

# Marine Fisheries Information Service



Technical and  
Extension Series



भारत  
ICAR

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



कडलमीन™  
cadalmin

# Marine Fisheries Information Service

No. 212 \* April-June, 2012

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

## CONTENTS

Habitat destruction: a case study on the evaluation of litter in the marine zone of north Vembanad Lake, Kerala	1
Sediment quality evaluation towards developing scientific restoration protocol for mangroves	4
Scientific advisory on water quality management for traditional fish farms	6
Harvesting <i>in situ</i> microalgal feed by enriching seawater	8
Diet composition of <i>Johnnieops sina</i> (Cuvier, 1830) from Cochin coast	9
New distributional record of the cuttlefish <i>Sepia arabica</i> (Massy, 1916) from the east coast of India	10
Unique fishery of the whelk, <i>Babylonia zeylanica</i> at Saktthikulangara	11
First record of the dogtooth tuna, <i>Gymnosarda unicolor</i> , Ruppell from Tuticorin	13
First time occurrence of the flathead sillago, <i>Sillaginopsis panijus</i> in commercial landings at Chennai	14
Occurrence of blue spotted cornet fish <i>Fistuluria commersonii</i> at Chennai	14
Report on an albino seerfish <i>Scomberomorus commerson</i> landed at Chennai	15
First report of the black saddled coral grouper, <i>Plectropomus laevis</i> (Lacepede, 1801) from Indian waters	16
Unusual heavy landings of oilsardine at Cotbona Landing Centre, south Goa (Goa Zone I)	16
Bumper catch of <i>Protonibea diacanthus</i> (ghol) landed at Jakhau, Gujarat	17
Dense bed of the seagrass <i>Halophila beccarii</i> in Kadalundi Estuary, Kerala	18
Olive ridely turtle stranded at Thambankadavu, Thrissur	18
Unusual landing of sand eel <i>Bleekeria</i> sp. at Chennai	19
Scalloped hammerhead shark, <i>Sphyrna lewini</i> (Griffith & Smith, 1834) landed by gillnetters at Sassoon Docks, Mumbai	19
Heavy landing of tuna, <i>Thunnus tonggol</i> at Sassoon Docks, Mumbai	20
Indiscriminate exploitation of <i>Epinephelus diacanthus</i> juveniles at Mumbai	20
Heavy landing of <i>Mobula</i> sp. at Neendakara, Kollam, Kerala	20

### PUBLISHED BY

**Dr. G. Syda Rao**  
Director, CMFRI, Cochin

### EDITOR

**Dr. Rani Mary George**

### SUB - EDITORS

**Dr. K. S. Sobhana**

**Dr. K. Vinod**

**Dr. T. M. Najmudeen**

**Dr. Srinivasa Raghavan V.**

**Dr. Geetha Antony**

**V. Edwin Joseph**

### EDITORIAL ASSISTANCE

**C. V. Jayakumar**



*Babylonia zeylanica*

*Sphyrna lewini*

*Sepia arabica*

**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.

## **Habitat destruction: a case study on the evaluation of litter in the marine zone of north Vembanad Lake, Kerala**

V. Kripa, D. Prema, P. S. Anil Kumar, L. R. Khambadker, Jenni Sharma and Rakesh Sharma  
*Central Marine Fisheries Research Institute, Kochi*

The marine ecosystem has been facing impacts due to anthropogenic activities ever since urbanisation started. However, during the last few decades, the coastal population has increased tremendously and it is reported that 44% of the world's population lives within 150 km of the coast (Report of the 28<sup>th</sup> session of Joint Group of Experts on the Scientific Aspects of Marine Environment Protection, GESAMP). It is also presumed that this trend would continue and the population in the coastal region is expected to double by 2025. The technological advancements have definitely supported the coastal area development and more people depend on these regions for diverse activities like tourism, shipping, construction, health, education, small and large business ventures and so on.

Some of the negative impacts of these developments have been felt on the coastal marine ecosystems. During the last century, one of the main issues related to ecosystem health was the after-effects of industrialisation and related untreated effluent which degraded the water quality. When studies proved that bioaccumulation and biomagnification of metal and pesticide residues in the marine biota can also affect humans, policies were formulated to prevent environment degradation and effluent treatment plants (ETPs) became mandatory. Another form of waste that is impacting the natural habitats is the non-biodegradable litter (NBL) or marine litter generated in the mainland and entering the rivers, estuaries and finally the sea, which is being viewed with concern by environmentalists.

Vembanad Lake is one of the major coastal habitats along the south-west coast of India. The Cochin backwaters is part of this lake and the Kochi City is situated on the banks of this estuarine system. The rapid growth of Kochi (the largest urban agglomerate in the state of Kerala), has been felt on

the Cochin backwaters which has long been identified as the nursery ground of penaeid and non-penaeid shrimps and several commercially important fishes. 'A targeted study was conducted to evaluate the quantity of different types of litter entering the Arabian Sea through one of the bar mouths at the northern part of Vembanad Lake.

### **Methods used to assess different types of marine litter**

The total area surveyed was 142 ha and the intertidal shore line was 8.88 km. In each intertidal site, visual grading was made based on the spread of marine litter. A detailed survey was done for litter in the main water body. Three types of marine litter were assessed, viz., i) floating litter; ii) bottom litter and iii) column litter.

Floating litter are those which float and these were visually assessed. In the subtidal regions, submerged samples (Quadrant) were collected by diving. The NBL at the bottom were collected and graded. Column litter which floats in the column, actually enters the estuaries from the land and flows through the estuary into the sea. With time, the floating litter can gain weight due to accumulation of silt and other particles and gradually sink down to form column litter and this can eventually become bottom litter. Due to the turbidity of coastal waters and constant flow, evaluation of marine litter is a difficult task. Fishermen were involved in collecting the data through a participatory approach.

### **Participatory approach and involvement of stake net fishers**

Stake nets are special type of bag nets used for fishing in coastal areas. The length and width of each net is approximately 15 m and 4 m respectively (Fig. 1). These are tied to the stakes placed in different parts of the estuary and are operated according to tide.



Fig. 1. Stake net

A proforma for collecting information on the quantity of litter collected was prepared and the fishermen families of Moothakunnam area were involved in collecting the information. Daily records of marine litter collected in the stake net were made by the fishers and from this the quantity of marine litter accumulating in the stake net was estimated.

### Salient observations

In the intertidal area, dense settlement of oysters was observed and in the crevices of these oyster beds, empty bottles were found stuck (Fig. 2). Along



Fig. 2. Marine litter in the intertidal area

with this, rubber foot wears, pieces of foam material, synthetic bags, tin cans, glass bottles *etc.* were also observed (Fig. 3). Empty plastic bottles, plastic bags and plastic sachets were the main floating items forming more than 90% of the litter and plastic sheets and bags were the main items recorded at the bottom. From the region near the bar mouth opening,



Fig. 3. Marine litter collected from the intertidal area



Fig. 4. "Ghost net" collected from the subtidal area

a "ghost net" *i.e.*, a discarded fish net was obtained (Fig. 4). This is a clear indication of the casual discarding of torn/damaged net by the fishermen in the fishing area. The lack of awareness of fishermen on the damages which a "ghost net" can do to the live nektonic and crawling biota is also evident.

From the stake net survey, the quantity of litter flowing into the coastal ecosystem was found to be considerably high during the fullmoon and newmoon period coinciding with the spring tides. This also indicates that when NBL generated in coastal areas is not properly disposed off in homesteads and public places, these can enter the coastal open waters when the high tide waters flush the shore line.

The quantity of litter ranged between 2 to 18 kg per day and consisted of rubber tyres, bottles, metal plates, tin cans *etc.* during the pre-monsoon period. In one instance, four metal boxes of 50 cm height and 30 cm width was collected along with the catch. Similarly tyres of cars and two wheelers were common.

It was estimated that during the pre-monsoon period (March - April) litter enters the Arabian Sea @ 6.8 kg per day (204 kg per month) through the bar mouth at Moothakunnam. This is estimated from the litter collected from stake nets (8 nos.) of mouth size 5 m x 4 m and length 15 m, placed near the bar mouth entrance at Moothakunnam.

### Impacts of marine litter

Through interaction with fishermen, it was inferred that the stake nets get torn when metal litter gets entangled and it is expensive to repair the nets. Most often it is a tedious task to sort the litter and the catch collected in the net (Fig. 5 and 6). Usually in the nets, large plastic sheets like silpaulin and plastic bags are obtained. Most often the fishermen throw the litter collected in the nets back to the coastal waters



Fig. 5. Marine litter collected from stake net along with fish catch



Fig. 6. Fisherwomen sorting the catch and the litter collected during fishing

(Fig. 7), which again destroy the habitats. Observations on the spread of litter indicated degradation of habitats which are usually used by common resident species of fishes like *Etroplus* spp. for breeding. Though actual statistics are not available, there are clear indications that the backwaters and estuaries are polluted by marine litter thereby destroying the breeding and nursery habitats of fishes. This can definitely be a cause for the declining fishery resources of the coastal waters as evidenced by the poor fish catch.



Fig. 7. Fishermen throwing the litter collected during fishing, back to the coastal waters

### Suggested measures for reduction of litter

- Create awareness about the harmful effects of marine litter in coastal areas
- Discourage casual littering of private and public places in coastal areas which will be inundated during high tide, flushing the non-biodegradable litter into the coastal waters
- Convince the governing bodies on the importance of placing garbage bins at several locations in coastal villages so that the waste can be effectively disposed off
- Educate fishermen not to dump the litter collected in the nets back to the sea
- Organise coastal clean-ups frequently involving local villagers including children
- Promote eco-watch groups of local residents and fishers
- Prohibit dumping of land waste in backwaters, coastal areas as well as in common open areas and penalise defaulters

## Sediment quality evaluation towards developing scientific restoration protocol for mangroves

D. Prema, P. S. Anil Kumar, K. K. Valsala, L. R. Khambadker, Rakesh Sharma, Anjana Mohan, John Bose and V. Kripa

Central Marine Fisheries Research Institute, Kochi

The role of mangroves as bio-shields and as critical habitats are being increasingly recognised and proved in the recent years. However, urbanisation and other anthropogenic activities have reduced the mangrove cover of most coastal areas. To overcome this, restoration programs are planned in several areas. Planting of mangrove seedlings without considering the ecological criteria suitable for the biological success of the mangroves, have given poor success rates. Hence the Central Marine Fisheries Research Institute initiated a program on development of scientific protocol for mangrove restoration. The mangrove saplings reared in the nursery developed at Moothakunnam, Ernakulam District during June 2010 (Kripa *et al.*, 2011) were ready for transplanting in September 2010. These were transplanted in 13 stations of different sediment quality, as a participatory community programme in Moothakunnam, Sathar Island and Puthuvypu of Ernakulam District. The mangrove species planted were *Rhizophora mucronata* and *Bruguiera gymnorrhiza*.

Among the abiotic characteristics, sediment quality is an important factor in mangrove ecology. Zonation in mangroves, their growth and other biological characters depend to a large extent on the sediment and hydrological condition of the site. In the initial phase, if the site selected for planting the nursery saplings or the propagule, does not meet the required sediment and water characteristics, the growth and survival will be affected. Hence an experiment was conducted to identify the optimal sediment soil parameters for *R. mucronata* and *B. gymnorrhiza* which are two important native species of this area.

Soil reaction (pH) influences the chemical transformation of most nutrients and their availability to mangroves. Since mangrove soils are typically waterlogged, and hence anaerobic, microbial

decomposition takes place through a series of oxidation-reduction (redox) processes. The redox potential (Eh) is a quantitative measure of reducing power which provides a diagnostic index of the degree of anaerobiosis or anoxia. Anoxic sediments have redox potentials below -0.2 V, while typical oxygenated soils have potential of above +0.3V.

The species composition and growth of mangroves is directly affected by the physical composition of mangrove soils. The proportions of clay, silt and sand, together with the grain size, dictate the permeability (or hydraulic conductivity) of the soil to water, which influences soil salinity and water content. Nutrient status is also affected by the physical composition of the soil, with clayey soils being generally higher in nutrients than sandy soils. Organic matter deposited over time in mangrove soils plays a significant role in supporting growth of plants and animals by providing nutrients.. Soil organic carbon is a well known index of accumulated soil organic matter.

For studying the sediment qualities of different sites where planting was done, sediment samples were collected using PVC corers of 15 cm length and 3 cm diameter, closed with screwing lid for both open ends. These corers were marked for identification of 0-5 cm and 5-10 cm depth. They were inserted into the sediment to a depth of 10 cm after removing the lower cap, where the mangrove saplings were transplanted during low tide, to take duplicate samples of sediment from each location of planting. The samples were transported intact to the laboratory in the corer itself and kept in the refrigerator. The sediment samples were transferred to labeled petridishes the following day. They were measured for pH and Eh in the original moisture holding capacity of the sediment to estimate the soil reaction and the oxidation reduction potential in the

field. The air dried soil samples after processing were subjected to analysis on texture (% sand, silt and clay), % organic carbon and salinity. The methodology followed for these analyses are given in Table 1.

Table 1. Methodology used in sediment analysis

Parameter	Method	Reference
pH	pH meter	Boyd and Tucker (1992)
Oxidation-reduction potential	Eh meter	Hesse, (1971)
Salinity	Argentometry	Jackson (1958)
Organic carbon	Walkely and Black method	Jackson (1958)
Sediment texture	International pipette method	FAO (1976)

**Soil reaction and oxidation reduction potential**

The wet pH values showed a range of moderately acidic to near neutral condition (6.2-6.9) at the top sediment (0-5 cm) in all locations. The dry pH measured with the soil – water (1: 2.5) suspension ranged from 6.2 – 6.6, confirming no chance for extreme acidity of these sediments on drying and exposure. The wet and dry Eh showed the oxidised state of sediment in the top layer in all stations

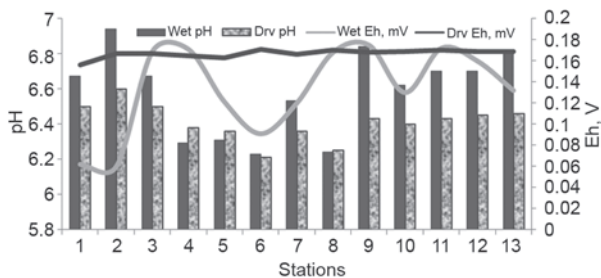


Fig. 1. Soil reaction and oxidation reduction potential in 0-5 cm depth of sediment

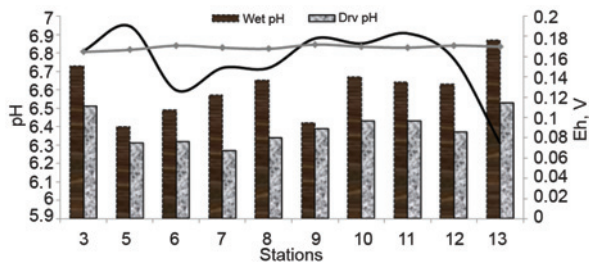


Fig. 2. Soil reaction and oxidation reduction potential in 5-10 cm depth of sediment

(Fig. 1). Similar trend in sediment pH and Eh was seen in the deeper (5-10 cm) layer also (Fig. 2).

**Soil texture**

The results of estimation and analysis of soil texture are indicated in Fig. 3 and 4. The stations with sediment of at least 11% clay and 5% silt in the top layer (Stations 1, 2 and 13) showed good growth of mangroves. In the lower layer, an increased clay (15%) and silt (7%) levels with muddy texture was observed in station 13. The mangrove survival percentage was also higher in these stations (>90%). Most mangrove soils are generally formed when sediment derived from coasts, river banks, or from upland areas accumulates after being transported down rivers and creeks. Mangrove top soil generally contains clay (fine-grained) whereas the soil beneath the surface is a mixture of silt and clay (known as mud).

Sediment grain size as well as other environmental factors (e.g., salinity, inundation,

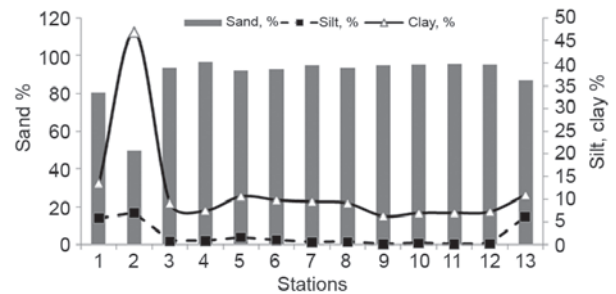


Fig. 3. Soil texture at top 0-5 cm

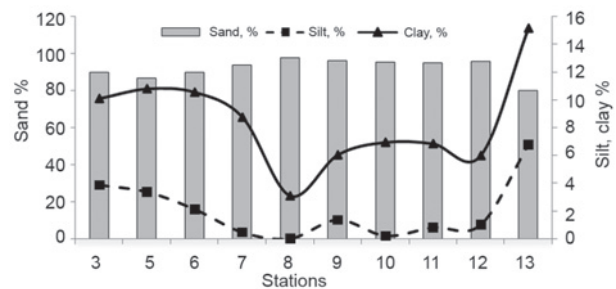


Fig. 4. Soil texture at 5-10 cm

nutrient availability or pollution level) can influence the presence and distribution of floral/faunal species. Macrobenthos for example, is commonly found in fine and medium sandy grains within mangrove habitats. Transportation of coarser or finer grains during tidal movements into these habitats may result

in migration of various species of macrobenthos to more suitable areas (Gueirero *et al.*, 1996).

### Soil salinity and organic carbon

Soil salinity did not vary considerably among the stations (Fig. 5 and 6). The organic carbon content at 0-5 cm and 5-10 cm is also depicted in Fig. 5 and 6. In top layer (0-5 cm), the organic carbon percentage was substantially more (>1.5) in stations with good growth of mangroves (stations 1, 2 and 13) than in the stations with scarce growth (<0.5). The sediment

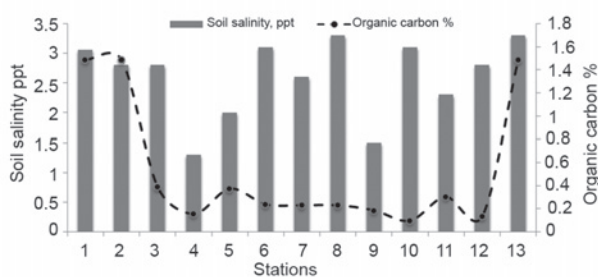


Fig. 5. Salinity and % organic carbon in sediment from different mangrove stations (0-5 cm)

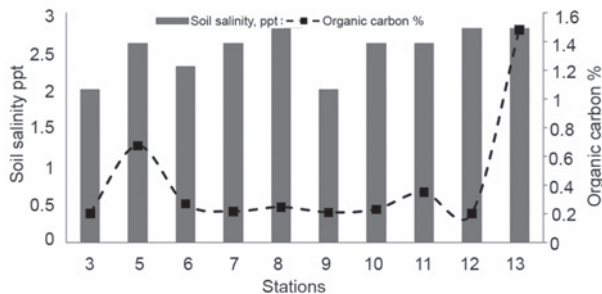


Fig. 6. Salinity and % organic carbon in sediment from different mangrove stations (5-10 cm)

acts as a sink, storing large amounts of organic matter that decomposes at a very slow rate. The source of organic matter found in mangrove sediments might have derived from plants (*e.g.*, litterfall, wood litter) and animal detritus, bacteria or plankton as well as from sewage and agricultural run-off. These nutrients (*i.e.*, organic matter) are then cycled throughout mangrove environments to be used by plants and animals.

The experiment clearly gave an indication that, sediment plays a major role in growth and survival of mangroves transplanted for restoration. It can be inferred that at least 11% clay and 1.5% organic carbon in sediment are essential for the initial growth and survival of transplanted mangroves. Mangrove soils, are in general, neutral to slightly acidic due to the sulphur-reducing bacteria and the presence of acidic clays. A pH lower than 6 retards growth of mangrove seedlings. For healthy stand of mangrove trees, both in terms of root growth and shoot growth, sites should offer a relatively neutral pH to induce good root as well as shoot growth. In general, mangrove vegetation is more luxuriant at lower salinities. Kathiresan (2002) recorded low levels of available nutrients, high salinity and low microbial load in degraded mangrove soil, as compared to those in the soil of luxuriant mangroves. Therefore, the areas suitable for mangrove restoration should be identified through soil analysis prior to transplanting. Lack of such scientific approach in taking up restoration plans has led to failure of mangrove restoration attempts. It is essential to follow scientific protocols while implementing mangrove restoration programs.

## Scientific advisory on water quality management for traditional fish farms

D. Prema, L. R. Khambadkar, P. S. Anilkumar, R. Remya and V. Kripa  
Central Marine Fisheries Research Institute, Kochi

Finfishes as well as shrimps are farmed in tide-fed ponds in several parts of central Kerala. These small scale farmers are at times affected by mass mortality of stocked fish. Most often, such mortalities of farmed stock are not extensive, but restricted to

individual farms. Farmers who observe fish mortalities or some change in water quality seek the help of Fishery Environment Management Division of the Central Marine Fisheries Research Institute, Kochi for expert opinion to redress the problem.

A common problem faced by the shrimp farmers in the area is poor pond water quality. This can be due to mixing of waste water from nearby households which are let out into the common feeder canals. The changes in the chemical parameters of a farm which encountered mass mortality of fishes and the advisories given to improve the water quality are detailed below.

The aqua-farm is located at Edavanakkad, Vypeen Island, Kerala and mass mortality of fishes was observed in November 2010. The farm was stocked with fishes like pearl spot (*Etroplus suratensis*), mullets (*Mugil cephalus* and *Liza parsia*) and shrimps.

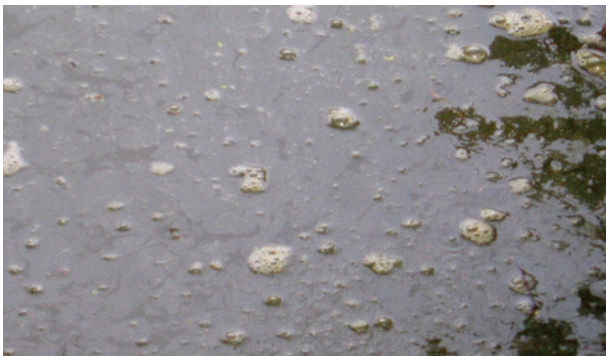


Fig. 1. Affected pond at Edavanakkad, Vypeen Island

Water samples were taken from the water entry point as well as from two different points of the affected pond (Fig. 2) for analysis. For comparison, water samples were taken from a distant canal as reference. Representative bottom sediment samples were also collected from these three stations (Fig. 3).

The water samples were analysed for pH, salinity, dissolved oxygen, total ammonia-nitrogen,



Fig. 2. Water sample collection for dissolved oxygen analysis



Fig. 3. Soil sample collection

nitrite-nitrogen, nutrients (phosphate and silicate), dissolved carbon dioxide, gross and net primary productivity as well as turbidity using standard methods. The sediment pH was also noted.

The pH of the water in the water entry point was acidic in range. This water when mixed with water in affected ponds changed to alkaline range (Fig. 4). A reference pond (non-affected pond) in the nearby area with alkaline range of pH clearly indicated that the mixing with acidic pH water has converted its alkaline pH to acidic range.

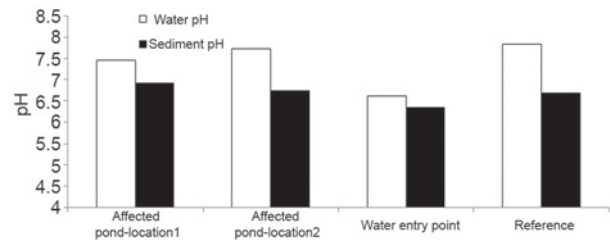


Fig. 4. Water and sediment pH

The dissolved oxygen content of contaminated water at water entry point was low compared to that of reference pond (Fig. 5). The CO<sub>2</sub> concentration of the entering waste water was higher than the maximum permitted limit of 5 mg l<sup>-1</sup>. After mixing with the affected pond water, because of its high dissolved oxygen concentration, the effect of high CO<sub>2</sub> got nullified (Fig. 5).

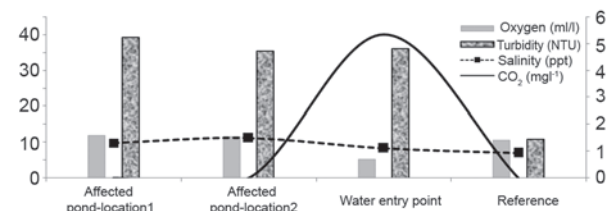


Fig. 5. Selected hydrological parameters recorded

The water entering the affected pond also showed very high  $\text{NH}_3\text{-N}$  levels ( $0.459 \text{ mg l}^{-1}$ ) and  $\text{PO}_4\text{-P}$  ( $0.622 \text{ mg l}^{-1}$ ). It was observed that after mixing with the affected pond water, because of its high dissolved oxygen concentration, the effect of high  $\text{NH}_3\text{-N}$  got nullified (Fig. 6). Hence the total toxic forms of dissolved inorganic nitrogen (ammoniacal and nitrite nitrogen) did not exceed the permissible levels of 0.1 and  $0.5 \text{ mg l}^{-1}$  respectively. After mixing with the water in affected ponds,  $\text{PO}_4\text{-P}$  remained as such retaining the  $\text{PO}_4\text{-P}$  in dissolved form in water, because of the high DO in water of the affected ponds and no further oxidation of  $\text{PO}_4\text{-P}$  was possible.

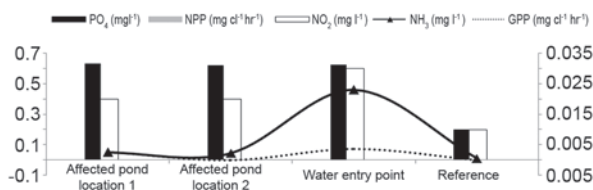


Fig. 6. Dissolved inorganic phosphorus (DIP), dissolved inorganic nitrogen (DIN) and primary productivity in water

The high dissolved inorganic phosphorus (DIP) and low inorganic nitrogen species has resulted in a highly imbalanced nutrient ratio of N/P. The very high phosphate levels in water might have resulted from the house hold waste water which entered the affected pond. The bubbles on the pond surface indicated presence of detergent in water. Detergents that contain phosphates are highly caustic, and surfactant detergents are very toxic. Surfactant detergents are used to enhance the wetting, foaming, dispersing and emulsifying properties of detergents. Phosphate detergents are used to soften hard water and help suspend dirt in water.

Detergents can have poisonous effects on all types of aquatic life. All detergents destroy the

external mucus layers that protect the fish from bacteria and parasites; plus they can cause severe damage to the gills. Most fish will die when detergent concentrations approach 15 parts per million. Detergent concentrations as low as 5 ppm can kill fish eggs. Surfactant detergents are implicated in decreasing the breeding ability of aquatic organisms.

Detergents can also add another problem for aquatic life by lowering the surface tension of the water. Organic chemicals such as pesticides and phenols are much more easily absorbed by fish. A detergent concentration of only 2 ppm can cause fish to absorb double the amount of chemicals they would normally absorb, although that concentration itself is not high enough to affect fish directly. The main contributors to the toxicity of detergents were the sodium silicate solution and the surfactants with the remainder of the components contributing very little to detergent toxicity. However, untreated or primary treated effluents containing detergents can pose a problem.

#### Advisory for improving water quality

It is essential that house hold effluents are to be properly drained out, without getting them mixed with natural embanked aquatic systems like, ponds, wells *etc.* The  $\text{PO}_4\text{P}$  accumulation in the present pond can be managed with application of lime as  $\text{CaCO}_3$ , or  $\text{CaMgCO}_3$  or  $\text{CaO}$ , in the pond soil. The pond sediment showed acidic soil reaction on observation of sediment pH (Fig. 4). Hence the addition of lime will not lead to excess alkalinity. Addition of lime induces phosphorous fixation as insoluble calcium phosphate, which removes excess phosphate from water and precipitates it in sediment by soil fixation and the nutrient imbalance can thus be overcome.

## Harvesting *in situ* microalgal feed by enriching seawater

P. Kaladharan and P. K. Asokan

Research Centre of CMFRI, Calicut

Mixed populations of marine natural microalgae were continuously cultured at high density through seawater enrichment with the Walne's medium, at the marine hatchery complex of Calicut Research

Centre of CMFRI. Freshly collected seawater from Konnad beach, decanted after an hour of sedimentation to remove sand and debris, was transferred to big transparent containers. Seawater

was enriched with Walne's medium at the rate of 200 ml solution A, 100 ml solution B and 50 ml of vitamins for 100 l seawater. This enriched seawater tanks were kept under a transparent roof and continuously aerated. After four days of high density mixed culture, *Astrionella japonica*, *Pyrophacus horologium*, *Chlorella marina* and species of *Diplopsalis*, *Trichodesmium*, *Spirulina*, *Chaetoceros*, *Pinnularia*, *Haplodinium*, *Dinophysis* and *Hemidiscus* were found growing exponentially (Table). This technique of live feed production is found very cost-effective for high density culture of multiple species of micro-algal feed for fish larval rearing.



High density culture of mixed populations of marine microalgae

Details (group, order and family) of the different algal species grown in the mixed culture

Species	Group	Order	Family
<i>Astrionella japonica</i>	Diatom	Fragilariales	Fragilariaceae
<i>Pyrophacus horologium</i>	Flagellates	Gonyaulacida	Pyrophacaceae
<i>Chlorella marina</i>	Chlorophyta	Chlorellales	Chlorellaceae
<i>Diplopsalis</i> sp.	Flagellates	Peridiniida	Proto-peridiniaceae
<i>Trichodesmium</i> sp.	Blue green algae	Oscillatoriales	Phormidioideae
<i>Spirulina</i> sp.	Blue green algae	Pseudanabaenales	Pseudanabaenaceae
<i>Chaetoceros</i> sp.	Diatom	Chaetocerotanae	Chaetocerotaceae
<i>Pinnularia</i> sp.	Diatom	Naviculales	Pinnulariaceae
<i>Haplodinium</i> sp.	Flagellates	Prorocentrida	Haplodiniaceae
<i>Dinophysis</i> sp.	Flagellates	Dinophysida	Dinophysiaceae
<i>Hemidiscus</i> sp.	Diatom	Coscinodiscales	Hemidiscaceae

## Diet composition of *Johnnieops sina* (Cuvier, 1830) from Cochin coast

N. Venugopal and N. G. K. Pillai

Central Marine Fisheries Research Institute, Kochi

*Johnnieops sina* is one of the commonest species constituting the jew fish fishery of the Kerala coast. The food and feeding of fishes becomes difficult to observe in their natural environment and therefore accurate determination of prey choice by fish species is indeed difficult. Rearing of fish in artificial environment may not reflect the exact feeding habits of particular fish. However, analysis of gut content is proven to be the method for determining feeding habits of any fish species. Samples were collected from three major landing centres such as

Munambam, Kalamukku and Cochin Fisheries Harbour. A total of 1141 individuals of *J. sina* in different size groups ranging from 99-209 mm were sampled for the present study. In order to understand the seasonal variation in feeding habits, samples were collected in different seasons during the study period. However, samples were not collected during the month of July because of the annual ban on fishing along Kerala coast. All the individuals were segregated sex-wise after examining the gonad maturity stages. The stomachs were preserved in 5%

formalin for analysis. Gut with contents were weighed, recorded the degree of fullness of stomachs and then cut opened for analysing the gut contents.

### Diet composition

Qualitative analysis of stomach contents of *J. sina* exhibited its preference for larger organisms in shallow waters. Some of the most dominant prey organisms were teleosts, penaeid prawns, squilla and *Acetes* sp. A detailed list of the food components is given in Table 1. Crustaceans ranked first and were the major food items followed by fish food items. Crustacean diet of *J. sina* comprised of various species of penaeid and non-penaeid prawns and stomatopods. Among fish food items, major group was teleosts with *Saurida* sp. forming the major portion.

Table 1. Food components of *J. sina*

Group	Species
Penaeid prawn	<i>Parapenaeopsis styliifera</i> <i>Metapenaeus affinis</i> <i>Metapenaeus dobsoni</i> <i>Penaeus merguensis</i>
Teleosts	<i>Coilia dussumieri</i> , <i>Trichiurus lepturus</i> , <i>Cynoglossus bilineatus</i> , <i>Nemipterus</i> sp., <i>Saurida</i> sp. Sciaenids
Non-penaeid prawns	<i>Acetes indicus</i>
Stomatopod	Squilla: <i>Oratosquilla nepa</i>
Molluscs	<i>Loligo</i> sp.
Other crustaceans	Crabs

Length group between 100-109 mm and 140-149 mm preferred *Acetes* sp. Occurrence of *Acetes* sp. was high (90.40%) in smallest juvenile length group of 100-109 mm while low in adult length group

(180-189 mm). Prey preference varied as the size of the fish increased. While *Acetes* sp. formed major food item in diet of juvenile length group, in addition to crustaceans, fishes were also seen notably in the adult length group. Highest percentage of penaeid prawns was observed in 190-199 mm length group (51.78%). Fishes varied from lowest of 1.16% in 120-129 mm length group to highest of 59.61% in 160-169 mm length group. Molluscs were not found in the diet of juvenile length group, but recorded in adults ranging between 160 and 189 mm with maximum of 2.97 % in 170-179 mm length group and minimum of 0.15% in 160-169 mm length group. Similarly other crustaceans like *squilla* sp. and crab were observed in the diet of adult length group (160-219 mm). Crab was highest (0.99%) in 210-219 mm group. *Squilla* sp. were also recorded high (4.06%) in length group of 180-189 mm whereas, lowest (1.24%) in 170-179 mm length group. Digested matter ranged from 0.83% in 110-119 mm group to maximum of 22.34% in 120-129 mm group.

Stomach analysis indicates that food composition of *J. sina* consisted of two main groups such as crustaceans and teleost fishes. They are found to feed largely on crustaceans and month-wise preponderance indices exhibited crustaceans to be the most dominant and preferable food for *J. sina* during all the months. Penaeid prawns, *Acetes* sp., crab and *squilla* sp. are the main crustacean items in the diet of *J. sina* in Cochin waters. Among crustaceans, penaeid prawns formed substantial portion of crustaceans in the stomach contents, which was followed by *Acetes* sp., crab and *squilla* sp.

## New distributional record of the cuttlefish *Sepia arabica* (Massy, 1916) from the east coast of India

S. N. Sethi, P. Poovanam and V. Venketesan\*

Research Centre of CMFRI, Chennai

\*Central Marine Fisheries Research Institute, Kochi

Due to the growing demand in the international market, cephalopods are exploited all along the Indian coast. With the increased exploitation rate and

expansion of fishing grounds, new species of cephalopods are being reported from Indian waters. Among the 60 species of cephalopods species from

the Indian waters; only 15 are commercially exploited (Silas *et al.*, 1985). A new species of the cuttlefish, *Sepia arabica* (Massy 1916) was observed in trawl landings at Kasimedu Fishing Harbour on 13<sup>th</sup> October, 2011 (Fig. 1). This is the first report on occurrence of *S. arabica* from the east coast of India. Dorsal mantle length (DML) of the specimens ranged from 45-55 mm (Table 1). *S. arabica* is a demersal cuttlefish species inhabiting 80 to 272 m depth range and geographically distributed in the Indian Ocean, Red Sea, Gulf of Aden, Persian Gulf, western and southern coasts of India and Lakshadweep Islands.



Fig. 1. Dorsal view of *Sepia arabica* collected from Chennai.

Arrow points the head with large, fleshy ear-shaped projections posterior to eyes which looks like a pair of ear rings (key character for this species identification)

### Diagnostic features

Mantle oval, fins widest in posterior third; anterior origin posterior to mantle margin, posteriorly with wide gap between them. Head slender, narrow than mantle. Male and female arms subequal in length. Arm suckers tetraserial in both sexes, suckers small and widely spaced. Arm sucker rims smooth.

Hectocotylus present on left ventral arm, with greatly reduced suckers, much smaller than normal suckers. Tentacular club is crescent shaped, small; with 5 or 6 small similar sized suckers in transverse rows. Head with large, fleshy, ear-shaped projections posterior to eyes. Reddish purple body colour, Head with chromatophores concentrated over eye orbits. Dorsal mantle chromatophores are irregularly distributed in patches; base of fins on posterior half with 10 to 12 patches of concentrated reddish purple chromatophores. Cuttle bone outline lanceolate; bone bluntly rounded anteriorly, very narrow, strongly tapered posteriorly; recurved ventrally; granulose dorsally; dorsal median rib indistinct, broadens anteriorly (Fig. 2).



Fig. 2. Ventral and dorsal view of cuttle bone of *Sepia arabica* collected from Kasimedu Fishing Harbour

Table 1. Mantle length, weight and sex of *Sepia arabica* collected from Chennai

Dorsal mantle length (cm)	Weight (g)	Sex
45	16	Male
55	23	Female

## Unique fishery of the whelk, *Babylonia zeylanica* at Sakthikulangara

Sijo Paul, A. Y. Jacob and K. C. Hezhakiel  
Central Marine Fisheries Research Institute, Kochi

The trawlers of Sakthikulangara engage a different fishery towards the lean period during March, targeting the whelk, *Babylonia zeylanica* along the south-west coast off Sakthikulangara. In March 2012, the trawl fishery of *Babylonia* spp.

was unique in that almost 99% of the catch comprised *B. zeylanica* with a very a small quantity of *B. spirata* (Fig. 1). The trawl nets used for this fishery had more weights than the usual ones. During the hauling process, the sea bottom is being ploughed so that



Fig. 1. *Babylonia zeylanica* (bigger one) and *B. spirata* (smaller one)

along with the catch, mud is also being hauled which can be highly detrimental to the bottom fauna. Trawlers of 10-17 m size are involved in fishing with 5-7 crew members. The fishing starts between 1400 and 1800 hrs on reaching the fishing ground,



Fig. 2. *Conus* spp. ready for auction

off Sakthikulangara at a depth of 30-50 m. Hauling lasts for about 1 h and 30 min is spent for washing the mud along with the catch at the sea surface. The crew members are paid ₹ 500 per trip for their extra

strenuous and continuous night fishing. A single trip may make 8-10 hauls. At times, along with *B. zeylanica*, *Conus* spp. (Fig. 2) is also caught. The landing is generally during the early hours from 0500 to 0700 hrs (Fig. 3) and the catch is auctioned at the landing centre (Fig. 4; 5). *B. zeylanica* is sold at an average price of ₹ 95 /kg and *Conus* spp. at ₹ 5/kg (Table 1).



Fig. 3. Unloading *Babylonia zeylanica* from the trawl boats at Sakthikulangara



Fig. 4. *B. zeylanica* ready for auction

Fig. 5. Auctioned *B. zeylanica* ready for transportation

Table 1. Details of the catch and revenue earned from whelk fishery at Sakthikulangara

Date	No. of boats	Average catch/boat (kg)	Average rate (₹)	Total revenue (₹)
19/04/12	40	800	95	30,40,000/-
26/04/12	75	500	95	35,62,500/-
11/05/12	44	587	95	24,53,660/-

## First record of the dogtooth tuna, *Gymnosarda unicolor*, Ruppell from Tuticorin

M. Sivadas, L. Renjith, S. Mohamed Sathakkathullah and K. Suresh Kumar  
Research Centre of CMFRI, Tuticorin

Tuticorin is known for tuna fishing since long. There has been a gradual change in the species composition, period of occurrence and magnitude of tuna landings, consequent to changes in fishing pattern and expansion of fishing grounds. According to Hornell (1917), *Euthynnus affinis* was the common tuna species caught off Tuticorin. Later, Silas (1962) recorded five species (*Euthynnus affinis*, *Thunnus albacares* and *Thunnus tonggol* as common and *Auxis thazard* and *Katsuwonus pelamis* as sporadic) with the major gear used being multiple trolling line. Siraimetan (1985) recorded seven species viz., *E. affinis*, *A. thazard*, *Auxis rochei*, *Sarda orientalis*, *T. albacares*, *T. tonggol* and *K. pelamis*. There is a shift in the pattern of fishing from troll line fishery to gillnet fishery, troll lines being operated only when the use of gillnets is temporarily suspended. Even with the introduction of multiday drift gillnet fishing in 2000, which are operated in depths above 300 m, the tuna species landed comprised only the above mentioned seven species (Abdussamad *et al.*, 2006). Thus the present report is the first one on the occurrence of *Gymnosarda unicolor* from Tuticorin adding the total number of tuna species caught along the Tuticorin coast to eight.

Landing of 15 numbers of *G. unicolor* was observed for the first time on 9<sup>th</sup> May 2012 in the drift gillnet catches at Punnakkayal. The landing was again observed on 13<sup>th</sup> June 2012 and totally 50 numbers were landed. They were caught 20 nautical miles straight off Punnakkayal from a depth of 25 m. It is said that 15 min ride from this ground will lead to areas above 100 m depth. *G. unicolor* is identified by its prominent lateral line that arch over pectoral fin, large conical teeth and naked body with no lines or markings (Fig.1a and b). The length of fishes landed ranged from 40 to 42 cm FL (Fig. 2) and weight from 0.95 to 1.125 kg. Male to female ratio was 1:0.6 and all belonged to immature stage II. The stomach contents comprised digested fish remains.



Fig. 1a. *Gymnosarda unicolor*



Fig. 1b. Head of *G. unicolor* showing teeth

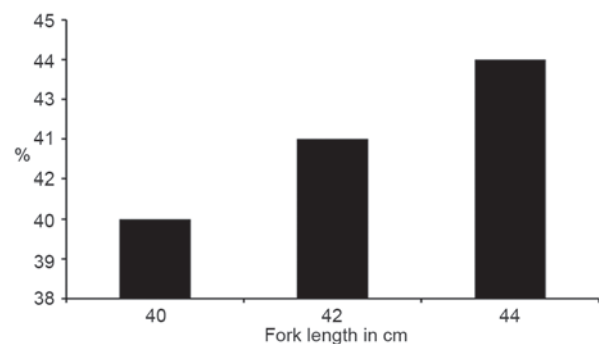


Fig. 2. Length frequency of *G. unicolor* landed at Tuticorin

## First time occurrence of the flathead sillago, *Sillaginopsis panijus* in commercial landings at Chennai

S. N. Sethi , Shoba Joe Kizhakudan and S. Rajapackiam

Research Centre of CMFRI, Chennai

Unusual landing of the flathead sillago *Sillaginopsis panijus* (Hamilton, 1822) was observed on 24<sup>th</sup> June 2010 at Kasimedu Fishing Harbour, Chennai. About 30 kg of *S. panijus* in the size range 280-360 mm (length) and 120-325 g (weight) was landed by trawl nets caught at a depth of 60-80 m. This is the first report on *S. panijus* at Chennai in commercial landings. Among the sillaginidae family, the silver sillago *Sillago sihama* (Forsskal, 1775), locally called as “vellai kilangan” is the only species usually landed at Chennai. Morphologically, *S. panijus* differs from other sillaginid fishes in the presence of elongated trailing second dorsal spine.



*Sillaginopsis panijus* landed at Kasimedu Fishing Harbour, Chennai

Morphometric measurements of *Sillaginopsis panijus* collected from Kasimedu Fishing Harbour, Chennai

Measurements	<i>Sillaginopsis panijus</i> (Female)	<i>Sillaginopsis panijus</i> (Male)
Total length (mm)	360	312
Standard length (mm)	305	280
Snout to dorsal (mm)	110	98
Anal soft rays	26	25
Snout to eye (mm)	38	35
Snout to head (mm)	90	77
Snout to pectoral (mm)	100	87
Snout to pelvic (mm)	108	90
Snout to anal (mm)	38	35
Length of dorsal 2 <sup>nd</sup> spine (mm)	162	152
Dorsal spines	11	11
Dorsal soft rays	27	26
Anal spines	2	2
Sex	Female	Male
Weight (g)	250	190

## Occurrence of blue spotted cornet fish *Fistuluria commersonii* at Chennai

S. N. Sethi, S. Rajapackiam and N. Rudramurthy

Research Centre of CMFRI, Chennai

On 17<sup>th</sup> March 2011, blue spotted cornet fish *Fistuluria commersonii* (Ruppel, 1838) commonly

called as pipe fish was recorded for the first time at Nochikuppam, Chennai. The size range of

*F. commersonii* ranged from 430 - 535 mm and the weight ranged from 45 – 110 g. Most of the female fishes were in mature stage (stage IV and stage V). The gonad length was 160-170 mm and the weight was 6.0-6.5 g. The estimated fecundity was 19,500 numbers per fish.



*Fistularia commersonii* landed at Chennai

Morphometric measurements (mm) of the blue spotted cornet fish *Fistularia commersonii* landed at Chennai

Fishes (Numbers)	1	2	3	4	5	6
Total length	430	448	490	505	510	535
Standard length	400	425	465	475	480	508
Snout to 1 <sup>st</sup> dorsal	338	360	395	405	408	445
Snout to pectoral	160	168	180	205	230	280
Snout to anal	325	345	385	390	405	425
Snout to eye	125	130	135	142	150	160
Head length	147	155	183	188	190	202
Length of prolonged caudal fin rays	140	158	170	178	185	195
Sex	F2	M	F5	F3	F4	F5
Weight (g)	48	60	75	85	90	110
Dorsal rays	11	11	11	11	11	11
Pectoral rays	13	13	13	13	13	13
Anal rays	11	11	11	11	11	11

## Report on an albino seerfish *Scomberomorus commerson* landed at Chennai

S. N. Sethi, S. Rajapackiam, P. Poovanam and A. Margaret Muthu Rathinam  
Research Centre of CMFRI, Chennai

An albino seer fish, *Scomberomorus commerson*, measuring 1290 mm in length and 13.50 kg weight was landed at Kasimedu Fisheries Harbour, Chennai on 24<sup>th</sup> March 2012. The fish was caught in hooks and line from a depth of 20-30 m towards Andhra Pradesh border. The entire body of the fish was yellowish in colour with pinkish fins

and whitish lateral line. The fish was sold for ₹ 8000/- in the local market.

Incidence of albinism among animal population is very often reported, whereas in fish it is rare. Albinism is a metabolic disorder due to lack of melanin pigment deposition in skin. This occurs when



Albino seerfish, *Scomberomorus commerson*, landed at Kasimedu Fishing Harbour

two recessive genes combine and block an enzyme essential in the synthesis of melanin pigment.

Morphometric measurements of the albino seerfish landed at Kasimedu Fishing Harbour

Parameters	Measurements (mm)
Total length	1290
Standard length	1130
Snout to origin of first dorsal	600
Snout to origin of pelvic fin	280
Snout to origin of pectoral	250
Snout to eye	100
Snout to anal	650
Head length	250
Head width	270
Length of dorsal fin	100
Dorsal fin width	90
Dorsal fin curve	75
Eye diameter	30
Weight (kg)	13.50

## First report of the black saddled coral grouper, *Plectropomus laevis* (Lacepede, 1801) from Indian waters

Sijo Paul

Central Marine Fisheries Research Institute, Kochi

A single specimen of *Plectropomus laevis* belonging to order: Perciformes, Family: Serranidae was found among the gillnet catch at Cochin Fisheries Harbour on 17<sup>th</sup> March, 2012. The specimen measured 70 cm in total length and had an approximate weight of 3-4 kg. The fish is easily identifiable with 7 dorsal spines and prominent five dark brown/black irregular blotches on dorsal side. Hitherto there is no published report of this species from Indian waters.



*Plectropomus laevis* landed at Cochin Fisheries Harbour

## Unusual heavy landings of oilsardine at Cotbona Landing Centre, south Goa (Goa Zone I)

Prakash C. Shetty

Field Centre of CMFRI, Goa

Cotbona Landing Centre is the major mechanised landing centre in south Goa having fish landing jetty of 1 km stretch. Of the total fish catch at this jetty

*Sardinella longiceps* contributed about 90% during the year 2012. Landings of *S. longiceps* is generally observed throughout the year with peak landings from

September to December. During the first week of May 2012, unusual heavy landings of *S. longiceps* was observed. On 3<sup>rd</sup> May 2012 heavy landings started from early morning 0600 hrs and continued upto 1200 hrs on 4<sup>th</sup> May. About 67 purse-seiners landed catch ranging from 8 to 40 t per boat. The average catch



landed during the day was about 938 t. The total length of *S. longiceps* landed ranged from 9 to 16 cm. The entire catch was iced, loaded in trucks and transported to Karnataka for fish meal production. The auction rate of the fish ranged from ₹ 100 to ₹ 110 per basket of 15 kg, i.e., ₹ 6/- ₹ 7/- per kg.



Purse seiners loaded with *Saradinella longiceps* at Cotbona Landing Centre, south Goa

## Bumper catch of *Protonibea diacanthus* (ghol) landed at Jakhau, Gujarat

Bhupatrai Vallabh Makadia  
Field Centre of CMFRI, Jamnagar

Bumper catch of ghol, *Protonibea diacanthus* was landed at Jakhau landing centre on 24<sup>th</sup> April 2012. The details pertaining to the bumper catch are given below.

Name of craft owner	Hasan Isha Bhaya
Name of craft	"Al Kadari"
Length of craft	42 feet
Type of craft	Gillnetter (Fibre-Tony)
Type of gear	Jadajal (Gillnets- Multifilament)
Mesh size of gear	200 to 240 mm
No. of pieces of nets	70 nos.
Horse Power	88 H P
Date and time of departure from Jakhau Landing Centre	20.04. 2012, 14.30 hrs
Date and time of arrival at Jakhau L. C.	24.04.2012, 14.00 hrs.
Duration of absence hours	95 h
Actual fishing hours	40 h
Distance from Jakhau L.C.	12 km.
Direction from Jakhau L.C.	North-west
Depth	8 to 10 m
No. of hauls	4
Man power employed	5
Fishing ground	Shekhranpir's Creek and Near Haji Ibrahimdada's Creek
Total number. of fishes landed	375
No. of fishes distributed free of cost	25 nos. (about 450 kg)

Details of weight, sex and market price of 350 nos. of fishes (*P. diacanthus*) landed at Jakhau

Sex	Weight range (kg)	Total weight (kg)	Price per kg	Total (₹)
Male fishes	≥15 kg	2246	1700/-	3818200/-
	10-15 kg	312	600/-	187200/-
	≥15 kg *DF	83.5	1500/-	125250/-
	10-15 kg *DF	12.5	500/-	6250/-
Female fishes	≥15 kg	3218	800/-	2574400/-
	10 kg-15 kg	166	400/-	66400/-
	≥15 kg *DF	351	650/-	228150/-
	Total	6389 kg.		70,05.850/-

\*DF= Damaged fishes

## Dense bed of the seagrass *Halophila beccarii* in Kadalundi Estuary, Kerala

P. Kaladharan and P. K. Asokan  
Research Centre of CMFRI, Calicut

Extensive seagrass beds of *Halophila beccarii* (Ashers) are reported for the first time from Kadalundi community reserve area close to the bird sanctuary, covering an area of more than 2 ha. The substratum is predominantly clayey. During low tide, the seagrass bed is exposed. *H. beccarii* grows along with the seaweed *Enteromorpha linza*. This seagrass beds harbour subadults of gastropods, shrimps, crabs and fin fishes such as *Liza* spp. and *Ambasis* spp.



*Halophila beccarii* in the Kadalundi Estuary

## Olive ridely turtle stranded at Thambankadavu, Thrissur

K. G. Baby  
Central Marine Fisheries Research Institute, Kochi

A large olive ridely turtle was found stranded in dead condition near Thalikulam Landing Centre at Thambankadavu (Thrissur District, Kerala) on 19.04.2012. The specimen weighed around 60 kg and length was 78 cm in length. Since the specimen was found in semidecomposed condition, other morphometric measurements are not available



Olive ridely turtle stranded at Thmbankadavu

## Unusual landing of sand eel *Bleekeria* sp. at Chennai

S. Rajapackiam and S. Mohan  
Research Centre of CMFRI, Chennai

About 2 t of the sand eel, *Bleekeria* sp., locally called “aruna,” was landed by mechanised trawlers, operated at a depth of 60-80 m, at Chennai Fisheries



Fig.1. Size range of *Bleekeria* sp. landed at Chennai



Fig. 2. Landings of *Bleekeria* sp. at Chennai

Harbour on 7<sup>th</sup> July 2011. The size range of the fishes was 110-144 mm with the dominant mode at 120-124 mm. The fish was sold at the rate of ₹ 40 per kg at the landing centre.

## Scalloped hammerhead shark, *Sphyrna lewini* (Griffith & Smith, 1834) landed by gillnetters at Sassoon Docks, Mumbai

Sujit Sundaram and Thakur Das  
Research Centre of CMFRI, Mumbai

A total of 650 kg of the scalloped hammerhead shark, *Sphyrna lewini* locally called as ‘kan mushi’ was landed by about 11 gillnetters at Sassoon Docks (old jetty), Mumbai on 22<sup>nd</sup> December 2010.

The length of the sharks ranged from 90 to 100 cm. The sharks were landed by gillnetters operated at 30-40 m depth, 40-50 km off Mumbai. The catch was unloaded at Sassoon Docks and sold at ₹ 110/kg and the entire catch fetched ₹ 71,500/-. A catch of this magnitude confirms the availability of sizeable hammer head shark resource along this coast.



Hammerhead shark *Sphyrna lewini* landed at Sassoon Docks

## Heavy landing of tuna, *Thunnus tonggol* at Sassoon Docks, Mumbai

Sujit Sundaram and K. B. Waghmare

Research Centre of CMFRI, Mumbai

About 60 t of *Thunnus tonggol* were landed at Sassoon Docks, Mumbai on 25<sup>th</sup> September 2010 by about 16 purse seiners from 30-40 m depth, 70-80 km off Ratnagiri. The length of tuna ranged from 480 to 630 mm and the corresponding weight ranged from 1.6 to 3.1 kg.

The catch was stored in crushed ice and was unloaded at Sassoon Docks and sold @ ₹ 35/kg. The entire catch fetched ₹ 21 lakhs which appears very



lucrative during the post-fishing ban period. The catch was exported mainly to European countries.

Landing of *Thunnus tonggol* at Sassoon Docks, Mumbai

## Indiscriminate exploitation of *Epinephelus diacanthus* juveniles at Mumbai

Sujit Sundaram, Vaibhav Mhatre and Punam Khandagale

Research Centre of CMFRI, Mumbai

New Ferry Wharf is one of the major fish landing centres of Mumbai and 80-100 trawlers operate daily from here. On 13<sup>th</sup> May 2011, large numbers of juveniles of *Epinephelus diacanthus* was landed at the New Ferry Wharf (Fig. 1). On an average, each boat landed 700-800 kg of juveniles over a period of 3-4 days. Landings of juveniles of *E. diacanthus* of this magnitude was a rare phenomenon. The size ranged from 70 to 100 mm in total length.



Juveniles of *Epinephelus diacanthus* landed at New Ferry Wharf, Mumbai

## Heavy landing of *Mobula* sp. at Neendakara, Kollam, Kerala

K. G. Baby

Central Marine Fisheries Research Institute, Kochi

On 12<sup>th</sup> June 2012, thirtysix numbers of *Mobula* sp. were landed at Neendakara Fisheries Harbour. The total weight of the landings was approximately 3400 kg. The species was caught in multiday hooks and lines from Goa coast at a depth of about 450 m. The fishermen sold the catch @ ₹ 80/kg.



Heavy landing of *Mobula* sp. at Neendakara Fisheries Harbour



Marine Fisheries Information Service