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Unit-II

MARINE FISHERIES RESOURCES OF INDIA

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UNIT II
MARINE FISHERIES RESOURCES OF INDIA

CATCH TRENDS

PELAGIC, DEMERSAL, MIDWATER, DEEP SEA AND OCEANIC FISHERY

I. PELAGIC FISHERIES

A. INDIAN OIL SARDINE

The Indian oil sardine, ***Sardinella longiceps*** belongs to the family, Clupeidae. This pelagic fish forms schools in coastal waters and is strongly migratory.

Of the fifty species of clupeoid fishes inhabiting Indian seas, at least 25 species are found to be commercially important.

These clupeoid fishes are of great economic importance as a source of food and oil.

Among the several clupeoid fishes, oil sardine is the most abundant and important one. It contributes to nearly 15% of the total marine fish production of India.

This fishery is characterized by remarkably wide fluctuations on a seasonal, annual and decadal scale. The success or failure of oil sardine fishery shows a remarkable influence on the socio-economic status of fishermen to a large extent.

Distribution in India

It is distributed from Gujarat to Kerala on the west coast and Tamil Nadu, Andhra Pradesh and Orissa coasts on the east coast.

Though it is available up to 50 m depth, the maximum abundance is found to be within 30 m.

The optimum temperature and salinity ranges for distribution and abundance of oil sardine are 27 - 28°C and 22.8 - 33.5 ppt respectively.

Occasionally, they enter the estuaries along the southwest coast.

Sardinella longiceps

Indian oil sardine	
Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Actinopterygii
Order:	Clupeiformes
Family:	Clupeidae
Genus:	Sardinella
Species:	*S. longiceps*

There are currently 24 recognized species in this genus:

- *Sardinella albella* (Valenciennes, 1847) (White sardinella)
- *Sardinella atricauda* (Günther, 1868) (Bleeker's blacktip sardinella)
- *Sardinella aurita* Valenciennes, 1847 (Round sardinella)
- *Sardinella brachysoma* Bleeker, 1852 (Deep-body sardinella)
- *Sardinella brasiliensis* (Steindachner, 1879) (Brazilian sardinella)
- *Sardinella electra* Hata & Motomura, 2019 [4]
- *Sardinella fijiense* (Fowler & B. A. Bean, 1923) (Fiji sardinella)
- *Sardinella fimbriata* (Valenciennes, 1847) (Fringe-scale sardinella)
- *Sardinella gibbosa* (Bleeker, 1849) (Gold-stripe sardinella)
- *Sardinella goni* Stern, Rinkevich & Goren, 2016 (Gon's sardinella) [5]
- *Sardinella hualiensis* (K. Y. Chu & C. F. Tsai, 1958) (Taiwan sardinella)
- *Sardinella jussieu* (Lacépède, 1803) (Mauritian sardinella)
- *Sardinella lemuru* Bleeker, 1853 (Bali sardinella)
- *Sardinella longiceps* Valenciennes, 1847 (Indian sardinella)
- *Sardinella maderensis* (R. T. Lowe, 1838) (Madeiran sardinella)
- *Sardinella marquesensis* Berry & Whitehead, 1968 (Marquesan sardinella)
- *Sardinella melanura* (G. Cuvier, 1829) (Black-tip sardinella)
- *Sardinella neglecta* Wongratana, 1983 (East African sardinella)
- *Sardinella pacifica* Hata & Motomura, 2019 [4]
- *Sardinella richardsoni* Wongratana, 1983 (Richardson's sardinella)
- *Sardinella rouxi* (Poll, 1953) (Yellow-tail sardinella)
- *Sardinella sindensis* (F. Day, 1878) (Sind sardinella)
- *Sardinella tawilis* (Herre, 1927) (Fresh-water sardinella)
- *Sardinella zunasi* (Bleeker, 1854) (Japanese sardinella)

Local **names** of **oil sardine** are, Mathi, Nalla mathi, Nei chala (Malayalam); Bhutai (Kannada); Tarli (Marathi and **Hindi**); Nonalai, Peichalai (**Tamil**); Noona- Kavallu (Telugu); Nna Kavala, Disco kabala (Oriya)

Production trend

- The maximum landing of 3.01 lakh tonnes which formed 33% of the total marine catch was in 1968 and the minimum of 7,412 tonnes which formed 1 % of the total marine catch was in 1956.
- About 95% of the total oil sardine landings were reported only from the southwest coastal states of Kerala and Karnataka until 1980's.
- Catch was high in 1989 (2.89 Lakh t) and gradually declined thereafter till 1994 (47,000 t). However, since 1995, it started increasing
- It is a highly fluctuating fishery, contributing 10 to 20 % of the total marine fish landings of the country with an average of about 200 thousand tonnes.

Recent production

Pelagic fishes formed about 55 % of the total marine fish landings in general. Among the pelagic fishes, oil sardine alone contributed 22.54% to 28.32% to the total pelagic fish landings and 11.51% to 15.46% to the total marine landings during 2001 -2006.

	2001	2002	2003	2004	2005	2006
Oil sardine landings (in tonnes)	267790	344103	403952	381448	334862	394598
% of total pelagic finfish landings	22.54	24.43	28.32	26.39	26.67	26.43
% of total marine landings	11.51	13.12	15.46	14.69	14.59	14.55

Fishing season

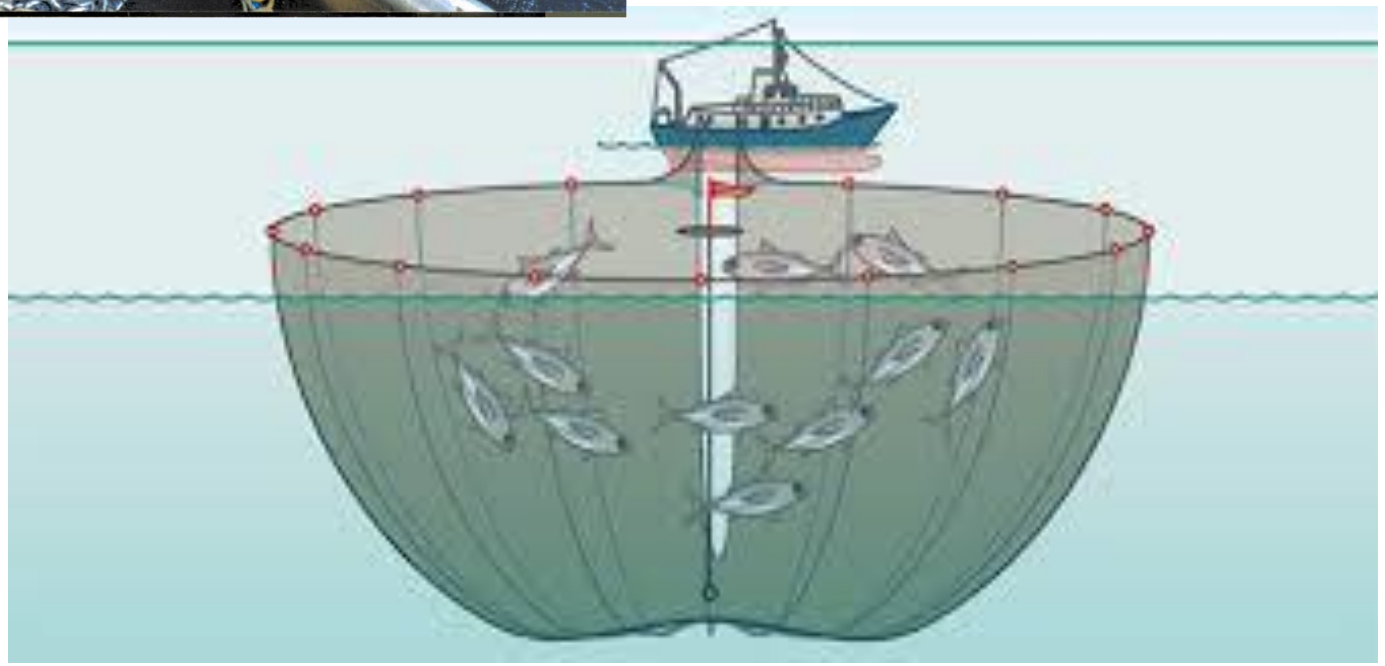
- Fishing season for oil sardine varies from one place to another place. It starts soon after the outbreak of monsoon in June and continues till March - April along southwest coast.
- Fishing is usually done throughout year except during Mar - May in Kerala, Sep/Oct - Jan in Karnataka and Goa and July - Oct in Andhra Pradesh.
- Usually juveniles appear during July-August period along the coast and they form a large proportion of the catch during Sep - Dec.

Mode of exploitation

- Oil sardine fishery has been exploited by the indigenous craft and gear from very early times. This fishery was exploited by employing Artisanal fishing gears mainly boat seines, beach seines, cast nets and small meshed gill nets.
- Fishermen started employing larger fishing gears like purse seines in the late 70's and ring seines in late 80's.
- In south Kerala, oil sardines are mainly caught by the one boat-seine and gill net and some purse seines
- In Tamil Nadu, trawlers are also operated at 12 -16 m depths in Pamban - Rameshwaram area while ring seines being used in the Palk bay.
- At present, purse seine fleet operates at 30 - 40 m depth almost throughout the year.
- Motorized ring seines target small pelagics like oil sardine and mackerel fish in inshore waters during the monsoon season also.
- Purse seine is the most important gear at present. However, shore seine and cast net are the gears commonly used for catching oil sardine.

PURSE SEINES

RING SEINES



Factors affecting fishery

- Periodical migration into offshore waters
- Heavy natural mortality
- Availability of the diatoms (*Fragillaria oceanica, Coscinodiscus and Pleurosigma)*
- Overfishing
- El Nino
- Water temperature
- Rainfall
- Ocean current.

Age at first maturity

It attains maturity at about the end of the first year at 150 mm size. Maturation is controlled by climatic factors like temperature and intensity of rainfall experienced by the pre-spawners.

Spawning season

- It grows rapidly during the first few months and matures early within its life span of about two and half years.
- Just prior to spawning, the oil sardine leaves, the inshore waters. It spawns only once a year and breeding season is rather short.
- On the west coast, peak spawning occurs during June - Aug, while on the east coast, intense spawning activity is observed during December to February.
- Juveniles are seen abundantly in the near shore waters during July-September.

Fecundity

It is a prolific breeder and liberates about 38,000 -80,000 ova at a time depending upon the age, size and condition of the fish.

Utilization

A major bulk of the catch is disposed off in fresh condition.

It also serves as a source for valuable by-products like sardine oil used in several industries and fishmeal for cattle and poultry feed production.

Conservation and management

There is an inverse relationship between the occurrence of oil sardine and Indian mackerel, *Rastrelliger kanagurta.*

Destructive fishing practices like using small meshed seines should be effectively controlled by enforcing mesh size regulation (minimum 18 mm), closed season and restricted fishing (June - Sep) besides strict licensing and optimum deployment of fishing units especially ring seines and purse seines.

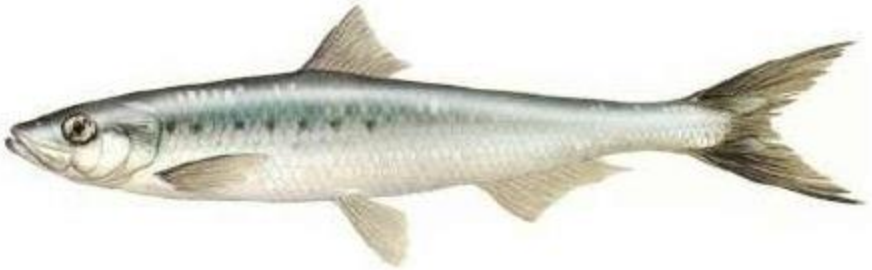
Present coastal fishery scenario demands responsible fishing by all sectors to sustain the fishery as well as ensure the socio-economic well being of the fishermen. Necessary steps should be taken to exploit the offshore grounds to have better catch

II. LESSER SARDINES

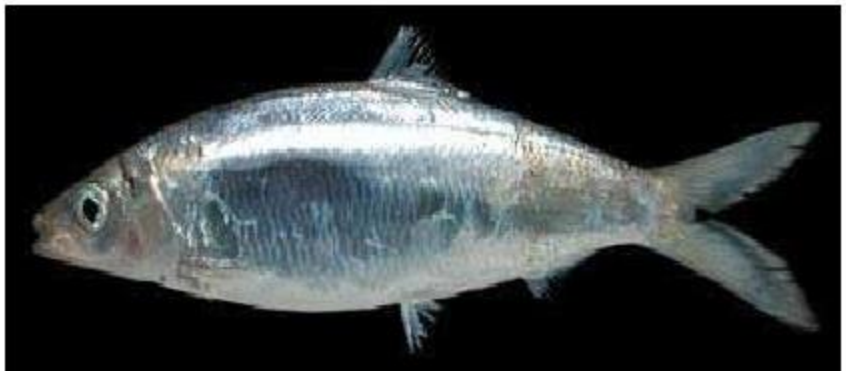
- **The lesser sardines belong to the families Clupeidae and Dussmieridae.**
- **Though lesser sardines rank much lower than the oil sardines, they are of considerable importance.**
- **They are shoaling fishes, the longer shoals striking the coastal waters seasonally resulting in quite good catches.**
- **They occur commonly in the inshore waters along both the east and west coasts of India.**
- **The lesser sardines comprising several species of *Sardinella* other than *S. longiceps* show wide distribution in the tropics and are one of the major pelagic fishery resources of our country.**
- **They occur in the landings of all the maritime states. However, they particularly available along the southeast and southwest coasts.**
- **Of the 15 species of lesser sardines in the Indo-Pacific region, 12 species occur in the Indian waters.**
- **They are *Sardinella jussieu* (Tembang), *S. gibbosa, S. fimbriata (Fringe-scale sardine), S. albello (Short-bodied sardine), Amblygaster sirm (Spotted sardine / Trenched sardine), S. dayi, S. clupeoides, (Bleeker smooth belly sardine) S. melanura (Black-tipped sardine), S. sindensis, Kowala covala, Escualosa thoracata (White sardine), Dussumieria acuta (common sprat / rainbow sardine) and D. hasseltii.***

LESSER SARDINE COMES UNDER 2 FAMILIES

1. Family: clupeidae



2.Family: dussumieridae



Sardinella jussieu

S. gibbosa

S. fimbriata

S. albello

Amblygaster sirm

S. dayi

S. clupeoides

S. melanura

S. sindensis

Escualosa thoracata

Dussumieria acuta

D. hasseltii.

DISTRIBUTION IN INDIA

- They occur along both the east and west coasts. However, catches are abundant in North of Cape Comorin along the entire east coast.

Production trend

- The catch of lesser sardines varied from 19,551 tonnes in 1962 (3.03% of total) to 11,12,117 tonnes in 1975 (7.88% of total) during 1958 -1979.
- They contributed 2.9 -7.3% to the total annual marine fish production of the country during 1986-2000; 4.8% during 1996-2000.
- Tamil Nadu stood first in lesser sardine production (average: 42,263 t, 43%) followed by Kerala (22%); Andhra Pradesh (17%) and Karnataka (6%) in 2004.

Species composition

- More than one species contribute to the lesser sardine fishery, forming a fishery throughout the year. In the Goa-Karnataka coast, *Sardinella gibbosa, S. dayi, S. fimbriata and S. albello* are abundant.
- Along the Kerala coast, *S. gibbosa, S. sindensis and Amblygaster sirm* dominate while *S. clupeoides, S. fimbriata, S. melanura and S. jonesi occur occasionally.*
- *S. albello and S. gibbosa* are dominant in the Palk Bay and the Gulf of Mannar regions while *S. sirm* is common between Vizhinjam and Tuticorin.
- Along the central east coast, *S. gibbosa, S. albella, S. dayi, S. sirm, S. clupeoides, S. fimbriata and S. gibbosa* are abundant.

	2001	2002	2003	2004	2005	2006
Lesser sardine landings (in tonnes)	76374	102885	102394	90257	69129	89041
% of total pelagic finfish landings	6.43	7.30	7.18	6.24	10.00	9.51
% of total marine landings	3.28	3.92	3.92	3.48	5.46	5.23

Size composition

- The lesser sardines do not grow to a big size.
- Total length of the different species forming the fishery ranges from 4 to 20 cm.

Fishing season

- Lesser sardines form a year round fishery in different regions of the country, but the fishing season, species composition and catch rates vary between and within regions.
- On the east coast i.e., along West Bengal, Orissa and Andhra Pradesh coast it extends from November to April and on the southeast coast of Tamil Nadu and Pondicherry, it is done throughout the year.
- On the west coast, it is from August to February in Kerala; Karnataka –September November; Goa -September -February; Maharashtra -December and April.

Mode of exploitation

- Traditional, motorised and mechanised boats are used for catching lesser sardines.
- Seines (shore seines, boat seines, ring seines and purse seines), gillnets, bag nets and trawl nets are the gears commonly used for catching lesser sardines.

Food and feeding habits

Lesser sardines feed on a variety of phytoplankton and zooplankton.

Phytoplanktonic organisms include Biddulphia, Coscinodiscus, Thallasiothrix, Fragilaria, Nitschia, Pleurosigma and zooplanktonic organisms include Dinophysis, Peridinium, Caratium, copepods, mysis, Lucifer, larvae of prawns and crabs, fish eggs, Acetes, fish larvae, crustacean larvae and molluscan larvae.

Spawning season

The lesser sardine species occurring along the two coasts show considerable variation in their spawning seasons. The spawning period for individual fish is of short duration, but the species as a whole breed over a prolonged period.

Growth, maturity and spawning

The lesser sardines exhibit fast growth, short life span (2-3 years) and high natural mortality. Most of the species attain 70% of their maximum length in the first year itself.

Fecundity

Fecundity of *Sardinella albello* is 10,000 - 13,000 in fish of 14.6 to 15.5 cm in length

Spawning season of lesser sardine

Species	Area	Spawning season
S. albella	Palk Bay	February/March-June/July
	Gulf of Mannar	March-June
	Malabar	September-May
S. gibbosa	Palk Bay and Gulf of Mannar	February/March-June/July
	Lawson's Bay	February-March
	Malabar	January-May
S. fimbriata	Tuticorin (Gulf of Mannar)	October-November
	Vizhinjam	Throughout the year
S. sirm	Tuticorin (Gulf of Mannar)	November-December, February-March, May-June

Species	Growth	Age and size at maturity	Spawning season
1. *S. jussieu*	Max. 18 cm	11 – 12 cm - 1st year	East coast: Off Waltair – Feb-June (Peak: Feb.-April)
2. *S. fimbriata*	Max. 14 cm	10 – 16 cm varying from region to region	Gulf of Mannar: Dec – Mar Tuticorin: Oct – Nov Malabar coast: Apr - June
3. *S. albella*	Max. 14 cm	10.5 – 15 cm - 1st year; Fecundity: 10,000-13,000/ 14.5 – 15.5 cm	-
4. *S. melanura*	20 cm	-	-
5. *S. clupeoides*	20 cm	-	-
6. *Amblygaster sirm*	Max.: 25 mm in 1½ years	14 – 15 cm	West coast: Oct – Feb (Peak: Nov – Jan)
7. *Kowala coval*	12 cm	8 – 11 cm	West coast – Oct - Feb (Peak: Nov-Jan)
8. *Dussamieria hasselltti*	18 cm	12 – 13 cm	Palk Bay and Goa – Mar.-Dec / Dec-March

C. ANCHOVY

Anchovies belong to the family Engraulidae.

They are the small pelagic fishes and constitute one of the most important pelagic resources in the world. In India, anchovies form the artisanal fisheries and a major source of income for the traditional fishers.

Distribution in India

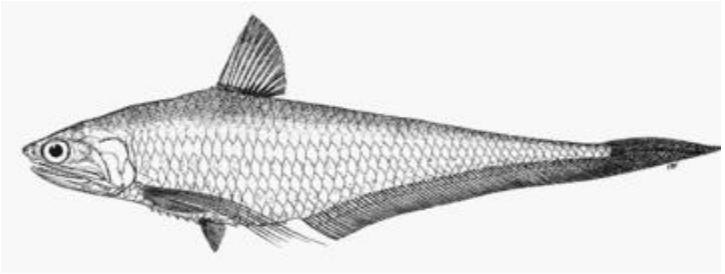
It is widely distributed along both east coast and west coasts of India.

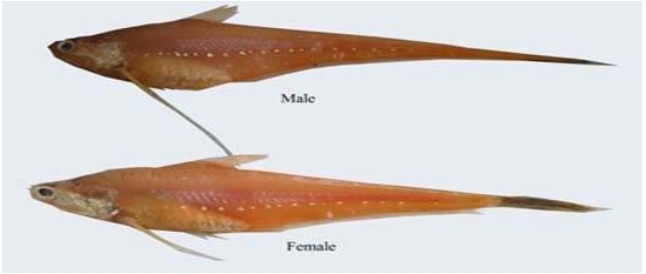
Production trend

Anchovy resource contributed an average catch of about 133,000 t during 1991-2000.

The species, which constitute the important fisheries, are *Coilia dussumieri, Stolephorus spp, Thryssa spp., and Setipinna spp.*

On the west coast of India, Kerala (Avg.: 20000 t; -1998-200I) is the leading state, followed by Gujarat (Avg: 24000 t; 1998-2001), Maharashtra (17,338 t; 1998 -200 I) and Karnataka (8,340 t; 1998-2001). On the east coast, Tamil Nadu is the leading state with an average of 20,596 t (1997-1999) followed by Andhra Pradesh, and West Bengal. The anchovy production is the least in Orissa (Avg.: 3000 t 1999- 2001).

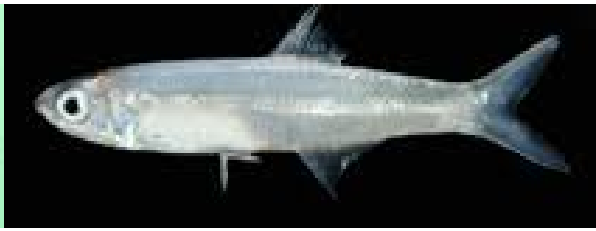




Coilia dussumieri

Stolephorus commersonnii

Stolephorus insularis



S. indicus

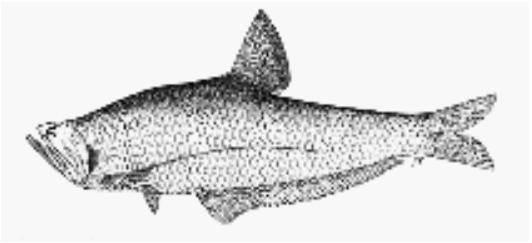
Thryssa malabarica

Thryssa dussumieri

Thryssa setirostris

Thryssa vitrirostris

Setipinna tenuifilis



Setipinna breviceps,

	2001	2002	2003	2004	2005	2006
Anchovy (in tonnes)	109982	122897	110727	116368	107972	97664
% of total pelagic finfish landings	9.26	8.72	7.76	8.05	8.60	6.54
% of total marine landings	4.73	4.68	4.24	4.48	4.70	3.60

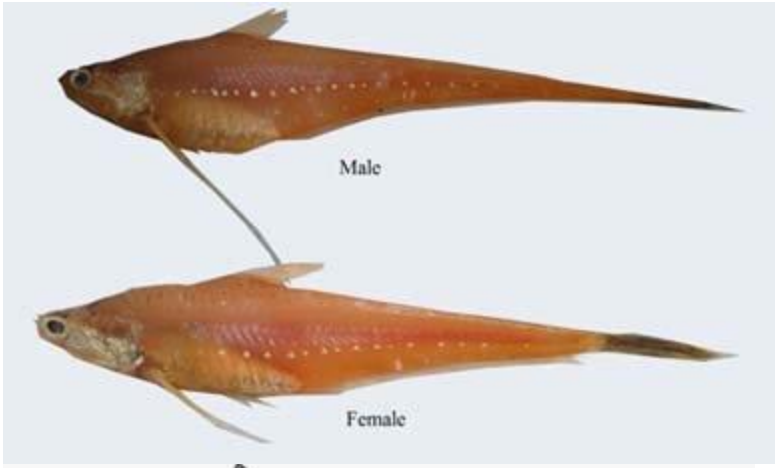
Species-wise catch

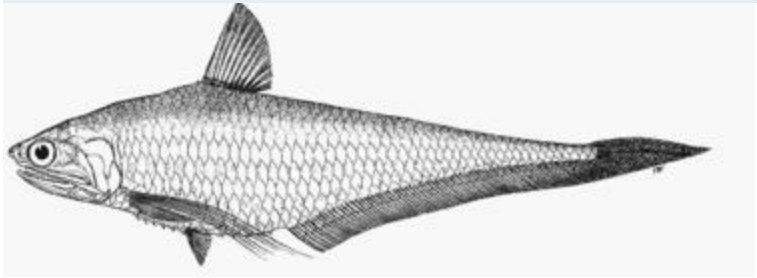
In Gujarat, *C. dussumieri and Thryssa spp.* constitute the fishery forming on an average 68% and 33% respectively. In Maharashtra, *C. dussumieri* contributes on an average of 79.4%, *Thryssa spp.* 19.6% *Stolephorus spp.* 1%.

In Karnataka, *Stolephorus spp.* formed 64% and *Thryssa spp.* contributed 36% to the fishery. The fishery in Kerala too is supported mainly by *Stolephorus spp.*, (83%) and *Thryssa spp.* (17%).

On the southeast coast *Stolephorus spp.* (60%), *Thryssa spp.* (35%) and *C. dussumieri* (4%) constituted the fishery in Tamil Nadu, whereas in Andhra Pradesh *Stolephorus spp.* (56%), *Thryssa spp.* (41%) and C. *dussumieri* (3%) form the fishery. On the northeast coast *Stolephorus spp.*, *Setipinna spp.*, Thryssa spp and Coilia spp. contributed 35, 34, 21 and 10% respectively in Orissa.

In West Bengal *Coilia spp.* (51 %), *Setipinna spp.* (29%), *Thryssa spp.* (18%) and *Stolephorus spp.* (2%) constitute the anchovy fishery. More number of species of *Coilia* constituted the fishery in West Bengal and the notable among them are *C. ramacarti, C. neglecta and C. reynaldi*.


Male
Female



D. WHITE BAIT

They are the small pelagic fishes.

Ten species of white baits occur in our seas -Encrasicholina devisi, E. heterolobus. E. punctifer (Stolephorus buccaneeri), Stolephorus andhraensis, S. baganensis (S. macrops), S. commersonii, S. dubiosus, S. indicus, S. insularis and S. waitei (S. bataviensis). Dominant species available throughout the coast are E. devisi, S. bataviensis. E. punctifel; S. commersonii. S. indicus and S. baganensis.

The availability and abundance of all these species indicate inter-annual variations.

They are distributed mostly in areas with bottom depths of 10-50 m and indicate diurnal vertical migration. The seasonal movements of whitebaits are directly related to the transport of water masses

Distribution in India

They are abundant in southern states like Andhra Pradesh, Tamil Nadu, Kerala and Karnataka. Very little catch is obtained from Maharashtra too.

Production trends

They show wide annual fluctuations. The production varied from 33,680 t in 1980 to 1 lakh t in 1988.

Recent production

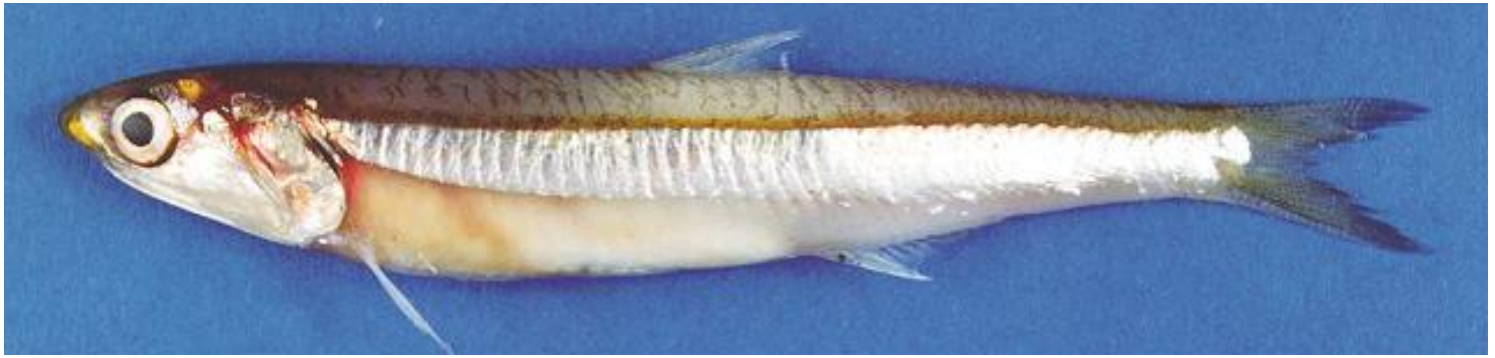
	2001	2002	2003	2004	2005	2006
Stolephorus (in tonnes)	44539	44209	41908	49155	27860	32704
% of total pelagic finfish landings	29	36	35	42	2.21	2.19
% of total marine landings	2.0	1.6	1.6	2.0	1.2	1.2

Species composition

In Karnataka, E. devisi (75.6%) dominated the catch during 1995 - 2000. This was followed by S. waitei (11.9%), E. punctifer (10.9%) and S. baganensis (1.3%). Principal gears employed were purse seine (51%) and trawl (47%).

In Kerala too, E. devisi dominated the catch (48%), followed by S. waitei (30%), S. commersonii (16%), S. baganensis (3%), E. punctifer (2%) and S. andhraensis (1%). The gearwise catch was ring seine (53%), trawl (32%) and others (15%).

Tamil Nadu, S. indicus (96%) and S. commersoni (4%), but in northern areas E. devisi (60%), S. waitei (20%), S. commersoni (15%) and S. indicus (5%) supported the fishery. Principal gears used were trawl (36%), non-mechanised gill net (34%), shore seine (17%) and others the rest. A long the northeast coast, the main contribution was from Andhra Pradesh.



Food and feeding

Food of E. devisi, S. waitei, S. baganensis and E. punctifer mainly comprises of copepods, Acetes spp. mysids and other zooplankters.

Spawning season

S. waitei spawns intermittently throughout the year; E. devisi spawns almost throughout the year.

Fecundity

Fecundity is around 1700-6790 eggs for E. devisi of 60-95 mm and 300- 4800 eggs for S. waitei of 80 -120 mm during the course of multiple spawning.

Utilization

They are consumed fresh and in dried form. Large species like S. commersonii and S. indicus possess good demand; but they are seasonal in occurrence and not landed in good quantity.

E. Indian mackerel

The mackerels are shoaling pelagic fishes belonging to the family, Scombridae.

It is the second important species after the oil sardine in India.

The well-being of the marine fishing industry of India is determined to a large extent by the sustaining yields from the mackerel fishery.

The bulk of the mackerel landings are contributed by a single species, *Rastrelliger kanagurta* (Indian mackerel).

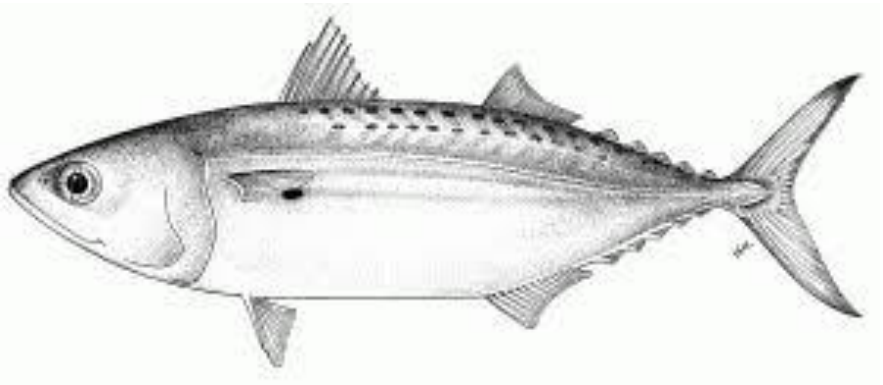
In addition to this, species such as *R. brachysoma* (Short mackerel) and *R. faughni* (Island mackerel) have also been reported to occur in India. However, their occurrence is very rare.

Distribution in India

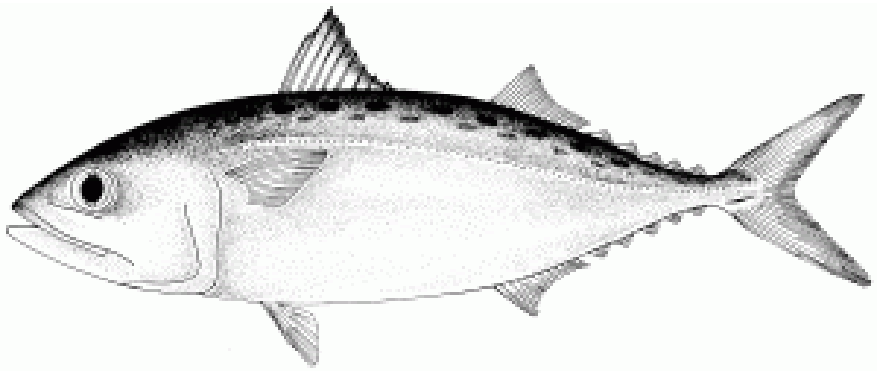
It occurs all along the east and west coasts of India from Karwar in the Northwest coast to Calcutta in the Northeast coast in the inshore waters up to 25 m.

Dense shoals of Indian mackerel appear regularly from Sep - Mar along the west coast of India from Ratnagiri in the north to Kollam (Quilon) in the south.

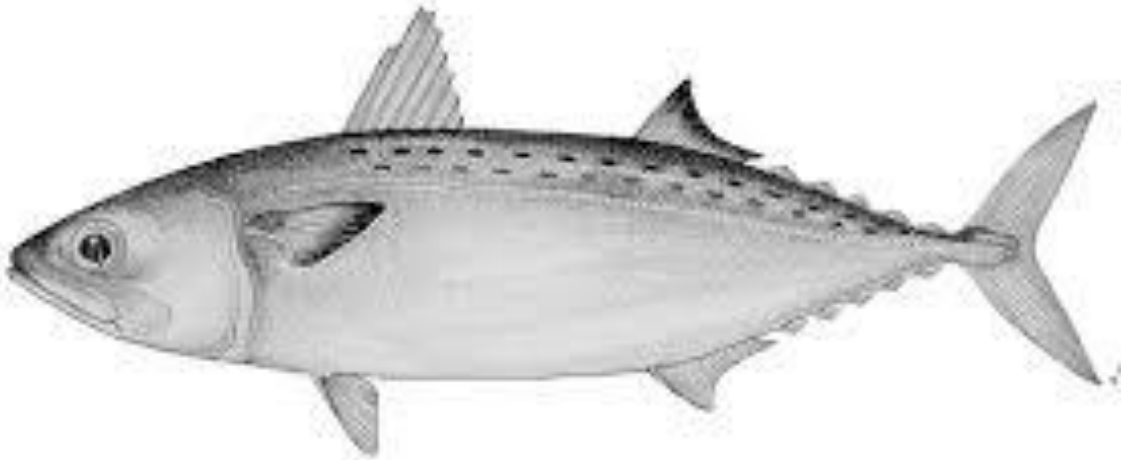
More than 75% of the total mackerel catch of the country comes from the west coast and the fishery until late 70's was mostly confined to a narrow coastal belt of a width of almost 10 nautical miles.



Rastrelliger kanagurta



R. brachysoma



R. faughni

Production trend

It constituted on an average 8.6% to the total marine fish production in the country during 1985 -2000.

During the last decade (1990 -1999), the average annual catch of this species amounted to 0.19 million tones.

Along the west coast, on an average 84.6% of the total landings were made. Along the east coast from where 15.4 % of the catch is realized, Tamil Nadu and Pondicherry dominate.

Recent production

It contributed 6.78% in 2002 to 10% in 2005 % to the total pelagic fish landings in India during 2001 - 2006. Its contribution to the total marine fish production ranged from 3.64 % in 2002 to 5.52% in 2004 during 2001 - 2006.

	2001	2002	2003	2004	2005	2006
Indian mackerel landings (in tonnes)	90134	95573	113439	143333	125424	141918
% of total pelagic finfish landings	7.59	6.78	7.95	9.92	10.00	9.51
% of total marine landings	3.87	3.64	4.34	5.52	5.46	5.23

Fishing season

It is from August to December along the west coast and from December to May (Peak: March - April) along the east coast.

Mode of exploitation

Beach seines, boat seines, drift net, gill net and cast net are the common traditional gears and dug-out canoes, canoe boats, catamarans and plank-built boats are the common crafts used for catching Indian Mackerels. However, bulk of the catch is mainly by large seines

Size composition

The commercial fishery exploits mackerel of 18 cm size which are six months old. West coast catch comprises of size ranging from 110 to 150 mm and east coast from 175 - 215 mm. About 80 -90% of fish in the commercial catch comes from size below 22 cm.

Food and feeding

It is a plankton feeder feeding to a greater extent on small zooplankton (cladocerans, ostracods, larval polychaetes etc.) and comparatively to a lesser extent on the phytoplankton (diatoms). Adult individuals feed on macroplankton such as larval shrimps and fish.

Size at first maturity: It is found to be between 190 and 220 mm.

Spawning season

- They start maturing by around December.
- They become mature and start spawning by February.
- Intensive spawning occurs from Apr/May - July.
- Spawning intensity increases and reaches a peak by May.

Age and growth: Maximum size recorded is 390 mm.

Utilization

- ✓ It is consumed fresh or in cured conditions.
- ✓ More than half of the mackerel catches are dried with or without salt.
- ✓ Consumption of fresh fish started gaining momentum recently.

F. TUNA

1) The tunas also known as the "tunnies" are fishes of the family, Scombridae. They are shoaling pelagic fishes.

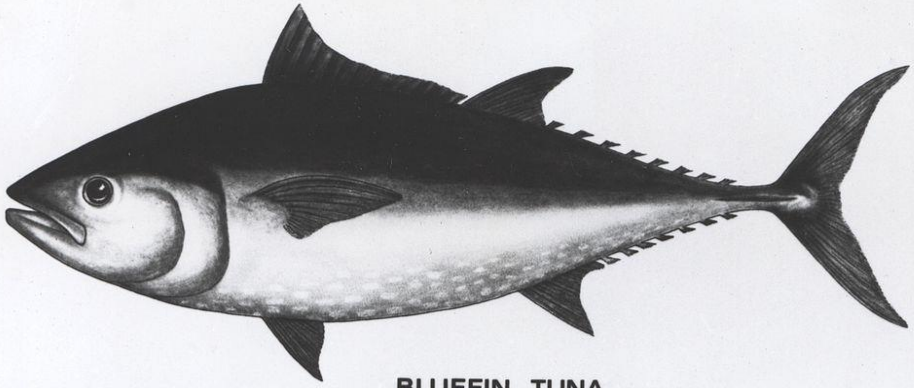
2) They constitute one of the economically important marine fisheries resources, but are caught mainly by small scale sector.

3) The meat of tuna both in fresh and processed form is much in demand all over the world. They are tropical and subtropical in their distribution in the world oceans.

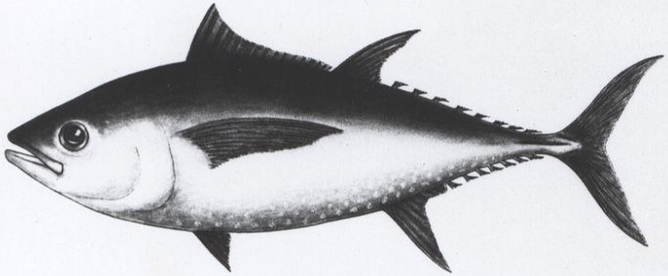
4) They commonly occur in the oceanic waters beyond the territorial limits of the fishing nations than in the coastal waters.

5) A few of them are neretic occupying shallow waters and are called coastal tunas.

6) The coastal tunas are cheaper than the oceanic tunas. Tunas are very popular as one of the best table fishes in western and other eastern countries whereas, in India, tunas are not relished as good as their counterparts like seerfish and mackerel.



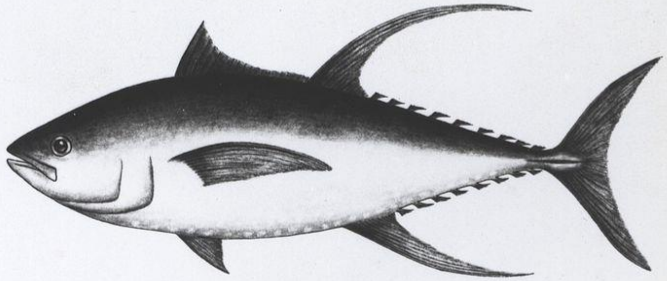
BLUEFIN TUNA



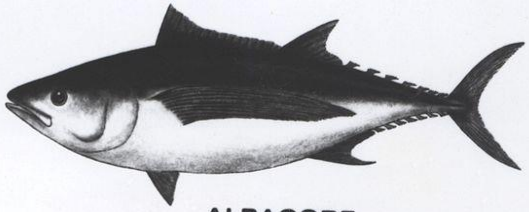
BIGEYE TUNA

SKIPJACK TUNA

LITTLE TUNA



YELLOWFIN TUNA



ALBACORE

BLACKFIN TUNA

Distribution in India: Tuna is distributed along the south-west and east coast and Lakshadweep. They are highly abundant in Lakshadweep islands, Goa, Vizhinjam and Ratnagiri coasts.

Common tuna species: The commonly occurring tuna species in the fisheries are *Euthynnus affinis, Auxis thazard, A. rochei , Katsuwonus pelamis , Thunnus tonggol , T. albacores, and Sardo orientalis, Gymnosarda unicolor and Thunnus obesus .*

Production trend

Tunas of the oceanic region remain underexploited in the Indian EEZ. Among the resources identified, the yellowfin tuna constitutes the major species in all the regions.

Bigeye tuna dominates in the equatorial region, while skipjack tuna is abundant in the northwest region. The potential of coastal tuna resources and oceanic tuna resources from the Indian Ocean have been estimated at 2, 35,000 t and 50,000 t respectively.

In India, the total annual catch is about 40,000 - 60,000 t, fonning about 3.5% of the total pelagic fish production and 2% of the total marine production.

Recent production: Tuna contributed 3 - 4% to the total pelagic fish landings during 2002 - 2006. Its production (in tonnes) during 2001 -2006 is as follows:

	2001	2002	2003	2004	2005	2006
Tuna (in tonnes)	47912	50122	52354	45684	39927	64006
% of total pelagic finfish landings	4.03	3.56	3.67	3.16	3.18	4.29
% of total marine landings	2.06	1.91	2.00	1.76	1.74	2.36

Species composition

- **The tuna fishery is mainly dominated by Euthynnus affinis (about 50%), followed by, Auxis thazard (16%), T. albacores (10%), Katsuwonus pelamis (9%), Thunnus tonggol (9%), A. rochei (3%) and Sarda orientalis (3%).**

- **E. affinis and A. thazard are the major species along both the coasts whereas T. tonggol and T. albacares are along the northwest coast.**

- **Sarda orientalis support a minor fishery along the southwest coast. Gymosarda unicolor is mainly caught by handlines in Andomans and by pole and line at Lakshadweep.**

Year	*E. affinis*		*A. thazard*		*K. pelamis*		*T. tonggol*		Other tuna	
	Catch (in tonnes)	% of total tuna	Catch (in tonnes)	% of total tuna	Catch (in tonnes)	% of total tuna	Catch (in tonnes)	% of total tuna	Catch (in tonnes)	% of total tuna
2001	21171	44.19	11202	23.38	2672	5.58	9040	18.87	3827	7.99
2002	24421	48.72	11833	23.61	3117	6.22	6350	12.67	4401	8.78
2003	18841	41.63	12397	28.90	2212	4.57	3567	7.37	15337	17.53
2004	20573	45.03	7772	17.01	3387	7.41	7016	15.36	6936	15.18
2005	22186		5786		1615		4515		5825	
2006	30607		16175		3330		6115		7779	

Fishing season

Though tunas are caught throughout the year, the peak season extends from October -May for the most of the species.

Fishing season of Auxis thazard is from August to December; Sardo orientalis; August. October; Gymnosarda unicolor: January -March; Euthynnus affinis: October - May; Thunnus obesus: October - May; Thunnus albacores: Oct -Jan and Skipjack tuna: December - March.

Food and feeding

Tunas are carnivores and the major food items include crustaceans (larvae, juveniles and adults of shrimps and crabs), cephalopods, eggs, larvae and juveniles of fishes, whitebaits and other small pelagics.

Size at first maturity

The size at first maturity of E. affinis is 43 - 44 cm; A. thazard - 30 cm; .A. rochei - 23 cm; K. pelamis - 44 - 45 cm.

Spawning season

E. affinis spawns during the premonsoon (April- May) and Post-monsoon (October - November); *A. thazard* -August -November; A. rochei -August - October; Skipjack tuna spawns throughout the year with the peak from January - April. The spawning seasons of yellow fin tuna are January -May; November-April; December -June in different oceanic sectors of the Indian EEZ.

Factors affecting tuna fishery

- Temperature
- Current velocity
- Food availability

Utilization

- In general, about 73% of the total tuna landed are iced and marketed fresh for consumption.
- 10% are used for Masmin production; Masmin is exported to Sri Lanka, Malaysia and Singapore.
- 9 % are frozen, chilled and exported chiefly to the Gulf countries.
- Yellowfm tuna, skipjack tuna and bigeye tuna are the main tuna species exported as frozen tuna.
- 4% of them are used for canning; 3% are salt dried for internal market.

G. SEERFISH

Seerfishes or Spanish-mackerels (Family: Scombridae) are one of the commercially important marine shoaling pelagic finfish resources of India of high commercial value.

Some of the species grow to very large size. The fishery is sustained by four species such as the king seer (Scomberomorus commerson), the spotted seer (S. guttatus), the streaked seer (S. lineolatus) and the wahoo (Acanthocybium solandri).

Of these, the first two species are more common than the last two species.

They usually hunt solitary and swim in shallow water along coastal slopes.

They are known to undertake lengthy long shore migrations, but permanent resident populations also seem to exist.

India

It is distributed along the east and west coasts and in the Andaman and Laccadive islands. King seer is dominant along the mid-eastern (Orissa, Andhra Pradesh), southeastern (Tamil Nadu), south-western (Kerala) and mid-western (Karnataka, Goa) coasts.

The spotted seer is dominant along north-east coast (West Bengal) and northwest coast (Maharashtra, Gujarat).

Scomberomorus commerson

S. guttatus

S. lineolatus

Acanthocybium solandri

Production trend

1) The potential of seer fish resources has been estimated as 50,000 tonnes.

2) The average annual catch was 14,954 t during 1990-99.

3) Along the east coast, Tamil Nadu stood first in production, contributing 38%, followed by Andhra Pradesh (35%), Orissa (16%), West Bengal (6%), Andamans (4%) and Pondicherry (1%).

4) Along the west coast, Gujarat contributed 40%, followed by Maharashtra (25%), Kerala (20%), Karnataka (7%), Goa (6%) and Lakshadweep (0.3%).

5) King seer contributed 62.8% and spotted seer, 36.6% during 1995-1999. In 2000, production was 50,376 t, which formed just 1.85% of the total marine fish production.

	2001	2002	2003	2004	2005	2006
Seer fish landings (in tonnes)	42578	52665	49473	48380	40577	49089
% of total pelagic finfish landings	3.58	3.74	3.47	3.35	3.23	3.29
% of total marine landings	1.83	2.01	1.89	1.86	1.77	1.81

Size composition

Mean size of king seer was 40.6 cm. and 39 cm for spotted seer during 1996-2000.

Fishing season

1) Fishing season is influenced by the monsoons along both the coasts.

2) Along the west coast, the season is from October to May with a peak during November -December.

3) In Tamil Nadu, the season is from March -October while it is February to May in Andhra Pradesh.

Mode of exploitation

1) Gill net (major gear); trawls, boat seines, shore seines and purse seines are the gears commonly used for catching seer fish.

2) In recent years, they are also caught in appreciable quantities by trawl from the deeper waters, enhancing the financial returns to the boat owners.

Food and feeding

- They are carnivorus and predominantly piscivorus.
- They occasionally feed on prawns, squids and cuttlefishes.
- The piscivorus tendency is more pronounced in larger fishes.
- They prefer sardines and whitebaits.

Minimum size at first maturity

- The minimum size at first maturity in S. guttatus is 480-520 mm.

- *S. commerson, S.guttatus and S. lineolatus* mature at 750 mm, 405 and 700 mm in length respectively.

Fecundity

i. *S. commerson*: 0.70 -3.5 million /2- 5 years
ii. *S. gutlatus*: 0.56 -2.1 million /2 -4 years
iii. *S. lineolatus*: 0.39 -1.1 million /2 -4 years

Spawning season:

Spawning season extends from January - August with a peak in April -May in the Indian waters.

H. Ribbonfish

The ribbonfishes (Hair-tailor Cutlass) are shoaling pelagic fishes. They belong to the family, Trichiuridae.

They are primarily marine, but occur in the estuaries too.

This group is comprised of

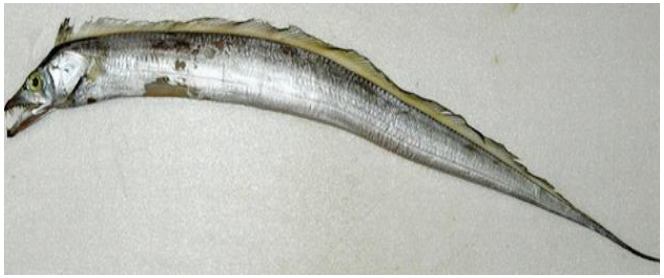
1) ***Trichiurus lepturus (Grey ribbonfish)*** **– Most dominated – available throughout**
2) ***T. russelli (Short tailed hair tail),***
3) ***T. gangeticus (Ganges hairtail),***
4) ***Lepturacanthus savala (Silver ribbonfish),***
5) ***L. pantuli (Coromandel hairtail),***
6) ***Eupleurogrammus intermedius,***
7) ***E. muticus (Small head hairtail) and***
8) ***E. glossodos*** **(Long tooth hairtail).**

They form an exclusive fishery of considerable importance in Andhra Pradesh, Tamilnadu and Kerala.

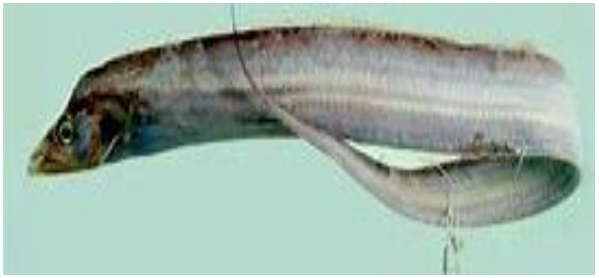
Distribution in India

They are distributed all along the coast with abundance in the northwest and central east coasts.

Trichiurus lepturus



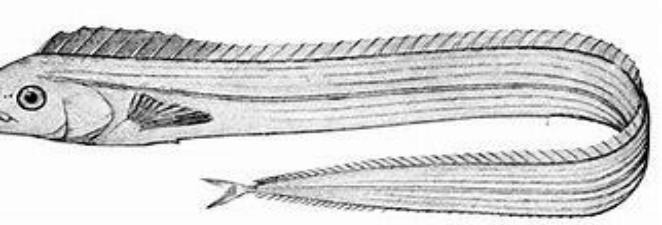
T. gangeticus



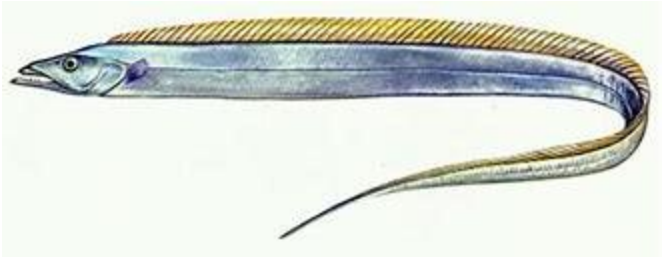
T. russelli

Lepturacanthus savala

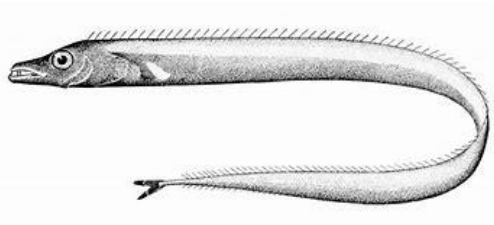
L. pantuli



Eupleurogrammus intermedius



E. muticus



E. glossodos

Production trend

The ribbonfish extends all along the coasts of India with varying intensity in the different maritime states. The ribbon fish landing in India has shown an increasing trend with considerable annual fluctuations.

On an average, it formed 4.4% of the total fish landings and 7% of the pelagic landings during 1956-2000. They are exploited all along the coast of India and the bulk of the landings during 1956-2000 came from Gujarat and Maharashtra, followed by Kerala, Tamil Nadu and Andhra Pradesh.

The contribution by other states was less than 10%. In the nineties, nearly 39% of the ribbonfish landings came from Gujarat, followed by Maharashtra (27%) and Kerala (11%).

The contributions by other states were much less. Juveniles of T. lepturus measuring less than 30 cm are normally discarded, since there is no market value. Plenty of juveniles are landed along with the trash fishes by the trawlers during the recruitment season.

	2001	2002	2003	2004	2005	2006
Ribbonfish landings (in tonnes)	175837	197106	148386	132005	114115	235084
% of total pelagic finfish landings	14.80	13.99	10.40	9.13	9.10	15.75
% of total marine landings	7.56	7.51	5.68	5.08	4.97	08.67

Species composition

1) Of the several species of ribbon fishes, Trichiurus lepturus is the dominant species forming more than 95% of the total ribbon fish landings. Other species are caught in less numbers.

2) These are mostly reported from northeast coast (Andhra Pradesh and Orissa) where they together constitute about 14% of the ribbonfish catch.

3) The contribution of species other than Trichiurus lepturus is only 5% of the total ribbonfish production in India.

Fishing season

The ribbonfishes move to the inshore areas of the continental shelf during monsoon, remain close to the shore in areas less than 60 m depth. This migration is mainly for feeding purposes.

Mode of exploitation

1) The principal gear is trawl net. This gear landed 74% of the catch during 1991-2000.

2) The other gears are dolnet, drift gill net, boat seine, shore seine, etc.

3) The mechanized sector (trawl net, gill net, purse seine and others) contributed about 85% and the rest is from the non-mechanised and outboard-motorized sectors.

Food and feeding

All the species of ribbonfishes are highly carnivorous, predominantly piscivorous and occasionally cannibalistic too. They are voracious feeders, feeding both during day and night. They prefer small and medium size fishes, prawns and shrimps.

Size at first maturity

The size at first maturity of the most common species, Trichiurus lepturus is 46 -47 cm when it is about 1 year old. It is 30cm in E. intermedius and about 43 cm in E. muticus.

Spawning

T. lepturus has a prolonged spawning in some areas. On the west coast, the peak spawning is in April - June. In the east coast, it spawns during February to June with peak in May. Another short duration spawning also has been reported in November - December.

Fecundity

T. lepturus is found to lay up to 1, 34,000 ova depending on the size and age. It is from 4000 (42 cm) to 16,000 (60 cm). The fecundity of E. intermedius varies from 2349 (40.9 cm) to 9950 (45cm). In E. muticus, it is from 1327 (49.5cm) to 2087 (55.lcm) and in L. savala it varies from 9178 (37 cm) to 17347 (54 cm).

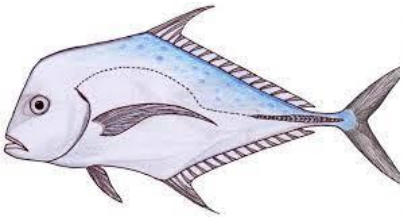
MESOPELAGIC RESOURCES

1. Carangids

- The carangid fishes in general include horse mackerels, round scads, queen fishes, trevallies, leatherjackets and pompanos.

- They belong to the family, Carangidae. They have emerged as one of the important resources especially in the mechanised sector but also exploited by motorized and non-motorised sector.

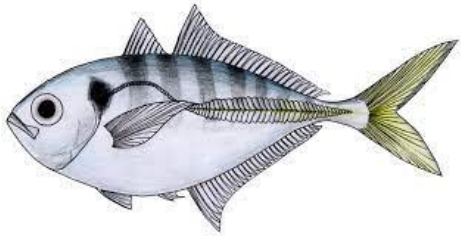
- Carangid fishes in India is represented mainly by 36 species (21 genera) such as Alectis indicus (Indian thread-fin trevally), A. ciliaris (Redfin trevally), Alepes djedaba (Djedaba trevally), A. para (Golden scad), Alepes kalla (Trevally), Atropus atropus (Kuwest trevally), Atule mate (One-fin let scad), Caranx sexfasciatus (Dusky trevally), C. carangus (Black-tailed trevally), C. ignobilis (Yellowfin trevally), C. melampygus (Bluefin trevally), C. para, Coryphaena hippurus (Dolphinfish), Carangoides armatus (Longfin trevally), C. malabaricus (Malabar trevally), C. oblongus (Coach-whip trevally), C. chrysophrys (Long-nose trevally), C. ferdau (Ferdau's cavalla), Decapterus russellii (Round-scad), D. kurroides (Scad), D. dayi (Day's scad), Elegatis bipinnulata (Rainbow runner), Megalaspis cordyla (Horse mackerel), Parastromateus niger (Black pomfret), Rachycentron canadus (Black kingfish), Scomberoides lysan (Talang leather-skin), S. commersonianus (Talang queen fish), S. tala (Deep queenfish), S. tal (Slender queenfish), Selar hoops (Banded scad), S. crumenophthalmus (Bigeye scad), Seriolina nigrofasciata (Black-banded kingfish), Selaroides leptolepsis (Yellow - strip trevally), Trachinotus blochii (Sub-nose pompano) and T. botla (Russel's pompano).



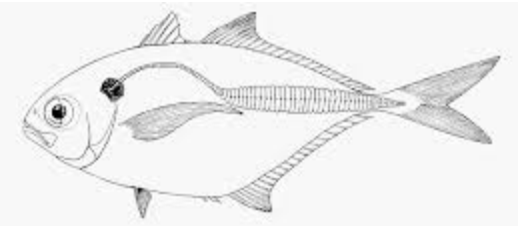
Alectis indicus

Alectis ciliaris

Alepes djedaba

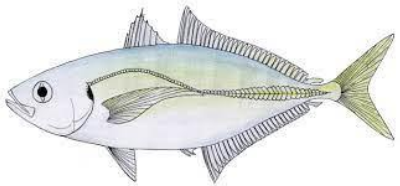


Alepes para



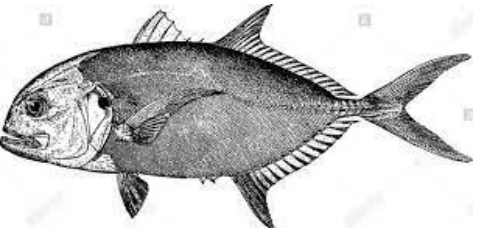
Alepes kleini

Atropus atropus

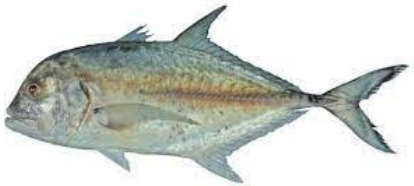


Atule mate

Caranx sexfasciatus



C. carangus

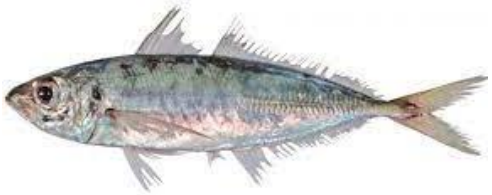


C. ignobilis

C. melampygus

Carangoides armatus

C. malabaricus



Decapterus russellii

Scomberoides lysan

Selaroides leptolepsis

Distribution in India

They occur along both the east and west coasts of India. However, they are highly abundant in southern most states like Tamil Nadu and Kerala. They distributed to shallow waters upto about 10 fathoms depth, where they breed.

Production trend

- This group stood 9th position with a production of 1.11 lakh tonnes, constituting 4.1 % of total marine fish production in India during 2000.

- Similarly, it ranked fourth among the pelagic fishes. Kerala contributed the highest (40.2%), followed by Tamil Nadu (16.5%), Karnataka (12.5%), AndhraPradesh (7.2%), Gujarat (6.4%), Goa (5.2%), Orissa (1.2%), Pondicherry (0.9%), West Bengal (0.6%), Andaman and Nicobar Islands (0.5%) and Lakshadweep (0.1%) during 1964 - 2000.

- Among the four major groups, the most dominant is the scads forming about 40%, followed by the horse mackerel 13%, leather jackets 5% and the rest 42% by other carangids during 1983 -2000.

Recent production

	2001	2002	2003	2004	2005	2006
Carangid landings (in tonnes)	117588	126307	129037	134863	142956	121863
% of total pelagic finfish landings	9.90	8.97	9.05	9.33	11.39	8.16
% of total marine landings	5.05	4.81	4.94	5.19	6.23	4.49

Species composition

In general, the small sized scads such as Decapterus spp, Horse mackerel, M. cordyla and bigeye scad, S. crumenophthalmus constitute a fishery all along the Indian coast. The species composition in the catch depends on the selective properties of the gears employed.

Decapterus dayi (43.5%) dominated in the trawl catch. This was followed by D. macrosoma (6.7%), Selar crumenophthalmus (8.9%), Horse mackerel, M. cordyla (6.9%), trevally Caranx para (9.8%), C. carangus (3.6%), Selaroides leptolepis (1.5%) and the remaining 19.1% is constituted by a number of other species. Megalaspis cordyla (37.3%) dominated in the gill net landings followed by Carangoides gymnostethus (6.2%), Caranx sexfasciatus (4%), Scomberoides spp. (8.1%), Elagatis bipinnulata (3.1%), S. crumenophthalmus (2.8%), Scomberoides tala (1.7%), Alepes djedaba (0.7%) and the rest 36.1 % by other species collectively. The purse seine landed very few species of carangids and in that A. djedaba was the dominant species (42.7%) followed by C. para (16%), D. macrosoma (16%) and M. cordyla (2.4). More number of species occur at Tuticorin due to the unique biodiversity supported by 21 coral islands in the Gulf of Mannar.

Decapterus dayi

D. macrosoma

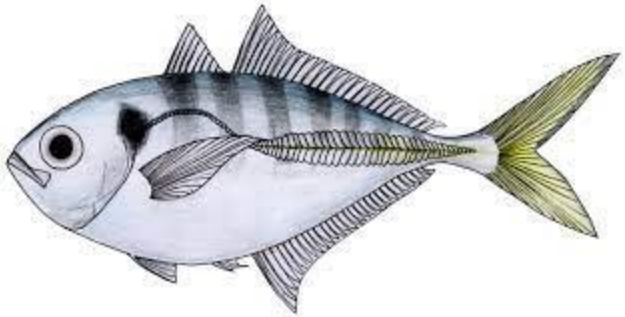
Selar crumenophthalmus

Caranx para

Selaroides leptolepis

Caranx sexfasciatus

Scomberoides tala



Alepes djedaba

Food and feeding

1) They are piscivorous feeding mostly on fishes like anchovies, sardines, Thrissocles spp., Apogon spp., silver bellies and ribbon fish among fishes, squids' and cuttlefishes among the molluscs and prawns and crabs among the crustaceans.

2) The young ones feed more on prawns, squids and anchovies and the adult mostly on fishes, prawns, crabs and molluscs.

Age and growth

1) Almost all the species exhibit faster growth and have a short life span varying from 2 to 6.6 years.

2) Small growing species like Selaroides leptolepis attain a maximum of 185 mm where as queen fishes and jacks grow to 1 - 2 m.

3) The smaller species usually occur in large schools in shallow waters.

4) Owing to their faster growth, prolonged spawning and continued recruitment, these species are able to withstand the higher fishing pressure prevailing at present.

2. Bombay-duck

- The Bombay-Duck, *Harpadon nehereus* belongs to the family, Harpadontidae.
- It is supported by this single species only.
- It forms a commercial fishery in the northwest along Gujarat and Maharastra coast; also available in northeast coasts of India.
- It exerts a pronounced influence on the livelihood of men and women engaged in this labour intensive sector in Maharashtra and Gujarat.

Distribution in India

It is discontinuously distributed along the Indian coasts.

Discontinuous distribution

1) Bombay duck occurs in large quantities on the west coast of India from Ratnagiri in the south to Jaffrabad in the north in the Gulf of Cambay.

2) On the east coast, it is taken in small numbers north of Chennai and along the Andhra coast. But there is a good Bombay-duck fishery exists in the estuaries of the rivers in Orissa and West Bengal.

Size composition

Larger and older fishes are usually scarce in commercial catches. Fishes ranging from 30-330 mm, in total length support the fishery. Indetenninate and immature fish below total length of 208 mm constitute seventy percent of the landings.

Recent production

	2001	2002	2003	2004	2005	2006
Bombayduck landings (in tonnes)	85836	123029	127408	119320	122353	120998
% of total pelagic finfish landings	7.23	8.73	8.93	8.25	9.74	9.63
% of total marine landings	3.69	4.69	4.48	4.59	5.33	5.27

Production trend

1) **It is abundant along the northwest coast of India contributing around 90% of all India landings of this resource followed by West Bengal and other states.**

2) **This species contributes about 5% of all India marine fish landings.**

3) **The Bombay duck catch ranged from 51, 570 (1972) to 1, 26, 044 t (1979) during 1958 -1979 constituting 5.02% to 14.01%.**

4) **The present average annual landing has been estimated at 1.1 lakh tonnes by traditional and industrial sector along the northwest (88%) and northeast (12%) coasts of India.**

Food and feeding

They are piscivorous and to some extent cannibalistic. They feed on the juveniles of their own species, other fishes and non-penaeid prawns.

The crustaceans like Acetes indicus and Palaemon tenuipes and fishes like Coilia dussumieri. Polynemus species and Heptadore typus form the main constituents of diet.

Minimum size at maturity

Minimum size at maturity in the female is between 200 -240 mm. They normally attain maturity at the end of second year.

Spawning

It is a continuous spawner but the individuals are out of phase with each other. However, two peak spawning periods, May-July and November-December commonly occur.

Fecundity

It ranges from 15,000 to 1, 50,000 based on the size and age.

DEMERSLA RESOURCES

Elasmobranch

1) Elasmobranchs are commonly called cartilaginous fishes as they posses cartilaginous skeleton.

2) This group consists mainly of sharks, skates and rays belonging to the families Carcharhinidae, Hemiscylliidae, Rhincodontidae, Sphymidae, Stegostomatidae, Hemigaleidae, Ginglymostomatidae, Triakidae, Rhincodontidae, Pristidae, Myliobatidae, Dasyatidae and Gymnuridae.

3) The maximum size in sharks ranges from 70 cm (Rhizoprionodon oligolinx) to 2000cm (Rhincodon typus), in skates from 270 cm (Rhinaancylostoma) to 656 cm (Pristis microdon) and in rays from 70 cm (Dayatis kuhlii) to 204 cm (D. zugei). In the past, it was considered as low value species.

4) It started gaining commercial importance in India only recently because of increasing demand for shark's fins in the Souteast Aisian countries. The sharks are predominant along the west coast (76%) while rays along the east coast.

Distribution in India

They are found distributed along both the coasts from the near shore regions to oceanic waters. The commercial sharks are mostly found at depths varying from 15 to 150 mm while the rays and guitar fishes are at 4-150 m.

Common elasmobranch species

The dominant and commercially important species of elasmobranches which support fisheries are listed below.

Sharks

The dominant species of sharks are Chiloscyllium indicum (Slender bamboo shark), C. griseum (Grey bamboo shark), Rhincodon typus (Whale shark), Stegostoma fasciatum (Zebra shark), Carcharhinus brevipinna (Spinner shark), C. dussumieri (White cheek shark), C. limbatus (Black-tip shark), C. macloti (Hard- nose shark), C. melanopterus (Blackfin reef shark), C. sorrah (Spot-tail shark), Galeocerdo cuvieri (Tiger shark), Rhizoprionodon acutus (Milk shark), Scoliodon laticaudus (Spade-nose shark), Eusphyra blochii (Wing-head shark), Sphyrna mokarran (Great hammer-head) and S. zygaena (Smooth hammer-head).

Skates

Important species among skates are Rhina ancylostoma (Bow-mouthed angel fish), Rhinobatos granulatus (Granulated shovel-nose ray), Rhynchobatus djiddensis (White spotted shovel-nose ray), Anoxypristis cuspidata (Pointed saw- fish) and Pristis microdon (Small-tooth saw fish).

Rays

The important species are Aetobatus narinari (Spotted eagle ray), Aetomylaeus nichofii (Nieuhof's eagle ray), Rhinoptera javanica (Javanese cow-ray), Himantura uarnak (Honey combed sting ray), H. bleekeri (Whiptail sting ray), Dasyatis zugei (Pale edged sting ray), D. imbricatus (Schneider's scaly sting ray), Amphotistius kuhlii (Blue spotted sting ray),

Pastinachus sephen (Drab sting ray/cow-tail ray), Gymnura poecilura (Long tail butterfly), G micrura (Short tail butterfly) and Mobula diabolus (Horny ray).

Production trend

1) The catchable potential of 64,934 t of elasmobranchs up to 50 m depth zone and 103,000 t from beyond 50 m have been estimated for the EEZ of India.

2) There have traditionally been important fisheries for elasmobranchs in India with a relatively steady growth up to the mid 70's, followed by a period of stability during most of the 80's, then a tremendous increase in catches in 1987 resulting in India becoming one of the top three elasmobranch producers in the last ten years.

3) Indian production of sharks and rays represents 8.78% of the world elasmobranch catches. Still, because of large inland yields, elasmobranchs comprised only 1.72% of total national catches in 1987-1991. Catches from the west coast were slightly larger than those of the east coast during 1977-1991.

4) The fishing is not restricted to any particular zone. It is distributed both in inshore and offshore areas. The fishery is operative almost throughout the year. The main fishing centers are: Bombay-Cambay area, Mangalore-Calicut zone, Tuticorin-Madras, Vishakhapatnam and West Bengal area. Of these, Bombay, Mangalore, and Tuticorin are the most important landing centres.

5) The fact that the elasmobranch fishes constitute an important marine fishery of India is borne out by the following landing figures of this class of fish in our country during the past few years.

Recent production

	2001	2002	2003	2004	2005	2006
Elasmobranch landings (in tonnes)	57022	60048	57671	60984	46328	48952
% of total demersal finfish landings	8.81	8.85	9.08	9.10	7.9	7.5
% of total marine landings	2.45	2.29	2.21	2.35	2	1.8

(Source : CMFRI, Annual Reports)

Groupwise production (in tonnes)

	2001		2002		2003		2004		2005		2006	
	Catch (t)	% of total	Catch (t)	% of total	Catch (t)	% of total	Catch (t)	% of total	Catch (t)	% of total	Catch (t)	% of total
Sharks	34586	60.65	37760	62.88	29912	51.87	37423	61.37	26139	56.42	27368	55.90
Skates	2254	3.95	2669	4.44	2633	4.57	3468	5.69	3249	7.01	3018	6.16
Rays	20182	35.39	19619	32.69	25126	43.57	20093	32.95	16940	36.56	18566	37.92
Total	57022		60048		57671		60984		46328		48952	

(Source : CMFRI, Annual Reports)

Food and feeding habits

Elasmobranchs are carnivores and predaceous in nature, with the exception of Rhincodon typus (Whale Shark) which is mainly a zooplankton (filter) feeder. Sharks mainly feed on pelagic teleosts such as sardine, mackerel, Bombay- duck etc. and cephalopods (squid, octopus, and cuttlefish). Skates and rays mostly feed on benthic organisms viz. crustaceans, molluscs, polychaetes, amphipods and teleosts (Apogon spp, Nemipterus spp., sciaenids)

Spawning season

The majority of species of ealsmobranchs in the Indian seas are viviparous, some are oviparous and few are ovo-viviparous. The breeding season of various species belonging to sharks, skates and rays vary. However, the majority of species breed during pre-monsoon (January- May) and post-monsoon (September- December) and few in monsoon (June-August) period.

Vivparous: Grey sharks, hammerheads, Galeorhinus,Hemitrikis, Hypogaleus and Logo

Ovovipiparous:

Filled sharks, cowsharks, bramble sharks, squalids, gulper sharks, tiger sharks, electric rays, sting rays, guitar fishes and saw fishes.

Oviparous: Whale shark, Zebra shark, bamboo shark, nurse sharks and skates of the family Rajidae

Fecundity

All the species of elasmobranchs have low fecundity.

The number of young ones (pups) in shark species ranges from

i. 1-2 in Scoliodon walbeehmi,
ii. 26- 44 in G. cuvieri,

in rays it is in Dasyatis walga,

i. 1 -4 in Gymnura poecilura
ii. 1 (Dasyatis walga) to more than one 1-4 (ingymnura poecilura)

and in skates
6 (Pristis cuspidatus) to 12 (Rhinobatos granulatus).

SILVERBELLY

1) Silverbelly also known as pony fishes and slip mouths belong to the family Leiognathidae. They constitute an important component of demersal fisheries resources.

2) 21 species of silverbelly are available in the seas around India. Species composition of different species of silverbelly varies from region to region.

3) They inhabit shallow coastal waters, moving in shoals mostly near the bottom.

4) They may enter the estuaries and backwaters and their seaward distribution is only upto a depth of 30 m.

Distribution in India

1) They are principally shallow water fishes distributed in the 0 - 40m depth range and enter the estuaries also.
2) The landings in Tamil Nadu, particularly southern areas account for 70% of the total national production, followed by Kerala (9.4%), Andhra Pradesh (7.4%), Gujarat (4.4%) and other states.
3) In Tamil Nadu, Gulf of Mannar and Palk Bay are the richest in terms of silver belly species diversity;
4) These fishes undertake diurnal vertical migration staying at the bottom at day time and moving upto surface water during night time.

Production trend

Its production ranged from 15,000 t in 1961 to 49,000 t in 2000. The annual production shows wide fluctuations with several peaks. The maximum annual landing was about 92,000 tonnes in 1983.

Recent production

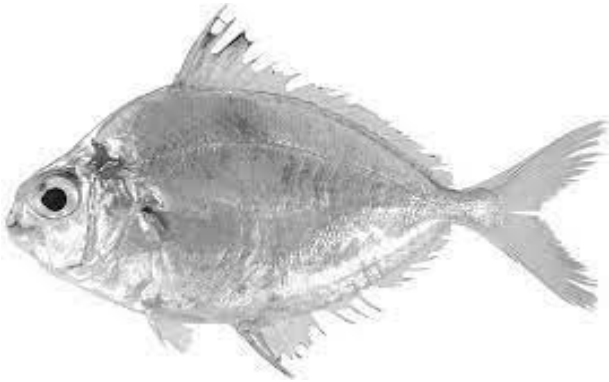
	2001	2002	2003	2004	2005	2006
Silverbelly landings (in tonnes)	51814	60856	48544	52827	58846	64633
% of total demersal finfish landings	8.01	8.97	7.64	7.88	10	10
% of total marine landings	2.23	2.32	1.86	2.03	2.56	2.38

Species composition

Almost all the 21 species are known from southern Tamil Nadu, but the dominant species are *Leiognathus dussumieri, L. jonesi, L. splendens,* and *L. equulus*. In the northern Tamil Nadu and along Andhra Pradesh, about 12 species contribute to the fishery, of which *L. bindus. L. splendens* and *Secular insidiatar* are most dominant accounting for nearly 70 - 80% of the silverbelly landings. It is interesting to note that these species are also known in the southern Tamilnadu but they are less abundant in this region. In Kerala, 16 species occur in the landings of which four species *(L. splendens, L. brevirostris. S. insidiatol; Gazza minuta)* contribute to the bulk of the landings.

Leiognathus dussumieri

L. jonesi



L. splendens

L. equulus

Gazza minuta

Fishing season

There are wide fluctuations in landings of silverbellies in different months in Tamilnadu. August is the peak period. It is March in Kerala; April in Karnataka and December in Gujarat.

Mode of exploitation

1) Trawl net is the major gear as bycatch. Trawl net contributes about 80% of the landings.

2) As the silverbelly is the major component in trawl catch in terms of quantity along the southeast coast, dependence by the local population on this resource is considerable.

3) In addition to trawl net, catch comes from shore seine, boat seine, gillnet, etc., also.

Food and feeding

They are mainly zooplankton feeders.

Spawning

They are fractional spawners spawning throughout the year with one or two peaks of longer duration each year.

Age and growth

1) Leiognathus and Gazza species attain a maximum size of 28 cm *(L. equulus)* and 23 cm (*Gazza minuta)* respectively.

2) Most of them are small in size, attaining a maximum length of 15 cm.

3) The lifespan of silver belies in the fishery in the Indian EEZ is very short and most species yield only annual crops.

Size at maturity

The length at first maturity ranges from 62 to 100 mm with majority of the species falling in the range 80 -95 mm.

Utilization

These fishes are of little demand in the fresh condition, but there is considerable market for sun- dried fish and for fishmeal and poultry feed.

THANK YOU