

## FISHERY POTENTIAL ALONG THE INDIAN COASTAL WATERS BETWEEN PORBANDAR AND RATNAGIRI

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### ABSTRACT

As part of the ongoing marine pollution monitoring programme the coastal stretch between Porbandar and Ratnagiri was considered to assess the fishery potential. Regular experimental trawling was done off Porbandar, Veraval, Diu, Hazira, Daman, Bassein, Bombay, Murud and Ratnagiri at a depth range of 5-25 m during 1988 to 1992. The catch rate varied from 1.2 to 225 kg/h (av.20.3 kg/h). Zonewise maximum catch (av.56.8 kg/h) was observed off Ratnagiri followed by off Porbandar (av.30.1 kg/h), off Bombay (av.23.9 kg/h) and off Murud (av.19.8 kg/h). The area between Hazira and Daman was poor in fish catch. In general, the catch rate showed a fluctuating trend during the period of observation. Among the hundred species identified from the collections the most common species were *Coilia dussumieri*, *Johnius glaucus*, *Scoliodon laticaudus*, *Lepturacanthus savala*, *Harpadon nehereus*, *Sardinella longiceps*, *Pampus* sp. and *Congresox* sp. The community structure and species assemblage at different zones are discussed in detail.

### INTRODUCTION

Gujarat and Maharashtra having a long coastline of about 2360 km are leading states in marine fish landings. The continental shelf offers rich potential for marine fisheries and comprehensive accounts on this aspect for the two states are made by Srinath *et al.* (1981) and Balan *et al.* (1987). The estimated marine fish production of India during 1988 to 1992 varied from 1.82 to 2.6 million tonnes (Anon, 1993) and the respective percentage contribution of

Maharashtra and Gujarat are 16.2 and 20.9. These estimates are mainly confined to marine fishery potential for the outer continental shelf and slope beyond the 30 m contour. Though coastal waters within the 30 m are also a good fishing ground mainly for prawn and fin fishes, limited knowledge is available on the quantitative and qualitative details. Many prawns and fishes spend a part of their life cycle in the creek or in estuaries. These coastal stretch is under pollution threat due to build

up of waste from various sources (NIO, 1992). This may have subtle influence on the water quality, on the biological productivity and fishery potential of the coastal zone. To evaluate the fishery potential of this coastal ecosystem, experimental trawling was done within the 5-25 m contour.

## MATERIAL AND METHODS

Regular experimental trawling was done along the coastal stretch between Porbandar and Ratnagiri (Fig. 1) at nine locations off Porbandar, Veraval, Diu, Hazira, Daman, Bassein, Bombay, Murud and Ratnagiri at a depth range of 5 to 25 m during February-May of 1988 to 1992. Transects were selected on the basis of ecological sensitivity, location of industries, location of urban establishment and recreational importance.

Bottom trawling was undertaken using a mechanised trawler. A high opening bottom trawl net of 20.7 m (636 meshes of 50 mm when stretched) was used for trawling. Total fish catch and composition at group level were estimated on board and a part of the catch was preserved in 5% formaline for species identification.

## RESULTS AND DISCUSSION

### Environmental characteristics

NIO (1992) has studied in details the water quality, sediment and biological characteristics of the

Gujarat and Maharashtra coast. Out of nine transects, Porbandar receives wastewater from an industry manufacturing soda ash, and other chemicals. This wastewater is reported to have abnormally high levels of suspended solids, high pH and high Ammonia. Veraval harbour is one of the major fish landing centre in Saurashtra coast and receives a variety of wastes, particularly sewage and effluent from fish processing units. At Diu there are no known major wastewater discharges. Hazira is a fast developing industrial centre especially for gas based industries. At Daman, Damanganga estuary transport wastewater from the industrial estates at GIDC, Vapi. Bassein-Bombay region is a highly industrialized and urbanized zone which receives large quantity of domestic waste as well as various types of industrial wastes. Murud-Ratnagiri region is under developed and except for a few industrial estates, there is not much development in the region.

Water quality of the region indicated that the area is free from contamination and results were comparable to expected variability inherent to the nearshore waters excepting selected creek environments. Wide variations were encountered at station like Veraval creek, Porbandar creek, coastal station of Bassein and Bombay which are known to receive wastewaters from domestic and industrial source (NIO, 1992).

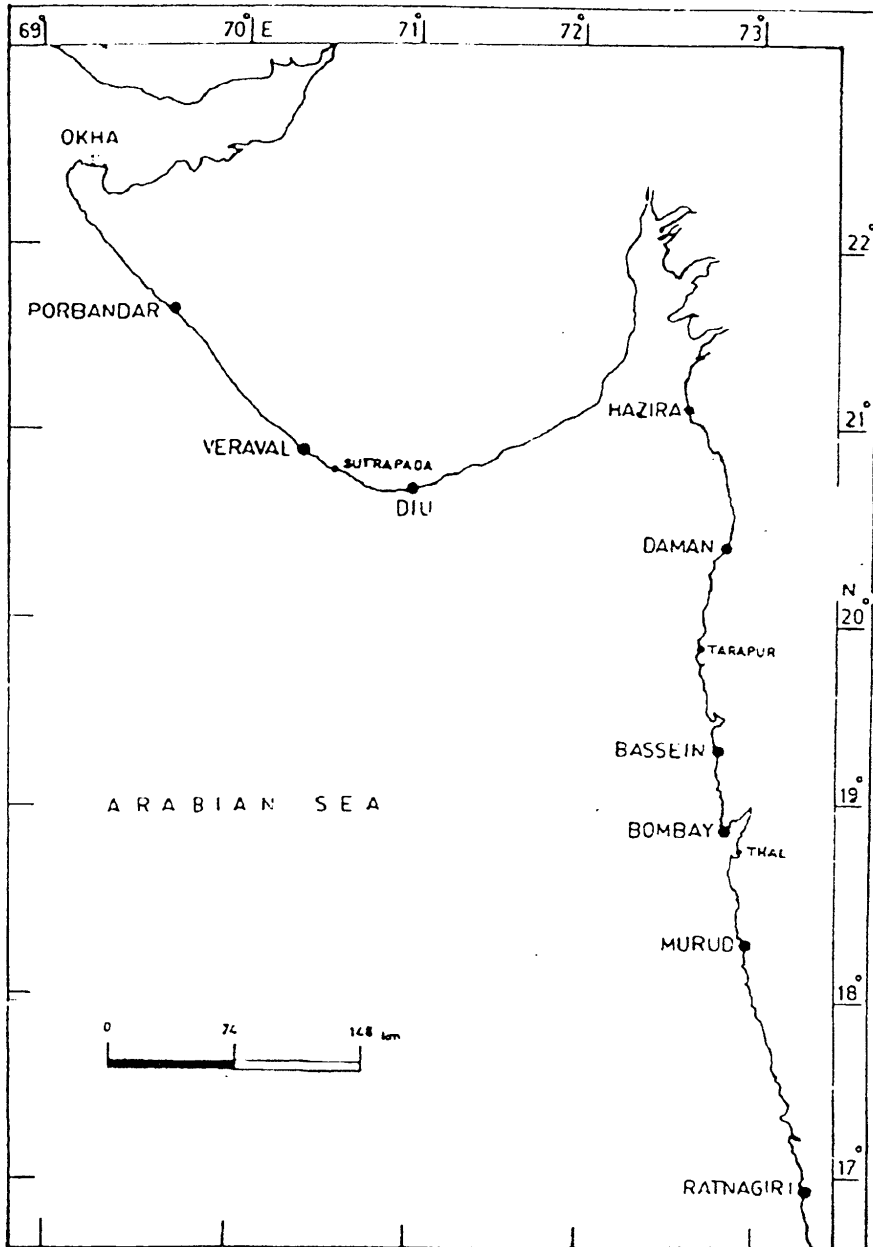


Fig. 1 : Area of sampling

Biological productivity in terms of plankton and benthos along the coastal waters indicated that Porbandar, Veraval, and Diu as the most productive zone, while the Daman and Bassein coast showed low production potential. The biological productivity towards Murud-Ratnagiri coast indicated an enhancement in production potential (NIO, 1992).

### Fishery potential

The catch rate of fish (Table 1) followed the same trend comparable to biological characteristics at lower trophic levels namely plankton and benthos of Gujarat and Maharashtra

coast. The results are in agreement with that reported for the two states (Tables 2 and 3). Catch rate indicated relatively higher fishery potential for the coastal waters of Porbandar (Gujarat) and Murud-Ratnagiri (Maharashtra) sectors than the other zones. Yearwise 1989 recorded higher rate of fish catch (35.4 kg/h) followed by 1988 (21.7 kg/h), 1991 (18.6 kg/h) and 1990 (15.6 kg/h). Lowest catch rate (12.7 kg/h) was observed during 1992. On an average Maharashtra zone was 1.6 times more productive than Gujarat area (Table 1).

During 1988, fish catch rate varied from 1.1 to 95.1 kg/h. The overall catch of the year was represented by 42 species of fishes, 13 species of prawns.

Table 1 : Average catch (kg/h) at different locations during 1988-1992.

Place	Year					Average
	1988	1989	1990	1991	1992	
<b>Gujarat</b>						
Porbandar	95.1	46.0	20.6	25.2	10.5	39.5
Veraval	17.8	10.0	1.0	8.6	3.9	8.3
Diu	14.5	8.8	2.5	12.9	4.3	8.6
Hazira	*	*	*	4.7	3.0	3.9
Daman	15.2	3.0	7.5	3.8	8.3	7.6
<b>Maharashtra</b>						
Bassein	11.0	12.1	6.1	23.3	15.7	13.6
Bombay	14.0	27.2	21.2	10.7	16.6	17.9
Murud	4.8	28.1	20.3	31.4	17.1	20.3
Ratnagiri	1.2	147.5	45.9	46.9	34.7	55.2

\* Trawling not done

4 species of crabs and 3 species of cephalopods. *Coilia dussumieri*, *Johnius glaucus*, *Lepturacanthus savala*, *Harpadon nehereus*, *Thryssa dussumieri*, *Otolithoides biauritus*, *Dussumieri acuta*, *Scoliodon laticaudus*. *Opisthopterus tardoore*, *Arius maculatus*, *Atypopenaeus stenodactylus*, *Exopalaemon styliferus*, *Parapenaeopsis stylifera*, *Acetes* sp and *Charybdis annulata* were the most common species.

Maximum fish catch during 1989 was recorded at Ratnagiri (225 kg/h) and minimum catch was obtained at Daman (1.5 kg/h). The catch composition showed 49 species of fishes, 13 species of prawn, 5 species of crabs and 3 species of cephalopods. Similar to 1988 *C.dussumieri*, *J. glaucus*, dominated the catch. The other major species were *Cynoglossus arel*, *H. nehereus*, *L. savala*, *T. haumela*, *Tetradon inermis*, *Congresox talabonoides*, *Metapenaeus brevicornis*, *Exhippolysmata ensirostris*, *Exopalaemon styliferus*, *Parapenaeopsis stylifera*, *Acetes* sp. and *C. annulata*.

In 1990, fish catch varied from 1.0 to 53.8 kg/h. Eventhough catch rate was low during the year, species diversity was higher. Overall 53 species of fishes, 11 species of prawns, 5 species of crabs, 3 species of cephalopods, one species of stomatopod and one species of lobster were recorded. As per the percentage contribution (frequency) the most common species were *Coilia dussumieri*, *J.glaucus*, *Scoliodon laticaudus*, *L.savala*, *H.nehereus*, *Caranx* sp. and *Parapenaeopsis*

*stylifera*. The other common species were *Arius maculatus*, *T.haumela*, *Pampus argenteus*, *Lactarius lactarius*, *Sardinella longiceps*, *Ilisha* sp., *C.arel*, *Congresox* sp., *Metapenaeus* sp., *Exhippolysmata ensirostris* and *Acetes* sp.

During 1991 trawling operation extended up to 25 km from the coast. The catch rate showed wide fluctuations from 1.9 to 74.5 kg/h. Trawl composition showed maximum diversity of 72 species of fishes, 16 species of prawns, 7 species of crabs, 1 species of squilla, 2 species of lobsters and 3 species of cephalopods. Out of these, species like *C.dussumieri*, *Harpadon nehereus*, *J.glaucus*, *L.savala*, *Scoliodon laticaudus*, *Thryssa mystax*, *Pampus chinensis*, *P.argenteus*, and *Ilisha megaloptera* were more common. Among the prawns *Exhippolysmata ensirostris*, *Exopalaemon styliferus* and *Parapenaeopsis stylifera* were the common species.

Catch rate for 1992 varied from 3.2 to 38.8 kg/h. Overall 43 species of fishes, 12 species of prawns, 6 species of crabs, 1 species of lobster and 3 species of cephalopods were encountered during the study. The dominance of major species were in the order of *J.glaucus*, *C.dussumieri*, *L.savala*, *T.haumela*, *H.nehereus*, *Arius maculatus*, *Tetradon* sp., *Opisthopterus tardoore*, *Thryssa mystax*, *Otolithes cuvieri*, *Scoliodon laticaudus* and *Ilisha megaloptera*. The prawn species obtained were *Exopalaemon styliferus*, *Exhippoly-*

*smata ensirostris*, *P.sculptilis*, *Penaeus* sp. and *Metapenaeus* sp. A comparison of the qualitative nature of the fish landings indicated difference between Gujarat and Maharashtra coast. Bombay duck, pearch, cat fish, ribbon fish and *Ilisha* sp. contributed more along the Gujarat coast than the Maharashtra coast. Prawns, mackerel and elasmobranch predominated the Maharashtra zone as compared to the catch from Gujarat.

Several authors (Jones and Banerjee 1973, George *et al.* 1977, Sudarsan *et al.* 1990) attempted to estimate the fishery potential of the Indian waters and the estimate varied between 2.3 million tonnes to 4.5 million tonnes. These pelagic and demersal fishery resources are mainly confined to inshore waters within 90 m depth belt (Sivaprakasham and Somvanshi, 1988). But most of the exploitation of the fishes is mainly confined to the area between 20 to 70 m depth. The nearshore waters within the 20 m contour of the industrialised cities is prone to different types of pollution. Sivaprakasham and Somavanshi (1988) reported on the decline in the fishery during 1972 to 1982 due to the pollution effect than natural causes. During the period of 1988 to 1992, the fish catch along the Maharashtra coast indicated fluctuations. In 1989-90 marginal increase in fish catch was observed followed by reduction during 1990-91 and 1991-92 and enhancement in

1992-93. The average landing along Maharashtra coast during 1989 to 1993 was  $371 \times 10^3$  tonnes while that for Gujarat coast was  $518 \times 10^3$  tonnes which is 1.4 times more than that recorded for Maharashtra region (Tables 2 and 3). The increase in catch rate along the Gujarat coast may be due to higher exploitation and relatively longer coast line. In general, off Veraval, Porbandar, Hazira, Daman, Bassein and Bombay steady decline in the catch rate along with species diversity was observed.

The catch composition indicated ribbon fish, Bombay duck, pomfrets, cat fish, anchovy, croaker and prawn as the major varieties (Figs. 2 and 3). The community structure indicated regional characteristics in the distribution of some categories of fishes. *H.nehereus* started its appearance in the catch at Diu and started increasing from Hazira, Daman towards Bassein/Bombay. Very few specimens of *H.nehereus* was found off Murud while the species was absent along the coast of Porbandar, Veraval and Ratnagiri. Occurrence of *Coilia* was also limited between Diu and Murud showing comparable distribution pattern like that of *H.nehereus*. Ribbon fish and croaker were noticed along all transects. In the coastal waters of Gujarat and Maharashtra *Coilia dussumieri*, *J.glaucus*, *Lepturacanthus savala*, *H.nehereus* and *Thryssa dussumieri* predominated. The other common species were *Otolithoides biauritus*, *Thryssa mystax*,

**Table 2 : Groupwise marine fish landing (in thousand tonnes) along Gujarat coast**

Group	Year			
	1989-90	1990-91	1991-92	1992-93
Pomfret	11.1	12.8	12.9	8.9
Bombay duck	67.8	72.2	66.4	104.0
Thread fin.	2.1	2.3	2.4	2.6
Jew fish	9.0	13.0	9.6	15.1
<i>Hilsa</i>	2.4	2.7	2.1	1.6
Clupids	6.3	7.8	8.0	9.6
<i>Coilia</i>	9.2	16.6	18.3	21.2
Shark	13.8	9.6	15.7	16.3
Mullet	6.6	4.0	2.9	3.8
Cat fish	13.8	12.4	17.0	17.6
Eel	2.6	3.4	2.3	3.3
Leather jacket	1.9	1.7	2.0	1.2
Seer fish	6.1	6.3	7.2	6.1
Indian Salmon	1.5	1.5	1.3	1.7
Ribbon fish	30.9	40.9	38.7	46.2
Silver bar	4.1	4.7	4.9	4.8
Pearch	4.0	3.8	6.3	6.5
Small scianeids	155.1	184.9	196.5	210.2
Prawns	26.5	24.2	38.0	44.0
Lobster	1.2	0.9	1.1	0.9
Levta	0.5	1.8	0.8	0.6
Cephalopods	14.0	12.4	18.1	21.5
Others	41.3	58.9	55.9	60.7
Crab	0.6	1.7	1.6	0.7
<b>Total</b>	<b>432.4</b>	<b>500.5</b>	<b>530.0</b>	<b>609.1</b>

Source : Department of Fisheries, Govt. of Gujarat.

Table 3 : *Groupwise marine fish landing (in thousand tonnes) along Maharashtra coast*

Group	Year				
	1988-89	1989-90	1990-91	1991-92	1992-93
Pomfret	11.5	8.9	8.6	10.5	12.7
Bombay duck	58.1	48.7	57.6	57.6	61.3
Elasmobranchs	7.2	6.6	6.7	8.4	9.1
Eels	1.9	2.2	2.8	3.6	1.9
Cat fishes	9.8	8.3	7.4	5.2	7.8
<i>Chirocentrus</i>	2.7	3.4	2.5	2.7	4.2
Sardines	4.7	6.5	4.6	3.4	3.7
<i>Hilsa ilisha</i>	1.5	1.8	1.7	1.3	1.5
<i>Anchoviella</i>	18.9	20.2	17.6	17.2	22.4
Thrisocles	3.2	3.4	3.5	3.7	3.6
Other clupids	6.6	2.5	3.4	1.8	3.1
Perches	0.6	0.6	0.6	0.7	0.7
Sciaenids	18.1	19.4	17.4	19.3	21.2
Ribbon fish	12.8	24.7	20.8	26.9	26.1
Carangids	3.4	8.3	4.1	4.5	3.4
Mackerel	6.8	44.4	10.2	2.4	14.4
Seer fish	6.4	6.3	3.0	8.1	10.1
Tunnies	2.5	4.5	1.0	1.7	3.4
Soles	8.0	4.1	4.1	4.4	6.3
Upenaidis	7.7	9.8	6.7	6.9	8.9
Prawns	114.6	121.4	115.1	107.1	132.0
Lobsters	0.6	0.6	0.6	0.6	0.3
Cephalopods	7.3	10.4	7.7	15.1	14.0
Others	31.4	36.6	34.5	31.0	47.5
<b>Total</b>	<b>346.3</b>	<b>403.6</b>	<b>342.2</b>	<b>344.1</b>	<b>419.6</b>

Source : Department of Fisheries, Govt. of Maharashtra



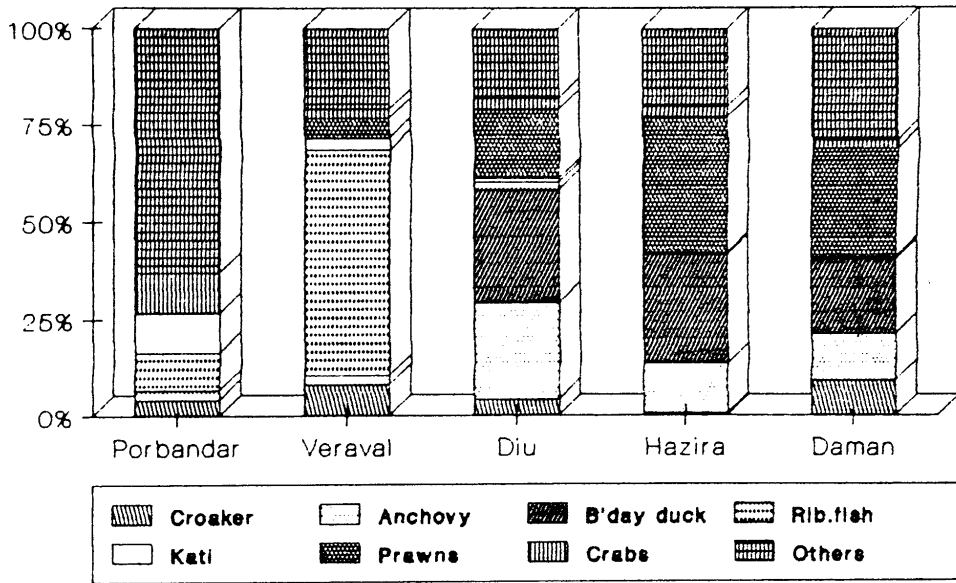


Fig 2 : Percentage contribution of trawl catch along Gujarat coast

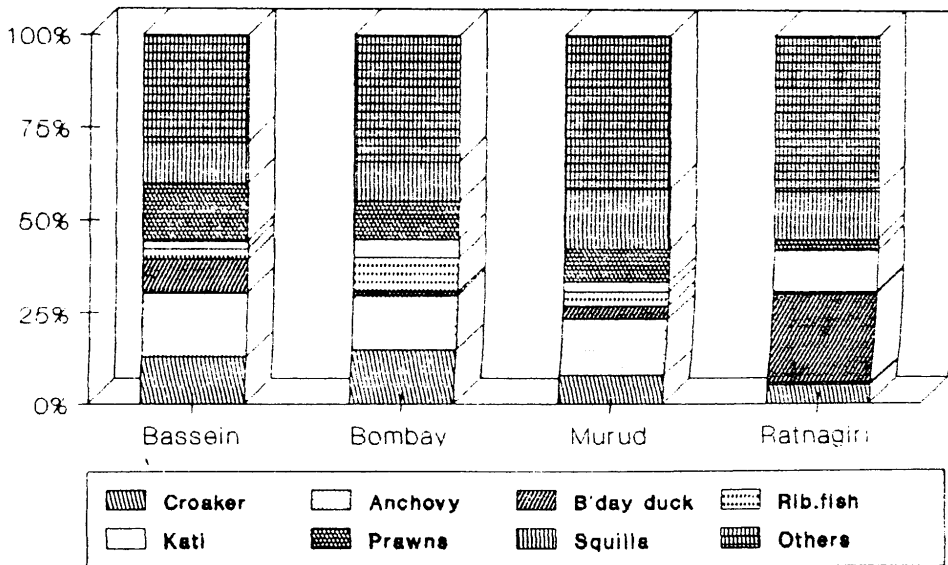


Fig. 3 : Percentage contribution of trawl catch along Maharashtra coast

*T. haumela*, *Pampus argenteus*, *P. chinensis*, *Ilisha megaloptera*, *Scoliodon laticaudus*, *Scomberomorus guttatus* and *Arius* sp.

Among the prawn *Exopalaemon styliferus*, *Parapenaeopsis stylifera*, *Atypopenaeus stenodactylus*, *Penaeus semisulcatus*, *Metapenaeus brevicornis*, *Exhippolysmata ensirostris* and *Acetes* sp. were the dominant species.

Overall, the sea adjoining Porbandar and Ratnagiri showed a higher yield of fishery both in term of quality and quantity. Areas off Hazira, Daman and Bassein sustained relatively poor fishery yield. Zones close to industrialised cities showed a fluctuating trend in catch rate along with low species diversity probably due to input of waste.

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