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THE BOMBAY DUCK*

Introduction

The Bombay duck, *Harpodon nehereus* (Hamilton) constitutes a fishery of great commercial importance in the country. It occurs along both the coasts but about 98% is caught from the west coast. The major catch is landed in the Satpati-Dahanu area of Maharashtra and the Jaffrabad-Nawabunder area of Gujarat. The season for Bombay duck lasts from September to May or June with the bulk of the landings taking place during October-December.

The annual average catch of Bombay duck during 1960-69 period was about 84,000 tonnes and formed about 10% of the marine fish catch. The landings did not show much fluctuations from year to year and the catch ranged from 73,894 t. in 1965 to 1,08,564 t. in 1960. The percentage of Bombay duck to the total marine fish catch varied from 8.35 to 14.02 in 1969 and 1963 respectively. The annual average catch of Bombay duck during the subsequent ten years also remained more or less the same forming 6.78% though within that period the maximum catch was 1,25,481 t. recorded in 1978. During this year Bombay duck constituted 8.94% of the total marine fish landings.

The Bombay duck is exploited by indigenous crafts and gear, the most important gear being 'dol' net (bag net) operated upto 40 m depth. The fishery is supported largely by fishes ranging in size between 90 and 300 mm belonging to 0-2 year classes.

All India Bombay duck production (Table 1)

The highest all India Bombay duck catch, during the seventies was in 1978. In 1979 also the landing was very good. However, fluctuations were noticed in the landings during 1970-77. In general the catch declined considerably from 1970 to 1972 and thereafter an increasing trend is noticed, reaching the maximum in 1978. The landings during 1979 was provisionally estimated at 1,18,948 t. as against 1,25,481 t. of the preceding year. During 1978 and 1979 the west coast accounts for 97.79 and 98.21% respectively of the total Bombay duck landings.

Statewise production (Fig. 1 and Table 1)

West Bengal and Orissa

The fishery in these two states accounted for 1,408 t. in 1979 representing 1.18% of the total landings of Bombay duck. It was slightly less than that of 1978

which stood at 1,679 t. During 1970-79, the years 1975 and 1976 witnessed unusually heavy landings viz 3,043 and 2,340 t. respectively. Between the two states West Bengal's share was 86.01% in 1979.

Andhra Pradesh

The catch in this state during 1979 was 717 t. against 1,099 t. of the previous year which was the best for the decade. In the remaining years the catch centred around 300 t. except in 1971 and 1977 when the Bombay duck landings were 778 and 960 t. respectively. The percentage contribution by Andhra Pradesh towards all India catch was 0.60% in 1979 as against 0.88% in 1978.

Tamil Nadu

The landings during the 1970-79 period were very poor for the state except during 1973 when the catch was 235 t. The percentage contribution towards the all India Bombay duck catches remained very low.

Kerala

The catch of Bombay duck in the state was insignificant during 1979 while in 1978, 21 t. were landed. During 1971-74 hardly 107 t. were landed on the whole. In some years the catch was nil.

Karnataka

The average value for the ten-year period (1970-79) is 10.8 t. In most of the years the landings were below the average. Only during 1970 and 1973 the Bombay duck catches for the state were 53 t. and 17 t. respectively.

Goa

The catch in this Union Territory was only 9 t. in 1979 as against 27 t. in 1978. The landings were very poor in general from 1975 to 1977 which accounted for a total of 76 t. The catch was negligible in the remaining years.

Maharashtra

This is one of the states which contribute a major portion of the Bombay duck catch in India. The landing in 1979 was 59,667 t. forming 50.16% of the

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Table 1. Statewise Bombay duck landings in tonnes during 1970-79.

Year	W.Bengal & Orissa	Andhra-pradesh	Tamil-Nadu	Kerala	Karnataka	Goa	Maharashtra	Gujarat	All India Total
1970	818	220	2	—	53	2	33,730	43,618	78,443
1971	1,031	778	13	1	10	2	33,993	35,680	71,508
1972	924	297	48	43	1	—	21,246	29,011	51,570
1973	1,984	221	235	45	17	—	34,179	27,664	64,345
1974	1,326	125	—	18	5	—	29,989	29,675	61,138
1975	3,043	359	1	—	2	10	51,645	44,554	99,614
1976	2,340	214	—	—	7	46	49,470	34,998	87,075
1977	1,146	960	14	—	4	20	50,803	32,289	85,236
1978	1,679	1,099	—	21	4	27	68,781	53,870	1,25,481
1979*	1,408	717	1	1	5	9	59,667	57,140	1,18,948
Average	1,569.9	499.0	31.4	12.9	10.8	11.6	43,350.3	38,849.9	84,335.8

* Provisional

total Bombay duck catch. In 1978 a landing of 68,781 t. was recorded which was the highest during ten-year period. It formed 54.81% of the total catch. Maharashtra's share during 1970-1977 in the all India Bombay duck catch varied from 41.20% in 1972 to 59.60%

in 1977. The landings in the state were below average from 1970 to 1974. During 1979 within the state, bulk of the Bombay duck catch viz 40,065 t. was landed in the Satpati-Dahanu zone, contributing to 67.15% of the state's Bombay duck landings. The catch along

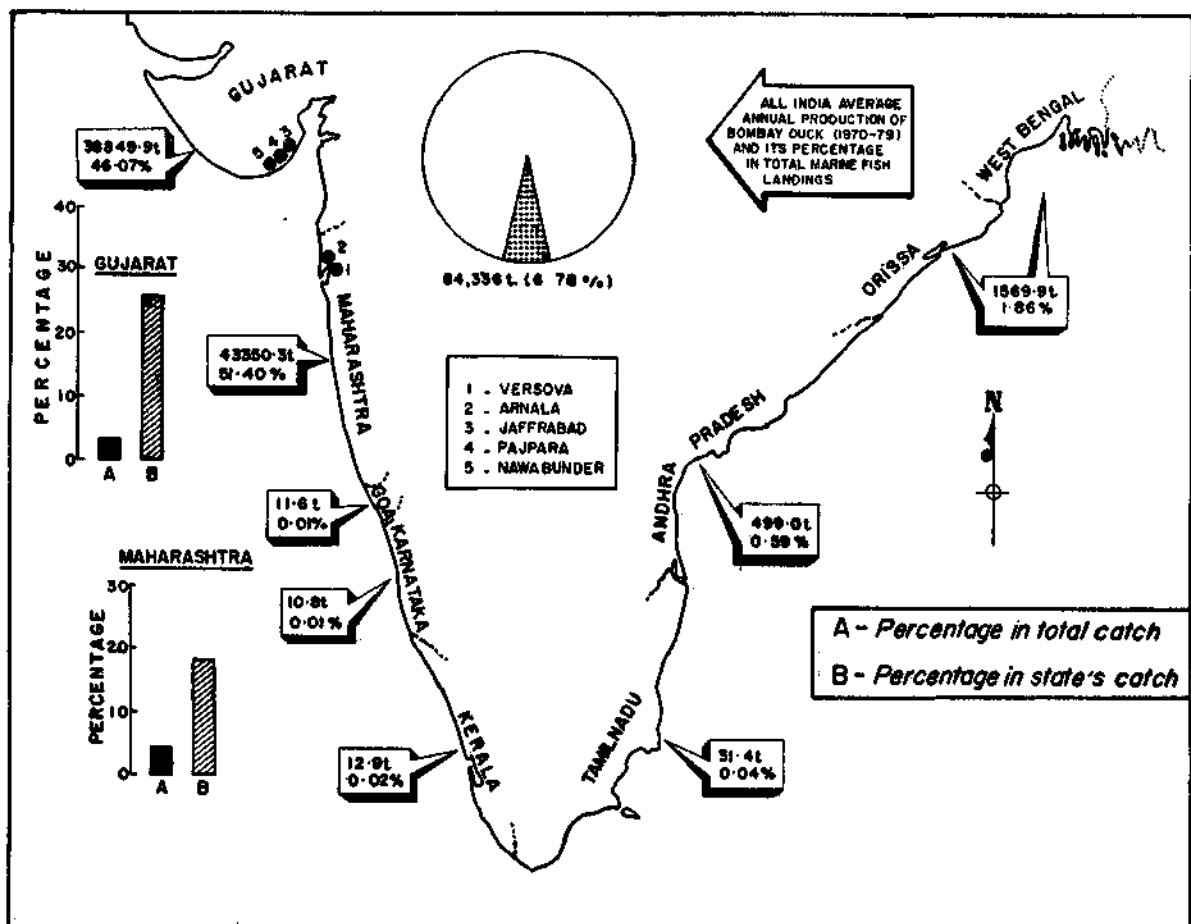


Fig. 1. Statewise average annual landings and percentage contributions of Bombay duck (1970-79).

Marve-Arnala coast, north of Greater Bombay accounted for 22.92% of the state's annual landings. Fish landing centres like Versova and Bassein contributed 2% each to the Bombay duck catch of the state. At Sassoon Dock the landings were poor, so was the case at Kasara Bunder. The Bombay duck formed a poor fishery in the coastal districts of Colaba and Ratnagiri that is from Alibag to Vengurla.

Gujarat

This is another state from where the country's major Bombay duck catch is netted. The average catch for ten years from 1970 to 1979 works out to 38,849.9 t. Only during 1970, 1975, 1978 and 1979 the landings exceeded the average. During this decade the percentage of the state's catch in the all India catch varied from 37.80% in 1977 to 56.26% in 1972. The catch in 1979 was 57,140 t. as against 53,870 t. in 1978 representing 48.04 and 42.93% respectively of the total catch of Bombay duck. The bulk of the state's catch came from the coast between Bhavanagar and Porbunder which has the major fish landing centres like Jaffrabad, Rajpura, Nawabunder in the Gulf of Cambay. During 1979 the landing was 51,840 t. which formed 90.72% of the state's Bombay duck catch. Along the Umergaon-Bilimora coast, it formed 7.34% while in the Cambay region it was 1.92%. The Bombay duck formed a very poor fishery in Jamnagar district.

Catch in relation to total marine fish landings (Table 2)

The total marine fish catch in the country in 1979 was provisionally estimated as 13,36,012 t. of which

8.90% was Bombay duck. In 1978, 1977, 1976 and 1975 the percentage values were respectively 8.94, 6.77, 6.44 and 7.00.

Statewise, the Bombay duck catch in West-Bengal and Orissa formed only 0.11% of the total marine fish landings of India in 1979 as against 0.12% in 1978. During 1977, 1976 and 1975 the corresponding values were 0.09, 0.17 and 0.21 respectively. Within the state the share of Bombay duck in the total catch was represented by 6.65, 4.24, 5.27, 3.20 and 2.70% respectively during 1975-79.

In Andhra Pradesh, the percentage of Bombay duck in the total marine fish catch was 0.03 and 0.02 respectively during 1975 and 1976. In 1977 it was 0.08. In 1978 and 1979 the corresponding figures were 0.08 and 0.05 respectively. Within the state during 1975 to 1979 the percentage of Bombay duck varied from 0.16 in 1976 to 1.34 in 1978.

In Maharashtra State the percentage of Bombay duck in the total marine fish catch of India in 1979 was 4.47 as against 4.90 in 1978. During 1977, 1976 and 1975 the corresponding values were 4.03, 3.66 and 3.63. In 1979 the percentage of Bombay duck catch in the state's marine fish catch was 20.35. The corresponding value in 1978 was 24.20. During 1975 to 1977 it varied from 19.21 in 1977 to 20.13 in 1975.

Bombay duck formed the major marine fishery in Gujarat. In 1979 it constituted 32.69% in the state's total catch. But in 1978 it accounted for 26.68%. During 1975, 1976 and 1977 the corresponding values

Table 2. Bombay duck catch and total fish catch from 1975-79 for different states.

States*	1975		1976		1977		1978		1979	
	Bombay duck catch	Total fish	Bombay duck catch	Total fish	Bombay duck catch	Total fish	Bombay duck catch	Total fish	Bombay duck catch	Total fish
West Bengal and Orissa	3,043	45,761	2,340	55,234	1,146	21,761	1,679	52,424	1,408	52,064
Andhra	359	1,55,638	214	1,31,321	960	1,00,756	1,099	82,116	717	91,182
Maharashtra	51,645	2,56,619	49,470	2,93,601	50,803	2,64,452	68,781	2,84,244	59,667	2,93,210
Gujarat	44,554	1,93,775	34,998	1,71,294	32,289	1,89,638	53,870	2,01,929	57,140	1,74,794

* Other states are excluded since the catch of Bombay duck was negligible.

were 22.99, 20.43 and 17.03. However its share in the all India marine fish catch was 4.28% in 1979 as against 4.07% in 1978. During 1975 to 1977 it ranged from 2.56 in 1977 to 3.13 in 1975.

Seasonal distribution (Table 3)

The 1978 season persisted almost upto May of 1979 in the country. The fishery of 1979 season commenced in September. The landing was at its peak during October to December. The lean period for the Bombay duck fishery was from June to August. The season along the west and east coasts was the same as described above.

In West Bengal-Orissa the catch was comparatively better during October to January whereas in the Andhra coast it was from October to December.

Along the Maharashtra coast, following the general trend, the fishery of 1978 season lasted upto May of 1979 and the 1979 season commenced from September. The catch was highest during October 1979. In the Gujarat area similar seasonal trend was noticed, the highest catch 17,563 t. being landed in November and the lowest 60 t. in June.

Catch per haul (Figs. 2 and 3)

Observation on catch per haul were made at a few selected important centres along Maharashtra and Gujarat coast. At Arnala in Maharashtra the catch per haul by 'dol' net was 90 kg in 1979. The maximum catch rate was 355 kg. during October but the lowest viz. 44 kg was recorded in April. The catch rate was good in the months of May, September, November and December. At Versova the catch per unit effort

(haul) was 26 kg in 1979. The highest catch per haul at this centre was 192 kg in September and the lowest 10 kg in March.

Along the Saurashtra coast at Jaffrabad fishing was restricted to 4 months, September to December. The catch per haul by 'dol' was 201 kg in 1979. The maximum value of 261 kg per haul was in October. At Rajpara the catch rate for the period March to December in 1979 was 153 kg, the monthly value ranging from 73 kg in April to 223 kg in October. At this centre the catch rate was better after monsoon compared to other months. During 1979 the catch rate at Nawabunder was 97 kg. The highest catch rate for this centre was 756 kg during November. The minimum 8 kg was recorded in January.

Length distribution (Figs. 4 & 5)

The total length as observed at a few selected centres in Maharashtra and Gujarat States in 1979 ranged from 5 to 400 mm. In Maharashtra the size ranged from 5 to 390 mm at Arnala and 15 to 400 mm at Versova. In Gujarat at Nawabunder the range observed was 15 to 375 mm whereas at the other two centres viz. Rajpara and Jaffrabad it was from 30 to 360 mm. Although the range in sizes showed similarity, the average size of the fishes over the different months of the year indicate some difference between the centres of the two states. A comparison of the average sizes shown in figs. 4 and 5 would show that the average sizes of the fishes were smaller in the centres of Gujarat than those of Maharashtra. This is also clear from the age size class representation shown in Table 4.

At Arnala young recruits with the modal size at 150-165 mm appeared in April and again in August

Table 3. Statewise seasonal distribution (percentages) of Bombay duck for 1979.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
West Bengal	15.69	2.97	2.81	0.50	2.64	1.90	1.98	11.07	3.30	13.54	11.89	31.71
Orissa	35.53	1.02	2.03	3.05	6.09	1.02	7.11	—	—	41.62	2.03	0.51
Andhra	0.42	3.63	2.09	3.63	0.28	—	2.37	6.69	1.53	21.34	37.80	20.22
Maharashtra	8.07	4.11	3.13	7.10	10.19	0.72	0.13	3.03	13.29	30.25	3.13	16.84
Gujarat	11.49	0.83	1.46	3.78	1.17	0.11	0.56	0.43	4.58	21.01	30.74	23.84

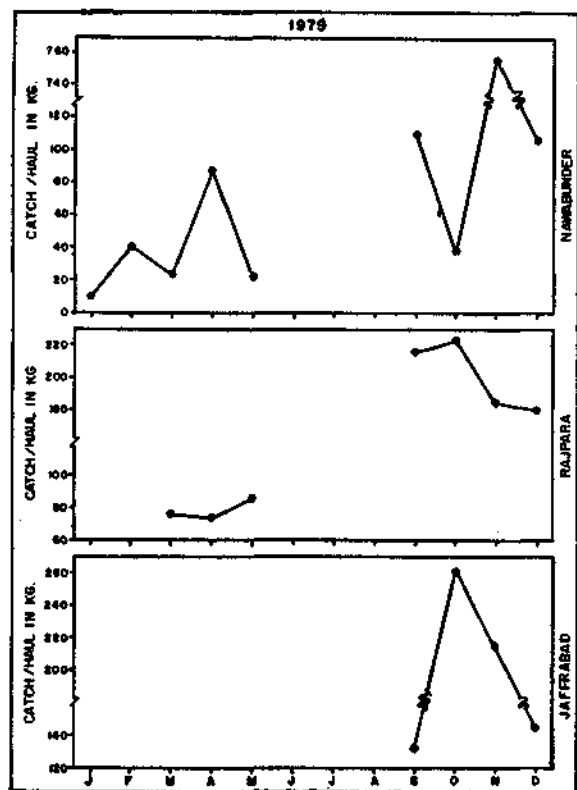


Fig. 2. Catch per haul at centres in Maharashtra

(165–180 mm). In the month of May, June and September to December the bigger size groups with modal values at 270–285 and 285–300 mm entered the fishery. In the remaining months fish with modal values 195–210 and 225–240 mm figured in the 'dol' net catches. At this centre the average size of Bombay duck ranged from 165 mm in August to 321 mm in December. Among all the centres of observation this centre showed the maximum average size represented from September to December.

At Versova, the young recruits with 60–75 mm mode appeared in the catches in June and also in October. In the post-monsoon season bigger fish with modal groups 210–225, 270–285 and 285–300 mm entered the fishery. Till May 1979 the fishery at this centre was supported by fish with modal sizes 180–195 mm, 150–165 mm and 210–225 mm. Here the maximum average size of fish 209 mm was recorded during December and the minimum average size of 163 mm in September.

Along the Saurashtra coast at Jaffrabad the fishery is for a short duration lasting from September to December. The recruitment of juveniles having a modal size of 45–60 mm into the fishery was noted in October but in December also there was indication of

another recruitment into the fishery. The older groups were represented in the fishery during October–November (120–135 mm) and December (225–240 mm.) The average size ranged from 119 mm in October and 187 mm in December.

Juveniles in the size range of 60–75 mm occurred in the 'dol' net catches at Rajpara during October and March. The older fish 255–270 mm group entered the fishery in December. An average size of 224 mm was recorded in December, while it was 107 mm during October. There was indication of bulk recruitment of the young group at 45–60 mm twice into the fishery at Nawabunder viz. during February–March and September–October. The older fish of 270–285 mm modal value were observed in the 'dol' net catches in December with an average size of 210 mm which is the maximum for the season. The minimum average size of 71 mm was recorded during February.

An analysis of the average size of Bombay duck landed at Versova over the years 1968–69 to 1977–78 (Fig. 6) indicates a general trend of decrease in size from the earlier years, reaching the minimum of 144 mm in 1972–73 and thereafter regular increase to the maximum of 180 mm in 1977–78. It is interesting to note that the general pattern of distribution of the average size of the fish at Versova follows the same

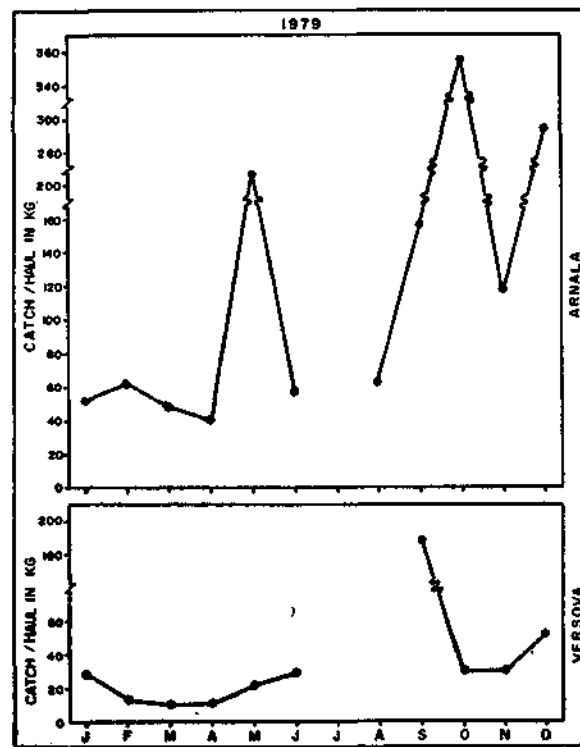


Fig. 3. Catch per haul at centres in Gujarat

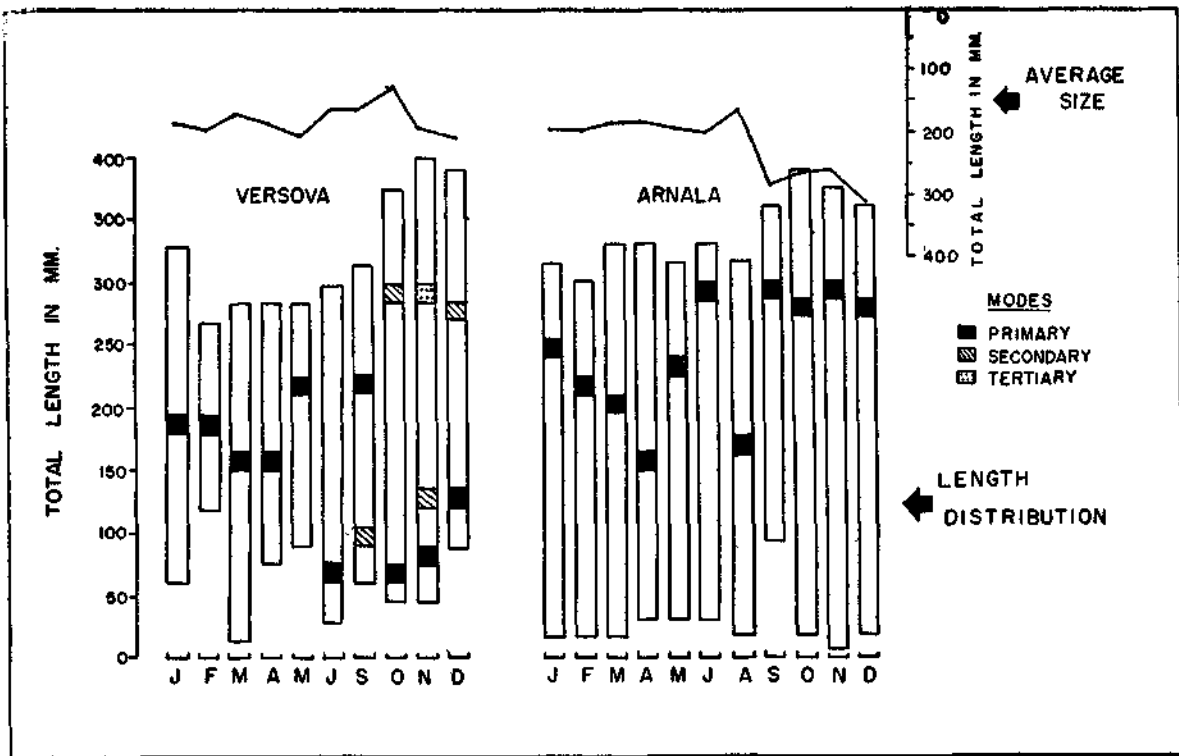


Fig. 4. Length distribution and average sizes of Bombay duck at centres in Maharashtra during 1979

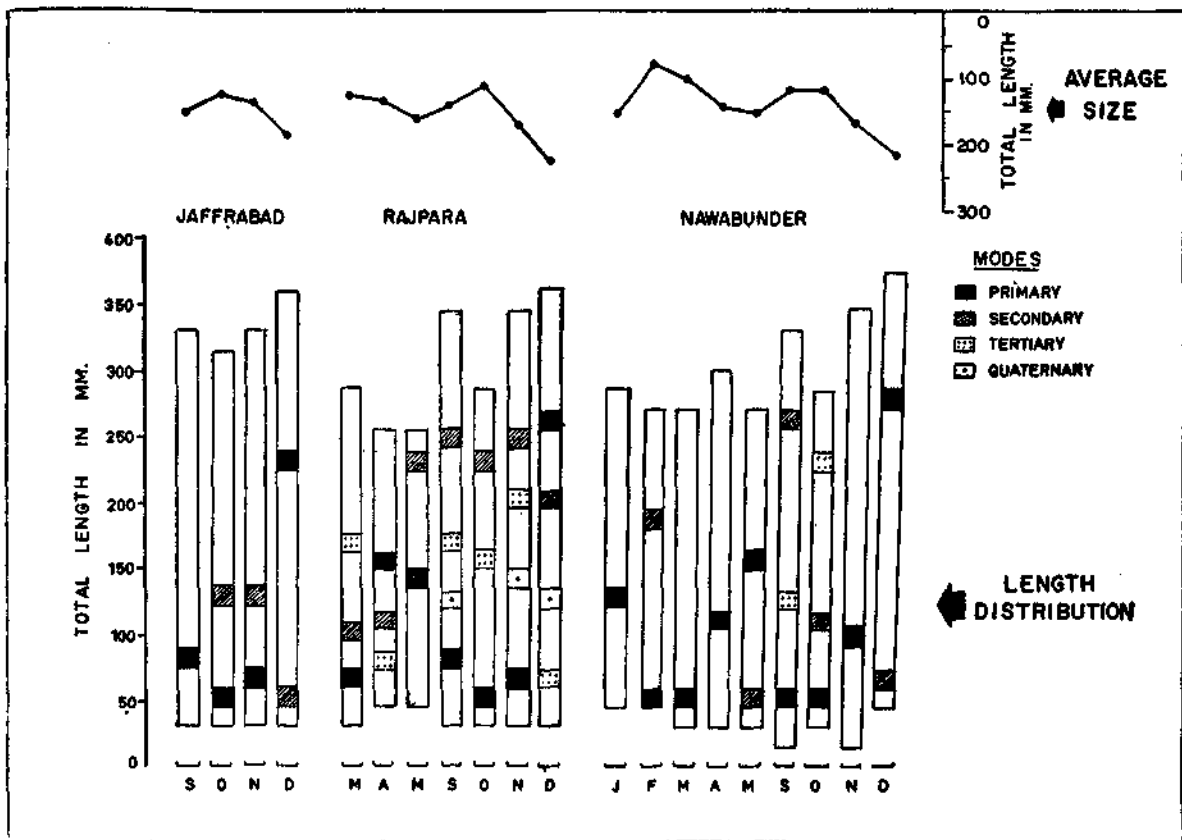


Fig. 5. Length distribution and average sizes of Bombay duck at centres in Gujarat during 1979.

trend in the total production, decreasing from 1969, reaching the minimum in 1972 and increasing thereafter to reach the maximum in 1978.

Growth

The shifting of modes from 60–75 mm in June to 90–105 mm in September at Versova indicates 30 mm growth in 3 months. The growth trend of the new recruits at Nawabunder shows an increase of 75 mm in 7 months. The mode at 45–60 mm during February shifted to 120–135 mm in September. Similarly at Rajpara the mode at 60–75 mm of March moves to 150–165 mm in October recording a growth of 90 mm in 7 months.

Age composition

The size age class structure in commercial catches at selected observation centres in the 'dol' (bag) net are given in Table 4. The commercial fishery consisted mainly of 0-year old fish (Less than 127 mm) during 1979 at Jaffrabad, Rajpara and Nawabunder centres, whereas the 1+ year olds (127 to 210 mm) dominated at Versova. However a marked dominance of the 2+ year and above fish (over 210 mm) was noticeable at Arnala.

Maturation and sex composition

At Arnala, except in August stages IV to VI dominated in all the other months. Spent stages were dominant in January, March and May. Females outnumbered males in January, February, May, June and September. High percentage of stage I was observed in August (55.26%) and October (20.45%). The occurrence of

oozing stages in all the months and spent stages in the majority of the months indicates that Bombay duck breeds throughout the year (Table 5).

On the other hand the picture in Gujarat was quite the contrary. In all the months, stages I to IV dominated whereas stage V occurred only in April and stage VI in February. Spent stages were observed during February, March, May and September (Table 6). The percentage of mature fish in the fishery at Versova during 1968 to 1978 (Fig. 6) shows the minimum in 1969–70 and maximum in 1977–78.

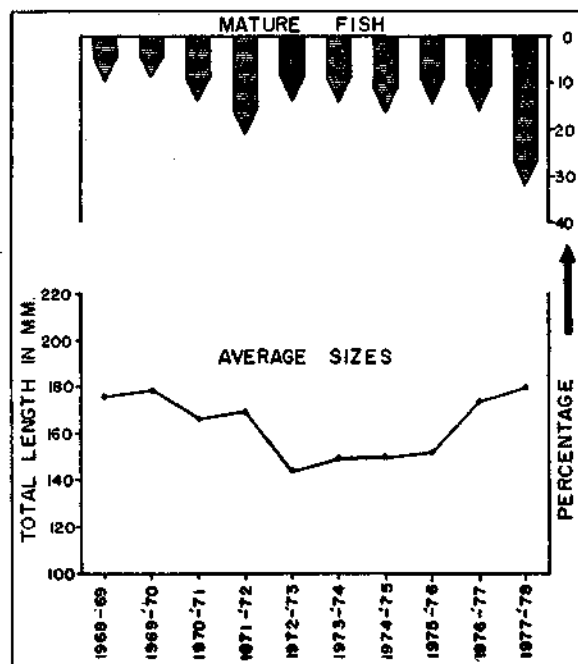


Fig. 6. Average sizes of Bombay duck and percentages of mature fish at Versova during the years 1968–69 to 1977–78

Table 4. Catch of the Bombay duck in number per haul in different size classes at selected observation centres during 1979.

Place	0 yrs. < 127 mm	1 + yr. 127–210 mm	2 + yr. & above 210 mm
Arnala	477	642	1,393
Versova	233	332	233
Jaffrabad	5,140	1,044	1,593
Rajpara	3,107	1,399	1,175
Nawabunder	1,714	1,047	700

Table 5. *Monthly percentages of maturity stages of Bombay duck at Arnala during 1979.*

Months	I	II	III	IV	V	VI	VII	Sex Ratio (male: female)
January	2.78	0.69	—	1.39	17.36	73.61	4.17	1:3
February	2.41	5.42	1.81	18.07	25.30	44.58	2.41	1:3
March	5.05	2.02	8.07	24.24	18.18	38.38	4.04	1:1
April	6.25	1.56	1.56	9.38	25.00	54.69	1.56	1:1
May	2.34	3.13	5.47	9.38	30.47	45.31	3.91	1:2
June	1.54	4.61	7.69	13.85	56.92	15.38	—	1:2
August	55.26	26.32	7.89	5.26	2.63	2.63	—	1:1
September	13.78	8.16	17.86	22.96	10.20	22.96	—	1:2
October	20.45	11.36	15.15	17.42	9.85	19.70	2.27	1:1
November	14.39	2.27	15.91	18.94	28.03	17.42	—	1:1
December	6.20	8.53	4.65	17.05	20.16	41.09	2.33	1:1

Table 6. *Monthly percentages of maturity stages of Bombay duck in Gujarat during 1979.*

Months	I	II	III	IV	V	VI	VII
January	56.25	25.00	12.50	6.25	—	—	—
February	13.62	27.24	18.16	27.24	—	11.35	2.27
March	11.83	23.66	35.49	24.04	—	—	1.69
April	31.39	17.44	13.95	33.72	3.48	—	—
May	67.24	25.86	1.72	3.44	—	—	2.72
September	29.26	17.07	17.07	34.14	—	—	2.43
October	61.76	29.41	5.88	2.94	—	—	—
November	47.50	30.00	17.50	5.00	—	—	—
December	40.00	30.00	15.00	15.00	—	—	—



Fig. 1. The Bombay duck *Harpodon nehereus*

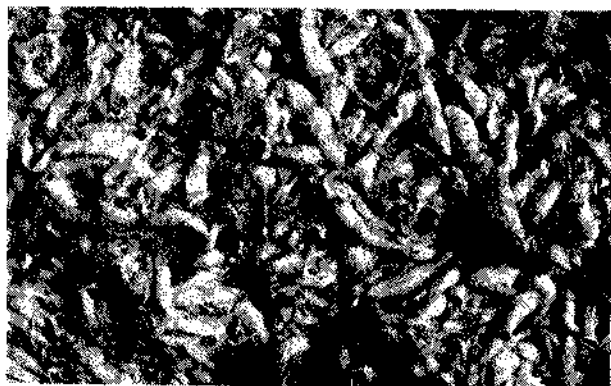


Fig. 4. Catch of Bombay duck



Fig. 2. Boats landing the catch at Versova

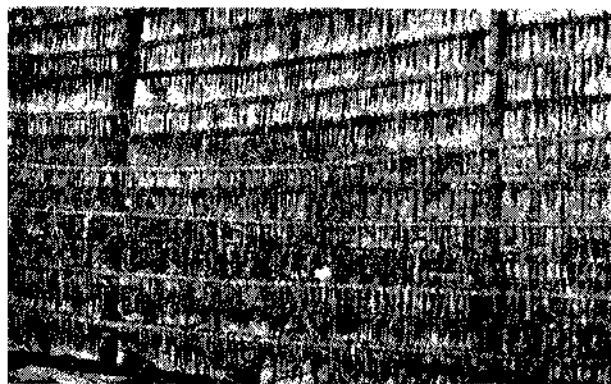


Fig. 5. Sun drying of Bombay duck



Fig. 3. Sampling the Bombay duck for laboratory studies



Fig. 6. A close up of the scaffold on which the fishes are set to dry

Feeding

Studies on the food and feeding habits indicate that Bombay duck is carnivorous and to some extent cannibalistic in its food habits. The food consisted of mainly prawns and fishes. Among Crustacea, *Acetes indicus* and *Palaemon tenuipes* and among fish *Harporodon nehereus* and *Coilia dussumieri* formed important constituents of diet.

Conclusion

On the whole the Bombay duck fishery, although showed declining trend in the earlier half of the seventies, picked up considerably in the latter half and

reached the maximum in 1978 and 1979. A similar trend in average sizes represented in the fishery is also noticed. However, it is seen that in 1979 the average sizes of the fishes landed at the centres of observation in Maharashtra and Gujarat, the two important states contributing to the major part of the Bombay duck fishery of the country, differed considerably. The sizes of the fishes landed at Gujarat centres were smaller and dominated by the 0-year class fishes, while in Maharashtra the sizes were dominated by 1+ and 2+ year classes. This would perhaps indicate that the fishery of these two states is supported by two independent stocks. Detailed studies for delimitation of stocks, both statistical and serological are necessary to establish the identity of stocks.

