ISSN 0254-380 X

No. 217
July-September 2013

Marine Fisheries Information Service

Technical and Extension Series

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ICAR

Central Marine Fisheries Research Institute
(*Indian Council of Agricultural Research*)
Post Box No. 1603, Cochin - 682 018
www.cmfri.org.in

Marine Fisheries Information Service

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Mola mola

Babylonia spirata

The Marine Fisheries Information Service *Technical and Extension Series* envisages dissemination of information on marine fishery resources based on research results to the planners, industry and fish farmers, and transfer of technology from laboratory to field.

From the Editorial Board.....

Marine fisheries sector of India had a lull phase with trawling/ fishing ban along the maritime coasts in different phases during the last quarter. Despite the trawl ban, this quarter of the year was in news with active debates in fisheries sector along Kerala and Goa coasts on revising the existing ban period. Mud bank fishery was also in vogue along the Kerala coast supporting the traditional fishery sector during the ban period. There were a few instances of international organizations supporting the Indian marine fisheries sector in the last quarter as in the cases of Marine Stewardship Council's (MSC) assessment of Ashtamudi short-neck clam fishery, United States International Trade Commission (USITC) deciding against imposition of countervailing duties on Indian Seafood exports and so on.

In the current issue there is a surge of articles on new occurrences or as first report of various species. Further, a detailed taxonomical analysis on the museum specimens of the newly reported species with an in-depth research on the ecological changes will impart better information. We are hopeful that the subsiding monsoon in the ongoing quarter of the year will enable the fraternity of researchers from marine fisheries in providing new information on mariculture and exploratory surveys. With the onset of an active fishery after the fishing ban in all the maritime states and Union Territories, we expect to publish more observations on the marine capture fisheries associated research activities. We take this opportunity to thank Dr. G. Syda Rao, former Director for supporting the editors of MFIS and researchers in publication of their observations and Dr. A. Gopalakrishnan, the present Director for continuing his support to the team.

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No. 217 * July-September, 2013

Abbreviation - *Mar. Fish. Infor. Serv., T & E Ser.*

CONTENTS

Holothuria sp. (Type Pentard), a new teat-fish variety from Indian waters

Asha, P. S.
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Commercial sea cucumbers that are targeted for the dried product '*beche-de-mer*' preparation consist of species belonging to seven genera under two families (Holothuridae and Stichopodidae) of the order Aspidochirotids and one genus under the family Cucumarriadae of the order Dendrochirotes. Among the *Holothuria* genus, five species are processed world-wide. Teat fishes consist of group of three species under the genus *Holothuria* characterised by the presence of teat like projection on their lateral side. They are widely processed and are considered high valued species in the commercial market. Mainly two varieties are coming under this group, the black teat fish *Holothuria nobilis* which is black on the dorsal side with white bloches and spot on the sides of the animal and around the teats. The white variety *H. fuscogliva* has varied colour pattern, ranging from dark brown to dark grey with whitish spots, or whitish or beige with dark brown blotches. Dried items are prized US$20-80 and US$17-33/kg for *H.nobilis* and *H. fuscogliva* respectively. Colour variants of teat fishes like *Holothuria whitamaei* (black teat fish), *Holothuria sp*. (type Pentard) commonly called flower teat fish are recently been included in this category and fetched high values in the international markets.

Earlier *H. whitamaei* was considered a synonym of *H. nobilis*, but recent taxonomic investigations revealed both species are valid. The Pentard is a new variant having dark brown on the dorsal side and mottled with irregular shaped, cream cloured blotches with prominent teats on the lateral side. Commonly inhabited in the lagoon over sandy beaches between 10-50 m depth, it forms a major fishery in Seychelles, Tanzania, Sri Lanka and Maldives. It is also reported to occur in Comoros and Madagascar. The *beche-de-mer* from this species is highly priced around US$17-26/kg. This species is not described taxonomically and further studies are required to decide if it is another species or simply a variety of Indian Ocean black teat fish *H.nobilis*.

In India teat fishes are reported to occur from Andaman and Nicobar and Lakshadweep Island in good numbers. *H.nobilis* is common on shallow reef bottom of lagoon areas and *H.fuscogliva* in deeper water on clean sand with turtle grass. Availability of *H.fuscogliva* has already been reported from the Kayalpatinam coast of Gulf of Mannar area in 1998. The author has noticed a semi processed teat fish among the sea cucumber raw material of a vendor in Threspuram area of Tuticorin in early 2003, during which period the ban on sea cucumber processing was not strictly implemented. The specimen was first recognized as *H.nobilis* and later identified as *Holothuria* sp. (type Pentard). Spicules of the dorsal and ventral body wall consist of tables and buttons which are ranged between 70–120 and 60-120 µm respectively, while that of tentacles are spiny rods of size 80-500 µm. On a survey, it was revealed that this species had been regularly collected by the divers of Kayapatinam coast from a depth of 60 m and sold to processors of Threspuram at a rate ₹ 200/piece.

In India, the sea cucumber industry that once existed was mainly depending on high value species like *H. scabra* and *H. spinifera* since long time and due to the inadequate fishery management, the resources had been over exploited, later the fishery came to a standstill due to the ban imposed by Ministry of Environment and Forest, Government of India since 2003. The industry can be revived again by looking forward to explore the unexploited the teat fish resources along Indian coast. The simultaneous implementation of judicious fishery management and wild and captive stock enhancement of these resources will ensure sustainability in the long run.

Long line farming of *Kappaphycus alvarezi* in Tuticorin coastal areas and its implication on environment

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Kappaphycus alvarezi, one of the fastest growing tropical red algae, is currently been cultivated by a group of fishermen in many areas of Tuticorin coastal waters. It is used mainly as the raw material for commercial production of hydrocolloid known as Kappa carrageen. In Tuticorin, long line method of culture is followed in coastal waters where the tidal currents are strong. In this system, thin lines having loops to secure multiple small seedlings are spread at regular intervals attached to longer and thicker lines. Poly-ethylene terephthalate (PET) bottles with caps are used as floats (Fig.1). Weighed blocks are used as anchors and use sufficient quantity of floats to maintain the proper depth below the water surface level.

Fig. 1. PET bottles used as floats in the long line farming of *K. alvarezi*

Cost is supposed to be the major factor for using PET bottles. They are as cheap as ₹ 1/bottle compared to the commercial buoys of 5/piece. These PET bottles have a life of more than 3 years, until it become brittle or damaged. Comparatively a lesser cost of production and a better space utilization, make Long line method preferred in Tuticorin area to raft method, which is widely accepted on other coasts.

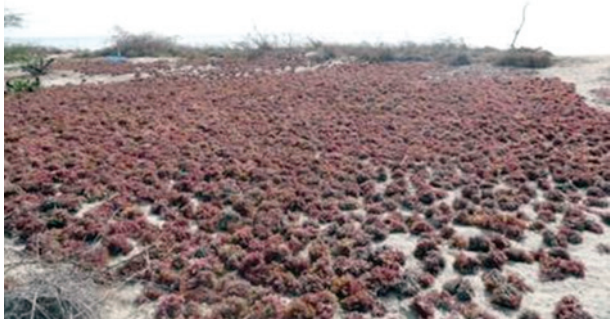

Fig. 2. Drying of *K. alvarezi* on beach

The extensive use of plastic bottles as floats in the long line seaweed cultivation reveals the lack or poor awareness among fishermen on the ban of plastics in Tuticorin, which came into force since 2011. In the long run, this would become one of the primary causes of marine litter build up and the liberation of micro plastics causing hazardous effects to the marine environment. These micro plastics (>5 mm) are usually produced because of the mechanical force like waves and photochemical process triggered by sun light on large plastic materials which are damaging the filter and deposit feeder fauna. Worldwide micro plastics has become a paramount issue due to the alarming effect it cause to the ecosystem.

Each crop of *Kappaphycus* takes an average 40 days and the average productivity from a single mainline rope is up to 2100 kg. Normally, 40% of the harvest is used for reseeding the upcoming crop. The wet product fetch 3.50/kg and the sun dried ones will realize up to 25/kg. They get an average income of up to ₹ 7400/- if they sell the wet product and the sun dried product can fetch an additional income of up to ₹ 500/-. Considering the poor labor inputs, lesser expenditure and infrastructure

requirements, this becomes a good income source for the poor fishermen families. It is important to make this sector of people aware on the impacts of the plastic pollution caused to the ecosystem and how they attribute it. Proper financial assistance through government agencies can be given to the genuine farmers for building up quality infrastructure which will help to maintain the income to these poor families and to reduce the pollution through these sources.

Economic analysis of fishmeal plants in Uttara Kannada district, Karnataka

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Fishmeal is a highly concentrated nutritious feed ingredient produced by processing of low value fishes and trash fish which are either not suitable for human consumption or has limited consumer preference. It is mainly used as ingredient for preparation of aqua feeds, poultry feeds or animal feeds. The growing demand for aquafeed production and increased landings of low value fishes promoted the establishment of a number of fishmeal plants in the country. Oil sardines, stomatopods, silver bellies and other trash fishes are usually preferred for preparing fishmeal. The trash fishes once discarded by the trawlers are now brought to shore as they realize an economic value owing to the demand from fishmeal plants.

The fishmeal plants convert the trash fish and other low value fishes and fish wastes to fishmeal. Byproducts like fish oil or fish manure are also produced by the fishmeal plants. In India, fishmeal plants are operating in the states of Karnataka, Kerala, Maharashtra, Gujarat and Tamil Nadu. The state of Karnataka has the maximum number of fishmeal plants mainly located in Mangalore and Uttarkannada regions. The present study deals with the economic analysis of fishmeal plants operating in Uttarkannada district of Karnataka. The annual net profit, benefit cost ratio and return on investment were worked out.

There are two fishmeal plants in Uttarkannada district, the Annapoorna bioproteins located at Baithkol and Anfal feed plant at Amdali. These plants operate for a period of nearly nine months depending on the availability of raw material in the region. Both units produce fishmeal and oil which are used as ingredients of aqua feeds. These units have processing capacity ranging from 100-400 tonnes of fish per day. Oil sardines are mainly used for fishmeal as it yields more oil when compared to other fishes. The purchase price of oil sardines varies

Boiling of fish in a fishmeal plant

A drier unit in the fishmeal plant

from ₹4 to ₹10/kg depending on the season and size of the fish. The recovery varies from 18-24% of fishmeal and 14-18% of fish oil. The fish is washed with water and then cooked in boilers. The cooked fish is pressed for separating the solids and fluids. The settled fish oil is separated from the fluids. The solids are dried and ground for making fishmeal. The fishmeal produced is tested in labs for protein and moisture content. The aquafeeds require fishmeal with protein content of at least 60% and moisture content of 8-10% whereas poultry and animal feeds require less protein content (30-40%) only. The fishmeal and oil are sold to aquafeed plants at Chennai.

Table 1. Annual Costs and returns of fishmeal plants (processing 100 tonnes fish/day)

	Particulars	Costs/returns per annum (₹ in lakhs)
A.	**Investment**	
	Buildings and other structures	100
	Machinery including boiler	150
B.	**Annual Fixed Cost**	
	Depreciation	8
	Interest on fixed capital	25
	Costs of management	3
	Insurance	2
	Total annual fixed cost(AFC)	38
C.	**Variable cost**	
	Labour	16 (0.88)
	Electricity	12 (0.66)
	Water	32 (1.75)
	Cost of fish	1600 (87.59)
	Lab Testing fees	0.64 (0.04)
	Interest on working capital	166 (9.09)
	Total Annual Variable cost(AVC)	**1827 (100.00)**
D.	**Total cost/ annum(AFC+AVC)**	**1865**
E.	**Returns**	
	Returns fishmeal (18 T/day for 200 days)	1440
	Fish oil (10T/ day for 200 days)	1040
	Gross Revenue	**2480**
F.	Annual net profit	615
G.	Benefit cost ratio (BCR)	1.33
H.	Return on investment (%)	246

(Figures in parenthesis indicate share in total variable cost in percentage)

The average investment cost for a fishmeal plant with 100 tonnes processing capacity is ₹2.5 crores. The investment cost consists of costs of buildings and machinery like boilers and driers. The boiler used for cooking fish costs up to one crore rupees. The annual fixed cost was ₹ 38 lakhs. The main components of operational costs were costs of raw material (fish), electricity, water charges and labour cost. Nearly 30-50 workers are engaged in each fishmeal plant for undertaking the various operations. The skilled workers were paid a monthly sum of ₹ 6,000/- and daily wages of ₹ 200/day is given for unskilled workers. The annual variable cost was ₹ 18.27 crores for operating 200 days in a year. The cost of fish accounted nearly 87% of the total variable cost. The price received for fishmeal ranged from ₹40-60/ kg and that of fish oil ranged from ₹50-80/kg depending on the quality. The gross revenue earned with a production capacity of 100 tonnes/day was ₹24.8 crores with an annual net profit of ₹6.15 crores. The benefit cost ratio was 1.33 and return on investment was 246%.

Packing of dried fishmeal in polythene bags

Even though the establishment costs are very high, the fishmeal plants proved highly economical with high return on investment. Trash fish and other bycatch which were earlier discarded due to low market potential can be effectively utilized through fishmeal plants. The increase in the landings of these fishes in recent years offers promising scope for conversion to fishmeal. The revenue generated by

fishermen could be enhanced and this also helps in reducing the environmental problems associated with discards. The landings of clupeids consisting of oil sardines, anchovies and other clupeids have reached 1.13 million tonnes in 2012 and these fishes have low consumer preference in many of the states. The presence of omega-3 fatty acids in these fishes improves the nutritive value of poultry and aqua feeds. Omega-3 capsules prepared from oil sardine and anchovy oil are now used as dietary supplements due to health benefits. The profitability of fishmeal firms can be further improved by development and preparation of value added byproducts like high quality fish oil or omega-3 capsules.

Azhikode South fishermen set example to reduce use of polythene carry bags

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Use of polythene carry bags is increasing tremendously in recent days especially in the coastal areas. After use, these are discarded and finally reach sea through river mouth. Studies conducted by CMFRI reveal that considerable quantities of plastic and other non-biodegradable objects are strewn around not only in beaches but also are recovered from fishing grounds while trawling (30-60.2 g/trawl). Knowing the ill effects of indiscriminate use and discards of polythene carry bags, the fishermen of Azhikode south unanimously have taken a decision to avoid the use of polythene carry bags for transportation of their share of fish for daily consumption after their work.

Azhikode south fish landing centre, is located about 7 km North West of Kannur town. About 300 traditional fishermen families are residing around the landing centre. Main gear in operation is Inboard Ringseine. Ten Inboard ringseine units are operated regularly and each unit along with carrier boats engage about 50 fishermen during regular fishing operations. Fish caught are landed at Ayikkara Fisheries Harbour. During the fishing days while returning from work each fisherman used to carry fish to their home in polythene carry bags. They may use even 2 bags if the catch is moderately good. From August 2011 onwards all the fishermen have purchased 5 litre plastic buckets with lid for transporting their share from the landing centre to their homes. Thus daily usage of minimum 500 carry bags is avoided. If a similar procedure is followed in other fishing villages the extent of pollution and the garbage generated through the use of polythene carry bags can be minimized considerably.

Fishermen carrying the plastic bucket while returning after fishing

Whale shark, *Rhincodon typus* landed at Kalamukku fish landing centre, Kerala

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A whale shark, *Rhincodon typus* caught by a trawl boat landed at Kalamukku fish landing centre on 23rd May 2013. This fish was accidently entangled in a trawl net operated off Kochi at a depth of 70 m. The fish did not have external injuries on its body. It was having a total length of 5 m (Fig.1) and other measurements could not be taken as the information received was at a later stage and the specimen was already thrown back to the sea.

It is locally known as "Thimingala sravu" and is listed as an endangered species as per the IUCN Red list. *Rhincodon typus* is a protected species included under Schedule-I of Indian Wildlife Protection Act, 1972.

Fig. 1. *Rhincodon typus* landed at Kalamukku, Kochi

Migrant women labourers in Puffer fish processing

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Puffer fish *Lagocephalus inermis* is found occurring in multi-day trawl catches off the coast of Karnataka. Incidence of puffer fish landing has been recorded at Mangalore and Malpe harbours. The peak season of puffer fish landing at Mangalore harbour was during the months of October (1653 t), November (1270 t) and December (955 t) in multi-day trawls, during the year 2012. At Malpe harbour the landings of puffer fish was 1786 t during October, 750 t in November and 687 t during December, 2012. These months provide additional employment for the women migrant labourers who are otherwise employed in the secondary sector which includes loading /unloading of fish, sorting, peeling and other processing activities. Around 75

Fig. 1. Migrant women labourers engaged in puffer fish processing at Mangalore Fisheries Harbour

women migrants from Tamil Nadu are engaged in the processing of puffer fish at Mangalore harbour once, it has landed. The working hours are from 7 to 9 am (3-4 h). A woman cuts 200 kg of puffer fish during this time. The cutting charges are ₹50/box. The capacity of a box is 40 kg and a woman can handle 4-5 boxes during 3-4 h. The average earning of a woman labourer is ₹250/day.

The cost of puffer fish at the landing centre varies from ₹13-17/kg. The processing of the puffer fish involves removal of the head, skin, ovaries and liver of the fish by cutting and separating these body parts. The skin, ovaries and liver of this fish contain the poison tetradotoxin (TTX), which is a neurotoxin and is found to shut down the central nervous system of the victim within 4-6 hours of consuming the fish. Though a delicacy in Japanese cuisine, only specialized cooks in Japan are certified to clean, cut and prepare the dish to ensure the safety standards in consumption. "*Fugu*" is the Japanese word for puffer fish and the dish prepared from it. Normally species of genus *Takifugu*, *Lagocephalus*, or *Sphoeroides*, or porcupine fish of the genus *Diodon* are used. Though the fish is popular in oriental cuisine, the fish is not known to be preferred in the Indian domestic fish market. At Mangalore harbour the price of puffer fish varies from ₹13-17/kg and at Malpe harbour in Udupi it is as low as ₹10/kg. In the fish markets at Udupi, the price is ₹15/kg. At Malpe harbour, the entire catch of puffer fish goes to the fishmeal plants.

At Mangalore harbour, puffer fish of weight more than 200 g are cut. Twenty percent of the fishes are taken by local agents for dry fish making. The rest (80%) are taken to Tamil Nadu, where the market price is ₹ 40/kg. In Tamil Nadu there is demand for the meat of puffer fish in the local wine shops where it is cooked and consumed as Kababs. The rest of the puffer fish from Tamil Nadu finds its way to fish markets in Malaysia and China. Once ignored by fishermen as a low value fish, the puffer fish catches are slowly gaining the attention of export markets and if the migrant women work force are effectively utilised, it could lead to the growth of small export houses exclusively for puffer fish processing along the Karnataka Coast.

Occurrence of picnic seabream, *Acanthopagrus berda* (Forsskal, 1775) along Visakhapatnam coast, Andhra Pradesh

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The picnic seabream, *Acanthopagrus berda* (Forsskal, 1775) is a sparid bream, common in Western Indian Ocean, South Africa, Mozambique, the Red Sea, Persian Gulf, India, Phuket and Malaysia. There are about 139 species belonging to family sparidae distributed in World Oceans and about 10 species has been reported from Indian waters. The genus *Acanthopagrus*, now widely recognized as a valid Indo-West Pacific genus was first proposed as a subgenus of *Chrysophrys* by Peters (1855). The type-species of the genus is *Chrysophrys vagus* Peters (1852) was later synonymized with *A. berda* by Smith & Smith (1986). There are 16 currently recognized species of *Acanthopagrus* of which *A. berda* is the most widespread. From Indian waters, three species of *Acanthopagrus* viz. *A. berda, A. latus and A. bifasciatus* have been reported so far. The species feeds on invertebrates, including worms, molluscs, crustaceans and echinoderms and small fish. It is a protandrous hermaphrodite species.

On 27th July 2013, a single specimen of the picnic seabream was collected from trawl sample at Visakhapatnam Fishing Harbour. The specimen was identified as *A. berda* (Fig.1) and deposited at the Marine Fish Museum of VRC of CMFRI, Visakhapatnam. This is the first report on the occurrence of *A. berda* along Visakhapatnam, east coast of India.

Fig. 1. *Acanthopagrus berda*, 235 mm (Total length)

The species is distinguished by fairly deep compressed body, its depth more than twice in standard length. Upper profile of head straight; snout pointed; eye moderate in size; ventral profile almost straight to anus; in both jaws, 4 large, more or less compressed teeth in front, followed by 3 rows of molar-like teeth in lower jaw and 4 rows of molar like teeth in upper jaw; absence of single enlarged molar posteriorly in jaws as observed in the genus *Rhabdosargus*; scale rows between fifth dorsal-fin spine base and lateral line 3.5; front edge of dorsal scaly area on head slightly convex; lateral-line scales 46; second anal-fin spine (2AS) longer than third anal-fin spine (3AS), 2AS/3AS ratio 1.46; anal-fin membrane dark; caudal fin slightly forked, with rounded lobes. Silvery gray colour on head, body and fins; upper part of body and base of scales darkest, lower part of head and body paler, a dark edge along opercle. Spinous dorsal fin with a dark edge and spines often silvery; pectoral fins dusky with a yellow tinge, soft dorsal, anal and pelvic fins blackish; Meristic and morphometric characters recorded are as follows Meristic characters: D XI+12, A III+10, P 15, V I+5, C 17, LI 46, Gr 14

Table 1. Morphometric measurements of *Acanthopagrus berda*

Characters	Measurements (mm)
Total length	235
Standard length	187
Fork length	214
Snout length	12
Body depth	81
Post-orbital length	29
Length of dorsal fin base	107
Spinous dorsal fin base length	75
Soft dorsal fin base length	37
Length of 1st dorsal fin spine	11
Length of 2nd dorsal fin spine	21
Length of 3rd dorsal fin spine	27
Length of 4th dorsal fin spine	30
Length of 5th dorsal fin spine	28
Length of 6th dorsal fin spine	28
Length of pectoral fin	71
Length of pelvic fin	47
Length of first pelvic fin ray	46
Length of pelvic fin spine	32
Length of anal fin base	35
Length of 1st anal fin spine	12
Length of 2nd second anal fin spine	41
Length of 3rd anal fin spine	28
Head length	53
Eye diameter	14
Caudal peduncle length	26
Peduncle height	33
Caudal fin height	56
Inter orbital width	21
Pre dorsal length	51
Pre anal length	131
Pre pelvic length	66
Pre orbital length	19
Upper jaw length	17
Total weight	500 g

First occurrence of yellow boxfish, *Ostracion cubicus Linnaeus*, 1758 (*Tetraodontiformes: Ostraciidae*) from Gulf of Mannar

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On 8th July, 2013 a single specimen of *Ostracion cubicus* (Fig.1) measuring total length 176 mm with a weight of 200 g was collected from a commercial trawler, operated at a depth 20 m, 25 km north-west off Tuticorin, southeast coast of India. Methods for measurements and counts followed Matsuura and Yamakawa (1982).

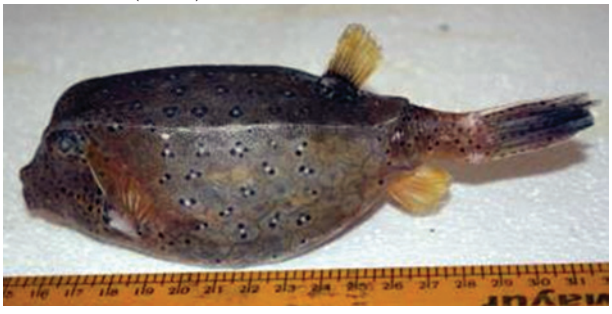

Fig .1. *Ostracion cubicus* Linnaeus, 1758

Ostraciidae family has eight genus and 24 species. The genus *Ostracion* has eight species and these species are slow-swimming benthic-dwelling fishes found to occur around rocky coral reefs, open sand bottoms and seagrass beds. These species are reported up to a depth of 90 m. The body of *O. cubicus* is completely enclosed in a rectangular carapace in the form of thickened scale plates, hexagonal in shape and firmly sutured to one another. Carapace is four-ridged and spineless. Ridges are blunt, but the ventral is more prominent than the dorsal ones. The carapace has openings for the mouth, eyes, gill slits, and fins, and for the flexible caudal peduncle; mouth small, terminal, with fleshy lips; teeth moderate and conical.

Body olive in color; dorsal, anal, pectoral fins are yellow in colour but caudal fin olive with block spots.

Table 1. Morphometric and meristic characters of the *O. cubicus*

Morphometric	**mm**
Total length	176.01
Standard length	141.05
Head length,	35.11
Snout length	29.06
Eye diameter	10.96
Interorbital width	31.32
Postorbital length	4.96
Gill opening length	13.12
Predorsal length	97.64
Dorsal fin height	21.8
Length of dorsal fin base	10.64
Preanal length	108.86
Anal fin height	21.52
Length of anal fin base	9.92
Pectoral fin length	27.24
Caudal peduncle length	27.55
Caudal peduncle depth,	15.35
Body width	47.77
B ody depth	50.51
Meristic counts	
Dorsal fin rays	9
Anal fin rays	9
Caudal fin rays	10

First record of Silver moony, *Monodactylus argenteus* (Linnaeus, 1758) from Visakhapatnam, Andhrapradesh

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The family Monodactylidae includes six fish species that are commonly called Moon fishes. Out of the six species only two have been reported by Indian researchers so far. The genus *Monodactylus*

has four species *viz. Monodactylus argenteus, M. falciformis, M. kottelati and M. sebae. M. argenteus* commonly known as silver moony is distributed in the Indo-West Pacific, Red Sea and East Africa to Samoa, north to the Yaeyamas, south to New Caledonia and Australia. This species usually occurs in bays, mangrove estuaries, tidal creeks, and lower reaches of freshwater streamsand occasionally in silty coastal reefs. It feeds on plankton and detritus. It is commonly seen in schools, small juveniles either solitary or in small aggregations.

Fig. 1. *M. argenteus*, 125 mm (Total length)

A specimen of *Monodactylus argenteus* (Fig. 1) was collected from the commercial trawler at Visakhapatnam fishing harbour on 6th August 2013. After detailed morphological examination, the specimen was fixed with 5% formalin and deposited at the marine fish museum of VRC of CMFRI, Visakhapatnam. The morphometric measurements were taken to the nearest mm and the specimen identified as *M. argenteus* is the first report on its occurrence along Visakhapatnam, east coast of India

The species is characterized by oval, deep, strongly compressed body; eye moderately large, its diameter longer than snout length; mouth small and oblique; dorsal fin with VIII spines and 28 soft rays; anterior soft dorsal-fin rays elongated, situated over mid-length of body. Anal fin with III spines and 28 soft rays; anterior soft anal-fin rays elongated, situated below mid-length of body, longer than elongated soft dorsal-fin rays; posterior edge of dorsal and anal fins distinctly concave. Caudal fin slightly emarginate. Pelvic fins rudimentary. Body, head, and unpaired fins covered by small, deciduous scales. Silver colored body with two vertical black bands over head, one passes through eye and other in front of pectoral-fin base; tip of dorsal and anal fins black; anterior edge of anal fin with broad black margin (Table 1).

Meristic characters: D VIII+28, A III+28, P 15, C 16, Gr 8+19

Table 1. Morphometric measurements of *Monodactylus argenteus*

Characters	Measurements (mm)
Total length	125
Standard length	94
Snout length	06
Body depth	84
Post-orbital length	16
Length of dorsal fin base	57
Dorsal fin soft ray length	39
Length of pectoral fin	21
Length of anal fin soft ray	43
Head length	34
Eye diameter	11
Caudal peduncle length	08
Peduncle height	14
Caudal fin height	37
Inter orbital width	13
Pre-dorsal length	40
Pre-anal length	40
Pre-orbital length	07
Pre-pectoral length	26
Width of maxilla	3.5
Maxilla length	09

Occurrence of plastic debris in the stomach of yellowfin tuna (*Thunnus albacares*) from the Arabian Sea: A cause for concern

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The ingestion of plastic debris is the result of huge and continuous release of this pervasive type of pollutant into the marine environment. Marine plastic debris significantly affects marine wild life and biodiversity. The present study reports the ingestion of plastic debris by yellowfin tuna (*Thunnus albacares*) from the southeastern Arabian Sea.

The fishes sampled in this study were caught from 1200 m depth, 410 km west of Kochi, India (10^{O} 43´N 72^{O} 50´E) during a routine oceanic squid jigging cruise carried out by *MV Titanic* under the NAIP Scheme on oceanic squids. On 08.02.2013, at around 1700 hours two specimens of yellowfin tuna were caught by using hook and line. The fish had a length (FL) of 65 and 62 cm and weighed 4.10 and 3.80 kg respectively. Fishes were immediately iced, and subsequently thawed at room temperature and stomachs were carefully removed for analysis on board the vessel. The stomachs were preserved in 5% formalin and observations were done in the laboratory.

Out of the two tuna stomachs examined, one had polyethylene material (piece of plastic carry bag about 3 cm length and 0.5 cm width) inside the gut. Stomachs also contained Squilla, zooplankton such as megalopa, decapods, chaetognaths, partially digested fish, fish bones and otoliths.

The ingestion of such plastic marine debris probably happened during the normal feeding activity, but the fact that it occurred very far from the coast indicates that plastics of terrestrial origin, have reached the oceanic realm. The source of this debris might be from Lakshadweep islands or from Indian mainland or from merchant ships.

Fig. 1. Stomach contents of yellow fin tuna including plastic debris (inside the yellow circle)

Many studies have documented the effect of large plastic debris in marine mammals through entanglement and ingestion. The plastics observed were mainly nylon rope fragments, fragments of lines or gillnet and fragments of fishery ropes, but in this investigation the fish stomach contained piece of plastic carry bag. Considering that the presently observed yellowfin tuna is a young adult of about one year age, it is liable to predation by larger marine fishes, sharks and mammals. This can cause vertical transfer of plastics from small fishes to large animals. Presence of plastics in digestive tracts can reduce the fish's feeding drive and may lead to eventual starvation. More damaging is the danger of degraded plastic compounds getting into the fish tissue which can lead to the bioaccumulation as it passes from one trophic level to another in the food chain and eventually to humans. Impact of smaller plastic debris on the marine environment and fishes will need more extensive research.

Olive ridley turtles released back into the sea at Visakhapatnam, Andhra Pradesh - A note

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Five species of marine turtles *viz.*, olive ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta)*, leather back turtle (*Dermochelys coriacea)*, hawksbill turtle (*Eretmochelys imbricata*) and green turtle (*Chelonia mydas)* are known to inhabit the Indian coastal waters. The most common species in Indian waters is olive ridley, which is also believed to be the most abundant marine turtle in the world. The coastline of Andhra Pradesh is one of the sporadic nesting habitats of olive ridley turtles which is popularly known as "Samudram Tabelu" in Telugu. The species is known to nest on the northern Andhra Pradesh coast which encompasses three districts namely Srikakulam, Vizianagaram and Visakhapatnam. This coast may also serve as an intermediate developmental habitat for sub-adult ridley turtles and for juvenile and sub-adult green turtles *Chelonia mydas*.

The present note is an account of an accidental capture of two olive ridley turtles as bycatch in trawl net at a depth of 40 m while carrying out experimental trawling onboard a commercial single day trawler along Visakhapatnam coast on 27th November 2012 (Fig.1 & 2).The turtles looked inactive with little movement of flipper. This may be due to the prolonged struggle inside cod end to extricate themselves from the trawl net. After taking morphometric measurement the turtles were released back into the sea. Initially the turtles exhibited slow movements. Thereafter the turtles freely swam deep into the sea. Accidental entanglement is a matter of concern since olive ridley turtle are endangered and are protected as per various international agreements. Olive ridley turtles are categorized as Vulnerable on the IUCN Red List (IUCN, 2010) and are included in Schedule-I of the Indian Wildlife (Protection) Act, 1972. They are listed in Annexure II of the SPAW (a Protocol Concerning Specially Protected Areas and Wildlife), Appendix-I of CITES

Fig. 1. Olive ridley turtle (*L. olivacea*) as bycatch in trawl net (Dorsal view

(Convention on International Trade in Endangered Species of Wild Flora and Fauna) and Appendices I and II of the Convention on Migratory Species (the Bonn Convention). So it's high time to educate and create awareness among fishermen to release back the turtles which are accidentally caught.

The curve carapace length and weight of both the turtle were 68 cm and 40- 45 kg (approximate) respectively. Detailed morphometric measurements recorded are as follows

Table 1. Morphometric measurement of Olive ridley turtle

Characters	Measurements (cm)
Total length	97
Curved carapace length	68
Curved carapace width	65
Plastron length	52
Plastron width	50
Head length	28
No. of Pre-frontal scutes	2 pair
No. of Pre-central scutes	1
No. of Central (neural) scutes	5
No. of Lateral (coastal)scutes	7
No. of Marginal scutes	12
No. of Post-central scutes	1
No. of claws on flipper	1
Tail length	18
Inframarginal scutes with pores	4

Surge in number of the Portuguese man-of-war (*Physalia physalis*) washed up on Juhu and Girgaum beaches, Mumbai, Maharashtra

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After the onset of South-west monsoon along the west coast of India, swarming of blue bottle jelly fish the Portuguese man-of-war (*Physalia physalis*) is observed at Juhu and Girgaum beaches, Mumbai almost every year. Portuguese man-of-war, though often mistaken as a jellyfish, is a marine Cnidarian of the family Physalidae. Its venomous tentacles can deliver painful sting. In July, 2013 sudden strong winds and high tide had brought in several bluebottle jelly fish (Fig 1). For several people, a walk by the seaside at Juhu and Girgaum beaches during first week of July, 2013 ended in redness of skin, swelling, irritation, itching, blisters and severe body ache. The daily news papers carried news items on the marine venomous creature, Portuguese man-of-war and their venomous sting threat to public.

This article attempts to gather information including classification, habitats and distribution and clinical effects of envenoming with appropriate first aid and definitive medical treatment.

The name "man of war" comes from 18th century armed sailing ship. The bluebottles have resemblance to the Portuguese version at full sail. In other languages it is simply known as the 'Portuguese war-ship' (Dutch: *Portugees oorlogsschip*), the 'Portuguese Galley' (German: *Portugiesische Galeere*, Hungarian: *portugál gálya*), or the 'Portuguese Caravel' (Portuguese: "*Caravela Portuguesa*", Italian: "*Caravella portoghese*").

Fig. 1. *P. physalis* washed ashore

Despite its outward appearance, the man-of-war is not a true jellyfish (true jellyfish are those that belong to the class Scyphozoa) but a Siphonophore, which differs from jelly fish in that it is not actually a single organism, but is actually a colony of numerous organisms called polyps (or zooids) that are so specialized that they cannot live without each other.

The Portuguese man-of-war lives at the surface of the ocean. The gas-filled bladder remains at the surface, while the remainder is submerged. It has no means of propulsion and moved by a combination of winds, currents and tides. Although it can be found anywhere in the open ocean (especially warm water seas), it is most commonly found in the tropical and subtropical regions of the Pacific and Indian oceans and in the northern Atlantic Gulf Stream.

Strong winds drive them into bays or onto beaches. It is rare for only a single Portuguese man-of-war to be found; often the finding of one results in the finding of many. Attitudes to the presence of the Portuguese man-of-war vary around the world. Given their sting, however, they must always be treated with caution and the discovery of man-of-war washed up on a beach may lead to the closure of the whole beach in the western world.

Portuguese man-of-war is composed of four types of polyp. One individual polyp becomes the

large gas-filled bladder called the pneumatophore (commonly known as sail) that sits horizontally on the surface of the ocean and enables the organism to float.

The other three polyp types are known as dactylozooid (defensive/prey capturing tentacles), gonozooid (reproduction) and gastrozooid (feeding). These polyps are clustered. It is believed that man-of-wars spawn together in large numbers, with each colony (being either all male polyps or all female polyps) releasing gametes into the water to be fertilized. The resultant larvae then go through asexual budding to produce a new man-of-war colony.

The Portuguese man-of-war possess microscopic stinging cells called nematocysts. These structures are numerous on the tentacles or body of the animal and are used to capture prey. A small dose of venom contained within each nematocyst is discharged in response to chemical or mechanical stimulation. Nematocysts from many jellyfish (Scyphozoa) do not penetrate human skin and/or their venom is not toxic to humans; encounters with these therefore do not produce a significant reaction. However, the stinging, venom-filled nematocysts in the tentacles of the Portuguese man-of-war can paralyze small fish and other prey and *Physalia* nematocysts do penetrate human skin and envenoming may lead to systemic effects. Detached tentacles and dead specimens (including those that wash up on shore) can sting just as painfully as the live organism in the water and may remain potent for hours or even days after the death of the organism or the detachment of the tentacle.

Most victims of *Physalia* envenoming will display no signs and symptoms other than localised pain and pruritus. Characteristically, stings cause a linear collection of elliptical blanched weals, with a surrounding red flare (resembling a "string of beads"). Extensive stinging (more likely from larger specimens) may lead to systemic symptoms including nausea, vomiting, headache, chills, drowsiness, breathing difficulties, cardiovascular collapse, or death; however, systemic symptoms are rare.

Treatment - Initially the victim should be prevented from rubbing the area or performing vigorous muscular activity, as this will lead to greater discharge of attached nematocysts and venom movement into the general circulation. On-site first aid consists of flushing the affected area with sea water to help remove any adherent tentacles; careful removal of tentacles with forceps may be required.

Traditionally, ice or cold packs were recommended for pain relief following *Physalia* stings; however, a recent randomised controlled trial has shown significant benefit of hot water over cold packs. Hot water immersion or showers should now be considered the treatment of choice for *Physalia* envenoming. The technique as described for fish stings should be followed, or alternatively a hot shower may be all that is required to alleviate pain. The local fishermen at Mumbai use lemon and Calcium hydroxide Ca $(OH)_2$ (Locally called as "Choona") to treat the victims of *Physalia*.

Congregation of *Scolopsis vosmeri* (Bloch, 1792) in Mumbai waters

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Nemipterids form an economically and ecologically important component of demersal fish catches throughout the west coast of India. During October 2010 a new species of Nemipterids not hitherto observed in trawl catches at New Ferry Wharf and Sasoon Docks at Mumbai, Maharashtra

was noticed. The fishes were caught at about 30-40 m depth.

The fish were identified as *Scolopsis vosmeri* (Bloch, 1792) (Fig. 1 and 2) (Superclass: Osteichthyes, Order: Perciformes and Family: Nemipteridae). It is commonly called as 'White-cheek monocle bream'. The species is widely distributed in the tropical waters from along Indo-West Pacific to Red Sea and East Africa to the Ryukyu Islands and northern Australia (32°N - 31°S, 29°E - 141°E). It is a common Reef-associated marine fish inhabiting depth range from 2 - 25 m and also found in inshore waters usually on sand or mud bottoms close to reefs.

Fig. 1. Male specimen of *Scolopsis vosmeri*

Some of the distinctive characters are: Dorsal fin contains 10 strong spines and 10 rays. Anal spine contains three spines; second spine in anal fin is much stronger than first and third spine with 7–9 soft rays. A forward directed sub-orbital spine is present. Strong dentition is present among edge of pre-opercle. Scales present on head upto nostrils. Pelvic fins long enough to reach at anus. The colour is brownish with reddish purple and yellowish margins on all fins. A broad white band is present on operculum staring from top margin of head and ending at the base of operculum. Another horizontal white band is present starting from origin of lateral line just above pectoral fin extending upto middle of dorsal fin.

Fig. 2. Female specimen of *Scolopsis vosmeri*

The length of the fish ranged between 16.5 to 19.1 cm and the corresponding weight ranged from 115.2 to 172.3 g. Gut content studies revealed that the fish feeds on benthic organisms including polychaete worms. The sex-ratio was 1:1.5 and 71% of the females were mature.

More number of mature female specimens indicates that the species may have congregated for spawning purpose. During October-November many species of coral fishes are observed along Mumbai coast. Further studies on this phenomenon needs to be carried out.

Successful sex reversal of Greasy Grouper, *Epinephelus tauvina* (Forsskal, 1775)

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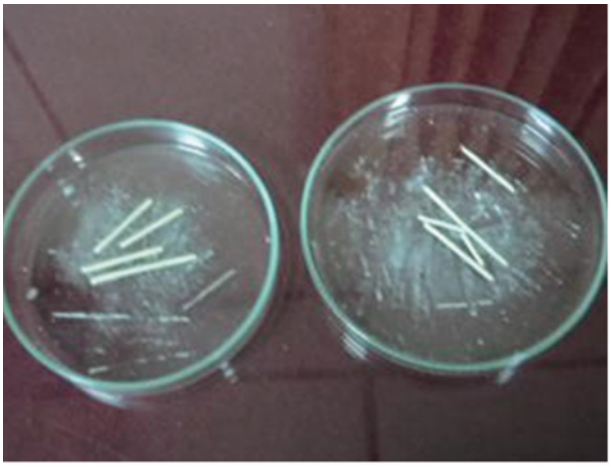
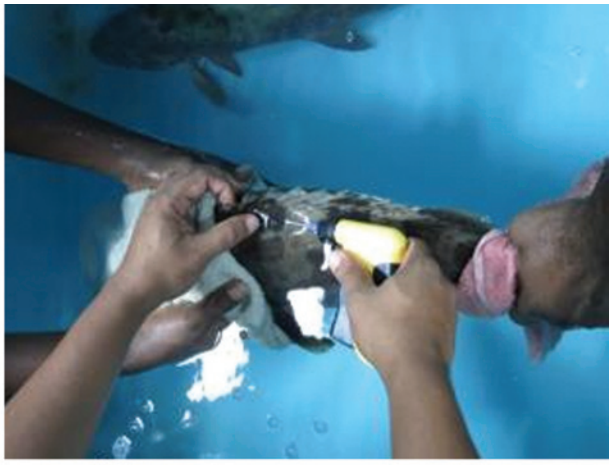
Large scale development of the grouper culture industry has been hindered by the lack of seed for stocking, which is due to the lack of a standardised method for controlled sex change and also due to the unavailability of mature male broodstock. Long term husbandry and maintenance of broodstock are

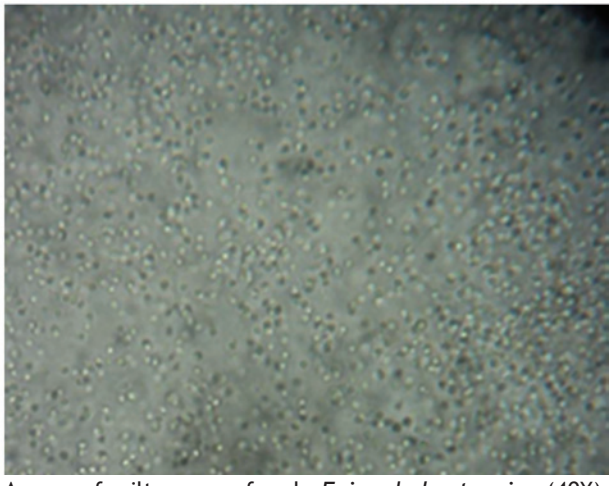


Hormonal and enzymatic pellets for implantation



Implantation of hormonal and enzymatic pellets

Cannulation of sex reversed male for milt collection



A snap of milt smear of male *Epinephelus tauvina* (40X)

time consuming and tedious, and consequently, the male broodstock for propagation is generally obtained by means of induced sex change at an early age. Therefore, induction of sex change in these species has been of great interest to aquaculturists.

E. tauvina is a protogynous hermaphrodite, which does not exhibit any externally distinguishable sexual characters. Being protogynous hermaphrodite, grouper gonad development undergoes sex transition from ovary to intersexual and then to testis; and primordial germ cells and different stages of gametic cells during oogenesis and spermatogenesis are synchronously observed in the transitional gonad (nonfunctional ovotestis). In protogyny, males may develop directly from the larval/ juvenile stage or may develop from adult females by sex reversal. With this backdrop, attempts were made for the sex reversal of greasy grouper to obtain male brooders for the captive breeding and seed production.

Successful sex reversal (female to male) was achieved with the hormonal and enzymatic manipulation. Twenty fishes were implanted with 17 α methyl testosterone alone or in combination with different doses of aromatase inhibitor enzymes (letrazole). Sixty percent of the implanted fishes were sex reversed male after 4 months with the implantation of hormonal and enzymatic combination. Periodic implantations of hormone and aromatase enzyme are being carried out once in two months to maintain the sex of male broodstock. These brooders were examined once in a month to assess the milt production. These sex reversed males were used for induced spawning of greasy grouper for seed production.

Occurrence of near threatened tiger shark, *Galeocerdo cuvier* (Peron & Lesueur, 1822) from Puri coast, Odisha

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Tiger shark, *Galeocerdo cuvier* (Peron & Lesueur, 1822) has a circumglobal distribution in tropical and warm temperate seas. The Tiger shark, *G. Cuvier* belongs to the family *Carcharhinidae*, which is constituted by 12 genera and 54 valid species. The genus *Galeocerdo* represents a single species *G. cuvier.* It is locally known as Valiyasurav. Tiger sharks feed on sea turtles, sea cow, teleost fishes, sea snakes, sea birds, jellyfishes, rays, marine mammals and crabs. This species is considered as an apex predator in the marine ecosystem.

On 20th March, 2013 a single specimen of tiger shark measuring 105 cm (total length) with approximate weight of 10 kg was landed at Pentakota landing centre, Puri, Odisha coast. The species was incidentally caught in hook and line operated from traditional fishing craft between 40-70 m depth from the coast.

The species is characterised by fusiform body, stout forward of the first dorsal fin, snout very short and bluntly rounded. Upper labial furrows long reaching the eyes, teeth coarsely serrated, inter-dorsal ridge present, caudal peduncle relatively narrow. Second dorsal much smaller than first. Keel on each side of caudal peduncle. Upper caudal lobe with long tapering tips. Grey colour above with vertical black to dark grey tiger stripe and spots marking on side and fins (Fig.1).

Fig. 1. Tiger shark, *Galeocerdo cuvier,* 105 cm (Total length)

Tiger sharks are included under Appendix II of CITES, making the trade of this species regulated. The species are categorized as “Near Threatened” in 2001 by the IUCN Red list of Threatened species. It is not usually fished commercially but previously it has been targeted for the fins, liver and jaws.

On the occurrence of Paper bubble shell, *Hydatina zonata* (Lightfoot,1786) from Maharashtra waters

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Paper bubble shell, *Hydatina zonata* (Fig. 1) was observed in trawl catch at a depth of 19-20 m off Maharashtra along with several other fish species in the month of May 2013. *H. zonata* is a rare form

Fig. 1. *Hydatina zonata*

of sea slug and known to be endemic to the Indo-Pacific region. The species was earlier reported from Chennai, Pamban, Kundukkal Point and Mandapam (Satyamurti, 1952; Sundaram, 1969) along the south-east coast and once from Gujarat (Menon *et al*., 1961). Ganesh *et al*. (2009) reported the species from the north-east coast of India and Sethi (2013) reported from Chennai waters. A literature review on the distribution of this species revealed that this is the first report of *H. zonata* from Maharashtra waters. *H. zonata* generally occurs at depth between 50-70 m in fine sand. The species was reported earlier as *H. velum* (Gmelin, 1791) which is its synonym.

Hydatina is characterized by many thin brown spiral lines coloring the shell. There are a number of names which apply to *Hydatina* shells in which brown axial lines predominate. Usually the brown lines are split into a series of spiral zones by white spiral bands. In one form, *H. cinctoria*, the brown zones are separated by five white bands, while in *H. velum* there is an upper, a lower, and a thin median white band, each of which is outlined with a thin dark brown line.

The *H. zonata* shell of is ovoid, fragile and thin. It is light straw coloured with dark brown broad spiral enclosing white, one near its sunken spire, another in the middle of the body whorl and third one at its lower part. Suture is deep and aperture is broad, thin, sharp and surface is smooth.

H. zonata were observed from four stations off Maharashtra during the period 28-05-13 to 31-05-13. The trawling operations lasted for three hours each and the mesh size was 35 mm. The shell length ranged from 30 – 40 mm and the weight ranged from 40.3 to 60.5 g. The specimens of *H. zonata* have been deposited in the Reference Collection of Central Marine Fisheries Research Institute, Mumbai.

Gastropod operculum - An unique trade

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Operculum of certain gastropods has long served as an incense material in ancient Jewish tradition as well as in Christian and Arabian Muslim faiths. The operculum of conch species *Strombus tricornis* and *Lambis truncata sebae* are most commonly used in the Middle East. Operculum powder is also an important ingredient to Chinese and Japanese incense makers. The other shells whose operculum used world over are Moon shell, *Rapana venosa, S. gigas etc*. There is a huge international market for operculum trade with the price ranging from US $ 7-9 to US $ 44-44.5/kg.

Operculum is traditionally treated with vinegar, alcohol and water to remove any fishy smell. The cleaned opercula are then ground to a powder and used as a scent fixative which is similar to the

technique used in perfumes with certain plant resins. In some countries the operculum is rubbed with an alkali solution prepared from the plant bitter vetch to remove impurities and it is then soaked in fermented berry juice of the Caper shrub or strong white wine, in order to enhance its fragrance.

India is one of the major exporter countries of dried high quality operculum. Some of the gastropod operculum exported from Mumbai (arranged according to their increasing price) are *Babylonia spirata* (Linne) (Plate 1) (shell size ranges from 45-51 mm), *Rapana bulbosa* (Dillwyn) (Plate 2) (65-70 mm), *Murex virgineus var. ponderosa* (Sow) (Plate 3) (80-90 mm), *Hemifusus cochlidium* (Linne) (Plate 4) (70-80 mm), *Lambis lambis* (Linne) (Plate 5) (90-110 mm) and *Chicorius ramosus* Linne (Plate 6 and Plate 7) (90-100 mm). Except for *B. spirata*, which is easily available in Maharashtra, all the other species are procured from Rameswaram or Mandapam to Mumbai in dried form, from where it is exported to different countries the world over especially the eastern countries. The price depends on the species, quality and availability.

Plate 1

Plate 2

Plate 3

Plate 4

Plate 5

Plate 6

Plate 7

Due to heavy exploitation of gastropods for its opercula, resource depletion of specific species is not far away. Hence research, management and preventive measures on endangered species of gastropods need to be carried out. The need of the hour is no develop a key for gastropods based on operculum for easy identification.

First record of *Octopus aegina* Gray, 1849 from Maharashtra waters

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Octopus catch was earlier discarded, as it did not fetch any price, but in recent years, octopuses are also being exploited in commercial quantities and the major species that contribute to the fishery in Maharashtra are *Cistopus indicus, O. membranaceus* and *O. dollfusi*. Cephalopods form about 8.8% in trawl landings at New Ferry Wharf among which octopus contributed 4.9%.

A new entrant *Octopus aegina* Gray, 1849 (Fig. 1) was recorded in the octopus fishery from Mumbai. This species is commonly known as 'Sand bird octopus' and is distributed in Western Pacific, Indian Ocean, Red Sea and Japan to Mozambique. It is a benthic species commonly found in the continental shelf from 30-120 m depth. Together with *C. indicus*, this is the most common species in Indo-Malayan markets. It is trawled on the

Fig. 1. *Octopus aegina* Gray, 1849

continental shelf or caught with traps and hook-and-line. It also supports subsistence fisheries in East Africa.

The mantle of *O. aegina* is round to oval and is covered with small tubercles or fine papillae arranged in a reticulate pattern. Eyes are prominent and the arms are moderately long with arm-I strikingly the shortest. The arm ratio is 4:2:3:1.

This species is observed throughout the year in Mumbai waters with relatively better catch during pre monsoon months. The species is more abundant in *Dol* net catches and very few specimens from trawl catch. This species was observed in the *dol* catch at New Ferry Wharf, Sasoon Docks, Vasai, Arnala etc. The maximum mantle length reported for the species is 100 mm with a total length of 300 mm weighing 400 g. However, mantle length of *O. aegina* observed at Mumbai was smaller ranging from 18 mm to 40 mm with a corresponding weight raging from 4.4 to 29.7 g.

Silas *et al*. (1985) had reported the occurrence of this species from Indian waters and Sivasubramaniam (1991) reported it from the Bay of Bengal. The present record is for the first time from Maharashtra waters.

Occurrence of *Parascolopsis eriomma* (Jordan and Richardson, 1909) and *P. aspinosa* (Rao & Rao 1981) from Tuticorin coast

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The family Nemipteridae has five genera and 69 valid species. The dwarf monocle bream belonging to the genus *Parascolopsis* has 12 species. They are small, bottom-living fishes usually occurring in moderately deep water on outer shelf and continental slope waters throughout tropical and sub-tropical waters of Indo-West Pacific, ranging from Western Indian Ocean to North East Australia, South Japan and Delaga Bay on the coast of East Africa. The present report on Rosy dwarf monocle bream, *Parascolopsis eriomma* from Tuticorin coast is evidently a range extension from the known distribution areas.

A single specimen of *P. eriomma* (Fig. 1) was collected from drift gillnet at Punnakayal landing centre during March 2013. *P. eriomma* has moderately deep body and snout short, bluntly rounded; jaw teeth villiform. Head scales reaching forward to mid-pupil; snout, sub-orbital and pre-maxilla naked, posterior margin of pre-opercle finely serrate; lower limb of pre-opercle naked; a weak sub-orbital spine present; gill rakers 18 on first arch.

Fig. 1. *Parascolopsis eriomma observed*

Colour: Body pinkish with a longitudinal yellow stripe along middle of body; dorsal fin pinkish, pectoral translucent yellow, anal and pelvic fins milky white; caudal fin rosy pink and lower lobe pale yellow (damaged).

Table 1. Morphometric and meristic characters of *Parascolopsis eriomma* from Tuticorin coast.

Characters	mm
Total length	248.2
Standard length	195.75
Body depth	70.43
Body width	32.99
Head length	71.1
Pectoral fin length	54.71
Pelvic fin length	47.73
Predorsal length	66.15
Prepectoral length	68.35
Prepelvic length	75.15
Preanal length	127.9
Preanus length	120.41
Caudal peduncle length	44.41
Caudal peduncle width	20.77
Eye diameter	19.56
Posteye width	28.06
Interorbital distance	17.73
Snout length	16.59
Orbit width	10.5
Meristics counts	
Dorsal fins	IX +9
Pectoral fins	17
Pelvic fins	I+5
Anal fins	III+7
Lateral line scale	36
Predorsal scale	6

A single specimen of *P. aspinosa* (Fig. 2) with standard length 143.66 mm was collected from the bycatch of a commercial trawler at Tuticorin fishing harbour (TFH) during month of Jaunary 2013. This specimen was caught approximately 30 nautical miles (Nm) from the shore off Tuticorin, Gulf of Mannar at a depth ranging from 100-150 m. After detailed morphological examination, the specimen was photographed and fixed with 10% formalin. The morphometric measurements were taken to the nearest mm and the specimen was identified as *P. aspinosa* described in FAO (1984). Occurrence of *P. aspinosa* is reported for the first time from the Tuticorin coast.

Fig. 2. *Parascolopsis aspinosa* caught off Tuticorin coast, Gulf of Mannar

Body moderately deep, laterally compressed; posterior margin of suborbital smooth with tiny spines; head scales reaching forward to between level of anterior margin of eyes and posterior nostrils; posterior margin of pre-opercle more or less vertical; lower limb of pre-opercle naked; Dorsal fin X+10; Pectoral fin II+14; Anal fin III+7 and Pelvic fin I+5; Gill rakers 11 on first arch; pectoral and pelvic fin long, reaching beyond level of anus; axillary scale present in pelvic fin.

Colour: Body rosy orange and four pale reddish saddles on back and two on caudal peduncle; suborbital and edge of pre-opercle silvery-yellow; a black blotch at base of dorsal fin between eighth spine and first ray; dorsal fin with orange edge; anal fin pale rosy; pectoral fin yellowish.

Table 1. Morphometric measurements of *Parascolopsis aspinosa*

Characters	(mm)	%TL
Total length	143.66	
Standard length	114.85	79.94
Body depth	42.4	36.91
Body width	17.23	15.00
Pectoral fin length	34.26	29.83
Pelvic fin length	32.5	28.29
Head length	43.46	37.84
Eye diameter	12.5	28.76
Orbit diameter	6.22	14.31
Snout length	11.35	26.11
Post eye length	21.2	48.78
Inter orbital depth	8.07	18.56
Pre-dorsallength	44.61	38.84
Pre-pectoral length	42.29	36.82
Pre-pelvic length	44.01	38.31
Pre-anal length	77.41	67.400
Pre-anus length	72.57	63.18
Distance between pelvicfin analfin	32.7	28.47
Caudal peduncle length	26.3	22.89
Caudal peduncle width	13.95	12.14

On the occurrence of pelagic thresher shark, *Alopias pelagicus* (*Alopiidae: Laminiformes*) from Tuticorin, Gulf of Mannar

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The family Alopiidae (thresher sharks) is found distributed worldwide in tropical and temperate seas. Alopiidae have one genus and three species *viz*., the pelagic thresher, *Alopias pelagicus* Nakamura, 1935, the bigeye thresher, *A. superciliosus* (Lowe, 1839) and the common thresher, *A. vulpinus* (Bonnaterre, 1788). On 20th June, 2013 a single specimen of *A. pelagicus* (Sex: female; total length: 270 cm; weight: 3000 g) was landed in by large meshed drift gillnet ("Paruvalai") operated from fishing craft ("Vallam") in Tharuvaikulam fish landing centre. The gear was operated between 100 and 150 m depth, at a distance of 60 nautical miles from the coast. The specimen was photographed and morphometric measurements were made with a measuring tape to the nearest centimeter and weight was taken to the nearest gram. The species identification was carried out based on Compagno (1984).

Head very narrow, convexly arched in dorso-lateral profile; snout moderately long and conical; eyes moderately large, orbit not expanded onto dorsal surface of head; mouth semicircular and placed below eyes, labial furrow absent; teeth very small and sharp-edged; weak nuchal groove present above the brachial region. Two dorsal fins, the first moderately large and the position of the first dorsal fin base closer to pelvic bases than pectoral bases; second dorsal fin minute and positioned well ahead of the small anal fin; pectoral fins with straight and very broad tips; caudal fin very slender; nearly equal to rest of the specimen body. Body blue to grey with silvery sides on dorsal surface; white colour from ventral side but the abdominal white colour does not extend over the pectoral fin base.

Fig. 1. *Alopias pelagicus* landed

Table 1. Morphometric measurements of *Alopias pelagicus* from Tuticorin, Gulf of Mannar

Measurements	cm
Total length	270
Standard length	158
Snout to eye	12
Snout to mouth	10
Mouth width	11
Eye diameter	5
Snout to first gill-slit length	34
Prepectoral length	44
Predorsal (1st) length	74
Prepelvic length	107
Distance between pectoral to pelvic fin	50
Caudal fin upper lobe length	138

The pelagic thresher is an oceanic epi-pelagic and highly migratory species distributed in the Indo-Pacific regions and Indian Ocean. The species is found to occur in a depth ranging from surface to at least 152 m. The distributional information of pelagic thresher is rather hindered by identification problems and confusion with the common thresher. Two species are externally distinguished based on the difference in colour pattern *i.e*., skin color on the sides above the pectoral fin base, pectoral fin shape, second dorsal fin position, and presence or absence of labial furrows (Table 2).

Table 2. External distinguishing characters between pelagic thresher and common thresher

Characters	Pelagic thresher	Common thresher
Sides above the pectoral fin base	Uniformly dusky gray	Mottled white
Pectoral fin shape	Straight and broad tips	Falcate and narrow tipped
Labial folds around the mouth	Present	Absent
Origin of the second dorsal fin	Aligned anterior to the free rear tip of the pelvic fin	Aligned posterior to the free rear tip of the pelvic fin

The pelagic threshers are smallest and early maturing among the three thresher sharks reaching its asymptotic length ($L_\infty$is about 330 cm TL) at about the growth rate, K =0.09 per year. In waters off Taiwan Liu *et al*. (1999) found that the length at first sexual maturity for females was found to be 282 to 292 cm TL (8 to 9.2 years) and for males it was 267 to 276 cm TL (7 to 8 years). The size at birth in the pelagic thresher varies considerably, ranging from 158 to 190 cm TL and representing the largest pup-to-maximum-adult size ratio of the three species of *Alopias*. Globally, the populations of *A. pelagicus* were declining due to over exploitation and IUCN declared the threat status is as "vulnerable" (IUCN, 2013).

First report on the occurrence of the silky shark, *Carcharhinus falciformis* (Müller & Henle, 1839) in commercial landings along the east coast of India

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Silky sharks *Carcharhinus falciformis* (Müller & Henle, 1839) are large oceanic sharks, known to be circumtropical in distribution, occurring mostly in the subtropics between 40æ%N and 40æ%S. They are highly migratory, known to inhabit continental and insular shelves and slopes, deep water reefs, and the open sea. They are also occasionally sighted in inshore waters. They are solitary in nature and are often found near schools of tuna, increasing the chances of forming a bycatch of tuna fisheries. These sharks have been reported in the fishery only along the southwest coast of India, and were recorded in small numbers at Cochin during 2000-2002. In 2010 however, this species formed about 16.3% of the shark landings at Cochin. In spite of this, these sharks have not formed a fishery along the east coast.

A young male *C. falciformis,* was recorded for the first time at Kasimedu Fisheries Harbour (Chennai) on 02.08.2012. This shark was caught by hook and line deployed for tuna fishing in the Bay of Bengal, north of Chennai at 200 m depth. Three more young sharks - two females and one male, were collected this year, on 11.07.2013, 18.07.2013 and 17.08.2013. The sharks were in the size range of 66-83 cm total length and 1.57–2.5 kg total weight.

Fig. 1. Young female silky shark caught in hook & line from the Bay of Bengal

On 20th Augsut, 2013, 10 young *C. falciformis* were landed at Visakhapatnam Harbour. The specimens ranged 75-97.2 cm in total length and 1.9-5 kg in total weight. The sharks were caught by motorized hook and line gear operated off the coast of Visakhapatnam. This is the first report of the species being landed along the east coast of India.

First report on *Sillaginopsis panijus* (Hamilton, 1822) off Visakhapatnam coast, Andhra Pradesh

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A flathead sillago, *Sillaginopsis panijus* was reported for the first time in the landings of Visakhapatnam fishing harbour. A single specimen measuring 372 mm in length weighed 348 g. The fish was caught with hook and line targeting seer fishes on 18-06-2013 at a depth of 30-40 m from a motorized craft. Biological investigations revealed that it is a mature female. Ovaries were bright orange in colour and voluminous when compared to body size and weighed 24 g and measured 68 mm in length. The fecundity was estimated at 8, 88,000 ova. Ova diameter ranged from 210-350 microns. Trace amounts (0.5 g) of digested matter was found in the stomach. Morphmetric and meristic measurements were taken and given below.

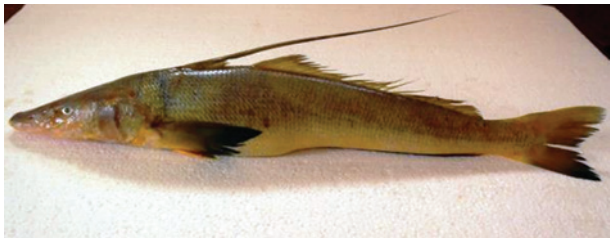

Fig. 1. *Sillaginopsis panijus*

Morphometric measurements	Length (mm)	Meristic measurements	Number
Total length(TL)	372	First dorsal fin spines	10
Standard length (SL)	330	Second dorsal fin spines	1
Body depth at first dorsal origin	82	Second dorsal fin rays	27
Body depth at anal fin origin	74	Anal fin spines	2
Maximum Body Depth	86	Anal fin rays	26
Depth at caudal peduncle	38	Pectoral fin rays	20
Head length	100	Pelvic fin spines	1
Snout length	34	Pelvic fin rays	6
Eye Diameter	0.9	Lateral line scales	92
Inter-orbital width	22		
Upper jaw length	28		
Tip of snout to origin of I dorsal fin	106		
Tip of snout to origin of II dorsal fin	156		
Tip of snout to origin of pectoral fin	104		
Tip of snout to origin of pelvic fin	114		
Tip of snout to origin of anal fin	190		
Length of I dorsal fin base	40		
Length of II dorsal fin base	142		
Distance between I and II dorsal fin bases	10		
length of anal fin base	70		
Pectoral fin length	38		
Pelvic fin length	118		
Distance between pelvic and anal fin bases	83		
Second spine of first dorsal fin	185		

A record of the brown mussel *Perna indica* in the intertidal zone along Mumbai coast of Maharashtra

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The green mussel *Perna viridis* has a wider distribution along the Indian coast, whereas brown mussel *P. indica* has very restricted distribution, along the southern tip of India, extending from Pondicherry to Cochin (Kuriakose & Nair, 1976). For the first time the occurrence of *P. indica* (Fig.1) is reported from the intertidal zone at Worli, Mumbai, thereby establishing the distribution of the species along the Maharashtra coast also.

Fig. 1. *Perna indica*

The intertidal region has many species of bivalves reported from Mumbai waters such as *P.viridis*, *Gafrarium divaricatum*, *Katelysia opima etc.* by Subramanyam *et al.* (1949) and Jaiswar and Kulkarni (2001 and 2005). The specimens were collected during low tide and the length ranged between 25 and 55 mm with weight ranging from 3.392 to 21.186 g. According to Kuriakose and Nair (1976), the maximum length of the species is 121 mm. The species was observed throughout the year with the peak period of abundance during April - June.

About 10% of *P. indica* collected were observed with infestation by tiny pea crab *Pinnotheres* sp. measuring between 6 and 8 mm. The record of *P. indica* from Mumbai waters confirms the establishment of brown mussel in Maharashtra waters. Jetani (2004) has reported the extension of distribution range of *P. viridis* in Gujarat waters.

Utilization of cuttlebone by aquafarmers at Visakhapatnam

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Cephalopods represent an important group of molluscs and form an important component of the exploited marine fishery resources of the state. Cephalopods include squids, cuttlefishes and octopuses.

Cuttlefish (family Sepiidae), along with *Nautilus* spp. (Nautilidae) and *Spirula spirula* (Spirulidae), are the only extant cephalopods with a chambered, gas filled shell that provides skeletal support and acts as a buoyancy regulation device and is composed primarily of aragonite (Denton, 1974). Visakhapatnam is the major fishing harbour where cuttlefish is brought from different landing centres and transported for export. The annual average landings of cuttlefish during 2008-2012 at Visakhapatnam ranged from 632 t to 1853 t. Their

fishery at Visakhapatnam is contributed chiefly by *Sepia pharaonis* and *S. aculeate* with small amounts of *Sepiella inermis*. They are mainly exploited by mechanized trawlers. *S. pharaonis* and *S. aculeata* are the two major species of cuttlefish landed. They are locally called 'Kandavalu' and support a regular fishery. Samples of *S. aculeata* and *S. pharaonis* were collected during June to December, 2012 to estimate the amount of cuttlebones generated (Fig. 2).The weight range of *S. aculeata* was 98-634 g with cuttlebone weight in the range of 4-47 g. Similarly in *S. pharaonis* the weights were in the range of 127-1057 g and range of cuttlebone weight being 4-59 g. In *S. aculeata* cuttlebones constituted 6% of the body weight and in *S. pharaonis* 5.5% of the total body weight. The amount of cuttlebone removed from a ton of cuttlefish was about 58 kg and constitutes about 5.8% of the body weight. The present report emphasizes on utilizing the huge resource of cuttle bone in a better way rather than it getting wasated.

Fig. 1. Cuttlefish landings at Visakhapatnam fishing harbour

Fig. 2. Cuttlebones removed from cuttlefish

Fig. 3. Cuttlebone observed

The cuttle bone collected near the fishing harbour is commonly used by school children as a duster for cleaning chalk dust from slates, at Visakhapatnam. Cuttlebone is used in making polishing powder, added to toothpaste, and are used as an antacid or as an adsorbent. As cuttlebone is able to withstand high temperatures and is easily carved, it serves as mold-making material for small metal casting for the creation of jewellery and small sculptural objects. Recently they are commonly used as feed additive for caged birds, chinchillas and reptiles. Cuttlebones are put in the domesticated birds' cage at Zoological parks to promote beak and jaw exercise for wearing down of overgrown beaks.

Cuttlefish bones can be used as decorative materials in fish aquariums. In large fish aquariums (freshwater and marine), cuttlebones can be released for periphyton settlements which in turn will provide detritus and plankton to the aquarium fish. In mariculture, large sized cuttlebones can be used as natural scrubs to rub and clean the biofouling organisms settled over the cultured pearl oysters in hatcheries, pens and cages. In open sea cage culture of marine fin fishes cuttlebones can be tied in nets into small packets and hanged inside at different places for settlements of diatoms and other periphytic organisms. Cuttlebones can also be used as a dietary supplement for hermit crabs thus increasing its functional utility. Bioactive compounds like polysaccharides isolated from the cuttlebone of *S. aculeata* and *S. brevimana* has both antibacterial and antifungal activity (Shanmungam *et al.*, 2008).

Large sized moustached Thryssa, *Thryssa mystax* (Bloch & Schneider, 1801) recorded from Cochin coast in Kerala

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Two large sized specimens of *Thryssa mystax* (Family: Engraulidae) were caught in *Chooda valai* and landed at Chellanam fish landing centre on 20th July 2013. The specimens measured 24.8 cm (Fig. 1) and 24 cm in total length and weighed 100 g and 80 g respectively. These sizes of this species are recorded for the first time in the world. The morphometric measurements of the specimens are given in Table 1.

Fig. 1. *Thryssa mystax*

Table 1. Morphometric measurements (in mm) of *Thryssa mystax*

Morphometric characters	Specimen 1	Specimen 2
Total length	248	240
Fork length	224	217
Standard length	208	202
Pre anal length	114	108
Pre dorsal length	102	89
Pre pectoral length	38	35
Body depth	56	53
Head length	38	37
Eye diameter	9	7
Pre orbital length	6	6

Generally small sized individuals of the species are landed. The normal size range of *T. mystax* is 8-16 cm. According to FishBase, the maximum standard length recorded is 15.5 cm, whereas the present specimens have standard lengths of 20.8 cm and 20.2 cm. The images given in the FishBase shows that the maximum recorded total length of the species is 21 cm in the photo uploaded on 26.02.2013 from Karachi, Pakistan. The total lengths of the present specimens are 24.8 cm and 24 cm which are much higher than that specimen also.

Unprecedented landing of spine tail devil ray *Mobula japanica* (Muller & Henle, 1841) at Tharuvaikulam, Tuticorin

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The spine tail devil ray *Mobula japanica* (Muller & Henle, 1841) is a large zooplanktivorous ray circum-globally distributed within tropical to warm temperate waters. This species belong to the family Mobulidae. In the genus *Mobula*, the mouth is located ventrally and is currently represented by nine recognised species. The species *M. japanica* has a broad disc and very long tail with a caudal spine. Tail is ventrally flattened near the base of dorsal fin and is covered in distinct rows of tiny white tubercles

along either side. The colour is dark blue dorsally and white ventrally. The dorsal fin is white tipped.

Normally the surface drift gillnet units that target tuna and seer fishes land one or two devil rays at Tharuvaikulam landing centre. But on 13.9.2013, 10 numbers of *M. japanica* was landed by a drift gillnet unit and all of them were caught in the same haul (Fig.1). These were caught off Kanyakumari at a depth of 150 m. Its disc width ranged from 234-108 cm. The stomachs were empty containing only fluids. Among these, one female (234 cm DW) contained a fully developed young one with its tail completely protruded out indicating the impending release of the young one. The young one had its pectoral fin fully folded giving a cylindrical shape when it was inside the oviduct of mother. The young one was a male pup (Fig. 2) with a disc width of 110 cm. The width of the mouth was 10 cm and width between horns was 11 cm. The total weight of the pup was 10.35 kg.

Fig. 1. A view of the catch of *M. japanica* at the Tharuvaikulam landing centre

The reproductive mode within this family is aplacental viviparity and the species possesses only a single functional ovary. Embryos obtain nutrients initially by yolk, then through absorption of enriched uterine fluid from the mother. Size at birth ranges between 70 and 85 cm DW (White*et al.*, 2006; *Mobula japanica*. In: IUCN 2013). The fact that the present catch contained a fish with 108 cm DW and the size of the pup yet to be released was 110 cm DW indicates a possible spatial difference in the size at birth as well as size at maturity.

Fig. 2. Dorsal view of the pup after unfolding its fin

M. japanica, *M. tarapacana* and *M. thurstoni* are all considered vulnerable in Southeast Asia where catches and demand are increasing (White *et al*. 2005, Clark *et al*. 2005). The high value of gill rakers in some countries is driving a dramatic increase in the catch of mobulids in Indonesia where devil rays are now targeted. In India, though there is no target fishing, it forms a by-catch fishery. Here also, the gillrakers of mobulid rays are in demand as an export item and its flesh is used for local consumption. From Tuticorin, the flesh is transported to Kerala. The species appear to be particularly susceptible to overfishing as their fecundity is among the lowest of all elasmobranchs with a single pup and the gestation period is nearly one year.

A note on the ocean sunfish, *Mola mola* (Linnaeus, 1758) landed at Karwar, west coast of India

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On 27th August 2013, an ocean sunfish (*Mola mola*) commonly known as mola was landed at Karwar fisheries harbour. The fish was caught in purseseine operated in the coastal waters at around 40 m depth. Specimen (total weight: 50 kg; total length 95 cm) was grey in colour, covered with

extremely thick, elastic skin (Fig.1). Also, extensive subcutaneous fat deposits were noted throughout the body. The mouth was small and teeth were fused to form a parrot-like beak. There were four pairs of gills with a slit behind the last gill. The intestines were coiled (Fig.2) with semi-digested matter. The morphometric measurement of the specimen is listed in Table 1. The *Mola* genus belongs to Molidae family. This family comprises three genera: *Masturus*, *Mola* and *Ranzania*. Molas have a very broad global distribution, occurring in both temperate and tropical waters of the Atlantic, Indian, and Pacific Oceans. They are pelagic and swim at depths of up to 600 m. The extensive fat deposits under the skin observed in the present case would probably help the fish to resist extreme cold temperature of the water in its habitat. Not many reports are available on biology, food and feeding of these fishes. Earlier, landings of oceanic sun fish (*Mola mola*) at Visakhapatnam in the east coast, Bombay, Veraval and Malpe in Karnataka in west coast have been reported.

Fig. 1. Ocean sunfish, *Mola mola*

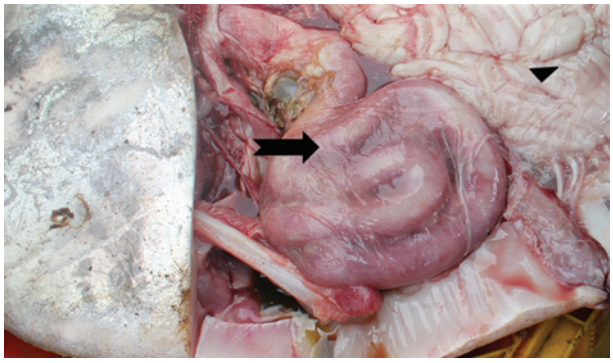

Fig. 2. Coiled intestine (arrow) and extensive fat deposits (arrow head) in *Mola mola*

Table 1. Morphometric measurements (in mm) of *Mola mola* caught at Karwar

Total length	950
Standard (preclaval) length	780
Height of the body	670
Length of dorsal fin	500
Pectoral fin length	140
Length of anal fin	480
Eye diameter horizontal	50
Eye diameter Vertical	45
Pectoral fin base breadth	65
Dorsal fin base breadth	220
Anal fin base breadth	230

Mud bank formation in Kerala during the south-west monsoon of 2013

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Mud bank formation was observed during the south-west monsoon season of 2013 along the Kerala coast. As in earlier years the locations of mud bank formation were similar to the areas of past. The effect of the mud bank formation was pronounced in the popular 'chakara fishery' in Alappuzha, Thrissur and Malappuram districts. Though this was an active traditional fishery being operated in these areas, the mud bank fishery is available only during the trawl ban. But the pattern of fishing was different in different

regions. The major species reported were *M.dobsoni*, *Sardinella longiceps* (egg bearing), *Stolephorous spp.*, *Johnius* spp., *Otolithes* spp.(small sized), *Hilsa kelee*, *Escualosa thoracata*, *P.indicus* (medium to large sized), *Leiognathus spp.*, *Lactarius lactarius*, *Trichiurus lepturus* and *Opisthopterus tardoore*.

Alappuzha District

Mud bank was observed at a 4 km stretch from 23rd June till August end with few breaks in between in the Thykal and Punnapra region. The crafts/ gears operated in this region were of the following specification.

Fig. 1 *M.dobsoni* (Poovalan chemmeen) landings at Thykal, Alapuzha District

Fig. 2. Bhajanamadom landings

Thrissur and Malappuram Districts

In Malappuram district mud bank fishery was significant at Ponnani region from June 17th to July end. Notable mud bank formation and 'chakara' fishery was observed in Bhajanamadom, Panchavadi, Chettuva and Blangad region of Thrissur district from June 19, 2013 onwards and remained till July 12, 2013.

Fig. 3. Chettuva mini harbour with *M.dobsoni*

In mini trawl operation carried out in Thrissur and Malappuram districts fishes of following sizes were observed:

Species	Size range
Trichiurus lepturus	120-140 mm
Leiognathus spp	10-16 mm
A.chacunda	10-14 mm
Lactarius lactarius	25-34 mm
O.tardoore	20-30 mm

Table 1. List of crafts / gears operated in Alappuzha District

Fishing vessel	Fishing vessel LOA	Gear Specification	No. of fishermen in a vessel	No of vessels in operation	Fishing duration (hours)	Fishing depth (m)
Out board Mini Ring Seine (25-50 hp Indian engine)	10-15 m	8-10 mm, (Chooda/ disco vala)	12-15	500	3-5	10-20
Non mechanized Gill netter (ponthu vallam)	2-3 m Thermocol built	26-36 mm (Dinghi vala)	1	700	2-3	2-8
Out board gill netter	7-9 m fibre built	28-32 mm Chala vala	5-6	100	5	10-20
Inboard ring seine	20-24 m steel, plank and fibre	20 mm	30-36	20	6-8	20-40

The crafts/ gears operated in this region are given in table 2.

Table 2. Crafts / gears in operation in Thrissur / Malappram Districts

Fishing vessel	Fishing vessel LOA	Gear Specification	No. of fishermen in a vessel	No of vessels in operation	Fishing duration (hours)	Fishing depth (m)
Non Mechanised Gill Netter	6-7 m plank built	Malaan Vala (28-30 mm); Loop vala (30-32 mm); Aiyla vala (50-58 mm and 52-54 mm)]	2	50	2-3	3-5
Inboard Mechanised Ring Seine(90/120 hp Indian engine and Chinese engine of 280/ 360/ 407 hp)	20-24 m Plank, fibre and steel built	18-20 mm mesh Thangu vala	38-48	Approximately 100 including those vessels who operated from outside this region during mud bank	6-10	10-14
Out Board Ring seine(19.8–40 hp Indian engine)	10-17 m plank built with a few fibre vessels	8-10 mm mesh Chooda vala	10-18	Approximately 150 numbers	5-6	8-10
Out Board Gill Netter(9.9 hp Indian engine)	8-9 m fibre as well as plank (muri vallom)	Malaan Vala (28-30 mm); Loop vala (30-32 mm); Aiyla vala (50-58 and 52-54 mm) Chala vala (28-30 mm	4	45	4	8-10
Out Board Trawl Net (Double net, Pothan vala) (9.9 hp Indian Engine)	stone used instead of otter board (muri vallom)	Cod end mesh of 10-12 mm and other areas of net mesh ranges from 18-22, 30-32 and 34 mm	6	100	3-5	2-6

Table 3. The estimated landing from mud bank fishery

Species	Alappuzha	Thrissur	Malappuram	total
S. longiceps	1825	1070	3482	6377
S. fimbriata	103	0	0	103
Stolephorus spp	1478	38	562	2079
H. kelee	0	6	0	6
S. macrops	286	0	96	382
Thryssa spp	126	22	7	155
A. chacunda	3	5	1	9
D. acuta	0	0	50	50
E. thoracata (=k.coval)	132	19	281	432
Hemirhamphus spp	0	0	8	8

R. russeliana	0	3	0	3
Opisthopterus spp	0	23	0	23
O. tardoore	4	0	0	4
Ambassis spp	100	40	19	159
Gerres spp	0	0	1	1
Johnieops spp	48	19	38	105
Otolithes spp	15	1	11	28
Trichiurus spp	0	2	3	4
Decapterus spp	47	0	0	48
Caranx spp	65	0	0	65
Leiognathus spp	24	31	26	81
L. bindus	1	0	0	1
Lactarius	4	9	90	102
P. argenteus	5	0	1	6
R. kanagurta	148	1	118	267
S. commerson	7	0	0	7
M. dobsoni	742	753	310	1804
M. monoceros	0	27	0	27
P. stylifera	0	16	0	16
P. indicus	73	11	14	98
P. monodon	0	1	0	0
P. pelagicus	0	2	0	3
P. sanguinolentus	4	2	0	6
T. vagina	0	5	0	5
Total	5240	2106	5118	12464

Market structure analysis of fish markets in Ramanathapuram district of Tamil Nadu

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Capture Fisheries is one of the major occupations and income provider for the people of the Ramanathapuram district. The district has 237 km coastline and covers almost 22% of the state fisher population. The district leads in marine fish production in the state and contributes for more than 20% of the fish landings in the state. The Marine fisheries profile of the Ramanathapuram district is given in Table 1.

Table 1. Marine fisheries profile of the Ramanathapuram district

Total coastline	237 km
No of fishermen villages	178
Fisher population	1,93,413
No. of fishermen families	41,048
No. of Mechanized boat	4,790
No. of Motorized boat	372
No. of non-motorized boat	1926
Fish production (2011-12)	87,508 t

There are nearly 35 markets in Ramanathapuram district, out of which nine are large, seven are medium and remaining are small (Table 2).

Table 2. Fish markets in Ramanthapuram district of Tamil Nadu

Market (Large)	Market (Medium)
Rameswaram	Thangachimadam
Ramanathapuram	Uchipulli
Erwadi	Periyapattinam
Keezhakkarai	Valinokam
Paramakuddi	Kannirajapuram
Devipattinam	Mudukulathur
Thondi	Sikkal
Pamban	
Mandapam	

Market Structure

A market is a set of buyers & sellers, commonly referred to as agents, who through their interaction both real and potential determine the price of a good, or a set of goods. The concept of a market structure is understood as those characteristics of a market that influence the behaviour and results of the firms working in that market. Among the 3 markets, the distance from the landingcentre of the Paranakudi market is more. Among the nine larger markets in Ramanathapuram district, Rameswaram, Ramanathapuram and Paramakudi markets were selected for the market structure analysis (Fig 1). Data collection was done through interview method and the results are given.

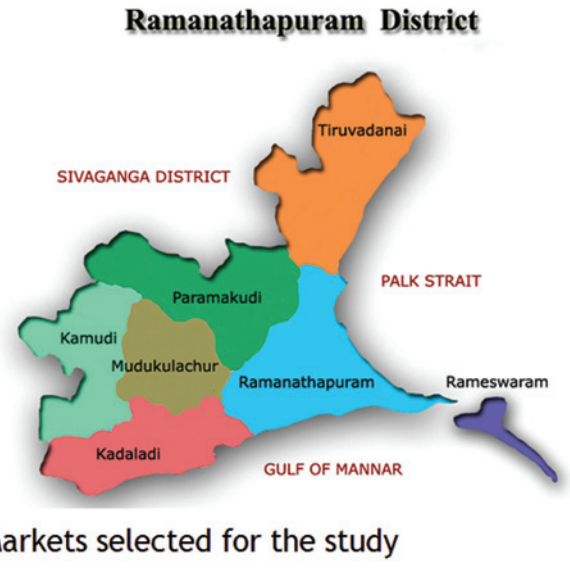

Fig. 1. Map showing the study area

Market Structure Analysis

The market structure analysis was studied based on the dimensions namely; market access, timing, conduct, arrival and disposal sources, market union and regulation. The results are presented in the Table 3.

The nearest major landing centre for the three markets is Rameswaram. The distance from the landing centre to the nearest railway and bus station for all the three markets are almost 2-3 km. The nearest airport and seaport for the three markets is Madurai and Tuticorin.

The distance from Rameswaram market to the airport and seaport is more compared to other markets. As the distance from the market to the landing centre, railway and bus stop in very less there is very good market access and transportation of fishes from one place to another takes place easily.

As the registered marketers were controlled by the local bodies, the entry fees are collected every day for operating in the market. Due to the entry fee, packing, icing, loading, unloading and transportation cost, the market price for a marine fish species is high in Paramakudi and Ramanathapuram market compared to the Rameswaram market.

The market arrival and disposal of marine fish species in terms of variety and quantity is more in Rameswaram market compared to the other two markets, because the market is closer to the landing centre. Nearly 20 to 30 marine fish species is marketed in Rameswaram market. But in Paramakudi and Ramanathapuram retail markets around 15 marine fish species are only marketed. The major marine fishes marketed were Thumbprint Emperor (*Villai meen*), Shrimp Scad (*Parai*), Crab (*Nandu*), Great Barracuda (*Ooli*), Seer Fish (*Seela*), Goat Fish (*Nagara*), Mullet (*Madava*), Sardine (*Sooda/Thondan*), Hound Needle Fish (*Mural*), Dorab Wolf Herring (*Mullu valai*), Needle Cuttle Fish (*Ottukanvai*), Lesser Tiger Tooth Croaker (*Panna*), Pick Handle Barracuda (*Kara ooli*), Silver Sillago (*Kilangan*), Giant Cat Fish (*Keluthi)*, Large Tooth Flounder (*Nakku meen*), Indian Mackerel (*Kumla*), Spiny Cheek Grouper (*Kalava*) and Shrimp (*eral*).

Constraint analysis of the different markets

The constraint analysis of the different markets was based on the opinion of the different marketing functionaries in the markets is given in Table 4.

Table3 Market Structure Analysis of Rameswaram, Paramakudi and Ramanathapuram fish markets

Market dimension	Rameswaram	Ramanathapuram	Paramakudi
A. Background information			
Year of establishment	1953	2004	1979
Type of Market	Retail	Retail	Retail
Lat/Long position	9°28' N/79°30' E	9°54' N/78°59' E	9°38' N/78°83' E
Market control	Local bodies	Local bodies	Local bodies
B. Market access			
Nearest landing centre	Rameswaram (2 km)	Rameswaram (95 km)	Rameswaram (58 km)
Nearest railway station	Rameswaram (3 km)	Paramakudi (3 km)	Ramanathapuram (3 km)
Nearest bus station	Rameswaram (3 km)	Paramakudi (2 km)	Ramanathapuram (2 km)
Nearest airport	Madurai (185 km)	Madurai (90 km)	Madurai (127 km)
Nearest seaport	Tuticorin (187 km)	Tuticorin (128 km)	Tuticorin (129 km)
C. Market timing	6 am to 4 pm	4 am to 4 pm	4 am to 5 pm
D. Market conduct structure			
Number of registered marketers	21	36	38
Entry fee for operation in market	₹ 10 per day	₹ 30 per day	₹ 30 per box and 8% of total sale
E. Market arrivals and Disposals			
Varieties traded	Thumbprint Emperor, Shrimp Scad, Crab, Great Barracuda, Seer Fish, Goat Fish, Mullet, White Sardine, Hound Needle Fish, Dorab Wolf Herring, Needle Cuttle Fish, Lesser Tiger Tooth Croaker, Pick Handle Barracuda, Silver Sillago, Giant Cat Fish, Large Tooth Flounder, Indian Mackerel, Rainbow Sardine, Spiny Cheek Grouper, Shrimp	Thumbprint Emperor, Shrimp Scad, Crab, Great Barracuda, Seer Fish, Goat Fish, Mullet, White Sardine, Hound Needle Fish, Dorab Wolf Herring, Needle Cuttle Fish, Lesser Tiger Tooth Croaker, Shrimp	Thumbprint Emperor, Shrimp Scad, Crab, Great Barracuda, Seer Fish, Goat Fish, Gold Spot Mullet, White Sardine, Hound Needle Fish, Dorab Wolf Herring, Needle Cuttle Fish, Lesser Tiger Tooth Croaker, Silver Sillago, Giant Cat Fish, Indian Mackerel, Shrimp
F. Market union			
Name of the union	Township Market	Sri Sakthi Fishing Market Development	Town Fish Market
Number of members	21	36	38

Table 4. Problems/ Constraints faced

Particulars	**Rank**
High marketing cost	I
Lack of infrastructure and amenities	IV
Lack of access facilities	V
High transportation cost	II
Cut-throat competition among traders	VI
Price Discrimination	III

The major constraints faced by the marketers were high marketing and transportation cost followed by price discrimination and lack of infrastructure and amenities. Even though the market is controlled by the local bodies, they are not properly maintained. The infrastructure facilities like parking area, freezer, icing and drying is almost lacking in all the three markets.

Rare landing of Indian mottled eel, *Anguilla bengalensis* (Gray, 1831) from coastal waters of Karwar

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A large sized freshwater eel, locally called 'hemmalaga' in Kannada and 'kadai' in Konkani was landed by shore-seine (Yendi) on 26-07-2013 at Aligadda landing centre in Karwar. The fish was caught live and was observed to be very active. The specimen was identified as Indian mottled eel, *Anguilla bengalensis* (Gray, 1831) of family *Anguillidae*. The specimen was an adult female with a total length of 142 cm and weight of 6.82 kg. Other morphometric measurements recorded were as follows: The dorsal fin length (96 cm), anal fin length (78.5 cm), pectoral fin length (11.5 cm), girth (32.5 cm), head length (29 cm) and head width (18 cm). The specimen appears to be the largest record of *Anguilla bengalensis* caught in the Indian coastal waters. The maximum reported length and weight of this species published in FishBase' is 200 cm and 6 kg. A total length of 120 cm for this species is reported by Menon *et al* (1998). Although the length of the present specimen is only 142 cm the weight seems to be the maximum reported so far.

Fig. 1. The rare large size Indian mottled eel, *Anguilla bengalensis bengalensis* (Gray, 1831) landed at Aligadda beach, Karwar in shore seine

During the week prior to the capture of the eel there was incessant rain in Karwar and in the upper reaches of river Kali. On the previous day the crest gates of Kadra dam was opened and there was a massive influx of fresh water into the Bay. Hence it is assumed that this *Anguilla* species which normally breed in sea while elvers migrate upstream into the freshwater areas of the river for their growth phase came to the sea for breeding. The fish was purchased by the local dealers for selling it in the interior markets where good demand exists for it. The fish which was earlier observed in the monsoon fishery nowadays have disappeared and the reason was attributed to the poor monsoon and damming of the river.

Occurrence of grooved razor fish *Centriscus scutatus* Linnaeus, 1758 from Kasimedu Fishing Harbour, Chennai

Sethi, S.N.and Rudramurthy, N.
Madras Research Centre of CMFRI, Chennai

On regular weekly observation at Chennai Fishing Harbour, during the month of July 2013, occurrence of grooved razor fish, *Centriscus scutatus* (50 kg) locally called as "Razar meen" belonging to Centricidae family of the order Syngnathiformes landed by trawl was recorded. This species is widely distributed in coral reefs and inshore habitats throughout the tropical Indo-Pacific. The species has been first reported in India from the Gulf of Mannar, during 1975 and from Lakshadweep Islands, Kerala and Visakhapatnam during 2012. It inhabits sandy or muddy floors of

shallow inlet waters. Usually they are observed in large schools among branching corals, seawhip gardens and black coral bushes to about 15-20 m depth.

Description: This species is characterized by a sharp-edged belly and shrimp-like appearance. It has a straight, sleek, razor-like body with three dorsal spines, one long sharp spine displaced at the rear end of the body and two shorter spines, rest of the dorsal fin and the caudal fin present at the ventral side of the fish. The snout is long and narrow, and the small mouth at the end has no teeth. Lateral line is dusky, continuous and has no interruption. Eight silvery crossbars were observed on the ventral plates (Fig.1).

Fig. 1. Grooved razor fish, *C. scutatus* from Kasimedu Fishing Harbour, Chennai

This fish is remarkable for its strange body shape and swimming habits. Unlike other fishes, they swim vertically and in a synchronized manner with snout pointing downwards. Razor fishes are not used as table fish but usually processed for fishmeal production and also live fishes are collected by aquarium hobbyists.

On the occurrence of swordtip squid, *Loligo edulis* Hoyle, 1885 in trawl catches off Tamil Nadu

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A new entrant of squid species, *Loligo edulis* Hoyle, 1885 commonly known as 'swordtip squid', was observed in the trawl catches at Kasimedu Fishing Harbour, and Karaikal Fishing Harbour, Karaikal, Tamil Nadu on 27.08.2013. The species is distributed along the Western Pacific, Northern Australia, Philippine Islands and northern South China Sea to central Japan. The occurrence of *Loligo edulis* is reported for the first time from the north-east coast of India during July 2013. At Sassoon Docks (new jetty), Mumbai, north-west coast heavy landing of *L. edulis* was observed on 18th February 2011.

Species Description

Fins large, rhombic with the anterior margin slightly convex, the posterior margin gently concave, and the lateral angles rounded. Fins become slightly longer than wide in adult specimens (up to 70% of mantle length), the mantle is moderately stout to elongate and mature males may be more slender (Okutani *et al.*, 1987) than female. Arms are moderately long forming about 25- 45% of mantle length (Fig.1 & 2). The arm formula is variable- 3.4.2.1 or 4.3.2.1. Tentacular clubs are

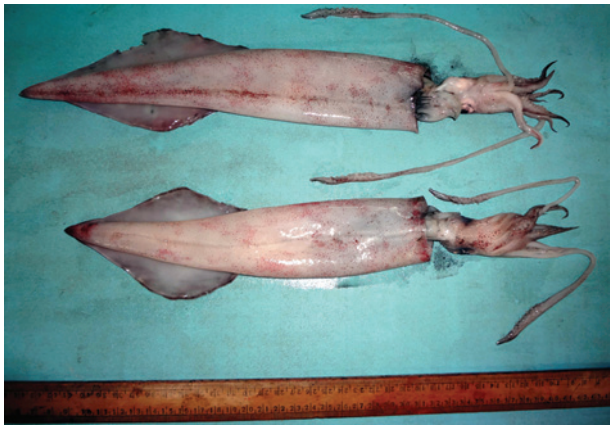

Fig. 1. *L. edulis* collected from Kasimedu Landing Centre, and Karaikal Fishing Harbour, Tamil Nadu

Fig. 2. Arm III suckers ring teeth's of *L. edulis*: More than 6-8 long slender square-cut teeth on the distal margin, Proximal margin smooth without teeth's

expanded with 30 to 40 sharp conical teeth. The gladius is long and moderately narrow. Arm III suckers: More than 6-8 long slender square-cut teeth on the distal margin, proximal margin smooth (Fig. 3). The average length and weight of the *L. edulis* varied from 178 ± 34.84 mm, 86.15 ± 35.56 g respectively (Table.1). There was a heavy landing of swordtip squid and also Indian squid, *L. duvauceli* along the Coromandal coast during July 2013.

Fig. 3. Landings of *L. edulis* at Karaikal Fishing Harbour, Tamil Nadu

Table 1. Morphometric measurement and maturity stages of *Loligo edulis* collected from Kasimedu Landing Centre, and Karaikal Fishing Harbour, Tamil Nadu.

Serial Number	Length (mm)	Weight (g)	Maturity Stages (Male/Female)
1	155	56	F4
2	180	63	M2
3	205	118	M2
4	235	115	M2
5	215	138	F4
6	220	156	M2
7	215	133	M2
8	200	84	M2
9	200	110	M2
10	210	106	M2
11	185	99	F2
12	155	69	F4
13	135	43	F4
14	140	50	M2
15	165	74	F4
16	145	57	F4
17	200	110	M2
18	130	36	F2
19	120	46	F4
20	150	60	F4
Mean ±SD	178 ± 34.84	86.15 ± 35.56	-

M=Male, F=Female

Sacred Chank, *Turbinella* (*Xancus*) *pyrum* trading at Karaikal Fishing Harbour, Tamil Nadu

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The Sacred Chank or 'Indian conch', *Turbinella pyrum* Linnaeus, is a large, thick-shelled gastropod abundant in the shallow waters of Palk Bay and the Gulf of Mannar, between India and Sri Lanka. *T. pyrum* is commercially exploited from the Gulf of Mannar, Palk Bay and Chennai (Fig.1 & 2). The chank are also caught entangled in small numbers in the indigenous boat seines locally called Naku Valai/ *vella valai,* operated from Gill-netter/Catamaran boats in shallow coastal areas of Tranquebar,

Fig. 1. Live Sacred Chank, *T. pyrum* from Karaikal Fishing Harbour, Tamil Nadu

Fig. 2. Sacred Chank, *T. pyrum* with operculum collected from Karaikal Fishing Harbour, Tamil Nadu

Pudupattinam, Sinnangudi, Kaveripatinam, Melamookkarai and TirumuUaivasal, of Tamil Nadu.

The shell is considered sacred in both the Hindu and Buddhist religions, where it is used as a ceremonial trumpet and as a libation vessel (*jhal shankha*). The rare 'valampuri' chanks are especially venerated; in these the shells are abnormally coiled anticlockwise. They are usually donated to temples by wealthy patrons, often richly ornamented with gold or silver.

Fishery

The Sacred Chank, *T. pyrum* from Karaikal Fishing Harbour, was fished by trawl net from a depth of 10-20 m. The price for single healthy chank varies from ₹ 500- ₹ 1000/-. Thirty numbers of live sacred chank was auctioned for ₹ 12,050/- and Fourty five numbers for ₹ 16, 500/- at the landing centre.

An overview of the marine fish landings in Andhra Pradesh during 2012

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Andhra Pradesh, with 974 km of coastline and continental shelf area forming 31,000 sq. km, is rich with many species of prawns, carangids, Perches, croakers and elasmobranchs. During 2012, the estimated marine fish landing of Andhra Pradesh was 3.04 lakh t.

The main gears operated during 2012 were trawl nets, driftnets/gillnets and seine nets. Their share towards the total landings in the state were trawl-net 55.9%, driftnet/ gillnet 14.6%, seine nets 13.1% and hooks and lines 3.6%. Nearly 88.5% of the trawl landings were through multi-day operations. About 96.7% of seines landings were by motorized ring seines and 96.9% of gillnet/ driftnet landings were by motorized gillnets. The overall catch per unit of multi-day trawl nets were 2,815 kg and that of single day trawlers were 434 kg. Percentage contribution of the major resources is summarized in Table 1.

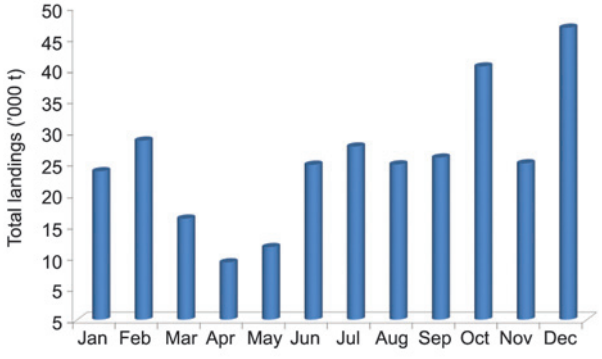
Table 1. Gearwise percentage contributioin of major resources

Resources/ gear	Mechanized		Motorized		Traditional
	TN	GN	RS	TN	
Carangids	62	11	10	1	10
Crabs	69	15	0	10	5
Croakers	61	13	5	6	14
Elasmobranchs	53	10	0	30	1
Goatfishes	87	3	2	0	7
Indian mackerel	38	22	31	0	10
Oil sardine	9	13	54	0	20
Other clupeids	42	20	14	2	22
Other sardines	9	16	27	0	48
Penaeid prawns	82	4	0	13	2
Perches	79	7	0	0	4
Pomfrets	64	25	3	6	2
Ribbon fishes	63	10	2	6	19
Seerfishes	14	33	20	1	16
Silverbellies	66	6	7	1	20
Stolephorus spp.	36	1	56	0	6

TN-trawl net, GN-gill net, RS-ring seine

Ring seine fishery in Andhra Pradesh was started from 2009. Based on the target group and mesh size, the ring seines along the Andhra Pradesh coast are classified into three groups, *viz.*, the large mesh targeting tuna and seer fish, medium mesh exploiting sardines, mackerel and carangid and small mesh targeting anchovies.

Ring seines in the motorized sector landed 602 kg/boat with a catch rate of 207 kg/h. Shore seines in the motorized sector landed 3,586 kg/boat with a catch rate of 897 kg/h. Nearly 52% of the total landings were by the mechanised sector followed by motorized sector 35% and the remaining 13% by the artisanal sector. Around 54% of the landings in Andhra Pradesh during 2012 were from the following six Fisheries harbours namely Visakhapatnam, Kakinada, Bairava Palem, Gilahalahandi, Nizampatnam and Vodarevu. Pelagic resources (54.6%) dominated the landings followed by demersal (28.6%), crustacean (13.4%), molluscan (1.4%) and others (2%). Monthly landings were the maximum during December 2012 with 46680 tonnes. June to December was the most productive season in Andhra Pradesh with more than 70% of the landings during this period. Fishing ban was implemented by the state fisheries department on mechanised fishing vessels and those fishing crafts fitted with outboard as well as inboard engines (motorized fishing boats) in the territorial waters along the entire coast of Andhra Pradesh for a period for 47 days from 15th April to 31st May 2012.



Month-wise marine fish landings in Andhra Pradesh during 2012

Table 2. Percentage landings of major resources in Andhra Pradesh during 2012

Name of the resource	1QR	2QR	3QR	4QR	2012
Elasmobranchs	2.6	4.7	2.6	5.0	3.8
Oil sardine	1.2	3.4	5.8	1.9	3.0
Other sardines	13.1	18.0	4.3	4.0	8.2
Stolephorus	2.8	10.4	2.4	1.4	3.3
Other clupeids	5.6	2.7	2.1	2.7	3.2
Perches	5.4	3.7	4.8	4.7	5.7
Goatfishes	2.7	1.9	2.7	2.3	4.7
Croakers	4.8	3.7	4.8	5.0	2.4
Ribbon fishes	3.5	3.4	6.9	11.1	7.2
Carangids	8.2	4.9	5.4	7.5	6.8
Silverbellies	2.4	2.7	3.1	2.0	2.5
Pomfrets	2.3	3.0	7.0	5.3	4.7
Mackerel	12.3	5.4	9.4	9.1	9.3
Seerfish	2.1	2.2	2.0	2.8	2.3
Penaeid prawns	7.6	9.0	11.5	10.2	9.8
Crabs	2.0	1.7	2.2	2.8	2.3
Others	21.3	19.3	23.1	22.2	21.8
Total landings	100	100	100	100	100

With 34% of the total production of the state, East Godavari ranked first in fish production followed by Visakhapatnam (29.7%), Srikakulam (8.5%), Prakasam (7.3%), Vijayanagaram (6.4%). The maximum contribution by mechanized trawl landings was from Visakhapatnam (42.9%) followed by East Godavari (42.3%).

The contribution by ring seine was the maximum from Vizianagaram (34.9%) followed by East Godavari (23.2%). Contribution by the motorized sector was the maximum from East Godavari followed by Prakasam. Contribution by the traditional sector was the maximum in Srikakulam (46.2%) followed by Visakhapatnam (22%).

In general, marine fish landings in Andhra Pradesh experienced an increase of about 30,000 tonnes during 2012 compared to 2011 landings. There was an increase in the landings by mechanised sector from 49% in 2011 to 52% in 2012. Trawl landings alone increased from 48% in 2011 to 56% in 2012. The state contributed 7.7% towards the total landings of main land in the country during 2012.

Coastal vulnerability to climate change: A pilot study in Cuddalore district of Tamil Nadu

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The impact of natural disasters like floods, cyclones and rising sea levels are evident in many coastal pockets of Tamil Nadu. A preliminary survey of the coastal districts in the state revealed that Cuddalore district has been the worst affected of all districts in the recent past, with the impact of tsunami in 2004, cyclone Thane in 2011 and cyclone Neelam in 2012, creating a detrimental impact on coastal communities and their activities, particularly fishing. This has in turn affected their livelihood to a great extent. In this context, a group of ten villages (Thazhanguda, Sonankuppam, Sothikuppam, Rasapettai, Chithiraipettai, Thammanampettai, Pettodai, Reddiarpettai, Samiyarpettai, Chinnur Pudupettai) based on climate change impact vulnerability indices, were selected (Fig. 1) and 100 households from each village were randomly interviewed under Integrated District Level and Sustainable Management (IDLAM) programme under the project on National Initiative on Climate Resilient Agriculture (NICRA).

Based on the response, it was observed that the direct impact relates to loss of employment due to destruction and damages of livelihood assets,

Fig. 1. Village map of Cuddalore district, Tamil Nadu

equipment and infrastructure. The indirect impact relates to employment loss due to disruption of supply of raw materials, goods, services and markets. Most active fishermen at sea and fishermen engaged in net mending, auctioning and marketing activities on the seashore, have suffered loss of life, health or property at some time or the other due to tidal waves. Maximum damage to fishing boats has been recorded in the case of catamaran, wooden and FRP boats, in that order. Widespread damage caused by recurrent cyclones has upset the economy of the fishing communities anchored in these villages. The loss and damages to boats, nets and fishing craft have made fishing impossible without rehabilitation for several fishing families. Households participating in fishing and related activities like fish processing and fish marketing have been severely affected. The workers in fishing industry were the worst hit as they belong to the below poverty line (BPL) categories. All the fishermen interviewed opined that cyclones have been the major causal factor for damage, while 68% ranked habitat destruction and 63% ranked sea level rise as the causal factors for immediate concern, next to cyclones. Pollution, ranked by 58% and high surface water temperature, ranked by 42% succeeded in the list of damage causal factors (Table 1 and Fig. 2).

Vulnerability Indices developed based on indicators and sub-indicators of climate change following the method given by Patnaik and Narayan (2005) revealed that Pettodai village was most vulnerable, followed by Reddiarpettai, Sothikuppam and Thammanampettai. The results tallied well with our observations during the pilot study. The extent of sea erosion and consequent loss of shallow fishing areas adjoining the coast (within a distance of 2 km) is very high in these villages (Plate 1), particularly Pettodai, where the fishermen do not have docking space for their country craft.

Table 1. Fishermen perception on climate change (Intensity ranking) causal factors

Climate change causal factors	Fishermen perception on climate change (Intensity ranking)				
	Negligible (0)	Low (1)	Medium (2)	High (3)	Very high (4)
Industrialization	33	0	0	30	37
Farming systems	54	30	16	0	0
Habitat destruction	0	14	18	68	0
Urbanization	33	14	32	21	0
Transportation	33	14	33	19	0
Pollution	0	0	2	58	40
Wind	33	0	14	37	16
Ocean currents	0	0	21	54	25
Land slides	2	23	16	19	40
Temperature	33	0	0	25	42
Sea level rise	0	0	0	37	63
Cyclone	0	0	0	0	100

Plate 1. Glimpses of sea erosion and weather conditions in coastal villages in Cuddalore district of Tamil Nadu

Finless porpoise *Neophocaena phocaenoides* incidentally caught off Mangalore, Karnataka

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An Indo-Pacific finless porpoise *Neophocaena phocaenoides* (G. Cuvier, 1829) was incidentally caught off Mangalore and landed at Bunder harbor on 1.10.13 (Fig. 1). The fishermen refused to identify the boat which caught the porpoise as they were well aware of the ban. In Mangalore, a large number of *N. phocaenoides* were earlier reported by researchers as being caught by purse seines. These porpoises are susceptible to bycatch in fishing gear, habitat degradation and are vulnerable to human activities. The morphometric measurements of the male porpoise is given in Table 1.

Fig. 1. Dorsal view of the finless porpoise *Neophocaena phocaenoide*

Table 1. Morphometric measurements of Indo-Pacific finless porpoise *N. phocaenoides*

Body Characters/sex	Male (cm)
Straight length (Tip of upper jaw to deepest part of caudal fluke notch)	134
Tip of upper jaw to anterior insertion of flipper (right)	24.8
Tip of upper jaw to anterior insertion of flipper (left)	24.8
Tip of upper jaw to centre of eye (right)	6.8
Length of eye	0.9
Width of eye	0.6
Tip of upper jaw to starting of tubercules on the dorsal surface	24
Starting of tubercules to the ending on dorsal ridge	72
Tip of upper jaw to blow hole	12.5
Tip of upper jaw to anterior edge of blow hole	11.5
Blow hole length	2
Blow hole width	1.3
Tip of upper jaw to centre of umbilicus	61
Length of flipper- tip to anterior insertion (left)	27.5
Length of flipper- tip to axilla (left)	21.5
Flipper width	9.5
Tip of upper jaw to centre of anus	94.5
Girth at eye	49
Girth at anus	52.5
Girth at axilla	68
Fluke span	38
Fluke depth of notch	1.8
Fluke width	12.5
Tip of upper jaw to centre of umbilicus	66
Length of genital slit	11
Fluke depth of notch	1.2
Teeth count (in numbers)	
Upper jaw (right)	16
Upper jaw(left)	18
Lower jaw (right)	16
Lower jaw (left)	17
Weight (kg)	28

Baleen whale stranding in Sasihitlu beach of Karnataka

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A baleen whale was found stranded (N 13°03.643', E 74°46.737') on 13.9.13 in the Sasihitlu beach of Karnataka (Fig.1). Ceteaceans are split between two main groups - Odontoceti (toothed whales) and Mysticeti (baleen whales). Different groups of marine mammals have different feeding ecologies. Mysticetes (baleen whales) feed on shoaling fishes and small invertebrates. Baleen whales are batch feeders, taking in large amount of prey and filtering them from the waters. They take huge quantity of water with the aid of their expandable throat. The throat region was visible in the decomposed mammal. The causes of marine mammal stranding are not always known, but single stranding usually involve an animal that is sick or injured and too weak to swim against the currents and other forces that bring it towards the shore.

Fig. 1. Baleen whale stranding in Sasihitlu beach

The baleen whales, reported earlier by other researchers from the Arabian Sea are the Blue whales (*Balaenoptera musculus*), Bryde's whales (*B. edeni*), Minke whales (*B. acutorostrata*), Fin whales (*B. physalus*) and Humpback whales (*Megaptera novaengliae*). Enquires with the fishermen revealed that the whale was found dead floating in the sea off Mangalore three days before with a deep cut on the belly. As the sea was rough and the current direction towards north, the whale stranded in the beach. The

whale was in a highly decomposed condition and partly buried in the beach due to the change in tide. The flipper length of the whale was 90 cm (Fig. 2) and median ridge length from rostrum tip was 190 cm. The length of the mammal with the flukes missing was 5.8 m. Some of the missing portion was seen scattered in the beach (Fig.3). The people where attempting to bury it with the help of local administration.

Fig. 2. Flipper and visible ventral throat groves

Fig. 3. Scattered tail stock region

F. V. Silver Pompano: The New Fishing Vessel of CMFRI, Kochi

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The world's Oceans are affected by climate change with likely impacts on ocean currents and winds, precipitation *etc*. Sea Surface Temperature (SST) has been increased by 0.2 to 0.3 ^{0}C along the Indian coast during the last 45 years. Global warming and consequent changes in climate patterns will have strong impact on fisheries with serious consequences on food and livelihood security of considerable section of the coastal population. Climate change is likely to play a key role in the distribution, abundance and phenology of marine and freshwater fishes and assessing the impact is vital for developing strategies for climate change mitigation. Nevertheless, there exits opportunities to reduce the vulnerability of Indian marine fisheries to climate change by way of projections on fish distribution, abundance *etc*. and thereby planning better management adaptations.

National Initiative on Climate Resilient Agriculture (NICRA) Project was initiated by ICAR as a major research programme on climate change to enhance the resilience of Indian agriculture, covering crops, livestock and fisheries to climatic variability and climate change. The project was initiated with an outlay of 350 crores in the XI plan and continues in the XII plan. Central Marine Fisheries Research Institute (CMFRI) is one of the major institutes in the strategic research component in the project and is the nodal agency to carry out climate related impact studies on Indian marine fisheries. Warming of waters and sea level rise may severely impact the fishery comprising both the resource and its tappers. Therefore, it is pertinent to study and evaluate the shift in spawning season, strength and recruitment into fisheries, determine quantitative and qualitative food availability, especially to the spawners and juveniles and find relationships between climatic and oceanographic variables on distribution, spawning and food availability of Indian marine fishes.

As part of the project, CMFRI has procured a 19.75 m OAL fisheries research vessel *F.V. Silver Pompano* (Fig.1) for carrying out fisheries related research in the territorial waters. The vessel shall be used for trawl fishing - both bottom and mid-water trawling using Issac-Kid Mid-water Trawl system and collection of oceanographic parameters and marine biotic and abiotic samples from the sea

Fig.1. Inauguration of the vessel by Dr. B. Meenakumari, DDG (Fy), ICAR

Fig. 2. Handing over of documents of CMFRI

towards climate change related studies. The vessel is equipped with underwater CTD sampler, Doppler current meter, instruments for chlorophyll measurements, zooplankton, TSS and sediment sampling. The vessel has a laboratory for preliminary analysis and to fix the samples for further analysis. The laboratory will be further equipped with modern instruments and highly sensitive microscopes for fishery and oceanographic research. An automatic weather station is available to collect the atmospheric parameters like rainfall, humidity etc.

Principal Dimensions of *F.V. Silver Pompano*	
Length Over All	19.75 m
Breadth (mxm)	5.50-6.0 m
Depth	2.80 m
Draft (mxm)	2.00 m
Free running speed	10 knots
Endurance	10 days/100 nautical miles
Scientists	Two
Crew	8
Classification	IRS SUL "Fishing vessel" IY
Type of fishing	Trawling

Facilities and Equipments

The vessel is fitted with four stroke Volvo Penta make 500 HP @1800 RPM marine engine. The main deck of the vessel contains cabins for scientists and crew, laboratory, weather station, galley, mess and toilet. Hydraulically operated trawl winch having 1000 m long 12 mm diameter steel wire rope on each drum and a speed of 0 to 40 m/minute and hydraulic power taken from main engine. Hydraulically operated CTD winch on the port and starboard side for operation of CTD probe is provided. Water samplers and other small items can be lowered through the Port and Starboard davits.

Life Saving Appliances (LSA) like Life rafts, Life buoys with self-ignition light and life line and life jackets are also installed in the vessel. A portable freezer of 400 L capacity is also installed for fish storage. The weather station is well equipped with basic amenities and space for Niskin water samplers, CTD probe, Van-veen grab and plankton nets are provided. Mandatory requirements for firefighting as per the safety standards like, fire extinguishers, fire hoses *etc*. are installed. One diesel generator for operation of hydraulic equipment, navigation light, air conditioners, light and other supplies and a separate generator for emergency purpose are also provided.

Nautical, Radio and fish finding equipment

Radio, nautical equipment (area operation A3), VHF, echo sounder cum SONAR (Fishing), magnetic compass, AIS A type, GPS, radar 90 miles rudder angle indicators approved by DG shipping are fitted in the vessel.

The vessel was formally handed over to Dr. G. Syda Rao, Director, CMFRI by Shri. Vivek sail, DGM, GSL limited on 24th July in a function arranged at Cochin in the presence of Dr. B. Meenakumari, DDG Fisheries, ICAR, New Delhi). The function was attended by Dr. K. A. Simon, Principal KMSET, CUSAT; Dr. Srinivasa Gopal, Director, CIFT; Dr. V. C. George, Retd. Head, Fishery Technology, CIFT, Cochin; Dr. S. Girija, Director, NIFPHTT, Cochin, Shri. R. C. Sinha, Director, CIFNET and Shri. Ashok Naik, GSL, Goa. Dr. P. U. Zacharia, SIC, VMC welcomed the gathering ad Dr. K. S. Mohamed, Head, MFD proposed vote of thanks.

F. V. Silver Pompano