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PRELIMINARY OBSERVATIONS ON THE DISTRIBUTION AND ABUNDANCE OF THE SWARMING CRAB *CHARYBDIS (GONIOHELLENUS) SMITHII* MACLEAY IN THE DEEP SCATTERING LAYERS ALONG THE WEST COAST OF INDIA

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ABSTRACT

Results of a preliminary study of the distribution and abundance of the swarming crab *Charybdis (Goniohellenus) smithii* Macleay in the Deep Scattering Layers on the west coast of India are presented based on the analysis of 244 IKMT samples collected by FORV *Sagar Sampada* during February, 1985 to January, 1986. The swarming crab is found to exist thoughout the west coast of India as against its known distributional limit in the north upto Bhatkal in Karnataka coast. Maximum density was observed along the southwest coast. The DSL population included all life stages of the crab such as zoea, megalopa, juvenile, subadult and adult, of which juveniles in the size range 12-20 mm carapace width dominated.

INTRODUCTION

The swarming crab *Charybdis (Goniohellenus) smithii* Macleay is an endemic species to the Indian Ocean where it has been reported from the Arabian Sea and off Southeast Africa as *Charybdis smithii* Macleay and *Charybdis (G.) edwardsi* Leene and Buitendijk (Della Croce and Holthuis, 1965; Sankarankutty and Rangarajan, 1962; Silas, 1969; Mohamed and Suseelan, 1973). Recently it has also been encountered in the Bay of Bengal during the fishery-oceanogrpahic cruises of FORV *Sagar Sampada*. The correct systematic position of the species was ascertained only recently in an exhaustive revision of the portunid crabs by Stephenson (1972).

In Indian waters *Charybdis (G.) smithii* is considered to be a potentially important deep sea crab occupying the outer shelf and upper continental slope regions. It is often found swimming in large numbers in the oceanic waters. Considering the commercial prospects of this species, a detailed investigation on its biology and resource characteristics has been taken up recently based on the collections of FORV *Sagar Sampada*. In the present paper the results of a preliminary study of the distribution and abundance of this crab in the Deep Scattering Layers (DSL) off the west coast of India are given together with notes on the biology of the crab population occurring in the DSL. So far no study has been carried out on these aspects in any part of the world in general and in the Indian EEZ in particular.

MATERIAL AND METHODS

The material for the study was obtained from the Isaacs-Kidd Midwater Trawl (IKMT) collections taken by FORV *Sagar Sampada* during her fishery-oceanographic cruises from February, 1985 to January, 1986. The IKMT collections were taken in the Deep Scattering Layers which occupied depths upto about 600 meters from the surface. Each haul was of 30 minutes duration. A total of 244 IKMT samples were analysed for the crabs covering the entire west cost of India between Latitudes 07°00'N and 23°30'N and Longitudes 64°30'E and 77°00'E. The distribution of IKMT hauls in the study area is shown in Fig.1.

The crab population of each sample was completely sorted out and measurements of the carapace width (C.W.) were recorded sexwise to the nearest millimetre for all specimens except larval stages whose numerical abundance alone was recorded. A total of 1,542 specimens were measured comprising of both sexes. The measurements of carapace were grouped into 2 mm size classes sexwise for studying the size frequency distribution. Sexes were separated based on the shape of abdomen and the number of pleopods present in it.

OBSERVATIONS

Spatial distribution and abundance

Out of the 244 samples of midwater collection analysed from the entire west coast of India, 59 samples contained the swarming crab in varying

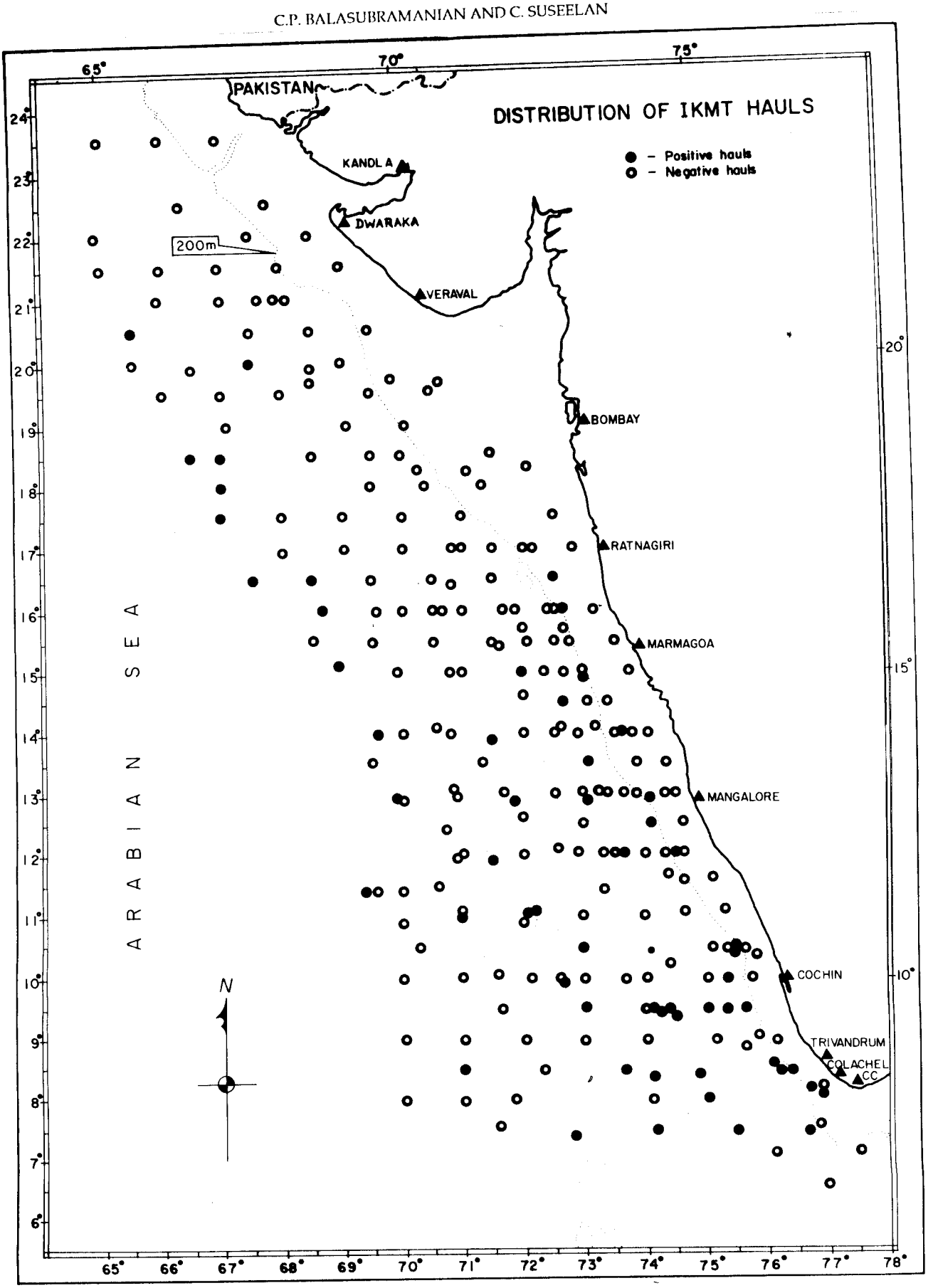

Fig. 1. Positions of IKMT hauls along the west coast of India.

numbers mixed with other pelagic groups. The species accounted for about 0.3% in the total DSL population in terms of number (Menon and Prabhadevi (1990), the maximum percentage being 81.3 recorded in the oceanic waters off Colachel on the southwest coast. The species is found to be occurring all along the west coast between Kanyakumari and Dwaraka (Fig. 2). In the positive hauls, the abundance of crab showed vast variations. Majority of these hauls yielded only stray specimens numbering less than 10 crabs per haul. Table 1 gives details of the samples containing more than 10 crabs per haul. In general, relatively more number of samples rich in crab population was recorded in the region between Ratnagiri and Mangalore, and Cochin and Kanyakumari, the maximum abundance having been observed off Trivandrum to Kanyakumari. Whenever rich catches were recorded, they were found to be sporadic and there was no consistency in the occurrence of crab in any particular region. The maximum number per haul amounted to 862 which was recorded off Colachel in the oceanic waters where the depth of the sea bottom was over 2,700 m.

Analysis of catch with reference to different depths of occurrence indicates that the species is distributed only in the outer continental shelf and in the oceanic waters. The minimum depth of the station from where the species has been encountered was 93 m at Lat. 18°30'N. The species showed its presence in varying densities within the shelf region upto about Ratnagiri, and beyond this it was encountered only in the oceanic waters far beyond the continental shelf.

Table 1. *Catch details of* Charybdis (G.) smithii *in the IKMT collections yielding more than 10 crabs/haul*

Sl. No.	Position		Depth at station (m)	Total number of crabs	Percentage in total biomass by number
	Lat. (N)	Long. (E)			
1.	08° 24'	72° 50'	1821	13	3.6
2.	07° 30'	75° 30'	2765	862	81.3
3.	07° 30'	76° 31'	1492	13	13.6
4.	07° 31'	76° 47'	1670	76	22.3
5.	08° 00'	76° 50'	99	17	21.2
6.	08° 30'	76° 12'	680	11	4.5
7.	09° 29'	74° 15'	2671	162	48.0
8.	11° 00'	72° 01'	1645	10	15.8
9.	14° 00'	66° 33'	4109	59	8.5
10.	14° 59'	73° 00'	229	37	14.8
11.	16° 00'	72° 40'	504	96	59.2
12.	16° 00'	68° 30'	3751	13	3.6

Seasonal distribution and abundance

The species was encountered in the samples throughout the year except during May and June when there was no IKMT collection. In order to study the seasonal variation in the abundance of crab in the DSL, the catch data have been pooled and averages taken for 3 seasons, namely, premonsoon (February-May), monsoon (June-September) and postmonsoon (October-January). It is found that the average number of crabs per haul varied significantly in different seasons of the year. The average catch rate per haul worked out to 64.79, 7.62 and 23.6 for premonsoon, monsoon and postmonsoon seasons respectively. The maximum number of crabs recorded in individual sample (862) was obtained during the premonsoon season (April).

Diurnal variation in abundance

From the analysis of the data collected during day and night separately, it is seen that during night, crab abundance was very high occasionally, but such rich collections were rather sporadic. (Tables 2 & 3). In the day series of collection, however, wide fluctuations in the abundance of crab were not observed as in the night series of collection. The maximum number of crab per haul recorded during the day time was 68 as against 862 crabs in the night.

Biological observation

Size composition

The IKMT samples contained all the life stages of the swarming crab, viz. zoea, megalopa, juvenile, subadult and adult. The juveniles dominated in most of the samples examined. The size frequency data have been pooled together and plotted sexwise to study the general size composition of the species in the DSL (Fig. 3A). It is seen that there is not much variation in the size composition between the two sexes. The size range of the crab, after the megalopa stage, was from 12 to 64 mm C.W. for male and 12 to 60 mm C.W. for female. Juveniles measuring 12 to20 mm C.W. formed the major component of the crab population for both sexes. In the advanced size groups, comprising of subadults and adults, individuals in the size range 34 to 54 mm C.W. were fairly common for both sexes. A study of size frequency distribution of some of the rich collections of the crab (Fig. 3 B-E) has shown that the richness of the crab samples was due to the abundance of juveniles in the size range 12 to 20 mm C.W.

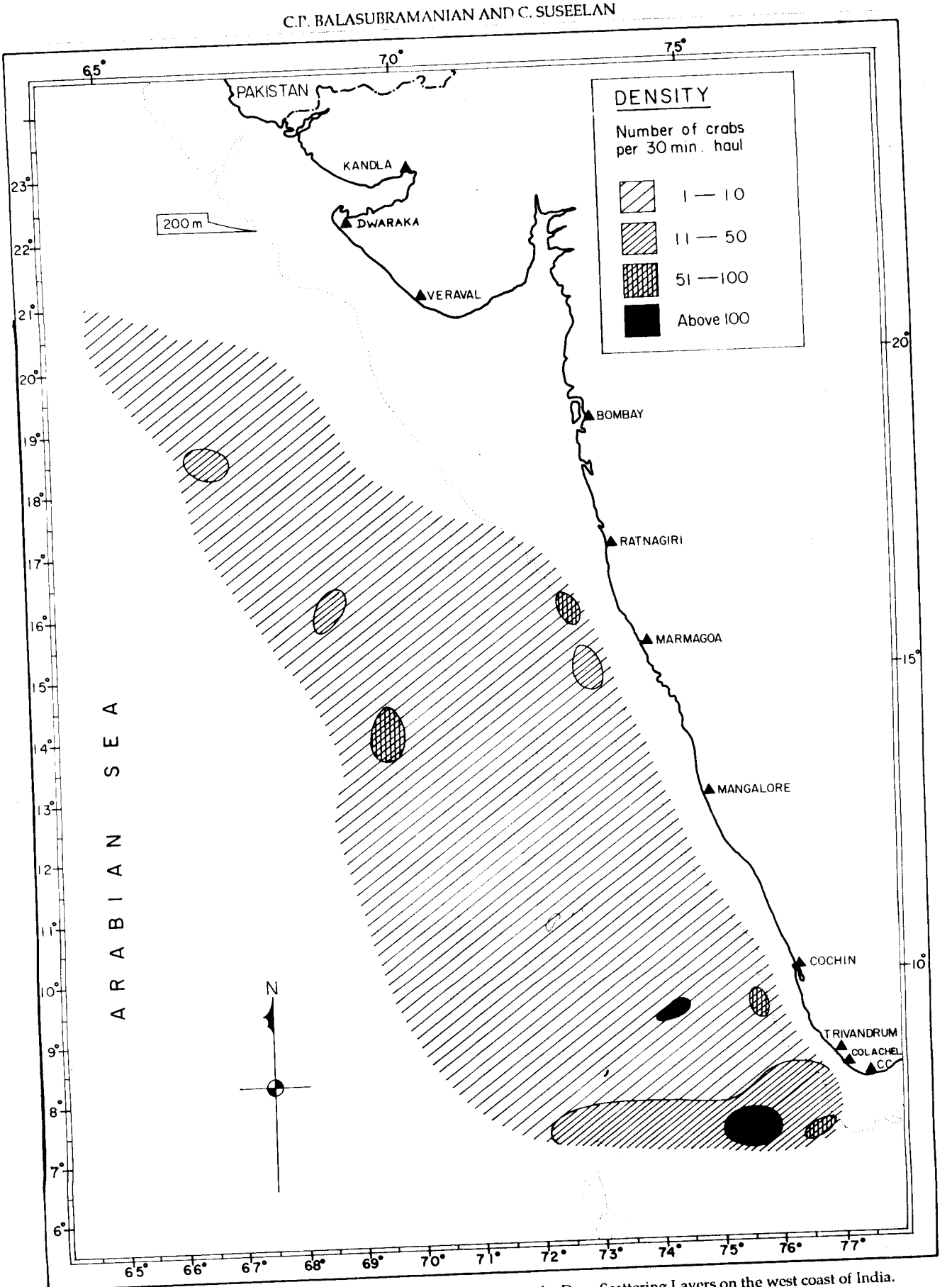

Fig. 2. Distribution pattern and abundance of *C. (G.) smithii* in the Deep Scattering Layers on the west coast of India.

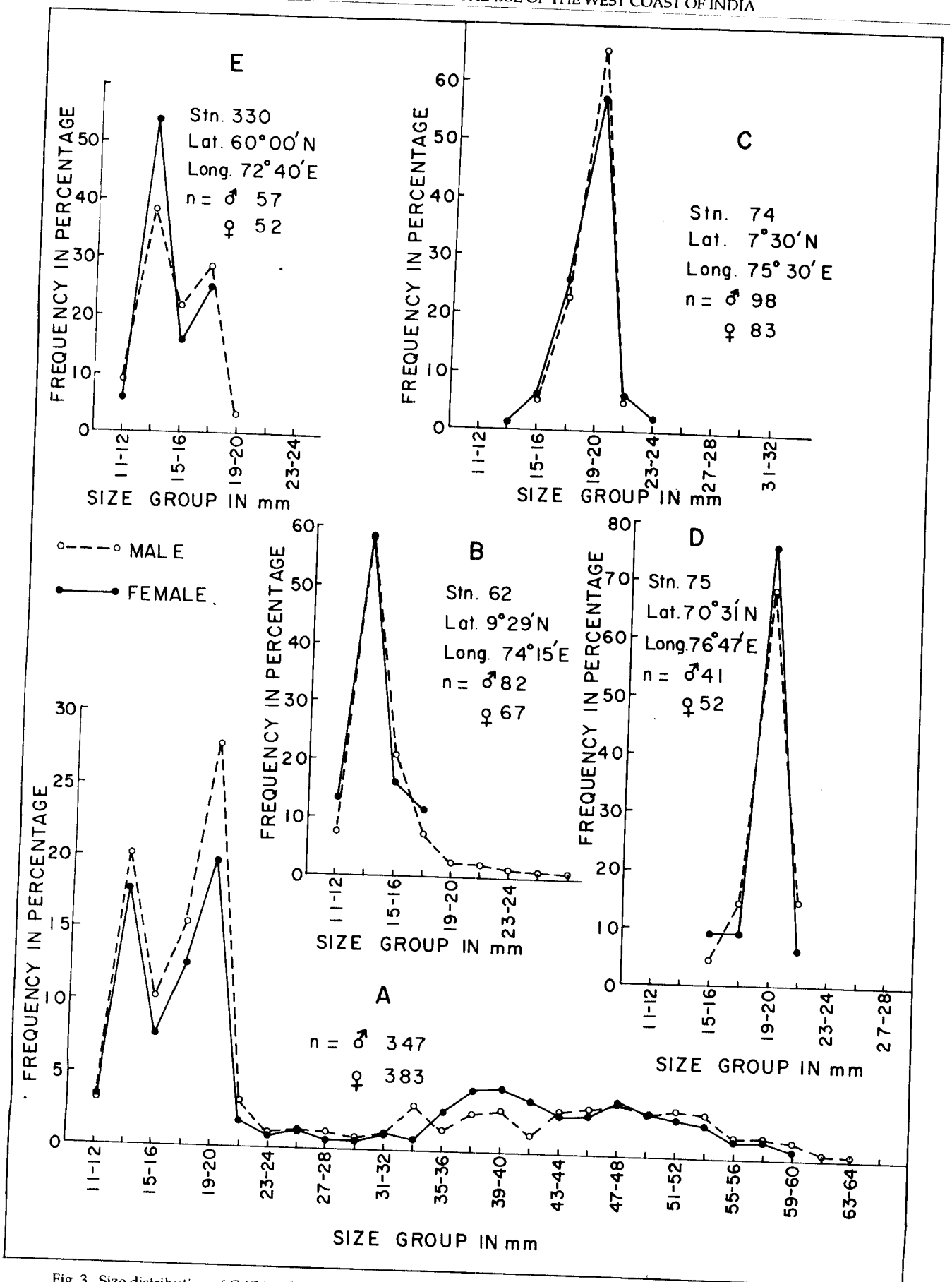

Fig. 3. Size distribution of *C.(G.) smithii*. A, pooled for all samples; B-E, individual samples rich in crab specimens.

TABLE 2. *Catch details of* Charybdis (G.) smithii *in the day series of IKMT hauls arranged monthwise*

Sl. No.	Month & year	Position		Total number of crabs
		Latitude E	Longitude E	
1.	Feb., 1985	11° 00'	71° 00'	1
2.	Mar., "	09° 30'	75° 32'	68
3.	" "	08° 21'	74° 54'	2
4.	" "	08° 30'	76° 12'	1
5.	Apr., "	07° 30'	74° 10'	9
6.	" "	09° 30'	73° 00'	1
7.	" "	08° 28'	74° 01'	1
8.	" "	09° 30'	75° 00'	3
9.	Jul., "	07° 30'	76° 38'	13
10.	" "	08° 00'	76° 50'	17
11.	" "	08° 14'	76° 38'	1
12.	" "	08° 30'	76° 26'	2
13.	" "	09° 30'	75° 24'	3
14.	" "	10° 00'	75° 25'	1
15.	Aug., "	11° 01'	72° 01'	10
16.	" "	12° 00'	74° 30'	3
17.	" "	12° 50'	69° 59'	4
18.	" "	14° 00'	60° 34'	59
19.	" "	14° 59'	73° 00'	37
20.	" "	15° 00'	72° 00'	4
21.	" "	16° 00'	68° 31'	13
22.	Sep., "	18° 00'	67° 00'	1
23.	" "	20° 00'	67° 30'	1
24.	Oct., "	17° 30'	67° 00'	1
25.	" "	14° 30'	72° 41'	1
26.	" "	13° 30'	73° 03'	1
27.	" "	16° 30'	67° 30'	2
28.	Jan., 1986	09° 00'	75° 00'	1

TABLE 3. *Catch details of* Charybdis (G.) smithii *in the night series of IKMT hauls arranged monthwise*

Sl. No	Month & Year	Position		Total number of crabs
		Latitude (N)	Longitude (E)	
1.	Mar., 1985	11° 29'	69° 26'	1
2.	" "	10° 31'	75° 52'	8
3.	" "	09° 29'	74° 15'	162
4.	Apr., "	08° 30'	73° 38'	1
5.	" "	08° 30'	73° 00'	1
6.	" "	07° 24'	72° 50'	13
7.	" "	07° 30'	75° 30'	862
8.	" "	07° 31'	76° 47'	76
9.	" "	10° 29'	75° 30'	4
10.	" "	10° 30'	73° 00'	2
11.	" "	09° 30'	74° 07'	1
12.	" "	09° 30'	74° 20'	4
13.	Jul., "	08° 30'	76° 02'	2
14.	Aug., "	09° 51'	72° 40'	2
15.	" "	11° 02'	72° 02'	2
16.	" "	12° 50'	73° 01'	3
17.	" "	12° 00'	71° 30'	3
18.	" "	12° 50'	71° 00'	1
19.	" "	14° 00'	71° 30'	5
20.	" "	14° 00'	73° 31'	1
21.	" "	15° 01'	68° 58'	4
22.	" "	16° 00'	68° 31'	13
23.	Oct., "	20° 30'	65° 30'	2
24.	" "	20° 30'	65° 30'	3
25.	" "	18° 30'	66° 30'	2
26.	" "	18° 30	67° 30'	3
27.	" "	16° 30'	72° 30'	1
28.	" "	12° 30	74° 03'	1
29.	" "	16° 30'	68° 30'	2
30.	Nov., "	12° 00'	73° 42'	3
31.	Dec., 1985	16° 00'	72° 40'	96

Sex ratio

In the total crab population, the percentage composition of male and female was 52 : 48, thereby showing a slight preponderance of males. In the larger size group comprising of subadults and adults, the overall sex ratio was 47 : 53.

REMARKS

Available information on the distribution pattern of the swarming crab along the west coast of India shows that the species occurs only in the south-west coast upto about Bhatkal in Karnataka coast (Silas, 1969). The present study reveals that the species enjoys a distribution throughout the west coast of India. Since the present investigation is only based on the IKMT samples taken from the pelagic realm, it is not certain whether at the bottom also the species occurs throughout the west coast of India. The fishery resource surveys carried out by the Polish vessel M. T. *Muraena* on the continental shelf and upper continental slope along the northwest coast of India in late seventies (Bapat *et al.*, 1982) have not indicated the presence of this species in the bottom trawl catches from any areas north of Karnataka. Examination of the trawl catch data of FORV *Sagar Sampada* also does not reveal the presence of this species in this region (Suseelan *et al.*, 1990). The poor abundance of *C. (G.) smithii* in the IKMT collections examined from this region during the present study could indicate less possibility of the existence of a rich benthic population of the species along the northwest coast.

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