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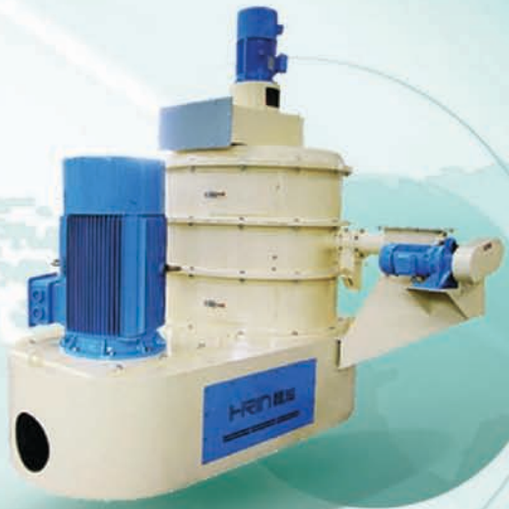

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Stop hatredness, help people to live in peace !!

Dear Readers,

This time, I want to share with you about different things that are disturbing the nation and the people.

BJP and its leaders have not done any good to India and its society in getting independence, except creating communal differences and disturbances among the people of this country on the name of caste, religion and region to get benefitted for votes. There are many political parties in India, and no party never tried to create such differences among different communities. They made it an agenda to talk against a community – instigate Hindus against Muslims and others with hate speeches only to get Hindu votes and they succeeded to some extent, because the government, the executive of the Constitution has not taken action against individuals who made hate speeches. What have they learnt from late A. B. Vajpayee, a great human being, past prime minister and a leader of BJP.

A very small section of people are dominating the BJP with hate ideas and thoughts against certain religions only to gain power to rule the country, but not to lead the country in peace and progress. Like others, Muslims and others also love India, live for India and for its progress. Let people lead their life with dignity and honour.

Supreme Court on February 27 rightly pointed out the Delhi police on not filing FIR against three MLAs in Delhi for their hate speeches which killed and caused damage to the lives of dozens and hundreds of people there.

Our Prime Minister and Home Minister should realize atleast now, stop this hatredness against any community, bring everybody – Hindus, Muslims, Christians, Sikhs and all together and work for peace and progress for the present and future generations in India and globally.

I want to ask a question to Prime Minister Mr Narendra Modi, where is the need for him to suddenly bring Citizenship Amendment Act (CAA) on 11 December 2019 and trying to implement it. Is it to divert the attention of people from the falling economy of the nation, unemployment problem etc? Many intellactuals, observers and senior journalists guessed that this wrong decision of act of Modi and Shah would lead to violence among the people of various communities. It happened.

What have we achieved even after 70 years of Independence? We still have bad roads without proper drainage facility, clean drinking water, electricity, street lights, sanitation, education, healthcare etc. Commodities prices are going up continuously and there is break in Law and Order every now and then. If he is honest enough to serve the nation and its people, he should achieve these things in coordination with all the states. One should not go for temporary gains with communal aspects, but aim at remaining in the hearts of all the people of the nation through solving these issues on priority.

Whatever achievement is made in different sectors in the country is mostly by private sector and its stakeholders. For example, today, Poultry sector is facing crisis situation and the government is thinking of importing American Chicken Legs to maintain their friendship with US and its leader – and damaging poultry farming community in India and its Rs 100,000 crore sector. Similarly, it will affect Maize and Soyabean growing farmers in the country.

In Europe and USA, people who come into politics take it as an opportunity to serve the people and their nation, whereas in India most of the people come into politics to make money through corrupt practices and to continue in power politics by dividing people on the name of religion and region.

Our country has wonderful resources for development, but it is unfortunate that many of our politicians destroying it with their corrupt and communal / religious politics as well as with hate speeches. These politicians have no value and respect to the constitution and to the democracy.

Politicians and people of my nation should always think, speak and do doing good for yourself and for others in the society, and remain in the hearts of the people for doing good deeds.

M.A.Nazeer
Editor & Publisher
Aqua International

NRS GROUP

Aqua International

Our Mission

Aqua International will strive to be the reliable source of information to aquaculture industry in India.

AI will give its opinion and suggest the industry what is needed in the interest of the stakeholders of the industry.

AI will strive to be The Forum to the Stakeholders of the industry for development and self-regulation.

AI will recognize the efforts and contribution of individuals, institutions and organizations for the development of aquaculture industry in the country through annual Awards presentation.

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Coronavirus impact: Fall in shrimp prices, demand may hit Indian firms

The massive shutdown in China due to coronavirus spread will lead to a contraction in Chinese demand for seafood causing a glut in the global market.

Kochi: Indian seafood industry may be impacted as global shrimp prices are expected to face pressure over the next few month with the trade adjusting to the changing demand dynamics in China, a key importer and consumer of farmed shrimp, says investment information and credit rating agency ICRA.

The sizable domestic production (estimated at over 10 lakh tonnes) and consumption of shrimp in China, makes the country a key price-mover in the global markets. In fact, China was a market stabiliser during 2019, when global demand from USA, EU and Japan floundered.

The massive shutdown in China due to coronavirus spread will lead to a contraction in Chinese demand for seafood causing a glut in the global market, says Pavethra Ponniah, vice president and sector head, ICRA Ltd, "Apart from the reduced demand, disruption in China's internal logistics: for unloading, storing and further processing, will play havoc with all types of seafoods, impact of which will be felt along the entire value chain, leading up to the farmers. Port clearance for seafood containers in Chinese ports would be difficult in the current environment, effectively cutting off the supply pipeline temporarily."

As far as impact on India is concerned, ICRA notes that China largely imports lower-value added and block frozen shrimp from India. Companies with high concentration on the Chinese markets, especially smaller ones, would be impacted immediately, as demand falls. The broader impact on India would stem from not only a reduction in Chinese demand but a correction in prices as the global supply-demand dynamics are disturbed.

Companies already locked into quarterly to annual price contracts would not feel the immediate impact. However, the margins of companies selling on spot prices would be impacted. However, the margins of companies selling on spot prices would be impacted. However, However, stocking levels in Indian farms is showing signs of contraction, during the seasonally peak stock month of February. This could reduce supply over the next few months, according to ICRA.

China is a key market for live seafood from India and this limited shelf-life market is already facing the brunt of the heightened Chinese regulations on live markets. Live and chilled seafood accounts for about Rs.1,000 crores of exports from India and this includes items like crabs, lobsters, whelks etc.

"India, like all other large exporters, including Ecuador would have to wait and watch for the spread and severity of the pandemic and the impact on demand in China, post the Chinese lunar holiday in February 2020. While a confluence of factors like the ability to find alternative markets, reduction in supply over the next 3-4 months, early harvesting, and delayed stocking will determine how the dynamics play out, the immediate term correction in shrimp prices is a given," adds Ponniah.

In terms of global trade, USA has traditionally been the largest importer of shrimp. During the second half of 2019, China overtook USA to become the largest shrimp importer globally, with its increasing domestic consumption far surpassing disease hit domestic production.

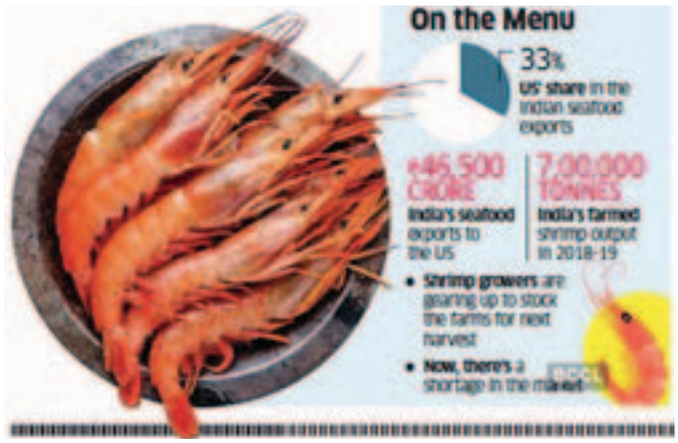
With China cracking down on imports via. Vietnam, India's direct exports to China jumped in FY20. China and Vietnam together now account for 25% of shrimp exports from India (in value terms) while 45% plus of India's exports are shipped to the USA. Vietnam's share dropped from 16% to 4% while that of China increased from 9 to 21% in FY20.

US may buy more Indian shrimp this year

Besides, the prices were also lower compared to the previous year.

Kochi: India's seafood exports are likely to gain from a recovery in US demand this month. The US was the largest buyer of Indian shrimps until last year when its offtake slipped because of oversupply and a dip in prices. China bought more shrimps from India than the US in 2019.

"The consumption of shrimps has gone up in the US and we are getting more orders from the country this month," said Abdul Karim, MD of Chennai-based Welcome Fisheries.



Prior to Christmas, the US demand was slack due to

oversupply, forcing the exporters to go slow on shipments. Besides, the prices were also lower compared to the previous year.

"The prices have not improved much, but the prices at which we are buying from farmers have gone up," Karim said. Shrimp growers are gearing up to stock the farms for the next harvest. As a result, there is a shortage in the market. The US has 33 per cent share in the Indian seafood exports, valued at over Rs 46,500 crore. India produced 6,50,000 to 7,00,000 tonnes of farmed shrimp in 2018-19. While the industry is yet to assess the output size in the current year, it is expected to lower be because of various factors.

"All indications are there for a decline in production. Less supply from hatcheries, paucity of broodstock, higher feed prices, diseases and lower prices for shrimps have all affected the production," said V Balasubramaniam, general secretary of Prawn Farmers Federation of India. Indian seafood exports to China were the highlight of the year. By November, exports had reached $1billion, according to Marine Products Export Development Authority (MPEDA). Though the supplies are on for the Chinese New Year towards the end of the month and the beginning of February, Indian exporters are facing some problems in China. China has started to monitor strictly for white spot syndrome virus in the seafood consignments. This even led to detention of some consignments.

"MPEDA chairman is meeting government officials in New Delhi today (Wednesday) to discuss the issue and we hope it will be solved," said Alex K Ninan, managing partner of Baby Marine International.

India's Blue Economy net getting bigger! Country ranks third in fisheries and second in aquaculture

More blue economy reforms are needed to unlock fishing & aquaculture potential

Interim Budget FY20 had created a separate ministry for animal husbandry, livestock, and fisheries, and Union Budget FY20 allocated Rs 770.25 crore for fisheries for a comprehensive development. The budgetary allocation has further increased to Rs 825 crores in the current budget for FY 21. This budgetary support has recognised the significance of 'blue economy'.

Centrally sponsored schemes including the Integrated Development and Management of Fisheries and Fisheries and Aquaculture Infrastructure Development Fund are made available to devise a framework of development, management, and conservation of marine (and inland) fisheries and to increase the exports by Rs 1 lakh crore in FY25. For example, about 65,000 fishermen have been trained under these schemes since FY17 until FY20.

So, to appreciate the significance of blue economy geared by the 'blue revolution', one needs to understand the fishermen economy: what are the fish production systems and how does fishermen economy perform? Fish production system predominantly consists of capture fisheries, marine fisheries, aquaculture, enhancement and integrated fish farming.

India ranks third in fisheries production, and second in aquaculture. Fisheries alone has employed 145 million people and contributed to 1.07% of the GDP and generated export earnings of Rs 334.41 billion as per a recent estimate of National Fisheries Development Board. National Institute of Agricultural Economics and Policy Research reported the projected demand would go 11.80 million metric tonnes by FY21.

Freshwater aquaculture that contributes about 55% of the total fish production is predominantly driven by small holder farmers and institutionalised culture fisheries in part. In small-scale fisheries, products are consumed at the household level or/and sold in local markets within the fishing community (Food and Agriculture Organization, 2008). Also, small-scale fisheries meet a raging concern for poverty reduction and food security in developing countries as it contains a rich animal protein and Omega 3 fatty acids, providing a nutritional diet.

While there has been a long-standing policy debate over natural resource utilisation and concern for environmental sustainability, small-scale fisheries and freshwater aquaculture system restores ecological safety by improving soil condition and water quality. Freshwater aquaculture engenders sustainability through manure loading, nutrient cycling into the agri-food-ecosystem. We can draw some anecdotal evidences from Nigeria where 50% fish farmers depend on the integrated fish farming for their livelihoods. Fish farming in developing countries utilizing capture fisheries and small-scale subsistence aquaculture system has received external support for capacity building, adoption of improved production practices, institutional credit access, and trade facilitation.

From the governance and organisational view point, the fisheries sector has a long way to go to unleash the potential of blue economy. First, South Indian Federation of Fishermen Societies, working in the marine fisheries sector, can help bring the necessary reforms to marine fisheries since it follows an AMUL-like

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Bengal Aqua Expo held at Nachinda, WB

Dignitaries on stage at Aqua Expo

Kolkata: The Bengal Aqua Expo 2020 was organized at Nachinda, Purba Medinipur (PM), WB by Bengal Aqua-Expo Committee with Contai Aqua-Technicians Welfare Association (WA); PM Prawn Farmers Association; All Bengal Aqua-Farmers WA during, 2020. In inaugural session, Dr B. K. Das, Director, ICAR-CIFRI mentioned that fish production potential in WB is more than Andhra Pradesh (AP); PM is hub of aquaculture and must be sustained (keep up); replication of Moyna model in other districts; selective breeding in Penaeus indicus can increase compatibility; ensuring sustainability and increase production; discussed about Slow Growth Syndrome Virus and WSD in shrimp; crop, production, price of company products as productivity model; ban on wild shrimp export from WB; importance of indigenous fish farming technologies; farming history and traceability of shrimp farms needed to improve export; Standard Operating Procedure (SOP), need for increasing domestic shrimp market chain in conditions of international market failure; farmers need infrastructural development (electricity, etc) from Government more than subsidy; companies should help farmers during production loss; EHP, parasitic diseases in shrimp causing emaciation, slow growth; disease incidences should come down; shrimp hatcheries must be vigilant to give farmers benefit; companies and industry will sustain if farmers remain healthy and benefited.

Dr B. K. Das making presentation

Mr B. Biswas, TS, FFDA, Birbhum emphasized and spoke about development of Moyna Block in PM as 'Pithasthan' (sacred place) in freshwater pisciculture and eyewitness of pisciculture revolution in WB; fish farmers must have exposure here; pelleted feed in markets too costly for medium- and small-scale fish farmers; emphasized on protein-rich home (farm) made pelleted fish feed being more profitable; incorporation of lysine (20gm) and methionine (30gm) per kg feed; use of Choline chloride in pond strengthens fish stomach and body physiology and aids in growth; less oxygen, phosphate and calcium availability in bottom of deeper ponds in WB (unlike AP) hampering growth of Labeo bata, L. calbasu, Cirrhinus mrigala; use of dolomite twice in culture period and Dicalcium phosphate (Rs 60-65/-/kg) monthly to facilitate growth of these carps; taste of major carps diminish after long distance transportation from Moyna as 'Na', 'K' are released from body, use of Legend brand 'Lemilyte' (ORS for cows) @ 200gm / 100kg fishes for 2hrs transportation is useful to keep up superior taste; treatment of spent broodfishes in carp hatchery in Lemilyte soln for 2 hours before releasing in pond; application of povidone iodine (Rs 160/-/lit) @ 400gm/33dec in fish ponds act as sanitizer, facilitates oxygenation and prevents disease occurrence; addition of glutaraldehyde @ 1.5-2.0lit / 50lit of 50% BKC (Rs 250-300/-/lit) at 7.5-8.0 pH condition accelerates fish growth and prevents disease; addition of Zinc chloride @ 1kg/33dec in pond eliminates toxic ammonia and neutralizes effect of excessive manure used; $ZnCl_2$ with sand kills dense mass of slimy macroalgae Spirogyra sp formed in ponds, when applied; possibility of probiotic bacteria culture in rectangular tanks and use in fish ponds.

Dr S. Sahoo, Professor at Faculty of Fishery Sciences, WBUAFS spoke about agenda of UN Mission Vision 2030; every farmer must get reward (benefit) from farming activity to maintain profit and livelihood; emphasis on retail market for farmed L. Vannamei production; economic value of total production will be zero in conditions of total export failure; inclusion of shrimp in daily diet in India and domestic market; need for study on its nutritional value; non-registered and non-licensed shrimp farmers must get registration done and farm information needed for future policy development; feed and medicine costs must be minimized to bring down production cost in shrimp farming; earmarking 'Special Potential Zone' in fish and shrimp farming in WB where Government will help adequately; emphasis on infrastructure development rather than subsidy; group formation and knowledge exchange among shrimp farmers, experience sharing aid to learning process to prevent shrimp farming from becoming uncertain.

Hon'ble Minister of

Fisheries, WB Mr C. Sinha in his speech emphasized on greater production of L. Vannamei in WB; cold storage, ice plants and markets established in WB; upgradation of pond soil and water testing lab at Block level to extend facilities to farmers; importance of CRZ regulation; initiatives taken in mud crab farming; production of ornamental fishes, byproducts from fishes and women empowerment via BENFISH; 'Moyna model' and targeted 12tonne/ha fish production; P. monodon seed production unit at Junput, PM and testing centre for shrimps before export will be set up; collaboration with Norway on investigation on rearing of Hilsa ilisha in freshwater ponds and propagation of threatened indigenous fishes; extend facilities to farmers, develop marketing chain that will prove convenient for them to market their produce, they should get profit upto expectations; fulfilling deficit in fish production in WB in every possible manner. Dr A. Mandal, Manager, Central Genetics Lab, RGCA (under MPEDA), Nagapattinam spoke lucidly about possibility of mud crab farming in PM and South 24 Pgs districts and its management practices. News communicator Subrato Ghosh was present in entire first day of Expo and gained knowledge.

India's Blue Economy net getting bigger! Country ranks third in fisheries and second in aquaculture

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cooperative model with a three-tier federal structure. With over 9,104 member fishermen, organised through 153 primary fishermen marketing societies in Southern peninsular, the federation renders various services to 65,000 fish workers, including non-members, for the last two decades. Second, the FM made two important announcements for strengthening fisheries extension by mobilising 3,477 'sagar mitras' and promoting 500 fish farmer producer organisations. Therefore, it is important to draw insights from states that have catalysed livelihood promotion of small-scale fishermen.

For instance, a donor agency and NABARD-funded integrated fish farming project was implemented in coastal regions of Odisha in 2011. A voluntary organisation, Gram Utthan , promoted four farmer producer companies with a paid-up capital of Rs 1 lakh for strengthening the market linkage of freshwater aquaculture in FY19. These organisations were hand-held by international donors for capacity building and World Fish for culturing the improved variety freshwater fish.

Third, skilling is important to subsistence of marginalised fishermen. In FY17, about 121,560 fishermen had undergone skill development training with an allocated budget of Rs 2.36 crores. Union Budget 2020 has aimed for skilling fishermen through fisheries extension akin to 'MatsyaVigyanKendras' in collaboration with the Central Fisheries Research Institute.

IISS 2020: China remains important market for seafood import: Experts

Kochi : China continues to be an important market for seafood import, given that the world's most populous country has an increasing presence of upper and middle classes who are keen on healthy food, experts said at the 22nd India International Seafood Show (IISS).

The marine food industry, though, must wake up to the fact that 'new retail' is the trend that is fast replacing 'online', where Chinese e-commerce giant Alibaba is building a retail ecosystem that innovatively blends online and offline channels in a unified way that features the consumer at the centre in unexpected ways, a technical session recently summit here noted.

All the same, one should be wary of overreliance on China as a partner in seafood trade, the speakers pointed out while deliberating on the topic "Prospective Markets & Regulatory Environment".

Carson Roper, Seafood Industry Consultant, France, in his talk on 'China and Farm-Raised Shrimp', said on Friday that the East Asian country is a major marine products market that remains largely untapped. Projections say that China will continue to feature among the world's top 11 seafood markets, he observed in the presentation that focused on how China impacts global seafood trade and consumption.

Mr Roper spoke earlier as well, starting the session with a presentation on 'Country and Brand Loyalty: An exploration of successful (and not successful) national and corporate seafood marketing initiatives'.

The other speakers at the session were Dr Lee Chee Wee of Singapore's Aquaculture Innovation Center (on 'Live shrimp transportation'), Mr Christopher Priddy, International Relations Specialist, USFDA, India ('Overview of FDA regulations for seafood') and Mr R M Mandlik, Deputy Director-Marketing, MPEDA ('Importing country regulations and its impact on trade').

The session was moderated by Dr C N Ravisankar, Director of Central Institute of Fisheries.

Mr Mandlik, to a query on how MPEDA ensures flow of seafood standard regulations to the country's aqua farmers, said the mechanisms on information dissemination are in place. "The farmers do get the message well in time; only that we need to give them a push to act on it," he said. "We are working on it."

The three-day biennial meet, with 'Blue Revolution: Beyond Production to Value Addition' as the focal theme, is being jointly organised by MPEDA (the 1972-founded nodal agency of the Union Ministry of Commerce & Industry) and the Seafood Export Association of India (SEAI).

CMFRI displays wonders of marine life

Ear-rings made of fish otoliths a huge draw

Visitors watching the ear-rings made up with fish otoliths at the Open House programme held at CMFRI to mark its 73rd Foundation Day

Kochi, Feb 04: A large number of people turned out to watch in awe the wonders of marine life at the Central Marine Fisheries Research Institute (CMFRI). Students and the public also got opportunity to understand the latest research developments being transpired in marine fisheries while the CMFRI opened its doors for public to mark its 73rd Foundation Day.

The National Marine Biodiversity Museum, various laboratories, marine research aquarium and hatcheries were major attractions that displayed a ringside view of marine aquatic life and offered a platform to acquire knowledge about secrets of marine biodiversity. The visitors watched the rich collection from a wide spectrum of niches ranging from estuaries to coastal and deeper waters of the Indian seasat the museum, which is designated as the National Repository by the Union Government. It offered a display of the largest fish – whale shark – horse shoe crab, sea snakes, sea birds, pearl oyster, sea cow, dolphins and sharks to mention a few.

Visitors also got attracted to the show of pelagic, demersal, molluscan and crustacean fishery resources such as flying fish, dolphin fish, rare species of sharks and rays, giant tiger shrimps and giant-sized crabs. The exhibition also offered marine ornamental varieties, pearls, pearl oysters, squid jigs, different varieties of mangroves, seaweeds, etc. On the occasion, information on cage fish farming, innovated aquaculture practices, hatchery production, ornamental fish culture and aquarium keeping was provided to the public. An awareness session, that gave insight into marine pollution and the impact of plastic pollution on fish ecosystem, was also held at the exhibition.

An exhibition-cum-sale of photographs on sea birds captured by CMFRI Technical Assistant and bird enthusiast Aju K Raju was also held as part of the programme.

Ear-rings made of fish otoliths a huge draw

Ear-rings made up of fish otoliths exhibited at CMFRI on its Foundation Day drew attention of large number of people on Tuesday. A huge rush felt to have a close watch of the ornaments in different size and design made up of otoliths. Though majority of the fish have otoliths, only that of around ten species are suitable for making ornaments. Researchers at the CMFRI regularly use the otoliths as taxonomic toolfor their identification and estimating fish age. The ornamental prospect of these otoliths was recognised only by chance on course of the regular research, says Dr E M Abdussamad, Principal Scientist of CMFRI.

"Even though ornaments made of fish otolith are not available in India, they are used as lucky stones in some countries like Italy, Brazil and Egypt. A repository of otoliths comprising around 1000 fishes in Indian coasts is available at CMFRI. Ornaments like locket and bracelets also can be made of the otoliths using ordinary metals, silver, gold and others. The ones designed by CMFRI are in silver. It may cost around Rs 1000 while designing in silver, though it may vary depending on size and models", he said. Making of otolith ornaments would become an additional livelihood for fisherwomen. This may have demand in places where foreign tourists assemble, he added.

According to CMFRI study based on fish otoliths, the oil sardine being caught in Kerala waters has one and half years of age, while the mackerel has two and half years and yellow-fin tuna has up to 19 years.

Visitors at Marine Research Aquarium of the CMFRI on the occasion of its 73rd Foundation Day.

ICAR-CMFRI's awareness campaigns pay off; Fishermen save endangered whale shark

Fishermen saves shark

The continuous and rigorous awareness campaigns on conserving endangered marine species by the ICAR-Central Marine Fisheries Research Institute (CMFRI) have paid off with a group of fishermen from Calicut, Kerala saving an endangered whale shark (Rhincodon typus). In a major impact of the awareness programmes, the shark, which was accidently caught in the trawl boat, was returned to the sea in a dramatic rescue by nine fishermen who set off to the sea from Puthiyappa, Calicut on 25th January 2020. The whale shark is protected under the Schedule 1 of the Wildlife Protection Act.

The fishermen had to cut the trawl net worth Rs. 1 lakh to rescue the whale shark, and the operation took nearly 4 hours. It would cost Rs. 40,000/- to repair the damaged net. Two fishermen sustained minor injuries while releasing the endangered shark. The shark measured about 5m in length and weighed around 900-1,000 kg.

Fishermen engaged with rescuing the shark

It was regular awareness campaigns by the ICAR-CMFRI that helped the fishermen rise to the occasion and motivate themselves to save the shark. The ICAR-CMFRI regularly organizes awareness programme on conservation of protected elasmobranchs. Besides these, the Institute had conducted a workshop on the International Whale Shark day at Ponnani and another at Calicut on. Along with animals like the tiger, rhino and so on, the whale shark too is under same category of the Wildlife Protection Act. The distribution of whale shark is fairly large in the Arabian Sea and the Bay of Bengal, but its highest aggregation is in Gujarat.

Coming to know of the heroic attempts of fishermen, scientists and other technical staff of the Calicut Research Centre of ICAR-CMFRI, Calicut rushed to the beach to meet the fishermen and congratulate their highly commendable efforts.

Felicitation

ICAR-CMFRI felicitates fishermen

Later, on the occasion of the 73rd Foundation Day celebrations of the Institute, the Calicut Research Centre of ICAR-CMFRI felicitated the fishermen who saved the whale shark. All the staff of the ICAR-CMFRI and the guests attended at the programme lauded the brave attempts of the fishermen. The ICAR-CMFRI presented them with certificates and mementos. Dr P.K. Asokan, Scientist-in-charge, Calicut Research Centre of ICAR-CMFRIsaid that the population of whale shark has dwindled over a period of time which necessitated the government to list this species in the Schedule I of the Wildlife Protection Act.

Marine experts moot revisiting list of protected sharks, rays

CMFRI to take lead in preparing a White Paper on current status protected species

Dr P U ZachariaHead of the Demersal Fisheries Division of CMFRI speaking at the stakeholder meet held as part of a three-day workshop on sharks and rays at CMFRI.

Kochi: Marine fishery experts have mooted revisiting the list of protected marine elasmobranchs (sharks and rays) in the Wildlife Protection Act (1972). Apart from the present status of common conservation measures for both terrestrial and marine organisms in same Act, the latter should be given special attention for making the conservation measures implementable, they said.

They were speaking at a consultative workshop on threatened and protected elasmobranchs (sharks and rays) organised by the Central Marine Fisheries Research Institute (CMFRI). The meeting also called for periodic scientific assessment of the species protected under the WPA and modification in the listing, as almost two decades have elapsed since the inclusion of 10 species of elasmobranchs in the protected list. Considering the complexity of use and stakeholder interaction in marine waters, a special provision for marine conservation may be brought in, experts suggested. The gathering felt that many of the species needs special conservation attention.

White Paper

According to the decision taken in the three-day workshop, the CMFRI would take the lead in preparing a White Paper on the current status of the protected marine elasmobranchs. The workshop, which was attended by scientists and researchers from various government institutes and NGOs working in the area, also recommended that the policy decisions on marine life should only be taken after consulting scientific community and stakeholders.

Some of the species in the protected list of the WPA may be modified by proper criteria, management measures and action plan, said Dr E Vivekanandan, Emeritus Scientist at CMFRI. "There is a need to improve scientific base of this Act. In conservation measures, marine species should not be considered on par with terrestrial wildlife protected in forests", he said.

Data sharing platform

In order to solve the knowledge gap in fishing and trade of sharks and rays, the workshop proposed a data sharing platform which would have options for scientists, researchers as well as fishermen and other stakeholders to share their information. The meeting also stressed the need for establishing a network of researchers working in elasmobranchs to coordinate the studies on these species.

Shark fishing reduced

A stakeholder meeting of those involved in shark fishing and trade was held following the workshop. They said that focus on fishing sharks was shifted post export ban of shark fin. "Fishing trips for shark alone has considerably reduced following the ban coupled with extreme weather conditions like cyclone Ockhi", they said.

In response to the request of the stakeholders, Dr P U Zacharia, Head of the Demersal Fisheries Division of CMFRI said the institute would study the impact of existing policies related to sharks on the livelihood of fishermen and those involved in the sector. Any suggestions on the conservation of these resources will consider the interest and opinions of the stakeholders too, he said.

CMFRI scientists Dr Shobha Joe Kizhakudan, Dr T M Najmudeen, Gillnet Longline Association Secretary M Majeed and Joyce Andrews spoke on the occasion.

SDC's YSN Murthy celebrates his son Vivek's wedding with Kavya Valli at Hyderabad

Y.S.N. Murthy, Executive Director, SDC Group celebrated the marriage of his son Vivek with Kavya Valli on February 5 at Hyderabad. Seen in the picture from left: Y.S.N Murthy, Vivek, Kavya Valli, Saila Prabha and Dr Chaitanya.

Andhra Pradesh to set up agency to supply renewable energy for agriculture, aquaculture

The Andhra Pradesh government has decided to set up Andhra Pradesh Green Energy Corporation Ltd (Apgecl) with a mandate to provide power free to agriculture consumers and at subsidised rates to aquaculture.

State Minister for I&PR Perni Venkataramaiah said, the Cabinet decided to form this new corporation to take care of renewable power to supply free power for nine hours in the day time to the agricultural sector through solar power.

Solar Power capacity

It is proposed to bringabout 10,000 MW under its fold to supply free of cost to farmers and at a subsidy to the aqua farmers. The Union Ministry for New and Renewable Energy provides a financial assistance of ₹20 lakh per MW.

The State plans to utilise this facility for the establishment of solar power projects.

The proposed Apgecl would be managed by the AP Genco and 18 new posts have been sanctioned including that of chairman and managing director.

Other decisions

The Cabinet decided to set up Andhra Pradesh State Financial Corporation Limited to facilitate proper utilisation of surplus funds.

It also decided to set up AP State Agricultural Council to provide a mechanism to ensure supply of quality seeds, fertilisers and pesticides to farmers.

The Agriculture Council would also supervise and regulate the functioning of agriculture and horticulture colleges in the State and accord recognition to them.

It would also monitor the functioning of public and private organisations in the sector.

The Cabinet has decided to bring about amendments to the Panchayat Raj Act to make it more transparent.

The Minister said a decision was taken to disqualify a representative of the panchayat, MPTC or ZPTC even after election, if found guilty of being involved in corrupt practices.

Notified areas

In order to empower the Scheduled Tribes, the Cabinet decided to reserve 100 per cent seats of sarpanches and ward members in the notified areas to STs.

With regard to the powers of the sarpanches, the Cabinet has decided to entrust them with the responsibility of taking up sanitation and development of greenery in their respective villages. It has been mandatory for sarpanches to stay in the villages all the time.

Three-day Fish Food Festival inaugurated

Hyderabad will soon have 150 mobile outlets for hawking fish in all the 150 divisions of the Greater Hyderabad Municipal Corporation. This was announced by Animal Husbandry and Fisheries Minister Talasani Srinivas Yadav while inaugurating a three-day Fish Food Festival at the NTR Stadium in the city on Friday.

"The State government is investing crores to help improve the livelihoods of communities that depend on fishing. This has led to a surge in fish production in the State. But the marketing opportunities have not matched this growth. The mobile outlets are a step in the direction," said Mr Yadav.

The Minister outlined other marketing efforts as well as financial aids to help improve the community.

Ram Nagar fish market

"Hyderabad has nearly one crore population but the number of fish markets are limited. The Begum Bazaar Fish Market was in a poor shape, we are building a bigger and better facility to help people. I have asked for plans to improve the Ram Nagar fish market as well," informed Mr Yadav.

A range of prepared fish items are on sale at the festival where 20 stalls have been set up by different women's cooperatives in the city. "This festival was planned at a short notice but women have shown their resourcefulness and we have a range of innovative items, including fish haleem," said K. Padma of District Fishermen Cooperative Society.

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Poseidon Biotech completes 25 years

Achieves INR 80 crore turn over in INR 1200 crore healthcare segment of Indian Aquaculture sector. "Any sensible healthcare company who wants to do good for aquaculture sector will not use any harmful chemicals or antibiotics in their products".

The Chennai based Poseidon Biotech Group has completed 25 years of its operations with manufacturing of healthcare and nutrition products besides auto feeders and other products for aquaculture. The company organised Silver Jubilee celebration in Hotel Green Park, Chennai on January 4. *Aqua International* Editor M.A. Nazeer, had an interview with Mr R. Srinivasan, Managing Director, Poseidon Biotech Group at their office in Chennai recently. Excerpts:

R. Srinivasan, Managing Director and S. Muthukaruppan, Director & CEO, Poseidon Group with play card showing completion of 25 years of its operations at Chennai on January 4

About R. Srinivasan

Mr R. Srinivasan, Managing Partner, Poseidon Group is an Aquaculturist by profession with MSc Mariculture working in the field of aquaculture and biotechnology for the past 35 years. Widely travelled as consultant and entrepreneur. Running business since 1995 after employment in several corporate groups of the country. Srinivasan was former president and currently advisor to Society of Aquaculture Professionals.

Mr S. Muthukaruppan, Chief Executive Officer, Poseidon Group is an Aquaculturist by profession working in the field of aquaculture and biotechnology for the past 30 years. Widely travelled as consultant and entrepreneur. Running business since 1995 after employment in several corporate groups of the country. **Mr Muthukaruppan** is former president of Society of Aquaculture Professionals and former vice president of All India Shrimp Hatcheries Association.

Key persons of the company:

Dr S. Thiyagarajan, Chief Technical Officer, working in the field of aquaculture and biotechnology for the past 28 years.

Mr K. Nithyanandam, Chief Operating Officer, working in the field of aquaculture for the past 27 years.

Establishment of Poseidon Biotech Group:

Poseidon Biotech was started in the year 1995. Basically we are all technocrats who had a passion for aquaculture. All technocrats who had exposure and expertise in aquaculture sector joined

R. Srinivasan addressing Silver Jubilee celebration

together to build Poseidon Biotech into a growing organisation. Out of 200 employees, 70% of them are professionals in the field of biotechnology, microbiology, biochemistry, fisheries and aquaculture. Constant touch and projects undertaken with the help of academic specialists from various universities have paved way for better growth, said Mr Srinivasan. Being practising aquaculturists, we understood the challenges faced by the farming community. In order to help them as well as to help ourselves, most of our products were designed and formulated in our R&D facility. All products

S. Muthukaruppan

were tested in our wet labs and later in the open fields before marketing the products, he stated.

Location of the company and its production facilities:

The corporate office with production facilities is located at Chennai. Stock points are located at Nellore and Akiveedu in Andhra Pradesh, Bilimora in Gujarat and Nachinda in West Bengal.

Category of products being manufactured

Poseidon Biotech manufactures Probiotics, Immunostimulants, Mineral mixtures, feed additives, sanitizers etc.

R & D facilities:

Poseidon Biotech has in-house R&D facilities.

Distribution & Dealership network:

Poseidon has distributors in all the maritime states of India with a dealer network of over 300 in numbers.

Sales, Marketing and Technical Team:

"Out of 200 employees in Poseidon Group, 70% of them are professionals in the field of biotechnology, microbiology, biochemistry, fisheries & aquaculture"

We have strong technical and marketing team to support our sales and technical services based at Tamilnadu, Andhra Pradesh, Gujarat, Haryana and West Bengal covering the neighbouring states of Maharashtra, Goa, Karnataka and Odisha, he informed.

Acceptance of products:

Mr Srinivasan said that almost every year a new product is being launched by our company based on the farmers feedback as well as our technical team recommendations. Unless and until it is accepted by the farming community, we would not have been in a position to increase our growth continuously.

Since most of our products are formulated to the needs based on our in-house R&D and production facility, we do not buy any microbes from anyone else.

Answering to a Question on best aspects of his company, Srinivasan said, we have tailor made products to tackle issues arising time to time.

Poseidon Biotech Group has achieved a turn over of INR 80 crores in Aquaculture. According to him, the size (in value) of healthcare

Poseidon Biotech Group promoters felicitated its close associations and supporters. Seen from left P. K. Senthil Kumar, K. Nithyanandam, S. Muthukaruppan, Sriram, Sandip Ahirrao, Saji Chacko, S. Chandrasekar, K. Madhusudhan Reddy, Dr S. Thiyagarajan, Ravi Kumar Yellanki and R. Srinivasan.

R. Srinivasan and S. Muthukaruppan receiving appreciation momentos from their close associates

Poseidon felicitates AI Editor M. A. Nazeer on the occasion

products market in Indian aquaculture sector is INR 1200 crores.

Replying to a question on the comments that healthcare companies are using harmful chemicals and antibiotics in their products Mr Srinivasan replied, "Any sensible healthcare company who want to do good for aquaculture sector will not use any harmful chemicals or antibiotics in their products".

Best practices implemented in Poseidon Biotech:

For the last eight years we are an ISO company. We are going to implement GMP by March 2020. We are strengthening our R&D team as well as improving our facilties to a greater extent. We strongly believe that time tested products in the market are all developed in-house products, he stated.

Turning point in your career which helped your company to do well and grow?

Continuous challenge posed by aquaculture sector itself is a turning point for us for growth and development, Srinivasan said.

To what aspects you attribute your company's successful growth and development in aquaculture sector?

Poseidon Biotech Group celebrating Silver Jubilee is a milestone and a very happy moment for the entire team. It is the passion, people, our distributors and suppliers and bringing together of individual skills and talents and as investment in long term relationship, he stated. We have to see that the farming community prosper which indirectly makes every player in this field prosperous. Shrimp farming is almost like a self help and self motivating sector, he said.

Future plans and Targets:

Mr Srinivasan said that he has future plans related to biotechnology in aquaculture, biotechnology on other fields, more automation in aquaculture other than auto feeders. Poseidon Group has shrimp hatcheries, auto feeders and automation in the field of aquaculture.

His advice to stakeholders:

"We are strengthening our R&D team as well as improving our facilties to a greater extent. We strongly believe that time tested products in the market are all developed in-house"

Srinivasan adviced farmers and other stakeholders of the sector to be ethical, always play safe. Always think about doing good to the sector and the society.

A view of felicitation and participants in the Silver Jubilee of Poseidon Group

Biology of commercially important freshwater prawns of India

Highlight Points

The wild population of commercially important freshwater prawns (*M. Rosenbergii, M. Malcolmsonii and M. Gangeticum*) of India have been declined over the period of time due to overexploitation, habitat degradation and pollution. Moreover, these endemic species have been replaced with *L. Vennamei* in prawn farming industry which may further lead to the extinction of these valuable species. The current biological study of these three species will help researchers and academicians to understand their life history and other biological details which in turn will help in their sustainable management and conservation.

Abhishek Kumar, Ravi Kumar, Jyoti Saroj, Ashish Kumar Maurya

Department of aquaculture, College of Fisheries, Govind Ballabh Pant University Of Agriculture And Technology, Pantnagar.
ICAR- Mahatma Gandhi Integrated Farming Research Institute, Piprakothi (E. Champaran) Bihar - 800 014

Crustacean family Palaemonidae (Class: Crustacea; Order: Decapoda) with more than 930 prawn species is predominantly marine, but also includes several freshwater species. The family Palaemonidae is divided into four subfamilies i.e. Palaemoninae, Pontoninae, Desmocaridinae and Typhlocaridinae. The subfamily Desmocaridinae comprise only of a single species, *Desmocaris trispinosus* (Aurivillius) found in fresh water streams in West Africa and Sollaud. The Typhlocaridinae includes two remarkable blind species, both belonging to the genus *Typhlocaris* which inhabiting in waters of subterranean origin of Palestine and Cyrenaica. The *Typhlocaris* differs from all other Palaemonidae in the presence of a longitudinal suture on its carapace, resembling to the certain species of Penaeidae and in Thalassinidea. Palaemonid prawns live in a wide range of environments, from freshwater to deep ocean. They can be characterised as having first two legs are chelated, second leg is larger than the first, rostrum with teeth on both dorsal and ventral sides and second abdominal segment overlaps the 1st and 3rd segment.

The subfamily Palaemoninae consists of 26 genera and more than 370 species, in marine and freshwater environments (Jayachandran, 2001). The commercially important genera under Palaemoninae are *Macrobrachium, Nematopalaemon, Peopalaemon, Palaemon* and *Pseudopalaemon*. There are 75 species belonging to 8 genera under subfamily Palaemoninae have been recorded from Indian waters (Jaychandran, 2010). In India, commercially important freshwater palaemonid prawns are *M. Rosenbergii, M. Malcolmsonii* and *M. Gangeticum*, brief description of which are given below.

1. *M. Rosenbergii* (de Man, 1879)

This prawn is commonly known as the Giant freshwater prawn, Malaysian prawn, Scampi & Golda or Moscha chingri in Bengali.

Distribution: This species is native to the Indo-Pacific region, northern Australia and Southeast Asia and generally inhabits in estuarine to freshwater zones of river mouths and backwaters with temperature 25°C-34°C and salinity 0-20 ppt. In India, it is distributed on both the East & West coast river systems, estuaries and wetlands.

Food and Feeding habits: Bottom feeder, omnivore, nocturnal, feeds on benthic macro & micro flora and fauna. They also feed on detritus. At times of food shortage or ecdysis, cannibalism is also observed. The main food items occurring in its gut are organic debris, sand, filamentous algae, insects, molluscs, crustaceans, fish larvae and detritus, but juveniles in the wild generally eat zooplankton, small insects and larvae of other aquatic invertebrates.

Age and Growth: *M. Rosenbergii* is a fast growing species. The maximum recorded size for males and females are 32.6 cm and 28.3 cm, respectively as reported by George (1969) from Valapattnam River in Kerala**.** Both male and female grow at similar rate until ovarian development. Growth within population is heterogeneous. There are two distinct types of juveniles are defined on the basis of their relative growth rates as 'Jumpers' and 'Laggards'. Jumpers are exceptionally fast growing individuals and Laggards are the slow growing ones.

Length-Weight Relationship: The length – weight relationship for male and female *M. Rosenbergii* and found that increase in its weight is slightly higher than its cubic length. (Rajyalakshmi, 1962; Rao, 1967).

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Log W = 5.5837 + 3.2276 log L (Rajyalakshmi 1962).

Log W = 5.57 +3.19 log L (r = 0.99) (Rao, 1967).

Reproductive Biology: Sexes are separated. Male and female can be distinguished morphologically. George (1969) studied sex ratio of *M. Rosenbergii* from Pamba river (Kerala) and adjoining backwaters and found that males are dominant in number throughout the year except the months of August to October. About 60%-90 % males are available in the population throughout the year except these months. Males can be distinguished from females in that the genital pore in males is situated at the base of the 5th pereiopod and in the 3rd pereiopod in females. Moreover appendix masculine is present in the 2nd abdominal appendages in males.

Maturation and Spawning: In case of *M. Rosenbergii,* male and female attain first maturity at 14-15 cm length in natural condition. This species migrate downstream to the estuarine environment where salinity ranges from 5-20 ppt for the purpose of spawning, hatching and better survival of their young ones. Spawning season is prolonged and varies with regions, but generally coincides with onset of monsoon. This species breed twice or more in a single spawning season. A few important natural spawning grounds of this species has been spotted in India as Phuleswar-Uluberia in Roopnarain River, Chakdah in Hooghly River, Kakinada Bay in Godavary Estuary and Vembanad lake of Kerala where they migrate during breeding season. Spawning occurs after 5-6 hours of mating and fertilization is external. Fertilized eggs are transferred to the brood chamber on the underside of the abdominal region of the female and are kept aerated by vigorous movement of the abdominal appendages.

The maturity stages in males are simply categorized as Small male, Orange clawed male and Blue clawed male of which blue clawed males are sexually most active and contribute in the development of next generation by mating with matured females. Maturity stages of female are classified as immature, maturing, matured, Berried (yellow, orange, grey and black) and spent. In berried stage females carry eggs in their brood chamber. This stage is further classified into four categories based on the color of the eggs such as yellow berried, orange berried, grey berried and finally black berried females.

Fecundity: The average number of eggs in breeding season is estimated to be around 80,000-100,000. Egg's size varies from 0.6 to 0.7 mm, elliptical in shape and bright orange in colour until 2 or 3 days before hatching, when they become grey-black in colour. Fecundity varies from place to place and based on the size of mature female. According to Mary John (1957) fecundity of *M. Rosenbergii* varies from 100,000 to 160,000 eggs, while according to Rajyalakshmi (1961) it varies from 7,000 to 111,4000 eggs. Ling (1969) reported that fecundity of this species varies from 70,000 to 120,000 eggs and according to Raman (1967) fecundity varies from 139,600 to 503,000 eggs.

Larval development: The incubation period lasts for 21 days in *M. Rosenbergii*. The hatching of eggs generally take place during the night hours where fertilized eggs hatch into zoea, which normally swim with its head down and 'jump' when it comes in contact with any surface. There are 11 distinct zoea stages. The larval cycle is completed within 23 to 32 days after which they metamorphose to the post larvae.

Larval stage	Prominent characters	Days after hatching
I	Sessile eyes	1-2
II	Stalked eyes	2-4
III	Uropods appear	4-7
IV	Two dorsal epigastric teeth at the base of the rostrum	7-12
V	Telson narrower and elongated	11-16
VI	Pleopod buds appear	15-21
VII	Pleopods biramous and bare	18-24
VIII	Pleopods with setae	22-28
IX	Endopods of pleopods with appendices internae	25-31
X	Three or four dorsal teeth on rostrum	28-33
XI	Teeth on upper half of dorsal margin	31-50
XII (Post Larvae)	Teeth on upper and lower margin of rostrum, body transparent with a slightly brown coloured chromatophore on head	35-50

The post larva can move against the current and migrate to freshwater canals and rivers. They become omnivorous and feed on aquatic insects and their larvae, phytoplankton, seeds of cereals, fruit, small molluscs and crustacean, fish flesh, and slaughter house waste.

2. *M. Malcolmsonii* (Milne-Edwards, 1844)

This is 2nd largest palaemonid species after *M. Rosenbergii* occurring in India. This species is commonly known as Indian River Prawn or Monsoon River Prawn.

Distribution: Widely distributed throughout the Indian subcontinent. It is also reported from Bangladesh, Sri Lanka, Pakistan and Myanmar. In India, it is mainly distributed in Godavari, Ganga and Indus river system.

Food and Feeding habit: Omnivorous, bottom dwelling, and naturally feeds on decomposing plants, algae, diatoms, snails, small worms, insects and their larvae. It is nocturnal in habit and feeds more actively at night. Cannibalism is also reported. Mud, sand grains and debris constituted the major part of the stomach contents, forming 65.7% in adults and 35.9% in juveniles (George, 1969).

Age and Growth: Jaychandran and Joseph (1992) recorded Maximum size for male and female as 24 cm and 20 cm respectively while Hossain (2012), reported maximum length and weight for male and female as 11.76 cm; 15.20 g and 10.20 cm; 10.70 g respectively. The average life span of this species is judged to be about 3 to 3½ yr in females and 4 to 4½ yr in males. Rajyalakshmi (1966) studied age and growth of *M. Malcolmsonii* and described growth of male and female as

48 mm, 58 mm, 90.5 mm and 118.5 mm in 0, 1, 2 and 3 year class for males and 36.5 mm, 56 mm and 93.5 mm in 0, 1 and 2 year class for females.

Length-Weight relationship: Based on 1502 observations on length and weight, Ibrahim (1962) observed that the increase in weight of this species was slightly higher than the cube of its length. He calculated the length-weight relationship as:

$$W = 0.000001815485L^{3.38788} \text{ (Male)}$$

$$W = 0.000002728978L^{3.82041} \text{ (Female)}$$

Reproductive biology: Sexes are separate. Male and female can be characterized in similar manner as in case of *M. Rosenbergii*.

Maturation and Spawning: Minimum size at first maturity in female is 41 mm according to Ibrahim (1962). Rajyalakshmi (1966) recorded that minimum size at first maturity in female is 79.0 mm. The breeding period in India, extends from April-December with a peak from August-November (Rajyalaksmi, 1980). Maturation, spawning, fertilization and hatching of eggs, occur in fresh water zones during monsoon season, but larvae grow in estuarine water. By the month of October, juveniles start migrating to freshwater bodies. Spawning occurs after 4-5 hr of mating.

Fecundity and Larval development: Fecundity ranges from 3500 to 94000 eggs (Rajyalaksmi, 1980). The average size of eggs is 0.52 mm. Eggs are spherical or elliptical in shape with a thin egg membrane provided with a coating of transparent adhesive secretion. Incubation period of eggs is around 12-13 days. Fertilized eggs hatch into zoea stage**.** Zoea metamorphoses to post larva, after passing through 11 subsequent zoeal stages. Duration of larval cycle is generally 40-60 days. Larval development is similar to *M. Rosenbergii*.

3. *M. Gangeticum* Bate, 1868

This is 3rd largest palaemonid species occurring in India and commonly known as Ganga River prawn.

Distribution: This species is native to Ganga and Brahmaputra rivers of Indian states particularly from Asom, U.P. and Bihar (Jayachandran, 2001).

Food and Feeding habit: Omnivorous, detritus feeder, naturally feeds on decomposing plants, algae, diatoms, snails, insects and their larvae.

Age and Growth: Singh *et al.,* (2012) collected samples from middle stretches of Ganga River around Varanasi and recorded the maximum size of males and females as 205 mm, 190 mm respectively. It grows 75-130 mm, 125-155 mm and more than 155 mm in 1, 2 and 3 or more years, respectively.

Reproductive biology: Sexes are separate. Males are larger than the females. Males have a pair of long and stout second walking legs, a big head and narrow abdomen. Genital openings are at the base of fifth pair of walking legs in males and at the base of third pair of walking legs in females. Colour of telson, uropods, carapace, dorsal region of the body and chelated legs is brown in adult males. Singh *et al.,* (2012) reported that females are more in percentage composition than the males in 65-165 mm length group, but males are dominant in larger size group from 70-205 mm length.

Maturation and Spawning: First sexual maturity is recorded at 8.5 cm total length (1year old). During mating sperms are deposited as a gelatinous mass on the thoracic region of the females at the bases of third thoracic legs. Soon after mating, females move to a safer place for spawning. During spawning, the body of the female bends forward and forms a U shaped structure due to which eggs are extruded directly into the brood chamber. Eggs are held and adhered tightly to the fine ovigerous setae of the first to third pair of pleopods.

Fecundity: Fecundity ranges from 7,500 - 75,250 eggs. Eggs are greenish yellow in colour. Incubation period is around 12-13 days in this particular species and larval stage is completed in 22-32 days. The hatching of eggs and larval development are similar to that of *M. Rosenbergii.*

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****More References can be provided on request***

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Zebrafish as model to study the innate immune response and NFκB signaling pathway

Highlight Points

►The cost of aquaculture infections can be high, making immunity failure a major risk to commercial fish farming. ►Macrophages, Neutrophils, and family members of NFκB transcription factor play a key role in the innate immunity and inflammatory reaction. ►Zebrafish - appropriate model for the development and testing of fish vaccines and drugs for disease contents in the aquaculture facilities. ►kebrafish - flexible, useful, and reliable animal model for understanding the mechanisms of infection and immune response involved in fish-affected infectious diseases, and for human inflammatory disease pathophysiology.

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Abstract

At the heart of this first-line defense, phylogenetically retained signaling mechanisms in innate immunity that provide an immediate cellular reaction. Macrophages and Neutrophils play a key role in the innate immunity and inflammatory reaction. The family members of NFκB transcription factor play a vital role in the development of innate immunity. NFκB triggers proinflammatory mediators (cytokines, immunomodulators and chemokines), provoking immunity and inflammation, and modulates expression of TNF-α. In recent years, zebrafish have been established as an ideal model for pathophysiology of human inflammatory diseases.

Introduction

Innate immune response is the front line of host defense which includes a number of cellular and molecular components, it also depends on recognition of conserved molecular patterns and mechanisms to identify and eliminate external threats without prior exposure (Douglas et al. 2019).It is well documented that phylogenetically retained signaling mechanisms in innate immunity that provide an immediate cellular reaction use the NFκB nuclear factor system at the heart of this first-line defense. Zebrafish have been used as a model for human disorders with their unique advantages in biology, genomics, and genetics, and their high conservation of disease-related signal transduction pathways. In particular, the pathological characteristics of zebrafish inflammation were similar to those of humans. Zebrafish have been established as an ideal model for human inflammatory disease pathophysiology in recent years (Yang et al. 2014).

Innate immune cells can mediate specific adaptive protection and that vaccination in rag1$^{-/-}$ mutant zebrafish leads to significantly increased survival if the fish are re-exposed to the same pathogen. The more plausible explanation suggested for this result was that NK cells are capable and responsible for maintaining immune memory in mutant rag1$^{-/-}$ zebrafish since the antigen recognition mechanism does not involve gene rearrangement mediated by rag1.

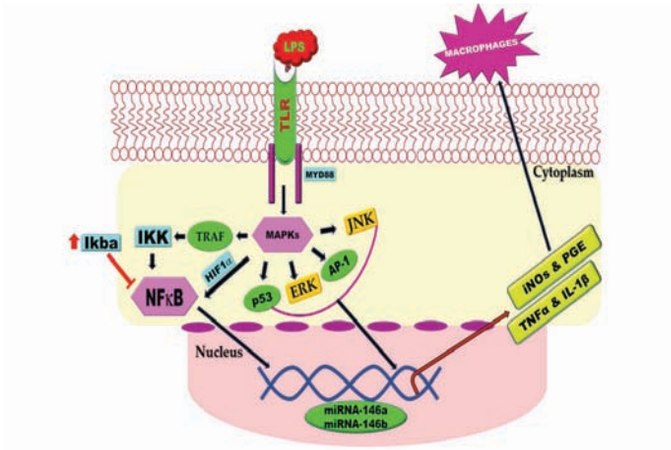
Role of Macrophages and Neutrophils

An inflammatory response is the characteristic manifestation of the innate immune response. Macrophages and Neutrophils play a key role in the innate immunity and inflammatory reaction (Binesh et al. 2018). In zebrafish, macrophages and neutrophils are recruited at the injection site of immunogenic molecules Lipopolysaccharide (LPS) (Yang et al. 2014). Hydrogen peroxide secreted by damaged cells attracts migration of neutrophil into injured tissues in zebrafish by creating a gradient of chemoattractant. After the threat has been neutralized, the number of neutrophils is reduced by a reverse migration process that is thought to contribute to inflammation resolution as well as the previously known apoptosis of neutrophils at the damage site. This reverse migration and neutrophil apoptosis in zebrafishis delayed in fish with an increase in hypoxia-inducible factor 1 alpha (HIF-1α), either genetically or pharmacologically, suggesting a significant function of the HIF pathway in neutrophil activation and persistence in the damage or infected site.

NFκB transcription factor

The family members of NFκB transcription factor play a vital role in the development of innate immunity. While many receptor modules of the innate immune system use similar components and activate common downstream transcription activators including NFκB, AP-1 and C / EBP, they do so with varying amplification power. First, scientists demonstrated that zebrafish NFκB proteins can be functionally replaced by their mammalian counterparts, thus showing that the NFκB pathway is preserved in mammals and fish. Using

the zebrafish model, the contribution of NFκB to the formation of notochords in higher vertebrates was also addressed. Also described in vertebrates, especially in amphibians and zebrafish, was the potential role of the NFκB signaling pathway in embryonic dorsal-ventral (DV) patterning. Overexpression of a dominantnegative form of the murine Iκbα in zebrafish to block the NFκB signaling led to embryonic dorsalization, defects in notochord development, generating no-tail embryos. Activation of canonical NFκBis required for the specification of hematopoietic stem cells (HSCs) during embryogenesis demonstrated by (Espin-Palazon et al., 2014) using the in vivo visualization of embryogenesis in zebrafish.



The classical NFκB activator TNF-α which act via its TNFr2 receptor as one of the receptors triggering NFκB activation in the hemogenic endothelium to specify HSCs in zebrafish (Espin-Palazon et al. 2014;He et al. 2015). Sawamiphak demonstrated in zebrafish and mice that interferon gamma, another proinflammatory cytokine, is needed during HSC specification, in the case of downstream of Notch signaling.

Figure 1: Link between the innate immune response and NFκB signaling pathway in zebrafish

Important cytokine in the inflammatory response of fish

Pressley et al. (2005) detected increased gene expression and production of cytokines IL-1β and TNF-alpha in zebrafish infected with Edwardsiellatarda bacteria, a pathogen commonly found in farmed species such as Channel catfish, Japanese eel (Anguilla japonica) and Japanese founder (Paralichthysolivaceus), as regards the molecular mediators of innate immune response. In another study, Yang et al. (2014) found an increase on zebrafish embryos in the same cytokines plus IL-6 in an inflammation model induced by LPS.

Scientists also found increased expression of IL-1β and TNF-alpha coding genes, the innate immune-related gene MPX and the complementary system component SAA and C3B coding genes in soy protein-fed zebrafish and soy saponin-fed diets. It has also been found that soy-rich diet induces both macrophages and neutrophils to migrate to the mucosae of the intestinal tract. In this study, high levels of soy proteins and saponins included in the fish food caused the inflammatory response on the intestinal mucosae. For all the aforementioned studies, for in vivo observation and tracking of fluorescently labelled immune cells, the hyaline characteristic of zebrafish larvae was essential. Mutant larvae of zebrafish expressing green fluorescent protein (GFP) associated with leukocyte-specific proteins (e.g. myeloperoxidase, MPO) have also made it possible to visualize the entire process of recruitment and withdrawal of the inflammation (Yang et al. 2014).

IL-22 is another important cytokine in the inflammatory response of fish and mammals. Although it was first associated with adaptive immune cells, a study by Costa et al. (2013) in zebrafish and turbot (Scophthalmus maximus) found that IL-22 is expressed in developmental embryos where the adaptive immune system is not yet functional, as well as in mutant rag1/zebrafish lacking in T and B lymphocytes. In addition, evidences reported successful Carrageenan-induced zebrafish inflammation model with increased levels of MPO, TNF-α and inducible Nitric Oxide Synthase (iNOS) inflammationrelated proteins previously observed in rodent models. They also found that inhibition of either TNF-α or iNOS significantly reduced oedema formation and overall inflammation, indicating that both molecules play a significant role in determining the inflammatory reaction. All of these findings provide evidence of macrophage activity with cytokine-mediated signaling link in inflammatory processes caused by bacterial infection, toxins, or dietary components to the adaptive immune response elements. NFκB triggers proinflammatory mediators (cytokines, immunomodulators and chemokines), provoking immunity and inflammation, and modulates expression of TNF-α (Binesh et al. 2018).

Toll-like receptors

Two newly discovered types of receptors involved in primary immune response are less well studied in zebrafish. On the surface of dendritic cells and macrophages, Toll-like receptors (TLRs) recognize repetitive pathogen-associated molecular patterns (PAMPs) derived from bacteria or viruses. TLRs transmit signals from the cell surface to the nucleus following PAMP binding, a process mediated by five adaptor molecules sharing a common Toll / interleukin-1 receptor (TIR) domain with TLRs. This process results in activation of family members of MAP kinase, translocation of NFκB to the nucleus, and secretion of anti-infectious molecules. Right balance between p53 and immunity is necessary to promote cell health (Danilova et al. 2018), P53 suppresses NFκB and NFκB mediated inflammation (Munoz-Fontela et al. 2016).

Micro-RNA profile was also studied in zebrafish for innate immune response, identifying up-regulated and down-regulated miRNAs. Both miRNA-146 family members (miRNA-146a and miRNA-146b) were up-regulated during bacterial infection in embryos and adults. Because this miRNA family is highly preserved from fish to humans, the zebrafish is clearly a good model for studying the dynamics and effects of the innate immune response. Neutrophilic inflammation (wound response) is augmented in miR-223 (myeloid-enriched anti-inflammatory microRNA) deficient zebrafish, primarily due to the elevated activation of the canonical nuclear factor κB (NFκB) pathway (Zhou et al. 2018). Together, all of the above research provides sufficient evidence that zebrafish can be used as an appropriate model for cellular and molecular innate immune response and inflammatory reaction; and the results obtained using it may be extrapolated to aquaculture species.

Practical reasons exist, as the cost of aquaculture infections can be high, making immunity failure a major risk to commercial fish farming. In biological research, as model organisms for developmental, physiological, and biomedical research, several small fish species have increased in popularity. Particularly prominent among these were the zebrafish (Danio rerio), a small cyprinid teleost that provides researchers with an attractive combination of genetic tractability, rapid ex vivo development, optical transparency, a near completion genome sequencing and annotation project, and a rapidly expanding genetic and biochemical reagent resource including numerous mutant and transgenic lines.

The zebrafish genome has been fully sequenced, highlighting a remarkable similarity with humans. At least 70% of the human coding genome, including genes associated with disease, have a direct ortholog in zebrafish. Collectively, zebrafish embryos and larvae are widely accepted in the 21st century as in vivo models for a variety of human diseases including cancer, inflammatory disorders, and infection (Torraca et al. 2018).

Conclusion

As a result of this review, zebrafish has been shown to be a flexible, useful and reliable animal model for understanding the mechanisms of infection and immune response involved in fish-affected infectious diseases that are of concern to the aquaculture industry. It is also an appropriate system for the development and testing of fish vaccines and drugs for disease contents in the aquaculture facilities. Zebrafish also emerges as a good model for the assessment of fish food under immunological and toxicological approaches, which is important in the practice of fish farming since nutrition directly affects the volume of production.

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Ecolabelling of the Fisheries Products: Boon for Sustainable Blue Economy

Highlight Points

► Eco-labelling is a tool of providing information about environmental characteristics of products/services to enhance procuring decision for the product resulting in reduced stress on the environment. ►Paphia malabarica is the first Marine Stewardship Council (MSC) certified fishery in India. ►WWF has developed standards for aquaculture certification with an aim to eliminate the negative effect of fishing on environment and society which is known as Aquaculture Stewardship Council (ASC). ►Friend of the Seadon't provide certification to fish stocks captured from ocean having more than 8% discards.

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1. Introduction

Eco-labels and Green Stickers are one type of labelling systems used for food and consumer products. They are mostly voluntary in nature except green stickers, which are mandated by law. Eco-labelling is defined as the granting of product labels (usually applied voluntarily) by a private or public organisation to provide information to consumers about the environmental stress caused by a product (Vitalis, 2002). Eco–labels products are also known as "environmentally friendly products". It was first started in 1977. The main objective of eco-labelling is to provide information about environmental characteristics of products/services to enhance procuring decision for the product resulting in reduced stress on the environment. Labelling may be divided into several forms, like seals-of-approval, single attribute certification, report cards, information disclosures or hazard warnings. This type of labelling has several benefits such as environmental improvement, accurate information dissemination to consumers, improved market shares for producers, and increased awareness and interest by the public about environmental issues (Kuhre, 1997; Morris and Scarlett, 1996). There are about 400 ecolabels concerning different products in operation in the world, of which nearly 50 are related to fisheries and aquaculture. Fish is one of the most highly traded commodities in the world, and as a natural resource, there is worldwide concern about long-term sustainability of the resources. Ecolabels have emerged within the context of accumulated demand for fish and food, and a perception that a lot of governments policies failing to manage the aquatic resources adequately. Several mechanisms to manage the fish and fisheries resources are introduced by international bodies that square measure binding on national governments. These include:

- The United Nations Convention on the Law of the Sea (UNCLOS) (1982);
- The FAO Code of Conduct for Responsible Fisheries (the Code) (1995);
- The United Nations Fish Stocks Agreement (1995); and
- Various regional fisheries management organizations (RFMOs).

The RFMOs facilitate international cooperation at the regional level for the conservation and management of extremely migratory and straddling fish stocks. At the national level, governments are trying to plant the principles and goals of the Code– currently in its second decade of implementation – into their national fisheries management policies (FAO, 2010). However, they are having variable degrees of success. Disenchantment with the pace of regulative measures to curb overfishing and to boost fisheries property has caused environmentalists to develop alternative market-based methods for shielding marine life and promoting property. The present article focuses on overview of eco-labelling in global and Indian scenario and its role in fisheries sustainability and trade of fisheries products.

2. Principles of Eco-labelling

General principles of eco-labelling, based on ISO 14020, includes:

- Information provided through ecolabels should provide relevant, accurate and understandable environmental aspects of the product/service;
- Procedure and requirements should not create unnecessary barriers to trade;
- Scientific methodology that is verifiable should be used to support the claims;

- Information concerning procedure, methodology, criteria should be made available to all interested parties;
- All relevant aspects of products life cycles should be taken into account;
- Eco-labelling should not prohibit innovation or potential to improve environmental performance;
- Any administrative requirements should be limited as necessary;
- Development of eco-labelling should be opened to all interested parties; and
- Provide sufficient and understandable information to purchasers.

3. Different categories of Ecolabels

3.1 First party labelling schemes: These type of labelling is established by different individual companies based on their own product standards. These type of labelling also known as 'self-declaration'.

3.2 Second party labelling schemes: These type of labelling is established by industry associations for their members' products. The members elaborate certification criteria by drawing upon external expertise from academia and environmental organizations. Verification of the products is done by internal certification procedures within the industry.

3.3 Third party labelling schemes: These are usually established by a public or private initiator independent from the producers, distributors and sellers of the labelled products. Products supplied by organizations or resources should be certified and labelled. Labelled products should contain suitable information for consumers that the product was produced in an 'environmentally friendly' fashion.

4. Current labelling and product Certification in the fisheries sector

4.1 Mark of Origin

In this process, producers gain huge advantage by drawing attention to the origin of fish through labels. Other than that governments also make some mandate rules for labelling of fish by origin and species which is more effective way for tracking and identification of fisheries products to aid fisheries management.

4.2 Organic Seafood Labels

Different fishing or food companies in some parts of the world to label fish as farmed or wild, and more recently to win marketing niche with so-called 'organic seafood'. Organic labelling usually signifies that the fish or food should be produced without any artificial inputs—especially antibiotics and different chemicals rather then that it should be produced environmental friendly way.

4.3 Marine Stewardship Council (MSC)

The MSC is an independent, non-profit organization, which is located in London, UK. Marine stewardship council is initiated by the World Wide Fund for Nature (WWF) and Unilever, a large fish retailer. The main objective of MSC is to promote sustainable and responsible fisheries and fishing practices worldwide. Approximately, one hundred fifty fisheries round the world are engaged in some stage of the MSC assessment method (including pre-assessment) and fifty-six fisheries till date been certified. The MSC claims to cover "about seven per cent of the annual world wild harvest" of fish and food, accounting for 42 per cent of the worldwide wild salmon catch and 40 per cent of the worldwide white fish catch. The particular volume of MSC-labelled product on the market as a proportion of overall listed fish merchandise is probably going to be considerably decreased in terms of world trade, whereas there are not any strong statistics on the proportion of MSC-labelled merchandise on the worldwide market. Sales of MSC-labelled fish and seafood of USA calculable US$1.5 bil-

Fig 1: Principles and Criteria for Sustainable Fishing of MSC

4.4 The Marine Aquarium Council (MAC)

The Marine Aquarium Council was started in 1998 located in Hawaii (U.S.A.). Main aim of MAC is to provide voluntary standards and an eco-labelling system for the marine aquarium trade. It is working to establish standards for 'best management practices' in the supply of marine aquarium organisms. MAC also working for conserving coral reefs by creating standards and educating and certifying those engaged in the collection and care of ornamental marine life from reef to aquarium.

4.5 Global Aquaculture Alliance (GAA)

Global Aquaculture Alliance (GAA) is a non-profit trade association, established in 1997 for advancing responsible aquaculture through aquaculture certification standards. This Program is also intended to improve the efficiency and long-term sustainability of the aquaculture industry. GAA has developed nine individual codes of practices for responsible shrimp farming ranging from pond sitting and management to the use of chemicals and community and employee relations.

4.6 Friend of the sea

Friend of the sea (FOS) has its origins within the Earth Island Institute, discovered in 2006 and its founder is also the European Director of Dolphin Safe. It covers each wild and farmed fish and its criteria includes requirements associated with carbon footprint and "social accountability". Certification relies on the property of the stock, instead of whether or not the work is sustainably managed. Its certification methodology relies on existing official knowledge in terms of stock assess-

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ment. Friend of the Sea says it'll not certify stocks that area unit "overexploited" (based on Food and Agriculture Organization definitions of levels of exploitation), fisheries using destructive methods that have an effect on the ocean bottom and fishers that generate more than 8% discards. Certification is undertaken by freelance third-party certifiers. Friend of the Sea claims to be "the main property food certification theme within the world" covering almost 10 percent of the world's wild capture fisheries. It ought to be noted that eighty percent of the ten million tonnes of landed FOS certified product from capture fisheries (8 million tonnes) comes from Peruvian anchovies. There are about 600 FOS products (including animal oil and omega-3 fatty acid supplements) sold-out in twenty-six countries and covering 70 each from wild capture and culture.

4.7 Other NGO schemes

Other NGO-driven schemes such as KRAV, a Swedish non-governmental organization that focuses on organic farming but that has recently developed a "standard for property fishing" and Naturland in Deutschland also with a background in certifying organic farmed food however currently with a "Scheme for the Certification of Capture fishery Project", which incorporates social, economic and ecological property criteria. To date, Naturland has solely certified one fishery (Nile perch from Buboka within the United Republic of Tanzania).

5. Impact of Eco-labelling on sustainable fisheries

The concept of certification and eco-labelling based on development of sustainable fisheries development in market-based incentives is of recent origin. Over the last ten years these approaches have grown up in scope and became more and more visible to consumers. Certification refers to a spotlight upon the legal admissibility of the harvest and that the fish are caught within agreement restrictive framework. Certification primarily exists in regional fisheries agreements wherever cooperation on trade and management is important. Eco-labelling tends to maneuver one step more than certification (Teisl *et al*., 2002). A label tends to be granted on the idea of investigation into the ecological integrity of the harvest, as well as considering ecosystem within the fishery (Teisl *et al.,* 2002). Eco-labelling has a number of advantages that includes promoting consumer choice, improving economic efficiency, and enhancing market development to promote better environmental sustainability. The consumer's ability to distinguish between a labelled product will rely on a capacity to respond to environmental issues. Promotion of the label, the development of standard assessment process, and also the growth of incentives for the fisheries sector to pursue certification are very essential elements of a booming certification theme. Despite eco-labelling initiatives increasing within the fisheries sector, research analysis showed that the advantages of labelling to fisheries management and also the trade participants are still in scarce. Additionally, eco-labelling programs like the MSC are increasing and attracting variety of major and community fisheries to undergo certification. The empirical evidence suggests that the MSC program is increasing in quality by shoppers and is making incentives for fishing industries to get associated. The Food and Agriculture Organisation of the world organization (FAO) is increasingly facilitating a dialogue on criteria for certification and of the eco-labelling process.

6. Impact of Ecolabels on trade

It is difficult to estimate the amount of ecolabelled certified products in the global market. However, the MSC and FOS reported 7 percent and 10 percent respectively of world's capture fisheries – when put together they account for less than one-fifth of wild capture production. It is sure that the real volume of listed ecolabelled product is considerably less than that. Inspite, of the MSC's 6 million tonnes of production from certified fisheries only about 2.5 million tonnes end up carrying the MSC label. A significant major portion of FOS-certified fish is used in fishmeal and fish food. Different schemes living presently cowl fairly insignificant volumes of product. Overall, the market presence of ecolabelled products is probably going to be modest, and considerably lower than the publicity of surrounding such products.

Conclusion

In recent era of increasing demand of fish and fishery products with high pressure on natural resources, ecolabelling appears to be one of the alternative ways to bring higher degree of control over sustainable use of fisheries resources and environment. The increasing demand of aquaculture and fisheries globally is also being addressed by international organizations. In co-operation with Forestry Stewardship Council (FSC) and Marine Stewardship Council (MSC), WWF has developed standards for aquaculture certification with an aim to eliminate the negative effect of fishing on environment and society which is known as Aquaculture Stewardship Council (ASC) having its first certification on 2012. In conclusion, eco-labelling of fisheries products has a valuable role to play in modifying the pathway of capture of fish by changing the behaviour of different stakeholders. Issues of governance and the social context of fish and fisheries are obstacles to a wide-scale adoption of an effective ecolabeling scheme. Thus, a holistic approach with support from government and different stakeholders operating in the market chain will lead to enhance eco-labelling for a sustainable blue economy.

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Fish - MIS MODEL – A Market Led Extension Approach for Fostering Market

Highlight Points

The fish marketing system is till now lagging far behind the satisfactory performance with regard to existing improper infrastructures in the fish markets and with respect to providing market information to the supply chain actors. Henceforth, in the present-day scenario, it needs a radical transformation or rather a revamp in its orientation and structure to better serve the needs of the stakeholders as well as consumers. In this regard, it is imperative to establish market-led extension approaches to bring revolutionary change in the fish marketing system. In the current article, the authors have attempted to develop a Fish-MIS model which may help in facilitating an efficient and income enhancing marketing system, which in turn may result in increasing the producer's share in consumers rupee.

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Introduction

The fisheries sector occupies a significant place in the socio-economic development of the country. Various statistical data depicts that fisheries sector is growing at a faster pace but it is the irony of the situation that the major stakeholders of the sector i.e. the fish farmers and their socio-economic status are not growing at the same pace. One of the reasons may be the sector is focused more on production with improved technologies rather than producer's share in consumers rupee. Henceforth, it is observed that even after 70 years of independence, the quality, timely and cost-effective delivery of adequate inputs remains a dream for majority of Indian farmers (Kumar *et al*., 2008). They are unable to sell their surplus produce remuneratively, as a result there is plenty of distress sales among farmers of the country. However, the onset of globalization and emanation of new market mechanisms brought up new opportunities for the farmers which call for transfer of new extension approaches involving productivity to profitability, subsistence to commercial fish farming, commodity-oriented to farming systems orientation, local market to export market, monoculture to polyculture and so on. In the present scenario, Market-led Extension is the perfect blend for reaching the doorsteps of our farmers. The market-led extension is the market ward orientation of fisheries through extension, which includes fisheries and economics that acts as a perfect blend for reaching the doorsteps of the farmers with improved technology at low cost (Kaleel*et al*., 2007).

Scenario and pitfalls in the fish marketing system

The fish marketing system is till now lagging far behind the satisfactory performancewith regard to existing improper infrastructures in the fish markets (FAO, 2001). The fish marketing chain is succumbed with more intermediaries and is still continuing as traditional unhygienic depressed markets which thereby reduces the value of fish as well as downgrades the profession too. Besides this, we know fish marketing is an integral part of production and both should go hand in hand. Fish being highly perishable commodity, requires proper preservation and storage to increase the shelf life. In the present era of globalization and modernization, it is high time for the farmers to transform themselves from mere producers-sellers in the domestic market to producers cum sellers in a wider market sense to realize the best returns on their investments, risks, and efforts. This is possible through market-driven approaches which are successful when farmers create groups, able to access various knowledge & resources and receive remunerative price out of their sell within the supply chain. Erstwhile, mostly fisheries extension like agriculture extension has emphasized mostly on production-related aspects. Very little attention on developing marketing infrastructure and almost zero attention on marketing information management and marketing skill development have been given in fisheries sector. Lack of data on market intelligence and establishment of market information systemis a pressing issue in fisheries sector. Against this backdrop, the Fish-MIS (Fish- Marketing Information System) model is suggested which will leverage the establishment of market information systems in the sector as well as gather data on market intelligence. This step indeed may lead to the all-round development of the sector.

Design and details of the Fish-MIS Model:

The Fish-MIS (Fish- Marketing Information System) model is a market-led extension approach that embraces development of market information systems and generation of data with

regards to market intelligence. Market information system helps to collect, process, and analyse market data systematically and continuously; and ensures delivery of information ona timely basis to all market participants. The Fish-MIS model is an approach towards organized marketing system and a step towards market intelligence establishment. The model envisages a market data collection system through the help of Matsya Bazar Mitra and marketing resource persons.

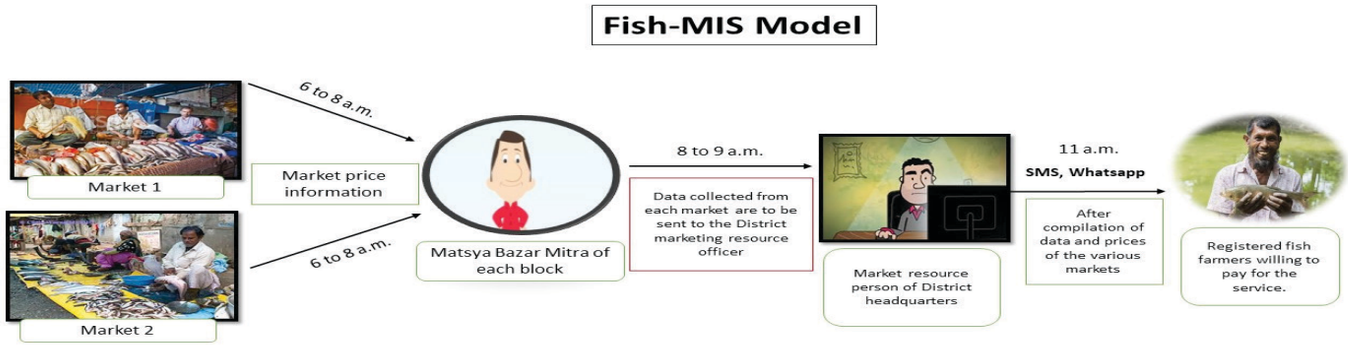

Fig. 1 – Fish-MIS (Fish Market Information System Model)

In the model, a Matsya Bazar Mitra will be entitled to each block who will be a 12th pass or graduate student having good communication and rapport building skills. The Matsya Bazar Mitra will collect data from the various wholesale and retail markets on fish species available and prices of different fish species on the specific markets. After the collection of data from the market, the Matsya Bazar Mitra will send the data to market resource person who may be the DFO (District Fisheries Officer). The marketing resource person will tabulate the market data along with species availability, demand and market prices of each species and will create database for each market. A directory of fish farmers, wholesalers, retailers who are willing to access and pay this market information service should be available with the marketing resource person. The marketing resource person will send customized messages to the willing stakeholders (fish farmers, wholesalers, retailers) about the market prices of the fish species and intimate about demand of the specific fish species. The DFO is designated as marketing resource person in the model because besides providing the market intelligence databases to the farmers, the person may provide other market-related advice to the stakeholders too. The stakeholders may be charged a nominal fee on a monthly basis for availing the service to pay the incentives to the Matsya Bazar Mitras. The model has been done with an idea of generation of revenue because most of the models are designed keeping in mind about the government subsidy which has proved to be an unsustainable practice. For sustaining this market information system model, the idea of charging is proposed and in turn for its continuation in the near future.

Benefits of Fish-MIS Model:

The implementation of the Fish-MIS model may entail a number of advantages as listed below:

1. Establishment of a market information system that will facilitate exchange of market information between the stakeholders and the concerned department officials and indeed lead to better income opportunities for the stakeholders.
2. Delivery of market information to the fish farmers will help them in making better-informed decisions with regards to selling of fishes and grasping right markets for their produce.
3. It will also facilitate the generation of data at block level/ district level which is otherwise not available in the public domain and always a persisting constraint.
4. Clutching the right markets for their products will indeed foster increase in the income levels of the farmers and further more may result in upliftment of their socio-economic status in their community.
5. The establishment of the model will generate employment opportunities for the graduates / young minds (12th pass) as they will be designated as Matsya Bazar Mitras.
6. The relative advantage and beauty of the model is, it is a self-sustaining model, with willingness of the community to pay for the services received by them.
7. The model may act in a PPP (Public-Private Partnership) mode engaging both the government as well as the community/ private people.

The array of advantages offered by the model dictates its suitability to address the present problems in the fish marketing sector and make it more profitable and sustained business in the days to come.

Conclusion:

The fish marketing system in the present-day needs a radical transformation or rather a revamp in its orientation and structure to better serve the needs of the stakeholders as well as consumers. It is imperative to establish market-led extension approaches to bring revolutionary change in the fish marketing system. The Fish-MIS model is a step towards developing an efficient and income enhancing marketing system which will increase the producer's share in consumers rupee. Henceforth, implementation of such models issine-qua - non for the prosperous growth of the fish marketing sector.

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Humic acid as a future of integrated farming system: a step towards climate change

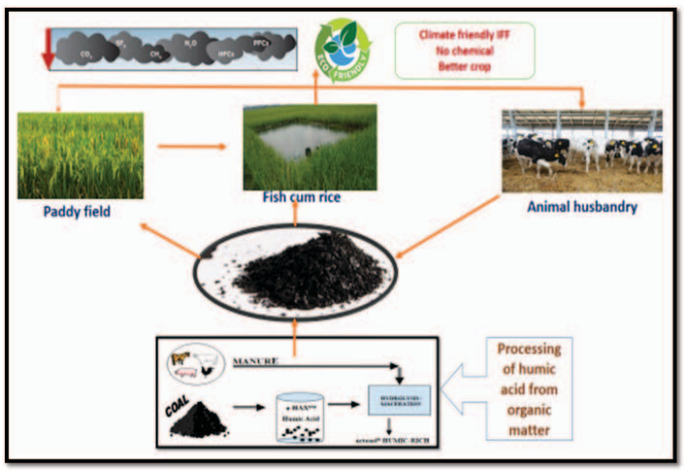
Highlight Points

▶Humic acid is an organic substance generated from humus. ▶It can be used in aquaculture, agriculture and as well as animal husbandry as organic manure and prophylactic treatment. ▶It has low decomposable organic matter, therefore has less effect on different water quality parameters. ▶Less release of GHGs from the system.

Sanchita Naskar, Kasturi Chattopadhyay, Subhendu Datta

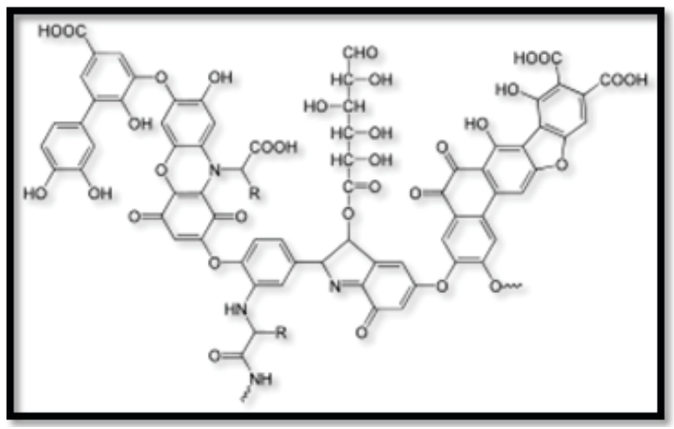
Introduction

Modern-day aquaculture and agriculture allied sectors have a huge responsibility of fulfilling the ever-increasingdaily food and protein requirement of 7.7 billion global population each year. Apart from this, the agri-aqua sector has to bear the responsibility of the present alarming situation of global warming of our mother earth. So the need of the hour is to develop proper management practices that include eco-friendly culturing and processing techniques that can simultaneously fulfil the present production trend and increasing risks of climate change. In agro-allied sectors, the presence of organic load in the culture system and the use of manures and fertilizers are the major causes of GHG emission such as CO_2, CH_4, and N_2O, etc. Therefore, a fertilizer/ manure that will be organic, easily applicable, having low decomposable organic matter, better crop production is required which can replace the use of conventional and chemical fertilizers. In this context, humic acid can be a promising fertilizer that can be used simultaneously for both agriculture crop (paddy) and fish culture without harming any of it in this type of integrated system. Humic acid has been reported to have increased disease resistivity and enhanced growth when used in fish culture systems. Higher organic carbon and lower decomposable organic load are the advantages of humic acid over any conventional organic manure which means it can be directly added into the culture system without any prior decomposition. This will prevent a sudden drop in dissolved oxygen level and faster release of nutrients into the system, thus maintaining the water quality. In return, humic acid can be processed from the excess aquatic organic debris, agricultural wastes, organic waste from animal husbandry and processing industries.



Humic acid

Humic acid is a group of molecules that bind to and help plant roots receive, water and nutrients and helps to increase the yields.



Some of the most common substances we collectively refer to as "humus" include:

- **Fulvic acid:** A yellow to a yellow-brown humic substance that is soluble in water under all pH conditions and is of low molecular weight.
- **Humic acid:** A dark-brown substance, soluble in water only at higher soil pH values and molecular weight is high than fulvic acid. Humic acid may be preserved for centuries in undisturbed soil.
- **Humin:** A black colour substance, not soluble in water at any pH, has a high molecular weight and is never found in base-extracted liquid humic acid products.

Processing of humic acid

1. Humus acid extraction from humus acid bearing minerals and then apply the extracted humus acid in a concentrated form by John C. Karcher (U.S. Pat. No. 3,111,404 and U.S.

Pat. No. 3,544,296). This is done by treating humic acid bearing ores, such as leonardite, to form a granular ammonia humate fertilizer. Phosphoric acid is first added during the process to convert the metallic salts of humic acid to humic acid, then ammonia is later added to form ammonium humate, which is then filtered to separate it from the solids present. The ammonium humate liquid is then dried to form a solid ammonium humate and to reduce the pH of the product to 7. The end product is granular and not a concentrated liquid and metallic trace elements are also removed. This drying procedure is time-consuming, requires significant power and requires additional equipment to accomplish it. And this whole procedure is a complex process and the end product formed is relatively expensive and the process itself employs expensive and complex machinery.

2. Nelson N. Schwartz (U.S. Pat. No. 3,398,186) has given a process of extracting humic acid is disclosed wherein an aqueous solution of a sulfate salt selected from the group consisting of sodium sulphate, potassium sulphate, and ammonium sulphate is used as the extracting solution. Then the mixture is cooled and acidified resulting in a dark precipitate of humic acid.
3. Yves Ramus (U.S. Pat. No. 3,222,160) has given a process for manufacturing a humic fertilizer by disclosing wherein a cellulosic containing material is impregnated with a solution of nitric acid which, in turn, is reacted with a compound selected from the group consisting of ammonia, potash, and lime.
4. **NaOH method:** In this method roots are removed and sieve the dried soil sample to pass a 2.0-mm sieve. Then the sample is equilibrated to a pH value 1 to 2 with 1 M HCl at room temperature. The solution volume is adjusted with 0.1 M HCl to provide a final concentration that has a ratio of 10 mL liquid/1 g dry sample. The suspension is shaken for 1 h and then the supernatant is separated from the residue by decantation after allowing the solution to settle or by low-speed centrifugation. The supernatant (FA Extract 1) is kept for the isolation of fulvic acid using XAD-8. The soil residue is neutralized with 1 M NaOH to pH = 7.0 then add 0.1 M NaOH under an atmosphere of N_2 to give a final extractant to soil ratio of 10:1. The suspension is extracted under N_2 with intermittent shaking for a minimum of 4 h. Allow the alkaline suspension to settle overnight and collect the supernatant through decantation or centrifugation. Acidify the supernatant with 6 M HCl with constant stirring to pH = 1.0 and then allow the suspension to stand for 12 to 16 h. Centrifugation is done to separate the humic acid (precipitate) and fulvic acid (supernatant - FA Extract 2) fractions.

Application in Aquaculture farms:

- Humic acid can be used in most of the aquaculture farms (e.g., fish, shrimp, etc.)
- It can combat the harmful pollution caused by feed left, heavy metals, etc. and promote the growth of algae.
- Humic acid have heavy-metal binding abilitythat have been utilized to develop remediation technologies for removal of heavy metals from wastewater.
- It regulates the pH of water for a healthy and optimum environment for growth.
- Increase in brood yield, through the prophylactic treatment of fish eggs and larvae and disease resistance in fishes.
- Humic acid treatment at concentrations of 50-90 mg/L reduced sickness and mortality
- Significant protection from Saprolegnia infection and an increase in hatching were observed in rainbow trout when treated with fulvic acid.
- Humic acid is a natural chelating agent. It acts as growth stimulator and soil conditioner.
- It improves the immunity, metabolism of crops and promotes the growth of their root systems.
- Humus aggregation makes the clay more porous, soft, and aerobic, with improved drainage, resulting in deeper root growth of all plants.
- Humic acids help in the rehabilitation of soil.
- They are functionalized molecules that can act as photosensitizers, retain water, bind to clays, act as plant growth stimulants, and scavenge toxic pollutants

Application in the Animal Husbandry:

- Humic acid can be used as a feed additive organic un nature.
- It improves the immune system of the animal, in such a way that a thin protective coating is formed on the animals' intestinal systems.
- Humic substances can be applied as an organic alternative to antibiotics.

Role of humic substances in climate change

Humic substances (HS) are the major carbon pool in the biosphereand play an important role in the global warming and climate change. As compare to conventional organic manure such as cow dung the decomposable organic matter is very less in humic acid. Thus the oxygen requirement for decomposition is less and nutrients are released immediately. It can store significantly larger amounts of carbon and one of the best measures for long-term carbon sequestration in the soils because they resist degradation and can remain in the soil for hundreds and sometimes thousands of years. And the greenhouse gases such as CO_2, CH_4, N_2O is less emitted from humic acid treated system compare to other organic system.

Conclusion

Humic acid can be a highly potent fertilizer which can be utilized simultaneously for both agriculture crop (paddy) and fish culture without harming any of it in an integrated type of culture system. When used in fish culture and animal husbandry, it has been reported to have increased disease resistivity and enhanced growth rate. Humic acid can be easily processed from the excess aquatic organic debris, agricultural wastes, and organic waste from animal husbandry, organic metal and processing industries. Its application is also easy and direct. Thus, proper utilization of humic acid can create a revolutionary change in agri-aqua or integrated farming system that can lead us towards a golden era of the climatically controlled farming practices.

**** References can be provided on request***

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