/hr to 4.52 kg/hr. Catch of more than 3.0 kg/hr was only found in coastal waters along the east coast of Malay Peninsula, the southeastern part of Vietnam and the Sibu Bay of Sarawak. However, the values of mean catch per hour are rather misleading since the gear used were not suitable for the survey.

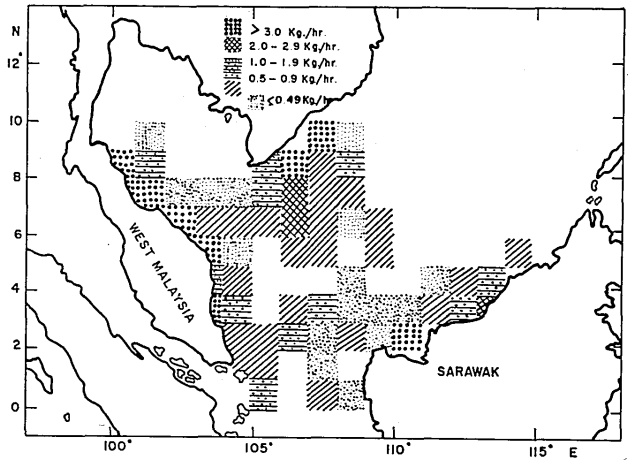

Fig. 1 Distribution of *Thenus orientalis* Lund in the South China Sea. (Trawl data collected by R/V CHANGI in 1972 and Thai research vessels in 1967–68)

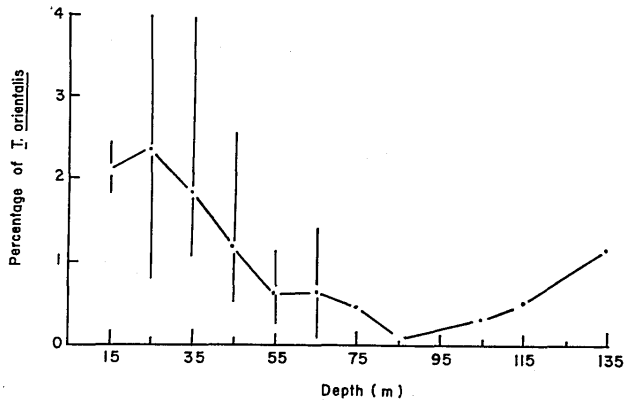

Fig. 2 Variation in catch of *Thenus orientalis* in relation to water depth.

The relationship between catch and depth is illustrated in Figure 2. It can be seen that *T. orientalis* is distributed in waters with depth of 12–140 m. and is most abundant in waters of depth less than 50 m.

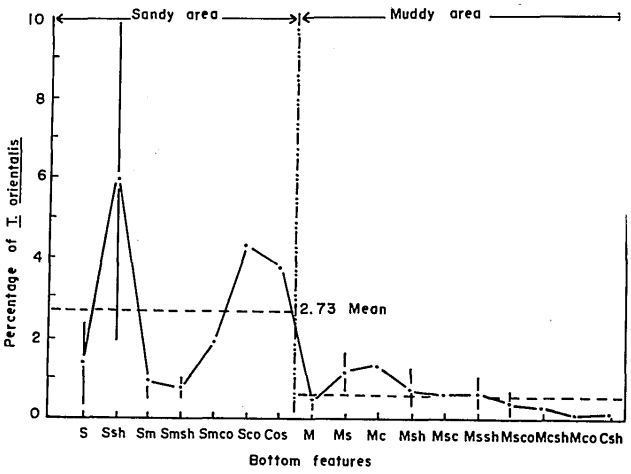

Fig. 3 Variation in catch of *Thenus orientalis* in relation to bottom features.

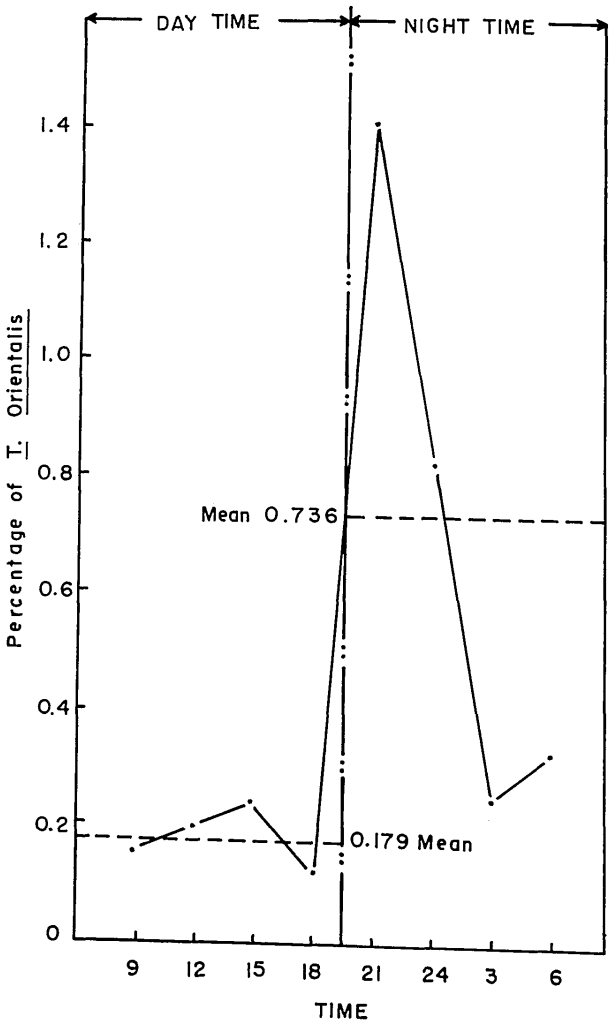

Fig. 4 Variation in catch of *T. orientalis* in day and night.

Table I. Catches and percentage of total catch of *T. orientalis* in the South China Sea

Station No.	Catches of *T. orientalis*									
	Mar.–Apr. 1967		May 1967		Nov.–Dec. 1967		Feb.–Mar. 1968		Apr.–Jun. 1972	
	kg/hr	%	kg/hr	%	kg/hr	%	kg/hr	%	kg/hr	%
005	–	–	–	–	–	–	1.33	1.16	–	–
007	–	–	–	–	–	–	0.50	1.09	–	–
008	–	–	–	–	–	–	0.33	0.93	–	–
104	1.04	0.72	–	–	–	–	–	–	0.08	0.25
105	–	–	0.83	1.43	–	–	–	–	–	–
107	–	–	–	–	–	–	0.25	1.67	–	–
203	0.85	0.32	–	–	–	–	–	–	–	–
204	1.78	1.52	0.37	1.70	–	–	–	–	0.16	0.16
205	–	–	0.75	1.24	–	–	–	–	–	–
206	–	–	–	–	–	–	1.00	1.60	–	–
207	–	–	–	–	–	–	0.25	0.46	–	–
208	–	–	–	–	–	–	0.50	0.32	–	–
209	–	–	–	–	–	–	0.40	0.56	–	–
210	–	–	–	–	–	–	0.50	0.16	5.50	7.75
303	3.83	0.94	–	–	–	–	–	–	–	–
304	2.53	0.76	–	–	–	–	–	–	0.24	0.17
306	–	–	–	–	–	–	0.50	0.48	–	–
307	–	–	–	–	–	–	1.00	0.82	–	–
308	–	–	–	–	–	–	0.40	0.31	–	–
309	–	–	–	–	–	–	0.14	0.03	–	–
310	–	–	–	–	–	–	0.33	0.41	–	–
311	–	–	–	–	–	–	0.57	0.94	–	–
312	–	–	–	–	–	–	1.25	2.80	1.23	2.01
313	–	–	–	–	–	–	2.00	1.20	–	–
403	1.91	1.27	0.23	0.63	–	–	–	–	–	–
404	–	–	0.40	0.32	–	–	–	–	1.08	1.38
408	–	–	–	–	–	–	0.25	0.21	–	–
411	–	–	–	–	–	–	0.25	0.36	–	–
412	–	–	–	–	–	–	0.75	0.36	–	–
413	–	–	–	–	–	–	1.83	0.83	0.28	0.30
502	5.42	4.49	–	–	–	–	–	–	–	–
503	5.42	4.75	0.50	0.95	–	–	–	–	–	–
504	–	–	0.31	0.31	–	–	–	–	–	–
506	–	–	–	–	–	–	0.50	1.09	–	–
507	–	–	–	–	–	–	0.75	0.45	–	–
509	–	–	–	–	–	–	0.75	1.45	–	–
514	–	–	–	–	–	–	0.60	0.31	0.51	0.21
601	–	–	–	–	3.75	2.14	–	–	–	–
602	5.86	3.75	3.10	1.71	1.25	0.46	–	–	–	–
603	–	–	0.50	0.47	0.50	0.16	–	–	–	–
604	–	–	0.60	0.70	–	–	–	–	1.21	1.00
605	–	–	0.67	0.44	–	–	–	–	–	–
606	–	–	–	–	–	–	2.00	0.87	–	–
607	–	–	–	–	–	–	0.75	3.36	–	–
608	–	–	–	–	–	–	0.33	0.789	–	–
609	–	–	–	–	–	–	0.50	1.73	–	–
700	–	–	–	–	3.28	1.19	–	–	–	–
701	–	–	–	–	3.87	0.99	–	–	–	–
702	–	–	–	–	0.50	0.25	–	–	–	–
703	–	–	–	–	0.28	0.09	–	–	–	–
704	–	–	–	–	0.37	0.23	–	–	–	–
705	–	–	–	–	1.87	1.18	–	–	–	–
706	–	–	–	–	3.17	1.54	1.50	3.93	–	–
707	–	–	–	–	–	–	0.75	3.72	–	–
708	–	–	–	–	–	–	0.50	0.38	–	–
800	–	–	–	–	3.00	1.80	–	–	–	–
801	–	–	–	–	1.00	0.34	–	–	–	–
805	–	–	–	–	1.00	0.69	–	–	–	–
806	–	–	–	–	3.50	1.86	2.50	1.69	–	–
807	–	–	–	–	–	–	0.50	1.92	–	–
808	–	–	–	–	–	–	1.00	0.39	–	–
900	–	–	–	–	0.33	0.06	–	–	–	–
907	–	–	–	–	–	–	3.25	15.25	–	–
908	–	–	–	–	–	–	0.33	0.48	–	–

Fig. 3 shows the variation of catch in relation to the physical features of sea bottom. From the catch records it appears that the most suitable habitat for this species is sandy bottom with shell pieces.

The variation of catch in relation to the time of operation is shown in Fig. 4. The figure shows that the catches in the night are higher than those in the day time. This is probably associated with its feeding behaviour and may suggest that it buries itself under the substratum in the day, as is the case of some prawn species.

From the encouraging results of the preliminary survey on the distribution and catch of the shovel-nosed lobster further studies need to be carried out before the resource of this economically important crustacean can be fully developed and exploited.

4. Acknowledgement

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SEAFDEC/SCS. 73: S-10

Results of the Experimental Trawl Fishing in the South China Sea by R/V CHANGI in the Years 1970 to 1972

by

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Abstract

From the data collected by R/V CHANGI from 1970 to 1972 the trawl fishing grounds in the South China Sea were discussed. To examine the trend of demersal fish resources, the data collected by R/V HAI-CHING in 1960–1962 were also utilized.

The areas near to Tioman Island and off the coast of Sarawak were considered as promising fishing grounds, although the mean catch per hour was not too good. Red snappers predominated the catch in most areas, while

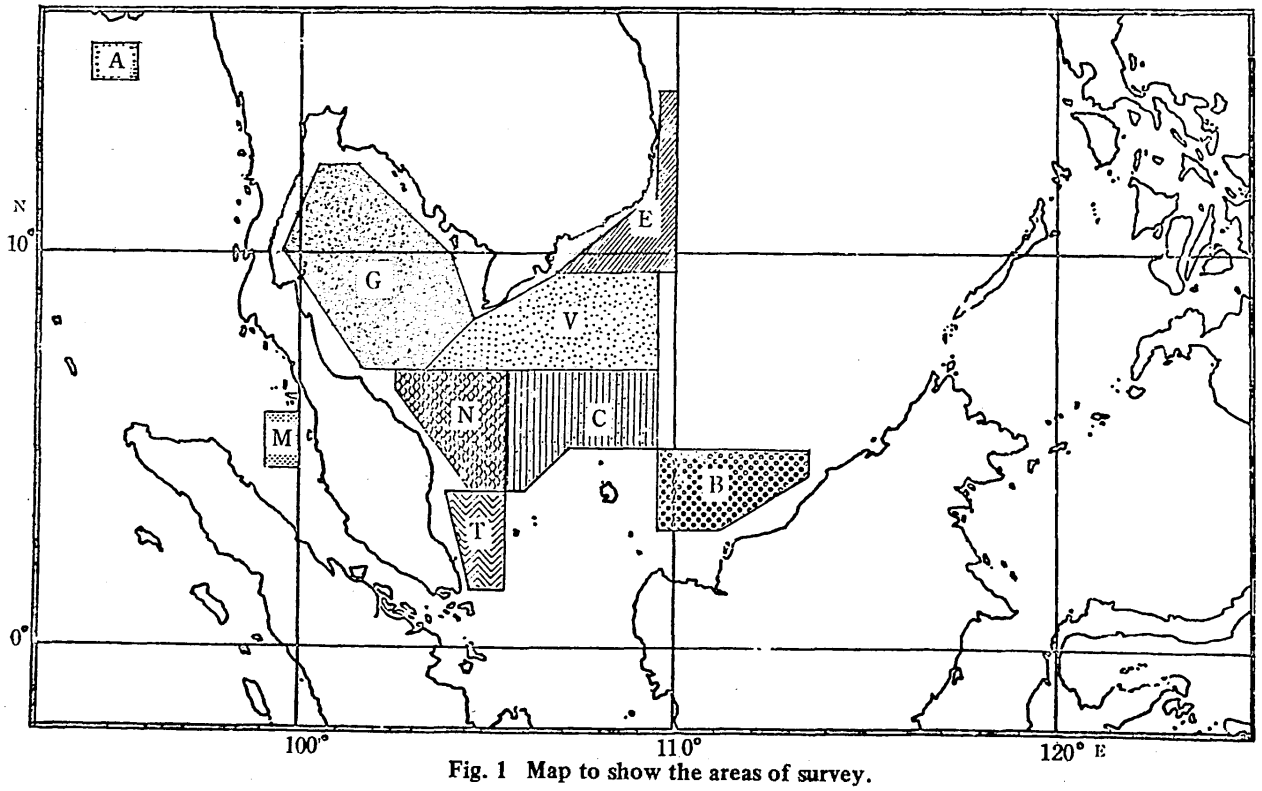

Fig. 1 Map to show the areas of survey.