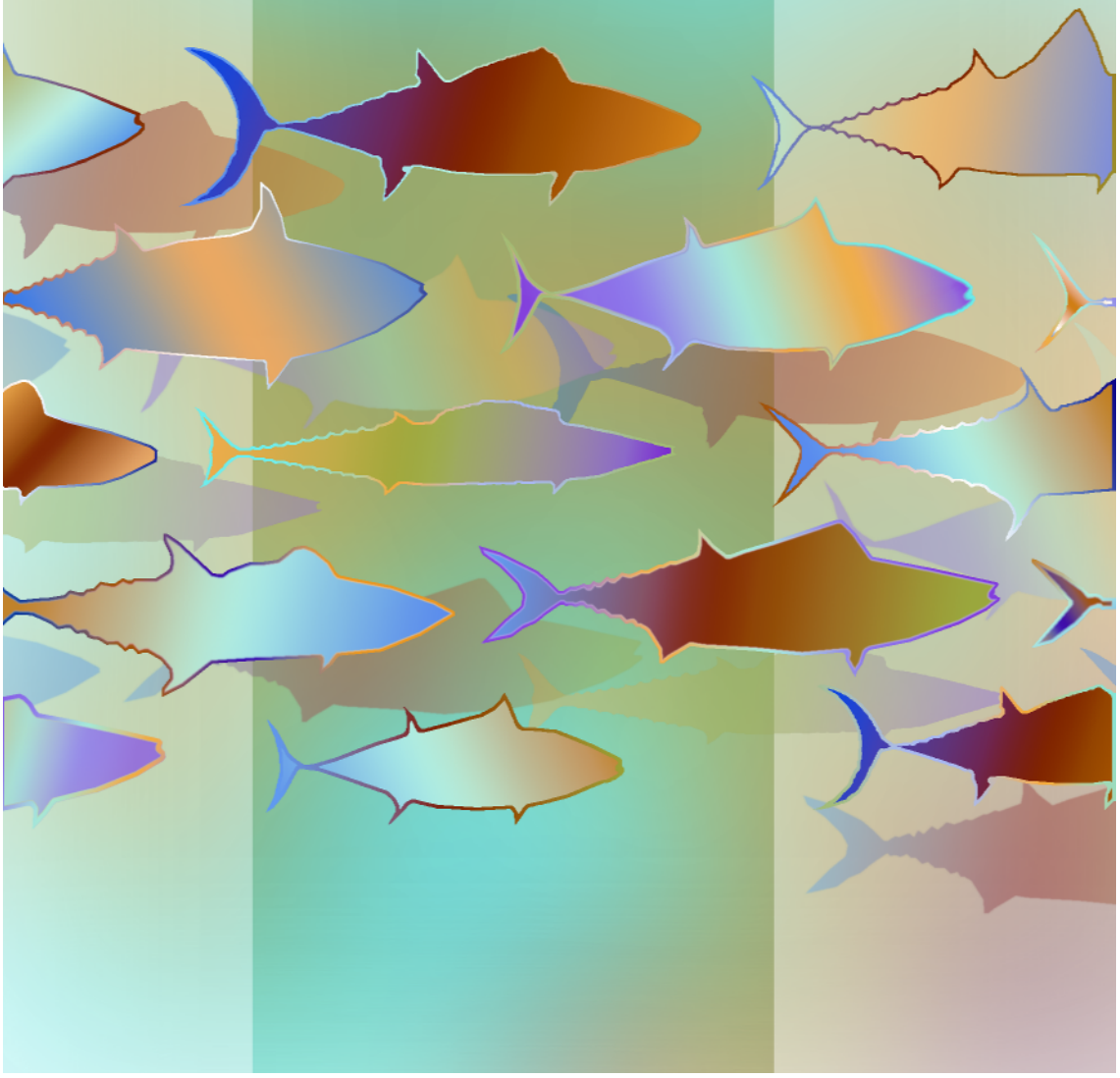
Status of Exploited Marine Fishery Resources of India



STATUS OF EXPLOITED MARINE FISHERY RESOURCES OF INDIA

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Penaeid Shrimps

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1. Introduction

India has ever remained one of the major contributors to the world production of marine crustaceans. The penaeid shrimps constitute the backbone of seafood export industry as the major foreign exchange earner as well as a source of livelihood for millions of fish workers. Frozen shrimp contributes about 70% (Rs. 4,480 crores) of the total export value of our country and the share of capture fisheries is 59% by volume. As penaeid shrimps are targeted for fishing, knowledge on the present status of the fishery is critical for implementation of proper management measures.

2. Production trends

Landings of penaeid shrimps showed a phenomenal growth in the last forty years with a seven-fold increase from 32,000 t in 1960 to 2,07,080 in 2000. This was mainly achieved by intense combing operation of inshore waters, increase in effort, extension of trawling to deeper waters, introduction of multiday fishing operations, night trawling and introduction of innovative gears in the artisanal sector. During 1991-2000, penaeid shrimps formed 47% of total crustacean landings along both coasts. The all India annual shrimp production

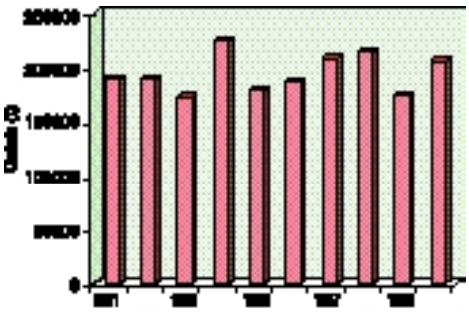

Fig. 1. All India penaeid shrimp landings (1991-2000)

during this period varied between 1,73,443 t and 2,24,902 t with an annual average catch of 1,95,059 t (Fig.1). About three fourth (75.5%) of the catch was harvested along the west coast (1,47,299 t) and the rest (24.5%) from east coast (47,754 t). Kerala, Maharashtra, Gujarat, Tamil Nadu, Andhra Pradesh and Karnataka were the important contributors to penaeid landings in the order of abundance (Fig. 2).

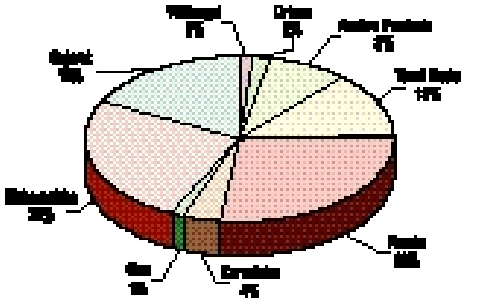

Fig. 2. State wise contribution to penaeid shrimp production (Av. 1991-2000)

Craft, gear and fishing operation

Trawl net, which is the most efficient gear to exploit demersal resources, is operated from medium sized mechanised boats all along the Indian coast, targeting mainly penaeid shrimps. During the decade, trawlers contributed to about 80% of penaeid landing of India. The mesh size of the cod end measures between 18-20 mm and in Gujarat region it is between 12-15 mm. The trawl operation, which was restricted to single day trip was changed to multiday fishing operation during latter half of eighties in order to save fuel cost, operation in deeper grounds as well as to combine day time fishing for cephalopods with prawn fishing during nights. Dol nets operated along north-west coast land smaller varieties of penaeids. Ring seines (smaller version of purseseine) are operated along Kerala-Karnataka coast during monsoon for getting larger varieties of penaeids. Mini trawls are operated from murivalloms along Kerala coast in 3-8 m depth for penaeid shrimps. Thalluvalai, a net resembling in its design a two seam shrimp trawl without otter boards with 7-16 mm cod end mesh is operated from flat bottomed wooden plank-built sail boats, in 3-4 m depth zone along Tuticorin-Mandapam region to catch juvenile prawns. Trammel nets along Vizhinjam-Manakudy region; bottom set gill nets and disco nets along east coast are the other gears operated in coastal waters to exploit penaeid shrimps. Juvenile shrimps are exploited by stake nets from backwaters of both coasts.

Species composition

Some of the important penaeid shrimps that support commercial fisheries along the Indian seas are Penaeus indicus (Indian white prawn) (Fig. 3), P.semisulcatus (Green tiger prawn) (Fig. 4), P.monodon (Giant tiger prawn), P.merguiensis (Banana prawn),

Fig. 3. Penaeus indicus

P.japonicus (Kuruma prawn), P.penicillatus (Red-tail prawn), Metapenaeus dobsoni (Flower-tail prawn) (Fig.5) , M.monoceros (Speckled prawn) (Fig.6), M.affinis (Jinga prawn), M.kutchensis (Ginger shrimp), M.brevicornis (Yellow prawn), Parapenaeopsis stylifera (Kiddi prawn) (Fig.7), P.hardwickii (Spear prawn), P.sculptilis (Rainbow prawn), P.maxillipedo (Torpedo prawn), P.uncta (Uncta prawn), Trachypenaeus curvirostris (Rough prawn), Metapenaeopsis stridulans (Fiddler shrimp), Parapenaeus longipes (Flaming prawn), Solenocera crassicornis (Coastal mud prawn) and S.choprai (Coastal mud prawn). Conventional resources such as Parapenaeopsis stylifera, Metapenaeus dobsoni, M. monoceros, Penaeus indicus and Solenocera crassicornis were the major constituents of penaeid fishery during 1991-2000 along west coast. With the extension of trawling operations and night fishing, non-conventional resources such as Trachypenaeus curvirostris, Metapenaeopsis stridulans, S. choprai, P. canaliculatus and P. japonicus were added to the fishery. P. stylifera dominated the fishery at all centres until recent years. However, S. crassicornis emerged as a prime contributor to the fishery in Gujarat (31-54%) and Maharashtra (23-28%) in 1999 and 2000. Along North Kanara, Calicut and Cochin coasts M. dobsoni and P. stylifera together contributed about 90% of the catch while at Sakthikulangara, P. stylifera (60%) dominated the catch followed by T. curvirostris (16%), M. dobsoni (9%) and M. monoceros (5%). At Mangalore-Malpe coast M. monoceros (26-29%), M. dobsoni (16-19%), T. curvirostris (7-22%), S. choprai

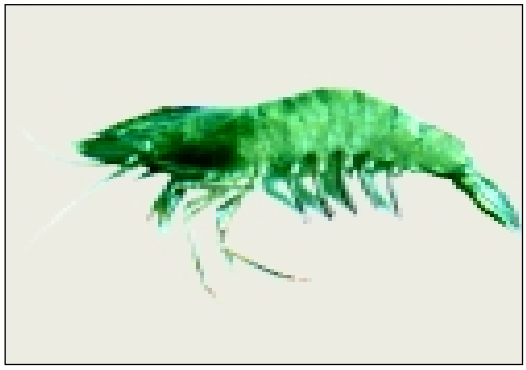

Fig. 4. Penaeus semisulcatus

Fig. 5. Metapenaeus dobsoni

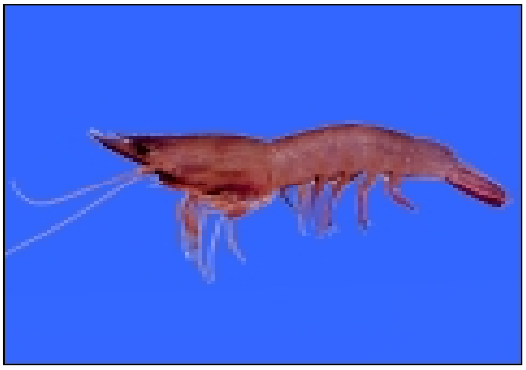

Fig. 6. Metapenaeus monoceros

(17-26%) were the main components of the fishery. Along the east coast, Penaeus semisulcatus dominated the fishery at Tuticorin and formed an important contributor at Mandapam region along with M. stridulans and T. pescadorensis. At Chennai, M. dobsoni and P. indicus were the major species observed in the prawn landings. Along Andhra coast M. monoceros, M. dobsoni, M. brevicornis and Solenocera spp,. were the main contributors. When penaeid shrimp landings of the entire east coast is considered M. dobsoni dominated the catch by contributing 21.4% followed by M. monoceros (13.2%), Metapenaeopsis spp. (9.4%), P. semisulcatus (9.2%), P. indicus (7.5%), P. maxillipedo (4.3%), Trachypenaeus spp. (4.2%), Solenocera spp. (4.1%), P. stylifera (4%), P. hardwicki (3.7%) and P. monodon (1.6%). Metapenaeopsis andamanensis, Aristeus alcockii, Penaeopsis jerryi and S. hextii are the important penaeid species contributing to about 20-40% of deep sea prawn landings along the southwest coast.

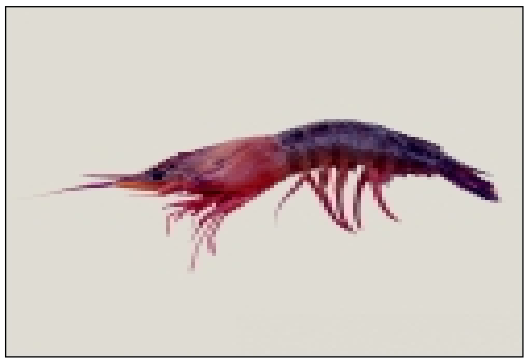

Fig. 7. Parapenaeopsis stylifera

3. Biology

The details on length distribution, estimated length at age, size at first maturity in females and fecundity for important penaeid shrimps are given in Table 1.

Table 1. Biological characteristics of some commercially important penaeid shrimps

Species		Size range (mm)	Total length (mm) 6 months	12 months	Size at first maturity (mm)	Fecundity (in lakhs)
P. indicus	M	76-205	120	180		
	F	51-270	135	200	130	7.3 at 200 mm
P. monodon	M	81-260	140	217	23 CL	
	F	81-300	167	254		8.1 at 81.3 mm CL
P. semisulcatus	M	71-228	113	177	23 CL	
	F	71-250	123	192		6.6 at 45 mm CL
P. stylifera	M	46-110	77	102	63	
	F	46-145	89	119		2.4 at 120 mm
M. dobsoni	M	31-105	90	120	64	
	F	31-115	100	130		1.6 at 120 mm
M.monoceros	M	41-185	84	129	112	
	F	41-210	112	166		3.9 at 163 mm
S.crassicornis	M	55-90			63	
	F	65-125				1.01 at 102 mm

(CL = Carapace length)

Penaeid shrimps are heterosexual. The female prawn is usually larger than male. Growth rate varies in different species and at different phases of life, under different physical conditions like temperature, salinity, etc. All the species show faster growth when young and below one year of age and growth decreases as the prawn becomes older. Penaeid shrimps belonging to the genus Penaeus grow to a larger size and among them the tiger prawn, P. monodon reaches a total length of 300 mm.

The penaeids feed mainly on animal food items and are carnivorous irrespective of size and sex in both marine and estuarine conditions.

Penaeid shrimps have high fecundity and the number of eggs produced varies between species and in proportion to size of females and weight of ovary. Penaeids breed throughout the year with peak spawning months varying between years. In the natural condition, a female shrimp spawns about 4-5 times. Success of the recruitment to the fishery depends mainly on the prevailing environmental conditions.

Life span of a penaeid shrimp is around two years and 0-year group contributes more to the prawn fishery.

4. Stock assessment

Estimation of stock for individual penaeid species to find out maximum sustainable yield for its judicious exploitation had been carried out by different research workers based on the data on the fishery and population characteristics of the species collected from different fish landing centres. The study showed that average annual yield of all commercial species such as P. indicus, P. semisulcatus, M. dobsoni, M. monoceros and P. stylifera had reached the MSY. The yield per recruit analysis further confirmed that there may not be any significant improvement in the yield with increase in fishing effort.

5. Management

Estuaries and backwaters are nursery grounds for many commercially important penaeid species (M. dobsoni, M. monoceros and P. indicus) and act as a source of recruitment for inshore stock. Large-scale destruction of juveniles takes place in this environment as a result of indiscriminate fishing mainly by stake nets. Today, unauthorized stake nets far exceeds the licensed ones. These should be removed permanently. Total ban of export of shrimps below a fixed minimum size is to be recommended to sustain the fishery. Capture of juvenile shrimps is uneconomical, curtails employment potential and a national loss worth crores of Rupees in foreign exchange.

Enforcement of a temporary closure of the fishery is an effective option in the conservation of the shrimp resource. Closure of fishing during the southwest monsoon along the west coast in the states of Karnataka and Gujarat act as a natural conservation measure. Ban on monsoon trawling in the first half of the monsoon season is in vogue in Kerala for the last 14 years. This partial ban has prevented the capture of undersized prawns in June and July resulting in increased availability of

larger prawns in the post ban period. However, the trawl ban did not benefit the fishery, as the monsoon Karikkadi (P.stylifera) catch did not show much variation when compared with the pre ban period. Maharashtra and Tamil Nadu has imposed trawling ban in recent years.

Cod end mesh size of the trawl net in operation along the Indian coasts is generally ranging between 15 mm and 20 mm which results in large scale capture of juveniles and undersized prawns, which are often discarded. The ideal size of the cod end mesh size is around 25 mm which should be followed by fishermen and monitored by Government.

Operation of mini trawl with a cod end mesh size around 10 mm operated along the Kerala coast and Thalluvala in Gulf of Mannar and Palk Bay regions cause heavy destruction of juvenile population of Karikkadi (P.stylifera) and green tiger prawn (P.semisulcatus) respectively. Fishing by these type of gears should be completely banned by compensating the fishermen involved or by offering alternate jobs.

At present inshore areas are overexploited. Extension of fishing to areas beyond conventional fishing grounds has to be encouraged by offering suitable subsidy. Natural stocks of heavily exploited prawn species can be replenished by large-scale sea ranching of the post-larvae.

Marine fishing regulation laws delimit area of operation of different types of gears and vessels to safeguard the interest of different sectors. These laws are more breached than observed. Trawling within 10 m depth by commercial trawlers as well as mini trawlers should be completely stopped in order to avoid exploitation of juvenile prawns. Existing laws should be strictly implemented to avoid sectoral conflicts.

Finally, the number of trawl units operated should be restricted based on the stock assessment study. The respective state government should stop issuing license to new trawl units for prawn fishery in inshore waters.

6. Suggested reading

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