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**INFORMATION ONLY**

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# Technical Notes



## DEMERSAL FISHERY RESOURCES OF INDIA – AN UPDATE

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### Introduction

The continental shelf of Indian EEZ extending upto 200 m depth is a rich abode of a variety of demersal finfish resources contributing substantially to the total marine fish production in the country. The major demersal fin fish resources are the elasmobranchs, major perches, catfishes, threadfin breams, silverbellies, sciaenids, lizardfishes, pomfrets, bulls eye, flatfishes, goatfish and white fish. A review of the literature shows that the demersal fisheries in India had been growing in a phased manner during the past 5 decades thanks to the development envisaged through different 5 year plans since the country's attaining independence. On the flip side we have several issues adversely affecting the increase in production of the resources such as growth overfishing, recruitment overfishing, increased operation of units through multiday fishing, scraping the benthic biota etc. In this chapter, an attempt is made to examine the present status and future needs of the demersal fisheries sector of India.

### Demersal fish production

#### Past and the present (Fig.1)

It may be seen that the demersal fish landings has increased from 164016t in 1961 to 174803t during 1964 but declining to 159912t during 1965. The catch however, indicated an increasing trend thereafter reaching a peak of 879786t in 1998 but declining to 788472t in 2000. The contribution of demersal finfish resources in total marine landings was 27.45% (Table 1).

#### Coastwise landings (Fig.2)

Of the Indian coastline of 8129 km length, west coast forms 41% with the east coast contributing to 32.85% and the rest by Andaman- Nicobar and Lakshadweep islands. The demersal fish production along the west coast during 1981-2000 indicated an increase from 291078t in 1981 to 644117t in 1998 but declining thereafter to 434890t during 1999 and 548884t during 2000 with an average of 429370t. Along the east coast, the demersal fish catch increased from 188735t in 1981 to 235669t in 1998 but declined to 239588t in 2000, the average being 227881t. The contribution by west coast and east coast was 65.33% and 34.67% respectively.

**Statewise landings:** State wise contribution of total demersal fish landings during 1981-2000(average) is presented in **Fig.3**.

Gujarat contributed to the maximum of 29.47% followed by Tamil Nadu (20.4%), Kerala (15.55%), Maharashtra (12.66%), Andhra Pradesh (6.6%) and Orissa (5.04%) of the average annual demersal fish landings of 657251t during 1981-2000.

### **Depth-wise landings**

All the commercial boats operate within the depth range of 70-80 m and detailed depthwise catch data is not available from commercial landings. However, exploratory surveys conducted along the Indian EEZ had generated information on the bathymetric distribution of major resources. Accordingly, threadfin breams are distributed in 100-200m depth while catfish are distributed in 50-100m depth. Major perches were found more abundant below 50m depth off Wadge Bank while at Gulf of Mannar, their depth of occurrence was 50-100m. Lizard fishes were distributed more in 100-200 m depth along the shelf waters of west coast. Black pomfrets were found more in 55-125m depth while silver pomfrets were abundant in 90-125m depth range. Sciaenids were found more in 50-100m depth along upper east coast and at 50-200m depth along lower east coast. The depth of occurrence of elasmobranchs was 100-200m off Gulf of Mannar while along north west coast, their distribution was more in shallow waters upto 100m depth.

### **Fishery of major demersal fishes**

#### **Elasmobranchs**

In India the average landings of elasmobranchs during 1990-2003 amounted to 63010t contributed by sharks (39437t, 62.6%), skates (2323t, 3.68%) and rays (21250t, 33.73%). The annual landings increased from 50690t in 1990 to a peak of 75304t in 1994 but declining thereafter. Statewise, Tamil Nadu (27.5%) contributed to the maximum followed by Gujarat (19.5%), Maharashtra (16.7%) and Andhra Pradesh (15%) (Fig.4A). Group wise, sharks were more abundant off Gujarat and Maharashtra while rays were more distributed off Tamil Nadu and Andhra Pradesh. Major species landed are *Scoliodon laticaudus*, *Carcharhinus sorrah*, *C.limbatus* and *Sphyrna zygaena* among sharks, *Aetobatus narinari*, *Himantura uarnak*, *H.bleekeri* & *Taeniura melanospilos* among rays and *Rhinobatus typus* & *Rhynchobatus djiddensis* among skates.

**Management:** Information on the species diversity and biology of elasmobranchs is scanty. Elasmobranchs are slow growing, viviparous, low fecund fishes with longer gestation period. To maintain regular fishery, management measures such as protection of females, observing their nursery ground as closed areas and protecting vulnerable species are required. Above all, a good data base on the specieswise landings and trade are to be generated.

#### **Catfishes**

With an average annual landing of 46012 t during 1990 – 2003, the catfish resources contributed to 6.87% of the demersal fish landings. West coast especially Gujarat & Maharashtra contributed to 70 % followed by east coast (Tamil Nadu & Andhra Pradesh) (30%). The resource was mainly exploited by gill net, hooks&line, purse seine, boat seine and other artisanal gears. The production indicated an increasing trend from 38230 t during 1990 to 58352t during 2000. Until 1980, south west coast was the dominant catfish producing region along the west coast but from 1981-85 onwards, northwest coast

produced 72.5% (Fig.4B) of the catfish production from the west coast. This may be due to the purse seine operation along the Karnataka/Kerala region capturing mouth breeding male catfishes especially of the species such as *Tachysurus thalassinus*, *T.tenuispinis*, *T.dussumieri* and *T.serratus*.

**Management:** Stock assessment studies recommend strengthening of hooks&line and gill net fishing, willful avoidance of shoals and trawling in the grounds beyond 50m. depth.

### Major perches

The average annual production during 1990-2003 by major perches amounted to 28776.8t contributed by rock cods (14827t; 51.52 %), snappers (4284t; 14.88 %) and pig face breams (9665t; 33.59%). The contribution of the group to total marine landings was 4.28%. These fishes inhabit the rocky grounds of Tamil Nadu, Gulf of Kutch, Gulf of Mannar, off Paradeep and Andaman seas. The potential yield of the group is estimated as 1,14,000t within 50m depth and 1,25,000t beyond 50m depth. They are caught in traps , hooks & line and dol net. The major species of groupers caught are *Epinephelus chlorostigma*, *E.diacanthus*, *E. areolatus*, *E. tauvina*, *E.morrhua* & *Pristipomoides typus*. Among snappers, *Lutjanus gibbosus*, *L.rivulatus* & *L.lutjanus* are the major species landed. *Lethrinus nebulosus* , *L.ramak* and *L.elongatus* are the major species landed among pig face breams. Studies on the size frequency distribution indicates that the mean size of *E.malabaricus* along south west coast is reduced over the years indicating fishing pressure on the species. Information on the biology of the species is scanty. However, it has been reported that the spawning season of *P.typus* off Kerala is February –June while in *E.areolatus* and *E.chlorostigma*, it is during June-July months.

**Management:** There is considerable scope for increase in production of major perches. Efforts have to be made to effectively exploit the stock by developing suitable fishing gears.

### Threadfin breams

Popularly known as “Pink perch”, the nemipterids contributed to 12.97% (86940t) of demersal fish landings in the country during 1990-2003. Statewise, the major contributors are Maharashtra (25.72%), Kerala (21.78%), Karnataka (21%) and Gujarat (21%) (Fig.4C). Fishery of threadfin breams are known to be influenced by upwelling and are known to move to inshore waters during monsoon along the west coast of India. Major species are *Nemipterus japonicus*, *N.mesoprion* *N.delagoae* and *N.luteus*. They are fractional spawners with protracted spawning season.

**Management:** Since threadfin breams inhabit deeper waters of 100- 200m depth, trawling in this depth has to be increased. The potential yield is 1,28,000t while the present yield is 1,16,680t ( as on 2000) which is within the permissible level.

### Silverbellies

The silverbellies (Family: Leiognathidae) with an average landings of 57823 t contributed to 8.6% of the total demersal fish landings in India. Statewise, Tamil Nadu contributed to maximum of 57.31% (Fig.4D). of the landings. They are principally shallow water fishes distributed in the 0-40m depth range. The silverbellies are exploited mainly by trawl and a

variety of artisanal gears like shore seine, boat seine, gill net etc. Of the 21 species of silverbellies distributed along the Indian coast, *Leiognathus dussumieri*, *L.jonesi*, *L.splendens*, *L.brevirostris* and *L.equulus*, *Secutor insidiator* and *Gazza minuta* are mainly represented in the landings.

Biology of *L. bindus* showed that they spawn almost throughout the year with peak during December-January months. Along Andhra Pradesh, *L.dussumieri* is reported to spawn during April-May while along the Gulf of Mannar, *L.brevirostris* is found to be a continuous spawner and along the Palk Bay and Gulf of Mannar, silverbellies are fractional spawners spawning throughout the year with one or two peaks of longer duration each year. The length at maturity ranges from 62 to 100mm with values of majority of species falling in the range of 80-95mm. They prefer zooplankton as food.

**Management:** Stock Assessment studies indicate that the management measures should be of a continuous nature taking into account changes in species composition, changes in the average length, life span, length at maturity and growth. Similarly, small scale industries such as making palmyra basket etc have to be developed for meeting the requirements of sun drying and salt cured silverbellies and transporting them to interior markets. Further, studies are also to be continued on the species diversity, revision of the potential yield etc which at present is lower (39,000t) than the landings (57,823t) (Table-2).

### Pomfrets

Pomfrets are export quality food fishes distributed along the Indian coast. This resource represented by 3 species namely *Pampus argenteus* (Silver pomfret), *P.chinensis*(Chinese pomfrets) and *Formio niger*(Black pomfrets) are caught mainly in trawl, gill net and dol net. Pomfret fishery in India brought an average landings of 40312t (6% in demersal landings) contributed by *P.argenteus*(63.86%),*F.niger* (34%) and *P.chinensis*(2.16%). Statewise, Gujarat contributed to the maximum(20.5%) followed by Maharashtra(18.4%) and west Bengal(17.23%)( Fig .4E). *P. argenteus* feeds on zooplankton such as copepods, jellyfishes and decapods. Stock assessment studies indicated that *P.argenteus* is subject to growth overfishing while in *F.niger*, there is need to reduce the fishing effort.

### Croakers

Sciaenids , popularly known as Jew fishes are one of the major demersal fishery resources of India. The annual average landing during 1990-2003 was 156280 t contributing to 23.33% of demersal fish landings of the country. North west coast represented by Gujarat and Maharashtra brought the major share of more than 50% of the total catch of this resource. Gujarat (30%) and Maharashtra (23.8%) contributed to the bulk of the landings (Fig.4F). Sciaenids are caught in trawl, dol net, gill net, shore seine and hooks & line. About 20 species represented by *Otolithus cuvieri*, *O.ruber*, *Johnius Spp.*, *Johneios Spp*, *Atrobucca nibe* , *Protonibea diacanthus* , *Otolithoides biauritus* , & *Kathala axillaris* are the major species contributing to the fishery.

**Capture of juveniles.** The capture of juveniles of sciaenids was more during monsoon and post monsoon months off Veraval, Mumbai and Kakinada. The air bladder of larger species such as *P.diacanthus* and *O.biauritus* are dried and are exported to far eastern countries for being used in the manufacture of isinglass, while smaller species are sold in fresh condition or are iced and transported to distant places. The sciaenids caught during

multiday fishing are also salted and sundried. The juveniles caught are sundried for preparation of fishmeal.

**Management:** With a view to check capture of juveniles, it is necessary to check capture of immature fish by regulating the size of cod end mesh to 25-30mm. And also the shallow protected coastal areas have to be declared as closed areas .

### **Lizardfishes**

Lizardfishes belonging the family Synodontidae forms an important bycatch in shrimp trawlers in tropical and sub tropical seas. The all India lizardfish landings during 1990-2003 amounted to 26593t contributing to 3.97% of the demersal fish landings . Statewise, Kerala contributed to the maximum (37%) followed by Gujarat(21%) and Tamil Nadu(13%)(Fig.4g). *Saurida tumbil*, *S. undosquamis*, *S.micropectoralis* and *Trachinocephalus myops* are the major species represented in the landings. Lizardfishes are carnivores, feeding on fishes and crustaceans and are also cannibalistic

Juvenile capture using small meshed cod end of trawlers is a major threat to the sustenance of lizardfish fishery. Off Chennai, the juveniles caught ranged between 32% and 55% of the exploited population of the resource. As in other groups, implementation of regulatory measures such as closed season and mesh size regulation are the immediate management measures to be initiated to maintain the MSY.

### **Flat fishes**

Fishes belonging to the families Cynoglossidae (Tongue soles), Psettodidae (Indian Halibut) Bothidae (flounders) and Soleidae (Soles) are popularly known as flat fishes. They are bottom dwelling fishes occupying muddy or sandy bottom of shelf areas. The average annual landings of flat fishes amount to 44764 t (6.68%). They are contributed the maximum from south west coast particularly Kerala (46.33%)(Fig.4H). Among all the species of flat fishes, *Cynoglossus macrostomus* is the most dominant species along the south west coast. Other major species are *C.bileneatus*, *C.macrolepidotus*, *Psettodus erumei* and *Zebrias quagga*. Juveniles form sizeable quantities of the landings of *C.macrostomus* contributing to 33 to 49% of the landings during 1997-2001. Stock assessment studies indicate that there is no evidence of overexploitation of flat fishes along the Indian coast. However, it is essential to adopt regulatory measures for sustaining the stock.

### **Goat fishes**

The goat fishes (Family: Mullidae) are small sized fishes distinguishable by their bright colouration and a pair of barbels on the chin. With an average annual landings of 15432t- during 1990-2003, they contributed to 2.3 % of demersal fish landings of the country. Regionally, goat fishes are landed the maximum from Andhra Pradesh(40%) followed by Tamil Nadu(37.21%)(Fig.4I). A total of 16 species are reported to occur along the Indian coast of which the major species contributing to the fishery are *Upeneus vittatus*, *U.bensasi*, *U.sulphureus*, *U.tragula*, *U.taeniopterus* & *Parupeneus indicus*. Juveniles contributed to sizeable quantities of the landings of goat fishes. However, since there is no targeted fishery, it may not be possible to implement management measures .

## White fishes

The white fish (Family: Lactariidae) represented by a single species *Lactarius lactarius* is a good quality fish of consumer preference. The annual average landings amounted to 6346t (0.94%) during 1990-2003 with major contribution from northwest coast (43%) followed by south west coast (32%) and South east coast (24%). Stock assessment studies indicated that the current exploitation rate (0.68) is above the optimum level (0.50). Irrational bottom trawling is known to affect the benthic stock and subsequently the white fish stock particularly along the south east coast. Since there is no targeted fishery for white fish, separate management measures are not possible.

## Non conventional fishery resources

Exploratory surveys conducted along the Indian EEZ had shown that there is rich abundance of non conventional fishery resources such as Bulls eye (*Priacanthus Spp*), Indian drift fish (*Ariomma indica*), and Black ruff (*Centrolophus niger*) in waters of 50-300/500m depth especially off south west coast of India where an estimated potential of 2,75,00t of these fishes is reported (Sudarsan, 1993).

## Harvestable Potential: (Table 1)

The estimated potential yield and current yield of major demersal fishes along the Indian EEZ are presented in Table-1. It may be seen that most of the resources except the perches have been exploited to the optimum level from waters upto 50 m depth. Beyond 50 m depth, the major potential groups are elasmobranchs(1.03 lakh t) catfishes(0.63 lakh t), sciaenids(22000t) and pomfrets(12,000t).

## The future

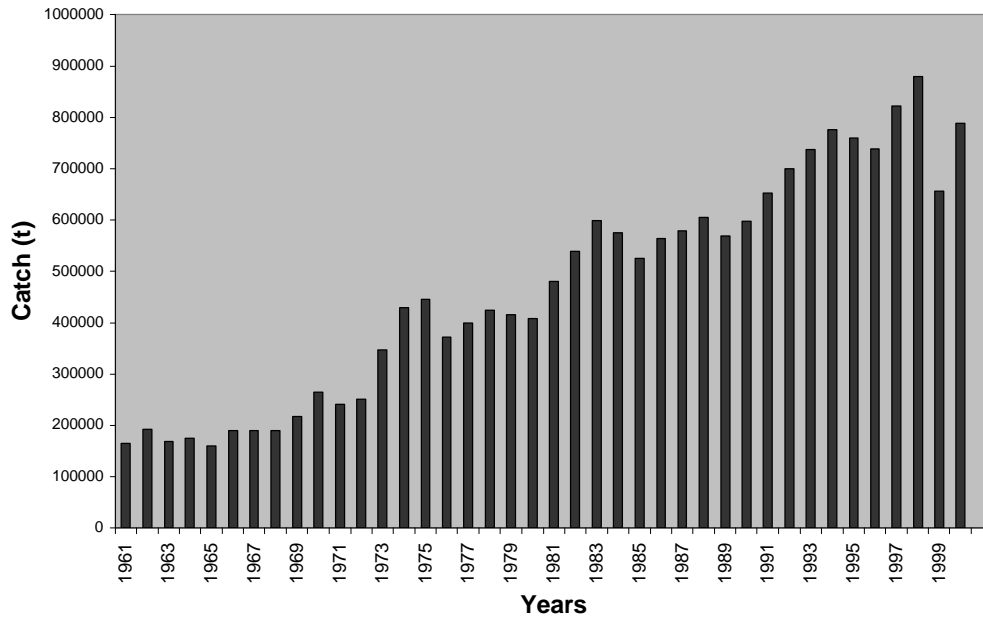
It may be seen from the foregoing account that most of the resources are almost fully exploited or have exceeded the potential level. This situation is created because of the continuous scraping of the bottom destroying the ground fishes, their favourite benthic food items and the exploitation of juveniles resulting in growth overfishing and capture of brooders leading to recruitment overfishing. Therefore, it is hightime that management measures such as enforcing mesh size regulation and gear regulation, observing closed season, identifying and declaring closed areas, and minimizing bycatch/discards from the inshore waters are implemented. Besides, steps are also to be taken for diversification of fishing effort to exploit ground fish inhabiting the rocky areas along the continental shelf edge and to extend fishing to deeper waters to tap the nonconventional fishery resources. It is also necessary to check fishing pressure by undertaking voyage fishing and the use electronic devices for fish finding and fishing. And there is need for policy intervention between state governments and at national level to enforce the regulations to uplift the socio-economic condition of fishermen simultaneous with attempt to develop alternate means of enhancing fish production through mariculture.

### Suggested Readings:

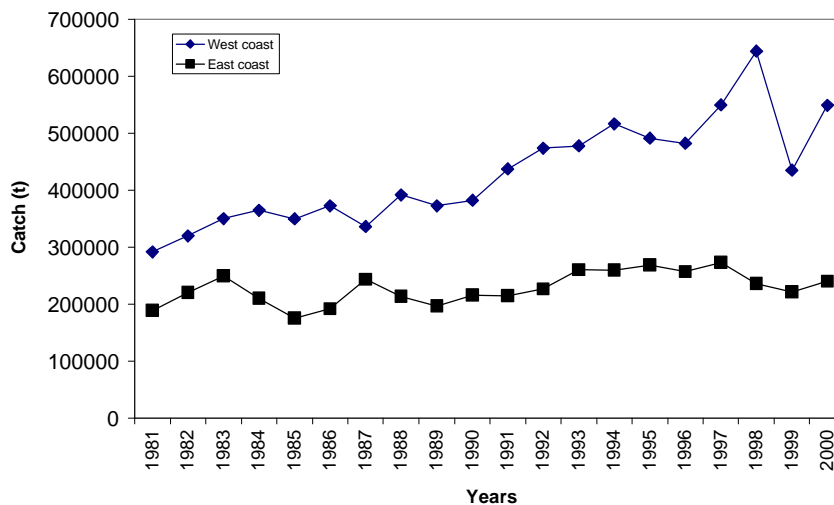
Mohan Joseph Modayil & A.A. Jayaprakash (Eds)2003. Status of Exploited Marine fishery Resources of India. Central Marine Fisheries research Institute, Kochi-682014, India: P.308.

Sudarsan, D.1993. Marine fishery resources in the Exclusive Economic Zone of India In: *Proc. Low Energy Fishing*. P.4-11.

**Fig.1. Demersal fish landings in India during 1961 - 2000.**



**Fig. 2 All India Demersal fish landings West coast and East coast during 1981 - 2000.**





**Table-2. Current yield and potential yield of major demersal finfishes of India**

Groups/Year	Current Yield(1000t)		Pot. Yield Upto 50m	(1000t) Above 50m	Total P.Y. (1000t)
	2002	2003			
Elasmobranchs	59.8	58.3	65	103	168
Catfishes	58	56	60	63	123
Lizardfishes	27	29	27	21	48
Perches	153	137	114	125	239
Goatfishes	12	12	20	0	20
Croakers	125	125	120	22	142
Silverbellies	62	52	82	4	86*
Pomfrets	41	40	42	12	54
Soles	40	46	38	0	38

\* Including Andaman & Nicobar Islands.

**Fig. 3. Statewise Demersal Fish Landings during 1981 - 2000 ( average % )**

