RESULTS OF THE TRAWLING SURVEY BY AN INSTITUTIONAL BOAT CADALMIN II IN THE PALK BAY AND GULF OF MANNAR, MANDAPAM, DURING 1977-80

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ABSTRACT

During the course of trawling survey conducted in 1977-80 R.V. CADALMIN II (13.3 m, 100 BHP) landed from the Palk Bay and Gulf of Mannar a total of 46,366 kg of 'all fish' at an annual average catch rate of 57.5 kg as a result of a total fishing effort of 806.3 h. Silverbellies formed 80% of the catch. The sub-areas 9-78|1F, 9-79|2B, 2C, 3B, 3C, 3D, 4A, 4B and 4C were found to be most productive. April-June in the Palk Bay and October-December in the Gulf of Mannar were the best seasons for trawling. Over 70% of the catch came from 4-10 m depth. When compared with earlier studies, a change was noticed in the composition of fish species in this region. The estimated potential yield for all the eight sub-areas surveyed in the Palk Bay and seven sub-areas in the Gulf of Mannar was 874.6 t and 473.7 t, respectively.

INTRODUCTION

The Central Marine Fisheries Research Institute had formulated a project aimed at investigating the trawling grounds from selected bases, deploying its CADALMIN series of research vessels (100 HP). As a part of this, R.V. CADALMIN II, based at Mandapam, was assigned to cover the adjacent Palk Bay and Gulf of Mannar areas. The paper deals with the distribution and relative abundance of demersal fishes of these areas in space and time as observed from the results of the fishing operations of this vessel from 1977 to 1980.

SURVEY PROGRAMME

R.V. CADALMIN II is a 13.3 m, 18.5 t research-cum fishing boat fitted with a 100 HP engine. It is designed mainly for trawling and operated a 28-m monofilamenet two-seam trawl with rectangular otter boards weighing 60 kg each. The trawling speed was 2.5 knots. The fishing programme followed a grid system involving repeated systematic linear bottom trawling along selected parallels of latitudes and passing through different depth ranges. Each major area was 1° square and a sub-area was a 10 x 10 minute square. The survey was started in April 1977 and continued till February 1978. After a spell the

survey was again carried out from July 1978 to November 1978, when the vessel was badly damaged by cyclone and was laid up for repairs from December 1978 to June 1979. The survey was resumed from July 1979.

On each fishing trip the relevant environmental data and haulwise effort and catch data were recorded. These data were processed for areawise, seasonwise and depthwise abundance of 'all fish' and of fourteen major categories of fishes. The catch-per-hour was taken as the measure of abundance on the fishing ground.

Results of the Survey

Areawise Distribution

The area explored in the Palk Bay and Gulf of Mannar extends from 9° 0 N to 9° 40' latitude and 78° 50' E to 79° 40' E longitude, comprising nearly 4,500 sq. km. Fifteen sub-areas in two major areas were surveyed, viz., 9-78|1F, 2F, 9-79|1A, 1B, 1C, 2A, 2B, 2C, 3A 3B, 3C, 3D, 4A, 4B and 4C (Fig. 1). The depths of operation were 4-14 m in the Palk Bay and 5-31 m in the Gulf of Mannar. The sea bottom was mostly muddy.

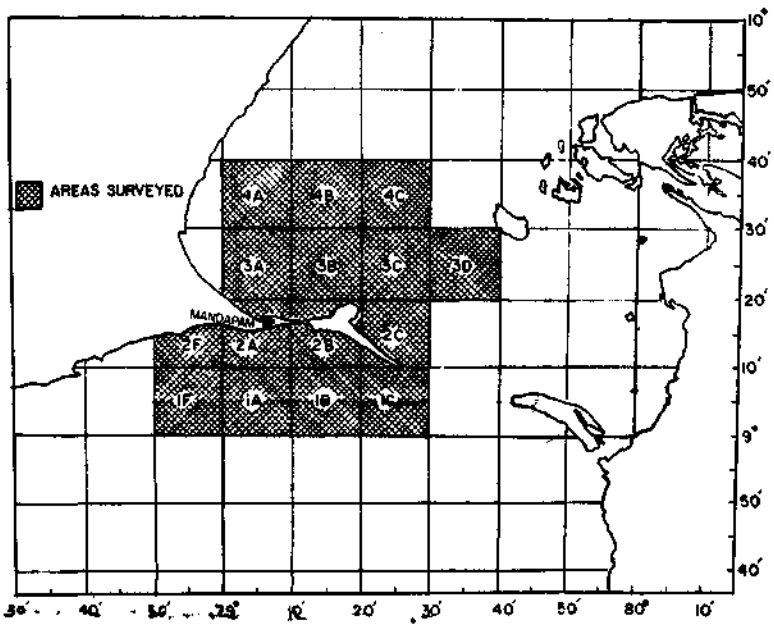

FIG. 1. Map showing the sub-areas surveyed by R.V. CADALMIN II in the Palk Bay and Gulf of Mannar during 1977-1980 from Mandapam base.

During 1977-80 a total effort of 806.3 h of actual fishing spread over 302 days was expended in the 15 sub-areas, realising a catch of 46,366 kg of 'all fish', at an overall catch rate of 57.5 kg|h (Fig. 2). The annual averages

of fishing effort, catch and catch rate were 201.6 h, 11,592 kg and 57.5 kg|h, respectively. The maximum catch rate of 107 kg|h was obtained from 9-79|4C, followed by 9-79|3C with 106.2 kg|h. Based on the annual average catch rate,

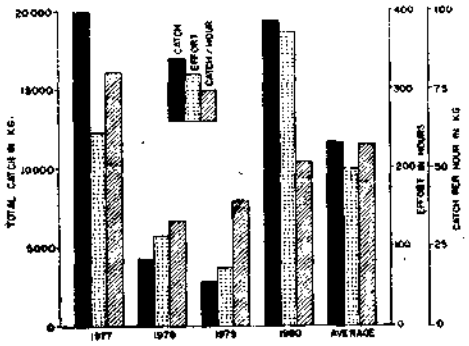

FIG. 2. Yearwise annual average, total catch, effort and catch rate obtained by R.V. CADALMIN II for the years 1977-1980.

the sub-areas that were identified as potentially rich fishing grounds for 'all fish' were: 9-78|1F, 9-79|2B, 2C, 3B, 3C, 3D, 4A, 4B and 4C (Fig. 3). The monthly average effort, catch and catch rate of 'all fish' ranged from 13.3 h (October) to 41.4 h (September); 503 kg (February) to 3204 kg (April) and 34.4 kg|h (January) to 83.7 kg|h (April) respectively. Quarterwise, the highest catch rate was obtained in the second quarter (77.9 kg|h), followed by the fourth quarter (62 kg|h), third quarter (46.5 kg|h) and the first quarter (38.4 kg|h).

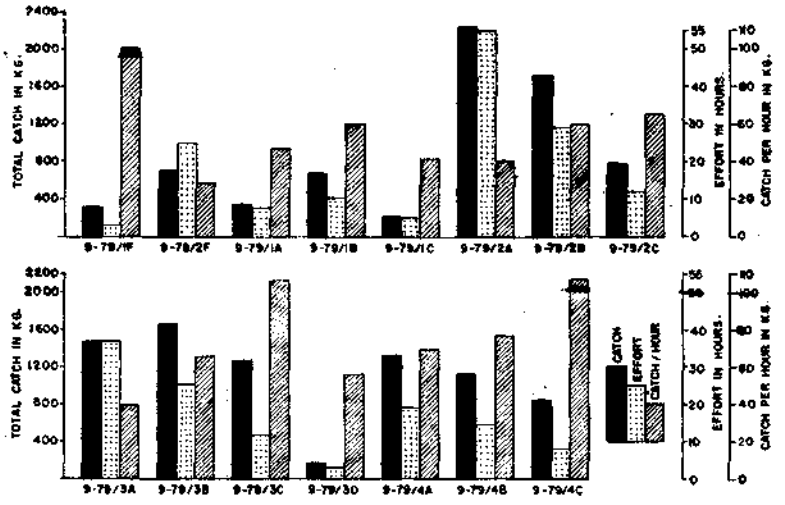

FIG. 3. Areawise particulars of catch, effort and catch rate obtained by R.V. CADALMIN II (Average for 1977-1980).

The bulk of the catch was silverbellies, which ranged from 1,994 kg in 1979 to 16,566 kg in 1977, with an annual average of 9,518 kg. The percentage contribution of the fourteen fish groups for the years 1979-80 in the order of abundance was: silverbellies 79.9%, miscellaneous fishes 3.7%, *Pellona* 3.5%, carangids 2.4%, sciaenids 2.2%, lesser sardines 2.1%, rays 1.7%, catfish 1.2%, *L. lactrius* 0.8%, prawns 0.7%, *Upeneus* 0.6%, pomfrets 0.5 %, cephalopods 0.4% and crabs 0.3% (Fig. 4). For silverbellies the productive areas were 9-79|1A, 2C, 2B and 9-78|1F; for carangids 9-79|3B and 3A; for lesser sardines, 9-78|1F, 9-79|4A, 2B and for prawns, 9-78|2F, 9-79|1A, 2B and 3B.

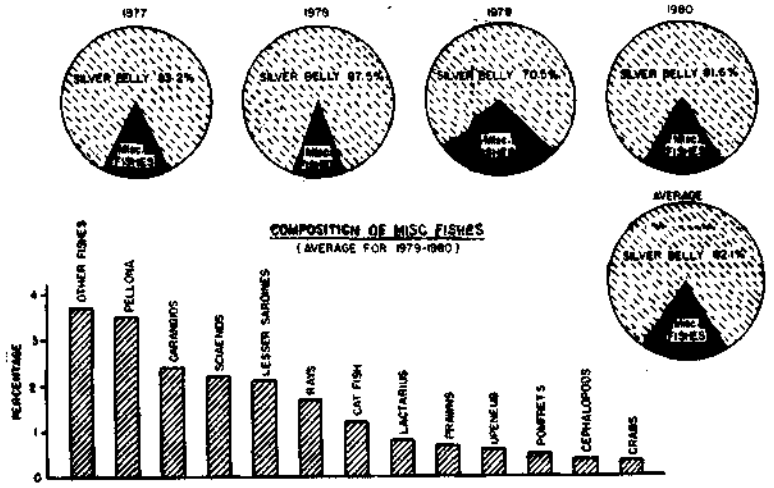

FIG. 4. Composition of catches by R.V. CADALMIN II for the years 1977-1980.

Depthwise Distribution

During the four years trawling was done in 4-31 m depth range, which was divided into four depth zones: 4-10 m, 11-20 m 21-30 m and 31-40 m. The catch data in respect of these depth zones are given in Table 1. Depth zones 4-10 m and 11-20 m were fished in all the four years, whereas the depth zone 21-30 m was fished only in 1977 and 31-40 m in 1980. The bulk of the catch came from the 4-10 m depth, which accounted for 70.4% of the total catch, while 28.5% was obtained from the 11-20 m depth zone. The catch rate of 99.6 kg|h registered from 31-40 m depth zone was the highest but the fishing effort spent in this zone was scanty. A catch rate of 97.3 kg|h was obtained from 11-20 m depth zone followed by 49.5 kg|h from 4-10 zone and 27.4 kg|h from 21-30 m zone.

The catch and catch rate figures in different depth zones for the fourteen categories of fishes are given in Table 2. Silverbellies were most abundant in

TABLE 1. *Details of fishing effort (h) catch (kg) and catch per hour (kg) obtained in different depth zones in the years* 1977-1980.

Year	Effort catch per hr.	Depth zones in m 4-10	11-20	21-30	31-40
1977	E	135.90	103.05	7.58	—
	C	9635.80	10077.75	207.90	—
	C|hr	70:90	97.80	27.42	—
1978	E	109.25	6.00	—	—
	C	2917.12	1280.24	—	—
	C|hr	26.70	213.37	—	—
1979	E	71.00	1.00	—	—
	C	2814.83	16.10	—	—
	C|hr	39.65	16.10	—	—
1980	E	343.50	26.00	—	3.00
	C	17259.74	1857.65	—	299.00
	C|hr	50.25	71.45	—	99.67
All years	E	659.66	136.05	7.58	3.00
	C	32627.49	13231.74	207.90	299.00
	C|hr	49.46	97.26	27.42	99.67
	%	70.36	28.54	0.45	0.65

11-20 m, while quality fishes like sciaenids, catfish and lesser sardines were more in 31-40 m. The catch rate of prawns was more or less the same in all depth zones. Rays were caught more from 4-10 m depth zone.

Relative Abundance of Fish in Palk Bay and Gulf of Mannar

The catch, effort and catch-per-hour data were considered separately for the Palk bay and Gulf of Mannar (Fig. 5). The Palk bay gave an overall catch rate of 68.4 kg|h while in the Gulf of Mannar the overall catch rate was 44.2 kg|h.

In the Palk Bay silverbellies formed 79.2% of the total catch. The other fish groups, in the order of their abundance, were *Pellona*, miscellaneous fishes, carangids, sciaenids, lesser sardines, rays and catfish. The above fish

TABLE 2. *Depthwise average catch (kg) and catch per hour (kg) (in parenthesis) of fishes landed by R.V. CADALMIN II during the years* 1979-1980.

Categories	Depth zones in m		
	4-10	11-20	31-40
Silverbellies	15963.80	1701.00	170.00
	(38.51)	(63.00)	(56.70)
Sciaenids	437.95	31.65	9.00
	(1.06)	(1.17)	(3.0)
Carangids	503.97	17.95	1.75
	(1.22)	(0.66)	(0.58)
Lesser sardines	443.60	9.85	20.00
	(1.07)	(0.36)	(6.67)
Pellona	741.40	38.00	0.50
	(1.79)	(1.41)	(0.17)
Cat fish	260.10	2.15	18.00
	(0.63)	(0.08)	(6.00)
Upeneus	178.60	11.20	1.00
	(0.43)	(0.41)	(0.33)
Lactarius	83.83	—	4.50
	(0.20)		(1.8
Pomfrets	93.65	1.50	8.00
	(0.23)	(0.06)	(2.67)
Rays	385.13	—	—
	(0.93)		
Prawns	150.78	10.70	0.95
	(0.36)	(0.39)	(0.32)
Crabs	66.68	4.20	—
	(6.16)	(0.16)	
Cephalopods	86.53	13.90	—
	(0.21)	(0.51)	
Miscellaneous fishes	718.42	29.85	65.30
	(1.73)	(1.11)	(21.77)

groups formed 1.3 to 4.4% of the total catch. Prawns and pomfrets contributed 0.7% and 0.6%, respectively. In the Gulf of Mannar also silverbellies dominated in the total catch forming 82.1%, followed by miscellaneous fishes, lesser sardines, sciaenids, *Pellona*, rays, carangids, catfish and *Upeneus*. Prawns and pomfrets formed 0.9% and 0.2%, respectively.

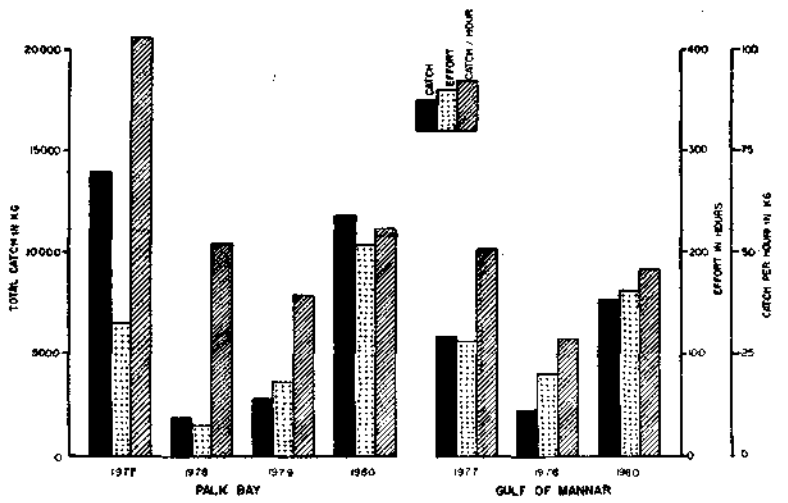

FIG. 5. Yearwise particulars of catch, effort and catch rate obtained by R.V. CADALMIN II for the years 1977-1980 in the Palk Bay and Gulf of Mannar.

The density distribution of silverbellies was higher (41.3 kg|h) in the Palk Bay when compared with that in the Gulf of Mannar (37.9 kg|h). Within the group *Leiognathus jonesi* dominated the catch from the Palk Bay, followed by *L. brevirostris*, *L. berbis* and *Secutor ruconius*. On the other hand, *Leiognathus dussumieri* was the dominant species in the Gulf of Mannar, followed by *L. jonesi*, *L. brevirostris*, *Gazza minuta*, *Secutor ruconius*, *L. bindus* and *L. lineolatus*. The catch rates of sciaenids, *Pellona*, *Upeneus*, pomfrets, cephalopods and miscellaneous fishes were higher from the Palk Bay. Lesser sardines, catfish and rays were more or less equally abundant. *Lactarius lactarius* was obtained only from the Gulf of Mannar, where the catch rate of prawns was also slightly higher.

In the Palk Bay, the catch rate of 'all fish' from the 11-20 m depth was nearly double that from 4-10 m. In the Gulf of Mannar the catch rate from 4-10 m zone was 42.9 kg|h, which was less than 65.9 kg|h obtained from 11-20 m depth zone.

Both in the Palk Bay and the Gulf of Mannar, silverbellies were found to occur in good concentration in the 11-20 m depth zone and carangids and *Pellona* in 4-10 m depth zone. While in the Gulf of Mannar the catch rates of

lesser sardines, catfish, pomfrets and miscellaneous fishes were high from 31-40 m depth zone. Their catch rates were perceptibly good only in 4-10 m depth zone in the Palk Bay. Prawn catch rates were more or less the same in 4-10 m and 11-20 m in the Palk Bay but in the Gulf of Mannar 11-20 m depth zone yielded higher catch rate than 4-10 m depth zone.

Estimated Potential Yield of the Areas Surveyed

Based on the catch and effort data and employing the 'Swept Area Method' the standing stock and potential yield of the different sub-areas surveyed in the Palk Bay and the Gulf of Mannar were estimated (Table 3).

The average standing stock of demersal fish in the Palk Bay ranged from 99.7 t in 9-79|3A to 269.9 t in 9-79|4C, and in the Gulf of Mannar from 35.9 t in 9-78|2F to 251.4 t in 9-78|1F (Table 3). A maximum potential yield of 495.8 kg|sq. km and 461.8 kg|sq. km could be obtained from 9-79|4C in

TABLE 3. *Sub-area-wise standing stock and potential yield of demersal fish.*

Area	Fishable area in sq. kms.	Average standing stock in kg.	Potential yield in kg.
	PALK BAY		
9-79|2C	293.9	148,130	88,878
9-79|3A	326.6	99,670	59,802
9-79|3B	326.6	164,611	98,767
9-79|3C	326.6	267,913	160,748
9-79|3D	326.6	138,589	83,154
9-79|4A	326.6	174,876	104,926
9-79|4B	326.6	194,069	116,441
9-79|4C	326.6	269,855	161,913
	GULF OF MANNAR		
9-78|1F	326.6	251,369	150,821
9-78|2F	163.3	35,863	21,518
9-79|1A	326.6	117,021	70,213
9-79|1B	326.6	153,262	91,957
9-79|1C	326.6	105,470	63,282
9-79|2A	163.3	51,197	30,718
9-79|2B	163.3	75,269	45,162

the Palk Bay and 9-78|1F in the Gulf of Mannar respectively. The estimated potential yield for all the eight sub-areas surveyed in the Palk Bay and seven sub-areas in the Gulf of Mannar were 874.6 tonnes and 473.7 tonnes respectively, with a potential yield of 339 kg|sq. km in the former and 264 kg|sq. km in the latter region.

General Remarks

The trawling survey has brought to light some interesting features. During 1964-65, the catches of the Indo-Norwegian Project vessels had 88.9% silverbellies from the Palk bay and 90.8% from the Gulf of Mannar (Rao 1973). But in the present case silverbellies constituted 76.1% in the Palk Bay and 82.1% in the Gulf of Mannar. Among the miscellaneous fishes in the earlier years, the dominant groups in the Palk Bay were catfish, shark and rays and other fishes and in the Gulf of Mannar other fishes, *Lactarius* and pomfrets (Rao 1973). But the present analysis indicates that the important fish groups in the Palk Bay now are *Pellona,* carangids and sciaenids and the Gulf of Mannar lesser sardines, sciaenids *Pellona,* rays, carangids, catfish and *Lactarius*. Thus there appears to have been a notable change in the composition of fish groups in these regions during the past fifteen years. The seasonal trend of 'all fish' during the present survey shows that the highest yield rate was in the April-June quarter in the Palk Bay and in the October-December quarter in the Gulf of Mannar. In the early 60s the maximum yield per hour was noticed in the October-December quarter in both the Palk Bay and the Gulf of Mannar (James and Adolph 1965). The depthwise analysis reveals that the silverbellies are now dominant in 11-20 m depth zone and catfish, rays, prawns and miscellaneous fishes in 4-10 m depth zone in the Palk Bay, similar to the depthwise distribution observed by Rao (1973). The prawn catches from both the Palk Bay and the Gulf of Mannar were low, probably because the trawling was conducted only during day time. From the available data it is seen that the area 9-78|2F, off Pudumadam, stands out as potentially rich for exploitation of prawns.

During the years 1977 to 1980 CADALMIN II surveyed a total of 2580 sq. km in the Palk Bay and 1796 sq. km in the Gulf of Mannar. A potential yield of 339 kg|sq. km and 264 kg|sq. km in the respective regions estimated could be considered only as provisional, since more than half of the assigned area still remained to be surveyed.

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