MPEDA

Newsletter

VOL. IX NO. 3 JUNE 2021

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Arowana: The King of Aquarium

Chakkada: How a Simple Ride Enhanced Life of Saurashtra's Fishing Community

How to Tackle EHP Problem in Shrimp Farms?

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On the Platter

MPEDA
VOL. IX / NO. 3 / JUNE 2021 Newsletter

K. S. Srinivas IAS
Chairman

Friends,

The activities of an organization in the electronic platform measure the efficacy with which it disseminates information to the target group. The website of an organization is now considered as its face. MPEDA website is in existence for more than 2 decades, and we had been revamping it time and again accommodating as much information as possible on the goals and services of the organization. However, it was felt that the website needs to be more user-friendly, especially in the pandemic period, facilitating easy transaction of e-services offered by MPEDA. Considering this, it was decided to give a new face to the MPEDA website and this required integration of various services spread across different web portals and pages on the cloud to a single window system.

We had launched the refurbished MPEDA website on 14th June 2021, which provides the users an option to select the separate interface according to their interest and needs of service. This would facilitate ease of doing business to the stakeholders. The interface options could be used by exporters, importers, aqua farmers, fishers and seafood lovers as well. The interface for exporters provides export statistics, link for registration and other services relevant to them. The portal for importer has exporter's directory, product information and trade links. The services such as farm enrolment, Pre-Harvest Test certification, sustainable practices and advance technologies in aquaculture are extended to the interface meant for aqua farmers. In addition, the option also gives information about the activities and services of MPEDA societies, NaCSA and RGCA. The fisher's portal elaborates the capture fisheries, products classification, gears and crafts, information on species, fishing grounds and NETFISH activities.

The website is also loaded with a new page for seafood lovers that have various seafood recipes, blogs and videos as content. The page also encourages seafood lovers to submit new seafood recipes. I request the readers to visit the MPEDA website and provide critical feedback so as to improve it further.

During the month, we also had a meeting with the GACC authorities of China, wherein the Indian side had expressed strong concerns over the unilateral decisions taken by them alleging detection of Covid-19 nucleic material in seafood consignments exported from India and subsequent suspension of the units without providing evidences of testing and detection. Indian side has strongly demanded to have solid actions by the Chinese to smoothen the trade by revoking the suspension of the units and by stopping tests for Covid-19 nucleic material in frozen cargo, as it does not have any scientific basis.

Thank you,

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Emerging disciplines on Fisheries subsidies negotiations in the WTO

Prof. Mukesh Bhatnagar, Centre for WTO Studies,
IIFT, New Delhi

Fisheries subsidies negotiations were launched under the WTO Doha round in 2001 due to the persistent push of international civil society, NGOs, UNEP and World Bank reports highlighting that subsidies granted by governments to their fishing fleets had contributed to the depletion of global marine fish stocks as a result of over exploitation of fishery resources.

The Hong Kong Ministerial Declaration of 2005 clearly stated that: ***"Appropriate and effective special and differential treatment for developing and least-developed Members should be an integral part of the fisheries subsidies negotiations, taking into account the importance of this sector to development priorities, poverty reduction, and livelihood and food security concerns."***

Under the UN SDG (Sustainable Development Goals) target 14.6 there is a commitment of UN Members to eliminate by 2020 the subsidies that contribute to Illegal, unreported and unregulated (IUU) fishing and to prohibit subsidies that contribute to over fishing and over capacity .While recognizing that, in the negotiations in WTO, appropriate and effective S&D treatment for developing countries and LDCs should be an integral part of the fisheries subsidies negotiations.

Global fisheries subsidies

In the most recent estimates of global fisheries subsidies by Rashid Sumaila & others [1], subsidies to the extent of USD 35.4 billion were provided in 2018. Capacity-enhancing subsidies constituted the highest at over USD 22.2 billion. Fuel subsidies (including fuel specific tax exemptions) is the largest subsidy type at 22% of the total global subsidy, followed by subsidies for fisheries management (19% of the total) and non-fuel tax exemptions (15% of the total).

However, the extent and amount of fisheries subsidies notified to the WTO by Members as per notification obligation under the WTO Subsidies Agreement (ASCM) is far less. In a review by the Centre for WTO Studies of the notifications of fisheries subsidies to the WTO, up to September 2019, the total amount of notified fisheries subsidies were only USD 4.45 billion.

What explains this vast difference in fisheries subsidies figures? First, the report of Sumaila & others uses an estimation methodology where the subsidies are not notified by countries. This is based on modelling techniques. Second reason is that Members notify to WTO only specific subsidies, i.e. subsidies that are specific to fisheries sector. In the case of fuel subsidies, which account for the largest component of fish subsidies, a large proportion is not reported to the WTO as these are not specific to the fisheries sector in many countries, particularly in developed countries.

Extent of IUU fishing

The FAO's International Plan of Action to prevent, deter and eliminate IUU fishing (IPOA-IUU) was agreed in 2001. It spells out what constitutes as "Illegal", "Unreported" and "Unregulated" fishing. Broadly the IUU lays down a framework of obligations for national authorities to put in place rules and regulations so that the marine fishing activities are regulated from the point of registering of a vessel for fishing and up to point of vessel's return from fishing with reporting of catch.

There are several Regional Fisheries Management Organizations (RFMOs) and Arrangements for management of marine fishing resources in High Seas. FAO's IPOA-IUU recognizes the role of these RFMOs and Arrangements as well as the role of national authorities of the Coastal States for the purposes of conservation and management measures.

In 2009 a paper by Agnew et al[2] estimated that IUU-caught fish in 2003 was 11-19% of reported catches, representing 10-26 million tonnes of fish valued at USD10-23 billion.

In February 2015, FAO convened a workshop in Rome to consider methodologies for estimating IUU fishing at the global level. In June 2016, a study was presented by Poseidon Aquatic Resource Management Ltd upon request by FAO which was titled "Review of Studies estimating IUU Fishing and the Methodologies Utilized."[3]

The study found that: (i) there are many different methodologies being used to estimate IUU catch but many estimates are not robust and methodologies not consistent; (ii) estimates of global "missing catch" made in some studies include catch that is not necessarily IUU in terms of the definitions in the IPOA-IUU; (iii) developing an updated global estimate of IUU catch may have limited benefit due to wide confidence intervals and a lack of clarity over IUU behaviors included; (iv) indicators of IUU fishing to monitor progress in combating IUU fishing need not necessarily include global estimates of volumes of IUU fish, and could focus on other aspects such as number of vessels on IUU fishing vessel lists, etc.

One of the conclusions of this study states that the global estimate of IUU catch suggested by the FAO-supported workshop in Rome in 2015 is not necessary or advisable from a technical point of view. It also states that however there may still be political impetus for such an estimate, and that in this case, FAO may be considered the most appropriate organisation to support the development of such an estimate given its global mandate for fisheries.

While it is difficult to ascertain where maximum IUU fishing takes place, it is undeniable that IUU fishing that may take place within the 12 nautical miles of territorial waters of a coastal state by small fishermen is far less serious in nature than that which occurs in high seas by industrialised fleets or by foreign distant water fishing fleets in others' waters.

Some organisations such as the Pew Charitable Trust has also found that a lot of unregulated fishing occurs on the high seas. The high seas are international waters beyond the exclusive economic zone, which extends 200 nautical miles from the shoreline, of a coastal state. Patchy regulation, little enforcement and the vast expanse of the ocean – the high seas cover almost 45 percent of our planet – combine to allow rampant illegal and unregulated fishing in those areas.[4]

State of Play of Negotiations in the WTO

The protracted fisheries subsidies negotiations launched in Doha in 2001 now seem to be headed to a decisive phase. The Ministerial decision of MC 11 (December 2017) was to engage constructively in the fisheries subsidies negotiations and to conclude the negotiations by the next Ministerial Conference which was scheduled to be held in June 2020.

The conclusion of the negotiations has missed several deadlines- as Ministerial meeting in Nur Sultan could not be held in June 2020 due to COVID 19 pandemic. Understandably WTO Members are aiming to conclude the fisheries subsidies agreement by the MC 12, now scheduled to be held in December 2021. And there is some degree of convergence in developing disciplines to prohibit subsidies that contribute to IUU fishing.

What contributes to overcapacity and overfishing?

However, the most challenging so far has been that the Members are yet to find an agreeable approach for prohibition of subsidies that contribute to overcapacity and over fishing (OCOF). There are entrenched positions of Members to have a list based prohibition, i.e. to prohibit subsidies for Vessel construction/ modernization; equipment for vessels etc. and Operating costs such as fuel. There are others who prefer an effect based approach, i.e. to have reliance on fisheries management measures. The NGR Chair proposed a 'hybrid' approach – with a mix of list of prohibited subsidies and 'sustainability' approach.

There is another approach being proposed whereby, a subsidy contributes to OCOF when a stock is being fished at a rate of fishing or with a measurement of fishing capacity that is greater than would allow the stock to be maintained at a biologically sustainable level.

A biologically sustainable level is the level determined by a coastal Member having jurisdiction over the area where the fishing is taking place, using Maximum Sustainable Yield (MSY), or alternative reference points such as level of depletion, or level of or trend in time series data on catch per unit effort, commensurate with the data available for the fishery; or by a relevant RFMO/A.

Seeking S&DT in fisheries subsidies negotiations

A very important component of fisheries subsidies negotiations is the special & differential treatment

for developing countries and LDCs (S&DT). This has become a highly contentious issue with strong divergence of views among Members.

Developed countries such as the USA, Australia, New Zealand, Japan, EU, Canada and Russia strongly oppose a horizontal broad S&DT exception for developing countries and LDCs. They are also supported by a group of Latin American countries called (6 LAT) viz. Argentina, Peru, Colombia, Costa Rica, Panama and Uruguay.

India, ACP group, LDCs group, Indonesia, Vietnam have been seeking effective S&DT in these negotiations. India made a proposal seeking S&DT exception from disciplines for LDCs and developing countries which reflects their legitimate needs keeping in view the development priorities and concerns of food and nutritional security.

It seeks to secure livelihoods of fishers, who are resource poor and marginalized, and address capacity constraints in implementing the disciplines being negotiated. The carve outs in respect of fishing within 'Territorial' waters from the disciplines for Developing countries and LDCs is critical as subsistence, artisanal and small-scale fishermen predominantly fish in Territorial waters and hence their needs have to be dealt differently.

In the IUU pillar India has sought S&DT carve out for Unreported and Unregulated fishing (U&U) for LDCs and developing countries for fishing activities up to territorial sea (12 nautical miles) by vessels other than large scale industrial fishing vessels. For fishing in EEZ and RFMO area India has sought S&DT for U&U as a transition period of 7 years. In the pillar of prohibition of subsidies that contribute to OCOF, India has sought S&DT carve out for LDCs. For developing countries India has sought carve out up to territorial sea (12 nautical miles).

For fishing in EEZ and RFMO area India has sought S&D for developing countries based on four criteria viz. if the GNI per capita is less than USD 5000 (based on constant 2010 $); if share in global marine capture is less than 2%; if a member does not engage in distant water fishing; and the share in GDP from Agriculture, forestry and fishing is more than 10%.

The developing country can continue to avail the S&DT till it is not covered by all the four criteria. This S&DT criteria is in the nature of transition period as developing countries will graduate out of these four

MUKESH BHATNAGAR

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eligibility criteria. However, developed countries see these four criteria as a permanent carve out and are strongly opposed. Developing countries including India and ACP are engaged in negotiations to find an amicable way to pursue the S&DT demand.

Fuel Subsidies

Another important aspect of the negotiations is the treatment of fuel subsidies. The general approach is to prohibit subsidies that are specific as per the provisions of WTO Subsidies Agreement (ASCM).

While in the case of many developed countries, the fuel subsidies may not be specific in view of the design of the tax-rebate schemes in their systems, in the case of other countries, including India, the fuel subsidies schemes are specific to the fisheries sector.

As per one OECD report of 2012 fuel subsidies of developed countries were to the extent of USD 2 Billion [5]. Report of Sumaila & others [1] also mentions that fuel subsidies account for the highest component of fisheries subsidies. India has proposed that even non-specific fuel subsidies, which benefit fisheries sector, should also be subject to disciplines as these are as harmful as specific fuel subsidies.

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[3] http://www.fao.org/iuu-fishing/en/

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MPEDA Tuticorin holds virtual meeting with seafood exporters

An online meeting with frozen seafood exporters was organized by MPEDA SRD Tuticorin on 19/05/2021. The main agenda of the meeting included discussion on the various issues concerning seafood industry during the current lockdown especially man and material movement, trainings for industry workers, virtual training on value added products and VBSM. 18 exporters attended the meeting. The participants were Amulya Seafoods, Jude Foods India P Ltd, Kader Investments & Trading Co P Ltd, Baby Marine Eastern Exports, KSA & Company ,Maria Aquacon P Ltd, Gladson Exports, Edhayam Frozen Foods P Ltd, Kadalkanny Frozen Foods, Diamond Seafood Exports, Britto SeaFoods Exports P Ltd, V.V. Marine Products, Kiefer Seafoods, Maria Aquacon P Ltd, Jude Foods India P Ltd,, Britto SeaFoods Exports P Ltd, Lifaa Sea Foods Private Limited and Subu Sea Foods.

The meeting began with the welcome note by Mrs. Anju, Assistant Director, SRD Tuticorin, MPEDA. The agenda for the meeting was mentioned and the exporters were requested to offer their comments on the various issues faced during the lockdown. Majority of the exporters mentioned that they had no issue with material and labour movement due to provision of pass for essential services and they are maintaining 50% workers strength and following Covid guidelines. A major issue raised was the increase in freight charges especially to USA. There has been a two-fold increase in the freight charges and this increase is observed weekly.

An exporter informed the difficulty in procurement of packaging material and carton stickers as the local shops are closed. Details in this regard are being collected to resolve the issue. Exporters were requested to inform area of interest for conducting training both for technologists and value addition of seafood. Some expressed interest and have been requested to send mail with details of the specific training required by them.

Shrimps & Quinoa in Coconut-Orange Sauce

Recipe Card

Quinoa :	100 gm
Salt :	to taste
Butter :	10 gm
Olive oil :	20 ml
Onion chopped :	1 medium sized
Ginger chopped :	1 table spoon
Curry powder :	2 table spoon
Cumin powder :	1/2 table spoon
Cayenne pepper :	1/2 table spoon
Shrimps :	450 gm
Broccoli florets :	100 gm
Coconut milk :	2 table spoon
Orange juice :	2 table spoon
Shredded coconut :	10 gm
Fresh coriander :	10 gm

Instructions

Cook quinoa in salted water, add butter and keep aside.

Heat olive oil in a pan.

Add onion, ginger and saute well till the onions are transparent.

Add curry powder, cumin powder, and cayenne, and saute for 30 seconds.

Add the shrimps and cook till the shrimps are pink.

Turn the shrimps after one minute.

Add coconut milk, orange juice, broccoli, cooked quinoa and coriander.

Cook until the sauce thickens and coats the prawns

Garnish with shredded, toasted coconut and chopped cilantro.

Prep time: 20 minutes

Cooking time: 20 minutes

Serves 4

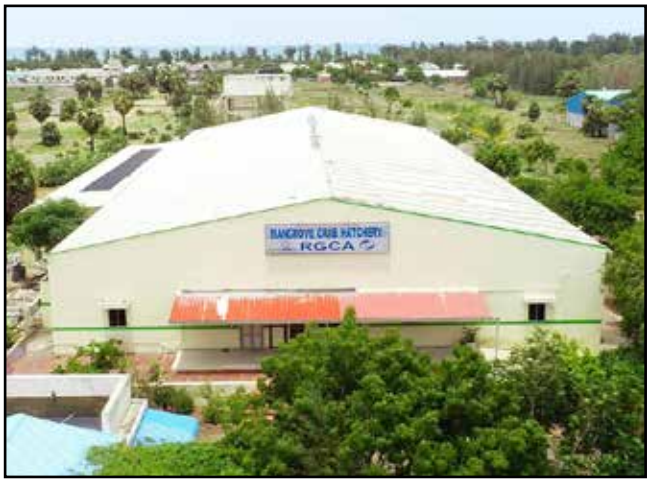
Scan the QR code to watch the recipe in Youtube

MPEDA–RGCA granted patent right for Mud crab (*Scylla serrata*) hatchery technology

MPEDA has established its own Research & Development Centre – Rajiv Gandhi Centre for Aquaculture (RGCA) for commercialization of diversified aquaculture species mainly to contribute for Indian marine products export. The Seabass, Mud crab, GIFT (Tilapia), Cobia, Pompano & Artemia are the main species focused by RGCA only for increasing the export by producing and supplying of good quality seeds which is prime input for aquaculture. This glory is continuing to the aquaculture sector for the past 25 years under the helm of MPEDA with the financial support as a Grant-in-Aid from Dept. of Commerce, Ministry of Commerce & Industry, Govt. of India. Many young Scientists are working round the clock to achieve the desirable result of the various projects in all over Country.

The Centre is extending technical know-how to the entrepreneurs, various State Govts. for setting up of hatchery to meet the demand of the seed requirement of aquaculture farmers who intend to undertake diversified species for aquaculture instead of shrimp aquaculture alone. Among the various species, Mud crab (*Scylla serrata*) is a highly valued species in South East Asian Countries where live crabs are highly preferred for its delicacy. Hence, MPEDA initiated a Pilot Scale Project for Mud Crab seed (known as crab-instar) production during 2004 and subsequently made commercial hatchery for the first time in India during 2013 with the capacity of 1 million per annum.

Due to huge demand, the seed production capacity of RGCA's Mud crab hatchery has been increased to 1.4 million per annum.Dr. Emilia T. Quinitio, Eminent Scientist from Aquaculture Division of International Institute known as Southeast Asian Fisheries Development Centre (SEAFDEC), Philippines, has extended the consultancy service till 2013 to RGCA for the completion of commercial Mud crab hatchery at Thoduvai. Since then, the technology has been standardized by RGCA's young Scientists within a short span of period. The major achievement is increasing of survival rate of crab instar from 3% world record to 7%. Further, the hatchery unit is designed in such a manner that all sections are under one roof with all the bio-security measures. So far, 7.28 million seeds have



Mud crab hatchery

Pen culture of crabs

Match box sized Crablets

Mud crab juveniles

Harvested crabs

Mud crab adult

Crablets for grow-out culture

been produced and supplied to 659 farmers across the Country. Based on all the above experience and as there is no other hatchery for Mud crab in India, RGCA has applied for Patent Right for the Mud Crab Hatchery Technology for India during 2011 with the Controller General of Patent, Design and Trade Marks, Govt. of India.

However, the matter for granting Patent Right to RGCA has been crucial by consulting with various Research Institutions in the World, discussed with renowned experts who referred various research references and several meeting with RGCA's Scientists with facts and figures yielded to the conclusion that the Mud crab hatchery technology of MPEDA – RGCA is unique in India and granted the Patent Right to RGCA for 20 years from 2011 to 2030.

This is the remarkable achievement in the history of Indian Aquaculture that first time Govt. of India granted Patent for Mud crab Hatchery technology in India. MPEDA is dedicating this achievement to the farmers of the country for their support and to the young scientists of RGCA who have worked round the clock to achieve this milestone.

Highlights of marine fish landings and boat arrivals at selected harbours of india in May 2021

Dr. Afsal V.V. & Dr. Joice V. Thomas
NETFISH-MPEDA

As part of the MPEDA's Catch Certification system, recording of daily boat arrivals and marine catch landings happening at selected major harbours/ landing centres in the 9 coastal states of India is being done by NETFISH.

The Harbour Data Collectors of NETFISH record the number of boat arrivals and the quantity of various fishery items landed at their respective harbours. This report highlights on the species wise, harbour wise and state wise trend of marine landings during May 2021, based on the landings from 70 major landing sites.

I. ESTIMATION OF FISH LANDINGS

In the month of May 2021 a total quantity of 18122.23 tonnes of marine catch landings were registered from the 70 selected landing sites. The total catch was comprised of 8741.82 tonnes (48%) of Pelagic finfish resources, 5528.72 tonnes (31%) of Demersal finfishes, 1978.01 tonnes (11%) of Molluscs and 1873.69 tonnes (10%) of Crustaceans (Fig.1).

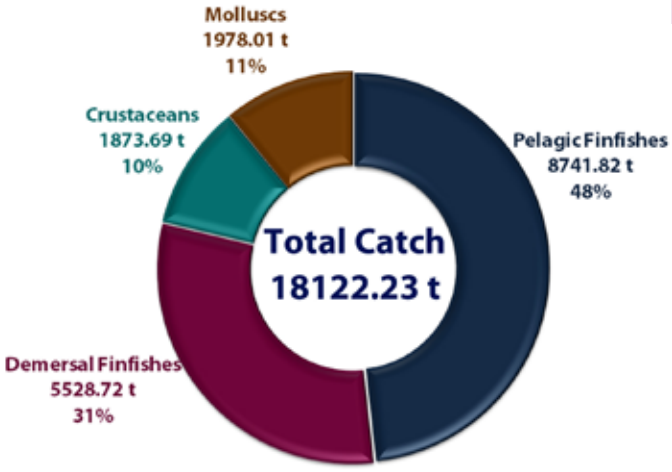


Fig.1. Catch composition of marine landings recorded in May 2021

The marine landing recorded during the month was composed of about 215 species of marine fishery items. The top five contributing species were *Harpadon nehereus* (Bombay duck), *Rastrelliger* kanagurta (Indian mackerel), *Nemipterus japonicus* (Japanese thread fin bream), *Saurida tumbil* (Greater lizardfish) and *Trichiurus spp* (Ribbon fish) (Table 1).

Table 1. Major fish species landed during May 2021

Sl. No:	Common name	Scientific name	Qty. in tonnes
1	Bombay duck	*Harpadon nehereus*	1658.33
2	Indian mackerel	*Rastrelliger kanagurta*	1620.35
3	Japanese thread fin bream	*Nemipterus japonicus*	1252.66
4	Greater lizardfish	*Saurida tumbil*	690.97
5	Ribbon Fish	*Trichiurus spp*	536.23

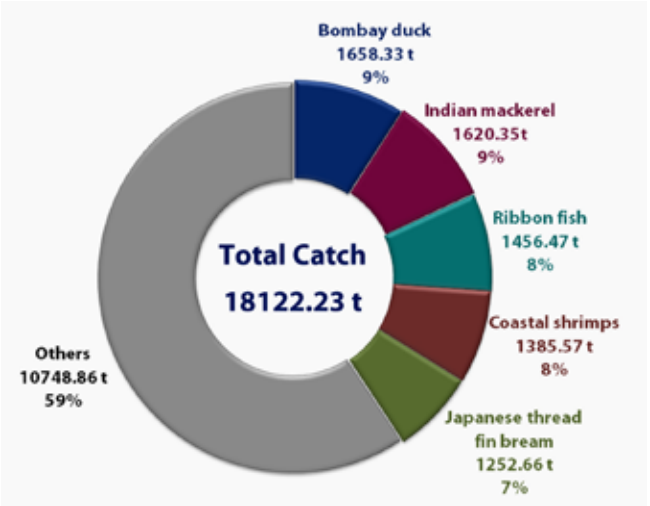


Fig. 2 Major fishery items landed during May 2021

On analysing the group-wise landings, it was observed that the major five items landed during the month were Bombay duck, Indian Mackerel, Ribbon fishes, Coastal shrimps and Japanese Threadfin bream, which together formed 41 % of the total catch (Fig 2).

Total catch quantity of various categories of fishery items recorded during May 2021 is enlisted in Table 2. Among the Pelagic finfish resources, Bombay duck, Indian mackerel and Ribbon fishes were the major contributors with each having a landing of more than 1400 tonnes. Japanese Threadfin breams and Lizard fishes were the most landed items among the Demersal finfishes, each contributing more than 1000 tonnes. About 74 % of the Crustacean catch was comprised of different species of Coastal shrimps of which the *Karikkadi* shrimp was the most landed species with a share of 401.03 tonnes. In the case of the Molluscs, 60% of the share was of squids and 33 % was of cuttle fishes.

Table 2. Category- wise landing of various fishery items during May 2021

FISHERY ITEM	QTY.IN TONNES	% OF TOTAL CATCH
Pelagic Finfishes		
Bombay duck	1658.33	9.15
Indian mackeral	1620.35	8.94
Ribbonfish	1456.47	8.04
Tunas	979.87	5.41
Scads	835.80	4.61
Anchovies	589.11	3.25
Lesser sardines	432.59	2.39
Seerfish	241.12	1.33
Trevally	171.52	0.95
Indian oil sardine	126.95	0.70
Flying fish	108.44	0.60
Barracudas	87.85	0.48
Sail fish	76.95	0.42
Mahi mahi	73.71	0.41
Herrings	67.21	0.37
Shads	60.10	0.33
Mackerel	36.32	0.20
Needle fish	31.00	0.17
Marlins	21.21	0.12
Mullets	15.76	0.09
Indian Salmon	13.60	0.08
Queenfish	13.24	0.07
Cobia	13.08	0.07
Milk fish	7.27	0.04
Halfbeaks	3.99	0.02
Total pelagics	*8741.82*	*48.24*
Demersal finfishes		
Japanese thread fin bream	1252.66	6.91
Lizard fish	1075.37	5.93
Croakers	909.33	5.02
Sea Catfishes	562.86	3.11
Reef cods	310.45	1.71
Sole fish	288.84	1.59

Sea breams	249.99	1.38
Bullseye	213.96	1.18
Pomfrets	154.00	0.85
Unicorn leatherjacket	89.76	0.50
Sharks	73.34	0.40
White fish	51.03	0.28
Moon fish	50.51	0.28
Triggerfishes	49.44	0.27
Snappers	45.14	0.25
Goat fish	41.32	0.23
Eels	26.84	0.15
Rays	17.54	0.10
Emporer breams	15.94	0.09
Flat head	14.61	0.08
Indian Threadfin	10.46	0.06
Ponyfish	7.23	0.04
Job fish	5.50	0.03
Silver Biddies	4.50	0.02
Perch	2.60	0.01
Groupers	2.01	0.01
Indian Threadfish	1.63	0.01
Whitings	0.95	0.01
Halibut	0.46	0.00
Surgeon fish	0.15	0.00
Parrot fish	0.13	0.00
Rabbit fish	0.10	0.00
Pompano	0.09	0.00
Total demersal	*5528.72*	*30.51*
Crustaceans		
Coastal shrimps	1385.57	7.65
Deep sea shrimps	333.20	1.84
Crabs	141.03	0.78
Lobsters	13.89	0.08
Total Crustaceans	*1873.69*	*10.34*
Molluscs		
Squids	1184.24	6.53
Cuttle fish	648.30	3.58
Baigai	74.71	0.41
Octopus	70.76	0.39
Total Molluscs	*1978.01*	*10.91*
TOTAL CATCH	**18122.23**	**100.00**

State-wise landings: Considering the state-wise total catch quantity, it was found that the highest marine catch landings occurred during May 2021 was in Gujarat state, with a share of 7307.85 tonnes (40%) (Fig.3). Maharashtra with a contribution of 5046.05 tonnes (28%) stood in the second position and Karnataka held the third position with a total landing of 2084.11 tonnes (12%). The least marine landing during the month was observed in Andhra Pradesh, with a meagre quantity of 16.91 tonnes of catch. No catch was reported from the selected harbours of West Bengal during the period.

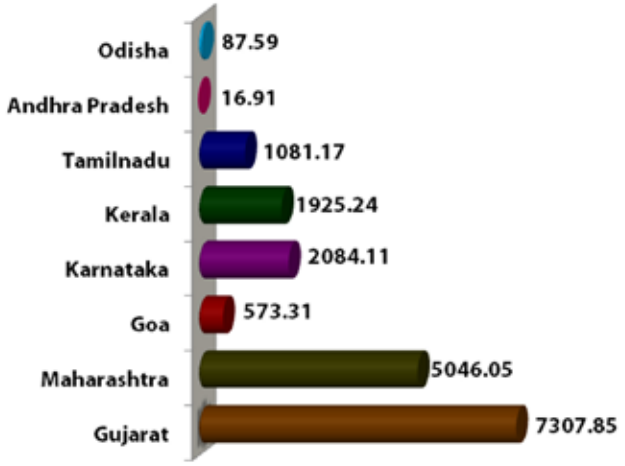


Fig.3 State- wise fish landings (in tonnes) during May 2021

Harbour-wise landings: The total marine landing reported from each harbour is given in Table 3. Among the 70 harbours, Veraval harbour in Gujarat recorded the maximum fish landing, which was to the tune of 2396.46 tonnes (13%) and it was followed by Malpe and Porbandar harbours with 1713.73 tonnes (10%) and 1639.29 tonnes (9%) respectively. The least landing was reported from Tadri harbour in Karnataka (0.33 tonnes).

Table 3. Harbour-wise catch quantity & boat arrivals during May 2021

S.No	State	Harbour	Catch Quantity (tonnes)	Boat arriv-als (nos.)
1	Andhra Pradesh	Visakhapatnam	10.03	247
2		Pudimadaka	6.88	107
3	Goa	Malim	335.13	132
4		Cutbona	145.81	66
5		Vasco	75.82	79
6		Chapora	16.55	123
7	Gujarat	Veraval	2396.46	1661
8		Porbandar	1639.29	1009
9		Jafrabad	1308.47	381
10		Mangrol	873.96	718
11		Okha	860.52	440
12		Vanakbara	112.12	77
13		Chorwad	89.94	423
14		Kotada	27.10	14
15	Karnataka	Malpe	1713.73	621
16		Mangalore	254.38	193
17		Bhatkal	43.70	100
18		Gangolli	34.89	72
19		Karwar	27.64	36
20		Honnavar	8.78	13
21		Amdalli	0.66	7
22		Tadri	0.33	2
23	Kerala	Thoppumpady Cochin	888.03	321
24		Munambam	320.04	165
25		Sakthikulangara	251.36	222
26		Kayamkulam	136.09	81
27		Beypore	92.89	97
28		Neendakara	56.18	66
29		Azheekkal	29.05	52
30		Thottappally	24.60	42
31		Vypin	23.98	13
32		Ponnani	18.31	56
33		Cheruvathur	16.20	69
34		Thangassery	14.79	31
35		Chellanam	13.38	39
36		Vizhinjam	11.56	158
37		Puthiyappa	11.42	25
38		Mopla Bay	7.92	61
39		Koyilandi	5.03	50
40		Vaadi	3.55	33
41		Chettuva	0.87	5

42	Maha-rashtra	New Ferry Wharf	1481.68	305
43		Ratnagiri	906.12	279
44		Arnala	876.81	263
45		Sasoon Dock	716.39	317
46		Harne	257.98	516
47		Sakharinate	196.20	172
48		Alibagh Koliwada	102.20	295
49		Malvan	94.18	224
50		Uttan	91.39	52
51		Versova	84.81	102
52		Satpati	65.78	89
53		Taramumbari Devgad	58.99	351
54		Onni Bhatti Dabhol	42.12	108
55		Vasai	38.80	81
56		Dahanu	32.61	152
57	Odisha	Balugaon	87.59	317
58	Tamilnadu	Colachel	554.37	232
59		Thengaipattinam	411.86	270
60		Tharuvaikulam	24.35	70
61		Chennai	23.89	308
62		Pazhayar	15.07	132
63		Nagapattinam	13.26	122
64		Cuddalore	8.94	120
65		Poompuhar	7.49	110
66		Karaikal	5.27	90
67		Chinnamuttom	5.05	186
68		Pulicat	4.29	56
69		Mallipatnam	3.77	61
70		Kodiyakarai	3.57	89
TOTAL		**18122.23**		**13576**

II. ESTIMATION OF BOAT ARRIVALS

A total of 13576 nos. of boat arrivals were recorded from the 70 harbours during May 2021. State wise figures (fig. 4) show that the highest number of boat arrivals had occurred in Gujarat (35 %) and then in Maharashtra (24 %) and Tamilnadu (14 %). The harbour wise details of boat arrivals are given in table 3 above. The highest recording was from Veraval (1661 nos.), Porbandar (1009 nos.) and Mangrol (718 nos.) harbours in Gujarat. The Tadri harbour in Karnataka had the least number of boat arrivals.

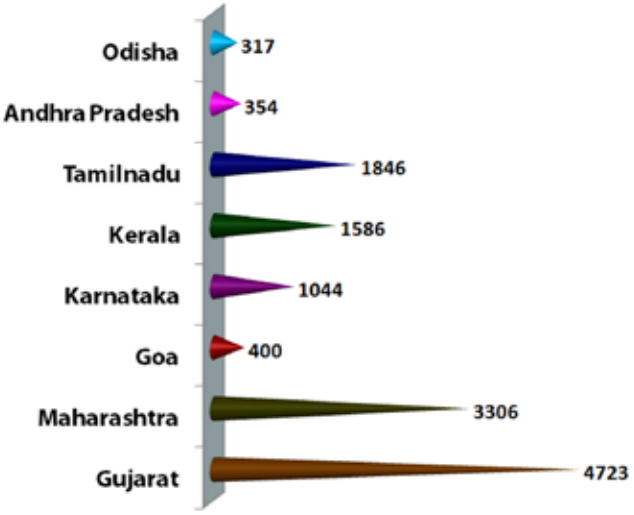


Fig.4 State- wise boat arrivals (nos.) during May 2021

Summary: In May 2021, a total of 18,122.23 tonnes of marine catch landings and 13,576 nos. of boat arrivals were reported from the 70 major fish landing sites of India. The total catch has shown a decrease by around 21,120 tonnes, when compared to that of April 2021 and the number of boat arrivals has decreased by around 14,171 numbers.

The reduction in catch quantity and boat arrivals during the period can be attributed to the monsoon fishing ban in the East Coast, adverse weather conditions and Covid-19 lockdown. Pelagic finfish continued to be the major contributor to the total landings and the Bombay duck attained the 1st position among the most landed fish species for the month pushing Indian mackerel to the second position.

As in previous months, the state of Gujarat continued in the first position among the states in terms of total catch landed and the Veraval harbour took over the prime position among the harbours. In the case of number of boat arrivals, Gujarat state and Veraval harbour maintained its first position.

A Glimpse of the Thoothoor Fishing Community

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Thoothukudi, Tamil Nadu.

Introduction

Thoothoor located in Vilavancode Taluk of Kanyakumari, the southern district of Tamil Nadu has around 2000 families, and is famous for deep sea shark fishing and football. This hamlet is a cluster of eight villages namely Thoothoor, Chinnathurai, Eraviputhenthurai, Poothurai, Erayumanthurai, Vallavilai, Marthandathurai and Neerodi. There is St. Jude's Community College emphasizing the importance of education in the lives of Thoothoor people. The Catholic Church plays a prominent role in the development of the community.

The main occupation of the village with a coastline of just 1 km is fishing though a small percentage of the population is also involved in agriculture or other professions. The fishers here mainly use hook and line method of fishing. Thoothoor has 258 mechanized boats and 189 country crafts.

Thoothoor fishers travel to Gujarat, Kerala, Karnataka etc to catch sharks. During November 2020, a survey conducted by the State Fisheries Department found that the boat safety norms were not up to the standard for deep sea fishing boats at Thoothoor. There is an Association of Deep Sea Going Artisanal Fishermen at Thoothoor, established in 1992 to promote deep sea fishing activity.

View of Thoothoor fishing village

St. Thomas Catholic Church, Thoothoor

Thoothoor Fishing village

Thoothoor fishing village has 1700 members under the Fishermen Cooperative Society, which comes under the Fisheries Department, Tamil Nadu. The village is famous for deep sea long line fishing. Major species fished include sharks, Yellowfin tuna, Swordfish, Sailfish, Black marlin, Skipjack tuna, Ray fish and Seer fish. Now-a-days, Groupers also appear in the catch. Along with hook and line, gill net fishing is also practiced. Gill nets have a mesh size of 116 -140 mm.

The fishermen go for multi day fishing (10 to 40 days) carrying on an average 15 tons of ice and 1000 litre of diesel. The average catch per boat per voyage is 2000 to 6000 kg. Country craft or traditional boats mainly carry out hook and line fishing targeting species like tuna, reef cod and they are also involved in squid jigging.

There are three major boat unions available in Thoothoor Jesus Boat Union, Arputha Matha Boat union and St.Thomas Boat union.

Fishing in Thoothoor

Fishermen of Thoothoor have a long history of shark fishing. With the changing generation, Thoothoor fishermen have adopted hook and line fishing, citing the reason as sustainable fishing practice. Earlier, if it was the traditional knowledge that assisted the fishermen in locating shark fishing grounds, now they seek the help of GPS and VHF.

Sharks caught are washed, salted and dried in the sun. Similar procedure is followed for ray fishes. The main market for these dried items is Sri Lanka.

Shark Processing

Shark processing for drying

Thoothoor is the only village in India using hook and line for shark fishing. Fishermen buy hook, line and other accessories as per their need and then prepare the line. There are mainly two types of lines: floating line and sinking line. Sinking hook and line fishing targets smaller fishes like carangids, groupers etc. whereas the floating hook and line is for bigger fishes like shark, tuna etc. The different size of hooks used are “00” (11cm) , “000” (10cm), “4” (10cm), “5” (9.5cm), “6”(8cm), “7” (7.5cm), “8” (6.5cm), “9” (6cm), “10” (6cm), “11” (5cm), “14” (4cm), “15” (3.5cm), “16” (3cm). The targeted species include Carangids, Groupers, Tuna and Sharks. The price of the hooks range from Rs 3 to Rs. 25 per piece.

The mechanized boats used for fishing range from 12 to 21m with engine power of 122-140 hp. Storage capacity of these boats range from 6 to 69 tons. The boats are mainly constructed of fiberglass or wood or a combination of wood and steel. Some boats exclusively fish with long line whereas others use both gill net and long line. Since there is no landing centre at Thoothoor, catch is landed at Thengapattinam and boats are anchored at Kochi fishing harbour. There is a boat repair yard near Thengapattinam harbour called Anushaya boat yard for construction and repair of boats.

The availability of cuttlefish and squid is more during the months of August to December. Yellowfin tuna, skipjack tuna, swordfish, marlins etc are found in abundance during November to February.

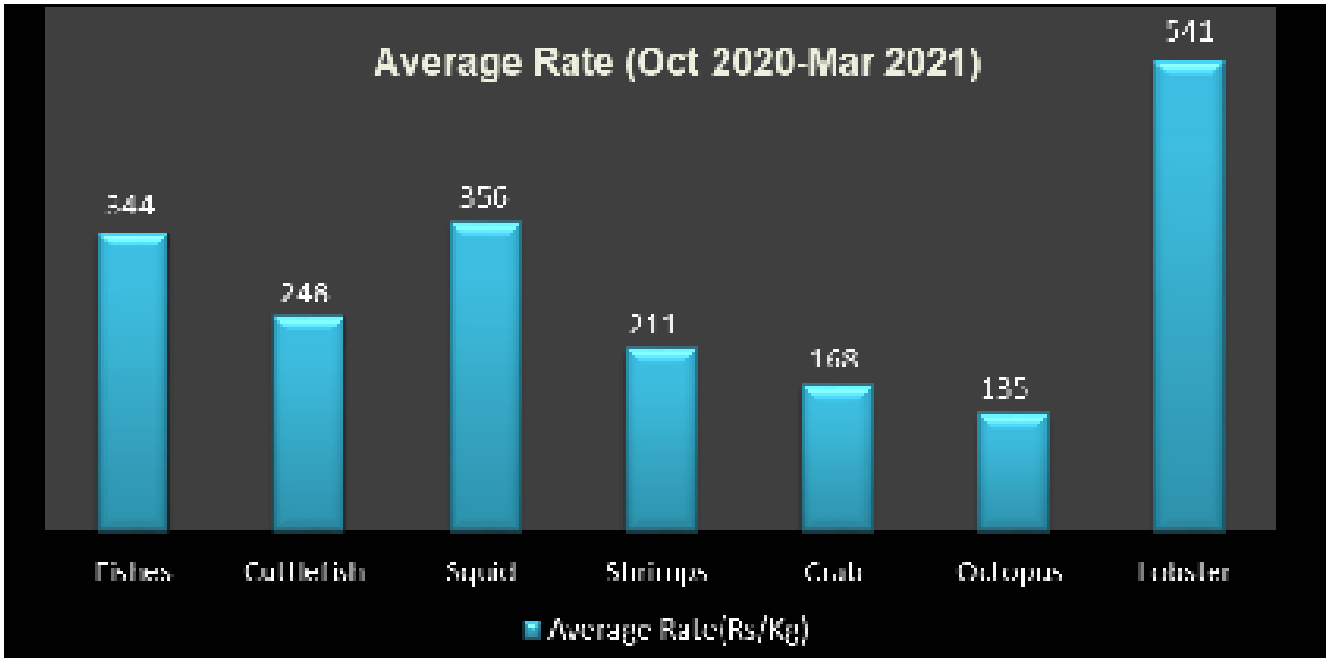
Marketing channel

Thoothoor has local markets in all the villages. Local vendors procure fish from landing centres and sell it in the local market. During Covid, to prevent the overcrowding at fish markets, the fish selling points were relocated to seven terminals such as near Agathammal Shrine, near the Parish Hotel Building, near St. Antony Shrine, near Dennis Viapari’s house, near Bethel Bakery, near Arokia Matha Shrine, and near Sharon Sarees at St. Thomas Nagar.

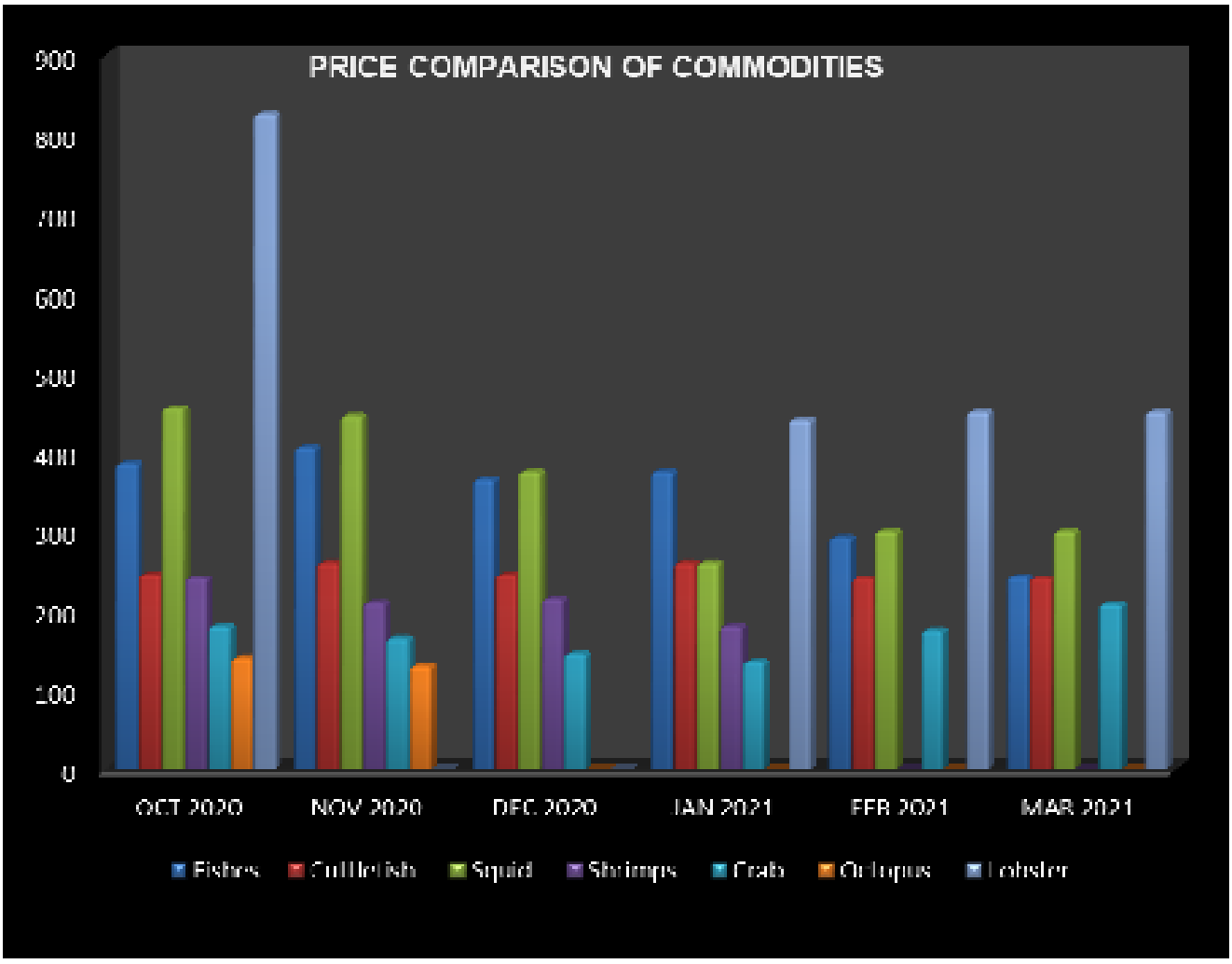
The average landing and rate of fish, cuttlefish, squid, shrimps, crab, lobster and octopus from October 2020 to March 2021 is given below. The highest average rate is for live lobster which has a very good international market.

Average landing and rate of various items

Item	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021	
	Qty (Kg)	Rate/Kg (Rs)	Qty (Kg)	Rate/Kg (Rs)	Qty (Kg)	Rate/Kg (Rs)	Qty (Kg)	Rate/Kg (Rs)	Qty (Kg)	Rate/Kg (Rs)	Qty (Kg)	Rate/Kg (Rs)
Fishes	9,26,860	385	8,23,997	405	4,11,848	365	4,49,539	375	5,42,468	292	10,41,231	242
Cuttlefish	50,650	245	21,280	260	5,330	245	3,445	260	1,900	240	455	240
Squid	81,270	455	39,280	445	6,760	375	3,605	260	2,850	300	2,905	300
Shrimps	1,970	240	880	210	1,300	215	80	180	0	0	0	0
Crab	1,200	180	4,060	165	2,880	145	1,225	135	1,757	175	3,498	208
Octopus	7,240	140	2,050	130	0	0	0	0	0	0	0	0
Lobster	33	825	0	0	0	0	7	440	3	450	2	450



Average rate of different items from October 2020 – March 2021



Price comparison of various commodities

Price variation of different commodities from October 2020 to March 2021 shows a prominent decrease in the rate of fish; this may be attributed to the increased supply during the month of March 2021. Most of the other commodities showed somewhat stable prices over the mentioned period.

Major structures of Thoothoor

- St. Thomas Catholic Church
- Government hospital
- Pius Higher Secondary School
- Indian Bank
- Jesus Marine Company Thoothoor
- Sub Inspector Office (Fisheries department)

Source of information

The details for the articles were collected by personal interview with around 10 fishermen. In addition, information was also taken from published papers and newspaper articles, details of the same are included in the references.

Harbour Data Collector from the area also contributed information on the facilities available in the village along with details on fishing practices, landing pattern and price variations.

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Contribution of *Chakkada* in the livelihood enhancement of fisherfolk community in Saurashtra coast

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A livelihood is the set of capabilities, assets and activities that furnish the means for people to meet their basic needs and support their wellbeing. In India, 14.5 million people are directly or indirectly dependant on fisheries activities for their livelihood. Gujarat is a major hub of fisheries related activities in India and is the state standing first in marine fisheries production for last 4 years with an average production of 7.5 - 8 lakh MT and an export of 3 lakh MT of seafood.

Generally, the fisherfolk's livelihood in Gujarat depends on fishing, aquaculture and fish supply. Apart from that, they are involved in fish marketing and are major workforce in seafood establishments. The artisanal fisherfolk and part time fishermen plays a major role in the seafood sector of Gujarat. The fisheries sector of Gujarat is incomplete without a discussion on "*chakkada*."

Chakkada

Chakkada stand

Chakkada is locally called '*Saurashtra no sinha*' meaning "The lion (on the road) Saurashtra". A chakkada is as much a symbol of Gujarat as the Asiatic lion of the Gir due to its power and strength. "*Chakkada*" is the local public transport vehicle used for multiple activities in Gujarat especially in Saurashtra coast. This multipurpose vehicle plays a significant role in fishing industry. It is used for transporting ice, oil barrels, fisherfolk, provisions & vegetables for fishing trips, fish waste, fishing materials viz., craft and gear materials, fuel tanks etc. Apart from these, it is used for domestic purposes like transportation of public, canned drinking waters, vegetables, fruits and other agricultural commodities. The low value fishes and fish wastes are transported by *Chakkada* from the landing centres of Veraval, Mangrol, Porbandar and Okha and are used for production of fish meal, fish fertilizer and dried fish. Different sizes and grades of fishes from

small size (sardine, mackerel, perch, lizard, goat fish, bull eye etc.) to larger size (sharks, tuna, rays etc) are being transported by chakkada.

Most of the *Chakkadas* are owned by members of the Kharwa, Koli and Muslim communities and operated (96%)by the owners. Nearly, 500-600 kg of fish waste is usually carried to fish meal plants, while 6 -7 no.s (1200-1400 litres) of oil barrel are transported to fishing harbours in a trip. The *Chakkada* are hired over mobile phones by the fishermen / processors / commission agent for transportation of materials (Table 1).

Table 1: Materials transported per trip by *Chakkada*

No	Material	Quantity (Holding capacity)
1	Low value fish	500 kg
2	Fish (with crates)	700-750kg (40-45 kg/crate (16 Nos)
3	Fish waste	700-750 kg
4	Ice	900 kg (8 -9 Blocks)
5	Oil barrel	1200-1400 litres (6-7 barrels)

Evolution of *Chakkada*

There is no clarity among the local people about when the first *chakkada* took to the road, but the one popular story is that the first *chakkada* was made by the then Jam Saheb, the Maharaja of Jamnagar. He got a trailer fitted to his motorcycle to transport garden manure across his palace grounds that was spread over several hectares.

The concept appealed to the local people of Jamnagar, who started converting their Royal Enfield or other high power motorcycles into *chakkadas* in the 1950s (Deorukhkar, 2015). By the mid 1970s, *Chakkada* was introduced as a means of public transport mainly due to the narrow roads in the villages of Saurashtra coast.

In due course, it was used for transportation of fertilizers, harvested agricultural crops, agricultural products. The use of *chakkada* in seafood industry started much later in the early 1980s. The technical specification including the dimension, design and structure has not been changed till today.

Before the introduction of *chakkada*, the fishes were transported in small vans, donkey cart and bullock cart. For the transportation of high value fishes, small vans were used, while low value fishes were transported by donkey and bullock carts.There are around 3000 registered *Chakkada* operating in the Gir - Somnath District. The average price of *Chakkada* is Rs.1,75,000/- and the cost varies with the engine horse power. Usually, two different types of engines are used in chakkada (7.5 HP and 6.5 HP). The materials used for construction of the transportation platform of *chakkada* are wood and iron plates.

The transportation charges per trip is Rs.100-300/- and depends on the materials transported. The average net income during the peak season (September-December) is Rs.15, 000 - 20,000/- per month. During lean season (except fishing ban months) the average income ranges from 8,000 - 9,000/- per month. During fishing ban season most of the personnel are engaged in daily wage works in dry docking, painting the boat and net mending and earns Rs.3,000 - 4,000/- per month.

Transportation time

Most of the fishing related activities in Veraval, Mangrol and Okha are very near to the fishing harbor. In Veraval, the time taken to cover the distance from ice plant to fishing harbor is few minutes to half an hour and from fishing harbor to fish meal factories is around 15-20min (Table 2). Minimum 7 to 20 trips has been carried out depend on the season and type of material to be transported.

Table 2: The details of transportation time by *Chakkada* in Veraval, Gir-somnath District, Gujarat

Details of trip	Time	Cost/trip
Ice plant to fishing harbor	2-3 min	Rs.100
Fishing harbor to seafood factories at GIDC, Veraval	15-20 min	Rs.200–Rs.300

Transportation of fish in crates

Transportation of low value fish

Transportation of fuel barrel

Transportation of ice

Recommendation

"*Chakkada*" is a cheap, cost effective, easily available and commonly used mode of transportation that generates employment in the fishing sector, along the Saurashtra region of Gujarat. Maintenance of freshness of fish and hygienic handling conditions are of primary importance during transportation of seafood for better value generation. For this reason, the vehicles used for transportation has to be highly reliable. There is a need for modification of the existing design to make it more hygienic for transportation even for the low value seafood.The *Chakkada* should be re-designed and constructed to protect the seafood from all likelihood of contamination during transport.

A protection from direct sunlight, making the contact surfaces more hygienic, a protection from dust, flies, birds and bird droppings also is essential for making the transportation more efficient. But any modification should be brought into considering the cost, weight of structure, its ergonomics and surely in consultation with the local fishers actively using the vehicle.

The surfaces of the *Chakkada* which comes into contact with fish shall be made of safe materials and easy to be cleaned. The fish carrying spaces of *Chakkada* shall be sufficiently insulated in cost effective way so that the product can be maintained at less than 4°C during transport.

Impact of COVID-19 on the livelihood of fisher folk community in Gujarat

China is the major export market for Gujarat and the trade was adversely affected from January 2020 when the COVID-19 virus infection affected China. The year 2019-20 is one of the worst years for the fishing industry of the state.

The fishing season was interrupted for three months due to cyclone threats. It is estimated that there will be a 40-60 % reduction in the catch during this year. Moreover, due to the extended winter there had been a reduction in the catch further. The workers involved in the fishing industry whose livelihood are affected due to uncertain export market and reduction in the fish production.

Reference

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National Virtual Consultation on "Indian Ornamental Fisheries 2.0 - The Way Forward"

ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, New Delhi and National Fisheries Development Board (NFDB), Hyderabad organised the National Virtual Consultation on "Indian Ornamental Fisheries 2.0 - The Way Forward" from April 22 - 24, 2021. Hon'ble MoS, MoFAHD & MSME, Shri. Pratap Chandra Sarangi, inaugurated this programme and called for indigenous manufacturing of aquariums and the accessories for an Atma Nirbhar Bharat and promoting the aquarium hobbying thus increasing the production of ornamental fish to develop the ornamental fisheries sector in the country.

Other dignitaries for the inaugural programme were Shri Atul Chaturvedi IAS, Secretary, Department of Fisheries & Animal Husbandry and Dairying, Dr C. Suvarna IFS, CE, NFDB, Dr J.K. Jena, DDG, Fisheries Science, Dr J. Balaji IAS, Jt. Secretary, DoF, Dr Dilip Kumar Former Vice Chancellor, ICAR-CIFE, Dr S. Felix, Former Vice-chancellor, TNJFU, Dr. V.V. Sugunan, Former ADG, ICAR, Dr. S. Raizada, Former ADG (Inland Fy), ICAR .Several other scientists and top officials from the ministry participated in the programme.

Technical sessions followed the virtual inaugural session and it began with the Presentation on "PMMSY Support Schemes for Ornamental Fisheries Development" by DoF, MoFAHD. Technical sessions on following topics were arranged in three days.

Session I: Enhancing the Domestic Ornamental Fish Production & Constraints in Marketing

Inaugural session of virtual seminar

Session II: Achieving Self-reliance in Manufacturing of Aquarium Accessories

Session III: Quality Feed, Medicines & Aquatic Plants

Session IV: Promoting the Domestic Retail Trade of Ornamental Fish & Hobby Promotion

Session V: Boosting Ornamental Fish Exports and Issues in Imports

Session VI: Biodiversity Concerns & Policy Issues

Session VII: Research & Development Priorities, Govt. Schemes, HRD & Capacity building

Dr. T R Gibinkumar, Deputy Director, Statistics & Market Promotion attended the Virtual Consultation representing MPEDA and gave a presentation on "Institutional support for Indian ornamental fish exports" in the Session V: Boosting Ornamental Fish Exports and Issues in Imports.

The three days consultation covered different thematic areas for discussion such as enhancing the domestic ornamental fish production & constraints in marketing, achieving self-reliance in manufacturing of aquarium accessories, quality feed, medicines & aquatic plants, promoting the domestic retail trade of ornamental fish & hobby promotion, boosting ornamental fish exports and issues in imports, biodiversity concerns & policy issues and research & development priorities & capacity building .

Thirty-two key stakeholders from different key segments of the sector participated in the consultation and shared their opinions and the event was attended by more than 2000 other stakeholders. The concerns raised by the stakeholders were documented properly, compiled and subjected to elaborate discussion during the event. Based on the discussions, a set of draft recommendations were made and circulated for stakeholder opinion. Subsequently a detailed roadmap was proposed to be developed for the Ornamental Fisheries Development in India.

On the third day after technical sessions a Panel Discussion on Cross Sectoral Issues were done with a Presentation of the salient outcomes of the consultation and an Open Session for finalizing the outcomes. The National Virtual Consultation concluded at 13.30 hrs on 24th April 2021 with a Valedictory Session Chaired by Dr V. V. Sugunan, Former ADG (Inland Fy.), ICAR and Co-chaired Dr Paul Pandian, Fisheries Dev. Commissioner, DoF, MoFAHD and Dr G. Gopakumar, Former Pr. Scientist & HoD, ICAR-CMFRI. Dr S.K. Swain, Director, ICAR-CIFA & his team made all the arrangements for the event.

Mud Crab – the rising star of Indian seafood industry

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Introduction

Crabs are the third most popular crustacean delicacy in the world following shrimps and lobsters. They are known for their sweet-flavoured and firm meat as well as the ability to be presented in various forms such as claw meat, colossal, jumbo etc. making it a sought after export commodity. The crab market of the world predominantly relies on wild caught crabs which are from the offshore as well as in shore regions. Crabs are among the top in the crustacean list of cultured and captured species of the world. Globally, the marine capture species composition of crabs is dominated by the Gazami crab (*Portunus trituberculatus*) while the culture species is dominated by Chinese mitten crab (*Eriocheir sinensis*). Crab fisheries around the world are highly popular and it has put some of them on the world map such as the King crab fishery of Alaska, the Blue crab fishery of North Carolina etc. In India, marine crab is not part of the cuisines in all states particularly inland because of the perishability but freshwater crab is considered a medicine and tonic in inland regions as a cure for numerous physical and physiological issues. However, the coastal states of Kerala, Tamilnadu, and West Bengal are quite familiar with crabs, crab fattening and farming using wild caught seeds and crablets. Nowadays, the spread of canned and processed products are also creating a demand for crab meat in the inland regions. Being a delicious and healthy food item, if supported with research findings on its hatchery and grow-out techniques, crabs may be a growing but profitable option to the farmers in India.

Crab species diversity in India

True crabs come under Crustacea and are decapods included in the brachyuran infraorder. Crabs vary from the largest Japanese spider crab to the smallest pea crab. In India, the commercial crab fishery is supported by the *Portunus sanguinolentus, P. pelagicus* (Blue swimming crab), *Charybdis spp., Scylla serrata, S olivacea*, etc. Recent reports based on DNA evidences have proven that the species described earlier as *S. tranquebarica* is actually *S. serrata* and the species reported as *S. serrata* earlier is in fact *S. olivacea* (Balasubramanian et. al., 2016; Mandal et al., 2021). Among the commercially important species, the distribution of blue swimming crab is prevalent in almost all coastal states except West Bengal and the maximum diversity in the crab species is seen in Tamilnadu with more than 10 species. The mud crab or green mud crab or the mangrove crab is distributed all along the indo-pacific coast and found in plenty along the east and west coast of India. Presently, mud crabs in India includes only 2 species *S. serrata* (the green morph), *S. olivacea* (the brown morph). They are found in the estuarine and mangrove habitat with ease and is cultured using the wild caught juveniles traditionally by fishermen and other coastal communities.

Potential of crabs for Indian aquaculture & seafood export

Crabs were not given due importance in the past owing to all the focus on shrimps – the most popular crustacean. The 1980s-2000s saw the rise and fall of *P. monodon* in Asia and *Litopenaeus vannamei* in America as candidate shrimp species particularly owing to the spread of WSSV among other diseases. Crab was a potential species for this time but breeding and seed production technology was not perfected. This led to depletion of wild stocks due to the uncontrolled fishing activities to meet increased demand. Eventually, in 2000, SEAFDEC developed the breeding, seed production and larval rearing of mud crab, a major breakthrough and opening a new era for coastal aquaculture. But, around the same time i.e. end of the 90s, SPF/SPR *vannamei* was introduced and Asian farmers also took it up. It spread to all countries and has been tried and tested in waters of all salinities with varying degrees of success. *Vannamei* was officially introduced in India in

Female Mud crab

Mud Crab farming for soft shell crab production in boxes

Mud crabs collected from a seawater canal in Thoothukudi

2009 and since then it has reigned the seafood export. Recently, the shrimp farming industry is under turbulent waters owing to rapid technology advancements, disease outbreaks and scrutiny by environmentalists for habitat destruction, additives, water pollution, etc.

This has diverted the attention of all stakeholders towards environmental consciousness and sustainability of resources, production systems. Mud crab being a native species, adaptability to any habitat particularly the mangroves and the ability to be sold live makes it an aquaculture species for the future.

In 2004, the RGCA standardized the seed production for mud crab (*S. serrata*) in India and had established pilot scale hatcheries to distribute seeds to farmers. MPEDA had listed the production of mud crab in the list of new exportable species along with Sea Bass, Tilapia and Pangasius during the year 2017-18 when there was a total crab production of 2126 MT from 7494 ha in 6 coastal states. Its potential and future scope will only increase as it is sustainable than shrimp.

Status of mud crab seed production and farming in India

In India, crab farming started with low density stocking of wild juveniles in polyculture with fish or shrimp during the early eighties when cages, pens and small ponds with net were used for holding crabs for 4 to 8 weeks. Continued demand for crabs, coupled with capture fishery concerns have driven to consider the species for aquaculture, both for restoration efforts of fishery, habitat or for food production. Research institutes took up the project and developed standardized protocols for seed production as it can also ensure uniformity in the size of animals produced through culture, increasing its preference in the market.

In India, two prominent species explored most thus far are mud crab (*S. serrata*) and the blue swimming crab (*P. pelagicus*). The seed production for *P. pelagicus* and *S. serrata* was done by CMFRI and CIBA respectively. Crabs are reared by fattening or through culture. Even though fattening is done in many species, culture is restricted to one or two species because of

lack of techniques in seed production and hatchery management in the others. Culture activity refers to the rearing of seeds or juveniles to marketable size (500 g) while fattening is holding of the adults or water crabs or soft shelled crabs to acquire marketable features in it.

Mud crab has been much commercialised since the pilot project by RGCA (R&D arm of MPEDA) for seed production in 2004, the mangrove mud hatchery is established at Thoduvai, Nagapattinam, Tamilnadu. It is one of the very few mud crab seed hatcheries in the world and it had a production of 8.09 lakh crab instars for the year 2017-18. Today, with the help of this hatchery, rearing of mud crab is flourishing in the states of Kerala, West Bengal, Andhra Pradesh and Odisha.

Culture systems for mud-crab

Mud crab can be cultured in ponds, cages, pens or in cellular/box systems.

Pond grow-out culture

In ponds, it can be monoculture or polyculture with compatible species. It can be done in brackish water ponds, coastal ponds, creeks and tide fed ponds. It can also be done in places where saline water is available. The most important aspect is fencing with netting or plastic as the crabs tend to walk out of the ponds. They also have burrowing character, hence the soil must be more towards clayey i.e. a sandy soil with 50% clay is preferable.

Mounds can be given with some amount of earth or soil raised above water level with some vegetation. Hideouts must be provided in the ponds to reduce cannibalism. Stocking density is done at 1/m^2. Traditionally, they are fed with trash fish but nowadays commercial farmers use shrimp feed for crab farming also.

Pond culture can also be done in mangrove areas integrating itself with the mangrove vegetation. The ponds are constructed as usual with depth of and constructed around the tree. Most suitable would be of 100 m^2 area some area can be left above the water level with mangrove vegetation trees which will act as a refuge for the crabs during low tide.

A canal is to be constructed around the pond which will have water even at low tides. The crabs maybe fed occasionally with low value fishes and clam meat. The pond should be surrounded with a netting or plastic to prevent escape of crabs.

Pen culture and aqua-silviculture

Pen culture of mud crabs is dominantly practised in mangrove ecosystems. RGCA uses pens of 20 m x 10 m x 1.2 m. it was made of HDPE netting. The advantage of pen culture is that it facilitates easy monitoring, harvest and provides selective harvesting options.

Pens can also be constructed with locally available wood and logs split and arranged to form the pens with sufficient gaps to let water flow through them. Aquasilviculture uses the mangrove nursery to culture crabs in pens, this will aid in sustainable utilisation of the mangrove areas. It is imperative that the mangroves be conserved. Silviculture is the art of planting the mangrove saplings in deforested mangrove areas. This area can further may made used for the crab farming by erecting pens.

A model of such integration was carried out in Philippines and it can be carried out in India in the various mangrove regions by incorporating the locals, fisher folk or even women as a means of alternate livelihood. This integrated approach to conservation and sustainable utilization of mangroves aims to maintain the integrity of the mangrove ecosystem while capitalizing on the economic benefits of brackish water aquaculture. The Sundarbans and Pichavaram mangrove sites are potential sites for such integrated utilisation projects.

Box/Cellular system

Boxes are different types of enclosures but the similarity is that the crabs are placed individually in each box. This prevents cannibalism and can also help in production of soft shell crabs. Boxes are placed in racks and maybe submerged in ponds or floating. Traditionally enclosures were made of locally available wood but these days HDPE boxes and other ready-made boxes are available for the same.

Cellular systems are well organised racks of boxes stacked one above the other with recirculation and round the clock monitoring system. They are mostly used in South East nations where soft-shelled crabs are much sought after and in demand. Soft shell crabs are those adult crabs immediately after moulting i.e. within 1 hr, it requires trained personnel to categorise the animals on time at pre-moulting and harvest immediately after moulting.

Bottlenecks in crab culture

- Dispersed research data on breeding, larval rearing and dietary interventions of various species
- Dependence on wild caught juveniles despite hatchery establishment
- Disease and parasite infestation
- Absence of commercial low cost feed

- Less survival and cannibalism
- Difficulty in transportation
- Lack of awareness among public on crab meat and myths on crab meat allergens

Conclusion

Crab culture can be an equivalent to shrimp culture. It requires more expertise in handling and better feeds are to be developed. When integrated with mangrove afforestation, it is a highly sustainable option in coastal aquaculture. Presently, many research institutes are working on various aspects of crabs particularly mud crab. They need to be unified under one umbrella and develop standardised technology that is fool proof for farmers. This can ensure higher economic returns for farmers as well as export earnings for India.

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Role of GIS & satellite technologies in farm traceability

Neenu Peter, Assistant Director, MPEDA Regional Division, Bhubaneswar

The Marine Products Export Development Authority (MPEDA) is in the forefront to support the primary producers/aquaculture farmers and aquaculture development activities in the country for the last 4-5 decades. It stood up with the aqua farming sector on need basis by taking up commercial production and supply of shrimp seeds and diversified species which have demand in international markets, by extending technical assistance to stakeholders including hatcheries, by operating Aquatic Quarantine Facility when *Litopenaeus vannamei* emerged as a promising species in India and many more.

When we witnessed more than five-fold increase in production of aqua cultured shrimp over a period of 10 years, MPEDA took a pro-active step to enroll aquaculture farms and hatcheries. This exhaustive online database has been designed to capture individual aquaculture farm details through field surveys and a series of verification performed before an enrolment card is issued to the farmer. The database is a valid pack of information which is tagged with geographical information of the farm. The geo tagging of farms across the country make the system developed and maintained by MPEDA a unique one in the Indian aquaculture and fishery sector.

Geographical Information Systems (GIS)

Geographical Information Systems (GIS) is recognized by various working sectors as capable of generating useful information for decision support. GIS may be defined as "An information system that is designed to work with data referenced by spatial or geographic coordinates. In other words, GIS is both a system with specific capabilities for spatially-referenced data, as well as a set of operations for working with the data". (Star and Estes, 1990).Environmental Systems Research Institute (ESRI) which is an international supplier of Geographic Information System (GIS) software, web GIS and geo-database management applications states that a working GIS has five key elements - software, hardware, data, people and methods. In fact MPEDA has engineered a simple system integrating these elements for maintaining an online platform for enrolled farms.

Vital elements in the Aquaculture farm database management system

The key components that contribute to the aquaculture farm database of MPEDA are summarized below:

a. Data: The input data includes the details collected during ground survey and the geographical coordinates recorded at the field for individual aquaculture farm.

b. People: The people involved in the generation and management of the database are the aquaculture farmers, technical staff to conduct survey, data entry operators for making online entry, GIS Personnel to handle the geospatial data, Monitoring Officers at Field Offices, Quality control staff involved in laboratory for testing of aquaculture produce and Administrator who controls as well as maintains the Online database.

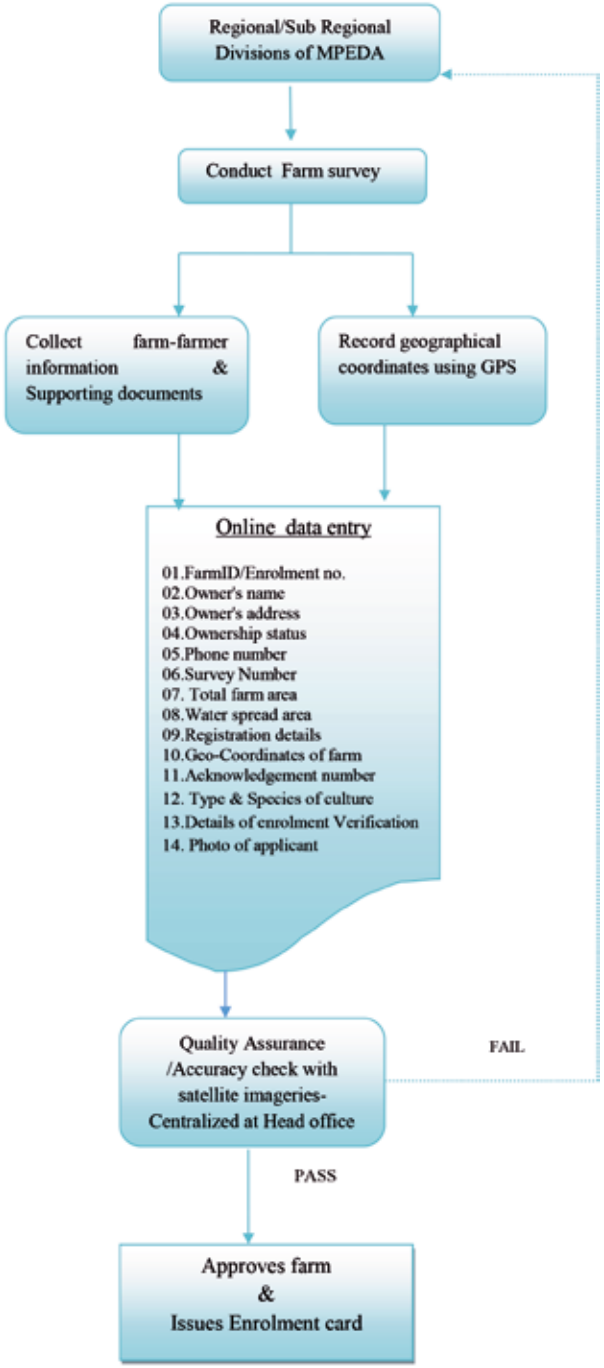
c. Hardware: The hardware components involve the Computer with internet connection for making online entries at the field offices, GPS device and the Computer at the head office on which the GIS softwares are installed.

d. Software: GIS software is the tool which is used to represent the spatial data recorded using GPS device, analyse, modify and generate digital sketch of individual farm for use in GPS device & Google Earth application. GIS Softwares used for the purpose are ARCMAP 10 and Open source softwares like Quantum GIS.

e. Method: MPEDA has developed methods and protocols for (i) generating, maintaining, updating the database; (ii) managing data flow between field offices, quality control laboratories and head office; and (iii) data verification processes for assuring the validity of basic data and the quality of geospatial data .

Data Flow Management

The progression of stages in the generation of Spatially referenced database of aquaculture farms is detailed in the data flow chart as given below.



Quality of spatial data and its relevance

Utmost importance is given to ensure that the geographical coordinates of a farm are recorded and tagged properly. This is important due to closeness of farms along the coastal belts and a minute error in recording will tamper the correctness of geo-tag information of the farm.

Standard handheld GPS devices with advanced satellite systems and high positional accuracy are used in the field to record the geographical coordinates of all corners of an aquaculture farm. Commonly used GPS device for MPEDA enrolment activities is Handheld GARMIN eTrex 30 device (Fig.1), which has the capability to track both GPS and GLONASS satellites simultaneously.

GPS (Global Positioning System) is a satellite constellation built by the Unites States of America

Fig. 1. GARMIN eTrex 30 device

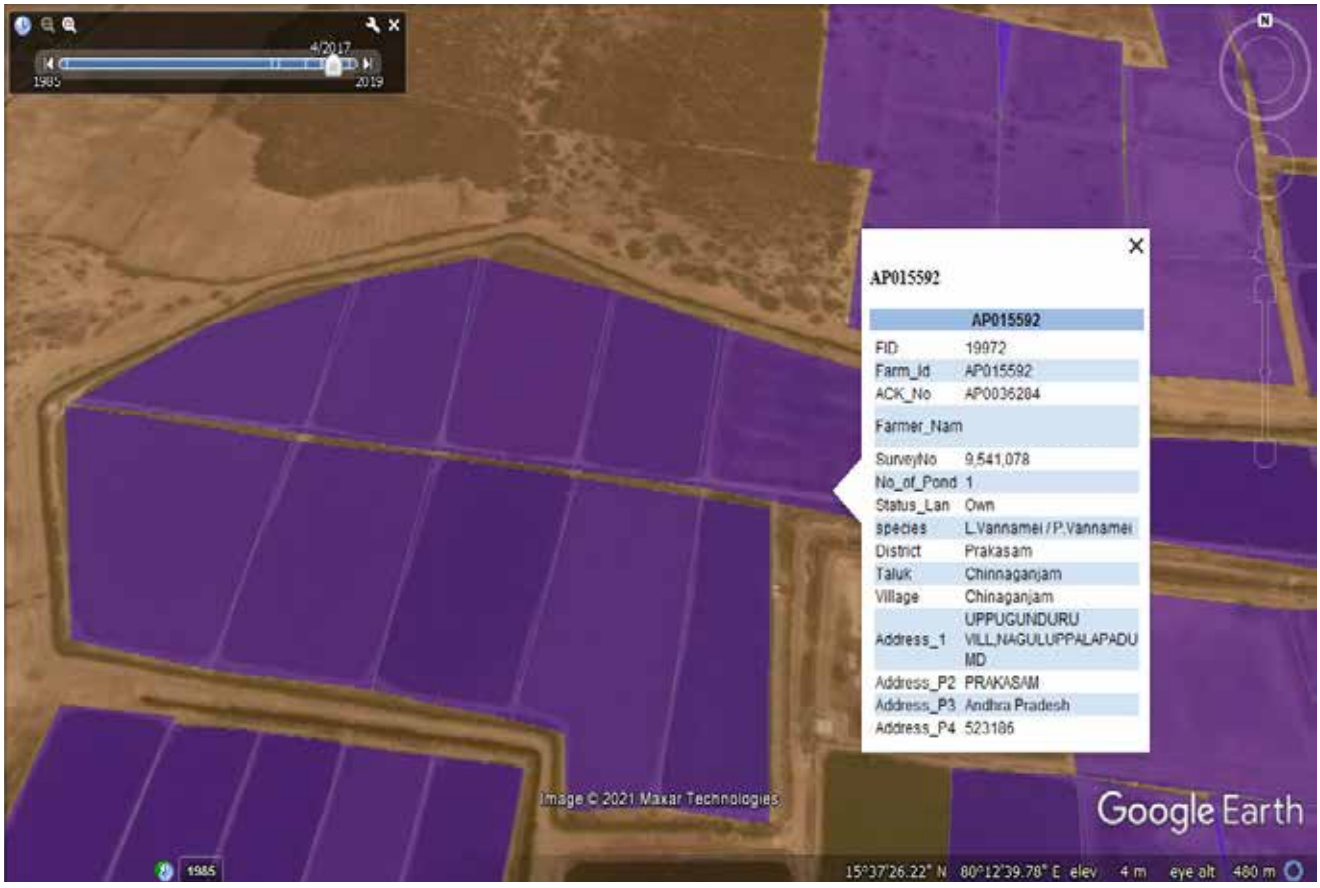


Fig.2. View of MPEDA enrolled farms in Google Earth

and GLONASS (Global Navigation Satellite System) is the one built by Russia. The combined access to both satellite systems offer increased performance in challenging environments and faster position acquisition by the device.In addition to geo-tagging of a newly enrolled aquaculture farm, the analysis of data collected during physical verification of a farm using GPS device in GIS softwares helps to identify issues like change of ownership, wrong or incomplete recording of geographical coordinates etc.

The coordinates can be converted to digital sketches of maps viewable in Google Earth application tagged with the details of individual aquaculture farms which could be used by anyone who has an internet connection (Fig.2).

End user application

The database of aquaculture farms with spatial reference is a robust one and forms the backbone of the decision support system in various activities of the organization.

The scope extends from traceability of farm during sampling and testing of its produce, extraction of multiple location based information like disease affected areas, hot spots where banned antibiotics are used, identification of farming areas which regularly test soil-water-microbiology parameters at Aqua One Centres of MPEDA- NaCSA, farms which supply produce for different markets like EU, USA, easy navigation to enrolled farms etc.

MPEDA, through its field offices continuously encourage to bring all aquaculture entities which supply their produce to the export market under the enrolment scheme. Anyone who would like to enrol his/her aquaculture farm, which supplies produce to cater to export demand can contact the nearest MPEDA office.

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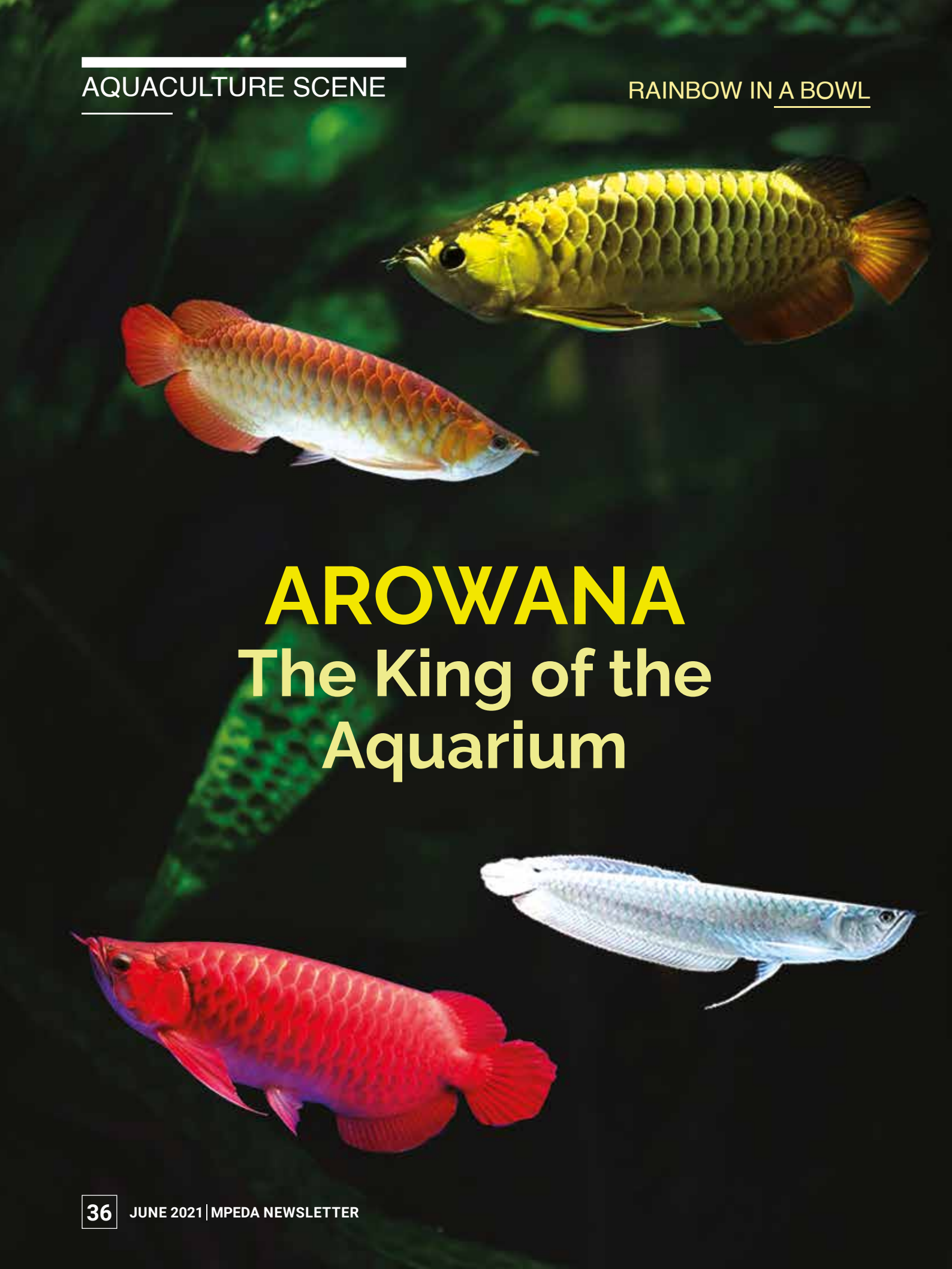


AROWANA
The King of the Aquarium

V. K. Dey

V K Dey has over three decades of experience in diverse sectors of seafood industry in Asia-Pacific region. He was the Deputy Director of MPEDA and then associated with INFOFISH, Malaysia. As part of INFOFISH, he was involved in several studies related to seafood industry in the Asia-Pacific region and beyond, including setting up of Aqua-technology Park for ornamental fish. MPEDA has published Living Jewels, a collection of his articles on ornamental fish.

Asian Arowana, commonly known as Dragon fish, belongs to the family Osteoglossidae and is widely regarded as the “King of the Aquarium" due to its popularity. Since it resembles the ancient dragon, it is considered to be another “Feng-shui” fish that brings luck, wealth and prosperity. It is unique in shape with a large mouth and neatly arranged distinctive scales. The body is symmetrical with limb-like fins. The fish is distributed in Cambodia, People's Democratic Republic of Lao, Peninsular Malaysia, The Philippines, Vietnam and Indonesia (Kalimantan and Sumatra).

Though they prefer slow flowing turbid or weedy waters in their natural habitat, they do equally well in clear, good quality water in large aquaria. In the wild, they eat a wide range of foods, largely from the surface and upper layers of the water column. They are difficult to breed in aquarium conditions and breed only in shaded natural earthen ponds that are sufficiently planted with aquatic plants. They prefer neutral to slightly acidic water (pH 6.5 – 7) and a temperature range from 26 – 30°C. Spawning takes place almost throughout the year with the peak season being in July and December. The sexes are indistinguishable before maturity and sex differentiation is difficult even after maturity. Males are slightly slimmer than females and possess deeper and wider mouths. A brooding male can be recognised easily by its conspicuous brood pouch used for holding eggs. Due to the aggressive nature of the fish, the growth of juveniles is often uneven hence it is better to isolate the individual fishes.

The dragon fish is found in a number of colour forms such as Golden, Red and Redtail Golden, and Green Dragon fish. The value of the fish depends on the body colour of the fish. The more uncommon the colour, the more valuable the fish. The Golden Dragon fish is the most expensive at present.

The Golden Dragon fish is a native of west Malaysia. There are more than six varieties, based on geographical distribution. As the fish matures, the scales turn yellow with a tinge of olive green which extends to the fourth row of scales from the stomach region. The edge of each scale is pinkish, with some golden yellow colour. As the fish is fully-grown the pink colour of the scales diminishes and the whole fish turns golden yellow, extending to the fifth row of scales and over the back. However, depending on the condition of the environment in which they are grown, the colour may differ. Since it is in limited supply, its demand is great.

The Red Dragon fish originates from Kalimantan and Sumatra in Indonesia and is also known as the Indonesian Red Dragon. The Chinese consider it as a prosperous fish and it is a most preferred variety due to its red colour. A good quality fish has a chilli or blood red body colour and the edges of the scales are radiant. Though the scales are orange yellow with a tinge of light green in the young, it has prominent red trimmings as the fish grows. The scales have a shade of purple blue when it becomes fully grown.

The Red-Tail Gold Dragon fish, also a native of Indonesia, is more affordable than the Golden Dragon. The reason is because the dorsal portion of the fish is dark green including the dorsal fin and upper half of its tail fin with the rest of the body scales gold. In younger fish the scales are golden tinged with pink; however the luster of the scales will not extend to the fifth row as in the case of the Gold Dragon.

The Green Dragon fish is a native of Thailand, Malaysia, Vietnam and Myanmar. It has green scales and a very distinct lateral line and is the cheapest among the Dragon fish. Due to its widespread distribution there could be many differences in its appearance and colour pattern. The more expensive varieties have purplish-spotted scales. Fish without purple spots are very common and regarded as a cheap variety.

Factors such as colour, body shape, colour of scales and their pattern, fin shape, eyes, mouth, teeth, gill covers, vent and swimming pattern determine the quality of the fish. In view of their greater market demand, they have been hunted in the natural environment, resulting in the depletion of stock. Efforts have been made to conserve the natural stock during the past few years and the Asian Dragon fish is now protected under CITES Category 1, as an endangered fish. Trading of this fish is regulated by CITES, with breeders having to indicate that they have successfully bred the fish in captivity. Only F2 generations are allowed to be marketed. Throughout the world a very few farms in Indonesia, Malaysia and Singapore have managed to get the CITES licence.

How to tackle the EHP problem in shrimp farms?

M. Viswakumar, Assistant Director, MPEDA Regional Division, Kochi

Enterocytozoon hepatopenaei (EHP) has emerged a serious problem for the shrimp farmers to tackle for ensuring success in their operations. EHP infection occurs when the spores of the fungal pathogen is ingested by the shrimp. The sources of EHP spores for ingestion by shrimp are: water, sediments, infested live feeds or through cannibalism. Literature and experts opinion suggest the following for tackling EHP problem in shrimp farms:

EHP infected L.vannamei showing differential growth

Measures to be taken during pond preparation:

1. Drain the ponds completely, ensure the pond bottom is cleaned effectively

2. Sterilize all farm equipment, screens etc.,

3. For lined ponds apply >15 ppm KMnO4 or >40 ppm chlorine to inactivate spores. For earthen ponds apply Calcium Oxide or Quicklime (>6 MT) to raise pH to >12 (Apply when the soil is dry; plough the soil thoroughly and then moisten to activate the lime)

4. Sterilize the water using Chlorine to remove carriers of EHP spores.

Shrimp Farm

Measures to be taken during culture:

1. Observe proper stocking densities.

2. The ageing of water may reduce EHP infection.

3. Only stock EHP-free PL, Destroy EHP-infected stock.

4. Only buy PL from registered hatcheries.

5. Keep pond bottoms clean – remove accumulating organic matter that could act as a spore reservoir.

6. Move aerators to ensure effective water movement and collection and removal of sludge.

7. If an infection is detected, give a high protein diet to help the shrimp's digestive capacity and recovery of the Hepatopancreas.

8. Do not overfeed shrimp – energy spent in digestion will only weaken the shrimp.

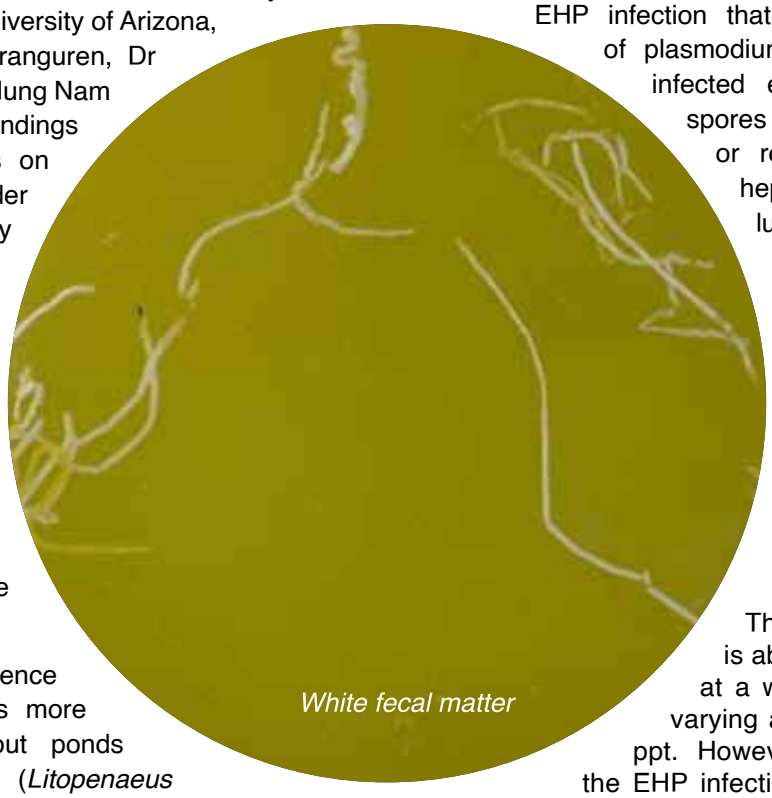
9. Ensure proper removal of suspended matter and sludge.

10. Ensure any new water entering production ponds is treated to prevent re-infection.

How salinity impacts EHP in Whiteleg shrimp ?

Hepatopancreatic microsporidiosis (HPM), which is caused by the microsporidium EHP, is probably the most important disease in shrimp farming at the moment. EHP has been reported in shrimp producing countries in Asia – including China, Indonesia, Malaysia, Vietnam, Thailand and India – as well as in Venezuela. EHP has been reported in shrimp ponds with a wide range of salinities (below 5 ppt and up to 55 ppt).

An article in the Fishsite website shares valuable information about the impact of salinity on EHP infection in Whiteleg shrimp (*Litopenaeus vannamei*). Following are the excerpts from the article authored by three scientists from the University of Arizona, Dr Luis Fernando Aranguren, Dr Arun K Dhar and Dr Hung Nam Mai based their findings of challenge studies on SPF *vannamei*, under different salinity conditions:



White fecal matter

"The salinity levels of shrimp ponds have been shown to have a major impact on the prevalence of Enterocytozoon hepatopenaei (EHP), according to new research from the University of Arizona.

"Anecdotal evidence suggest that EHP is more prevalent in grow-out ponds of whiteleg shrimp (*Litopenaeus vannamei*) where the salinity is high - >15 parts per thousand (ppt) - compared to grow-out ponds with low salinities (<5 ppt)."

"In our study, we were able to induce experimental infection using faecal strings as the inoculum.

The faecal strings, used as a source of EHP inoculum, were sufficient to elicit an infection in shrimp maintained at the three different salinities. The infectivity of EHP in shrimp reared at 2 ppt, 15 ppt, and 30 ppt salinities was confirmed by PCR and histopathology. Our results show that the prevalence and severity of EHP infection was higher at 30 ppt than at 2 ppt and 15 ppt.

This study demonstrated that faeces could be used as EHP inoculum in experimental challenge and concurrently, infectious faeces could be a source of contamination in hatcheries and grow-out ponds. Taking advantage of the detritivorous behaviour of crustaceans and the presence of undigested feeds, comprising 25-50 percent of the faecal matter, we were able to deliver EHP infectious spores to shrimp and perform experimental challenges.

Using faeces collected from confirmed EHP-infected shrimp, our experimental design simulated horizontal transmission of EHP, as observed at a farm level. Histopathology of hepatopancreas tissue dissected from experimentally challenged shrimp reared at three different salinities displayed characteristic lesions of EHP infection that include the presence of plasmodium in the cytoplasm of infected epithelial cells, mature spores within the cytoplasm or released spores in the hepatopancreatic tubule lumen.

L. vannamei is a euryhaline species, which is raised in a wide range of conditions including high salinities (30 ppt), estuarine environments (10-20 ppt), and low salinities (2 ppt).

This study confirms EHP is able to cause an infection at a wide range of salinities, varying as much as 2 ppt to 30 ppt. However, the prevalence of the EHP infection increased at 30 ppt salinity (87.5 percent prevalence), compared to 15 ppt (30.0 percent prevalence) and 2 ppt salinity (33.3 percent prevalence).

The difference in the severity of the EHP infection at the three different salinities was probably due to the differential effect of salinity on spore germination. One

of the critical phases in the spore germination is the increase of intra-spore osmotic pressure. The difference in salinities led to a hypotonic environment at 2 ppt and 15 ppt compared to the hypertonic environment at 30 ppt. It is possible that the hypertonic solution enhances the germination of the spore by increasing the spore activation process."

Conclusion

"This study demonstrated that faecal strings from known EHP-infected shrimp could be used as a reliable source of inoculum to conduct EHP experimental infections via the faecal-oral route.

An EHP infection can occur in water with a salinity as low as 2 ppt, although the prevalence and the severity of infection is higher at a salinity of 30 ppt. These findings have implications in disease management in EHP-endemic areas.

In shrimp farming areas where EHP is a major sanitary issue, farmers can minimise the risk of EHP infection by stocking EHP-free post-larva, carrying out a thorough disinfection process of the grow-out pond prior to stocking PL, and by using liners to isolate the PL from the natural pond bottom. Alternatively, shrimp can be cultured in lower salinity (~15ppt) to minimise the severity of EHP infection."

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MPEDA pays tribute to Prof. Donald V. Lightner

Shrimp Disease Research Laboratory, The University of Arizona, USA

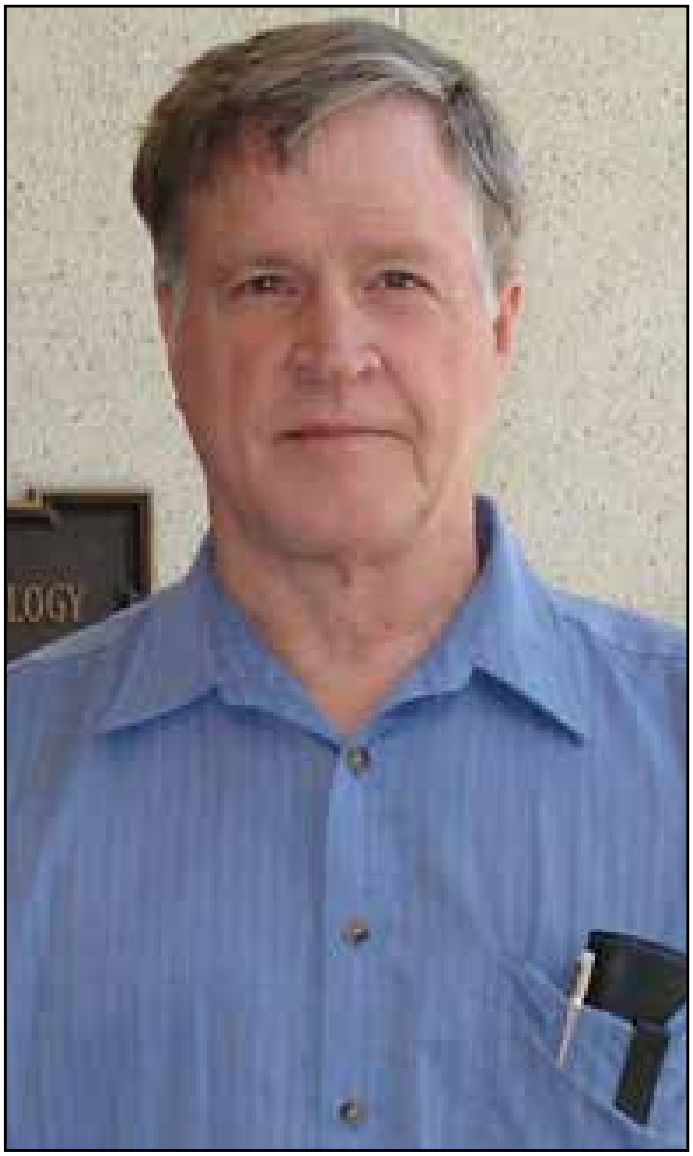
The world of aquaculture, especially aquatic animal disease specialists lost an iconic figure. Legendary Professor Donald V. Lightner passed away on May 4, 2021 in Tucson, Arizona. The Aquaculture Pathology Laboratory lead by Professor Lightner plays a pivotal role to assist world's shrimp aquaculture to become a sustainable industry. He was associated with the department of Animal and Comparative Sciences of The University of Arizona, USA. Since 1973 till 2019, he published 231 research outputs, which are having nearly 10 thousand citations.

MPEDA had a very wonderful relationship with Prof. Lightner and his Lab. When Indian Black tiger shrimp aquaculture was devastated with White Spot Syndrome, the sector was desperate to find a way out of it. MPEDA was the first organisation to invite him to India for seeking an advisory to control the dreaded white spot disease. The first consultative meeting was held at Vizag, Andhra Pradesh during 1995.

Since then, he was a true advisor to solve various aquaculture disease related issues faced by MPEDA, especially for its society, Rajiv Gandhi Centre for Sustainable Aquaculture (RGCA). Dr Lightner had visited various projects of RGCA several times and offered valuable suggestions. His team has immensely contributed to make AQF as a world class facility as per the biosecurity protocol concern.

Dr Lightner has also helped in making RGCA's Central Aquaculture Pathology Laboratory at par with the world standards. RGCA jointly conducted a Short course on Shrimp Pathology with Prof. Lightner's lab for the benefit of Indian Aquaculture Industry in 2013.

His remarkable contributions in designing RGCA's Domestication of Tiger Shrimp Project (DTSP) & Nucleus Breeding Centre (NBC) based on biosecurity aspects is highly remembered.Dr Lightner's works in aquaculture pathology would remain as valuable reference material for generations to come. MPEDA & RGCA pay homage to Professor Donald V Lightner.



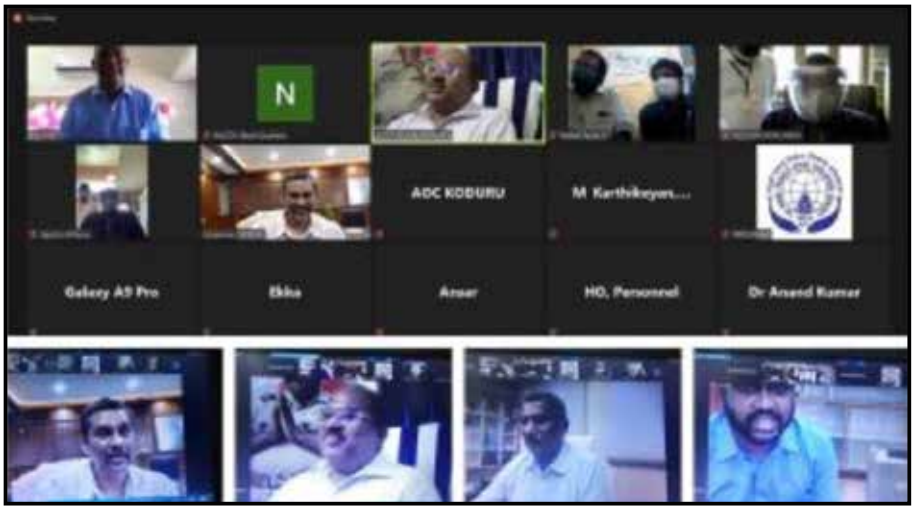
Professor Donald V. Lightner

NaCSA opens more AOCs in Andhra Pradesh

Three AOCs in Krishna district

3 Aqua One Centres (AOCs) in Krishna district were inaugurated by Shri A. Md. Imtiaz IAS, Collector and District Magistrate, Krishna District. The AOC at Machilipatnam was inaugurated physically by Collector & District Magistrate in presence of CEO, NaCSA, Fisheries Officials and NaCSA officials.

The other two Aqua One Centres located at Nagayalanka and Koduru were inaugurated virtually from MPEDA, HO, Kochi in the presence of Shri K. S. Srinivas IAS, Chairman, MPEDA & President, NaCSA on 17-05-2021. Felicitations were offered by Dr. M. Karthikeyan, Director, MPEDA, Shri K. S. Pradeep IFS, Secretary, MPEDA, and NaCSA GC Members. Around 3644 farmers are engaged in shrimp/sea-bass & crab farming in Krishna district with a total WSA of 3449 ha under NaCSA Aqua farmers Welfare Societies. The details are given below:



1. There are 1411 farmers with a total WSA of 1330 Hectares at Machlipatnam.

2. In Nagayalenka there are 1469 farmers with a total WSA of 1499 Hectares &

3. In Koduru there are 764 farmers with a total WSA of 620 Hectares.

With the establishment of AOCs,

the major farming areas will be totally covered. NaCSA will provide complete farm level analysis on water quality and to cover major chunk of Aqua farmers both inland and brackish water areas thus reduces the cost of production with right advisory inputs during culture.

This will increase the efficiency of farms by monitoring their seed and water quality from stocking to harvest at regular intervals for high survival rate and better production.

AOC at Ramayyapatnam, Prakasam district

The Aqua One Centre (AOC) in Ramayyapatnam, Prakasam district was inaugurated virtually by Shri Chandra Sekhar Reddy, Joint Director of Fisheries, Prakasam district on behalf of Dr P. Bhaskar IAS, Collector and District Magistrate, Prakasam District in the presence of Shri K. S. Srinivas IAS, Chairman, MPEDA & President, NaCSA on 19-05-2021. Shri K. Shanmukha Rao, CEO, NaCSA welcomed all the dignitaries to the virtual inauguration of AOC at Ramayyapatnam.

Felicitations were offered by Dr. M. Karthikeyan, Director, MPEDA, Shri K. S. Pradeep IFS, Secretary, MPEDA & Shri Chapalla Ramanaiah, NaCSA GC Member. Shri Dhirit Ekka, Dy. CEO thanked all the participants for attending the AOC inauguration.

During the programme,Chairman, MPEDA & President, NaCSA discussed and requested the Joint Director of Fisheries, Prakasam district to make use of the MPEDA SC/ST fund for aqua farmers in the district. JD Fisheries has shown interest on the issues & also assured to take up few projects in the district for utilization of fund.

There are 29 Aqua societies in Prakasam Dist and there are 577 farmers involved in shrimp farming with a total WSA of 526 Hectares. With the establishment of AOC in Ramayyapatnam, Prakasam district the major farming areas will be covered & will be helpful to the above shrimp farmers for getting their pond water/soil and animal health tested in the AOC.

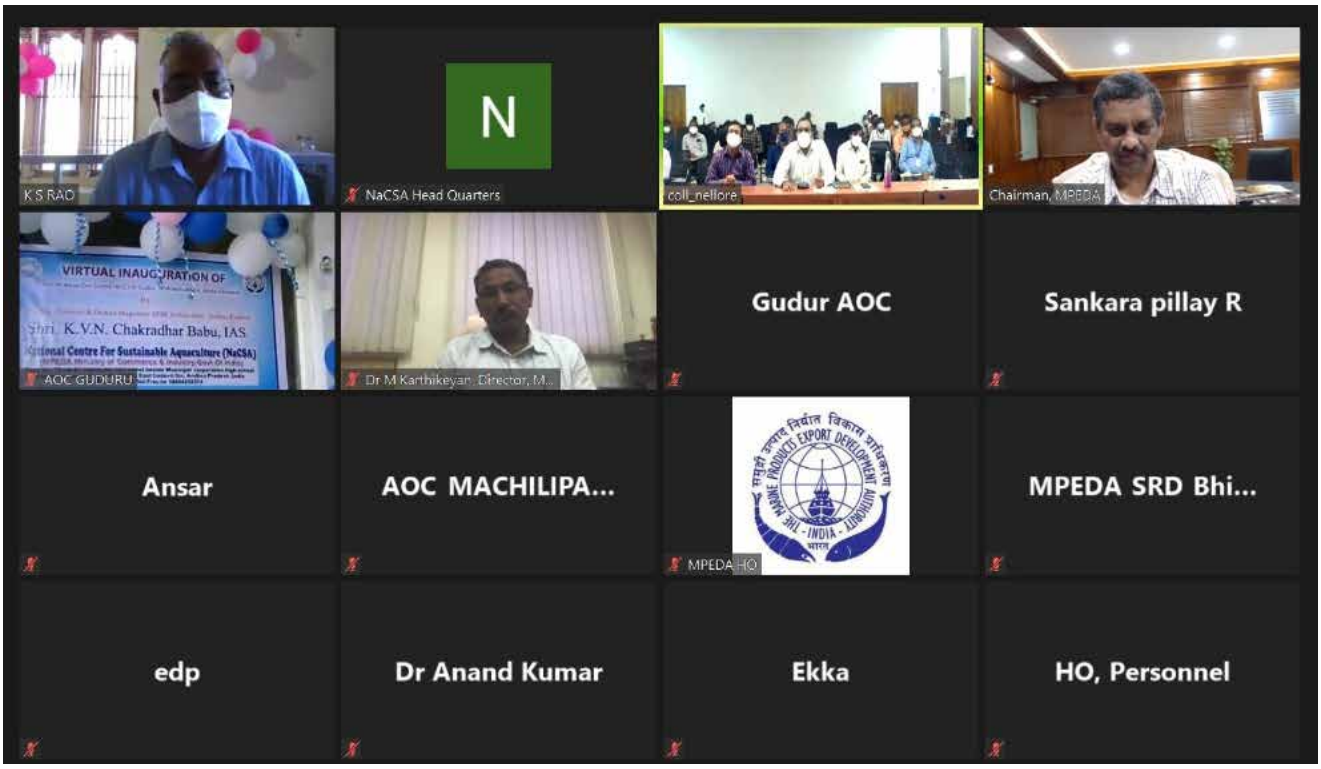
The establishment of AOC will also increase the efficiency of farms by monitoring their ponds, seed and water quality from stocking to harvest at regular intervals for high survival rate and better production under Continuous Pond Monitoring Programme (CPMP).

AOC at Varagali Cross Road,SPSR Nellore district

Aqua One Centre (AOC) in Varagali Cross Road (Gudur), SPSR Nellore District was inaugurated virtually by Shri K.V.N. Chakradhar Babu IAS, Collector and District Magistrate, SPSR Nellore District in the presence of Shri K. S. Srinivas, IAS, Chairman, MPEDA & President, NaCSA on 17-05-2021.

Felicitations were done by Dr. M. Karthikeyan, Director, MPEDA & Shri. K. S. Pradeep IFS, Secretary, MPEDA, Shri. K. Shanmukha Rao CEO, NaCSA thanked all the participants during the AOC inauguration.

During the programme, Chairman, MPEDA & President, NaCSA explained the importance of e-Santa which was recently inaugurated by Shri Piyush Goyal, Union Minister of Commerce & Industry and advised the District Collector to instruct the officials to



give more awareness on the uses of the platform.Also he requested the District Collector to make use of the MPEDA SC/ST fund for aqua farmers in the district. District Collector assured to utilize source.

Around 1822 farmers are engaged in shrimp farming in 75 Aqua Farmers Welfare Societies under NaCSA in SPSR Nellore district with a total WSA 1018 e- Santa.

With the establishment of AOC in Varagali Cross Road (Gudur), SPSR Nellore district, the major farming areas will be covered to maximum. NaCSA will provide complete farm level analysis on water quality and to cover major chunk of aqua farmers both inland and brackish water areas thus reduces the cost of production with right advisory inputs during culture.

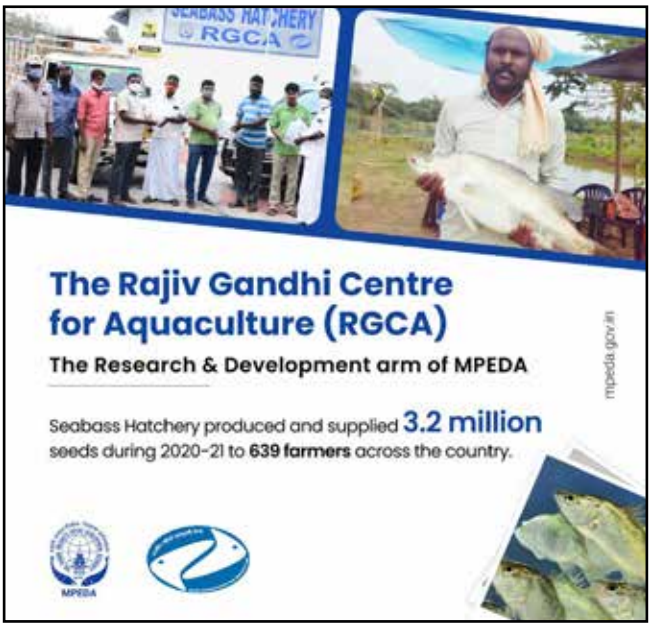
This will increase the efficiency of farms by monitoring their ponds, seed and water quality from stocking to harvest at regular intervals for high survival rate and better production under Continuous Pond Monitoring Programme (CPMP).

RGCA Seabass hatchery produces 3.2 million seeds

Rajiv Gandhi Centre for Aquaculture (RGCA) Seabass hatchery had 3.2 millon seed production. The Rajiv Gandhi Centre for Aquaculture, the Research & Development arm of MPEDA established its first large scale Sea bass (*Lates calcarifer*) seed production hatchery at Thoduvai, Mayiladuthurai District, Tamil Nadu during 1999.

The large scale seed production started during 2007 onwards for supporting farming community as diversified species for Shrimp aquaculture. During 2020-2021, the hatchery has produced more than 3.2 millions seeds and supplied to 639 farmers across the country.

The farmers, research institutes, private entrepreneurs, MPEDA- RGCA demonstration farms, State Fisheries Departments, NGOs and ICAR institutions have largely benefitted by the seeds.



SVR Hatcheries- the first to earn MPEDA"SHAPHARI" certification

The Marine Products Export Development Authority has been propagating its own certification scheme 'SHAPHARI' as a measure to produce and export residue free shrimps from India. 'SHAPHARI' is a Sanskrit word that means 'Superior quality fish suitable for consumption for even an Ascetic".

Frozen shrimp is the largest exported seafood item constituting 50.58 per cent in quantity and 73.21 per cent in terms of total US dollar earnings during 2019-20. Incidence of rejection of seafood consignments sourced from farms due to the presence of antibiotic residue is a matter of concern for Indian exporters.

To address the food safety issue in farmed produce, apart from National Residue Control Plan (NRCP) and Pre-Harvest Test (PHT) certification implemented by MPEDA, the certification scheme of 'SHAPHARI' was initiated to address the issue.

The certification of aquaculture was proposed as a market-based tool for hatchery/farmers in order to adopt Good Aquaculture Practices and produce good quality antibiotic free shrimp products addressing food safety concerns of global consumers. This scheme is based on FAO's technical guidelines on aquaculture certification.

The entire process of certification is implemented through a webportal to minimize human errors and to ensure higher credibility and transparency in the scheme implementation.


THE MARINE PRODUCTS EXPORT DEVELOPMENT AUTHORITY
(Ministry of Commerce & Industry, Govt of India)
MPEDA

'SHAPHARI' CERTIFICATE

App.No.:AP050002C Certificate.No.:MPAQ210001

This is to certify that

M/s.

SVR HATCHERIES,VEMAVARAM VILLAGE,EAST GODAVARI DISTRICT,AP

comply to the standards of 'SHAPHARI'-Certification of Hatcheries for the production of antibiotic free seeds.

Certificate is valid from 12-04-2021 to 11-04-2023

12-04-2021
DATE

Director, MPEDA

MPEDA's Pilot phase of hatchery certification scheme was initiated with the participation of 13 willing shrimp hatcheries engaged in seed production since May 2020. These hatcheries were willing to undergo audit by the designated auditors and agreed to be part of the surveillance program for shrimp seed quality. This certification of hatchery scheme will help farmers to easily identify the good quality shrimp seed producer whereas the certified hatcheries are benefitted by higher demand for their seeds among the farmers.

M/s. SVR Hatcheries, Vemavaram village, East Godavari District, Andhra Pradesh became the first shrimp hatchery in the country to get MPEDA 'SHAPHARI' certification for the production of antibiotic-free seed after successfully completing the mandatory audits.

Mr KS Srinivas, Chairman, MPEDA, distributed the SHAPHARI Certificate to Prathipati Mr Veerabhadra Kumar, Managing Partner of M/s. SVR Hatcheries in a virtual function held on 27th April 2021, in presence of representatives from All India Shrimp Hatcheries Association, Prawn Farmers Federation, Seafood Export Association of India.

'Shapahari' Certificate distribution ceremony

Mr. P. V. Kumar with the Auditors of Shaphari scheme

View of SVR Hatchery

SVR Hatcheries is a leading producer and supplier of quality shrimp seed in Andhra Pradesh and is renowned for consistency in the production of high health antibiotic-free shrimp seed.

The hatchery is headed by Mr Prathipati Veerabhadra Kumar, Managing Partner, who is a Post Graduate in Fishery Science with more than 25 years of experience in shrimp hatchery operations. Their technical team is led by Dr. M. Lakshman Kumar and Mr. K. Chakravarthi.

SVR Hatchery is scientifically designed to meet stringent biosecurity challenges in shrimp seed production and is registered by the Coastal Aquaculture Authority (CAA) of India for the production of Pacific White leg shrimp (*Litopnaeus vannamei*) seeds.

The hatchery has independent facilities for maturation, spawning, hatching, larval rearing, Artemia nauplii production, indoor and outdoor algal culture etc. SVR is a registered hatchery under CAA.

MPEDA audits processing plants on implementation of Covid 19 protocols

To verify the adherence to the Covid19-guidelines prescribed by MPEDA, the Officials of the Regional Divisions of MPEDA in Veraval and Vizag has inspected the seafood processing units in the respective regions. Report of the visit is as follows:

The officials of Regional Division, Vizag had visited the processing plant of M/s. Lito Marine Exports P Ltd, M/s. Danica Aqua Exports P.Ltd, M/s. Sandy Bay seafoods India P.Ltd. During the visit it has been observed that the units are fully aware of Covid 19 guidelines and properly implemented in facility as well as in all operations.

Regular awareness is extended to all workers and staff by supervising team as per Covid guidelines. At main entry of unit, security team is deployed for with all necessary items like temperature scanner, hand sanitizers, record keeping of visitors etc. Units had its own SOP and it is implemented.

MPEDA Regional Division, Veraval officials had visited the processing plants of M/s. Deepmala Fisheries, M/s. Golden Star Cold Storage Co., M/s. Jalaram Kalidas Exports, M/s. Anjani Marine Traders, M/s. Soneri Marine Foods to ensure the implementation of Covid guidelines. During the inspection, it has been observed that the units are following the guidelines properly. Few deficiencies noticed were explained to the parties and requested to them to rectify & strictly adhere to the MPEDA Covid guidelines. It was also recommended them to maintain separate checklist and monitoring records for Covid 19 guidelines.

New species of deepwater Snapper discovered

A team of marine biologists from the United States, Spain and Taiwan has discovered a new species of the Snapper genus Etelis living in Indo-West Pacific waters.

Etelis is a small genus of massive bottom-dwelling fishes in the family Lutjanidae. The genus is comprised of four recognized species, three *(Etelis carbunculus, E. coruscans and E. radiosus)* with overlapping ranges across the Indo-Pacific, and one *(E. oculatus)* in the Atlantic.

Named *Etelis boweni*, the newly-identified species looks nearly identical to *Etelis carbunculus*, but is genetically different. Both species are strikingly bright pink in color and occur at a depth of 200-400 m (650-1,300 feet), and both are widely found across the Indian and Pacific Oceans. Although they look remarkably similar, *Etelis boweni* grows much bigger than the other, sometimes more than 1 m (3 feet) in length. The new species also has smaller eyes and a black spot on the tip of its upper tail fin."It is similar to and was often misidentified as *Etelis carbunculus*, with both species sharing the diagnostic character of low number of developed gill rakers," explained Dr. Kim Andrews from the University of Idaho and her colleagues.

"Nonetheless, the two species are genetically divergent and differ morphologically in adult body length; proportions of eye, snout, cheek and caudal fin; shape of head, opercular spine and sagittal otolith; and coloration of the tip of the upper caudal fin.""*Etelis boweni* has a wide Indo-West Pacific distribution that largely overlaps with *Etelis carbunculus*, and the two species are often caught on the same fishing line."The researchers described *Etelis boweni* based on 16 specimens collected from the Red Sea and Western Australia, with confirmed genetic records throughout the Indo-West Pacific."The discovery of the new species has important implications for fisheries management, especially in areas where both species occur together, since it's important for different species to be managed separately," Dr. Andrews said.*Etelis boweni* was named in honor of Dr. Brian Bowen, a researcher at the University of Hawai'i at Mānoa Hawai'i Institute of Marine Biology, who has spent more than three decades studying marine fishes."It's an honor of a lifetime. I'm sorry that the great Jack Randall didn't live to see this completed, and humbly thank the team that described this species. It's a handsome fish with particularly good taste," Dr. Bowen said. The team's paper was published online in the Journal of Fish Biology.

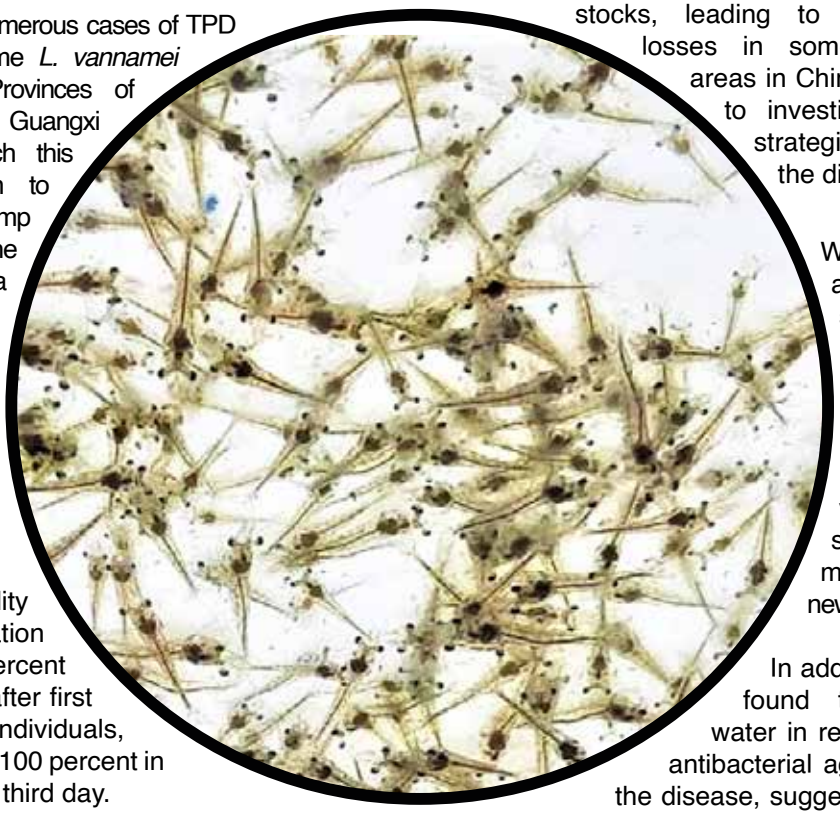
Image credit: NOAA Fisheries

www.sci-news.com

Study finds that novel *Vibrio parahaemolyticus* is the causative agent of the Translucent Post larva Disease in Pacific white shrimp

A novel disease called "Translucent Postlarvae Disease" (TPD) or "glass postlarvae disease" (GPD) in Pacific white shrimp (*Litopenaeus vannamei*) has become a rapidly growing threat to shrimp farming in China recently.

Since March 2020, numerous cases of TPD have occurred in some *L. vannamei* hatcheries in the Provinces of Guangdong and Guangxi provinces, after which this new disease began to spread to major shrimp farming areas in the north of China via postlarvae (PL or PLs) transportation in April 2020. Translucent postlarvae disease mostly affects PLs at four to seven days old (PL4 to PL7) with very severe infectivity.



Usually, the morbidity of a diseased population can reach up to 60 percent on the second day after first observing abnormal individuals, and even up to 90 to 100 percent in severe cases on the third day.

Translucent postlarvae disease affected shrimp mainly show similar gross clinical signs, such as a pale or colorless hepatopancreas and empty digestive tract, which causes the body of diseased individuals to become transparent and translucent; therefore, these diseased individuals were named "translucent post-larvae" or "glass post-larvae" by local farmers.

TPD disease has become prevalent in farmed shrimp stocks, leading to serious economic losses in some shrimp farming areas in China, so it was urgent to investigate and develop strategies for preventing the disease.

We sampled TPD-affected shrimp and screened for several known pathogens of shrimp, but our results indicated that these shrimp were free of known shrimp viral pathogens, and suggested that TPD might be caused by a new emerging pathogen.

In addition, some farmers found that treatment of water in rearing tanks with an antibacterial agent could alleviate the disease, suggesting TPD might be caused by a bacterial pathogen.

www.aquaculturealliance.com

How seaweed aquaculture can tackle oceanic dead zones

Activities like industrial-scale farming send lots of nutrients into the ocean, where they cause massive algal blooms. While these algae produce oxygen when they're alive, they die so suddenly and in such volume that their rapid decomposition consumes all the available oxygen in the water, creating dead zones. However, cultivated seaweed could draw down available nutrients, limiting the resources for unchecked growth of nuisance algae and microbes. Seaweeds also produce oxygen, which could alleviate the development of hypoxic dead zones.

"Dealing with nutrient pollution is difficult and expensive, the US alone spends more than $27 billion every year on wastewater treatment. Seaweed aquaculture could be financed by water quality trading markets for anywhere between $2 and $70 per kilogram of nitrogen removed, which is within range of observed credit prices in existing markets. Many regions employ water quality trading programmes to manage this issue. In these cap-and-trade systems regulators set a limit on the amount of a pollutant that can be released, and then entities trade credits in a market. Seaweed aquaculture would fit nicely within these initiatives.

Depending on farming costs and efficiency, seaweed aquaculture could be financed by water quality trading markets for anywhere between $2 and $70 per kilogram of nitrogen removed, which is within range of observed credit prices in existing markets."

Researchers note that demand is rising for seaweed in food and industry sectors. Potential products include biofuel, fertilizer and food, depending on the water quality, Racine said. This means that, unlike many remediation strategies, seaweed aquaculture could pay for itself or even generate revenue.

www.thefishsite.com

Aquaculture waste becomes biomaterial for bone repair

Scientists at Nanyang Technological University, Singapore (NTU Singapore) have developed a new biomaterial made entirely from discarded bullfrog skin and fish scales that could help in bone repair.The porous biomaterial, which contains the same compounds that are predominant in bones, acts as a scaffold for bone-forming cells to adhere to and multiply, leading to the formation of new bone.

Through laboratory experiments, the NTU Singapore team found that human bone-forming cells seeded onto the biomaterial scaffold successfully attached themselves and started multiplying - a sign of growth. They also found that the risk of the biomaterial triggering an inflammatory response is low.Such a scaffold could be used to help with the regeneration of bone tissue lost to disease or injury, such as jaw defects from trauma or cancer surgery. It could also assist bone growth around surgical implants such as dental implants.

The scientists believe the biomaterial is a promising alternative to the current standard practice of using a patient's own tissues, which requires additional surgery for bone extraction. At the same time, the production of this biomaterial tackles the problem of aquaculture waste, said Assistant Professor Dalton Tay of the NTU School of Materials Science and Engineering (MSE), who led the multidisciplinary study.

More than 20 million tonnes of fishery by-products, such as fins, scales, and skins, are discarded every year. In Singapore, the combined annual consumption of frog flesh and fish is estimated to be around 100 million kilograms, making bullfrog skin and fish scales two of Singapore's largest aquaculture waste side streams.

Asst Prof Dalton Tay said: "We took the 'waste-to-resource' approach in our study and turned discards into a high-value material with biomedical applications, closing the waste loop in the process. Our lab studies showed that the biomaterial we have engineered could be a promising option that helps with bone repair. The potential for this biomaterial is very broad, ranging from repairing bone defects due to injury or ageing, to dental applications for aesthetics. Our research builds on NTU's body of work in the area of sustainability and

is in line with Singapore's circular economy approach towards a zero-waste nation."

Professor Matthew Hu Xiao, the study's co-author and Director of the Environmental Chemistry and Materials Centre, Nanyang Environment and Water Research Institute (NEWRI), added: "These waste streams can also be converted into green chemicals and materials for environmental remediation and timely treatment can reduce wastewater contamination."Clinical Associate Professor Goh Bee Tin, Director for Research at the National Dental Centre Singapore, who was not involved in the study, said: "The National Dental Centre Singapore is excited about the use of bullfrog skin as a natural biomaterial for tissue regeneration.

We see many potential dental applications ranging from the regeneration of gum tissues in periodontal disease, to bone for placement of dental implants, to jawbone following tumour surgery. Obviating the need for additional bone harvesting surgery also translates to time and cost savings, and less pain for patients."

The research findings were published online in Materials Science and Engineering C in April and will be published in Volume 126 of the journal in July.The research team has filed patents for the biomaterial's wound healing and bone tissue engineering applications. The team is now further evaluating the long-term safety and efficacy of the biomaterial as dental products under a grant from the China-Singapore International Joint Research Institute and aims to bring the waste-to-resource technological pipeline closer to commercialisation.

www.technologynetworks.com

India backs IMTA (Integrated Multi-Trophic Aquaculture) initiative

The project was undertaken by India's Central Marine Fisheries Research Institute (CMFRI), working with fish farmers in Moothakunnam, Ernakulam.

CMFRI started the venture in December last year as part of its research initiative for developing a sustainable cage fish farming model suitable to Kerala's ecosystem. In the first harvest among the three crops of the integrated farming, around one tonne of green mussel was produced from 150 strings hung around four fish cages.

Theindividual mussels grew to 72 g, which is a successful growth rate in mussel farming, according to CMFRI. Despite the harvest taking place during the Covid lockdown, the entire produce sold out quickly.According to experts from the CMFRI, a good harvest with better growth rate of green mussel showed that IMTA is economically feasible and well suited to Kerala's conditions. A scientific team led by Dr Shoji Joseph, principal scientist of CMFRI, also observed that the fish inside the cage attained better growth and seaweed being cultured around the cage showed healthy status, with a fast growth rate. The fish are due to be harvested by the end of June.

IMTA also helps to maintain environmental sustainability. "Excess nutrients and carbon dioxide from the cage farm are directly or indirectly utilised by green mussel and seaweeds," said Dr Joseph.CMFRI director Dr A Gopalakrishnan said that the institute would take steps to popularise IMTA around the coast. "CMFRI has successfully developed a model of IMTA practice on open sea waters of Tamil Nadu which helps coastal people fetch increased income. The popularisation of this innovative technology, in line with the increasing trend of adoption of cage farming technology, will help transform the lives of coastal communities," he said.

www.thefishsite.com

UN global initiative tackles marine litter to clean world's oceans

A new program is being launched under the auspices of the United Nations to tackle marine litter and clean up the world's oceans. The GloLitter Partnerships Project is being implemented by the Food and Agriculture Organization of the United Nations (FAO) in partnership with the International Maritime Organization and 30 countries and initial funding from the Government of Norway through the Norwegian Agency for Development Cooperation.

GloLitter will assist developing countries in identifying opportunities to prevent and reduce marine litter, including plastic litter, from the maritime and fisheries sectors. The project aims to decrease the use of plastics in these industries and identify opportunities to recycle plastics, to better protect our fragile marine environment. The program is aligned with the UN Sustainable Development Goal 14 that is committed to prevent and reduce marine pollution and conserve and use the oceans sustainably.

"Plastic litter has a devastating impact on marine life and human health," said Manuel Barange, FAO's Director of Fisheries and Aquaculture. "This initiative is an important step in tackling the issue and will help protect the ocean ecosystem as well as the livelihoods of those who depend on it."

The GloLitter project will help the sector to apply best practices for the prevention and reduction of marine plastic litter, including lost or discarded fishing gear, in a bid to safeguard coastal and global marine resources. Among the efforts, it will look at the availability and adequacy of port reception facilities as well as enhancing awareness within the shipping and fisheries sectors, including seafarers and fishers.

Jose Matheickal, Head of the IMO's Department for Partnerships and Projects, welcomed the initiative. "Marine litter is a scourge on the oceans and the planet. I am delighted that we have more than 30 countries committed to this initiative and working with IMO and FAO to address this issue."The GloLitter Project will equip partner countries with tools such as guidance documents, training materials, and strategies to help enforce existing regulations. For example, it will encourage fishing gear to be marked so it can be traced back to its owner if discarded or lost at sea.

The IMO will also encourage partners to consider the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V regulations on the prevention of pollution, which prohibits the discharge of plastics (including fishing gear) from ships into the sea. Another treaty, the IMO London Convention/London Protocol, regulates the dumping of wastes from ships, permitting only certain types of non-harmful waste to be dumped.

The availability and adequacy of port reception facilities and their connectivity to national waste management systems will also be a focus of the project and participating countries will be assisted in the development of port waste management plans. GloLitter also includes pilot initiatives with women-led organizations active in fisheries to reduce the use of plastic in fisheries, fish processing, and marketing, and to collect plastic for recycling.

Another key aspect of GloLitter will be the establishment of public-private partnerships to spur the development of cost-effective management solutions for tackling marine plastic litter, including ways to decrease the use of plastics in these industries as well as opportunities for recycling plastic products or waste.

Ten countries have been confirmed as Lead Partnering Countries, including Brazil, Costa Rica, Cote d'Ivoire, India, Indonesia, Jamaica, Kenya, Madagascar, Nigeria, and Vanuatu. Another 20 countries, (Argentina, Cabo Verde, Colombia, Ecuador, the Gambia, Mozambique, Nicaragua, Panama, Peru, Philippines, Senegal, Sri Lanka, Solomon Islands, Sudan, United Republic of Tanzania, Thailand, Timor-Leste, Togo, Tonga, and Viet Nam) have been selected as Partnering Countries (PCs) of the GloLitter Project.

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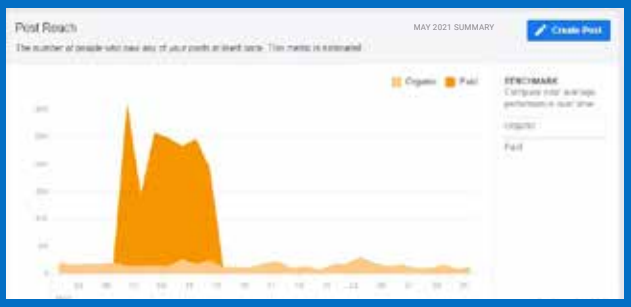

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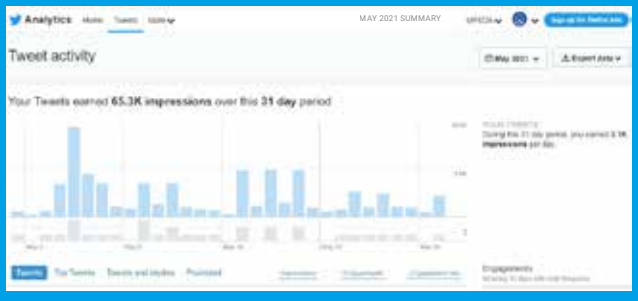

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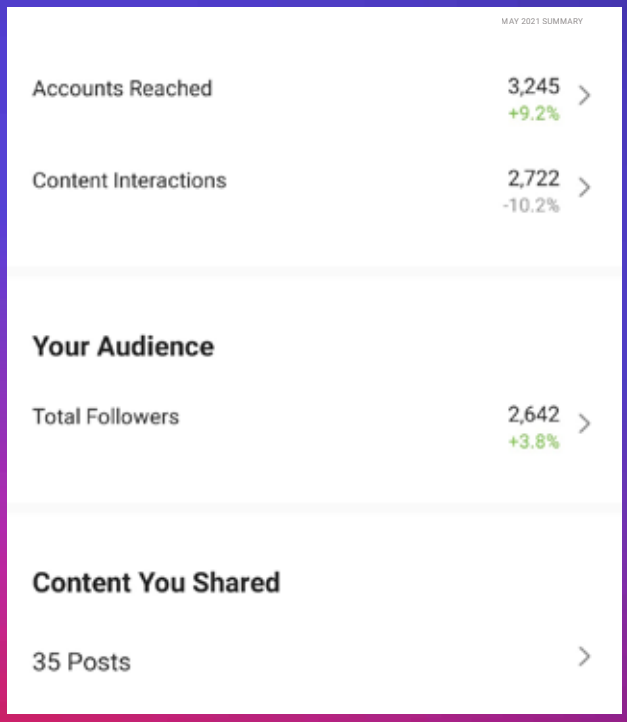

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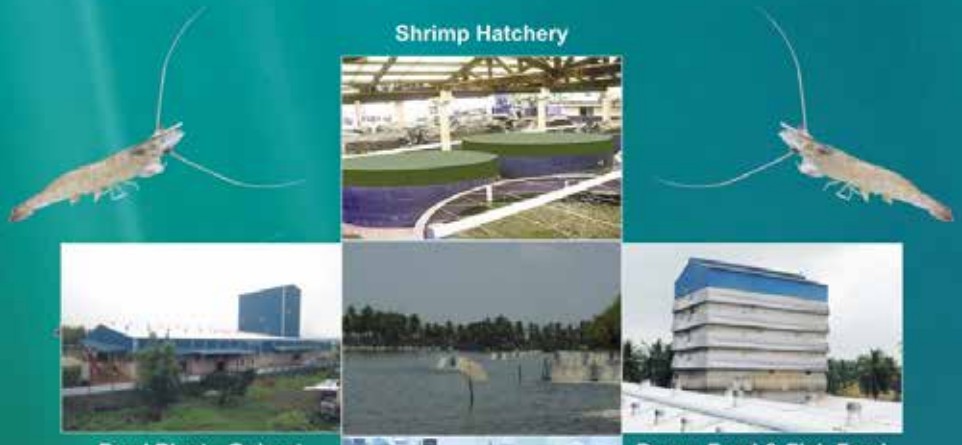

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