

ON THE INCIDENTAL FISHERY OF SKATES AND RAYS OFF CALICUT

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ABSTRACT

The total skates and rays landed as incidental components by the three main gears, trawl net, drift net and hooks-and-lines, accounted for 70.9 t, forming 10% of the total elasmobranch landings of Calicut during 1977-80. The most common species of rays were the sting rays, spotted eagle-ray, and the devil-ray, and the skate, *R. djeddensis*. The trawlers alone landed 95%. The trends of effort, catch and catch rate, examined for the 10-year period 1971-1980, showed that during the earlier half both catch and CPUE had a general upward trend, the former reaching the all-time high of 64 t in 1974 followed by the latter reaching the maximum of 11.9 kg per standard effort in 1975, after which both had descended down steadily to the all-time low of 1980, with clear negative response to effort, indicating the probability that the stock in the area could not stand the type of effort that was put in 1974-75. The reasons peculiar to this elasmobranch group contributing to its easy depletion are pointed out.

INTRODUCTION

With the mechanisation of the fishing industry, and also with the recent intensification of fishing, the all-India production of skates and rays have increased from 35,000 t in 1969 to 56,000 t in 1981, with a peak of 66,000 t in 1974. The all-India average annual catch of elasmobranchs amounted to 55,000 t. For the last ten-year period (1971-80), the elasmobranch production from the west coast amounted to 2,84,750 t (51.49%) as against 2,68,183 t in the east coast of India (CMFRI, 1982).

Skates and rays, producing only limited offsprings, and the recruitment to the fishery being very slow, are a group very vulnerable to intensive fishing. The landings of elasmobranchs in India for 1971-80 shows that the fishery failed to respond to increased fishing in the latter part of seventies (Fig. 1).

MATERIAL AND METHODS

Everyday observations were made at the Vellayil fish landing centre for collection of catch statistics. Samples were collected twice a week for biological observations from the catches of trawlers, drift nets and hooks-and-lines, which

are the gears that land skates and rays in Calicut area. The data collected from January 1977 to December 1980 formed the basis of this study. The trawl/day fishing was taken as standard unit for trawlers. The units of effort of drift net and hooks-and-lines were standardized in relation to this unit effort of trawl. In each month the values of the standardized units were added to the effort under trawl to obtain the total standard effort (SE) and thus all the values were presented in units of the trawl.

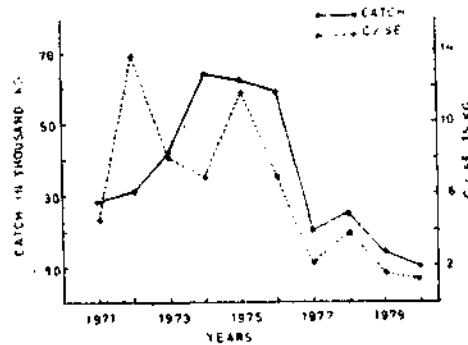


FIG. 1. Catch and catch/standard effort of rays and skates for the years 1977-80.

FISHERY RESOURCES

Skates and rays were caught from September to May. The total landings of skates and rays for the years 1977 to 80 were estimated at 70.9 t, forming 10% of the total elasmobranch landings at Calicut, and 0.25% of the total estimated landings of elasmobranchs along the Kerala coast. The most common species constituting the fishery were the skate *Rhynchobatus djeddensis* (2.6%), the sting rays, *Dasyatis uarnak*, *D. jenkinsii* and *D. sephen* (these three together 68.1%), the spotted eagle-ray, *Aetobatus narinari* (20.3%), the cow-nose ray, *Rhinoptera javanica* (5.4%), and the devil ray, *Mobula diabolus* (3.5%). Others like saw-fishes, *D. imbricatus*, *D. zugei*, *Aetomylus maculatus* and *A. nichofii*, were rarely caught. No fishing was attempted during the S.W. monsoon period. Fishing by trawlers were normally during December to May.

ABUNDANCE AND FLUCTUATIONS

The specieswise catches of the three units for the four-year period (1977-80) are shown in Fig. 2 and the monthly specieswise average catches in Fig. 3. The average catch, effort and CPUE of different gears are given in table 1. Of the four years the year 1978 accounted for better catches, to the tune of 25,715 kg with a catch rate of 3.89 kg per standardised effort (Table 2), 28% over that of 1977. After 1978 the effort, catch and CPUE all steadily declined through the succeeding years. In fact, but for the rise in 1978 (when, in spite of the decrease in effort to 6613 units from 8873 units in 1977 there

TABLE 1. Average catch, effort and CPUE by different gears at Vellayil centre during 1977-80 (in kg).

Month	Mechanised boats			Drift nets			Hooks & Lines			Total		
	E	C	C E	E	E	C E	E	C	C E	SE	C	C SE
Jan.	1,598	2,934	1.8	834	299	0.4	320	22	0.1	1,781	3,255	1.8
Feb.	1,619	3,581	2.2	316	189	0.6	255	18	0.1	1,695	3,788	2.2
Mar.	1,423	2,669	1.9	292	22	0.1	108	57	0.5	1,487	2,748	1.9
Apr.	1,381	5,624	4.1	92	258	2.8	87	50	0.6	1,404	5,932	4.2
May	478	722	1.5	135	21	0.2	101	5	0.1	510	748	1.5
Jun.	20	—	—	11	—	—	44	—	—	24	—	—
Jul.	8	—	—	34	—	—	38	—	—	17	—	—
Aug.	—	—	—	214	17	0.1	220	—	—	54	17	0.3
Sep.	—	—	—	424	127	0.3	428	—	—	106	127	1.2
Oct.	220	1,017	4.6	455	521	1.2	422	—	—	332	1,538	4.6
Nov.	253	60	0.2	358	30	0.1	351	—	—	342	90	0.3
Dec.	1,031	339	0.3	449	16	0.1	317	114	0.4	1,137	469	0.4
Total	8,031	16,946	2.1	3,614	1,500	0.4	2,691	266	0.1	8,889	18,712	2.1

E = Effort

C = Catch in kg

SE = Standard effort

was increase in catch) the catches had been on the decline soon after both the effort and CPUE (11.9 kg per standardized effort) had reached their maximum level in 1975.

A quarterwise analysis has shown that the skates and rays were better fished during the second quarter with a maximum of 6.49 kg per standardized effort in 1978. The third quarter recorded the least catch, and a poor CPUE, because the fishery then came to a close owing to the Southwest monsoon. From table 2 it is clear that merely increasing the fishing effort does not contribute to increasing returns. On the other hand, it has resulted in negative response only.

Gearwise analysis showed that bottom trawls were the most effective gears for this fishery, which contributed 90.5% of the total skates and rays (Table 2), distantly followed by drift nets with 8.2%. A steady reduction in the trawl catch per unit of effort was noticed from 3.89 kg in 1978 to 1.64 kg in 1979 and 1.29 kg in 1980.

Species of the genus *Dasyatis*, contributing to 68.1% of the catches, were the most predominant. Their percentage rose to as high as 81% in 1979. A similar dominance of *Dasyatis* sp. in the catches of elasmobranchs was also observed in the Portonovo and Cuddalore regions on the east coast (Devadoss 1977 and 1978). Next in the order of abundance was *A. narnari*, whose average annual contribution was 20.3%, which rose to 35.8% during 1977.

SUCCESION OF SPECIES IN THE FISHERY

R. djeddensis

R. djeddensis was observed in the fishery during March-April only (Fig. 3). The maximum length of this skate at Calicut was 1940 mm, although the species has been reported to grow 2700 mm in Indian waters (Misra 1955).

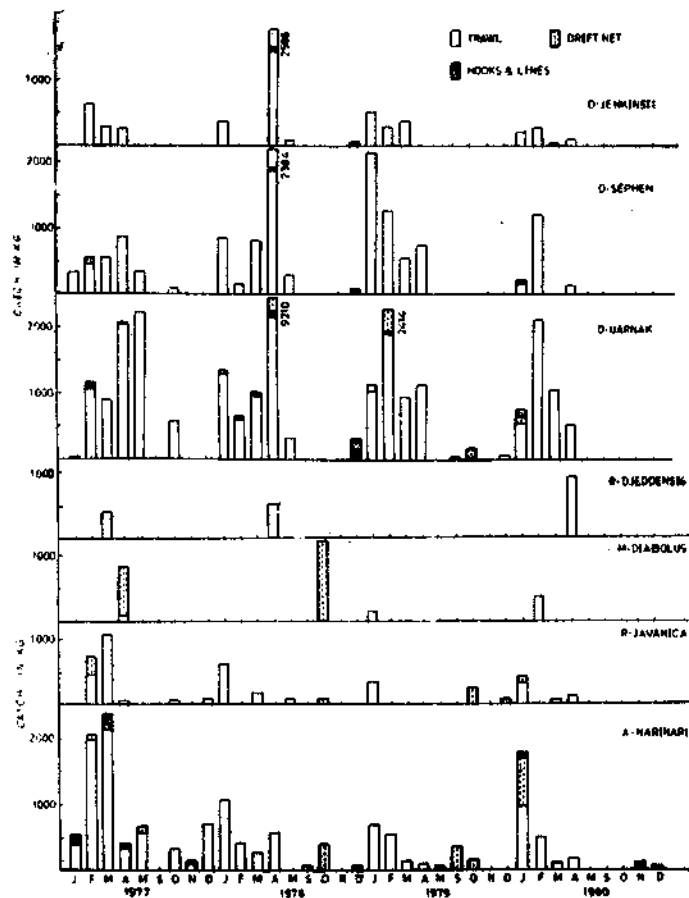


FIG. 2. Specieswise catch of rays and skates for all the four years 1977-80.

The size represented in the trawl catches was 1290-1940 mm. They feed on the bottom fishes, squids, prawns, crabs, *squilla* and polychaetes. *R. djeddensis* is ovoviviparous without placenta, producing 10 embryos a litter. The flesh is much valued both in fresh and salted conditions. There is a particular demand for their fins, which are exported to far east.

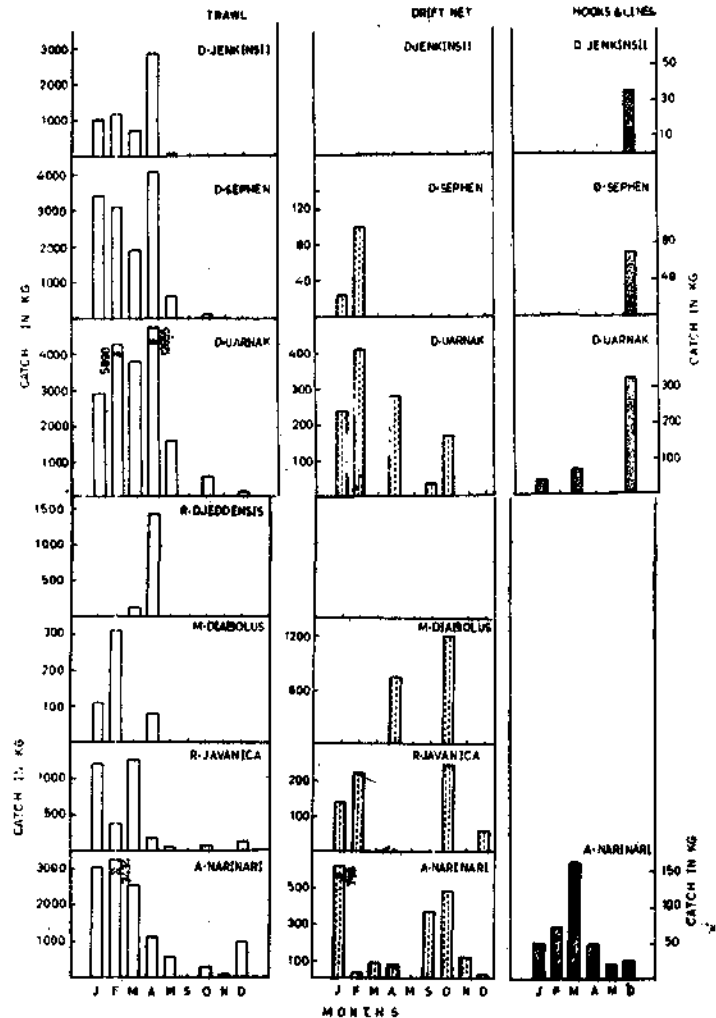


FIG. 3. Gearwise, specieswise average monthly catch of rays and skates.

Dasyatis uarnak

The ray, *D. uarnak*, grows to a size of 1500 mm across the disk and is a voracious feeder devouring any fish and other fauna it would come across, causing extensive damage to the fisheries (Devadoss 1978). The maximum

number of embryos were two, collected from a specimen during January-March period. Free swimming youngs measuring 220 mm were recorded in the months April to June.

D. jenkinsii

D. jenkinsii occurred in the trawl catches and sometimes in the hooks-and-line (Fig. 3). It grows to one meter across the disk. It closely resembles *D. uarnak* except for the colour patterns. It feeds on the bottom fishes, prawns, crabs, *squilla*, *Thennus* and polychaete worms.

D. sephen

D. sephen, known to attain 1800 mm across the disk and to bear only two embryos per pregnancy, formed a good fishery by trawlers from January to May. It was found to feed mainly on polychaetes, prawns forming next in importance. Molluscs and fishes too were found occasionally in the stomach.

Aetobatus narinari

This cosmopolitan ray, reported to grow to 300 cm (Wallace 1967), was the commonest species of the family Myliobatidae in the fishery. Its meat is highly valued. It occurred in the trawl and hooks-and-line catches (Fig. 2 and 3). Sizes up to 150 mm were recorded in Indian waters. Size groups that were common in the fishery are presented in Fig. 4. The main items of food consisted of bivalve, molluscs, prawns and crabs.

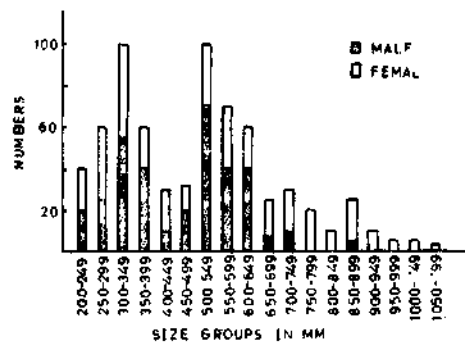


FIG. 4. Size frequency of *Aetobatus narinari* in the fishery.

The ratio of male and female in the catches was almost equal, 1 : 1.04. Females seemed to outgrow males. They mature at 550-600 mm size. The females were found to bear a maximum of 3 embryos at a time. The young ones measured between 200-225 mm at the time of birth.

Rhinoptera javanica

The cow-nose ray, *R. javanica*, was occasionally fished by trawl and drift nets during October to May. James (1962) observed huge catches, more than

500 numbers, in each haul of the shore seines in the Palk Bay and the Gulf of Mannar regions on the east coast. No such magnitude in the catch was ever observed at Calicut during this period. Normally it grows to 150 cm in Indian waters, but the fishery at Calicut was observed with individuals having only 55-120 cm size from October-April (Fig. 3). A casual examination of the gut contents on the landing site revealed the presence of broken bivalve molluscs. Only one embryo was observed in a pregnant female at a time.

Mobula

Large specimens of the devil rays of the genus *Mobula* were also occasionally caught in the drift net and trawl net during October to April (Fig. 3). *M. diabolus* was the common species in the catches. Their size varied from 620-1120 mm. They are known to feed on fishes.

DISCUSSION

A study of the catch data from 1971 to 1980 indicated that the elasmobranch catches rose from 28 t in 1971 to a peak of 64 t in 1974. But the fishery had not only had not kept up the trend afterwards but resulted in a sudden fall to 20 t in 1977 (from 59 t in 1976), in spite of only a marginal decrease in effort. The decrease was only 1% in 1979 and 6% in 1980. Correspondingly, there was also reduction in the CPUE (Table 2). CPUE registered two peaks, one in 1972 and another in 1975, after which it decreased steadily and touched the all-time low of 1980 (Fig. 1). The fact that the Catch and CPUE continued to decline even after reduction in the effort of trawlers appear to point out a probable depletion in the stock, perhaps by overfishing, of this group, which,

TABLE 2. Yearwise and gearwise fluctuations in effort and catch in kg (CPUE) of rays and skates for the years 1977-80.

	Trawl		Drift net		Hooks & lines		Total		
	Units	Catch	Units	Catch	Units	Catch	SE	C	C SE
1977	8,250	18,318 (2.28)	2,201	1,451 (0.52)	1,613	279 (0.17)	8,873	20,048	3.89
1978	5,956	23,178 (3.89)	2,768	2,012 (0.73)	2,049	525 (0.26)	6,613	25,715	3.89
1979	8,020	13,163 (1.64)	3,442	1,243 (0.36)	2,008	21 (0.01)	8,789	14,427	1.64
1980	7,377	9,549 (1.29)	5,343	1,114 (0.21)	5,053	88 (0.02)	8,327	10,751	1.29
Total	29,603	64,208 (2.17)	13,754	5,820 (0.42)	10,723	913 (0.09)	32,602	70,941	2.18

SE = Standard effort (trawl units|days fishing)

because of its low rate of recruitment, is unable to replenish. The elasmobranchs being in the habit of migrating to inshore to liberate their youngones (Springer 1967), the pregnant ones are more vulnerable and the removal of which in large quantities would also account for a depletion during the coming years. Even otherwise, that the lower rate of reproduction places them easily in a vulnerable position in the face of intensive fishing is amply shown by the species like the Californian soup fin shark, *Galiorhinus zyopterus*, (Ripley 1946) and the Australian school shark, *G. australis* (Olsen 1954), which had responded negatively to intensification of fishing.

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