

# A PRELIMINARY STUDY ON THE BIOLOGY AND FISHERY OF *MURAENESOX TALABONOIDES* (BLEEKER) FROM BOMBAY AND SAURASHTRA WATERS

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## ABSTRACT

*Muraenesox talabonoides*, a false conger eel ('wam'), supports an important fishery along the north-western parts of India. It is a predator, taking in a variety of fishes, including eels, and prawns. Length frequency studies showed that recruitment of small juveniles of the species to the trawl fishery is twice a year. The size at first maturity is 125 cm. There appeared to be two spawning periods, one in April-May and the other in September-October. A specimen of 169 cm total length was estimated to have a fecundity of 922,033 ova. The fishery is mainly dependent on the trawling operation and a study of the New India Fisheries Company's vessel landings during 1956-63 showed that 'wam' formed over 10% of the trawl catches and that the southern part of Bombay—Saurashtra waters, comprising Cambay, Veraval and Bombay formed the more productive grounds. The eels were found to move to the deeper zone in the warmer months from April onwards, and move towards the shallower area by September and then move to moderately deep waters up to March.

## INTRODUCTION

Most of the eels recorded from Bombay waters do not have much economic value and though a number of them occur commonly those used for human consumption are very few in number. Amongst the edible eels, *Muraenesox talabonoides* is considered a good food fish and has a flourishing fishery and a rich market. The next in commercial importance is *M. cinereus* but it occurs in small numbers only. *Uroconger lepturus*, *Thyrsoidea macrurus* and *Muraena* (*Gymnothorax*) *meleagris* are of still less economic value and are used as fish bait or consumed as food by the poor people. Some of the *Muraena* spp. are nonedible since they are considered poisonous.

The reports on the fish catches by S.T. *William Carrick* (Hefford, 1923), S. T. *Meena* (Government of India, 1954), M.T. *Ashok*, M.T. *Pratap* and *Taiyo Maru* - No. 17 (*Jayaraman et al.*, 1959) and *Arnalla - Paj* and *Satpati - Pilotan* (*Rao et al.*, MS) show that *M. talabonoides* occurs in fair abundance in the trawler landings of Bombay—Saurashtra waters. Owing to the economic importance of this species and also because of the paucity of information on the subject, the present preliminary study on the biology and fishery of *M. talabonoides* was undertaken.

## BIOLOGY

A total of 560 specimens of *M. talabonoides* was measured for their total length from the landings of the bull-trawlers *Akashi Maru* - Nos 23 and 25 of the New India Fisheries Company and the Government of India fishing vessels during the period August 1964 to August 1965. The food analysis is based on the gut contents of 80 specimens and the maturation study on the gonadal condition of 104 individuals.

*Food and feeding habits*

The food analysis revealed that the occurrence of empty stomach is very common in this fish, about 83% of the stomachs examined. A few fishes that had food in their stomachs indicated a carnivorous and predatory habit. The semi-digested food mostly consisted of *Sciaena* spp. *Polynemus heptadactylus*, *Coilia dussumieri*, *Trichiurus* spp., *Lactarius lactarius*, *Harpodon nehereus* and sometimes even young eels. The crustacean food comprised prawns and crabs.

*Maturation and spawning*

Of the 104 specimens examined, 72 were females and the rest males. The diameter measurements of 300 ova each from four fish were taken. The size of this eel egg is much larger than that of the majority of fish eggs. The ovary in the immature stage is thin and the ova, which are transparent, measure less than 0.2 mm in diameter; the nucleus in the centre is large. As the ovary matures, the eggs increase in size and yolk gets deposited in the cytoplasm. Since the diameter range of the maturing ova is large in this species, for convenience, the ova were grouped into four maturing stages, II, III, IV and V, taking also into account the colour and the size of the ovary in relation to the body cavity. In stage II the ova measure up to 0.29 mm, in stage III to 0.67 mm, in stage IV to 1.05 mm and in stage V to 1.43 mm. In stage VI (ripe) the loosely packed ova measure 1.62 mm and above in diameter, the maximum size observed in the course of this study being 2.2 mm, and are transparent, with a single oil globule measuring about 0.32 mm in diameter. The spent ovary is bloodshot and thin, with the ova measuring less than 0.2 mm in diameter.

The smallest specimen in the running condition in the sample measured 127 cm in total length and spent individuals were in fair abundance in the size group, 120-130 cm. Based on these observations it may be considered that the size at first maturity may probably be at 125 cm being the mid point of this size range.

Spent individuals started appearing in the catch from March onwards, the maximum number being noticed in the month of May. Specimens with gonads in the running condition were met with in April and May. Fully ripe and also spent males were found in abundance in May. A few spent females were noticed in the months of September and October.

The frequency polygons drawn for the ova diameter measurements (Fig. 1) of four fishes, show two modes in each. In the maturing gonads A, B and C of Fig. 1

both the modes represent maturing ova whereas in the ripe gonad D, one represents early maturing eggs and the other ripe eggs distinctly separated from the former. It may be that the two modes appearing in the maturing ovaries, may soon merge into one with the approach of the spawning season since the difference in diameter between them is not much and a fresh batch of eggs may be separated from the

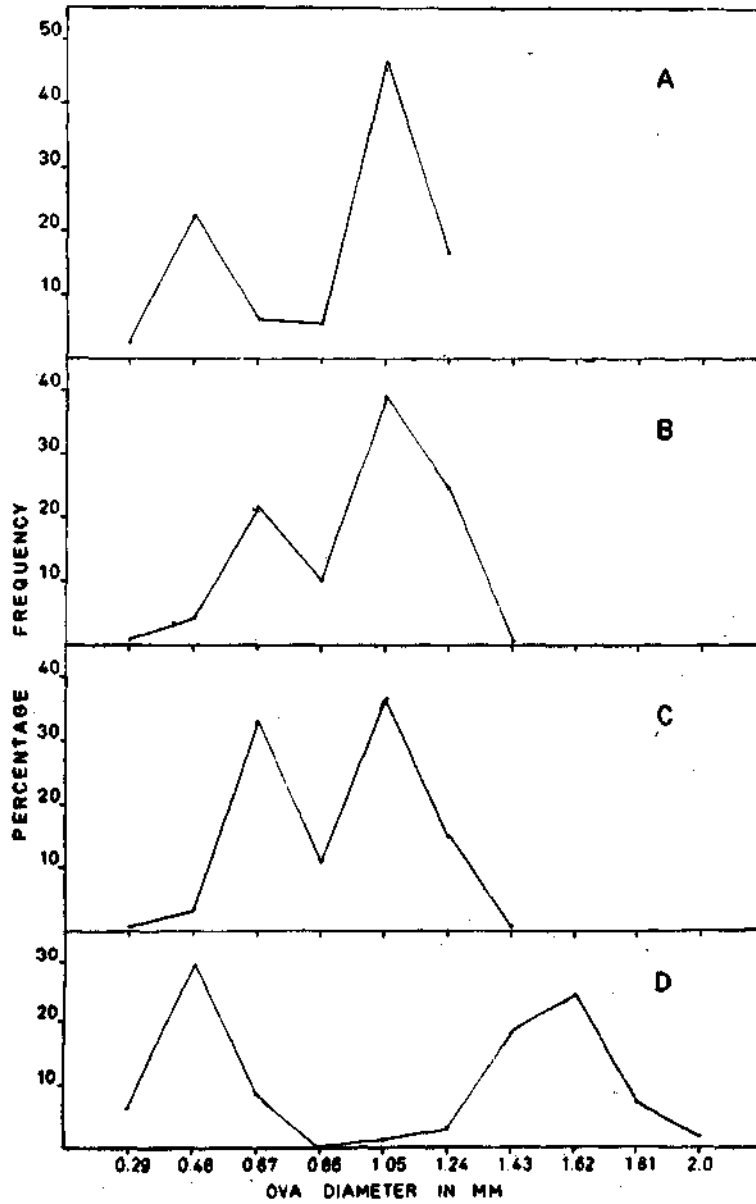


FIG. 1. Ova diameter measurements in *Muraenesox talabonoides*.

general egg stock. From the knowledge of the earlier work by Hickling and Rutenberg (1936), Clark (1934) and Prabhu (1956) on other fishes, the modes in the ripe gonad of *M. talabonoides* observed here clearly indicate two spawnings. There being no smaller groupings in the ripe eggs, it appears that the ova are not shed in batches. Since the abundance of spent individuals was found to be higher in April-May, this period may be considered as the major spawning season and September-October as the secondary spawning season.

Egg counts of six fish of the total lengths 110-169 cm ranged between 306,573 and 922,033. Two fish of the same total length of 126 cm showed difference in their egg counts (639,203 and 363,228), one of them having roughly about half the number of eggs found in the other. This suggests that of the two spawning batches of eggs mentioned earlier, one batch must have already been shed. Nair and Mohamed (1960) collected leptocephali and elvers of *M. talabonoides* from the bag ('dol') net catches at Versova and Sassoon docks during April-June and this period roughly corresponds to the major spawning period as suggested above.

#### *Length frequency*

The size of the fish in the samples obtained from the commercial catches ranged between 60 and 187 cm and these were grouped into 10cm class intervals. The majority of the individuals of the trawl catch measured between 100 and 180 cm in length (Table 1), and the smallest size group in the trawl catch was 55.5 cm in May. In the same month there are three dominant size groups at 85.5 cm, 125.5 cm and at 165.5 cm. In September and October, a size group at 95.5 cm, which nearly corresponds to the size group at 85.5 cm of May, is noticed to enter the fishery. Though the ages of these dominant size groups cannot be fixed, since the age of the elvers is still not known, it is indicative of the recruitment of small juveniles of *M. talabonoides* to the trawl fishery twice a year. As far as the observations reveal, the trawl catch is composed of three dominant size groups.

#### FISHERY

During the five-year period 1962-1966 the marine eels from the Atlantic, Indian and Pacific Oceans gave an annual average yield of 55.4 thousand metric tons, of which congers (family Congridae) were 9.8 thousand and morays (families Muraenidae and Muraenesocidae) 45.6 thousand metric tons. Congers are mainly from France and Spain. The major contribution of the moray eels, to the extent of 30.8 thousand metric tons on an annual average, was from Japan and from India it was 4.9 thousand metric tons.

#### *Marine eel catch of India*

Marine eels have been estimated to contribute annually an average of 6,101 metric tons, forming about 0.82% of India's fish catch, during the period 1956-65 (Govt. of India, Central Marine Fisheries Research Institute, 1956 to 65). The

State-wise distribution of the catch shows that 74.07% of the eel catch comes from Maharashtra, 18.28% from Gujarat, 5.32% from Andhra, 2.13% from Madras (including Pondicherry), about 0.10% each from Kerala and Mysore and a still smaller catch of 0.01% from West Bengal and Orissa. Andamans, Laccadives and Goa do not seem to support any significant eel fishery. Annually about 3% of Maharashtra's total marine fish catch and about 1.14% of Gujarat's marine fish catch consist of eels.

In Maharashtra the major species contributing to the eel fishery is *M. talabonoides* ('wam'). Of the three species of *Muraenesox* in India, Day (1889) reports that this is the rarest, but the present catch data indicate that this is the chief species supporting the eel fishery of this country.

#### Fishing methods

*M. talabonoides* is generally captured in the bag nets, long lines and trawl nets. A bag net ('dol') is a long stationary net fixed to the stakes in the tidal region facing the currents at depths of 15-45 metres. It is operated up to a distance of 35 km from the shore. Long line fishing is the most common method employed in the capture of eels. A unit of this tackle locally called 'khanda' has about 60 hooks of No. 5 or 6 size. Each boat operates about 12 such units with the help of a 5-member crew in waters at depths of 20-30 m. The baits commonly used in this fishing are pieces of sciaenids, clupeids, Bombay-duck, prawns, squilla, squids and also some of the non-edible eels.

TABLE 1. Frequency of occurrence of *M. talabonoides* in the trawler landings of Bombay

Midpoint (cm)	Aug 1964	Sep	Oct	Feb 1965	Mar	Apr	May	June	July	Aug
55.5	—	—	—	—	—	—	1	—	—	—
65.5	—	—	—	—	—	—	1	—	—	—
75.5	—	—	—	—	—	—	1	—	—	—
85.5	—	—	—	—	—	—	5	1	—	—
95.5	—	3	8	—	—	4	4	1	—	—
105.5	2	1	2	—	4	3	7	4	1	—
115.5	3	6	13	—	8	14	25	3	—	—
125.5	9	12	12	—	12	8	33	1	2	2
135.5	19	20	12	—	11	18	24	3	4	3
145.5	20	20	1	1	5	16	19	2	11	6
155.5	10	11	—	5	1	15	12	2	2	2
165.5	3	3	1	2	—	16	32	1	—	1
175.5	—	—	—	3	2	2	5	4	—	—
185.5	—	—	—	—	—	—	2	3	—	—
Total	66	76	49	11	43	96	172	25	20	14

Heavy catches of eels are landed by the trawl nets operated by motor fishing vessels. Although the shallower regions up to about 40 m are frequently covered by these vessels, the depths up to about 90 m are also occasionally exploited.

*Fishery of M. talabonoides by commercial trawlers*

The fishery of *M. talabonoides* described in the following account is based on the catches landed by two sets of bull-trawlers, *Arnalla—Paj* and *Satpapi—Pilotan*, of the New India Fisheries Company in their operations in the Bombay-Saurashtra waters during the period 1956-'63. The vast stretch of the continental shelf is divided into six regions, viz., Bombay, Cambay, Veraval, Porbunder, Dwarka and Kutch and each of these regions is further sub-divided into smaller areas of 600 square nautical miles (Fig. 2).

*Annual trawler landings*

Table 2 shows that annually, 'wam' contributed 7.01 to 21.58% of the trawl landings in the eight-year period from 1956 to 1963. Except in the two years of 1960

TABLE 2. Annual regional catch (catch/hr) in kg and percentage of 'wam' in the landings of New India Fisheries trawlers during 1956-63

Year	Bombay	Cambay	Veraval	Porbunder	Dwarka	Kutch	All regions
1956	10,062 (15.29) 2.5%	306,594 (244.26) 77.3%	22,500 (266.87) 5.7%	1,818 (40.52) 0.5%	55,710 (73.78) 14.0%	—	396,684 (139.51) 17.41%
1957	7,038 (92.88) 1.0%	495,270 (246.37) 70.1%	92,628 (176.67) 13.1%	70,506 (49.44) 10.0%	41,328 (28.90) 5.8%	54 (20.30) 0.0%	706,824 (129.96) 21.58%
1958	2,772 (34.76) 0.5%	312,282 (178.36) 58.0%	96,462 (139.44) 18.0%	50,779 (36.38) 9.4%	75,826 (85.58) 14.1%	90 (2.41) 0.0%	538,211 (106.76) 15.03%
1959	9,522 (103.78) 2.4%	227,268 (177.50) 58.1%	64,332 (126.90) 16.5%	29,088 (31.84) 7.4%	20,412 (24.55) 5.2%	40,806 (59.85) 10.4%	391,428 (90.91) 14.39%
1960	414 (36.83) 0.1%	13,122 (91.22) 4.4%	47,398 (122.82) 15.9%	34,110 (37.54) 11.5%	7,524 (20.39) 2.5%	195,632 (58.42) 65.6%	298,200 (57.71) 7.01%
1961	36 (20.57) 0.0%	123,102 (187.92) 41.2%	31,482 (76.43) 10.6%	29,988 (46.24) 10.0%	12,618 (52.82) 4.2%	101,772 (38.29) 34.0	298,998 (64.80) 7.59%
1962	162 (28.47) 0.1%	253,188 (349.76) 66.2%	42,354 (160.51) 11.1%	34,470 (37.27) 9.0%	3,078 (21.91) 0.8%	49,032 (25.98) 12.8%	382,284 (96.89) 10.75%
1963	72 (13.71) 0.0%	200,006 (265.60) 57.0%	24,966 (70.91) 7.1%	83,412 (84.73) 23.8%	3,726 (31.39) 1.0%	39,540 (29.28) 11.1%	351,722 (99.19) 13.11%
Average	3,760 (30.84) 0.9%	241,354 (225.23) 56.4%	52,765 (131.05) 12.3%	41,771 (44.87) 9.8%	27,528 (46.48) 6.4%	60,989 (42.92) 14.2%	420,544 (96.40) 12.8%

and 1961, this species always formed above 10% in the total landings. The highest catch of 706,824 kg with the highest percentage of 21.58 at a catch rate of 129.96 kg/hour, was in 1957. The highest catch rate of 139.51 kg/hour of 'wam' was obtained in 1956. In the bull-trawler operations by M.T. *Ashok* and M.T. *Pratap* during the fishing season of December 1953 to May 1954, the monthly percentages of 'wam' were low and ranged between 1.71 and 10.36 (Jayaraman *et al.*, 1959).

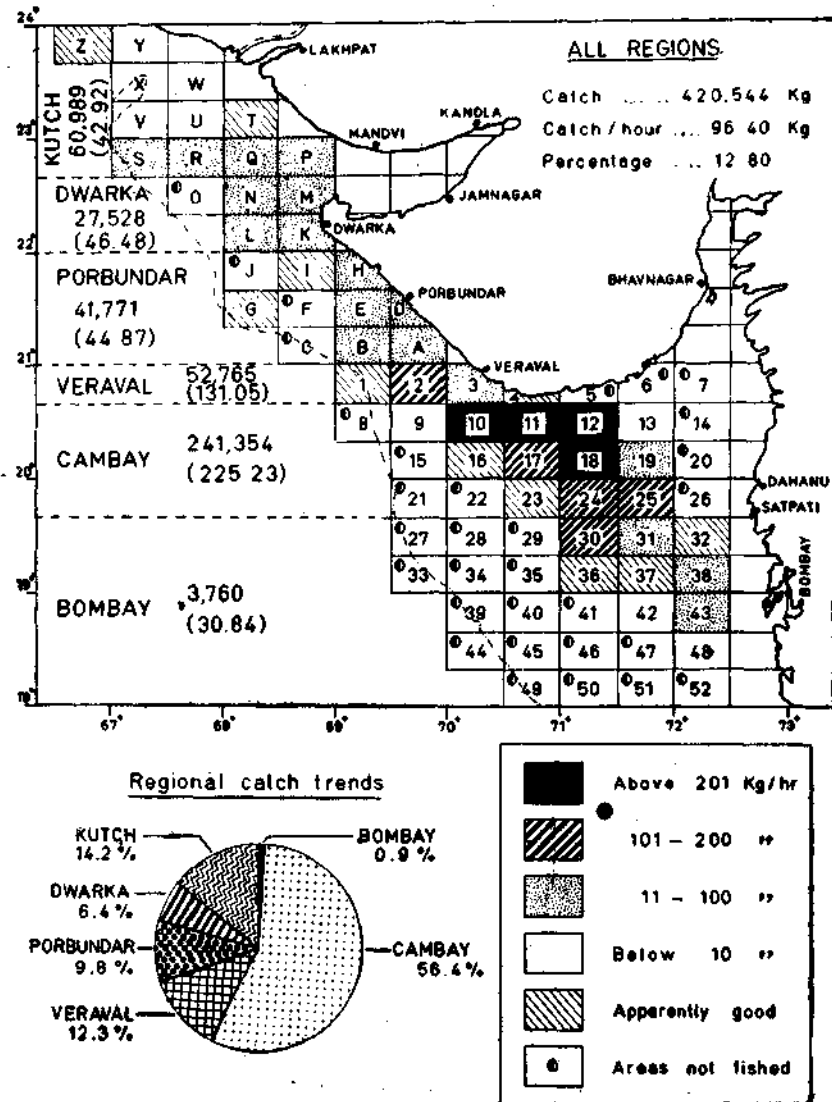


FIG. 2. Average annual landings and distribution pattern of the 'wam' grounds in Bombay-Saurashtra waters fished by the New India Fisheries trawlers in 1956-63.

*Regional abundance*

The relative richness in the distribution of 'wam' in the six regions of the Bombay and Saurashtra waters can be judged from Table 2.

From the table it is clear that 'wam' was more abundant in Cambay than in any other region. Veraval ranked next. Porbunder, Dwarka and Kutch regions were almost alike in their 'wam' yield. The abundance in the Bombay region could not be assessed fully since it was not adequately fished by the New India Fisheries trawlers. Rao *et al.* (1966) ranked Bombay third, next to Veraval, basing their observations on the average yield for the period 1957-62; but in 1956 when there was heavy fishing in this region for about 703.92 hours the yield was only 10,062 kg at the rate of 15.29 kg/hour. Bombay region did have a place for 'wam' in the trawl fishery in the earlier period of 1949-55, when it was fished well (Jayaraman *et al.*, *op. cit.*). The productive areas are shown in Fig. 3.

*Cambay*—Areas 10, 11, 12 and 18 with the exception of a few years, yielded 'wam' at the rates of more than 200 kg/hour, the areas 17, 24 and 25 between 100 and 200 kg/hour and 19 less than 100 kg/hour. Apart from these some areas were fished rarely; 9 and 13 fished in one or two years recorded no catch and 16 and 23 fished in only one year registered more than 100 and 200 kg/hour respectively.

*Veraval*—Only the areas 2 and 3 were fished very regularly. Excepting in 1956, the catch rates from area 2 were always higher, ranging between 108.82 and 290.02 kg/hour, (average 180.2 kg per hour) as against 38.32 and 329.17 kg/hour, with an average of 94.68 kg/hour, in the area 3. Area 1 fished in 1956 and 1958 recorded the same catch of 198 kg and the same catch rate of 148.87 kg/hour for both the years. However, there are indications that if sufficiently exploited, this ground may prove to be a good one for 'wam'. The area 4 fished only once in 1961, gave only a low catch of 54 kg at a catch rate of 46.15 kg/hour.

*Porbunder*—Of the four regularly fished areas A, B, D and E, A was the best exploited. H was fished regularly from 1960 onwards and the areas G and I were each fished in only one of the years during this period. The catch rates for 'wam' in most of the years were the highest in the area B, between 15.84 and 172.17 kg/hour. The area A usually had fairly high catch rates, between 28.10 and 193.32 kg/hour. These two areas A and B may be considered as almost equally rich with an average catch of over 65 kg/hour. The areas D, E and H usually had given very moderate catch rates ranging between 22 and 35 kg/hour. The areas G and I recorded good catch rates of 57.60 and 86.58 kg/hour respectively, the latter also was the highest catch rate of all the areas fished during that year. Yet it is too premature to comment on their richness since they have not been adequately fished.

*Dwarka*—The areas K, L, M and N of this region recorded moderate annual catch rates, with K ranking last as the catch rates from this area did not exceed



57.28 kg/hour. Area L had 200, M 109.33 and N 124 kg/hour. Areas L, M and N appeared to be more or less equally good in their 'wam' yield recording an annual average of 50 to 65 kg/hour while K was poor, with about 20 kg/hour.

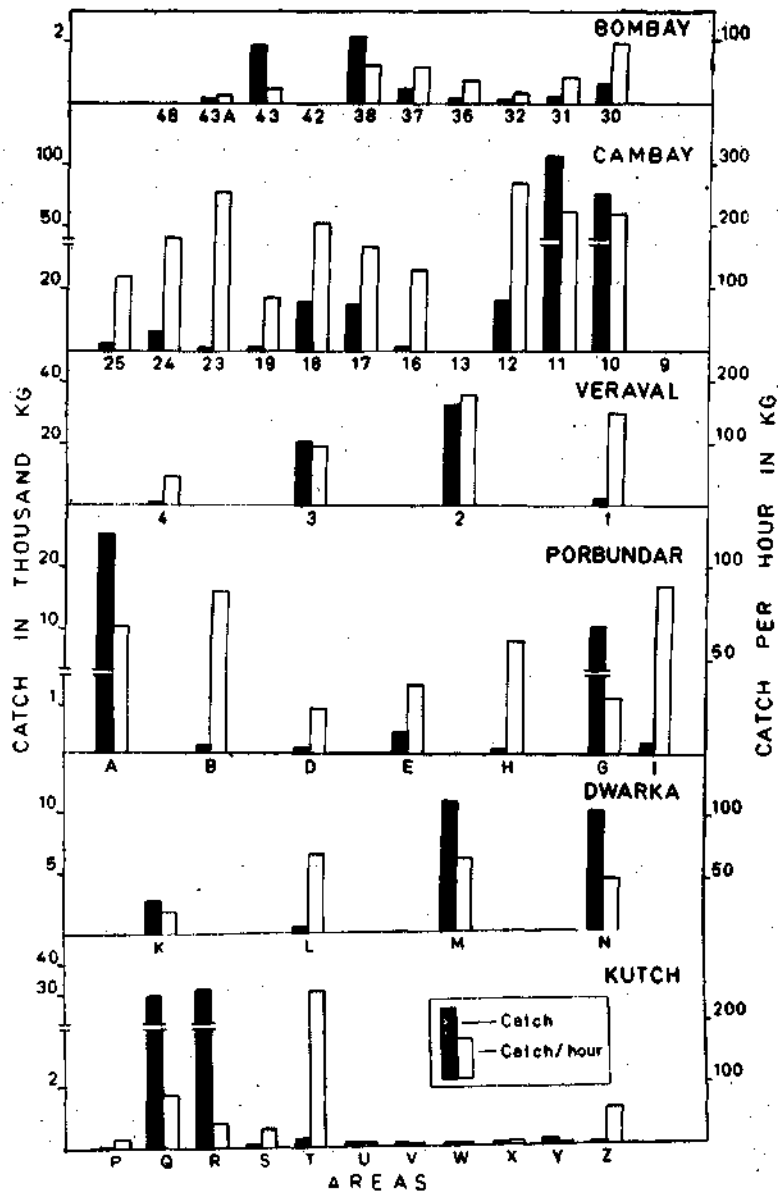


FIG. 3. Average annual area-wise distribution of 'wam' catch and catch rate in the different regions of the Bombay-Saurashtra waters fished by the New India Fisheries trawlers in 1956-63.

*Kutch*—Amongst the eleven areas in Kutch region, the area Q generally recorded slightly better catch rates, P, R and S a little lower catch rates and all the rest of the areas extremely poor catch rates. The highest catch rate of 327.18 kg/hour was from the area T of this region during 1960, but in the very next year the catch from here was nil. Area Z recorded a moderate catch rate of 62.06 kg/hour in 1960.

*Bombay*—In the Bombay region which is the least exploited, areas 43, 38, 31 and 30 were fished more than the other areas. Considering the poor fishing in this region, records of the catch rates often over 100 kg/hour in some years suggest that these are good grounds for 'wam'. Areas like 48, 43A and 42 were poor and 37 and 36 which were fished only once yielded moderate catch rates of 56.79 kg and 36.00 kg/hour respectively.

*Seasonal abundance (Table 3)*

*Cambay*—In this region 'wam' was observed to form a good fishery from April to October, after which the catches dwindled to less than 1%. In five out of eight years of fishing, the highest 'wam' catch was during August, with percentages ranging between 27.1 and 82.0. In one year the maximum yield of 58.8% came in July and in two other years the maximum yields of 39.8% and 64.2% were during September. The 'wam' season in Cambay region is thus from April to October with the peak during July to September.

*Veraval*—The 'wam' fishery in Veraval commences in April and lasts up to September. The highest catches were distributed almost equally during the two months of June and July in different years and there were records of good catch rates in August in most of the years. The season for 'wam' fishery in this region appeared to be shorter than that in Cambay, with the peak period from June to August, slightly ahead of that in Cambay.

*Porbunder*—The 'wam' season was not clearly recognizable in this region. In all the years most of the months have recorded good percentage catches for this species. September October and to some extent November appeared to be the lean months while the catch improved from December onwards. The period of best yield was May - August, which was in advance of that in Veraval.

*Dwarka*—Mostly there was no fishing during the monsoon months of May to September in this region. The percentage catches were more or less evenly distributed all through in most of the years. However, the average monthly catch rates were relatively higher from August to November with the exception of September.

*Kutch*—No definite 'wam' season had been noticed in the Kutch region. The species occurred all through the year without exhibiting any high percentage catch in any period.

TABLE 3. Average monthly catch (catch rate) in kg and percentage in the total 'wam' landings of New India Fisheries trawlers from the different regions during 1956-63

Month	Cambay	Veraval	Porbunder	Dwarka	Kutch
January	237 (9.26) 0.1%	522 (19.75) 0.9%	2,147 (17.56) 4.7%	604 (6.42) 1.7%	3,343 (9.84) 3.2%
February	364 (11.75) 0.1%	165 (6.45) 0.3%	1,656 (16.93) 3.6%	1,347 (12.62) 3.7%	2,664 (7.88) 2.5%
March	1,325 (40.04) 0.5%	296 (15.40) 0.5%	2,760 (19.94) 6.0%	2,070 (18.18) 5.6%	10,010 (35.59) 9.5%
April	7,391 (131.37) 2.8%	1,289 (68.38) 2.3%	3,906 (44.09) 8.5%	1,206 (30.34) 3.3%	12,262 (52.41) 11.7%
May	18,754 (199.85) 7.1%	3,939 (102.39) 6.9%	5,497 (82.27) 12.0%	216 (12.60) 0.6%	19,710 (103.70) 18.7%
June	17,007 (194.65) 6.4%	18,841 (189.03) 33.0%	11,440 (61.25) 25.0%	198 (12.68) 0.5%	1,732 (58.63) 1.6%
July	27,628 (243.69) 10.4%	17,829 (163.29) 31.2%	13,295 (76.32) 29.0%	342 (19.44) 0.9%	3,474 (48.19) 3.3%
August	96,862 (303.87) 36.6%	10,582 (207.61) 18.6%	1,962 (81.47) 4.3%	1,080 (114.52) 2.9%	20,784 (137.92) 19.8%
September	53,367 (212.06) 20.2%	2,891 (169.75) 5.1%	216 (25.68) 0.5%	1,476 (37.19) 4.0%	6,498 (34.24) 6.2%
October	40,727 (228.67) 15.4%	94 (20.34) 0.2%	156 (9.58) 0.4%	4,582 (123.53) 12.5%	15,222 (99.71) 14.5%
November	108 (17.70) 0.1%	112 (19.71) 0.2%	802 (17.78) 1.8%	21,464 (130.82) 58.5%	6,156 (47.29) 5.8%
December	768 (31.65) 0.3%	477 (13.48) 0.8%	1,934 (21.26) 4.2%	2,114 (19.29) 5.8%	3,303 (17.51) 3.2%

*Bombay*—The fishing was discontinuous. Still the highest percentage of 'wam' appeared in May in most of the years. In 1958 the highest percentage catch of 37.7 was in March and in 1956 the highest catch of 40.6% was in July. This suggests that the season might be early for this region, between March and July.

Observing the seasonal catch trends of the Government of India vessels of the Bombay base for 1961-67, Rao *et al.* (MS) have stated that 'wam' yields are best obtained in the second quarter with high catch rates. In the present study it has been found that, in general, the yields and the yield rates are highest in the third quarter, July-September, in the southern regions of the Bombay-Saurashtra waters, and no definite seasonal variation has been found in the northern regions. The above difference may be due to the fact that there has been more intensive fishing in the monsoon months by New India Fisheries Company's vessels than by the Government of India vessels. Rao (1969) has pointed out that the yield and yield rates of prawn and 'wam' are particularly high in the monsoon months in Bombay and Saurashtra waters, which is in agreement with the present findings.

#### *Depth-wise distribution*

In 1962 the fishing operations were carried out between the depths 20 and 72 m in different regions. This depth range was divided into five-metre intervals to study the seasonal distribution pattern of 'wam' in relation to depth (Table 4).

TABLE 4. *Depth-wise distribution of 'wam' in different regions in the landings of New India Fisheries trawlers in 1962 : catch (catch rate) in kg*

Depth (metres)	Cambay	Veraval	Porbundar	Dwarka	Kutch
16-20	—	—	—	—	288 (248.27)
21-25	—	—	936 (225.00)	0	684 (19.02)
26-30	648 (111.14)	0	54 (9.81)	190 (12.96)	6,017 (10.04)
31-35	46,728 (499.33)	216 (28.49)	1,566 (20.30)	810 (18.53)	8,496 (13.01)
36-40	91,980 (460.26)	2,610 (61.18)	2,862 (11.03)	2,016 (27.03)	9,730 (30.30)
41-45	25,722 (279.58)	27,378 (250.39)	21,762 (49.28)	72 (21.11)	5,364 (45.88)
46-50	15,390 (244.05)	3,888 (79.44)	7,974 (56.61)	—	3,690 (95.64)
51-55	12,564 (220.61)	2,898 (115.41)	252 (13.41)	—	1,800 (148.88)
56-60	22,392 (259.04)	4,824 (194.98)	—	—	5,508 (128.72)
61-65	30,888 (427.33)	340 (125.00)	—	—	414 (47.69)
66-70	6,444 (167.62)	—	—	—	126 (58.06)
71-75	396 (169.95)	—	—	—	—

Note: In Bombay region 162 kg at 69.23 kg/hr was obtained in 41-45 m depth zone.

Cambay, the best region for 'wam', recorded good catch rates of over 110 kg/hour at all depths fished between 26 and 75 m. Between 41 and 60 m the catch rates were over 220 kg/hour and in the shallower depths of 31-40 m and in the deeper waters of 61-65 m the catch rates were over 427 kg/hour. In Veraval, the best yield of 250.39 kg/hour was from the depth of 41-45 m, followed by 194.98 kg/hour from 56-60 m. In the Porbunder region the maximum of 225 kg/hour was from the shallower regions of 21-25 m, followed by 56.61 kg/hour from the deeper waters of 46-50 m. In Dwarka, however, the concentration of this species in any one particular depth zone was not evident and the highest catch rate of 27.03 kg/hour was from the 36-40 m depth zone. The shallower depth of 16-20 m in the Kutch region recorded the maximum catch rate of 248.27 kg/hour and the deeper zone of 51-55 m ranked next with a catch rate of 148.88 kg/hour.

From the above it is noticed that in most of the regions, there appears to be two depth zones with concentration of eels, one the shallower area of 16-45 m and the other the deeper one beyond 51 m.

An examination of the monthly depth-wise distribution of the catch shows, in general, that from January to March 'wam' inhabits rather moderately deep-water grounds. With the approach of the warmer months, i.e. from April onwards, the fish moves to deeper waters where concentration is highest from May to July. There is a sudden movement to the shallower areas in September. Thereafter the concentrations increase gradually in moderately deeper waters, a condition which lasts till March. Their movement into the deeper waters during the May - July period appears to suggest that the fish avoids the more turbulent shallow water zones in monsoon and seeks shelter in comparatively calmer waters at deeper zones.

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