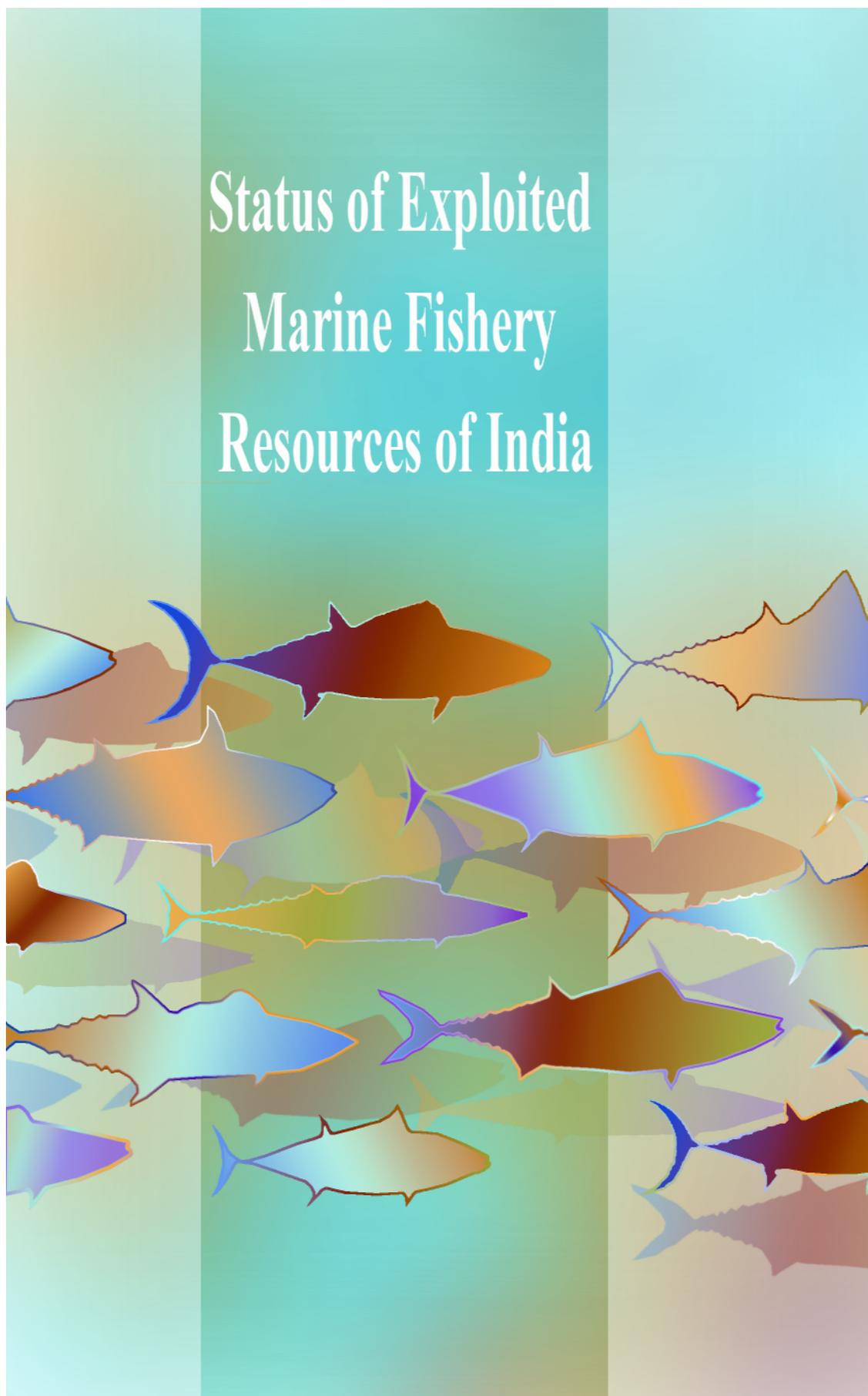


# Status of Exploited Marine Fishery Resources of India



**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

# 28

---

## Cephalopods

M. M. Meiyappan and K. S. Mohamed

---

1. Introduction .....	221
2. Production trends .....	223
3. Biology .....	226
4. Stock assessment .....	226
5. Management .....	227
6. Suggested reading .....	227

### 1. Introduction

Cephalopods include squids, cuttlefishes and octopuses and are commercially exploited all along the Indian coast. These were once thrown overboard as discards but the demand from export trade in the mid-seventies induced the fishers to save these catches. Since then the production has been rapidly increasing and the present annual production is around 100,000 tonnes. The cephalopods contribute to about 4% of total marine landings. They account for about 10% by value of the total marine products exported. There are about 80 species recorded from Indian waters but only a dozen are of commercial importance (Table 1).

Table 1. Cephalopod species, their common names, local names and distribution along the Indian coast

Species 1	Common name 2	Local name 3	Distribution 4
Squids			
Loligo uyii	Little squid	Oosikanava in Tamil Nadu	Chennai & Visakhapatnam
L. duvauceli	Indian squid	Narsinga in Gujarat, Narasingha/Nal in Maharashtra, Bondas in Karnataka, Koonthal/Olakanava in Kerala, Oosikanava in Tamil Nadu, Kumutimuna/Kalirinda in Orissa, Samudra shasha/Bed in West Bengal	All along Indian coast

Status of Exploited Marine Fishery Resources of India

1	2	3	4
<i>Doryteuthis sibogae</i>	Siboga squid	Olaikanava in Tamil Nadu, Soochikanava in Kerala	Southwest & Southeast coasts
<i>D.singhalensis</i>	Needle squid	Soochikanava in Kerala	Kerala coast
<i>Loliolus investigatoris</i>			All along Indian coast
<i>Sepioteuthis lessoniana</i>	Palk Bay squid	Kanava in Tamil Nadu	Palk Bay & Gulf of Mannar, Lakshadweep
Cuttlefishes			
<i>Sepia pharaonis</i>	Pharaoh cuttle fish	Dedka in Gujarat, Makul in Maharashtra, Kappe Bondas in Karnataka, Kallankanava in Kerala, Ottukanava in Tamil Nadu	All along Indian coast
<i>Sepia aculeata</i>	Needle cuttlefish	Dedka in Gujarat, Goti in Maharashtra, Kallankanava in Kerala, Ottukanava in Tamil Nadu	All along Indian coast
<i>Sepia elliptica</i>	Golden cuttlefish	Dedka in Gujarat, kallankanava in Kerala	Gujarat & Kerala
<i>Sepia prashadi</i>	Hooded cuttlefish	Ottukanava in Tamil Nadu	Southwest & Southeast coasts
<i>Sepia brevimana</i>	Shortclub cuttlefish	Ottukanava in Tamil Nadu	Chennai & Visakhapatnam
<i>Sepiella inermis</i>	Spineless cuttlefish	Dedka in Gujarat, Makali in Maharashtra, kallankanava in Kerala, Ottukanava in Tamil Nadu, Salakh in Gujarat, Negal in Karnataka, Neerali/Kinavalli in Kerala, Peikanava in Tamil Nadu	All along Indian coast
Octopus			
<i>Octopus dollfusi</i>	Marbled octopus		Southwest & Southeast coasts
<i>Octopus membranaceus</i>	Webfoot octopus		Southwest & Southeast coasts
<i>O. lobensis</i>	Lobed octopus		Southwest & Southeast coasts
<i>O. vulgaris</i>	Common octopus		Southwest & Southeast coasts
<i>Cistopus indicus</i>	Old woman octopus		Southwest & Southeast coasts

Sexes are separate in all cephalopods. In many species the female die after spawning, though this phenomenon is not universal. They are active predators and in turn are preyed upon by large predators. They play the role of subdominant predators and tend to increase in biomass when other species that prey upon them

become depleted due to heavy fishing. The cephalopod meat is high in protein and low in fat content that makes them ideal for human consumption.

## 2. Production trends

The production of cephalopods increased from a mere 94 t in 1961 to 1,11,534 t in 2000 along the Indian coast (Fig.1). However, the increase in production was not consistent and showed the following four phases during the four decades; (i) sharp increase from 94 t in 1961 to 10,786 t in 1976; (ii) marginal increase from 10,786 t in 1976 to 20,407 t in 1984; (iii) sharp increase from 20,407 t in 1984 to 1,16,753 t in 1995; and (iv) stagnation at around 1,10,000 t during 1996-2000.

The sharp increase in the landings during 1961-76 could be attributed to the combined effect of finding virgin trawling grounds for cephalopods in the inshore waters after the

introduction of commercial trawlers in the early 1960s, as well as export demand, which induced the fishermen to exploit the resource. The decrease in the rate of growth in production in the second phase was perhaps due to the trawl fishery attaining the fully exploited phase in the inshore waters. The sharp increase in the third phase was due to the extension of fishing grounds to areas beyond 50 m depth (up to 100 m depth), by induction of larger trawlers (OAL 13-18 m) as well as introduction of high opening bottom trawls along the Indian coast. The stagnation in production during the last five years may be due to the trawl fishery attaining the fully exploited phase up to the 100 m depth. It appears that the cephalopods are being fully exploited up to 100 m depth contour along the Indian coast during the last 5 years.

### Regional landings

The production of cephalopods increased all along the Indian coast during 1961-95. However, the increase was more along the west coast than in the east coast. Whereas the production increased from 83 t (1961) to 1,00,246 t (1995) along the west coast, it increased from 11 t to only 16,507 t in the east coast during the same period. Consequently, the contribution of the west coast to the cephalopod landings increased from 67% (1961-70) to 86% (1991-2000) (Table 2). Along the west coast, the contribution of the northwest coast (Maharashtra and Gujarat) to the all India cephalopod landings substantially increased from 13% (1961-70) to 45% (1991-2000), whereas that of the southwest coast (Goa, Karnataka and Kerala) decreased from 54% to 41%. The contribution of the southeast coast (Tamil Nadu, Pondicherry

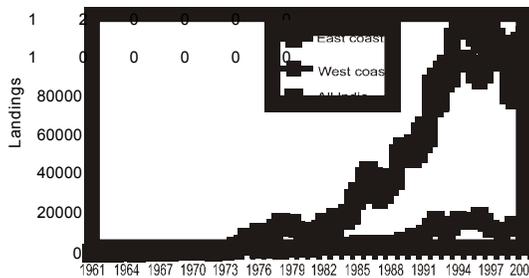


Fig. 1 Estimated annual Cephalopod landings (t) along the Indian coast

and Andhra Pradesh) also decreased from 32% to 13%. The contribution of the northeast coast (Orissa and West Bengal) to the cephalopod landings in India was negligible. During the last decade (1990-2000), the west and east coasts contributed 86% and 14% to the cephalopod landings, respectively; the northwest, southwest, southeast and northeast coasts contributed 44%, 42%, 13% and 1% respectively.

Table 2. Regionwise contribution (%) of cephalopods along Indian coast

	NE	SE	SW	NW	East coast	West coast
1961-1970	1	32	54	13	33	67
1971-1980	0	19	42	38	20	80
1981-1990	0	15	39	45	16	84
1991-2000	0	13	41	45	14	86

#### Gear and depthwise landings

Cephalopods are caught as by-catch of trawl nets along the Indian coast except along the Vizhinjam-Kanyakumari area where there is a targeted fishery for cuttlefishes. Trawl nets operating up to 100 m depth account for 85% of the cephalopod landings. The introduction of high opening bottom trawl nets resulted in rapid increase in cephalopod production. Other gears that exploit cephalopods are hooks & lines, boat seines and purse seines. Along the Vizhinjam-Kanyakumari coast, hooks & lines operated from motorized and non-motorised craft account for the entire cuttlefish catch of the region. Squids are caught in boat seines in this region. Purse seiners occasionally catch shoals of squids along Mangalore – Malpe coast. Shoals of spawning squids, mostly males, were caught along Alleppey coast in cast nets and scoop nets close to shore during post-monsoon period in 1978.

Squids are columnar whereas cuttlefishes and octopus are bottom dwellers. Trawling within 30 m depth contour yields more of squids and near shore species of cuttlefishes. Beyond this zone more of cuttlefishes are caught. Some cuttlefish species such as *Sepia elliptica* exhibits bathymetric distribution. This species is caught along Cochin and Veraval coasts by trawling beyond 40 m. Recently, deep sea trawling beyond 100 m off Cochin has landed species such as the diamond-back squid *Thysanoteuthis rhombus*, an oceanic species hitherto unknown to fishery.

#### Species composition

Cuttlefishes account for about 51% of cephalopod landings along the Indian coast followed by squids (48%). Octopus landings are meager but show an increasing trend. Along the northwest coast, *Loligo duvauceli* (Fig. 2) constituted the entire squid landings whereas along the southwest region *Doryteuthis sibogae* added to the squid landings. Cuttlefish catch along the west coast was composed of *Sepia pharaonis* (27%), *S. aculeata* (16%), *S. elliptica* (2%) and *Sepiella inermis* (2%). Along the east coast, *L. duvauceli* (24%), *Doryteuthis sibogae* (11%), *L. uyii* (2%) and *Sepioteuthis lessoniana* (7%) constituted the squid landings with the latter species restricted to Palk Bay and Gulf of Mannar. Cuttlefish catch was represented by

*S.pharaonis* (30%), *S.aculeata* (17%) and *S.inermis* (5%). Octopus catches along Chennai coast were composed of *Octopus dollfusi* and *Cistopus indicus* whereas along Cochin coast, in addition to these two, *Octopus membranaceus*, *O.lobensis* and *O.vulgaris* were also observed. No marked change in species composition has been observed over the years (Fig. 3).



Fig. 2. *Loligo duvauceli*

Length composition and contribution of juveniles to the fishery

The length range of *L.duvauceli* varied from 30-180 mm (mean size 95-135 mm) along east coast, and 20-330 mm (mean size 105-245 mm) along west coast; that of *S. pharaonis* 80-310 mm (mean size 115-145mm) along east coast and 110-310 mm (mean size 135-265 mm) along west coast; that of *S.aculeata* along east coast, 30-180 mm (mean size 105-145 mm) and along west coast, 30-220 mm (mean size 105-155 mm). There has been no marked decrease in the average sizes. The contribution of juveniles to the fishery has been estimated at 15-20% along both the coasts and trawl net accounted for their capture.

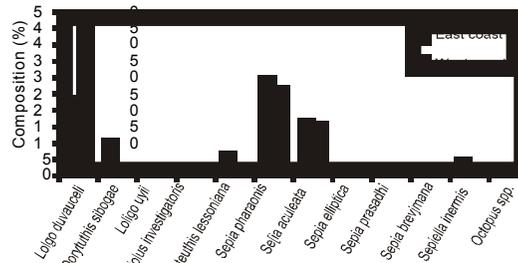


Fig. 3. Species composition of cephalopods caught along east and west coasts of India

Utilization

Bulk of the production is utilized by the export industry and very little is used for local consumption. They are exported as frozen or dried products (34 listed products). Export of cephalopods from India during 1991 to 1999 is shown in Figure 4.

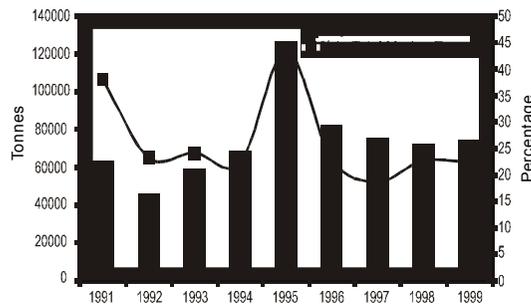


Fig. 4. Export of cephalopods from India during 1991-99

When the exports peaked in 1995, the cephalopods formed nearly 45% of the total quantity exported, however, the annual average is about 25%. The value of cephalopods in total marine exports has remained between 11% and 15% without much variation. The main markets for export of Indian cephalopods are Europe, Japan and China.

### 3. Biology

Spawning in *L.duvauceli* has been observed throughout the year with peaks during post monsoon period. Spawning congregations of this species have been observed along southwest coast very near to shore and become vulnerable for exploitation. But these congregations consisted of mostly males with females probably migrating to deeper waters for egg laying. Available evidence suggests that squid does not die after spawning but this needs confirmation. Mature cuttlefishes of two species such as *Sepia pharaonis* and *S. aculeata* have been observed throughout the year, the former with peaks during October-April along both the coasts; and the latter during February-April and July-August along east coast and February-March and September-November along west coast.

#### Recruitment

Since the cephalopods spawn throughout the year along the Indian coast, the recruitment of *L.duvauceli*, *S.pharaonis* and *S.aculeata* is continuous without any well-defined peak periods.

#### Food

The cephalopods are carnivorous and the food consists of teleost fishes, crustaceans and cephalopods. Cannibalism is common among cephalopods. Feeding intensity is found to decrease during the spawning periods.

#### Growth and lifespan

Cephalopods generally have short life span, which may not exceed two years. Differences in growth rates between sexes have been observed especially along the west coast. Along the west coast, the males of *L. duvauceli* were found to grow faster than the females. Males have been found to attain 198 mm in the first year and 287 mm in the second year but the females attained only 155 mm and 206 mm in the corresponding period. Along the east coast there was not much difference in the growth rates between the sexes. Males attained 131 mm and 184 mm in the first and second year and females attained 149 mm and 190 mm in the same periods. *Sepia pharaonis* males were found to attain 180 mm in the first year and 274 mm in the second year whereas the females grew to 192 mm and 275 mm. In the case of *S.aculeata*, both the sexes attained 122 mm and 202 mm in the first year and second year respectively along the west coast; in the east coast the size attained at different centres varied from 96 mm to 139 mm in the first year and from 158 mm to 184 mm in the second year.

### 4. Stock assessment

Stocks of three species viz., *L. duvauceli*, *S. pharaonis* and *S. aculeata* have been assessed for the Indian coast and separately for some maritime states. The Maximum Sustainable Yield (MSY) of *L.duvauceli* was 1,084 t and 17,199 t; that of *S. pharaonis* 1,058 t and 7,660 t; *S.aculeata* 2,066 t and 8,422 t along the east

and west coast during 1985-89. It seems that the present level of exploitation is at optimal level.

## 5. Management

Since there is no targeted fishery for the cephalopods in India except along the Vizhinjam-Kanyakumari coast, it is difficult to set any management options exclusively for the cephalopods. The jigging experiments to catch squids conducted by the Fishery Survey of India have not yielded encouraging results. Hence the fishery has to depend on trawls only. However, indiscriminate bottom trawling severely disturbs the habitat that facilitates the cephalopods to lay their egg masses. It also affects their food availability. Seasonal trawl ban, which exists along the west coast, has been recently enforced along the Tamil Nadu and Andhra Pradesh coasts also. This has to be extended all along the Indian coast. Closure of trawling during peak spawning periods and increase in the cod end mesh size from 15 to 25 mm are recommended for sustaining the cephalopod production along the Indian coast.

## 6. Suggested reading

- Meiyappan, M.M, K.S. Mohamed, K. Vidyasagar, K.P. Nair, N. Ramachandran, A.P. Lipton, G.S. Rao, V. Kripa, K.K. Joshi, E.M. Abdusamad, R. Sarvesan and G.P.K. Achary. 2000. A review on the cephalopod resources, biology and stock assessment. In: V.N. Pillai and N.G. Menon (Eds.) Marine Fisheries Research and Management, Central Marine Fisheries Research Institute, Cochin. p 546-562
- Pierce, G.J. and A. Guerra. 1994. Stock assessment methods used for cephalopod fisheries. *Fish. Res.*, 21: 255-285.
- Silas, E.G. 1985. Cephalopod fisheries of India - An introduction to the subject with methodologies adopted for the study. In: E.G. Silas (Ed.) Cephalopod bionomics, fisheries and resources of the EEZ of India. *Bull. Cent. Mar. Fish. Res. Inst.*, 37: 1-4.