MPEDA

Newsletter

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CPF-TURBO PROGRAM

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MPEDA Newsletter
VOL. VII/NO. 5/AUGUST 2019

CONTENTS

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Mr. Penemetsa Bhima Raju, Shrimp farmer from Bhimavaram uses Waterbase Baywhite Enriched feed

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K. S. Srinivas IAS
Chairman

Dear friends,

MPEDA had successfully organized the 5th edition of Aqua Aquaria India at Hyderabad from 30th August to 1st September 2019. The exhibition was inaugurated by Hon'ble Vice President of India and had the participation of over 5000 delegates and 2300 visitors. There were 250 stalls in the exhibition besides the theme pavilion by the Rajiv Gandhi Centre for Aquaculture.

The exhibition was unique in many ways. First of all, it was held for the first time in a non coastal state as a measure to promote scientific aquaculture in hinterland and to tap the resource potential of inland states. The theme of the event was kept as "*Taking Blue Revolution to India's Hinterland*". MPEDA had honored 10 prominent farmers from different states handling different species for their proven expertise and entrepreneurship in aquaculture. To familiarize good quality seafood to the visitors and local populace of Hyderabad, a seafood festival was also organized along the side lines of the show, which turned out to be roaring success.

There were technical sessions by international experts who spoke on the successful models abroad, advances in the technology of aquaculture of various species and also on the mitigation measures to be adopted in the event of crisis in farms. The third day also had a unique session wherein experienced farmers shared their success stories and farming tips to the fellow farmers who came to the show from various states. I could feel that many of the farmers were in pursuit of the modern technologies such as re-circulatory aquaculture system, biofloc and also on the application Internet of things in farms. The adoption of digital and automated technologies into the farming systems will revolutionize our aquaculture scenario and will help to improve the productivity and cost effectiveness, cutting the flab.

I am glad that show has helped the farming community to get familiarized to modern technologies and I am hopeful that the adoption of such technologies in the long run will be benefitting the farmers, and will decide the course of export oriented aquaculture the country is going to take in the near future.

Thank you.

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Socio-Economic Dimensions of the Ocean

SHERINE SONIA CUBELIO AND M. SUDHAKAR

Ocean is life. Ocean provides countless ecosystem services. The Millennium Ecosystem Assessment describes ecosystem services as "the benefits people obtain from ecosystems". Ecosystem services from ocean are delivered without human interventions and the major vital ones are distribution of heat around the planet, functioning of the hydrological cycle and absorption of carbon dioxide as part of carbon cycle. Apart from this ecosystem services in the form of benefits are through the intervention of humans.

Food produced through capture and culture fisheries may be taken as the best example. The human activities are to be carefully managed to maintain ecosystem structure and function, the acquisition of such ecosystem services can result in damage to the marine environment. Important issues arise for the institutions of ocean governance at global, regional, national and local levels in balancing the benefits of acquiring these services against the damages caused by over-exploitation. Another category of ecosystem services of importance to humans are the aesthetic, cultural, religious and spiritual ecosystem services.

The environmental and socio-economic dimensions of oceans depend on the activities such as offshore oil and gas, maritime transport, telecommunications cables, leisure and recreation, military defence, fisheries, aquaculture, water abstraction, mineral extraction, renewable energy, coastal defence, waste disposal, education, power transmission and storage of gases.

Fisheries

According to the 2018 statistics reported by member states to the FAO Fisheries and Aquaculture Department, compiled in the State of World Fisheries and Aquaculture (SOFIA), production of fish from capture fisheries and aquaculture for human consumption and industrial purposes has grown at the rate of 3.2 per cent for the past half century from about 20 to nearly 171 million tons by 2016. India stands in seventh position in capture fisheries production.

Approximately about one per cent of the total population depends upon fishery sector in India as a primary source of livelihood, direct employment to about 6

Centre for Marine Living Resources and Ecology, Atal Bhavan, Ministry of Earth Sciences, LNG Terminal, Puthuvype, Kochi 682503, Kerala.

million fishers and to another six million people who are employed in fishery-related activities. India has an estimated marine resources potential of about 4.24 million tons per year.

International Organisation like Indian Ocean Tuna Commission (IOTC) manages trans-boundary resources like tunas and sharks. Large Marine Ecosystems are of concern to the nations involved for sustainable ocean development. Central and Western Arabian Sea is considered as a unique ecosystem, where the presence of Deep Scattering Layer has been recognised.

One of the major components of this layer is myctophid fishes, especially Benthosema spp. The countries around the Central and Western Arabian Sea could co-operate so as to sustain, manage and effectively utilise these resources, which otherwise remain unexploited. India is also a member of Commission for Conservation of the Antarctic Marine Living Resources (CCAMLR). Important activities initiated by CCAMLR to protect and conserve the Marine Resources of Southern Ocean includes Bio-regionalisation programme, Marine Protected areas, delineation of vulnerable areas, introduction of catch quotas for exploited resources, ecosystem modelling and census of life in Southern Ocean.

The processing industry in India does not depend on shrimps alone, for these constitute only about 12 per cent of the country's total catch. Considerable advancement has been made on the economic utilization of many other varieties of fish. These include marketing of the entire fish, fish fillets and pickled meat. Other products such as fish flour, fish protein concentrate, fish hydrolysate, fish soup powder, fish flakes and fish sausages seem to have great possibilities. Products such as bacteriological peptone prepared from trash fish are gaining more importance.

Fish processing industries established after independence are bringing more foreign exchange to our nation and hence received special significance. One of the effective means of utilising thrash fish is by the conversion of it into edible fish flour or fish protein concentrate (FPC) which can be blended in suitable proportion with protein-deficient food materials such as cereals. India is among the few world countries which have perfected the preparation of FPC with excellent colour and high protein content of 78.8 per cent.

Mariculture

Fish production in India is mainly from the capture of fisheries, despite the country having huge potential for sea farming. With nearly 3.5 per cent growth per annum, India should be producing at least 10.5 million tons of marine fish by 2050. Unlike other South Asian countries, sea farming or mariculture in India has long been confined to culture of seaweeds, pearly oysters, edible oysters and mussels at scattered places of the South West coast. Currently, the capture fisheries are stagnated (3.63 million tons in 2018), the vast expanse of sea coast could be profitably used for mariculture by adopting sustainable and socially-acceptable methodologies.

SEA FARMING OR MARICULTURE IN INDIA HAS LONG BEEN CONFINED TO CULTURE OF SEAWEEDS, PEARLY OYSTERS, EDIBLE OYSTERS AND MUSSELS AT SCATTERED PLACES OF THE SOUTH WEST COAST.

In this direction, India has taken initiatives for farming crustaceans, finfishes, molluscs and seaweeds. Mariculture can partially fulfil the deficit in fish production. Open sea mariculture should be taken up in a large scale. Cage culture is proposed as one of the feasible proposals. It is estimated that effective utilisation of at least one per cent of this vast resource could achieve an annual production of more than 30 lakh tons of fish from sea-cage farming.

Maritime transport

All sectors of maritime transport (cargo trades, passenger and vehicle ferries and cruise ships) are growing in line with the world economy. Of India's international trade, about 95 per cent by volume and 70 per cent by value is undertaken through the maritime route. Inland Water Transport (IWT) is one of the oldest economically and environmentally sustainable means of transportation. It consists of transportation through a network of lakes, rivers, canal, creeks, and backwaters. It is location-specific, and confined to regions that have waterways.

Offshore energy businesses

Offshore oil production is predominantly in the Gulf of Mexico (about 60 per cent of the industry is located in the Gulf of Mexico) and the North Sea. India remains an energy deficit country and imports 77 per cent of total domestic demand of 145 million MMT. Of the total 3.14 million sq, km of sedimentary basins of Indian EEZ, only

0.687 million sq.km is moderately to well explored and rest remains poor or unexplored. Offshore renewable energy production is very much in its infancy.

Off-shore mining

There is limited information about the value of the offshore mining industry or the number of people employed, but it is unlikely to be significant in comparison to terrestrial mining. As and when mining begins on the seabed beyond the limits of national jurisdiction (the "Area"), the framework established by United Nation Convention on the Law of the Sea (UNCLOS) will regulate the related activities. International Seabed Authority (ISA) is mandated to issue licences to explore for the riches that lie on the floors of the Pacific, Indian and Atlantic oceans. The ISA allows India to explore an area in the Indian Ocean up to 75,000 square kilometres (about 29,000 square miles), equal to roughly 2 per cent of the country's size. With the new licence issued at July 2014, India will start looking for polymetallic sulphides that are rich in copper, zinc, gold and silver in the Indian Ocean basin.

Tourism

Tropical coral reefs are very productive ecosystems. Not only they do support enormous biodiversity, but also of offers immense value to humankind. Coral reefs provide opportunities for a number of recreational activities such as swimming, snorkelling and SCUBA-diving and can attract visitors from across the globe. While some recreational activities may be undertaken privately, many require the support of local tour operators providing further livelihood opportunities for local populations. More than 100 countries and territories currently benefit from reef-associated tourism. In 2015, the global net benefits of reef tourism were valued at USD 12 billion.

Besides supporting marine biodiversity, reef ecosystems provide a number of ecological services and goods to human populations on a local, regional, and national level as they play an important role in coastline and habitat protection, nitrogen fixing, sand supply, climate records, fisheries, medicine, recreation and tourism. Beach tourism has grown significantly throughout the world bringing enormous economic benefits to host communities, and causing many environmental and social impacts to the coastal environment. Development of beach resorts and attractions continues to expand to meet increasing intra-regional and domestic demand which is supplemented by long-haul demand. As India is at its infant stage in beach tourism, an integrated approach is required to develop, promote and sustain beach tourism without any environmental and social impacts to the pristine beach environment.

Use of marine genetic material

The commercial exploitation of marine genetic resources had very modest beginnings in the 20th Century and at present is a subject of heated debate at international level. The value of the use of marine genetic material is therefore only just beginning to develop and projections of its potential economic value differ greatly among plausible scenarios for its future development. All scenarios assume that increase in commercial exploitation will be driven primarily by more developed countries, making issues relating to access and benefit sharing of marine genetic resources an important issue.

Southwest Indian Ocean Ridge is considered to be hotspots of biodiversity with many hydrothermal vents and seamounts. Hydrothermal vents have multiple commercial exploitation possibilities and scientific value. Species, which survive at such extreme temperatures and in highly toxic environments, have potential value for a wide range of medical, industrial, biotechnological and agricultural applications.

Exploration of deep-sea hydrothermal vents is likely to reveal further chemosynthetic communities. By possible collaboration with developed countries with excellent scientific expertise and infrastructure facilities in exploring deep sea, a new gateway in deep sea research may perhaps open in India. However, an Intergovernmental Conference to negotiate on an international legally binding instrument under the United Nations Convention on the Law of the Sea (UNCLOS) on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction is in the process at United Nations.

Different economic and socio-cultural aspects should be taken into consideration while evaluating the benefits and costs of different activities, prioritise needs, and encourage policies that maximize societal benefits from ocean and coastal resources in a sustainable way. This will aid us to achieve UN Sustainable Development Goals (SDG) especially SDG-14 which says to conserve and sustainably use the oceans, seas and marine resources for sustainable development. Nevertheless, India's Blue Economy Initiative, an innovative, integrated and multi-sectoral approach to the management of ocean and its related resources aim at maximizing the ecosystem goods and services obtained by the use of oceans, inland waters and wetlands, while also providing social and economic benefits.

Ornamental fish farming: An avenue for livelihood security and entrepreneurship development

B. K. DAS, D. K. MEENA, A.K. SAHOO AND H. S. SWAIN

Recreation and livelihood income through fisheries are the two important entities for personal and societal development of human being. Aquarium keeping is the second largest hobby in the world and the ornamental fish and aquatic plant industry is gaining importance due to its huge economic opportunities and prospects. Ornamental fish production sectors growing at an annual rate of 14 per cent. About 600 ornamental fish species have been reported worldwide from various aquatic environments. About 300 exotic species and more than 100 indigenous species of ornamental fish are being cultured and traded globally. At present, world trade of ornamental fish is estimated to be about USD 3.4 billion but India's share is only USD 0.25 billion, which shows its untapped potential.

The growth of ornamental fish trade in India is very much encouraging. Most of the ornamental fishes cultured and marketed in India are exotic species. Our country has a rich and unique biodiversity with a variety of indigenous ornamental fishes in Western Ghats and North East region of India, but these resources have not been properly exploited. The Western Ghats of India is a hub of tropical ornamental fishes and it is one among the 25 hotspots of the world. It exhibits exceptional mega biodiversity and high degree of endemism with respect to fresh water fishes.

In addition to this, Kerala has rich resources of indigenous ornamental fish in various river systems having 142 species, out of which 72 (51 per cent) are considered as possible ornamental value that have the potential to earn income for the rural people. Fishes like *Sahyadria denisonii* (former name *Puntius denisonii*) which is known as "Kerala Queen" has a high value in the international market. In North -Eastern part of India *Channa orientalis, Badis badis, Barilius sp, Botia sp.* etc. have high value as ornamental fish. Hence, the need of the hour is to develop the packages of practices to expand the ornamental fish trade across the country. In this backdrop, it is interesting to have a look into the present status, and potential and opportunities of ornamental fisheries in India, and way forward for commercial scale production for livelihood security and trade for better entrepreneurship development.

Steps required to develop ornamental fish trade

Ecolabelling and Green Certification: The need to have stamps and ecolabels is based out of some legal and policy issues which are related to environmental concerns and not maintaining resources on a sustainable manner. Some of the destination nations for Indian ornamental fishes have started having restriction on the incoming consignments due to some technical

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issues and return the consignments back to India. Ecolabelling and Green Certification are suggested to counter this. Ecolabel is a stamp put on the product, which indicates that particular product has been developed using sustainable and environmentally manner. Green certification includes standardization of breeding technology of important Indian ornamental fishes for conservation and export with the guidelines of authorised institution like MPEDA. The authorities have put different type of ecolabels (Ecolabel-I, II, III etc.), to screen out the ornamental fish for better international market.

Breeding and seed production of commercial varieties of important ornamental fish

As it is well known that the ornamental fisheries in India is considered as part of alternate or sustenance income through backyard farming and by developing entrepreneurial level for domestic trade. Therefore, there is a need to develop the breeding protocol for important ornamental fishes for maximising the international trade along with backyard business.

Standardization of various live food production systems

The success of ornamental fish rearing is critically dependant on various factors. Among them, live feed production and supply are very important due to many reasons. The larvae and even if some of the fish are very small in size they cannot take artificial feed due to bigger size and live feed acts as stimulant due to their twitching movements. Moreover, live feed does not degrade the water quality. Live feed can be used as medium for enrichment for colour enhancement and other benefits so, it is highly essential to setup an ample live feed production and to ensure the supply for sustainable ornamental trade.

Public Private Partnership mode (PPP) for ornamental fish trade

Development of ornamental fish villages in different parts of the country by involving the State governments and other stakeholders. It is necessary to harbour the natural resources, which are diversity hot spot and envisage an ample number of ornamental fish endemic to the particular wetlands, rivers and other resources. There should be collaborative approach starting from research institution to involvement of private entrepreneurs and State government so that the research and development both can be propagate for sustainable ornamental fish trade.

Development of model aquarium

Development of world class public aquaria in every state capital especially in major metropolitan cities for the public, students, entrepreneurs and hobbyist for popularisation. Once, it is popularised, will create a deep interest among different stake holders.

Development of ornamental hatchery using quality stocks

Good quality stocks of important commercial varieties should be available in India for farmers so that good quality of offspring can be produced to fetch a good market price. Development of large scale hatcheries is highly essential, in every State for seed distribution for growers.

Showing male and female Angel fish, Pterophyllum scalare

Showing Sword tail, Xiphophorus hellerii breeding procedure

Awareness and human resources development

Development of trained manpower on breeding and farming practice with an exposure to Asian countries such as Singapore and Malaysia is essential. Simultaneously, unemployed youths and rural women are to be encouraged for production and trade. The education system and research activities should cover the new concept like "Students Ready", to encourage more students to do research by educational institutes. Moreover, the concept of 'Learning by Doing' can also be introduced for better orientation of rural youth and interested youngster who can think of the ornamental business.

Economics of a small-scale breeding and rearing unit

An ornamental fish production unit may be of three types – a breeding unit, rearing unit or combined breeding and rearing unit. The profit depends on the carrying capacity, candidate species and infrastructure. For instance, average cost and return of a breeding and rearing unit of live bearers with a total cost Rs. 13,000 (capital and culture cost of 3 cement cisterns, 5 mx 3m x 2 m, and 2 glass aquarium of 2.5 ft x 2 ft x 1 ft), will in turn have an annual profit of Rs. 28,000. Accordingly, the profit will vary as per the size of the infrastructure.

This showed the potential of ornamental farming at small scale, however, the marginal and small farmer should see the feasibility of marketing.

Practices of ornamental fish culture in potential states

West Bengal

About 2,000 people are involved in ornamental fish trade, and 150 families are involved in ornamental fish farming to maintain their livelihood. Ornamental fish farming is considered as an additional income generating business in 500 families. Some small-scale fishers have established ornamental fish farming as a small-scale business.

The general culture practices followed by the small-scale ornamental fish farming of West Bengal are as follows.

Sites of ornamental farming

The main sites of ornamental fish farming are located in North and South 24-Parganas, Nadia, Hooghly, Howrah districts nearby Kolkata in order to market their fish. Howrah is the largest wholesale ornamental fish market in India from here fish are distributed to different destination using different mode of transportation.

Cluster of fishers

Normally, there are no planned clustering of fishers here, however, the work distribution is based on priorities. The engaged family can earn a monthly income of USD 50-100. Usually, the men have other priorities profession and their work is to collect seed and to market the produced ornamental fish while the daily routine care such as water exchange, feeding and others, is taken by women and children.

Fish Species

Mainly two types of ornamental fish are culture and marketed, exotic ornamental fish and native fish of India. More than 200 species of these freshwater fish are bred in different parts of India, and ornamental

fish farmers of West Bengal are mainly engaged in breeding and rearing of common exotic live bearers and egg layers. Among the preferred fish, common exotic live bearers of poecilidae family like guppy, molly, sword tail etc. and egg layers like gold fish, tiger barb, Siamese fighter, etc. In addition to breeding, they are collecting the fry of native ornamental fish including honey gourami, rosy barb, zebra fish, glass fish, Reticulate loach and selling them. About 52 native fish species from West Bengal have been earmarked as aquarium fish (Ghosh et al., 2010).

Backyard culture facilities

Generally, cement cisterns, all glass aquaria, earthen ponds, and earthen pots are being used for ornamental fish rearing. The urban and suburban landless farmers use cement cistern in the backyard or on the roof. Small earthen tanks can be used for rearing juveniles with the food fish. Marginal farmers even use large earthen pots of 1.5m diameter for rearing the larvae and juveniles.

Marketing

Kolkata is the main centre for distribution of ornamental fish from India. Two categories of market run for exotic and native fish. More than 99 per cent of the exotic species are sold out into domestic market and left over species like gold fish and angelfish are exported. Whereas, 90 per cent native ornamental species are collected and reared to meet export demand. The amount of marine ornamental fish trade is negligible in this area.

Karnataka

Potential Site of ornamental fish farming

Before the inception of the National Agricultural Innovation Project (NAIP) in the Chitradurga district of Karnataka, the farmers were not aware of ornamental fish culture. Thereafter, initiatives taken by MPEDA, helped several beneficiaries to open breeding units in Shimoga (15), Haveri (3), Davangere (2) andunits in Mysore, Chikmagalur, Kodagu and Chitradurga also.

Fish species

As the ornamental trade is taking up the pace in the State, the live bearer is the prime choice along with other fish species.

Backyard culture facilities

Ornamental fish farming is done in cement tank/cistern and by introducing the suitable varieties of ornamental fishes (Molly, Guppy, and sword tail).

Clusters of fishers

As initiative from Government of India and State government, farm women were being trained and exposure visits were arranged to the establish fishery units around Bangalore, besides showing assured market. Formation of ornamental fish grower association further led to forward and backward linkages which secured good prices for ornamental fish. In the fairs, the farm women and Self-Help Groups are also selling fish to the customers at the rate of Rs.150 for a pair of fishes in 6 or 8" bowls along with a packet of feed (25 g) and a twig of ornamental aquatic plant.

Marketing

Marketing is taking place through Bangalore mainly, however, the scattered domestic marketing is taking place in other places also.

Odisha

Fish species

As such the ornamental farming is not developed in Odisha, despite its potential. Ornamental fishes found in Odisha waters are: *Danio rasbora, Trichogaster spp, Gara spp, Botia spp. And Carasius auratus*. In addition to this, ICAR-CIFA has recommended live bearers such as molly, guppy and others under fish village initiatives, for back yard farming. There may be scope for live bearers (guppy, molly, swordtail and platy), gold fish, koi carp and fighter fish for back yard farming in Odisha.

Concept of fish village

The concept of fish village involves the integrated approach of proving capacity building and exposure by research institute like, ICAR-CIFA, financial support by the Agricultural Technology Management Agency (ATMA), Krishi Vigyan Kendra, Deogarh for popularisation the new vocation in the farmers. Fish village was established at two place; Landijhari and Sarouli in Deogarh district of Orissa as part of promotional activity for rural aquaculture.

Clusters of fishers

Efforts are being taken by State Government, and other institution to develop SHGs and other cluster groups for ornamental fish farming development in the State.

At present 177 beneficiary farmers are involved ornamental fish culture from 4 villages i.e. Landijhari, Saruali, Nuagaon and Daanra (newly adopted). Mobilization, awareness, skill building through training, exposure visits, handholding of the farmers, backyard unit establishment, guidance and technical support have been given with market linkage.

Farmer's meet and demonstration programme were conducted at each village where villagers showed their interest and attended the programme for knowledge sharing in the community. On an average 2,90,100 live bearers have been produced by 124 farmers with an average income of Rs. 7,000-9,000 per 8 months with an investment of Rs. 4,000-6,000 per farmer.

The new village "Daanra" is added in Barkote block, where 12 backyard units have coming up and in 2015-'16 they have produced 4,100 livebearers, specially guppy, molly and platy. Linkages have been established with State administration for setting up a field laboratory and construction of new concrete tanks besides ATMA's financial support of Rs. 2,000 per farmer.

Input distribution like FRP tanks and other accessories have been made to selected 50 farmers of Landijhari, Saruali and Nuagaon for production of livebearers under CIFA-NAIP which boosted their production. Technical guidance also provided for breeding and rearing of ornamental fishes, especially for gold fish and Koi carp.

Marketing

In Bhubaneswar, there is big market for ornamental fishes and other pets. There are around 30-40 shops of ornamental fish. In other districts also few shops of ornamental fishes have opened. Most of the stock made available in these shops come from Kolkata and Chennai.

Prospectus of ornamental fish trade in India

India's overall ornamental fish trade was about USD 1.06 million during 2009 (UNCOMTRADE, 2014) which can be doubled with scientific intervention, harbouring the geographical spread, extensive species diversity and intensive research and development effort that are already put in by the research institutions such as ICAR- CIFA, ICAR-CIFE, ICAR-CIBA, ICAR-CMFRI and ICAR-CIFRI. Increased production will provide avenue for livelihood security which is witnessed by strong demand from domestic and export markets. Surging livelihood security options would create a quest for expansion of ornamental fish exporters, subsidies in the industry may be momentum to enhance export earnings (Herath and Wijewardene, 2014).

It is highly warranted to campaign breeding operation with major species suitable as per their favourable season for breeding, to ensure a sustenance expansion of ornamental fish trade. An innovative entrepreneur can earn much higher profits by implementing such activities to explore the natural (freshwater, marine and brackish water) ornamental resources of the country.

The natural resource of fresh water, Western Ghats, NE region and peninsular region must be explored in intensive manner, the possibility and opportunity in brackish water must be encashed. Indian Maritime zone in the proximity of the Andaman, Nicobar (Murugan et., al, 2008), Gulf of Mannar, Palk bay, Gulf Kutch and Lakshadweep islands have a potential for ornamental

Showing Tiger barb, Puntigrus tetrazona brooders

fish which could be rationally exploited and exported. More than 500 species of fishes and 200 species of invertebrates are available in these islands and India can annually export marine ornamental fishes to the tune of USD 340 millions by the exploitation of these islands. Ornamental fishes from the marine origin have tremendous competition in international market including Singapore, US, UK, Belgium, Italy, Japan, China, Australia and South Africa. CMS analysis revealed that exports were in fact more competitive in USA when compared to major export destinations namely Singapore and others (Prathvi et al., 2014). About 90 per cent of Indian aquarium fish exports from Kolkata, followed by 8 per cent from Mumbai and 2 per cent from Chennai (Felix, 2009). The global trade in the ornamental fish is estimated at Rs 5,000 crores, of which India has in the year of 2003-04, Rs.7 lakhs (Bojan, 2005).

At present the ornamental fish has created a big market in the past one decade which is witnessed with more than 3500 breeders, 5000 retail outlets and more than 2,000 commercial units in India. Moreover, in Bangalore alone, 1,200 outlets sell ornamental fish and the monthly turnover is around 1.5 crore. Despite of the potential of indigenous ornamental fish, the trade is mostly confined to import of exotic ornamental fishes from other States of the country particularly from Kolkata which are then sold out on the basis of temporary management. Most of these fishes are caught before their first maturity and sold in the market as food fishes. These indigenous ornamental fishes can easily be collected from the wild resources and can be cultured and reared for keeping in the aquarium.

Promotion of aquarium trade

For up scaling and promotion of any industry there is need to have subsidiaries bank and reliable financer. For instance, NABARD is providing the fund for promoting the activities related agriculture and allied sector. The Government of India provides financial assistance to the ornamental fish hatcheries, with a 10 per cent subsidy component of Rs. 15 lakh per unit with a capacity of 5-10 million fry every year. The Marine Products Export Development Authority (MPEDA) and the National Fisheries Development Board (NFDB) also have provisions for supporting enterprises in ornamental fish export. In order to make ornamental fisheries an export oriented industry, Matsyafed, and FIRMS are providing assistance for ornamental fish breeding and export.

Different State governments have their own strategies to develop the ornamental fish production. For instance, the Government of Kerala in public private participation mode (PPP), is providing the opportunities for investment and trade to promote the ornamental fish farming. In addition to this, the consultancy services provided by the research institution to cater the need of basic information related to ornamental fish breeding and culture is also highly valuable. Further, Government of India has taken initiatives on pilot scale to promote ornamental fish culture in Assam, West Bengal, Maharashtra, Kerala, Karnataka, Gujarat, Tamil Nadu and Odisha through cluster-based approach.

The ICAR-CIFRI is a partner institute in mega ornamental seed project and given the task of breeding and entrepreneurship development of important ornamental fish species of West Bengal, Assam and Odisha (Fig. 1a-1h).

Guideline for introduction of exotic ornamental fish

Ornamental fish is often used as a generic term to describe aquatic animals kept in the aquarium hobby, including fishes, invertebrates such as corals, crustaceans, crabs, hermit crabs, shrimps, molluscs, snails, clams, scallops, and also live rock.

Invasion of exotic ornamental fish species have numerous demerits like contamination of genetic pool, infestation of disease and ecological interaction with natural germplasm. As per World Trade Organization (WTO) Agreement, it is necessary to reduce the risks associated with ecological interactions and disease infestation. The disease outbreak due to introduction of exotics is witnessed by example of Koi herpes virus disease and Epizootic Ulcerative Syndrome.

As the ornamental trade is increasing, the negative impacts on ecological parameters also increasing simultaneously. Therefore, it is highly warranted to establish some management measures to regulate the negative impact of exotics on environment. Institutions like Department of Animal Husbandry, Dairying and Fisheries (DAHDF), Ministry of Agriculture have come together to frame these norms in consultation with National Bureau of Fish Genetic Resources (NBFGR), Central Marine Fisheries Research Institute (CMFRI) and Central Institute of Brackish Water Aquaculture (CIBA). The guideline involves different definitions of related subjects to ornamental fish, requisites, mode of transport, quarantine measure and certification etc.

Conclusion

Ornamental fish breeding and culture can be a promising alternative for many people as well as

unemployed youths. Despite of its advantages in terms of requirement of little space and less initial investment than most other forms of aquaculture, however it is being neglected and ornamental fishes are caught as food fish, which led to both losses diversity and economic losses. The main requisites for ornamental fisheries are; understanding of habits and biology of the fishes. Due to less manpower necessity, the women or the elders can run small home aquarium units and improve their social and economic development.

The demand for ornamental fish, freshwater, brackish water and marine ornamental fishes is increasing. Most of the traded marine ornamental fishes are being collected from the wild and so, the development of marine ornamental hatchery technology and production of young ones to satisfy the increasing demand in the export market is necessary. So, there is quest to develop the breeding technology for ornamental fish for better entrepreneurship development and livelihood security.

The concept of designer fish may also be applied into ornamental fish trade as the value of any ornamental fish in mainly depends on its colour attractiveness. Therefore, the dietary inclusion of colour enhancer like carotenoids and other live enriched feed may also be used for better colour appearance.

As some of the indigenous fish species are endemic to the particular region, for instance, the wetlands of West Bengal, particularly oxbow lakes which has link channel with major rivers, are good source of ornamental fish species. But due to loss of connectivity of wetlands with river, these species are in the verge of extinction.

So, there is urgent need to develop breeding technology of such indigenous fish species such as *C. fasiata* and others. Therefore, the intervention of ICAR- Central Inland Fisheries Research Institute, is highly mandatory to establish the breeding technology for such important species which would serve both purpose; first livelihood and nutritional security and second one is biodiversity and conservation of the fish species. For the promotion of ornamental fish farming and trade the research institutions in collaboration with State Governments should develop the concept of Fish Village in the line of ICAR-CIFA.

This will facilitate the promotion of rural aquaculture and up scaling of the ornamental fish farming across the country. Moreover, as a part of alternate livelihood option the potential of natural water bodies where ornamental fish are the regular residents may be harboured. Especially in States like Rajasthan, where commercial fisheries is not much practised, however, the natural water bodies having immense potential in districts like Bharatpur, Ganganagar etc. Therefore, the need of the hour is to develop the awareness and skill development in unemployed youth.

Further, freshwater ornamental fish breeding and rearing in backyard hatcheries should be popularised as a cottage industry, among the rural community and SHGs as an alternate vocation and commercial breeding and rearing to be given impetus in the private sector.

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Cobia Cage Culture Demonstration in Open Water Body

The Regional Division of MPEDA at Kochi took out a demonstration on Cobia cage culture in open water body at Thuruthipuram Kayal of Puthenvelikkara village in Ernakulam district through a private beneficiary Mr. Anthappan (Jenson) of the same village.

The main objective of this demo was to popularise the production of marine fish Cobia in cages as a part of aquaculture diversification for export production by a common farmer using simple technology.

Salient Features

Date of stocking fingerlings: 12 March 2019
Date of Harvest: 21 July 2019
DOC: 131 days
No of Cobia fingerlings stocked/ ABW: 450 nos./ 200 gm
No. of cages/ size of each cage: 5nos/ 4mx4mx3m
Range of water salinity during culture: 25 – 10 ppt
Quantity harvested/ABW at harvest: 505 kg/ 1.3 to 2.3 kg
Survival rate:-100%

Seed stocking

For demonstration, total five cages were fabricated locally by the farmer by using Nylon nets and GI pipe in two layers of size 4m (L) x4m (W) x 3m (H). GI pipes were coated with anti-corrosive paints to protect it from rusting. Twelve plastic drums were used for keeping the each of the five cages in buoyancy. Cat walks were also fabricated with GI pipes for feeding and monitoring. After making all arrangements, the cages were erected in the water body during March 2019 for stocking.

Fig.1. Cobia fish after two weeks of stocking into cages

Food and feeding

The fishes were provided with trash fishes like *Metapenaeus dobsoni* and Anchovies as feed. Fishes shown aggressive feeding nature and fast growth rate was recorded during the culture period. The size of the chopped fish pieces was changed according to size of fish in the cages. Total quantity of feed used during the demonstration was 2,550 kg with FCR is 1:5. The trash fishes were mainly collected from Munambam and Kottapuram fish landing centres.

Growth monitoring

Regular growth monitoring and sampling was done during the culture period. 80 per cent of the fish reached marketable size of 1.5 kg - 2.4 kg within 4 months of culture. Significant growth in fishes was observed throughout the demonstration with 100 per cent survival even in low salinity of 10-15 ppt towards harvest during July. Regular technical guidance to beneficiary was extended by the technical officers of MPEDA Regional Division, Kochi through field monitoring.

Fig. 2. View of cages with Cobia fishes under culture

Harvesting and Marketing

The stock from demonstration cages were harvested on July 21, 2019 on emergency basis due to sudden release of water in the backwater owing to heavy rain. After making all the arrangements like ice, labourers and vehicle for transporting the fishes in good condition, harvest started by 11.00 pm and was completed by 2:00 am. After sorting according to size, fishes were packed with ice in a ratio of 1:1 (15 kg fish with 15 kg ice) in crates and transported to Chambakara local market in Ernakulam. The total quantity of fishes harvested was 447 fish weighing a total of 505 Kg, with 100 per cent survival. Harvest was done in presence of MPEDA Regional Division Officials.

The DOC was 131 on the day of harvest. Most of the fishes attained size of about 1.5 kg – 2.4 kg. But about 5 per cent of the harvest was found to be of size 500 gm each only. The harvested fish, weighing 505 kg was sold in good condition and value realised through sales was Rs. 1,75,105.

This demonstration has been witnessed by a number of farmers in the area and many of them have shown interest in adopting this. In the area, best period for culture of Cobia in cages appears to be during January to June. However, availability of low cost pellet feed is essential for mass propagation of Cobia culture in cages by the farmers.

Fig. 3. Harvested Cobia fishes ready for marketing

Highlights of marine fish landings in selected harbours of India during June 2019

AFSAL V. V., N. J. NEETHU AND JOICE V. THOMAS
NETFISH-MPEDA

NETFISH, the extension arm of MPEDA, keep a record of boat arrivals and marine fish landings happening at the major harbours of India. This report describes the analysis results of harbour data obtained during June 2019.

Data Collection & Analysis

The fish catch and boat arrival data were obtained on a day-to-day basis by the Harbour Data Collectors stationed at selected harbours across the 9 maritime states of India (see Table 1). The name, registration number and type of fishing vessels arrived as well as the approximate quantity of major fishery items landed at the harbour were recorded by primary and secondary modes. The data were further analysed using online applications and MS office (Excel) tools to arrive at species-wise, region-wise, State-wise and harbour-wise estimations. During June 2019, data from 76 harbours along the 8 coastal states were obtained, which were analysed for this report.

Table 1. List of landing sites selected for data collection

Sl. No.	Maritime State	Harbour
1	Gujarat	Veraval
2		Jafrabad
3		Porbandar
4		Mangrol
5		Dwarka Rupen
6		Sutrapada
7		Chorwad
8		Umargam
9		Dholai
10	Goa	Vasco
11	Karnataka	Gangolli
12		Bhatkal
13		Mangalore
14		Malpe
15		Amdalli
16		Karwar
17		Tadri
18		Belekeri
19	Kerala	Munambam
20		Thoppumpady
21		Sakthikulangara
22		Koyilandi
23		Kayamkulam
24		Neendakara
25		Thangassery
26		Chellanam
27		Ponnani
28		Vaadi
29		Vypin
30		Beypore
31		Chettuva
32		Vizhinjam
33		Thottappally
34		Mopla Bay
35		Puthiyappa
36		Cheruvathur

37	Kerala	Azheekkal
38	Tamil Nadu	Colachel
39		Chennai
40		Nagapattinam
41		Karaikal
42		Pazhayar
43		Thengaipattinam
44		Cuddalore
45		Pulicat
46		Pondicherry
47		Poompuhar
48		Mudasalodai
49		Tuticorin
50		Mandapam
51		Mallipatnam
52		Kodiyakarai
53		Pamban
54		Tharuvaikulam
55		Rameswaram
56		Chinnamuttom
57		Kottaipatnam
58	Andhra Pradesh	Kakinada
59		Nizampatnam
60		Machilipatnam
61		Visakhapatnam
62		Vodarevu
63		Pudimadaka
64		Yanam
65	Odisha	Paradeep
66		Dhamara
67		Balramgadi
68		Bahabalpur
69		Balugaon
70	West Bengal	Deshpran
71		Sankarpur
72		Raidighi
73		Kakdwip
74		Namkhana
75		Fraser Ganj
76		Soula

Estimations on fish landings

A total of 18159.22 tons of landings of marine fishery resources was recorded from 76 landing sites during June 2019, which was composed of 6968.53 tons (38 per cent) of Pelagic finfish resources, 5025.65 tons (28 per cent) of Demersal finfishes, 3965.27 tons (22 per cent) of crustaceans and 2199.78 tons (12 per cent) of Molluscs (Fig.1).

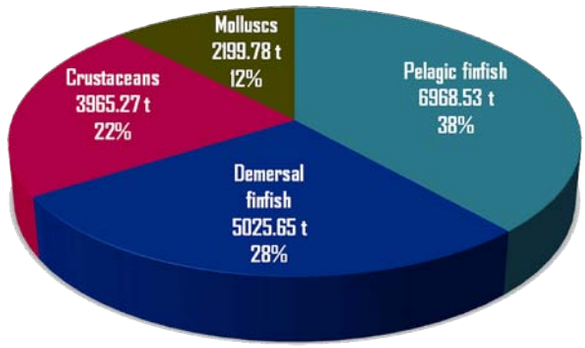

Fig.1. Category-wise fish landings during June 2019

The total catch was comprised of around 200 varieties of fishery items, among which the top five species were Indian Anchovy (*Stolephorus indicus*), Indian Mackerel (*Rastrelliger kanagurta*), Poovalan Shrimp (*Metapenaeus dobsoni*), Indian Oil Sardine (*Sardinella longiceps*) and Croaker (*Johnius spp.*) (Fig. 2). These five fishery items together formed 28 per cent of the total catch. The other major species contributed to the catch was the Bombay duck with a quantity of 745.46 tons. The species which registered least landing during the month was the Spiny lobster (*Panulirus ornatus*), with a quantity of 0.004 tons.

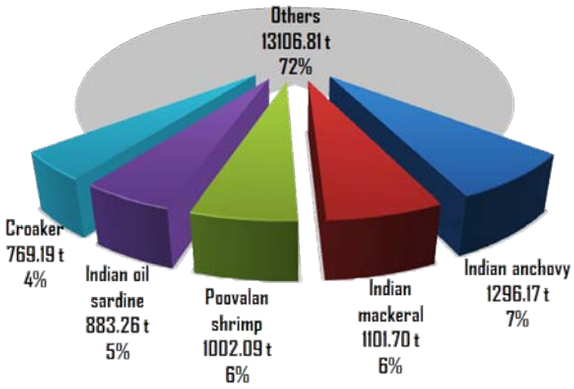

Fig. 2. Major fishery items landed during June 2019

Table 2 presents the quantity of various categories of fishery items recorded during June 2019.

Among the Pelagic finfish resources, Anchovies, Indian mackerel and Indian oil sardine were the major contributors and in the case of demersal finfishes, it was Croakers and Pomfrets which contributed more. Major items among Crustacean were Poovalan shrimp and Sea crabs, whereas among Molluscs Squid and Cuttlefish were the major items landed.

Table 2. Category-wise landing of various fishery items during June 2019

Fishery item	Quantity in tons
Pelagic finfishes	
Anchovies	1568.902
Indian mackeral	1156.084
Indian oil sardine	883.260
Tunas	851.124
Bombay duck	745.455
Shads	333.430
Scads	288.242
Trevallys	139.838
Seerfish	135.281
Sail Fish	108.265
Barracudas	105.539
Indian Salmon	94.255
Mullets	88.420
White sardine	73.352
Dolphin fish	62.068
Sillagos	52.710
Sword fish	47.679
Halfbeaks	45.960
Lesser Sardines	44.013
Silver Biddies	38.794
Marlins	31.478
White fish	17.031
Flyingfish	14.475
Herrings	13.089
Cobia	12.152
Queenfish	7.025
Spanish mackerel	6.588
Needlefish	1.510
Barramundi	1.051
Surgeon fish	0.756
Milk fish	0.450
Indian threadfish	0.250
Total	**6968.530**
Demersal finfishes	
Croakers	911.780
Pomfrets	632.007
Thread fin breams	600.436
Ribbon fishes	594.528
Lizard Fish	410.831
Sole fishes	371.472
Catfishes	367.569
Snappers	214.096
Ponyfishes	187.988
Rays	149.720
Goat Fishes	104.581
Bull Eyes	84.740
Reef Cods	74.771
Moon Fish	65.520
Sharks	52.806
Indian halibut	52.228
Congers	36.400
Triggerfish	26.280
Rabbit Fish	23.700
Emperors	20.818
Perches	15.246
Parrot Fishes	13.244
Threadfin	7.185
Leatherjacket	4.795
Seabreams	2.700
Trout	0.200
Flat Heads	0.005
Total	**5025.650**

Crustaceans	
Poovalan/ Kadal shrimp	1002.090
Sea crab	728.290
Pink/Brown shrimp/ speckled shrimp	467.580
Karikkadi/kiddi shrimp	431.570
Deep sea shrimp	233.020
Brown/ Pink/ Kazhanthan	229.500
Indian White shrimp	209.510
Indian Tiger shrimp	203.980
White Shrimp	141.080
Flower shrimp	99.750
Jawala / Thelly	78.920
Rainbow shrimp	70.080
Red Tail Prawn	18.790
Shrimp	18.040
Mud crab	14.010
Lobster	11.880
Banana shrimp	3.060
Kuruma shrimp	2.500
Argentine red shrimp	1.530
Yellow prawn	0.080
Total Crustaceans	**3965.270**
Molluscs	
Squid	791.920
Cuttlefish	703.110
Whelk	478.000
Octopus	226.750
Total Molluscs	**2199.780**
GRAND TOTAL	**18159.220**

Region-wise landings

From region-wise analysis of landings during June 2019, it is found that the South West coast had registered the maximum quantity and the least landing was from North West coast (Fig. 3). Along the South West coast a total of 6219.31 tons (34 per cent of total catch) of marine landings was reported from the selected 29 harbours of Kerala, Karnataka and Goa as well as West coast of Tamil Nadu. The North-East coast recorded 5832.87 tons (32 per cent) of fish catch, altogether from the 12 harbours of West Bengal and Odisha. In South-East coast, landings from the 26 selected harbours in Tamil Nadu and Andhra Pradesh were totalled to 5172.02 tons (28 per cent). The North-West coast comprised of Maharashtra and Gujarat coasts could contribute only 935.02 tons (5 per cent) to the total catch.

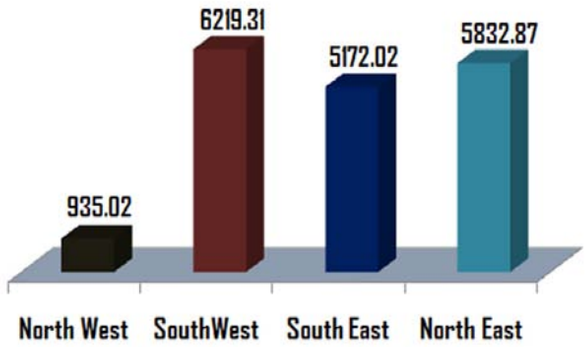

Fig. 3. Region-wise landings (in tons) recorded during June 2019

State-wise landings

Considering the State-wise catch, the maximum landing recorded was from Kerala, which was to the tune of 5840.51 tons (32 per cent of total catch) (Fig. 4). This was followed by West Bengal with 4166.40 tons (23 per cent) and then by Tamil Nadu with a contribution of 4156.99 tons (23 per cent). The State which reported least landing during the period was Goa, where only 32.56 tons (0.18 per cent) of marine fish catch was recorded. In view of fishing ban, no catch was reported from Maharashtra. The East Coast States together formed 62 per cent of the total catch.

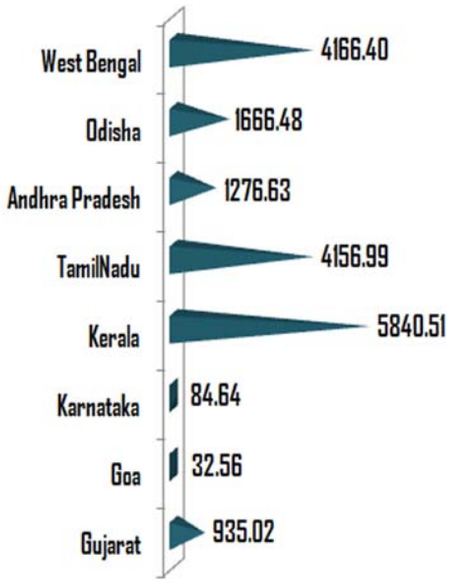

Fig. 4. State-wise fish landings (in tons) during June 2019

Harbour-wise landings

Figures 5 and 6 represent the fish landings recorded during the month at the selected harbours of West and East coasts respectively. Of the 76 harbours, Deshapran harbour in West Bengal registered the maximum landing of 1636.64 tons (9 per cent) and it was followed by Munambam harbour in Kerala with a landing of 828.20 tons (4.5 per cent). The least quantity of marine fish catch was recorded from Bhatkal harbour in Karnataka (0.07 tons).

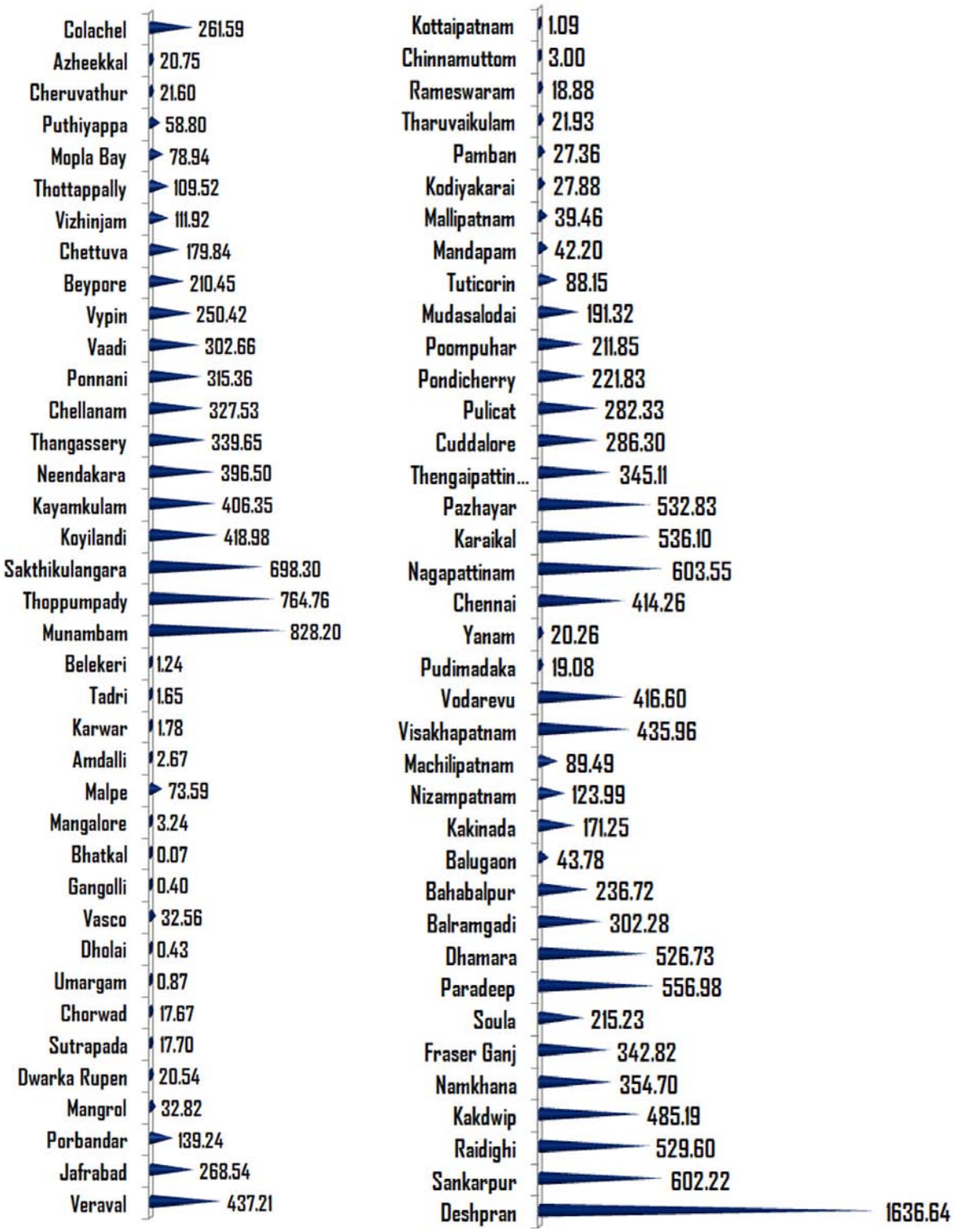

Fig. 5. & 6. Landings (in tons) recorded at harbours in west & east coasts during June 2019

Estimations on boat arrivals

A total of 22076 boat arrivals were recorded during June 2019, of which the highest recording was from Vizhinjam harbour (2108) and it was followed by Vaadi harbour with 1059 boat arrivals. The Chinnamuttom harbour had registered the least boat arrival during the month.

Summary

In June 2019, a total landing of 18159.22 tons of marine fishery resources was registered from the 76 major fishing harbours of India, wherein Pelagic finfish was the major contributor. Considering the fishery item-wise landings of the month, the Indian anchovy was the species which registered the highest landing.

Though 62 per cent of the total catch recorded during June was from the East coast, the maximum catch was reported from the South West region. The least contribution from the North-West coast can be attributed to the fishing ban period started in June. Kerala recorded maximum landing during the period and the Deshapran harbour registered the highest landing. However, the maximum boat arrivals happened at Vizhinjam harbour.

Meeting to spot Logistics Performance Index (LPI-S) for marine sector

A view of the meeting with IIFT and Seafood Exporters of Kerala Region

A meeting was held with members of SEAI-Kerala chapter at SEAI House, Willingdon Island on July 08, 2019 to identify the sector specific logistic performance index (LPI-S). This meeting was convened on the request of Prof. Nitin Seth of IIFT, New Delhi, as MPEDA is entering into a MOU with the IIFT on LPI-S.

The meeting was attended by nearly 19 members of SEAI-Kerala chapter, who are prospective marine exporters or processors. Dr. A. S. Upadhyay, Joint Director, and Mr. V. Vinod and Mr. Sreejith, Assistant Directors, MPEDA were among those who represented MPEDA and Prof Nitin Seth represented IIFT. Many critical points were raised during the detailed deliberations made at the meeting.

It was noticed that seafood processing industry is facing problem due to shortage of raw material and

their capacity remains unutilized. While sea catches is declining or at least stagnant, aquaculture export production is also not sufficient to meet the requirement in Kerala. This problem can be addressed only through aquaculture production of exportable fish species, for which special schemes need to be formulated by the State Government of Kerala for effective utilization of *Pokkali* fields and *Padasekharams* for prawn or fish cultivation.

It was also deliberated that availability of raw material especially through aquaculture need to be at a reasonable or lower cost so as to compete in the international market through export processing of such products.

Exporters stated that the industry is facing acute problem due to non-availability of skilled workers locally, as they no more interested to work with seafood processing or peeling units due to their assured employment and financial support through MGNREGA and other State Government social welfare schemes like offering rice for Rs.1/kg.

In order to reduce the associated risk on quality of frozen seafood items in sealed containers which are randomly opened by the customs officials at the port for checking, it was suggested to have a dedicated enclosed facility within the port area.

There is urgent need for modernisation of existing fishing harbours and fish landing centres and equipping them with required facility including fresh water, cold storage and chilled room facility as well as hygienic auctioning facility so as to minimise spoilage, quality deterioration in the catches. Also, such harbours need to be maintained properly through empowered harbour Management Committee, the meeting observed.

The meeting ended with Dr. A.S. Upadhyay, Joint Director, MPEDA Regional Division, Kochi proposing the vote of thanks.

Hands-on training on the Microbiological analysis of fish and fishery products

Mr. S. Asok Kumar, Deputy Director, MPEDA Sub Regional Division, Goa addressing the audience

MPEDA conducted five days' hands-on training on the microbiological analysis of fish and fishery products and validation of ELISA (2002/657/EC) at Goa in association with Mumbai Research Centre of ICAR-CIFT from June 25 to 29, 2019 at MPEDA subsidized laboratory of M/s. Albys Agro Pvt Ltd, Goa. The main objective of the proposed microbiology training was to give hands-on training to laboratory technologists of Goa region on various aspects of microbiological analysis of raw materials, finished products, sanitary and hygiene control samples from the reparation of samples, enrichment, inoculation, incubation and biochemical confirmation test for various parameters like TPC, E. coli, Staphylococcus, Salmonella, *V. cholerae*, and *V. parahaemolyticus* etc.

In total 24 technologists representing registered 14 seafood processing units of Goa region participated and were trained on microbiological technique used in seafood export unit. Most of the seafood processing units are following old microbiological protocol for microbiological analysis of fish and fishery products. Hence, the training was planned to update the microbiological protocol for the seafood testing in order to properly conduct microbiological examination in the in-house lab testing method.

In this training programme, all technologists were trained as per the Bacteriological Analytical Method (BAM) protocols. Inaugurating the programme, Mr. Rajendra Singh Jari, Managing Partner of M/s. Albys Agro Pvt Ltd, Goa, emphasized on the importance of safety of seafood products exported from our country. He pointed out the significance of training programmes and requested the participants to carefully attend the classes to get equipped themselves with updated knowledge on microbiological analysis.

Earlier, in his welcome address, S. Asok Kumar, Deputy Director, Sub Regional Division, Goa, explained the requirement for updated knowledge on microbiological examination of fish and fishery products in seafood processing establishments.

Dr. L. Narasimha Murthy, Principal Scientist, ICAR-CIFT, Mumbai; Mr. B. K. Jayanth, Deputy Director,

Views of the programme

Export Inspection Agency, Sub Office Ratnagiri and Mrs. Dipty Arvind Shiriskar, Assistant Director, Export Inspection Agency, Sub Office, Goa, also spoke on the need of the training progammes to tackle with latest improvements on microbial analysis and the important role of technologist in seafood processing plants.

Mrs. Dipty Arvind Shiriskar delivered a lecture on the rules and regulation to be followed in exporting of consignments to various countries as per EIC regulations as well as per importing countries requirements. Dr. L. Narasimha Murthy delivered a lecture on the processing method and good manufacturing practice of the seafood industry.

Later Dr. S. Visnuvinayagam, Scientist, ICAR-CIFT, Cochin, handled the microbiological training from June 25 to 29, 2019. The training started with pre-evaluation followed with the preparation media, sterilization and Aerobic plate count, *Staphylococcus aureus* and coliform, faecal coliform and *E. coli* enumeration, isolation of seafood pathogens like *Vibrio cholerae*, *V. parahaemolyticus, Salmonella* and *Listeria monocytogenes*. The suspected colonies were subjected to biochemical test then the pathogens were confirmed by the serological test (Slide agglutination test). As a part of programme, Validation of ELISA as per 2002/657/EC was demonstrated to find a detection capability.

The training programme ended on June 29, 2019 with the post evaluation followed by valedictory function where participation certificates were distributed and feedback collected from the participants.

Workshop on Stock Assessment of Indian Oil Sardine

A view of the inaugural session

The Sub Regional Division of MPEDA at Ratnagiri participated in a one-day workshop on the Stock Assessment of Indian Oil Sardine along the coasts of Goa and Maharashtra on July 03, 2019. The workshop was organized by Omega Fishmeal and Oil Pvt Ltd, a registered Fishmeal and oil manufacturer exporter in Ratnagiri in association with CPF (lndia) Pvt. Ltd., Chennai. They have launched the "Fishery Improvement Project" (FIP) for Indian oil sardine in 2017 along the West coast of India, limited to the coastal waters of Goa and Maharashtra with an intention to implement the international standards that are accepted worldwide for the well-managed fisheries.

The project is guided by the International Fishmeal and Fish Oil Organization (IFFO), UK and Mr. Duncan Leadbitter, the Director of Fish Matter Ltd, Australia, is the manager of this FIP. Mr. Duncan is an expert in fisheries, who has more than 22 years of experience in fisheries management in the Pacific Ocean and South East Asian Seas.

The project's main focus is to improve the efficiency of fisheries management and governance, together with environmental responsibility and transparent traceability of fishery products throughout the supply chain. Two similar workshops were conducted in 2017 and 2018 in Goa.

The Fishery Improvement Project (FIP) is a collaboration between the government agencies and the private sectors involved in the fisheries, more specifically the private sectors representing the fishermen co-operative societies, who are the main stakeholders. Those private associations include Ratnadurga Macchimar Society, Ratnagiri; Adarsh Macchimar Society, Ratnagiri; Vasco Fishing Boat Owners Marketing Co-operative Society Ltd, Goa and Zuari Marketing Fisheries Co-operative Soceity Ltd, Goa, The government agencies involved in the FIP are Directorate of Fisheries, Goa; Department of Fisheries, Ratnagiri; College of Fisheries, Ratnagiri, Central Institute of Fisheries Technology (ClFT) Kochi, Central Marine Fisheries Research Institute (CMFRI) Kochi and Marine Products Export Development Authority (MPEDA) Kochi.

The project is progressing well in the past two years and on July 3, 2019, the third workshop in the series was organised at Hotel Vyankatesh Executive, Ratnagiri. The workshop started with an inaugural session chaired

by Dr. Hukkum Singh Dhaker, Associate Dean, College of Fisheries, Ratnagiri.

The session was attended by Mr. Amol Patil, Director, Omega Fishmeal and Oil Private Limited; Mr. Duncan Leadbitter, Director, Fish Matter, Australia; Mr. Anand Palav, Assistant Commissioner of Fisheries, Ratnagiri and Mr. Pichaiyut Tachapong, Vice President, CPF- India. The dignitaries on the dais lighted the traditional lamp to mark the beginning of the session. Mr. Amol Patil, Director Omega welcomed the participants and gave an introduction to the topic.

Mr. Manoj Kushe, Director, Omega Fishmeal and Oil Private Ltd, while delivering the felicitation address said that the project was initially covered only the Goa and Ratnagiri coast, but later on spread to the entire coastal belt of Maharashtra and Goa, considering the importance of the project. He stressed that the company is committed for a sustainable fishery and good fishery management in line with the Code of Conduct for Responsible Fisheries.

In his keynote address, Dr. Hukum Singh Dhaker, Associate Dean, College of Fisheries, stressed the need for certification of fisheries in the seafood export sector as most of the importing countries have started demanding for eco-labelled products to ensure its sustainability. He also said implementation of FIP is a proof of true intention of the government's and related seafood industry's effort to create a sustainable fishery for the business. This step comes in the light of the problems of IUU fishing and overfishing that resulted in the decline of fish stock for the past few years.

Dr. Dhaker also mentioned about the stock enhancement observed in Kerala coast after implementing the Minimum Legal Size (MLS). He said that similar regulations shall be implemented in Maharashtra also. He also expressed the full support from College of Fisheries, Ratnagiri for conducting the Stock Assessment studies.

After the inaugural session, Mr. Duncan Leadbitter made a presentation on the 'Review of the Fishery Action Plan and purpose of the workshop'. He covered important aspects such as the requirement of data collection for FIP, Fish for future, International demand and on International Fishmeal and Fish Oil Responsible Supply Standard (IFFO RS) sourcing policies.

He mentioned that stock assessment is one of the important aspects in FIP and as per the IFFO RS standards that has to be done in every three years as a minimum requirement. He also enquired whether other species of sardines can also be included in the stock assessment studies. Dr. Leadbitter highlighted that the main goals of FIP are:

• To ensure that fisheries products come from responsible fisheries sources and can be traceable throughout the supply chain.

• Supply chain must be transparent and the related information shall be clearly communicated among international buyers and all stakeholders.

• The implementation of effective fisheries management that prevent, deter and eliminate IUU fishing and overfishing as well as the protection of wider marine ecosystem.

• The development of credible monitoring and traceability system that reduces IUU fishing and protects those that respect the rules.

The presentations that followed were made by the faculty members from College of Fisheries Ratnagiri.

Dr. T. R. Gibinkumar, Deputy Director, MPEDA receiving the certificate

Dr. Vishnudas Gunaga, JTO, MPEDA receiving the certificate

Participants with dignitaries

Dr. M.M. Shirdhankar, Professor and Head FRESE, College of Fisheries, made a presentation on on 'Current stock assessment approaches and methods"; Dr. V H Nirmale, Assistant Professor, College of Fisheries, on 'Requirement for Future stock assessment'; and Dr. R.A. Pawar, Professor, College of Fisheries on 'Characteristics of the catch with special reference to by-catches'.

The workshop concluded with a valedictory function in which the certificates to the participants were distributed. Mrs. Latha Srinivasan, Vice President, CPF, proposed the vote of thanks.

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Inspiring Journey of a Science Graduate from a Carp Culturist to GIFT Consultant

A view of GIFT demo pond

Tilapia, a native of Africa and Middle East, is today one of the most productive and accepted fish in the global market. They are being farmed in 127 countries worldwide. The global tilapia aquaculture production in 2017 was 5.9 Million Metric Tons, with China and Indonesia continuing in the lead positions (FAO 2019).

The species of Tilapia commercially adopted for culture worldwide are Mozambique tilapia (*Oreochromis mossambicus*), Blue tilapia (*O. aureus*), Nile tilapia (*O. niloticus*), Zanzibar tilapia (*O. hornorum*), and Red belly tilapia (*O. zilli*).

The development of Genetically Improved Farmed Tilapia (GIFT), with the specific objective to improve commercially important traits of tropical farmed fish, is a major achievement in the history of tilapia aquaculture. Mono sex culture of this hardy and promising species is suitable for adoption by aquaculture farmers because of the faster growth as well as larger and more uniform sizes of male fishes.

Introduction of GIFT in Odisha

Prior to 2012, tilapia culture was solely practised in traditional manner along with Indian Major Carp (IMC) in open ponds – either with feeding or without feeding. The Marine Products Export Development Authority (MPEDA), Bhubaneswar introduced the culture of All Male Tilapia in scientific way using hatchery-produced seeds from Rajiv Gandhi Centre for Aquaculture (RGCA), the R&D arm of MPEDA, and formulated feed during 2012-'13. This was done through one of their field demonstration programmes in Balasore district of Odisha. The species started gaining popularity among the farmers in the State in the subsequent years as a result of regular demonstrations.

The Journey Begins

Mr. Saurava Kumar Biswal, a resident of Tulang village of Jagatsinghpur district, is an active aquaculture entrepreneur whose career profile progressed from that of an active aquaculture farmer to that of a consultant for the project of Malaysia-based World Fish Centre. The Centre in Odisha was launched by the Department of Fisheries, Government of Odisha. Mr. Biswal had been active in the culture of Indian Major Carp (IMC) for a decade-and-a-half and had once tried farming of *Litopeneous vannamei*. In 2016, he came to know about the field demonstration programme on the culture of GIFT proposed by the Regional Division of MPEDA, Bhubaneswar and applied for the same.

Successful first crop

The officers of MPEDA Bhubaneswar assessed feasibility of Mr. Biswal's farm. A pond with water spread area of 1.0 Ha in his 6.8 Ha farm was selected for the GIFT culture demonstration, the site being ideal with road accessibility, electrification with own 25 KVA

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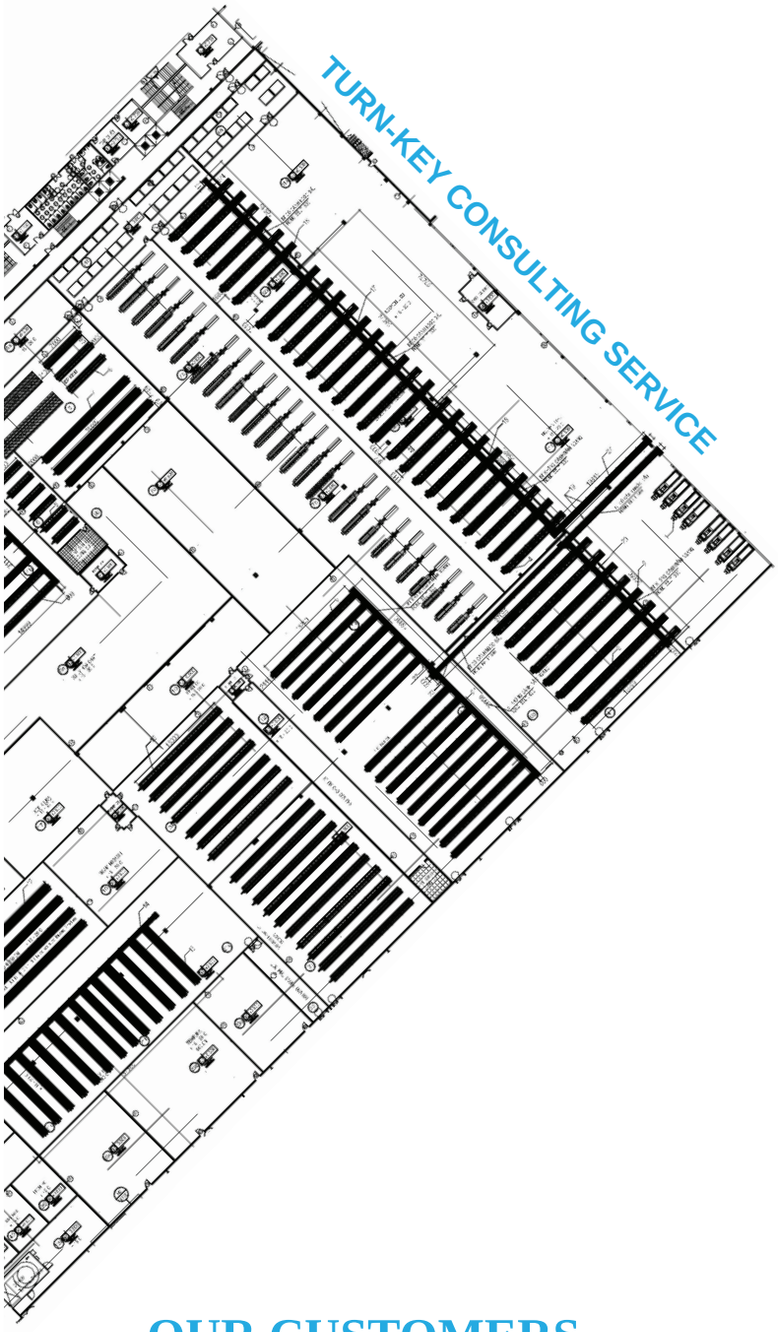

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Stocking GIFT seeds in nursery happas after acclimatization

transformer, one 7.5 KVA DG set, aerators and pumps and being run by an experienced farmer.

Additional infrastructure facilities including bio-security measures to comply with the guidelines for tilapia culture in India, issued by the Department of Animal Husbandry and Dairy, Government of India, were set up in the farm before applying for registration of the tilapia farm and getting permission from the Department of Fisheries, Government of Odisha.

During the second week of August 2016, 16,000 high-quality selectively-breed GIFT (breed of World Fish Centre, Malaysia) all male seeds were procured from RGCA Tilapia Project at Manikonda, Kankipadu Mandal, Krishna District, Andhra Pradesh in proper packed condition. A good survival of 99.5 per cent was observed even after the long 16 hours of transportation by road. Seeds of 2-3 cm size were stocked in happas (8 nos.) through proper acclimatization. The nursery-reared seeds were fed with pelletized 32 per cent high protein feed, six times daily by broadcasting and achieved an average body weight of 10 grams and 95 per cent survival during the rearing period of 22 days. The fishes were then released to the pond were fed with formulated floating pellet feed of 2 mm size with 26 per cent protein, and then 3 mm size with 30 per cent protein and finally 4 mm size 24-26 per cent protein. Feed was applied two times a day till they attain weight of 750 gms.

Pond, water and crop monitoring were made by Technical Officer of MPEDA, Bhubaneswar by visiting the farm frequently and adhering to RGCA guidelines. The feed amount was estimated based on fish sampling throughout the entire culture period. The fishes were observed to take feed actively showing schooling behaviour. 11.80 MT of feed was used in the first crop and Feed Conversion Ratio was 1:1.28.

Mr. Biswal did not report any specific problems during the eight months' culture period, except rare algal bloom issue and a few mortalities caused by cannibalism. He has also reported that medicines, antibiotics, chemicals etc were not used in the pond.

At the end of eight months, total of 9,168 kgs of GIFT fishes with an average body weight of 750 grams (survival 76.40 per cent) were harvested and sold at the rate of Rs. 80 per kg. He recalled that difficulties were faced in marketing after the harvest of first crop of GIFT, but gradually overrun the situation and he could sell at the rate of Rs. 100 per kg.

The success of GIFT culture demonstration programme in the farm of Mr. Biswal became a waking call for many farmers across the districts of Odisha. Soon after the completion of first crop at his farm, nearly 36 farmers

in Jagatsinghpur, Kendrapara and Cuttack districts started culture of GIFT. After his hard work yielded good result in the first crop, Mr. Biswal made it a passion for propagation of GIFT in Odisha and extended all possible personal guidance and supported the first batch of 36 farmers. He used to drive alone to RGCA project facility to procure seeds and stock them later in the farms.

Measurements during sampling

And the State Department of Fisheries played a relevant role in the expansion of Tilapia culture by providing financial assistance to eligible farmers. RGCA continued the pivotal role by supplying high-quality seeds and extended technical assistance whenever required.

Handing over of harvested Tilapia to the farmer

Experience becomes inspiration

In order to comply with the guidelines of MPEDA demonstration programme for diversification of export-oriented species, second crop was taken up in the same pond with 75 per cent financial assistance from MPEDA. This time, Mr. Biswal could achieve a targeted production of 10 MT from 1.0 Ha pond area. He recalled that he could achieve continued success in GIFT culture owing to several attributes such as quality seed, training which he received in nursery management, feed and algal bloom management and other technical assistance throughout the culture period. Several scientists and officers of CIFA (Central Institute of Freshwater Aquaculture), CIFRI (Central Inland Fisheries Research Institute), World Fish Centre and State Fisheries Department visited to observe the GIFT farming methodology.

Following the second crop harvest, MPEDA, Bhubaneswar organised a three days' hands-on training for 20 prospective farmers at the farm premises of Mr. Biswal. Experiences and technical know-how in GIFT farming were shared by Mr. P. Srinivas, Assistant Project Manager, Tilapia Project of RGCA; Mr. Arun Padiyar, Project Manager, World Fish Centre (a project to promote Tilapia farming in Odisha); Mr. Jananaranjan Samal, District Fisheries Officer, Jagatsinghpur district and Mr. U.C. Mohapatra, Deputy Director, MPEDA.

Presently about 95 farmers in the State are scientifically doing the culture of GIFT with the assistance of Department of Fisheries, Government of Odisha and by procuring quality seeds from RGCA Tilapia project.

An icon of excellence

Mr. Biswal emerged as an icon of successful GIFT farmer in Odisha, blessed with abundant freshwater and brackish water resources. He had a vision to make the tasty fish available so that demand is established for future market. He showed his excellence in marketing the produce by associating with Falcon Chilika Fresh outlets, which are operating in Bhubaneswar city. Bhubaneswar, Rourkela and Paradip port being the cosmopolitan cities and growing very fast with many business, education, health and tourism opportunities. This situation offered promising market for GIFT.

Mr. Biswal added another feather to his cap when he was appointed officially as a Consultant for the World Fish project in Odisha in association with State Department of Fisheries. He took it as a self-educating platform to learn from the experiences, involvement in these activities and interaction with the technical officers of various organisations and different farmer groups. With the expansion of area under culture of GIFT in the subsequent years, it is expected that processors and exporters in the State and neighbouring States would procure produce in bulk. It is also expected that the contribution of this exportable species from the hinterland of Odisha would become reflected in the export statistics.

Training on Shrimp Farming at Malgund

Sub-Regional Division, Ratnagiri organised a three-day training programme on "Eco-friendly and sustainable shrimp farming and aquaculture of diversified species" at Malgund village in Ratnagiri district from July 23 to 25, 2019. The main objective was to create a basic knowledge among the trainees on different farming methods for eco-friendly and sustainable aquaculture with special emphasis on diversification in culture using species having export potential. The programme was attended by 23 participants, including women self-help groups, potential farmers and fishermen.

Trainees with MPEDA officials

Malgund village in Ratnagiri district is located near Ganapatipule, a famous tourist place in the Konkan region. Hence, there is ample of scope for sale of fish in the local neighbourhood with value addition. Apart from that, Malgund village is also gifted with both cultivable brackish water as well as freshwater area for prawn, shrimp and fish culture.

The village has a predominant fishermen community, who is interested to know about alternative livelihood methods as their traditional livelihood of capture fisheries is showing signs of decline. Keeping all these points in view, Jai Ambe, the local Women Self Help Group requested MPEDA Sub Regional Division at Ratnagiri to organise a 3-day training programme for the benefit of their members and to get the locals involve in shrimp and fish farming.

The training programme was inaugurated by Dr. Vijay P. Joshi, former Dean, College of Fisheries, Ratnagiri on July 23, 2019. In his inaugural speech, Dr. Joshi appreciated MPEDA for taking initiative in conducting such training programmes at the door steps of stake holders. He advised the trainees to take the advantage of the programme and update themselves with latest technology in the field of aquaculture. Dr. T. R. Gibinkumar, Deputy Director, Sub Regional Division Ratnagiri, explained the purpose of the training programme and about the role of MPEDA for development of shrimp and prawn farming.

During the 3-day programme, various topics related to the subject were discussed in detail by MPEDA officials Dr. T. R. Gibinkumar, Deputy Director and Dr. Vishnudas Gunaga, Junior Technical Officer. Dr. Joshi delivered lectures on first and second day of the training programme as resource person on 'scampi farming' and on 'ornamental fish and breeding'.

Inaugural speech by Dr. T. R. Gibinkumar, Deputy Director, MPEDA

Field visit to the Vannamei farm

On the second day of the training, Mr. Jaffer Wadkar, a progressive crab farmer from Bhatye, Ratnagiri, delivered a lecture on crab farming with a special session on 'vertical crab farming". Mr. Arun Alsae, progressive fresh water farmer as well as the Chairman of Kurundwad Urban Cooperative Bank from Akiwat, Kolhapur, was also invited as resource person for this training programme. He shared his experience of *Vannamei* culture in low saline lands of Kolhapur District with trainees.

A field trip was also arranged for trainees on the same day. They visited the *Vannamei* shrimp farm that belonged to Mrs. Shubhangi Vilas Patil at Varavade village. Dr. T.R. Gibinkumar, and Dr. Vishnudas Gunaga, who accompanied the trainees, explained the techniques involved in Vannamei shrimp farming and also clarified the various doubts raised by participants. Trainees also visited the freshwater reservoir in Malgund village, where they were explained how it can be used for aquaculture purpose.

At the culmination of the 3-day training programme Dr. Gibinkumar distributed the certificates to the trainees in the presence of Mr Arun Alase and Secretary of Jai Ambe, Women Self Help Group.

Awareness Campaigns on Misuse of Banned Antibiotics and Diversification of Aquaculture

Awareness programme at Akiwat village

MPEDA, Sub Regional Division, Ratnagiri organised two awareness campaigns on misuse of antibiotics in aquaculture and diversification of aquaculture. The programmes were organised at Malgund village in Ratnagiri district on July 08, 2019 and at Akiwat village in Kolhapur district on July 21, 2019. As many as 39 farmers as well as interested individuals benefited from these programmes.

At Malgund, the programme was organised at the office of Jai Amba Mahila Self Help Group, whereas at Akiwat the programme was organised at the farm site of Mr. Arun Alase, a progressive freshwater farmer.

At Malgund, Dr. Vishnudas R. Gunaga, Junior Technical Officer, MPEDA explained the consequences of using banned antibiotics in aquaculture. Dr. T. R. Gibinkumar, Deputy Director, MPEDA explained the role of MPEDA in the development of aquaculture in Maharashtra and stressed the importance of diversification in aquaculture. He also requested the participants to attend Aqua Aquaria India, 2019 to be held at Hyderabad and informed about the scheme of inter-State study tour planned by the Ratnagiri office of MPEDA.

At Akiwat, the programme started with introductory speech by Mr. Arun Alase, a progressive freshwater farmer and the beneficiary of the first Vannamei demonstration in fresh water area in Kolhapur.

This was followed by Dr. Vishnudas R. Gunaga talking about the ill-effects on health and repercussions happening in trade due to the illicit use of antibiotics in aquaculture. He also presented the list of banned antibiotics for use in aquaculture and requested the farmers to observe the contents of each input used in the culture pond. He advised the farmers to demand test reports from approved laboratories establishing the absence of banned chemicals in the inputs while purchasing the same.

Dr. T. R. Gibinkumar explained the concept involved

in 'eco-friendly and sustainable shrimp farming' and advised farmers to adopt the BMPs in shrimp and scampi culture. He appealed to the participants to diversify their culture with species having export potential such as tilapia, seabass, pompano etc., instead of just concentrating on *Vannamei*. Related literatures printed in local language were distributed to the participants.

Dr. T. R. Gibinkumar also informed the participants regarding the inter-State study tour going to be arranged by Sub Regional Divison of MPEDA, Ratnagiri for taking interested farmers to Hyderabad to attend Aqua Aquaria India, 2019. During discussions that followed, 13 participants made spot registration by submitting the filled in applications and by paying the required delegate registration fee.

The campaign programme had the presence of Mr. Ravi Gouda, Regional coordinator of NaCSA. He explained the activities of NaCSA and urged the participants to attend Aqua Aquaria India, 2019. He also informed the participants regarding the scheme of NaCSA that provides financial assistance for farmers to attend inter-State study tours. Mr. Arun Alase, lead farmer and Mr. Anil Chile, former Assistant Commissioner of Fisheries, Ratnagiri, co-ordinated the programme.

After the programme, a demonstration of determining biomass in the pond was held for the benefit of the participating farmers.

Demonstration of biomass determination in the pond of Mr. Arun Alase at Akiwat

A view of the participants at Akiwat village

Awareness programme at Malgund village

Training programme on 'Sustainable shrimp farming and diversified aquaculture'

MPEDA Regional Division, Kochi organised three day's training programme on 'sustainable shrimp farming and diversified aquaculture' at Vellangallur in Thrissur district from July 30 to August 1, 2019. The training, which was mainly focussed on the benefit to new farmers to promote sustainable and diversified aquaculture production by adopting BMP, was attended by 19 farmers.

During three day's programme, the trainees learned about different aquaculture practices of shrimp and diversified species, stock assessment, feed and feed management, health-disease management, PHT sampling, harvesting methods, postharvest management, marketing aspects, importance of farm enrolment as well as misuse of antibiotics in aquaculture. The technical sessions were handled by officials of MPEDA Regional Division, Kochi including Mrs. Elsamma Ithack, Assistant Director and Mr. P. Bijimon and Mrs. Manjusha K., both Field Supervisors. Mrs. Jomol C. Baby, Sub Inspector of Fisheries, Thrissur, also handled one of the training session. Mr. Ismail, a leading *L. vannamei* farmer and NFDB award winner, shared his success story of recent crop. Trainees were also informed about Good Management Practices (GMPs) in aquaculture.

As part of this training, participants were taken to shrimp farm site of Mr. Sudhakaran C. K. at Narayanamangalam, who is a leading *P. monodon* and *L. vannamei* shrimp farmer in the area. Use of soil and water quality testing equipment and different test kits were practically demonstrated during this visit.

After the technical sessions, an interactive session was held where questions raised by participants were clarified by Dr. A. S. Upadhyay, Joint Director, MPEDA Regional Division, Kochi. The participants were also informed about the vast potential available in Kerala for aquaculture export production by utilising *padasekharams* (paddy fields). Certificates and stipend were distributed to the participants in presence of Mr. Unnikrishnan, Vice President, Velangallur Grama Panchayat and Mr. Mohanan K. S., Ward Member.

Technical session

Certificates being distributed to participants

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Silver Pompano Culture Demonstrated for the First Time in Gujarat

Silver pompano (*Trachinotus blochii*) is tropical and very active fish with superior quality white meat that tastes similar to that of Pomfret. It is a popular fish in USA known as American Pomfret. Silver Pompano can be cultured in wide salinity ranges from 5 to 50 PPT and is suitable for open water cage culture as well as open pond. This is a prime candidate species for aquaculture having domestic market with the least farm gate price starting from Rs.300 per kg for 200 gm and above. Export market is yet to be explored with increased production through aquaculture.

As a part of diversification of species in aquaculture MPEDA Regional Division, Valsad, organised demonstration of Silver Pompano culture at Borsi Village, Navsari district and the main objective of the demonstration programme was to popularise Silver Pompano culture in Gujarat. Demonstration of Silver pompano was undertaken by adopting the techniques developed by RGCA. The demonstration pond of Silver Pompano culture was monitored by Mr. Maruti D Yaligar, Deputy Director and Mr. Bhavin Gheravar, Field Supervisor.

Pond preparation

The pond measuring an area of 0.5 ha size of HDPE-lined pond belonging to Mrs. Paliben P. Tandel at Borsi village, measuring an area of 0.5 ha, as selected for demonstration programme and bio-security measures like crab and bird fencing were installed. The pond was washed thoroughly using 5 HP pump and 100 kg bleaching powder was applied on the pond bottom. The pond was then filled with chlorine-treated water up to 1.50 m depth. Four aerators of 2 HP each, which were washed thoroughly with Potassium Permanganate, were positioned in the pond. Then, 200 kg of Calcium Carbonate was applied to adjust water PH at 8.0 and soil and water proboitics were applied during the culture.

HAAT System

MPEDA/RGCA introduces a novel aquaculture practice - HAAT system (Heterotropic Auto–recycling Aquaculture Technique) in which zooplanktons and beneficial bacteria populations are maintained in the culture pond. This controls the algal growth and maintains the water quality naturally. The zooplankton, including Rotifers and copepods, will consume all the nitrogenous and organic waste materials in the form of excess or unconsumed feed, excretory waste, dead algae biomass etc. and convert them in to live biomass of these zooplankton themselves.

Wheat bran milk

Wheat bran @50 kg along with 50 g baker's yeast with freshwater in a 300-litre bin and fermented for 12 hours. This is applied as first dose of HAAT inoculums (50 litres) and second dose was applied after one week and water transparency was maintained at 35 cm. The fermented milk of wheat bran was applied during culture period as and when required.

Stocking

RGCA Hatchery produced silver pompano fingerlings of 3 cm size was transported from Trivandrum to Mumbai by flight and from Mumbai to Borsi by road. The total transportation period was 23 hours. The pond measuring 0.5 Ha was stocked with 10,000 fingerlings (3 cm size) after 45 minutes of acclimatization. In two happas of 1 x 1 x 1 mt size were stocked with 100 fingerlings each to check survival rate. After 24 hours, seed stocking survival in happa was 45 per cent and after 48 hours, no mortality occurred.

Feeding

Pompano is a fast-moving marine fish. It requires highly nutritive feed to meet its energy spent. The floating feed containing 45 per cent protein was given as per demand, generally 4 kgs per day was continued for almost 120 DOC. Pellet feed intake was not increased more than 4 kg/day due to the presence of zooplankton in the pond and healthy zooplankton population was maintained using fermented wheat bran milk up to 120 DOC. The use of fermented wheat bran milk was stopped and water exchange was done as pond water salinity increased to more than 50 ppt. In fifth month of culture, feed intake started increasing and reached 23 kg/day as zooplankton population started decreasing in the pond. A total of 1265 kg of floating feed was used in 188 DOC and FCR is 1: 1.66. As per experience recorded, pellet feed is not required if HAAT inoculum is used for stocking density up to 10,000 per Ha, but growth will be slow.

Table 1. Details of feed and feeding schedule

Weight of the fish (in gms)	Feed size (in mm)	Protein %	% to be fed as per the biomass	Feeding / day	Feeding time (minutes)
3 to 10	1	45	20	4	40
10 to 100	1.8	45	8	4	30
100 to 200	3	30	5	3	25
More than 200	4	30	3	3	20

Fig.1 Harvested silver Pompano of different sizes

Water quality management

Water quality parameter are very important for the success of pompano culture. The water quality has to be checked regularly for water transparency, which should be kept above 35 cm always in order to avoid stress.

Water salinity should not be increased to more than 50 ppt and dissolved oxygen should be kept at 5 ppm always and total ammonia should be less than 0.25 ppm. After 90 DOC, weekly 5 per cent water exchange is very essential. Apply Potassium Permanganate at 0.2 ppm during culture period, whenever the animals are under stress.

Growth pattern

The growth of fish was 46 g in 115 DOC due to low temperature (water temperature varied between 17 to 220C for almost 45 days) and the fishes were mostly consuming zooplankton. The fish growth started increasing after accepting pellet feed and weight increased from 46 to 160 gm in 73 DOC.

Table-2. Growth pattern

Day of culture	Weight (g)
1	2
27	11
35	17
45	22
56	26
84	36
91	38
99	40
115	46
144	68
158	100
173	130
188	160

Harvesting

Harvesting was done, as in shrimp harvest, through sluice gate. The harvested fish was stocked in plastic crates by adding layers of ice in equal quantity at the bottom and top of the fish after taking weight of the fish. The catch size varied and there were three sizes of 125 g, 150 g and 200 g. The total quantity of fish harvested on May 08, 2019 was 723 kg of average size 160 gms and 40 kg in April. Fish sized above 200 gm has more demand in local and export market. The material was sold in local market by the beneficiary at Rs. 280 per kg and total revenue earned was Rs. 2,02,044.

Organoleptic Test

After the harvest of the demonstration pond, Organoleptic test was conducted and the members were of opinion that the taste of the fish was similar to that of Silver Pomfret.

Conclusion

The demonstration proved that the culture of Silver Pompano can be undertaken in brackish water aquaculture with HAAT inoculums without using any pallet feed with 10000 seed per Ha., but growth will be slow or using only floating feed with stocking density of 2 to 3 nos. per Sq.mt without using HAAT inoculums.

Mortality during culture can be controlled by keeping water transparency at 35 to 40 cm, dissolved oxygen 4 to 5 ppm, salinity below 50 ppt and Ammonia less than 0.25 ppm and Potassium Permanganate can be used at 0.2ppm whenever the animals are under stress.

To control marine ich, chelated Copper Sulphate solution may be used at 0.2 ppm. Always use dechlorinated water during culture to avoid problems from marine ich and sea lice. Aeration is very important during night time. So, aerators should not be switched off during night time.

After fish attaining 25 g size, sampling twice in a month is necessary and after 10 weeks 5 per cent water exchange per week is essential. Silver Pompano culture is a profitable venture as it can be cultured with HAAT inoculum without using any pellet feed and it is a good technique for small farmers.

Many farmers from Valsad, Navsari, Surat and Bharuch districts visited the demonstration pond during the samplings at Borsi and became interested in starting Silver Pompano culture. However, sufficient quantity of good quality seed is not available at appropriate time.

Seed and feed cost must be reduced to popularise Silver Pompano culture. Development of marine fin fish hatchery in all maritime States will boost the diversification of species in aquaculture in the country.

Scientists discover a new small catfish in northeast

A new small catfish has been discovered by a team of eight scientists working in northeast from the Sinkin and the Dibang River flowing in Arunachal Pradesh's Lower Dibang Valley District.

The scientists who are presently working in the Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences (PDDUIAS), Imphal, Rajiv Gandhi University, Itanagar, College of Fisheries, Agartala and Manipur University, Canchipur have named the new dark brown finger sized catfish species as 'Mystus prabini' to honour the memory of late Prabin Kumar Mahanta, former Director of the Directorate of Cold-water Fisheries Research, Bhimtal.

"The new catfish species which has a prominent narrow blackish mid-lateral stripe though it has similar look with other species of the group, was confirmed recently as a new catfish species only after DNA barcoding (DNA sequencing) though it was encountered earlier," said Achom Darshan, the main architect of the new discovery who presently works at PDDUIAS, Imphal. "The genus Mystus is a group of small catfishes, which Manipuris called as Ngasep."

Presently, there are around 46 species of Mystus catfish in the world, of which about 21 occur in India, said Darshan, who has described 13 new fishes so far.

The new species brings the total number of species of Mystus catfish recorded from the Ganga-Brahmaputra River basin to seven. Despite numerous previous studies, the actual diversity of the catfish remains poorly understood, he added.

Scientists in the Rajiv Gandhi University, Itanagar played an important role in the taxonomy while the molecular studies were assisted by scientists in the College of Fisheries in Agartala, which is under the Central Agricultural University, Manipur.

Well-known fish researcher Prof. W. Vishwanath of Manipur University, who works with the team, said, "based on the DNA Barcodes, which is also a part of the present paper, the new species (Mystus prabini) is very closely related to Mystus bleekeri, which is distributed in the Ganga in Uttar Pradesh and Bihar and some parts of the Brahmaputra drainage. It is also related to Mystus ngasep, which is found in the Chindwin drainage (Manipur valley), but more distantly than Mystus bleekeri."

The new species also resembles the Sri Lankan Mystus ankutta and Mystus zeylanicus by it's a long fleshy adipose-fin that contacts with the dorsal-fin. However, it differs from both these species in having lateral stripes.

– www.hindustantimes.com

IUCN's new Red List reports alarming decline in global freshwater fish species

According to the body, the world's freshwater fish species are undergoing a silent decline.

Freshwater fish species globally are under grave threat according to the latest edition of the International Union for Conservation of Nature (IUCN)'s Red List. In fact, over half of Japan's endemic freshwater fishes and more than a third of freshwater fishes in Mexico were threatened with extinction, the list of threatened species released on July 18, 2019, said.

The main reasons behind this were the usual suspects, namely loss of free-flowing rivers and agricultural and urban pollution. It was revealed recently that two-thirds of the world's great rivers no longer flow freely. Another noteworthy factor was competition with and predation by invasive alien species of fish.

"The world's freshwater fish species, which number almost 18,000, are undergoing a dramatic and largely unrecognised global decline, as made apparent in the high levels of extinction threat to freshwater fish species in Japan and Mexico," William Darwall, head of the IUCN Freshwater Biodiversity Unit, was quoted as saying in a press statement by the IUCN.

"The loss of these species would deprive billions of people of a critical source of food and income, and could have knock-on effects on entire ecosystems. To halt these declines, we urgently need policies on the human use of freshwaters that allow for the needs of the many other species sharing these ecosystems."

Is there a way?

According to experts, India's freshwater fish can still be saved. "There is no doubt that India's freshwater fish species are declining," Wazir Singh Lakra, former

Vice Chancellor, Central Institute of Fisheries Education told Down To Earth.

"The declining of water levels, pollution and other factors are contributing to this. However, our species are not yet at the point of extinction. They still have a scope of recovery," he added. Lakra said that the best way to prevent the decline of India's freshwater fish was to revive the country's rivers. "We just do not have the required amount of water in our rivers needed to sustain aquatic life. The biggest reason behind this is the construction of dams," he said. "In India, fisheries experts are not consulted for their advice before a plan to construct a dam is drawn up. Their advice is most important. If they can be consulted, it would mean a lot for freshwater aquatic life," he continued.

According to *Threatened Freshwater Fishes of India* published by Lakra in 2010 with three co-authors, 120 species of Indian freshwater fish species were threatened out of which, 71 were endangered and 49 were vulnerable. The report was a publication of the National Bureau of Fish Genetic Resources, Lucknow, of which Lakra was the then-director.

"India has an incredible diversity of freshwater fish, including many found nowhere else on earth. Of these, there are several in the most threatened category of Criticality Endangered, particularly in the southern peninsula, and many that are currently not assessed, which makes them extremely vulnerable," education and outreach officer of the non-profit Mahseer Trust, Steve Lockett said. He works on the hump-backed Mahseer of South India.

He added: "The main threats to native fish is gross and illegal pollution, and the loss of river flow and habitat due to dam building. Also, high up the list of threats are releases of invasive fish that bring potential diseases and over-compete for finite resources. Destructive fishing methods like use of poisons or dynamite not only harm fish, they also indiscriminately kill all wildlife and lessen the chances for future generations to sustainably harvest from rivers."

While agreeing with Lakra that river revival was crucial to save freshwater species, Lockett also highlighted the role of pollution and Indian laws. "The best place to start is enforcing laws that are as strong as any in the world. Pollution is very costly to the economy. I have read that it costs USD 500 million a year in lost productivity due to illness. Fixing pollution could help threatened fish, help businesses and boost water supply to cities," he said.

- www.downtoearth.org.in

MPEDA bets big on exports of live seafood by air

Realising the export potential of chilled and live marine foods, the Marine Products Exports Development Authority (MPEDA) is looking at the possibility of sending such shipments by air.

The agency has sought the Civil Aviation Ministry's intervention to facilitate logistical requirement for such consignments through the airports.

"Considering the higher unit value realisation of such cargoes, we are hopeful that the Ministry's involvement will be quite helpful in boosting exports of seafood in fresh and live forms, thereby enhancing the share of live and chilled marine products in the country's seafood export basket," said Mr. K. S. Srinivas IAS, Chairman, MPEDA.

To discuss the proposal, the Ministry has convened a meeting with major airports, airline operators and other stakeholders and has also formed a task force to steer forward actionable points that would be helpful to propel the export of live and chilled marine products to different destinations.

The export trade of live and chilled marine products -world over contributes around 20 per cent of the total seafood exports. However, the share of live and chilled marine products in India's total marine products exports is just 2 per cent.

As per the provisional figure 2018-'19, India exported 27,253 tons of live and chilled items valued at Rs. 996.62 crore (USD 143.85 million).

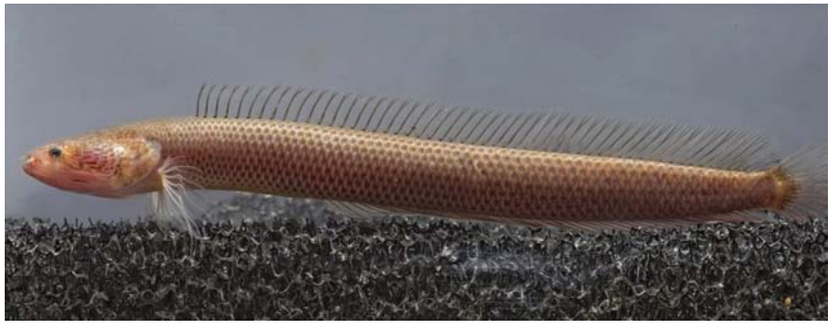
- www.businessline.com

New freshwater fish species discovered in Kerala

A new freshwater fish species was discovered in Kerala, a state blessed with freshwater resources, scientists said here.

This fish belonging to the subterranean snakehead species was found in the well of a house in Thiruvalla in Pathanamthitta district last year, they said.

The newly discovered fish, a cousin of the well-known 'varaal' and 'cher meen', is characterised by an elongated body, small size, a very large mouth, and most remarkably, the fin rays of the pectoral fin being greatly elongated as filamentous extensions. It is hypothesised that these extensions may be sensory in nature and used by the fish to find its way in the dark by touch.



Researchers at the Peninsular and Marine Fish Genetic Resources Centre of ICAR-National Bureau of Fish Genetic Resources (ICAR-NBFGR) here have described the species as *Aenigmachanna mahabali*.

The fish was collected by Arun Vishwanath, a native of Thiruvalla from the well in his house on April 2018. The discovery of this species comes on the heels of *Aenigmachanna gollum*, found earlier this year from Malappuram district.

It is remarkable that two species of Aenigmachanna have been discovered almost simultaneously, with a distance of over 200km separating them. Rahul G Kumar, a researcher with NBFGR who discovered the species, said nearly 250 species of fish are known from subterranean habitats across the world, with more being added to the list every year.

Some of these species have been discovered by explorers visiting underground caverns, but many have been accidentally discovered when wells are dug or cleaned, he said.

Researchers opined that Kerala is blessed with a variety of freshwater resources which are home to over 300 species of fish, about a third of which are endemic to the region. At the same time an equally varied and wonderful ecosystem exists, unrecognised and out of sight, in the extensive water bodies that lie below the ground, they said. In India, Kerala is an undisputed hotspot of subterranean fish diversity, with nine species known mostly from central Kerala in Pathanamthitta, Kottayam, Ernakulam and Thrissur districts.

"These subterranean fish species are characterised, for the most part, by adaptations which include a small adult size, red colour due to blood vessels near the skin, and reduced eyes and fins," they said.

According to Rahul, the discovery of fish, as well as crustaceans and other life forms, from subterranean waters is a reminder of the vast diversity of life which still remains to be discovered, studied and understood.

"The presence of fish and crustaceans in groundwater is usually an indicator of good water quality which can sustain life and residents have nothing to worry about over the discovery of these animals in their household wells," he said.

He said in fact given the rarity of specimens, people were encouraged to inform researchers when they encounter such life forms, as very little is known about the ecology and biology of subterranean waters and every little piece of information is useful.

"Groundwater resources across the world are being fast depleted, both by extraction and by pollution, and it is imperative that we implement measures to study and conserve these resources, both for the use of future generations and for the sake of the life that exists there," Rahul said.

- www.deccanherald.com

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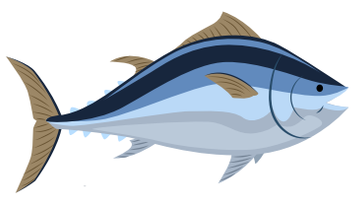

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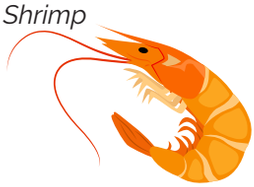

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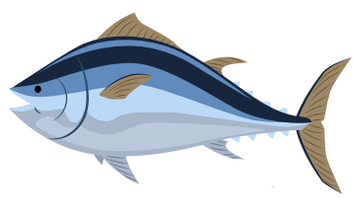

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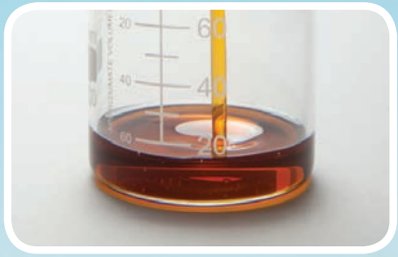
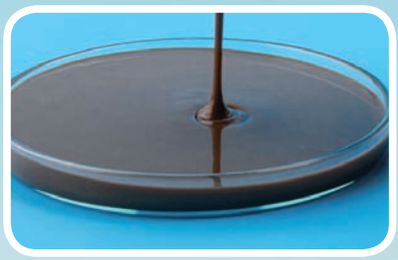

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Shrimp, Cuttlefish, Squid

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Mob: +81 80-9812-3826
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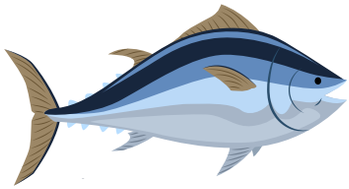
All kinds of seafood



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Shrimp sea caught, Squid,
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Shrimp

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All kinds of seafood

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Shrimp, Squid, Cuttlefish, Octopus,
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Shrimp Powder

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Fish Feed

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