OBSERVATIONS ON THE FISHERY OF BOMBAYDUCK, *HARPODON NEHEREUS* (HAMILTON), ALONG THE SAURASHTRA COAST

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ABSTRACT

The bombayduck, *Harpodon nehereus* (Ham.), formed 68 to 77% of the Dol net landings at Nawabunder along the Saurashtra coast. Estimated catches of 4,700 t, 2,690 t and 3,560 t were landed respectively during the years 1976-77, 1977-78 and 1978-79. The catch per haul declined from 126.7 kg to 57.8 kg over the period. Generally, the season begins with September with high catches, but by the end of January the catch declines. With intensive recruitment of fish during February-March and with the suspension of fishery during June-August because of the monsoon, the stock, however, gets replenished for the coming season.

The size composition of fish reveals that the bombayduck fishery is mainly on juveniles. The size group 45-60 mm is dominant in the catch in most of the months. The adult fish form only 8.5 to 11.8% of the catch. The percentage of adult fish is still less during February-May (4.4%). The fish appears to attain the size of 199 mm during first year, 288 mm during second year and 330 mm third year.

INTRODUCTION

Setna (1939, 1949) and Gokhale (1957) described the craft and gear employed and their mode of operation for bombayduck fishery in Maharashtra and Saurashtra regions and Bapat et al (1951), Bapat (1970) and Bapat and Alawani (1973) reported on the bombayduck fishery along the Maharashtra coast. But very little information is available on the fishery along the Gujarat coast, where the bombayduck fishery is confined to three regions, namely, Umbergaon to Kavi along the south Gujarat, Siyalbet to Diu along the Saurashtra, and Takkara to Modhwa in the Gulf of Kutch (Zafar Khan 1983). There are three major fishing centres along the Saurashtra coast, namely, Jaffrabad, Rajpara and Nawabunder. The present paper deals with the data collected at Nawabunder during 1976-77 to 1978-79, where, during 1976-77, about 110 boats were under operation. The nonmechanized boats were more in number than the mechanized boats, though there has been an increasing trend towards mechanization. Most of the nets were of polyethylene monofilament plastic twine.

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Catch and Effort

The bombayduck formed about 68 to 77% of the Doi net catch. Estimated catch, effort and catch per haul for 1976-77 to 1978-79 and their averages are shown in Table 1. An estimated catch of 4,700 t was landed during 1976-77 for an effort of 37,108 hauls, at a catch rate of 126.67 kg per haul. In the following season, 1977-78, 2,691 t were landed against an effort of 43,840 hauls, the catch rate being 61.37 kg per haul. During 1978-79, for an increased effort of 59,972 hauls, 3,292 t were landed, but with a lower catch rate of 57.8 kg per haul.

The monthly averages of catch and effort for the three seasons indicated that the peak of abundance was during October-December, when the catch ranged between 534.8 and 744.3 t. But for a fall in February the fishing activity was at its height from October to April (4,950 to 7,653 hauls). The low effort in February was due to a break in the effort of immigrant south Gujarat fishermen, who left for their home place for a month.

Taking the average for all seasons, the catch per haul was high in the beginning of the season (155.6 kg). Subsequently there was a gradual decline, and the lowest catch per haul was in January (34.0 kg). February onward it again increased steadily to reach 100.5 kg in May.

Size Composition

The size of bombayduck ranged from 15 mm to 345 mm in length. The monthly percentage frequency of length at 15 mm intervals shows that the dominant mode, at 45-60 mm, was present in all the months except September and November. Large-sized specimens, belonging to the size groups 195-210 mm to 255-270 mm, appeared in the catch in some months.

A total of 9 modes (Fig. 1), *a* to *i*, were taken into account to estimate growth rate. All these modes were tabulated to obtain average monthly growth rate. It is evident from the figure that the mode at 52.5 mm has progressed to 262.5 mm in 18 months.

The average monthly growth rates have been used to calculate L_∞, K and t_o which are as follows:

L_∞: 367 mm, K: 0.0634 and t_o: -0.282

Graphic representation of L_∞ and t_o are given in Figs. 2 and 3. Based on the annual values of K and t_o Von Bertalanffy growth equation is expressed as:

$$Lt = 367\ (1-e^{-0.761\ (t\ +\ 0.024)}$$

TABLE 1. *Catch in t* (C), *fishing effort in No. of hauls* (E) *and catch per unit of effort in kg* (CUPE) *of bombayduck for the period* 1976-77 *to* 1978-79.

	1976-77			1977-78			1978-79			Average for 3 years		
	C	E	CPUE	C	E	CPUE	C	E	CPUE	C	E	CPUE
Sept.	128.8	759	169.7	93.8	784	119.6	160.6	920	174.6	127.7	821	155.6
Oct.	790.2	5,340	148.0	585.0	4,232	138.3	690.4	6,272	110.0	688.5	5,281	130.4
Nov	726.5	6,072	120.0	300.2	5,334	56.3	577.7	10,791	53.5	534.8	7,399	72.3
Dec	688.4	6,900	99.8	891.6	6,880	129.6	652.8	9,180	71.1	744.3	7,653	97.3
Jan	384.8	6,342	60.7	228.3	5,684	40.1	66.1	7,920	8.4	226.4	6,649	34.1
Feb	164.2	1,440	114.0	67.8	2,346	28.9	204.6	4,998	40.9	145.5	2,928	49.7
Mar	641.6	4,056	158.3	82.2	5,185	15.9	131.9	5,608	23.5	285.2	4,950	57.6
Apr	643.4	4,160	154.7	230.8	10,325	22.4	735.5	8,280	88.8	536.6	7,588	70.7
May	532.6	2,039	261.2	211.0	3,070	68.7	72.0	3,003	24.0	271.9	2,704	100.5
Total	4,700.5	37,108	126.7	2,690.6	43,840	61.4	3,291.5	56,972	57.7	3,560.9	45,973	77.5

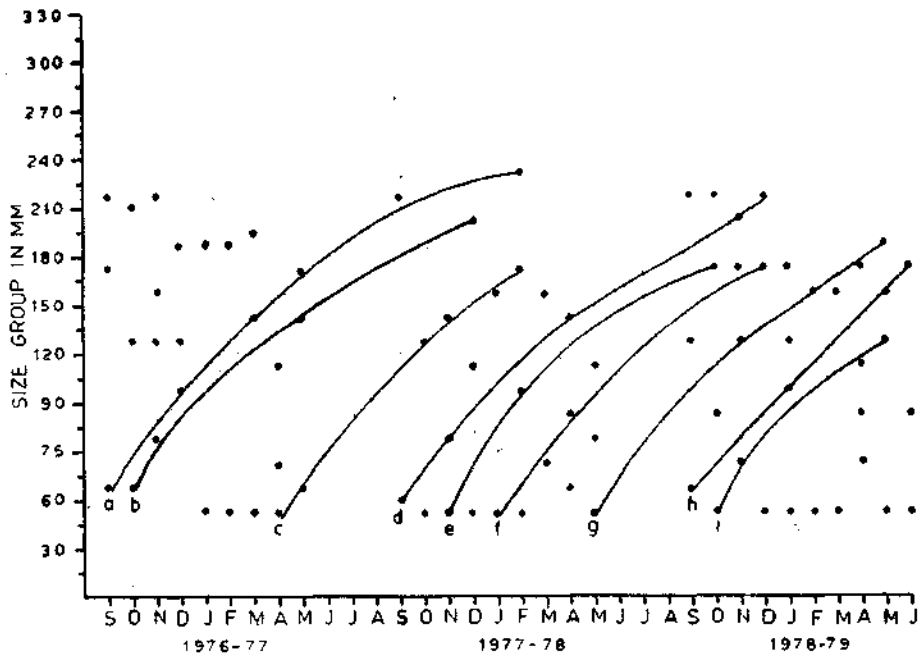

FIG. 1. Dominant modes present in the catch and their progress.

Based on the Von Bertalanffy growth equation the fish is estimated to grow to 199 mm the first year, to 288 mm the second and to 330 mm the third year.

The average sizes of fish for 1976-77, 1977-78 and 1978-79 were 114 mm, 110 mm and 120 mm, respectively (Table 2). In 1976-77, comparatively lower average sizes were recorded in February and March (64 and 70 mm), when the catch per haul in number was very high (32,986 and 37,045), indicating that a large number of young ones are recruited into the fishery during this period. Although the lowest average size was observed in March (97 mm) in the second year and February (71 mm) in the third year, the catch per haul in number was low during these periods indicating poor recruitment during the two seasons.

When the catches were estimated numberwise, the number per kg showed peaks, which are as follows: the first year in October (93), in February (289) and in March (234); the second year in October-November (165), in March (127) and in May (126); the third year in November (110), in December (128), in February (163) and in March (152). This indicates the possibility

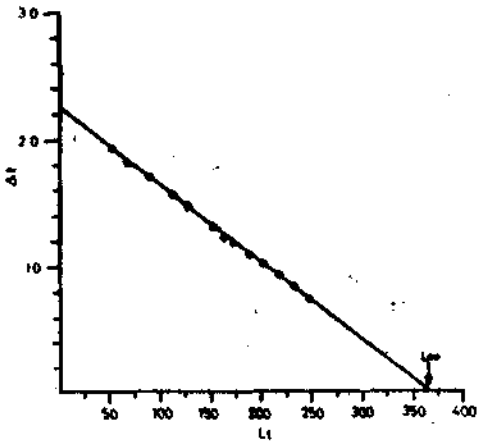

FIG. 2. Monthly increment against Lt.

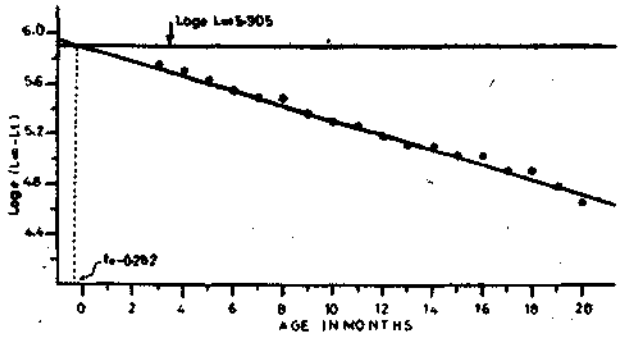

FIG. 3. Loge (L —Lt) against age in months.

of the bombayduck's having two peak periods of recruitment every year along the saurashtra coast, with the recruitment at times prolonged as was in the case of the second two years under study. It is also evident that the second recruitment (February-March) was more intensive than the first. The data also reveal that the bombayduck fishery at Nawabunder is mainly supported by juveniles, the percentage of adult fish in the catch being only about 11.8%, 8.5% and 10.5%, respectively for the three seasons.

Remarks

Banerji (1973) had stated that the fishery for bombayduck begins by September on the west coast of India, after the S.W. monsoon, and remains in full swing till the end of January. According to him the fish move away from the inshore waters by February and reappear in big shoals by next September-October. But the average catch rate of 3 seasons presently studied reveals (Table 1) that, on the Sourashtra coast, the catch rate is high in the beginning

TABLE 2. *Monthwise averages of number per haul, size and number per kg of bombayduck during the years* 1976-77 *to* 1978-79.

Month	1976-77			1977-78			1978-79			Average of 3 years		
	Number/ haul	Average size (mm)	No. of fish per kg	Number/ haul	Average size (mm)	No. of fish per kg	Number/ haul	Average size (mm)	No. of fish per kg	Number/ haul	Average size (mm)	No. of fish per kg
Sept	8,566	133	50	7,840	108	66	8,617	140	49	8,353	124	54
Oct	13,740	122	93	22,830	103	165	1,661	164	15	11,365	120	90
Nov	4,162	132	35	9,269	103	165	5,909	125	110	6,239	124	86
Dec	3,317	145	33	3,885	147	30	9,079	86	128	5,791	134	60
Jan	3,838	124	63	1,240	146	31	423	148	51	1,742	135	51
Feb	32,986	64	289	1,989	117	69	6,667	71	163	9,724	85	196
Mar	37,045	70	234	2,020	97	127	3,571	98	152	12,173	78	211
Apr	18,116	99	117	1,790	115	80	5,966	138	67	6,292	118	89
May	7,770	145	30	8,688	102	126	1,299	148	54	5,722	129	57
Average for the year	11,893	114	94	5,616	110	92	4,829	120	84			

of the season, but decreases as monsoon advances. Heavy recruitment of young ones takes place in February-March consequently increasing the catch rate. Further, there is an inadvertent protection provided to the fishery during June-August when fishing is suspended for the monsoon, which might also contribute to the usually high catch rates in the beginning of the season.

Kesavan Nair and Balakrishnan (1957) had observed that the catch in Gujarat in the first quarter (January-March) was higher than in the second quarter (April-June) but vice versa in Maharashtra. They had attributed this to the movement of fish from Gujarat to Maharashtra during April-June. But the data in the present observations (Table 3) show that the catch during the second quarter was higher than the first, though there was fishing only for two months. The monthly catch rates of three years also indicate higher catch rate during second quarter than the first. Hence, the present findings do not agree with the observations made by these authors.

TABLE 3. *Quarterwise bombayduck landings at Nawabunder for the period from* 1976-77 *to* 1978-79.

Year	1st quarter Jan.-Mar.	2nd quarter Apr.-June	3rd quarter July-Sept.	4th quarter Oct.-Dec.
1976-77	1,190.59	1,175.99	128.775	2,205.128
1977-78	378.24	441.755	93.8	1,776.805
1978-79	402.59	807.495	160.608	1,920.865
Average	657.14	808.413 _	127.728	1,967.599

The growth has been estimated at 199 mm in the first year, 288 mm in the second year and 330 mm in the third year, indicating that the fish grows at a faster rate than what has been observed by the earlier workers (Krishnayya 1968 and Bapat 1970). K. value (0.761) is also suggestive of higher growth rate. Pauly (1978) too estimated higher K value (0.52) from Bambay region.

The presence of young ones almost throughout the year indicates that the fish breeds throughout the year. The data on number of fish per kg reveal two peak periods of recruitments. One in October-November and the other in February-March, the latter being more intensive than the former. Bapat (1951) also found that Bombay duck, though a continuous breeder, has two peak breeding periods, viz., May-July and November-December.

The average size of fish varied between 64 to 164 mm during the 3 fishing seasons. The adult fish formed only 8.5-11.8% of the catch. Bapat and

Alawani (1973) had found that there were 7-10% adult fish in the catch at Versova during 1968-69 to 1970-71. In the Saurashtra coast the adult fish formed 16.7% of the catch during September-January, whereas it formed only 4.4% of the catch during February-May.

The whole fishing season for bombayduck along the Saurashtra coast can thus be divided into two periods, i.e., September-January, which is more productive and with less juveniles, and February-May, which is less productive, with juveniles for the most part, suggesting that a regulation of the Dol fishing during the latter period may be helpful in sustaining the bombayduck fishery along the Saurashtra coast.

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