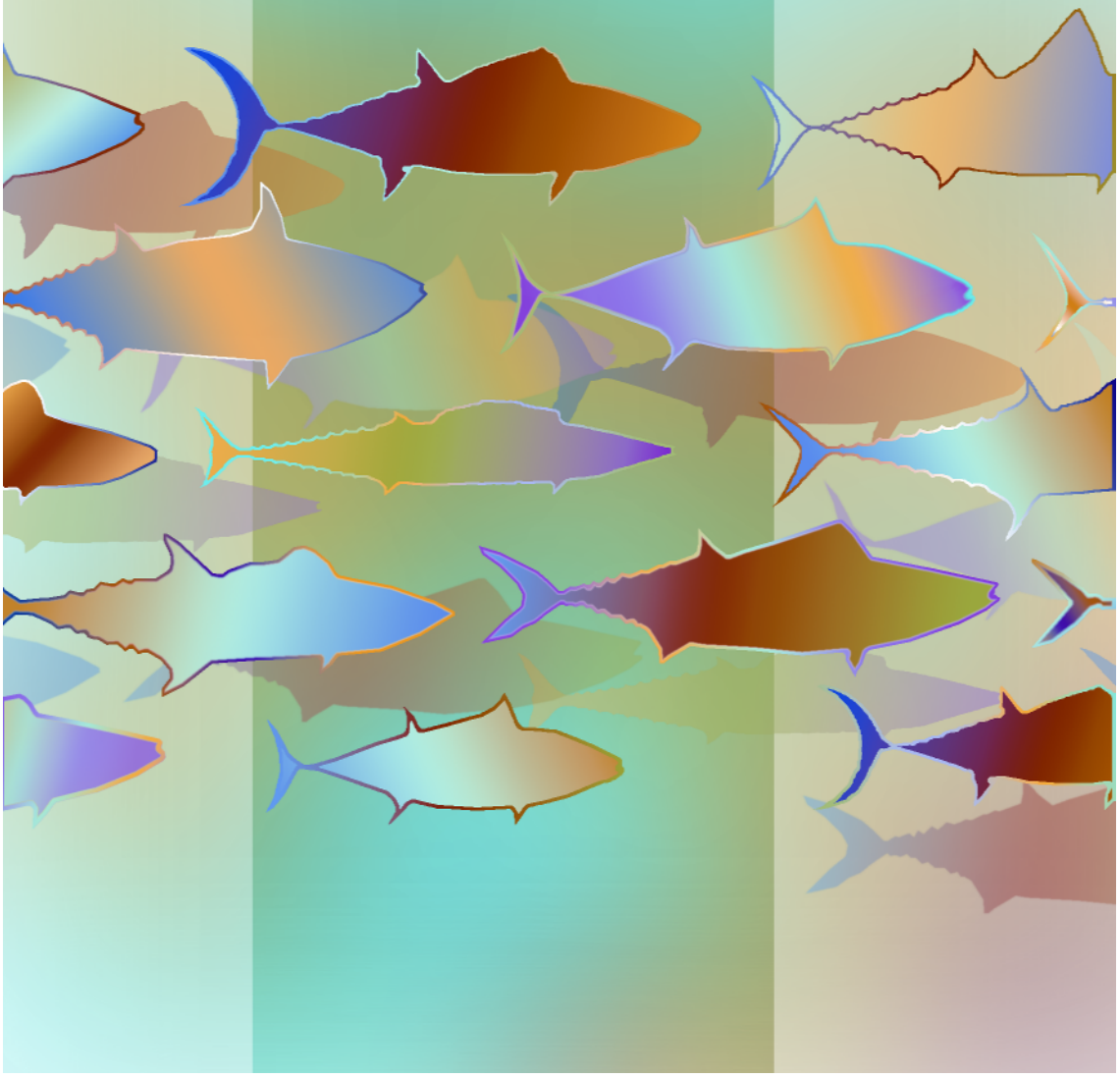
Status of Exploited Marine Fishery Resources of India



STATUS OF EXPLOITED MARINE FISHERY RESOURCES OF INDIA

Editors
M. Mohan Joseph
and
A.A. Jayaprakash

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
Post Box No. 1603, Tatapuram P.O.
Kochi – 682 014, India

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Bombay-duck

Alexander Kurian

1. Introduction

The Bombay-duck holds a pride of place in the long established artisanal sector of the northwest and northeast coasts of India. A good or poor harvest of Bombay-duck exercise direct influence upon the livelihood of men and women engaged in this labour intensive sector in the maritime states of Maharashtra and Gujarat. It is an important fish for domestic use and also a valuable export item in dried or laminated form. Fresh extracts from Bombay-duck is believed to have considerable medicinal properties. The fishery is supported by a single species, Harpadon nehereus, popularly known as Bombay-duck in English. In Gujarati, this species is called Bumla, Bumili, Bombil or Bummaloh, in Marathi, Bombil; Cucah Sawahri, Coco mottah in Telugu and Nehere, Lutee or Bombla in Bengali (Fig.1).

Fishing for Bombay-duck is carried out by a stationary bag net worked entirely by the forces of tide along Maharashtra and Gujarat coasts. With the onrush of water, the interstices get closed or clogged and the net will resemble a 'hermetically sealed unit'. This gear is known as dol in Gujarat and Maharashtra and as beenjal, behundijal or thorjal in West Bengal.

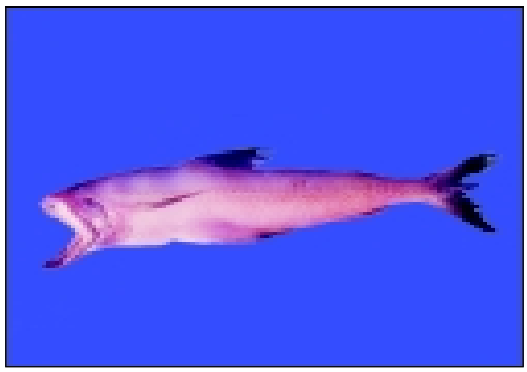

Fig. 1. Harpadon nehereus

2. Production trends

Bombay-duck is an abundant species along the northwest coast of India contributing around ninety percent of all India landings of this resource followed by West Bengal and other states. The fishery along the northwest coast is supported by a single stock. The landings of this species contribute about five percent of all India marine fish landings. The average annual landings has been estimated at 1.1 lakh tonnes by traditional and industrial sector along the NW (88%) and NE (12%) coasts of India. Along the NW coast, landings in Gujarat has been showing a stabilized trend with seasonal swings, whereas in Maharashtra the landings have shown wide fluctuations. Seasonal distribution of Bombay-duck can be separated into two phases: static and dynamic. During static phase (September to January) the fish becomes temporary residents within near shore fishing areas between five and twenty five-meter depth zone. During dynamic phase (February to May), the fish actively migrates beyond twenty-five meter depth zone and are scattered. Large catches are occasionally made from scattered aggregates. Larger and older fishes are usually scarce in commercial catches. Bombay-duck shares the ecosystem with golden anchovy and non-penaeid prawns. The landing patterns, quarter wise, are shown in Figure 2 and the stock density in Figure 3. Length groups ranging from 30-330 mm. in total length support the fishery. Indeterminate and immature fish below total length of 208 mm constitute seventy percent of the landings. The catches are sold fresh and as there are no excess, due to low yield, commercial drying on bamboo scaffoldings, once landmarks have ceased to exist.

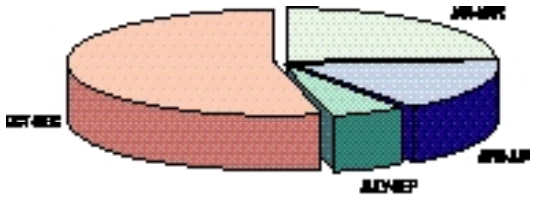

Fig. 2. Quarterwise % production of Bombay-duck

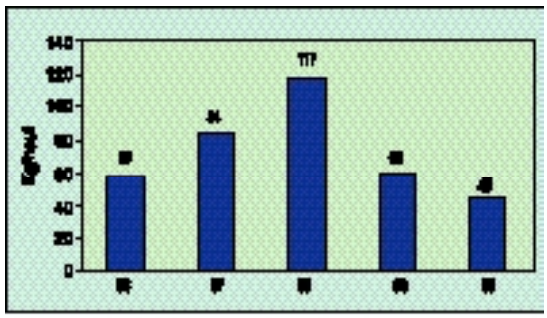

Fig. 3. Stock density of Bombay-duck

3. Biology

The presence of immature, maturing, gravid and spent individuals throughout the year shows that Bombay-duck is a continuous spawner but the individuals are out of phase with each other. However, two peak spawning periods, May-July and November-December, have been noticed. Spawning areas are not known and eggs and larval forms have not been recorded so far even from areas of abundance. The

average total length at attainment of sexual maturity is 230 mm and the male female ratio shows a progressive decline in number of males with increase in size or age. A new recruit spawner takes seven months to complete first spawning, second spawning cycle is complete in nine months, the third in ten months and the fourth in eleven months. The mean total lengths at these spawning are 252 mm, 305.5 mm, 347.5 mm and 372.5 mm respectively. The index of reproductive stress gives a value of 0.54, which is suggestive of low reproductive stress for recruit spawners. Fecundity increased with length and linearly with weight by reduction in ova size signifying that the somatic growth occupies a small segment of adult growth life. Intensive fishing in near shore areas permits a fish to spawn only twice resulting in average egg production of 1,15,011 during the effective life span. Though bimodality is seen in the distribution of oocytes, they develop in paired manner. Complete absence of ripe ova in the spent ovary indicates that Bombay-duck is a total spawner. Recruitment to the fishery is continuous; age at recruitment is 0.28 years and the age at selection 0.41 years.

Food

The food spectrum appears to be broad with more than ten prey species occurring in the diet. The final grading shows that the juveniles of Bombay-duck ranked first followed by non-penaeid prawns thereby confirming that Bombay-duck is cannibalistic.

The Bombay-duck is a multistage population in which number of broods contributes to the biomass in a year. On an average, five broods originate each year at an approximate interval of two months. The average length growth values indicate that the fish attains a total length of 165 mm in first year, 264 mm in second year, 330 mm in third year and 372 mm in fourth year. The effective life span in the inshore areas is 2.5 years.

4. Stock assessment

It is now well established that Bombay-duck fishery operates on the coastal portion of a widespread stock, which reproduces offshore. Thus the area of production and area of harvest differs. This renders projection of total availability complicated not only by the mobility of the species but also by the reaction of the species to coastal environmental factors and intensity of fishing effort. Therefore, the fluctuations in yield are likely to be a reflection of changes in the 'catchability'. Evidently, a stock recruitment relationship is very difficult to be established. Inherent weakness in existing stock assessment models coupled with unexplained fluctuations in stock density leads to assessments which are likely to be insecure. As this species is becoming less abundant in the multispecies dol net fishery, an appropriate gear-time-area index for stock abundance has become difficult to find. However, catchability coefficient, in simple terms, the probability of a fish being caught, is indicated here as some measure of the state of the fishery. The total mortality estimate, Z, converge to an average annual value of 1.4 and the rate of fishing, E at 56 %,

indicate that the available stock is optimally exploited with catchability coefficient, q of 9.77 x 10^{-7} for 1996-2000. The current exploitable stock is estimated at 87,163 tonnes. These estimates are indicative of a past activity and should not be taken as future projections considering state of flux the fishery is in.

5. Management

The Bombay-stock has been exploited with a mixture of success and failure in the past. Large-scale landings of indeterminate and immature fish have been a source of concern since long. The only possible method by which age or size at first capture can be adjusted is by regulating the mesh size at an appropriate size. Experimental fishing for Bombay-duck was conducted by the CMFRI at Bassein in Maharashtra using dol nets with different cod end mesh to determine the selectivity of the gear and to evolve an optimal mesh size for the escapement of the undersized fish. The results revealed positive and negative changes in size of the fish caught and total catch owing to changes in the selectivity of the gear in respect of Bombay-duck as well as other interacting species. The immediate reduction in the Bombay-duck catch with 30 mm mesh was 37% of the catch by 15 mm conventional mesh and with 40 mm mesh the catch had dropped by 23%. Besides Bombay-duck, the golden anchovy and non-penaeid prawns also registered considerable decrease.

The dol fishery is multispecies. The optimum mesh size for each species or group is different. Therefore, it is not easy to evolve a new single optimum mesh size. The mesh size currently under operation with seasonal shifts appears to be the most appropriate for maximization of yield in general. The only suitable strategy is to allow the fishery to find its own equilibrium rooted in regional socio-economics.

6. Suggested readings

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