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ON THE COLLECTIONS OF PHYLLOSOMA LARVAE BY ISAACS-KIDD MIDWATER TRAWL FROM THE WEST COAST OF INDIA

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ABSTRACT

The operations of Isaacs-Kidd Midwater Trawl from February, '85 to January, '86 along the west coast of India have indicated the regular occurrence of phyllosoma larvae belonging to palinurid and scyllarid lobsters. The average number of larvae caught per haul varied from 2 to 8, though a single haul contained a maximum of 92. The night collections were richer than that of day. The depth-wise operation has shown that greater numbers were taken from 10-200 m zone. Dispersal of larvae of different species in relation to oceanographical conditions is discussed.

INTRODUCTION

Among the reports available on the occurrence of phyllosoma larvae of palinurid, synaxid and scyllarid lobsters in the coastal waters of India, systematics of larvae have been dealt with by Prasad and Thampi (1957, 1959a, 1960a and 1968), Prasad *et al.* (1975), Thampi and George (1975) and Sarasu (1985). The seasonal availability of phyllosoma larvae in the plankton samples is reported by Alikunhi (1948), Bal and Pradhan (1952), Chacko (1950), George (1953), Menon (1945) and Prasad (1954), while information on the hatching of eggs, description of larvae and larval rearing under laboratory conditions are given by Deshmukh (1968), Mohamed, Rao and Suseelan (1971), Prasad and Tampi (1959b and 1960b) and Sankolli and Shenoy (1973). The present study deals with the occurrence and distribution of phyllosoma larvae in the Exclusive Economic Zone of the west coast of India, based on the materials obtained from the operation of Isaacs-Kidd Midwater Trawl on board FORV *Sagar Sampada*.

MATERIAL AND METHODS

The larvae obtained from the area lying between latitudes 7° to 23° N and longitudes 67° to 78° E were considered for the present study. The phyllosoma larvae were collected in 30-minute horizontal haul by Isaacs-Kidd Midwater Trawl (IKMT) made during the cruises 1, 3A, 3B, 6, 7, 8, 9, 10 and 11. The depth of operation of the gear varied from 10 to 500 m. The total number of larvae for each haul came from the entire sample analysed. To study the seasonal abundance, the number of larvae from each haul were pooled together on month-wise basis, irrespective of the cruises and the average number per haul per month was worked out based on the total number of hauls made in each month. For depth-wise distributional study, larvae were grouped into different depth zones starting from 0 to 500 m at 50 m interval. To identify the larvae and fixing up of stages' the keys and salient characters given by Prasad *et al.* (1975) and Tampi and George (1975) were followed.

OBSERVATIONS

Larval abundance

The location of stations from where the phyllosoma larvae obtained is marked in Fig. 1. The details of total number of hauls made and group-wise number of larvae caught are given in Fig. 2. Totally 280 hauls were made, of which, 108 hauls contained larvae. Out of these 108 hauls, 56 were made during the day time and the rest 52 during the night. Altogether 456 larvae were caught, of which, 168 belonged to palinurid, 1 to synaxid and 287 to scyllarid lobsters. In the case of palinurids, maximum number of larvae were obtained during March-April, October, December, '85 and January, '86. Whereas the scyllarid larvae were more in number during August and December, '85. A single larva of synaxid lobster was caught in December '85. Though the average number (combined figure for all these three groups) per haul varied from 2 to 8, the maximum of 8 was recorded in August and December,

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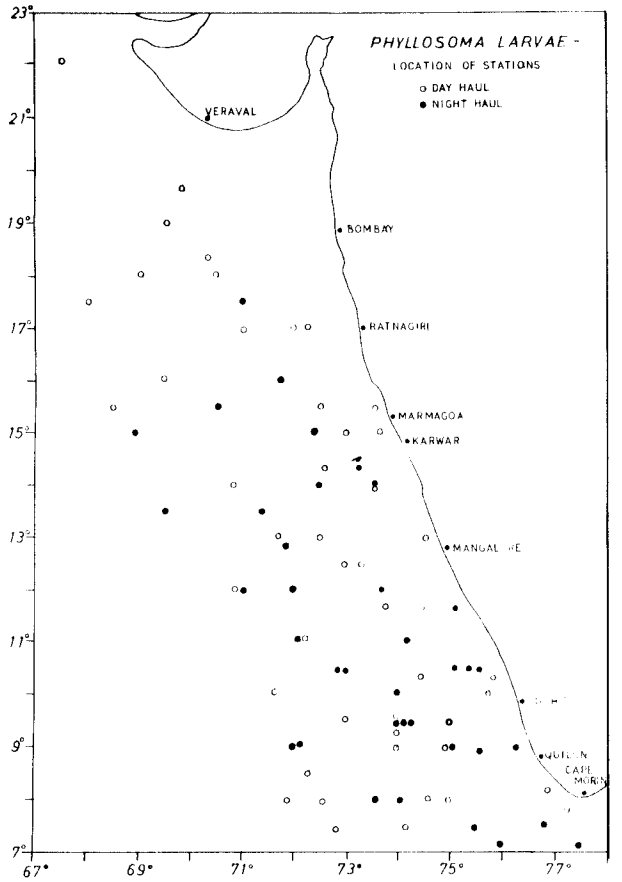

Fig. 1. Map showing the location of stations.

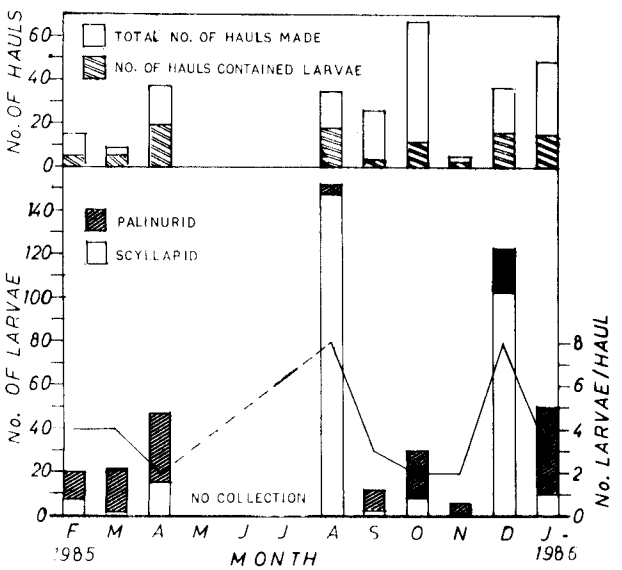

Fig. 2. Abundance of phyllosoma larvae during February, 1985 to January, 1986.

'85. However, a single haul from Cruise 10 contained 92 larvae (2 palinurid, 1 synaxid and 89 scyllarid) in December, '85. Inspite of the gap in the collection of larvae during the three months (May to July, '85), the phyllosomae were present in all other months in the study area. This could be due to the lengthy larval life and dispersal of larvae to distant waters.

To study the diurnal variations, the total number of palinurid and scyllarid larvae caught during day and night hauls during February, '85 to January '86 are marked in Fig. 3. In the case of palinurid larvae, greater numbers were caught during the night hauls in February-April, '85 and again in January, '86. In other months, fairly good representation was made in the day time hauls. For the scyllarid larvae, day time hauls yielded more number during February, April, August and December, '85 and January, '86 and the night hauls during August and December, '85. In general, night hauls were

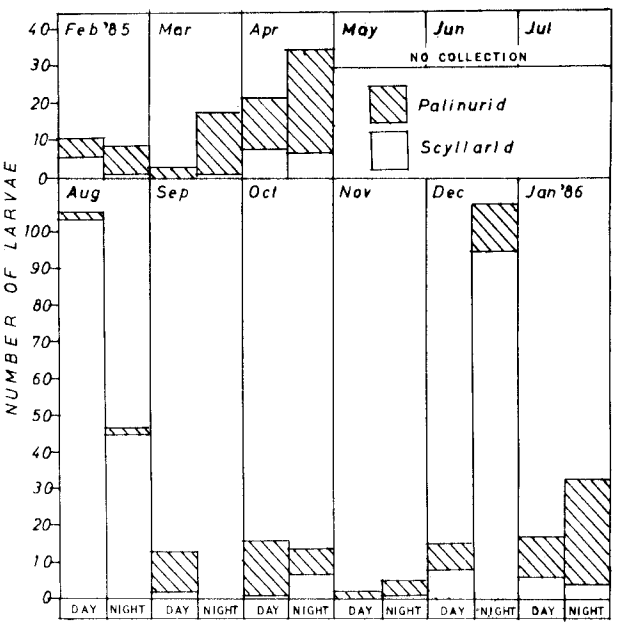

Fig. 3. Diurnal variation in the collection of palinurid and scyllarid lobster larvae.

richer than that of day for both palinurid and scyllarid larvae.

The data on the depth-wise operation of IKMT was available only to the cruises 3B, 6, 7, 8, 9A, 10 and 11. Based on these data, the larvae obtained from different depth zones are summarized in Table 1.

It is seen that though more hauls were made upto 100 m depth, the number per haul was 2.8 at 0-

TABLE 1. *Depth-wise distribution of phyllosoma larvae*

Depth zone	No. of hauls made	Number of larvae			No. of larvae per haul
		Palinurid	Scyllarid	Total	
0-50	56	24	131	155	2.8
51-100	10	78	83	161	16.1
101-150	2	35	44	89	44.5
151-200	1	20	14	34	34.0
201-250	1	1	8	9	9.0
251-300	4	5	2	7	1.4
301-350	3	2	1	3	1.0
351-400	2	1	1	2	1.0
401-450	2	2	0	2	1.0
451-500	1	0	3	3	3.0

50 m and 16.1 at 51-100m. In the case of other depth zones, the number of hauls taken ranged from 1 to 4. However, the number of larvae per haul ranged from a minimum of 1 to a maximum of 44. Thus, greater number of larvae were hauled up from a depth of 51 to 200 m.

Species composition:

The palinurid larvae belonged to 4 genera, namely, *Panulirus, Puerulus, Palinustus* and *Linuparus*, while those of *Scyllarus* and *Thenus* represented scyllarid larvae. Among the palinurid larvae, *Panulirus homarus* accounted for 47.4% by number, followed by *P. versicolor* (33.3%), *P. penicillatus (5.1%), P. sewelli* (4.5%), *P. polyphagus* (2.8%), *P. longipes* (2.8%), *L. trigonus* (1.7%), *P. mossambicus* (1.2%), *P. ornatus* (0.6%) and *P. angulatus* (0.6%). In scyllarid larvae, *S. martensii* formed 80.3%, followed by *S. rugosus* (12.7%), *S. batei* (4.7%), *S. cultifer* (1.0%), *Scyllarus* sp.1 (1.0%) and *T. orientalis* (0.3%). The single larva of synaxid lobster belonged to *Palinurellus wienckii.*

TABLE 2. *Stage-wise occurrence of phyllosoma larvae*

Species	Stages											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
P. homarus	—	2	1	11	6	29	13	10	7	5	—	—
P. versicolor	—	—	—	4	—	6	11	8	10	20	—	—
P. penicillatus	—	—	—	—	—	—	2	3	1	1	—	2
P. polyphagus	—	—	—	—	1	3	—	1	—	—	—	—
P. ornatus	—	—	—	—	—	1	—	—	—	—	—	—
P. longipes	—	—	—	—	—	—	1	2	—	2	—	—
P. sewelli	—	3	1	—	1	—	1	1	—	1	—	—
P. angulatus	—	—	—	—	—	—	—	1	—	—	—	—
P. mossamibicus	—	—	—	—	—	—	—	—	—	2	—	—
L. trigonus	—	—	—	—	—	—	3	nos ?	—	—	—	—
P. wieneckii	—	—	—	1	—	—	—	—	—	—	—	—
S. martensii	—	6	8	28	17	68	17	54	42	3	—	—
S. rugosus	1	1	4	5	—	2	1	4	5	3	6	6
S. batei	1	2	3	4	—	1	—	—	1	2	—	—
S. cultifer	—	1	1	—	—	1	—	—	—	—	—	—
Scyllarus sp.1	—	—	—	—	—	—	—	—	—	—	—	3
T. orientalis	—	—	—	1	—	—	—	—	—	—	—	—

Larval stages

The number of larvae caught in each stage for the species studied are given in Table 2.

Species like *P. homarus, P. sewelli, S. martensii* and *S. batei* had more number of early stages (I to VI), while more number of advanced stages (VII to XII) were present in *P. versicolor, P. penicillatus, P. longipes, S. rugosus* and *Scyllarus* sp. 1. Some of the larval stages of *P. sewelli, P. angulatus, P. mossambicus* and *L. trigonus* were caught for the first time from the wild. The description of these larvae will be published elsewhere.

Dispersal of larvae

Based on the location of the stations, the distance from the nearest shore was calculated. The number of palinurid and scyllarid larvae in different stages were plotted against the distance and the details are shown in Table 3. It is seen that majority of larvae of both the groups were caught within 200 km distance from the shore. The advanced stages were found mostly closer to the shore (up to 100 km), indicating the possible return to inshore waters for settling at the bottom after metamorphosing into postlarval stages. The earlier larval stages were found in considerable numbers in the nearshore waters and a very few of them in the distant waters, even upto 600 km from the shore.

Discussion

The present observation on phyllosoma larvae collected by IKMT along the west coast of India has indicated their occurrence throughout the year. Among the larvae, those belonged to scyllarid dominated, as observed by Berry (1974) in the South African waters. Moreover, the swarming of scyllarid larvae (92 number) netted in a single haul had added up the numerical abundance. The peak occurrence of larvae was recorded during October-April, which is in agreement with the collection of earlier phyllosoma larvae during November-March by Bal and Pradhan (1952), George (1953) and Menon (1945) from the coastal waters of the west coast of India.

The observations by Johnson (1960) Chittleborough and Thomas (1969) and Rimmer and Phillips (1979) have shown that the night hauls contained more phyllosoma larvae than that of the day due to the ascending movement during the night and descending movement during the day. The present collection of more larvae during the night could be due to such diurnal movement of larvae. The depth-wise collection of larvae in the present study has indicated the capture of maximum number of larvae in 51-200 m depth zone. Whereas the observation by Prasad (1978) has shown the maximum concentration of larvae between 50 and 100 m depth.

The dominance of larvae of *P. homarus* among palinurids and *S. martensii* among scyllarids in the present study could be due to greater adult population in the coastal waters and high fecundity and protracted breeding season (at least in the case of *P. homarus),* as suggested by Prasad and Tampi (1965). The data on dispersal of larvae in the inshore and offshore waters has indicated the presence of advanced stages in the waters upto 200 km distance from the shore, which could be due to return to nearshore waters before the settlement at the bottom. The occurrence of early stages in the distant waters (upto 600 km) could be due to the movement off shore rather than inshore, as pointed out by Rimmer (1980) for phyllosoma larvae.

The dominance of larvae of *P. homarus* in the present material has already been mentioned. George (1967) who studied the biology of the species has reported the peak breeding season as November-March along the Kanyakumari coast. According to Murty (1965), the current flows northward during November to February and southward during March-September along the southwest coast of India. It is quite possible that the larvae of *P. homarus* liberated during November-March and carried away by northerly flowing currents return to the original habitat of the adult by southerly currents, as more larvae of the species were obtained in the southern part of the west coast. A detailed study on the biological aspects of different species of lobsters and intensive collection of larvae may throw more light on the dynamics involved in the abundance and dispersal of larvae in space and time.

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TABLE 3. *Dispersal of palinurid (P) and Scyllarid (S) larval stages in the inshore and offshore waters*

Distance from the shore (km)	I		II		III		IV		V		VI		VII		VIII		IX		X		XI		XII		Total	
	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Up to 50	—	1	—	2	—	8	3	10	1	6	3	37	3	15	5	29	3	20	6	2	—	1	—	—	24	131
51-100	—	—	1	—	1	—	2	8	2	2	7	21	12	8	12	18	15	20	26	4	—	2	—	—	78	83
101-150	—	—	—	1	—	3	7	4	5	9	6	14	8	2	3	4	3	2	3	3	—	2	—	—	35	44
151-200	—	—	—	2	—	1	4	2	—	—	10	2	3	2	1	3	1	2	1	—	—	—	—	—	20	14
201-250	—	—	—	1	—	—	—	2	—	—	1	4	—	—	—	1	—	—	—	—	—	—	—	—	1	8
251-300	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—	—	2	—	—	—	—	5	2
301-350	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	1	—	—	2	1
351-400	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	1	1
401-450	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	2	0
451-500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
501-550	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	0	3
551-600	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0

Assistant in assisting in the analysis of the samples

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