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Inside...

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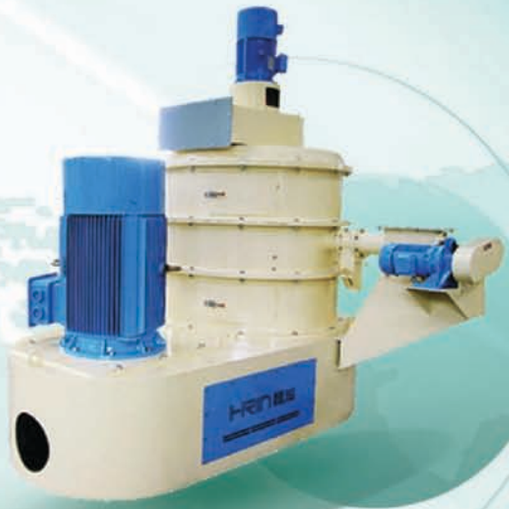

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Editor & Publisher
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Editorial & Business Office:
AQUA INTERNATIONAL
NRS Publications,
BG-4, Venkataramana Apartments,
11-4-634, A.C.Guards,
Hyderabad - 500 004, India.
Tel: 040 - 2330 3989, 96666 89554
E-mail: info@aquainternational.in
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Marketing Off: # 59A-15-28, 1st Floor,
Pantakaluva Road, Near NTR Circle,
Patamata, Vijayawada-520010, AP.
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The 'Fisherinarian' Professional in my view !

Dear Readers,

The July 2019 issue of *Aqua International* is in your hands.

India has over 1,000 Aquaculture Doctors or call it Technical Experts who did their B.F.Sc or M.F.Sc or Ph.D and serving the estimated Rs 65,000 crores plus (both shrimp & fish) Indian aquaculture industry. There is significant progress and development in Aquaculture science worldwide like genetics, broodstock multiplication, selection of broodstock / lines for different climatic and geographical conditions, breeding practices, nutrition, innovative biological and pharmaceutical products production for aquaculture healthcare, biosecurity, advanced disease diagnostic services, feed and inputs analytical laboratory systems, farm management, productivity enhancement, farming systems and other aspects.

Although we have experienced and knowledgeable Fisheries Doctors (Veterinarians) and scientists, there is a need of augmenting knowledge, standards and reputation of many Fisheries Professionals (Veterinarians). It is the individuals who bring good name to the position, industry and to the institutions like Dr A.P.J. Abdul Kalam as the President of India, Dr Manmohan Singh as the Union Finance Minister and Mr Atal Bihari Vajpayee as the Parliamentarian in India's Parliament, who were known for knowledge, honesty and serving the nation, and they are known worldwide. Every Fisheries Doctor Professional should work hard and try to become an example to others.

In my view, a Fisheries Doctor or Professional means, he or she should be knowledgeable in the respective subjects of aquaculture science, should be able to write and speak proper English language and communicate effectively with discipline and command respect in the industry / society. Some how, I could not see these features with many and I attribute it to the non-fulfilment of Fisheries University Vice Chancellors. A platform is needed where "Academicians & Industry Stakeholders Meet" together on a platform and discuss about how both of them understand each other, their requirements, and how they can work together to develop aquaculture sector in a sustainable way in India.

The VCs should discuss with the industry and intellectuals and come out with changes and programmes on how to make aquaculture/ fisheries students the quality faculty and scientists for the future and contribute to the welfare and development of the industry.

Whatever comments I made here, I appeal to the fisheries professionals to take it sportively, work hard and make sure that you have identity and respect for your good work to enhance productivity without diseases and develop aquaculture in the country.

A person who has done B.V.Sc or M.V.Sc is called a "Veterinarian". Similarly, there is a need of a term for fisheries graduate or post graduate who did B.F.Sc or M.F.Sc. I request the Fisheries Universities to discuss and come out with an appropriate term for fisheries graduate. It seems, internationally fisheries graduates are also termed as 'Veterinarians'.

Fisheries Doctors are an important lifeline of aquaculture industry, and the Universities should make them worthy. Most of the students at 12th standard come from regional languages as the medium of education. When they enter into B.F.Sc or B.Sc (Fisheries), the Universities should make proper English faculty arrangement at least in the first year or upto second year of graduation, so that the students can develop good English vocabulary, understand the subjects well and use it in their career in the interests of aquaculture sector.

A fisheries professional should be proficient with spellings, meaning and definitions of at least 500 words in English language and such professionals will be in demand in any segment of aquaculture industry in India and worldwide. It's not difficult to achieve it. The students, junior and senior fisheries professionals and scientists should feel happy that they are in a Noble Profession and they should try to update their knowledge time to time, be humble, serve the society and lead a happy and prosperous life.

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.

AI will strive to maintain quality and standards at all times.

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KVK launches farm service centre to support farmers

Dr A Gopalakrishnan, Director of CMFRI inaugurating the functioning of the farm service centre of Ernakulam KVK at the CMFRI.

Kochi: In an effort to combat shortage of skilled labour for farming activities in the district, the Ernakulam Krishi Vigyan Kendra (KVK) of the Central Marine Fisheries Research Institute (CMFRI) has launched a farm service centre equipped with a wide range of farm machineries and equipments to offer paid services in all kinds of farm initiatives. Aqua, animal and agri farmers of Ernakulam district can avail the facility.

The centre will offer all kinds of farm supports to the farmers using the machineries such as tractors, power tiller, power weeder, different types of ploughs, rotavators, earth augers, motorized and hand operated sprayers, paddy transplanter, agro waste shredder, slurry pump, water pump etc. In addition, scientific advisories will be provided during the farm visits.

Dr A Gopalakrishnan, Director of CMFRI who inaugurated the functioning of the farm service centre, said the new initiative from the KVK will be beneficial to hundreds of farmers in the district who are struggling owing to the shortage of technically trained labourers. The farm service centre has been set up with a cost of Rs. 40 lakhs under a project of the Union government to popularise the mechanised farming, he said. "Presently, trained staff of the KVK provides thse technical services such as land preparation, pond preparation, fish cage fabrication, ploughing and so on. Self-help groups will be formed in the future to make available the farm services to large-scale farmers in future. More equipments and machinery will be added soon", he added.

"Now, the farm service centre is focusing on the seasonal works of paddy land preparation as the monsoon has arrived", said Dr Shinoj Subramannian, Senior Scientist and Head of KVK.

Those who are in need of farm services may register their names with the KVK at 8089434479 to avail the service of the centre. Those who are trained in agro machinery operation and interested to take part in this mission can also register their names in the above number.

Provide compensation: Fishermen to state

The group stated that there is no policy for compensation for losses incurred during the survey period of three months.

Jun 10, 2019: Mumbai: Mumbai fishermen claim that the extraction survey carried out for oil and natural gas under the sea by Oil and Natural Gas Corporation Limited (ONGC) is incurring them huge losses as this time the operations are being carried out in catchment areas.

The group approached the state government stating that for three months between January and March this year, fishermen were prohibited from indulging in fishing activities at the site due to the ONGC work.

Maharashtra Machhimar Kruti Samiti. The fishermen had earlier too stopped the survey work twice citing negative impact on the fishing activities.

Moreover, they highlighted their prolonged concerns over the consequences of seismic surveys done by the oil company by undertaking the blasting operation. After repeated pleas, the state has now directed the ONGC and Central Marine Fisheries Research Institute (CMFRI) to carry out a detailed study on the matter.

Fishermen meet ONGC authorities

The group stated that there is no policy for compensation for losses incurred during the survey period of three months. "The ONGC and the contractors have told us that they would not compensate for the loss in fishing business. At that time, there is complete ban on movement of boats and trawlers.

Especially during the winter season, we are able to catch more fish, however this kind of activities has still led to losses," said Mr Kiran Koli, secretary of the

"The CMFRI has been directed to initiate a 6 month long study in the next ten days. After the report on the impact of ONGC's surveys on the fishing areas and losses incurred by fishermen, the compensation will be decided," said an official.

"Earlier too, our fish nets were destroyed during the survey and we were not given compensation. Moreover, the high decibel blasts in deep sea during seismic surveys poses risk to fish and marine life," added Mr Koli.

Illegal aquaculture on rise in East Godavari

With vast seacoast of 138 kilometres across 13 mandas in the district and more than 4.50 lakh acres of agriculture land, East Godavari along with West Godavari known as rice bowl of India

Kakinada: With vast seacoast of 138 kilometres across 13 mandas in the district and more than 4.50 lakh acres of agriculture land, East Godavari along with West Godavari known as rice bowl of Andhra Pradesh. In the last one and half decade along with paddy, aquaculture also picked up momentum in the district. The activity spread to fresh water and brackish water culture is said to have attracted the attention of politicos both in ruling, opposition and even the leaders of national parties as profitable business with good crop yield and best financial results with less labour costs.

As per official information, the aquaculture has been taken up in 20,000 hectares (50,000 acres across the 36 villages in the district). It is assessed that the unauthorised aquaculture is going on in another 4,000 hectares (10,000 acres).

The rise in unauthorised activity and the problems that are being faced by them was brought to the notice of the district administration by some paddy farmers of Konseema area in the district at the newly started Spandana grievances cell on last Monday. These include water sources pollution besides contamination of water ponds in paddy cultivation areas.

It is suspected that the aquaculture is going on in some areas with active unauthorised support of officials of stakeholder departments for personal gains as the process of clearance involves lengthy process. For clearance of aquaculture, revenue, agriculture, fisheries, groundwater, pollution control authorities have to give clearance.

Some big farmers are said to be luring small and marginal farmers of paddy, with additional financial benefits and getting the lands on lease for aquaculture. These sections, in turn, simply obtaining unproductive land certificates from agriculture department to pave way for conversion as aquaculture tanks.

According to Kakinada revenue division sources, aquaculture is more in Karapa, Tallarevu and Pedapudi mandals out of total 9 in the revenue division. In this revenue division, the unauthorised aquaculture noticed to the extent of 4,500 acres whereas the permitted area is to the tune of 15,000 acres. This indicates the raise in unauthorised activity in the district.

District Fisheries Joint Director V Venkateswara Rao said they have given June 30 as deadline for regularising the unauthorised aquaculture by applying in proper format and by paying the fee fixed for regularisation.

If this facility is not utilised on or before deadline, the panel of stakeholder departments may opt for the decision to dismantle the existing unauthorised aqua tanks in the district after verifying the records and number of applicants, the JD made it clear.

CIBA scientists advocate crop holiday to reduce shrimp mortality rate

Machilipatnam, July 03: The Central Institute of Brackishwater Aquaculture (CIBA-Chennai) scientists on Tuesday advocated crop holiday and micro-level focus on water parameters to bring down the mortality rate of shrimp due to 'White Spot Syndrome (WSS)'.

The group of Principal Scientists — Ms M. Poornima, Mr M. Muralidhar, and Mr S. Kannappan — have investigated the samples of the shrimp seed and water to find the reasons for the shrimp mortality in the nine coastal mandals in Krishna district, Kaikaluru, Kalidindi, Mandavalli, Bantumilli, Machilipatnam, Koduru, Avanigadda, and Nagayalanka.

Major hub

The nearly 100 kilometres aqua zone in the nine mandals is said to be one of the country's major hubs for shrimp cultivation. The scientists on Tuesday shared their investigation details with the aqua farmers during the one-day camp on 'Shrimp health and aquatic environment' under the aegis of the National Fisheries Development Board in Kaikaluru town in Krishna district.

Speaking to *The Hindu*, Ms Poornima said, "The seed will be tested prior to beginning of the cultivation. Holiday between the two crops is strongly advocated, given the existing unhealthy conditions in the shrimp cultivation in the district."

Ms Poornima has added that soil samples have also been collected in the district to conduct tests in the CIBA-Chennai laboratories as the farmers have expressed fear that soil conditions might have led to reporting the WSS in the shrimp.

Kaikaluru MLA Mr D. Nageswara Rao has released the study report on the WSS and distributed it to the farmers. Mr Muralidhar spoke on the aqua zones while another scientist Ms P. Ezhil Praveena delivered a lecture on the WSS and clarified doubts of the farmers on the shrimp cultivation.

Fisheries Department Krishna District Joint Director Mr Yakub Basha and Kaikaluru Assistant Director of Fisheries Mr D.S. Sudhakar were among those present.

New lab opened at CIFT to study fish behaviour

The aim of the lab is to study the behaviour of the fish as part of its move to promote responsible fishing.

The Moving Gantry System at CIFT

8th June 2019 o KOCHI: Ever wondered the fish's state of mind when it is caught in the net? Well, such ideas won't anymore be alien with the Central Institute of Fisheries and Technology (CIFT) inaugurating the first 'Fish Behavioural Lab' in the country.

The aim of the lab is to study the behaviour of the fish as part of its move to promote responsible fishing.

The lab was inaugurated on May 25 in the city by Mr Trilojan Mahapatra, Direct General of Indian Council of Agricultural Research and the Secretary of Department of Agricultural Research and Education.

"Fish reacts differently to varied actions. Our experiments will concentrate more on the behavioural changes it shows to light, speed, sound and nets that entrap them," said Ms Sheela Edwin, HOD, Fishing Technology Department.

Usually, a fish is caught when it gets tired after swimming with the boat and the net. So, experiments at CIFT will focus on how far a fish can swim before it gets tired and the subsequent biochemical reactions.

The fish behaviour lab uses an instrument named Moving Gantry System to study the behaviour. "Here, we try to find out the response of the fish to the stimuli. We don't know how they react when they are at the bottom of the sea, but this lab will help understand that. Our aim is to promote responsible fishing than improve the catch," said Mr V. R. Madhu, the principal scientist.

The lab will also focus on finding if there are any differences in the behaviours of an adult and a juvenile fish. As there is a sharp decline in the availability of fish, the institute studies how the issue of by catching can be avoided.

"By catching is a serious issue. The juveniles are often caught unintentionally while fishing. Certain sounds repel the fish from nets. So, this technique can be utilised to reduce by catching," he added. Though the lab is in a standardised stage where the experiments are carried out in fresh water, they plan to shift the fish to salt water very soon. The scientists hope the research would also help them find out the most suitable timing for fishing.

Huge potential for Tuna fishing: Union Fishing Secretary

17 Jun 2019: Hyderabad: Ms Rajni Sekhri Sibal, Secretary, Department of Fisheries, Government of India, said that there is a huge potential for harnessing tuna and tuna like species in the Indian EEZ (Exclusive Economic Zone). In her inaugural address at the 23rd session of the Indian Ocean Tuna Commission (IOTC) here today, Ms Sibal said that the Indian EEZ spread in the Andaman, Nicobar and Lakshadweep islands comprises 30% of the EEZ but only 1% of the production of tuna fish. Emphasising the need for regional cooperation between IOTC member countries, Ms Sibal said that there is need for responsible and sustainable management of tuna. IOTC has to ensure that there is a level playing field between the developed and the developing nations, she said.

Ms Sibal further said that India is the second largest fish producing country, India contributes 6.3 percent of the global fish production. There is a great potential for growth in the fisheries sector which is at present 7 percent, sustaining 14.5 million fishermen. She said that, fisheries is a sun rise sector in India, considering the commercially viable global tuna market, which stood at US $ 11.38 billion in 2017, and projected to reach US $13.75 billion by 2023, she said, it is imperative that we enhance productivity, maintain quality control and improve infrastructure. As the shelf life of tuna is very short, it is very important to develop cold chains and ensure the catch is marketed at the earliest, she added.

Ms Sibal said that in the present IOTC session, quotas of tuna to be caught in the economic zones of the member countries would be fixed. The Government of India has created a separate Department of Fisheries in the Ministry of Animal Husbandry, Dairying and Fisheries in February 2019. India plans to develop its capacity in deep sea fishing and play a pivotal role in IOTC towards conservation management, and sustainable harnessing of tuna and tuna like species, which are becoming endangered.

OTC is a Regional Fisheries Management Organization (RFMO) under the Food and Agriculture Organization, responsible for the management of tuna and tuna like species in the Indian Ocean. Currently there are 31 members in the IOTC including India, Australia, Bangladesh, China, Comoros, Eritrea, European Union, France, Indonesia, Iran, Japan, Kenya, Korea, Madagascar, Malaysia, Maldives, Mauritius, Mozambique, Oman, Pakistan, Philippines, Seychelles, Sierra Leone, Somalia, Sri Lanka, South Africa, Sudan, Tanzania, Thailand, United Kingdom and Yemen. Ms Rani Kumudini, Chief Executive, NFDB; Dr K.

>>

Black tiger shrimps from MPEDA hatchery, a big hit among farmers

Kochi, June 17: Ending a decade's slide in the production of black tiger shrimps, India is experiencing a fruitful comeback of the high-health seafood, thanks to a much-needed initiative the Marine Products Export Development Authority (MPEDA) launched earlier this year.

Former Kerala Director-General of Police Mr Hormis Tharakan, a progressive shrimp farmer along with his family members at his shrimp farm at Poochakal in Alappuzha.

Encouraging feedback to the MPEDA's efforts to revive the production of black tiger shrimps by mass sale of its seeds since the past 100 days shows a rapidly growing interest among the farmers to raise the disease-free variety, according to authorities with the statutory body that functions under the Union Government's Ministry of Commerce & Industry.

Primarily, Kerala has accounted for a chunk of the recent rise in black tiger shrimps, even as a similar trend is being reported from Goa and parts of the Coromandel Coast along eastern India, officials noted.

The Kochi-headquartered MPEDA had on February 18 begun supplying black tiger shrimp seeds from its new multispecies aquaculture complex (MAC) at Vallarpadam here.The inaugural sale was done by MPEDA Chairman Mr K.S. Srinivas by handing over one lakh seeds to former Kerala Director-General of Police Mr HormisTharakan, a progressive shrimp farmer.

Today, Mr Srinivas noted that the black tiger prawn supplied from the nine-acre MAC has been showing "excellent" performance in various parts of the state. "We knew that increased production of the black tiger variety can boost India's shrimp exports in the long run. We are seeing the early signs of it happening," he added. "Recently, I visited some of the aquaculture farms to understand the field performance of the seeds from our facility. Our seeds are doing very well. The farmers' comments are encouraging."

K.S.Srinivas, IAS, Chairman, MPEDA along with Hormis Tharakan, Ex-DGP Kerala at his shrimp farm at Poochakal in Alappuzha.

Mr Tharakan, buttressing the point, said the seeds showed very good performance during the three months of culture period. "They gained an average weight of 38 grams, thanks to the quality. I got 260 kg of shrimp in the 90 days from an area of 50 cent by stocking 10,000 seeds. Currently, we are rearing another 90,000 seeds," he revealed. "This is in happy contrast to my facing a continuous crop loss for the last three years."

The Rs 7.26-crore MAC, which was inaugurated on December 8 last year, features a hatchery with an annual production capacity of 20 million black tiger shrimp seeds, besides nurseries for four varieties of fin fishes.

Mr C.V. Mathew, another farmer who has been into shrimp cultivation for 16 years in his native Kumbalangi suburb, said black tiger seeds from MAC attained25-gram size in the first 50 days. "In 86 days, the animals reached an average size of 40 grams," he pointed out. "I have never experienced such a growth rate of my crop."

No different has been the feedback from the farmers from downstate Kollam and Kannur in north Malabar after culturing the seeds taken from the Vallarpadam hatchery, top MPEDA officials said.

It was from 2010 that the black tiger shrimp, an endemic species to south-east Asia, began to face a slump in its traditional reputation as a major variety of cultivated shrimp item in India. That was after aquaculture farmers in the country began to focus on growing the exotic vannamei species of shrimps in a big way.

Huge potential for Tuna fishing: Union Fishing Secretary

Contn from Page 18

Gopal, Principal Secretary, Animal Husbandry, Dairying and Fisheries, Government of Tamil Nadu; Mr Sandeep Kumar Sultania, Principal Secretary, Animal Husbandry and Fisheries, Government of Telangana; Dr J. Balaji, Joint Secretary Marine Fisheries, Government of India Suvarna, Commissioner Fisheries Telangana, Mr Christopher O'Brien, Executive Secretary of IOTC; Mr Alejandro Anganuzzi, Global Coordinator, FAO and Mr Susan Imende Ugandi, Chairperson of the IOTC were also present.

Shark, 15 other fish species along Maharashtra coast under threat

The study's findings not only highlight the dangers of indiscriminate fishing to the environment, but also to the fishing community that has seen a drop in the volume of their catch.

Bycatch of juvenile hammerhead sharks. The study revealed that juvenile fish were being illegally caught with gill and trawl nets at fishing ports, including at Mumbai

Mumbai: At least 16 species of fish along Maharashtra's coast, including some endangered shark species with low reproduction rates, are at risk from overfishing and killing of juvenile fish. In the first month of a yearlong study, the Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra (MMBCFM) found 16 species of elasmobranchs – cartilaginous fish such as sharks, skates, rays and sawfish – along the state's coast.

The study's findings not only highlight the dangers of indiscriminate fishing to the environment, but also to the fishing community that has seen a drop in the volume of their catch.

"Despite a government ban, sharks and other elasmobranchs continue to be caught by fishermen to supply fins for food or medicines," said Mr E. Vivekanandan, former principal scientist and current national consultant at the Central Marine Fisheries Research Institute (CMFRI). "They are being diverted to Chennai and sold illegally to Southeast Asian countries."

The study revealed that juvenile fish were being illegally caught with gill and trawl nets at fishing ports, including at Mumbai. All 16 species the study identified are already under threat, with some classified as 'near threatened' or 'vulnerable' in the International Union for Conservation of Nature's Red List.

Mr Dhanashree Bagade, a marine biologist from the Mangrove Foundation, who led the study, said the population of elasmobranchs is being overexploited. "Our aim is to develop a report on elasmobranch juveniles and their diversity (with seasonal variations), mainly focusing on commercially important shark species, skates and stingrays falling under the Wildlife (Protection) Act, 1972, to suggest mitigation measures for their safety," said Mr Bagade.

The impact of overfishing is already being seen – according to the Indian Council of Agricultural Research (ICAR) - CMFRI, elasmobranchs catch along the state's coast declined by 34%, from 5,779 tonnes in 2014 to 3,832 tonnes in 2017.

"The commercial demand for elasmobranchs has increased leading to overexploitation of these fish, rendering this group vulnerable," said Mr N. Vasudevan, additional principal chief conservator of forest, state mangrove cell. Mr N. Vasudevan said these species take a relatively long time to reach maturity so catching juveniles will stop the reproduction cycle. "The main threat was low fecundity (potential for reproduction). Unlike other bony fishes, elasmobranchs produce fewer offspring. If they are overfished, they would easily become endangered," Mr Vasudevan said.

A genetic approach to improving FCRs

The efficacy of a new technology that has the potential to predict the feed conversion rate (FCR) of individual rainbow trout is being tested in a study that could improve the feed conversion efficiency in the trout sector.

The study is being undertaken by Hendrix Genetics and GenetiRate, a US based start-up, which has developed an innovative technology that can predict FCRs based on metabolic rates measured on fish larvae or muscle tissue.

GenetiRate was founded by Dr Benjamin Renquist

from the University of Arizona and recently won the Seafood Innovation Award at the North Atlantic Seafood Forum. It has run successful trials using their technology with other aquatic species. If successful, the project will allow Hendrix Genetics to select individual trout with the best metabolic rates and FCRs.

"We are excited to begin these trials to understand how our selection process can be applied to improve both growth and feed efficiency in rainbow trout. We appreciate that Hendrix Genetics recognizes the value in applying our technology to better serve their customers' needs. By improving feed efficiency, GenetiRate and Hendrix Genetics Aquaculture aim to help the aquaculture industry meet the sustainability demands of the consumer at the restaurant or grocery store," says Dr Renquist

Robbert Blonk, director of R&D at Hendrix, states, "Feed conversion is notoriously difficult to measure on an individual level in aquaculture species. However, this new technology allows us to measure individual feed conversion and thus improve efficiency of the Troutlodge breeding stock. Ultimately, this translates into an improved final product with increased profitability and sustainability for the entire industry."

The project is set to start soon, with a review of the results scheduled to occur at the end of 2020. This collaboration using innovative technology to study Troutlodge breeding stock has the potential to make significant genetic progress for our customers and the industry.

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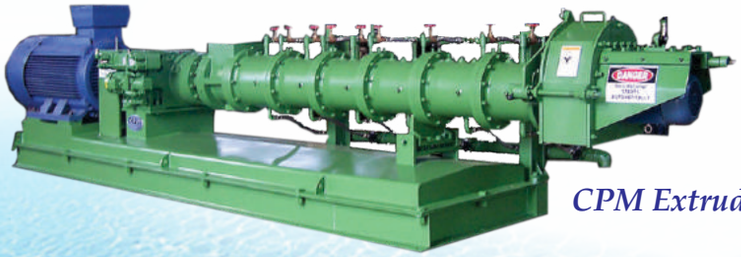

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Muthukaruppan Celebrates daughter Sruthi's Wedding at Chennai

Mr S. Muthukaruppan, Director, Poseidon Biotech and former President, SAP, Celebrated the marriage of his daughter Sruthi with Karthik, son of Mrs & Mr V. Arunachalam on June 13 and reception was hosted on 21 June 2019 at Chennai in which a large number of VIPs and stakeholders of aquaculture sector participated and blessed the newly wed couple.

Muthukaruppan the father with bride and bridegroom Sruthi and Karthik

R.Srinivasanand and his family with the bride groom

Aqua International Editor M.A. Nazeer and others

Team Vaishaki Bios (Ravikumar, Bhat, Surrendran) Dr Subbrao, Mr Bapi Biswas

Tarun Srdhar, Secretary, Minister of Agriculture, Dr Yugraj Yadava, Tikku and Friends

With Mariculture friends Dr A.G. Ponniah, Dr K.K Vijayan, Dr Joe Kazakudan, Dr Jaideep Kumar, Dr S.M. Pillai, Easwaraprasad, Surrendran, Krishnakumar, Menon, D Ramaraj, Muralidharan

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India hosts Asian Pacific Aquaculture (APA) 2019

Kochi: To make fish seed varieties more available to aquaculturists, the Marine Products Export Development Authority (MPEDA), opened the sale of silver pompano fish seeds at its Multispecies Aquaculture Complex in Vallarpadom, near Kochi.

Ms Rajni Sekhri Sibal, Secretary (Fisheries), Government of India, inaugurated the sale of these seeds, developed by MPEDA, with the help of its research wing, Rajiv Gandhi Centre for Aquaculture (RGCA). MPEDA chairman Mr K. S. Srinivas, Mr B. Sreekumar, Secretary of MPEDA, and Mr Manoj, an officer with Multispecies Aquaculture Complex, were present.

Silver pompano is the most preferred fish on the western coast, especially in the Konkan region. The fish grows up to 350 to 400 grams within six months in ideal climate conditions, with a production cost not exceeding D150 per kg.

Sibal, who is also the first secretary of the newly formed Fisheries Department, appreciated the efforts taken by the MPEDA-RGCA to supply seeds of various species of fish to the aquaculture farmers. She said the various state governments can adopt the technology from MPEDA-RGCA and set up similar facilities to cater to the needs of the aquaculture farmers.

The Vallarpadam Multispecies Aquaculture Complex, inaugurated by the Minister of Commerce and Industry Mr Suresh Prabhu in December last year, has achieved a turnover of D1 crore in 100 days by selling seeds of GIFT, Seabass and Black Tiger.

A view of participants in APA 2019

Prof Modayil speaks on Mariculture and Coastal Food Security in India

Prof Mohan Joseph Modayil, Former Director of CMFRI making a presentation in APA 2019.

In the recently-completed Asian Pacific Aquaculture 2019 organized by Asia Pacific Chapter of World Aquaculture Society at Chennai Trade Centre, Tamil Nadu during June 19 - 21, 2019, Prof Dr Mohan Joseph Modayil, Former Director, CMFRI, Kochi and Expert Member, ASRB, New Delhi gave an invited talk on 'Mariculture and Coastal Food Security in India' in the Session 'Open Sea Cage Culture'.

Prof Modayil emphasized on the fact that considering present scenario, we have to look beyond production. In addition to production of marine fish for money, export and consumer, it should be of consequence and should change the level of poverty in coastal regions. He gave an account on world aquaculture production in 2016 and the contribution of sectors like foodfishes, aquatic plants, molluscs and crustaceans in it. The traditional system of cage culture and open sea finfish culture in India has now risen to non-conventional and industrial mode.

More and more small farmers are entering into aquaculture with mariculture. Prof. Modayil explained that in Asia, growth rate of fishes under culture is faster in comparison to sub-tropical regions due to higher productivity of water; marketable-sized fishes can be harvested in less than a year period.

Prof Modayil explained the term 'food security'; spoke on requirement of nutrient balanced food; numbers of hungry people in the world, in Asia and Africa; undernourished populations of the world; malnutrition; climate shock related food insecurity; intensive aquaculture systems followed in south-east Asia. 50% percent of world's hungry people live in India

Main entrance of APA 2019

and the problem of chronic food insecurity in India has not been completely solved. Mariculture supplements deficit in fish production from capture fishery, provides self-employment and financial independence to women aqua farmers and impacts the home economy (small-scale mariculture).

With the initiative of Prof Modayil, sea cages, i.e., cages for farming of economically-important marine foodfishes in open sea environment were introduced in India in 2005 with establishment of the first cage off Visakhapatnam coast. He spoke about his experiences in China about mariculture in cages. We were informed that currently our country has 1688 nos cages where marine fish farming is being done in coastal waters; another 1700 nos cages are coming up, which will be installed soon in Indian coast with support of NFDB, Hyderabad. CMFRI has carried out commendable work in expansion of marine cage farming in Indian coastal waters. Presently 2795 persons, including 30 SHGs are engaged in this fish farming vocation.

While food security is partially addressed, there is nutritional deficiency or hidden hunger in Indian coastal communities. While producing more fish, we have to look into environmental cost, social impacts, impact on natural finfish and shellfish stock. The future of mariculture for Asia is not large industrial cage farms and our production should benefit poor people. Fish production from intensive systems has to ensure safe and responsible practices.

Environment monitoring, policy framework, technical backstopping from R & D institutions will be steps towards coastal food security. Prof Modayil further emphasized that we must encourage use of formulated feed for marine fishes in sea cages, instead of trash fishes and must not encourage trash fish feeding. Giving trash fishes to marine fishes under culture has to be stopped. We have to produce more fish but sustainably and inclusively. Growing fish in seas is no longer a new concept now. In 2004, China had 10,00,000 nos cages for mariculture.

Courtesy: Mr Subrato Ghosh, who was present during this invited talk of eminent Indian fishery scientist Dr Modayil.

Manoj Sahrma opens 'Zhingalala' Restaurant in Surat

Such outlets will help to promote Domestic Marketing of Farm Reared Shrimp in India

MLA Ms Zhankana Patel and Ms Rani Kumudhini inaugurating 'Zhingalala Pesco-veg Restaurant' in Surat on June 9, owned by Manoj Kumar Sharma. Pradip Navik, Dr Krishna Reddy, Manoj Sharma and others are seen.

Surat: It was an interesting moment for the Shrimp farming community in Surat, Gujarat on 9th June 2019, when it took the first step – a novel concept to promote domestic consumption of farmed shrimp in India with the opening of "Zhingalala", the first Pesco-vegetarian restaurant in the country.

Ms Rani Kumudhini, CE, NFDB

This innovative project with a tagline "From our Pond to your plate" was initiated by Manoj Sharma, one of the most popular figures among the Aquaculture sector in Gujarat; a successful consultant, entrepreneur and farmer who played a key role in the development of Shrimp Aquaculture in the state.

Beginning his career as a consultant, Manoj has spread his activities to Shrimp farming (Mayank Aquaculture Pvt. Ltd), operating farms in 7 locations across Gujarat in a total area of 200 Ha, running a Shrimp Hatchery exclusively for meeting own requirements and also supplying Shrimp feed and a range of healthcare products for Shrimp farming through Mayank Aqua Products.

Speaking at the opening ceremonyof Zhingalala, Mr Manoj Sharma said that it was his proudest moment and the fulfilment of his dream to be able to start this innovative concept of a Pesco-vegetarian restaurant to popularise the consumption of fresh farmed shrimp in India. "This is a thanks giving to the Shrimp farming community in Gujarat in gerenal and Surat in particular, which has given me so much of recognition and helped me grow to what I am today", he said.

Saji Chacko

The Chief Guest of the programme was Ms Rani Kumudini, IAS, Chief

Pradip Navik

Executive of the National Fisheries Development Board (NFDB). Ms Zhankana Patel, MLA of Chauraysia taluk, Narendra Tandel, President, Gujarat Aquaculture Farmers Association, Pradeep Navik, President Surat Aqua Farmers Association, Jacques Foudin, CEO, HTS Bio, France, Saji Chacko, General Secretary Gujarat Aquaculture Association and Shrimp farmers and their families participated in the programme.

In her brief address at the programme, Ms Rani Kumudini, Chief Executive of NFDB said that it was indeed a proud moment to see a Shrimp farmer coming forward to initiate this new concept of a Pesco-vegetarian restaurant, defying statistics that Indians don't eat non veg, don't eat prawns etc. "While the poultry sector got together for promoting egg and chicken consumption, in aquaculture we don't feel that we have done enough to educate the public on the benefits of farm raised seafood and its advantages over other meat forms. This initiative by Manoj Sharma is most creditable and a dream came true for the entire sector", she added.

Narendra Bhai Tandal

Ms Rani Kumudini also informed that NFDB would be keen to associate with Integrated Aquaculture projects coming up in the state and encourage the Aquaculture sector in Gujarat to come forward and avail the support provided by the Government through Fisheries Infrastructure

Manoj Sharma

Development Fund (FIDF). She added that new schemes could be made to accommodate innovative programmes like Zhingalala that promotes domestic consumption and marketing of Shrimps within the country.

Mr Saji Chacko, in his message observed that several people at several meetings and discussions on various forums had spoken on the need for seriously promoting domestic marketing in the country, but it was only Manoj Sharma who was "walking the talk".

Later, talking to media Mr Manoj Sharma said that India is producing close to 7 lakh tons of Shrimp every year and has the capability and resources for producing more quantity if required. Secondly, we have a population of 130 crore people. Assuming that 50% of the population is non-vegetarians, which comes to around 70 crores; if each of these people consume just one kilogram of shrimp per year, our entire annual production would be barely enough to feed ourselves and continued demand would mean a very stable market.

But the bitter truth is that there is no domestic market at all. The entire sector is focussing on just exporting the produce and grossly neglecting the enormous local market that is right in front of our nose. We just need to make fresh and good quality product available to the consumers at a reasonable price. It is unfortunate that there has been no organized focus on this yet. When it comes to the local market, most people look at the size of the shrimp. Anything from70 to 100 counts would be ok if made available at a reasonable price of around Rs. 300 to Rs. 350.

Marketing should be done in a way that goes with the present selling trends in the country. One of the reasons why several people burnt their hands trying to promote domestic marketing is because they procured good quality stuff for around Rs. 300 from the farmers, processed them for selling, added the vendor margin, retailer's margin etc., and raised it to Rs. 800 a kilo, which no one would even think of buying.

I had been planning on this

Aqua International Editor M.A. Nazeer greeting Manoj Sharma and the family.

for the last three years. I was feeling very jittery especially because several people had failed in such attempts earlier. I have been studying the market a lot to understand all the negatives, and made a plan to address all of them.

And I wanted to take this initiative in Gujarat because this is a very challenging place. Gujarat is considered to be a state with a maximum population of vegetarians. Eating meat or seafood was taboo here. Nobody here knows how to clean or how to cook shrimp and what the goodness or nutritive qualities / values of the shrimp are. A lot of false information among the public is spread that shrimp is high in cholesterol, causes allergies, bad for the heart and so on. With this restaurant, we will encourage people to come and try out farm fresh seafood prepared to their taste; we hope to make them love the taste and then try to prepare shrimp dishes themselves at their homes; to make it a part of their daily cuisine.

Speaking about Pesco-vegetarian, he saidPesco-vegetarian means a vegetarian diet that includes only Seafood in it and no other meat varieties. Zingalala will serve the choicest vegetarian food along with shrimp, fresh from my BAP certified Farms farm to begin with, and with other farm raised fish varieties later on when we start diversifying to other species as well.

Dr Manoj Sharma welcoming as VIPs of 'Zhingalala Restaurant' are on the dias

Pradip Navik, Narendra Bhai Tandel welcoming NFDB Chief Executive Ms Kumudhini at Zhingalala at Surat on June 9.

See, when you travel to Europe, the non-vegetarian food that is served in hotels there mainly comprises of poultry, pork or beef in steak or grilled forms that most Indians would not be able to relish. They are quite bland with the meat just cooked in water, with a little bit of salt topped with a little olive oil and some mild flavouring agents. We Indians on the other hand love to eat meat laced with a variety of Indian masalas that is strongly flavoured or spicy.

Zhingalala will have all kinds of food that appeals to the Indian public. It will have a cuisine that will trigger the Indian palate. It is 80% regional delicacies from across the country and 20% oriental with mostly Thai and Malaysian cuisine. This would be a restaurant that caters to tasty food that is made from the freshest farm raised seafood that anyone could possibly have. People will begin to eat shrimp and relish it.

All of us have been discussing time and again on the need for domestic marketing initiatives, on the need to popularise shrimp among the Indian public; to encourage its consumption, to remove the notion that it is expensive and only for the elite, that they cause allergies and that they are not healthy. But this is not happening. Obviously, no one will come forward and do it for us. We have to do it ourselves. It is necessary that one among us who has a belief that he could be the game changer take the initiative. I have been asking that question to myself over the last couple of years. Why not I? I have 27 years of experience in Shrimp Aquaculture. I have seen the ups and downs that the sector has faced over the years and feel that I am seasoned enough to take up another challenge. I believe in Mahatma Gandhi's philosophy "Be the change that you want to see in the world", said Manoj.

Several people are discouraging me. They say will be that you burning your fingers; everyone has failed in domestic marketing. Several others are laughing at me, just like they laughed at my concept in 2011, "To farm Vannamei the Tiger way" – at lower densities and growing to bigger sizes. All the pundits and the gurus of aquaculture strongly rubbished what Manoj was saying. They just wanted to make hay when the sun shines. Hatcheries wanted to sell more seed, feed mills wanted to sell more feed, several new substandard input manufacturers sprang up. They were not willing to support the concept that wouldn't increase their sales. No thought about sustainability at all. Each and every one who said that are falling in line today. That system would have been sustainable. India could have been the only country that produced larger sizes just like we did with Monodon. Today, everybody – farmers from Ecuador and Sri Lanka are trying to embrace the concept.

So may be, I could be the trend setter for domestic marketing of Shrimp too. I have a strong conviction that I will do. The dependency of our farmer on the export market has to be reduced. And Zhingalala, I am sure will be the first step in making more and more people want to eat more shrimp, and look forward in buying shrimps from the markets which will increase domestic demand.

If we need to compete with the rest of the countries,

Manoj Sharma with his Family Members

A view of participants - Synergy Biotechnology Director Nanda Kumar, Paresh Kumar Shetty, Pradip Navik and others.

we have to produce better quality shrimp at lower cost than them or produce sizes that others don't produce.

Another fact that we need to understand that, in India, we are beyond the period when we can grow 30 and 40 count shrimp easily in our farms. Farmers struggle to produce 60 and 50 count shrimp these days. No matter, whatever seed we select, whatever BMPs we follow, we are finding it difficult to produce 30 count shrimp. This is the reality now. You can imagine the situation when the entire production is of 60-80 count shrimp. Economics would not work out. Survival of farmers is going to be difficult. Today in Gujarat, seed cost is 70 paise feed is Rs. 87 a Kg, and electricity charges is Rs. 8 per unit when compared to 30 paise, Rs. 70/Kg and Rs. 2 per unit respectively. Therefore the minimum cost at which we in Gujarat can produce shrimp of any count is Rs. 270/Kg, whereas today the price of 80C shrimp is only Rs. 220/Kg. In 2 years' time the situation could go worse. So we can't wait anymore. It is now or never.

Time for a change

Zhingalala team cheering

Different state Governments have several hundreds of crores of rupees allocated for aquaculture development and promotion. Several central geverment agencies like MPEDA and NFDB too have budgets for the same. True, they only have certain areas where they can provide assistance. But it is time for a change. To bring in new schemes and policies that support development of domestic markets in the country. The world knows the health benefits of eating shrimp and seafood. But the Indian public still have wrong notions on the commodity.

We should have advertisements and messages that convey the health benefits of shrimp to the general public; on the high quality processes through which farm reared shrimp are produced. Protein produced through Aquaculture is also known to leave less carbon footprint than meat produced from terrestrial animals. Everyone must be made aware. If the Government supports the sector with this initiative, it will stay alive. Both the farmers and the consumers will be benefited. Subsequently the product should be made available to all corners of the country.

Domestic markets have not developed purely because of export. So much of promotion activities are being done over the years to enhance exports. In fact, there is a separate agency for this with several hundred employees working. And it is the dependence on this export that is killing the farming sector now. A couple of months back an exporter had visited us with his agents and they were telling the agents that they didn't require 30 count or 40 count shrimp as there was plenty available in Ecuador. He didn't know me, so I told him; okay let's take a flight to Ecuador tomorrow. Please show me one farm there that has 30 count shrimp. I told them that I had been travelling to Ecuador right from the year 2014 and I haven't yet seen a single farm there that produces 30 count shrimp. Most of them harvest 60 count shrimp and very few reach 50 or 40 counts. Can you please show me one such farm? They had a shocked expression on their faces. Let me be frank. Most of our processors don't have a clue as to what is happening there in Ecuador. They pass on the same message to our farmer that there is plenty of big shrimp available in Ecuador and so nobody is giving us any offers. Our farmers believe the information and continue to produce 60 count shrimp that is already flooding the market. How can we compete when we also produce the same count as they do?

70 per cent of Indian farmers targeted and successfully achieved 30 count vannamei till the year 2015. See, in Gujarat, upto 2016, average count was 27. We used to take 40% of our production to 20 count shrimp. But now, things have changes. No matter what we do, we are unable to achieve these sizes. At 12 grams, we see white gut infections.

Mayank Aquaculture, the shrimp farm which produces quality shrimps for Zhingalala. NFDB Chief Executive and the media visited the farm on June 10 near Surat.

Forget about stocking density or whatever BMPs you are following. White gut has become very prevalent and once it starts, the performance and profitability of the crop nosedives. Sometimes, it has nothing to do with the seed, feed, inputs or management in the farm. I feel that it definitely has something to do with carrying capacity of your ponds and creeks. We could go back to achieving the counts provided we do necessary damage control and alter our production strategies.

People have to understand the facts. Hopefully we will go back to production in the most sustainable way so that we can still achieve 40 and 30 count shrimp.

When China makes it, why not India? China few years ago was producing close to 1.5 million tons and they used to consume eighty percent of that quantity locally. They used to export only a small quantity of their production. But today, their shrimp production has come down to 5 lakh tons and they have become one of the largest importers of Shrimp in the world. If China can achieve that why can't India do the same? We are eating millions of tons of mutton and chicken. All we have to do is that, we should educate our people to shed their inhibitions and eat just 1 kilo per year. Smaller affordable shrimp will go for local consumption and larger shrimp can be exported. Both can co-exist.

A message needs to be conveyed to the Indian public that if they could consume just one kilogram of shrimp in a whole year, they will be of great support to the shrimp farming sector. Someone had to start and initiative on domestic marketing somewhere. Let me be that person. Everyone has to play a part in this. We have started this small initiative; you have to spread awareness on this through your magazine.

All aqua professionals convey the benefits of eating shrimp to all their families, friends and colleagues through social media. Farmers and traders will make high quality shrimp available at all markets at reasonable prices. That's it.

And there would be nothing like it if the message reaches the government and the policy makers and they understand that domestic marketing should seriously be promoted. Dependency of export market is not going to sustain shrimp farming in our country. Blue revolution does not mean only producing and exporting. Blue revolution should also be producing and giving food security to our own Indian population. I hadn't approached the National Fisheries Development Board for support to my venture because I knew that they do not have schemes that support a restaurant, even though it is a pioneering concept to promote domestic marketing. But I felt so happy when Ms Rani Kumudini, CE of the NFDB assured that the Govt. would try to bring in new schemes to accommodate such innovative projects. I too feel that this is the right time for the government to act. It would be a great service to the sector and to the farmers if initiatives for domestic marketing are initiated.

NFDB Chief Executive Ms Rani Kumidhini was happy to see the just harvested live shrimps in Mayank Aquaculture near Surat. Jacques Foudin is also seen.

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Fish farming in advanced-type RAS facility at Jalpaiguri district, WB

Subrato Ghosh, 122/1V, Monohar Pukur Road, Kolkata-700026

Introduction

Vill. Amguri-Kanyabari, P.O. Amguri, Block and PS Moynaguri, Dist. Jalpaiguri. It is at this place in north Bengal where the most advanced type of Recirculatory Aquaculture System (RAS) has been installed for the first time in non-Government sector in entire north-east India. Since June 2018, progressive fish farmer and aqua-entrepreneur Mr Dibakar Sarkar and his father Mr Dilip Sarkar at the afore-mentioned address have installed the RAS facility in 3600sq.feet area (90ft x 40ft) beside their house and are propagating economically-important high-valued freshwater fishes like *Mystus vittatus, Mystus cavasius, Ompak pabda, Heteropneustes fossilis* and *Puntius* javanicus upto marketable size in a commercial scale successfully in their own endeavour in this indoor environment-friendly fish farming system.

Mr Sarkar explained that in such a kind of fish farming system, an imported technology and fully under control, used water is treated and purified by dual means of mechanical and biological filter systems, the latter depends on functioning of beneficial bacteria. Water inside fish tanks is incessantly purified, recycled and reused. In the circular tanks in RAS, fry-staged fishes can be stocked at a higher density in comparison to earthen pond system. Problems like slow growth and even fish mortality arise in conventional fish farming practices when physico-chemical parameters of pond water turns improper, bottom soil becomes unhygienic; but such situations can be avoided in RAS. Presently certain issues like insufficient availability of quality water for fish culture in many rural areas, low water depth in ponds, shrunken pond water resource, deteriorating pond water and soil quality, water discharged from fish pond getting mixed with natural open freshwater resources and related environmental issues, spread of infectious/pathogenic microorganisms - all these factors have seriously impeded the steady development and prosperity of freshwater aquaculture in India. According to Mr Sarkar, RAS is a fruitful and viable alternative where such hindrances can be overcome, utilization of water for fish culture will not lead to its exhaust, more amount of fishes can be produced in less space, less requirement of labour for necessary monitoring and incidences of fish poaching will not occur.

Dooars Aquaculture Farm

Mr Dibakar Sarkar (aged 30) and Dilip Sarkar are joint proprietors of Dooars Aquaculture Farm, where this RAS has been set up. After completing BSc in Zoology (Hons.) from Ananda Chanda College, Dist. Jalpaiguri, Mr Dibakar Sarkar got involved in commercial fish farming practices. For one decade he has been farming *Anabas testudineus* and indigenous *Clarias batrachus* in 22-25 dec earthen ponds and also monosex Tilapia, *P. javanicus, A. testudineus,* H. fossilis in 20nos of outdoor rectangular cement tanks, each 28ft x 10ft in area and 30000lit capacity. One outdoor polythene-lined monosex Tilapia pond (900sq.feet) and RAS have been constructed recently. They have spent Rs 48,00,000/- in establishment of this RAS system and fish farming can be continued (i.e., sustainability of the system) for next 46-50 years uninterruptedly and efficiently without any major problem. It is the Israel model of RAS; a blend of experience, applied science and theoretical knowledge has led to innovation of this fish farming technology. Team of fishery scientists and technical experts from Israel and Bangladesh have visited this site and monitored the entire installation process of RAS. Resource-rich progressive fish farmers can also avail China or Canada model of RAS and the cost will be more or less similar to this model, Mr Sarkar stated. Entire area is covered with corrugated galvanized iron roofing (with ventilation facilities) at sufficient height from floor, transparent sheets used at few places.

Mode of functioning of RAS

This RAS comprise eight circular fish culture tanks, each 10000lit capacity, diameter 4mt, total height 1.2mt and water depth 1mt. Body of tanks made up of zinc-aluminium alloy sheets, commercially termed Jaylon sheet. Each tank has translucent polythene sheet covering on inner wall and base, taking shape of a single huge container; fishes are maintained within it. Used water passes through centrally-located outlet and enters into drum filter, it has filter screen of 80-100micron mesh size. Suspended and settle-able particulate organic waste matter is captured and separated. Further the water passes through pipeline and enters into biofilter system, main objective is to eliminate toxic ammoniacal nitrogen and dissolved ammonia.

Mr Sarkar stated that it is the single pass biofiltration (SPB) model, 12 feet in height. Water is forcefully sprayed into biofilter system through nozzle, thus water gets enriched

Highlight Points

In pursuit to modernize fish culture practices, Mr Dibakar Sarkar at Vill. Amguri in north Bengal has taken efforts to install and introduce the most modern version of Recirculatory Aquaculture System and this plant is the first of its kind to be constructed in non-Government sector in north-east India. Water is being reused over and over again and is functioning efficiently. Recently author had a glimpse of the entire structure and had intimate conversation with RAS practitioner Mr Sarkar at his fish farm site on 11/5/2019.

with dissolved oxygen and concentration of free/dissolved carbon dioxide is declined to its minimum. Subsequently adequate concentration of beneficial nitrifying bacteria (*Nitrosomonas sp, Nitrobacter sp*) significantly oxidizes the ammonia in water first into nitrite and next into nitrate. Mr Sarkar routinewise adds commercially-available biological media (resembling tapioca pearls) over biofilter bed to facilitate proper growth of beneficial bacteria. Water is now fit to be recycled back to circular fish culture tanks, harmful waste product and feed residues have already been detoxified in this process. Concentration of BOD, ammonia and nitrite is reduced to nil, that of nitrate remains within safe limit. An overhead tank 15000lit capacity has been set up outside RAS premises. Underground water drawn up via borewell is first treated and made iron-free, subsequently is supplied to overhead tank. From here, new freshwater is supplied into eight culture tanks in RAS as and when required.

Outdoor rectangular tanks at Dooars Aquaculture Farm

Initially when fish culture begun in this RAS, it took three months to have sufficient growth of nitrifying bacteria in biofilter of RAS. Here bacteria is not recharged directly from outside. In this system, 50000lit of water is purified and recycled every hour and depending on the capacity of pumps, water in the entire RAS (eight tanks) is recycled and reused once in two hours, Mr Sarkar explained. Water is renewed/exchanged incessantly, considerable volume of water is saved. He has taken special measures for continuous power supply (electricity generation) in RAS. Fishes are nurtured in an ideal environment, it grows fast and fed quality supplementary feed. Like greenhouse agri-farming, this RAS is a notable technology-based development and holds great potential.

Growth of fishes

Mr Sarkar produces and harvests 60kg fishes (*O. pabda, M. vittatus, M. cavasius*) from every cubic mt volume of water (1000lit) in 135-150 days period. Fry-staged O. pabda is procured from a hatchery located in Hili Block of Dakshin Dinajpur district (1.5 inch size; 2000-2500nos/kg) and stocked in RAS @ 8000-8500nos/circular tank. In next five months, it reaches marketable size of 50-60gm and sold in local market in Jalpaiguri district @ Rs 500-600/-/kg. Young ones of *M. cavasius* (4000-4500nos/kg) reach 25-40gm size at the end of 150 days and sold @ Rs 450-500/-/kg. Growing fishes are fed floating-type supplementary pelleted feed (Rs 65-75/-/kg, 30-40% protein content) everyday. No kind of medicine neither any chemical additive are used for promoting fish growth or water treatment. Healthy fishes 600kg in amount is harvested from each culture tank at the end of each culture duration. O. pabda has to be fed 4-5 times a day; it shows cannibalistic nature in conditions of insufficient feed. Only dried feed should be applied in RAS, Mr Sarkar stated. Fry-staged *H. fossilis* are stocked @ 6000-7000nos/circular tank. In one month, it reaches 2.5-3.0 inches and harvested at the end of 120 days. Air bubble diffuser type aerators, 2-3nos may be used in each culture tank. In conditions of low water column in tanks and power cut, farming of *H. fossilis* do not pose a problem as these fishes have accessory respiratory organ. In comparison to fishes grown in ponds, fishes reared in RAS show a highly economical FCR.

Mr Sarkar received training on seed production and farming of monosex Tilapia at RGCA, Vijayawada Centre, Andhra Pradesh where 125 families of the fish are separately maintained. He had procured monosex Tilapia seeds (5gm size; Rs 2.50/-/piece) and stocked experimentally both in large outdoor cemented chambers and in RAS. Those reached to 200gm size in 60-75 days period when reared in RAS tanks and same size was found to be attained in 110-120 days when reared in outdoor rectangular chambers. Pipeline control valves of this RAS have been manufactured in Italy, the drum filter component in Germany and finally all equipments/machineries are assembled at Israel. Fry stages of cultivable fishes are reared for 12-14 days in outdoor rectangular tanks before being transferred into RAS facility. A combination of commercially-available probiotic *Bacillus* sp (Rs 8000/-/kg) and molasses is used in each outdoor tank. Beneficial bacteria utilize molasses as carbon source and converts ammonia into protein efficiently. Ratio of carbon and nitrogen is maintained at 14:1 in each such tank.

End note

Initial investment in RAS can be lessened if rapid sand filter is used (indigenous technology) as an alternative to expensive but highly-efficient drum filter. In this way, settleable solid waste can be removed from used water of fish holding/culture tanks. About 350kg white sand will be required with particle size 2mm. In an indigenous biofilter model of 2000lit capacity (cement structure), dead oyster shells or freshwater mussel shells can be used, which provides a substratum for growth of nitrifying bacteria in the form of biofilm. Oyster shells with sufficient surface area are used for attachment of bacteria and for maximizing contact with passing water for removal of ammonia. It will cost Rs 65000/- and Rs 20000/- to set up such a rapid sand filter and biofilter tank respectively (Courtesy: Scientists of ICAR-CMFRI Visakhapatnam Regional Centre).

Mr Sarkar has also set up white cylindro-conical monosex Tilapia egg incubation-cum-hatching chambers, 60000 fertilized eggs can be kept in each. He further stated that since April 2013, a progressive fish farmer in Hyderabad has been farming *Pangasianodon hypophthalmus* in 40000lit circular tanks in modern RAS (cement tanks with coat of epoxy paint, 6mt diameter) facility. Fingerlings @ 3500nos/ tank are stocked and harvested at 1kg size at the end of 180 days. This farmer is able to produce 100kg fish from every 1000lit volume of water. RAS can be installed under carbonated tin shed. As strict biosecurity measure and to prevent entry of pathogenic microorganism in RAS premises of Dooars Aquaculture Farm, shoes are not allowed inside and one has to wear white apron coat and disposable face masks after washing hands with KMnO4 solution. Outsiders are not allowed inside RAS facility during an ongoing fish culture operation.

If indigenous components are innovated and used in RAS, it will become more acceptable to fish farmers in West Bengal in days to come, Mr Sarkar opined. Further research is necessary in this regard. Primary school teacher-cum-fish farmer Mr Dibakar Sarkar and his father, with support of two permanent labours have introduced this newer 'indoor fish farming' technology and advanced model of RAS in WB which holds great prospect. Fishes farmed here are considered as new candidate species in freshwater aquaculture. Aquaculture diversification, both in terms of system and species, has taken place here. Their pioneering endeavour is indeed praiseworthy, their indoor fish farm based on RAS will turn out to be a profitable venture and more fish farmers in different districts of WB and neighbouring states are expected to adopt this modern technology in near future. Author is truly grateful to Mr Dibakar Sarkar for providing much information on this new system.

In Pond Raceway Systems- An Innovation in Intensive Productions

V.Sonia, V.Lakshme Gayathre, S.Mariappan

Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam

Demand for seafood is continuously increasing due to increase in population and its demand on fish products as an alternative source of protein. The 2016 edition of 'The State of World Fisheries and Aquaculture' by FAO in February reports that capture fishery production is projected to increase by just 1% through the year 2025 as most of the sea are fully fished and therefore have no potential for increasing production. At the same time fisheries and aquaculture remain important sources of food, nutrition, income and livelihood's for millions of people around the world. In this scenario intensification of aquaculture is unavoidable but fisheries resources, land and freshwater become more limited in many regions. Thus aqua culturist must adopt intense production strategies without compromising sustainability thereby requiring judicious use of land and water as both are becoming scarce resources.

Pond aquaculture systems are highly challenged due to increase in water demand and compulsion of effluent to be treated due to the huge amount of waste generated from metabolic and faecal residues and phytoplankton crash. Thus new innovated pond management systems and production strategies has to be initiated that can maintain the natural rhythm of the system. In Pond ecosystem dissolved oxygen is the first limiting factor followed by ammonia poisoning. It is seen that in a pond with limited water exchange, aeration cannot be a solution for tackling ammonia poisoning and dissolved oxygen deficiency. As the organic wastes increases in the system due to feeding and plankton crush there will be steady increase in the TAN concentration and pH fluctuation in the pond system.

Thus the key areas to be concentrated is limited use of feed, continuous aeration, control over phytoplankton growth, monitoring after noon swings of ammonia and pH in culture ponds. Management strategies such as continuous circulation of water, reduction of water stratification and uniform acceleration of waste decomposition has been initiated for maintaining the water quality of the system. Circulating water in ponds is an effective tool in destratification that improves oxygen levels throughout the pond and increases

Highlight Points

IPRS can be a justified solution as it offers multiple benefits to tackle current environmental issues related with aquaculture. The System shows features and advantages of various other conventional systems clubbed together. The system can be adopted well by farmers as it has the potential to revolutionise the existing aquaculture systems and would pave way for further innovations in intensified production of farmed fish by mitigating significant reduction in the use of extra nitrogenous fertiliser, reducing the feed input, culturing of other value added fishes along with the candidate species. It appears to be more environmentally sustainable than other systems.

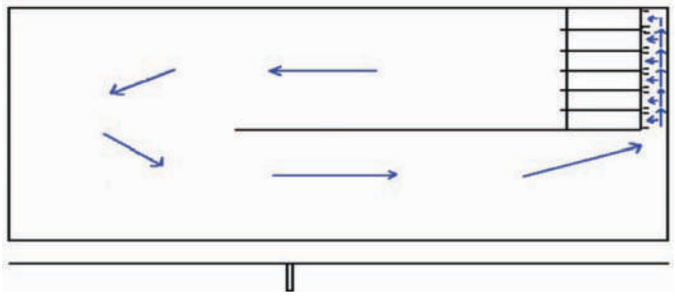
microbial oxidation of organic matter. In this context pond recirculation system technology is relatively new with many potential designs. Key to the systems is mechanical water circulation with the aid of air lift pumps and aerators in ponds or raceway or a combination of both ponds and raceways.

In- Pond Raceway Systems

In-Pond Raceway System (IPRS), a new aquaculture technology based on conventional pond culture and raceway system is a promising strategy to increase fish production in ponds in a sustainable platform. It was first conceived and developed at the School of Fisheries, Aquaculture and Aquatic Science – Auburn University (SFAAS-AU) in the early 1990s. This system offers multiple benefits to address environmental and food safety concerns by creating a riverine flow in the pond, the fish have a healthy environment, and water quality is protected due to the removal of waste and recycling for other uses, such as biofuel and fertilizer. It appears to be more environmentally sustainable than cages, raceways and conventional open pond system. It will also help to reuse the pond water and to significantly conserve limited water resources.

Operation of In pond raceway systems

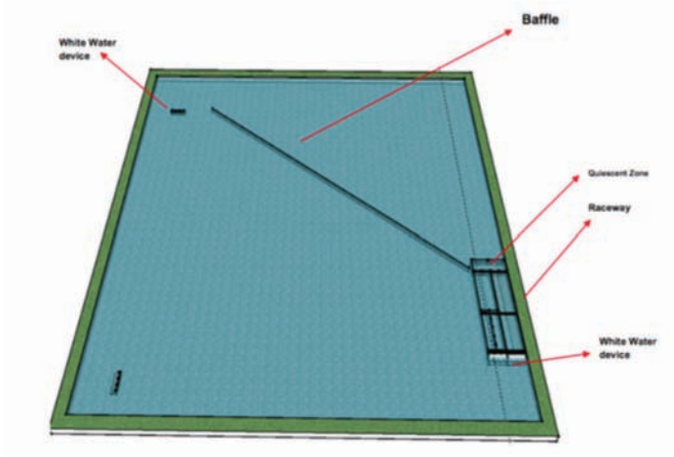
In -Pond raceway system design consists of fixed parallel raceways constructed in one corner of a traditional earthen pond with a centre baffle to provide a continuous circulation pattern around the pond and through the raceways. Low speed paddle wheels provide a constant current through the raceways. The raceways are stocked at high density with suitable fish species which are fed with pellet feed. As water flows through the raceways, the products generated in the raceways are carried into the open pond area where they are processed naturally and stimulate the production of organisms that will be the feed for other hardy fishes which can be reared in the pond area. The System shows features and advantages of four systems namely raceways, cages, recirculatory systems and pond systems clubbed together. The system can be adopted well by farmers as it has the potential to revolutionise the existing aquaculture systems and would pave way for further innovations in intensified production of farmed fish by mitigating significant reduction in the use of extra nitrogenous fertiliser, reducing the feed input, culturing of other value added fishes along with the candidate species



Aerial diagram of an IPRS in a traditional earthen pond (Arrows indicate water flow).

Major Components of IPRS System

- White Water Units- 4-5 units per Hectare (2 Meter water depth)
- Raceway Cells- 2-3 per Hectare (2 Meter water depth)
- Quiescent Zone (QZ) – Last 3 Meters of the Raceway
- Baffle Wall- One required per pond



White Water Unit

Using air blowers or White Water air lift devices at inlet end, water is airlifted and taken to the Raceway and let out at another end with little or no maintenance. White-water airlifts move and aerate water very well. Generally, a 1.5 hp motor is used.

Raceways

Raceways are basically production cells installed at a corner of the pond. All the fish will be stocked in this zone. Flow of water through the raceways brings both fresh water for the fish and moves fecal solids to a downstream point where they can be efficiently collected and removed.

Quiescent zone

The last 3m length of the cell is used as sludge collection point. This is the Quiescent Zone (QZ) at the extreme downstream portion of the raceway where fish are harvested and solid wastes are collected and removed. With the help of sludge treatment plant, the waste can be re-valued and reused as an income source.

Baffle

A baffle, made out of fabric and fence is placed along the longitudinal axis, at the Centre of the pond to force the water to take a long course around the pond before returning to the system head.

Advantages of IPRS Technology

- 8 times more production than ponds from unit area.
- Near zero effluent emission.
- Efficient utilization of Nutrients.
- Less water management cost.
- Utilization of water resources in a sustainable way.
- Less manpower requirement.
- Less possibility of disease occurrence.
- Inexpensive treatments.
- Protection from predators
- Better feed utilization

With all aspects considered, the IPRS seems to offer an economical and environmentally sustainable culture system that offers an alternative for fish aquaculturists to optimize their production resources. In addition to the potential for increasing fish production, the IPRS – with proper management – requires no water exchange to improve water quality. Water is only added to compensate for evaporative loss or seepage.

Triclosan, an emergent pollutant: Concern in aquaculture

Tapas Paul[1] and Saurav Kumar[1],

[1]Aquatic Environment and Health Management Division, ICAR- CIFE, Mumbai- 400 061,India

1. Introduction

Aquaculture is one of the fastest growing food-producing sectors, expanding and intensifying its culture practices and producing around 73.8 mmt of fish globally (FAO, 2017). In recent times, unmanaged urbanization, population growth, inadequate treatment and disposal of sewage are responsible to introduce diverse chemicals in to adjacent aquatic bodies and become reservoir of these emerging chemicals. Subsequently intake of unscreened and untreated water from these sources in to the aquaculture system emerge a serious distress that leading to sporadic death of fish and problem to aquaculture system. Emerging pollutants (EPs) are the major concerns for aquatic and human health, as very little regulatory information related to their uses and impact assessment is available. Among the several emerging pollutants, non-regulated trace organic EPs including pharmaceuticals, new generation drugs and personal care products are of environmental concerns due to their extensive use and possible ecological impacts to biota within the environment. Additionally, biocides comprise another relevant group of organic pollutants which are of solemnalarm from the ecotoxicological point of view. Among biocides, triclosan (TCS) is the most widely used antimicrobial agent in the personal care products. Triclosan (molecular formula $C_{12}H_7Cl_3O_2$ and the IUPAC name is 5-Chloro-2-(2, 4-dichlorophenoxy) phenol is a synthetic chlorinated aromatic compound with phenol and ether as functional groups. A wide array of personal care products like hand soap, toothpaste, deodorant, surgical scrubs, shower gel, hand lotion, hand cream, and mouthwash, TCS is an integral agent use as biocide (Dhillon et al., 2015). Uses and composition of various products of TCS is currently under review by the Food and Drug Administration (FDA) and Environmental Protection Agency (EPA). In 2009, the American Public Health Association (APHA) proposed for banning of TCS for household and non-medical use. In 2016, FDA has banned the use of TCS in antibacterial liquid soapsantiseptic products, yet its residual and persistent concentrations recorded in various aquatic bodies. Several authors found TCS concentration ranges from 1.4 to 40,000 ng L-1 in surface waters, 20-86,161 ng L-1 in wastewater influent and 23-5370 ng L-1 in wastewater effluent, solid waste and riverine system including animals (Fig. 1). TCS broadly showed as endocrine disrupter having high octanol-water Partition coefficient (logKow 4.76) and high hydrophobicity leads to bioaccumulation potential and cause cytotoxicity, neurotoxicity and genotoxicity (Dhillonet al., 2015). Moreover, most of the aquafarm filled the water from adjacent water resources with inadequate treatment and profiling of the emerging pollutants. Despite optimum rearing condition and good husbandry practices adopted at farming system, farmers frequently reporting the differential and slow growth of fishes and emerging diseases. One of the main etiology may be persistent TCS like molecules that modulate the growth related enzymes, metabolic and stress biochemical profiles, hormonal imbalance and immunosuppression in stocked fish (Sahu et al., 2018; Paul et al., 2019). Yet information related to emerging pollutant in different water body is scarce and its pathway to entry to aquafarm is discrete. Keeping the view of all these, the present article aims to highlight the impact of TCS on aquatic animal with special reference to aquaculture.

Highlight Points

- **Triclosan (TCS) is a biocide frequently applied in products of household and personal care to check the growth of microbes.**
- **It has a ubiquitous distribution in aquatic system which can substantially contribute towards antimicrobial resistance and currently considered as an emerging pollutant.**
- **The expanded use of triclosan as a multi-purpose antimicrobial agent and its consequent entry into aquaculture system is of imminent concern since it has potentiality to change the physiology and in some cases mortality to fishes.**
- **TCS has endocrine-disrupting potential and can alter behavioural, haematology, antioxidative, neurological enzymes and causes significant genotoxic effects in commercially important fish species.**
- **The chlorinated derivatives of TCS was found to bioaccumulate in aquatic flora and fauna including algae, invertebrates and fish and detected in top levels of aquatic food chain.**
- **The wide use of TCS and persistent in aquatic environment results in the spread of antibiotic resistance against gram positive and gram-negative non-spore forming bacteria.**

2. Fate of triclosan in aquatic environment and pathway to reach aquafarm

The discharge of TCS into the environment from various point sources and is mainly due to inadequate treatment of domestic sewage comprises various personal care products and sanitary products containing around 0.1% to0.5% (w/w) TCS(Piccoliet al., 2002). Incomplete removal of TCS from wastewater treatment plants (WWTPs), land application of biosolids containing residues of TCS, leads to occurrence of TCS in aquatic and terrestrial environment (Fig. 2). In addition, TCS can reach surface waters by run-off from fields treated with digested sludge and may be transported through oral, dermal, gills and inhalation to the organism. The chlorinated derivatives of TCS was found to bioaccumulate in aquatic flora and fauna including algae, invertebrates and fish and detected in top levels of aquatic food chain. The mean bioaccumulation factor based on water (BAFw) was 820 and sediment was 2.12 in Cauveri river (Selvarajet al., 2014). Further, it has also been reported in drinking water at concentrations as high as 2100 µg L-1 (Dayan, 2007).

3. TCS and its impact

3.1 Metabolites of TCS

Triclosan is reported to persist even after secondary treatment (activated sludge) however, it is susceptible to degradation after reacting with a disinfecting oxidant, sodium hypochlorite. Na-hypochlorite have the ability to chlorinate the TCS in ortho, or para positions generating three chlorinated TCS derivative (CTD) intermediate products which are further photodegraded to chlorinated dioxin. CTDs are of environmental concern as they may increase the antimicrobial and endocrine disrupting features. The most common degraded product of triclosan includes 2, 8-dichlorodibenzo-p-dioxin, 2, 4-dichlorophenol, chloroform and methyl triclosan.In aqueous solution, triclosan has the ability to produce several types of polychlorinated dibenzo-p-dioxins under exposure to sunlight, especially at high pH values.

3.2 Antimicrobial activity of TCS

Triclosan possesses wide-spectrum antimicrobial action and has been classified as a Class III drug (compounds with high solubility and low permeability) by FDA. TCS has antimicrobial activity against gram positive and gram negative non-spore forming bacteria. At low concentration TCS is bacteriostatic in nature whereas at higher concentration it has bactericidal effect through membrane intercalation and triclosan induced K+ leakage. Some strains of bacteria like staphylococci, E. coli, Proteus spp., Klebsiella spp., Enterobacter spp., some Mycobacteria and methicillin resistant Staphylococcus aureus are reported to be sensitive towards TCS. The minimum inhibitory concentration of TCS as a bactericide in products was reported to be 500ppb (Suller and Russell, 1999). However, the wide use of TCS and persistent in environment results in the spread of antibiotic resistance. The main underlying reasons behind microbial resistance to TCS are over amplification or modification of the targets. On note, mutation in the target enzyme enoyl reductase may lead to resistance to TCS. Several studies have reported isolates of different microbeshaving increased resistance to TCS because of membrane impermeability. TCS is reported to alter the indigenous microbial composition of wastewater operations, such as activated sludge and anaerobic digestion. Further, TCS can alter the indigenous microbesdiversity of freshwater biofilms which leads to change in gut microflora of host fish (Narroweet al., 2015). Subsequent alteration in gut microbes results into reduced growth performance and susceptible for infection and diseases.

3.3 Impact of triclosan in aquaculture system

3.3.1 Impact on aquatic organisms

In recent times, potential ecotoxicological risks and threats associated with triclosan to various aquatic organisms have been paved attention. Several studies have documented the concentrations of TCS as low as nanograms per liter are capable of causing toxicity to aquatic organisms. TCS is reported to alterbehavioural, haematology, antioxidative, neurological enzymes and causes significant genotoxic effects in commercially important fish species (Sahu et al., 2018; Paul et al., 2019). TCS has endocrine-disrupting potential in different types of aquatic organisms by its oestrogenic, anti-oestrogenic, androgenic and anti-thyroid activities in aquatic animals under in vitro and in vivo condition. TCS exposure results in elevation of vitellogenin gene expression and reduction in sperm count of different fish species. It has also shown varying degree of alteration in behaviour of fish such as air-gulping, respiratory distress, sluggishmovement and ataxia in exposed fish. Due to disruptive action of TCS on the erythropoietic tissue such as kidney and spleen, it leads to anaemia (decrease in erythrocyte number and haemoglobincontent) in fish. TCS is reported to cause varying degrees of oxidative stress resulting in alteration of cellular structural integrity and functional homeostasis of vital organs. Interestingly, exposed cells are being maintaining their homeostasis by raising reactive oxygen species (ROS) levels much higher than the detoxifying capacity of tissues. Exposure of TCS can induce inhibition of AChE activity which leads to buildup of acetylcholine causing prolonged excitatory postsynaptic potential consequential into in destruction of neuronal membrane. Triclosan exhibits a dose-dependent DNA damage resulting in significant genotoxic effects and increased alteration of DNA strands. TCS exposure can results in increase in micronucleus (MN) frequency due to production of ROS such as hydrogen peroxide (H_2O_2), superoxideanion (O_2^-) and hydroxyl radical (OH^-) which might inhibit normal celldivision, damage erythrocyte chromosome and interdict DNA duplication.

3.3.2 Impact on water quality

TCS and its derivatives are already present in measurable quantities in aquatic environment which may affect water quality, impact on ecosystem and human health. Different forms of triclosan vary with the change in pH. The phenolate form of triclosan predominates when the natural water pH > 8.1 and it converts into its neutral phenolic form if the water pH is below 7.9. Phenolate form of TCS is photo degradable, whereas phenolic form is photostable. Furthermore, physico-chemical parameters of water influence the stability of TCS and particularly it is observed that rate of degradation of TCS increases with increase in temperature of water body.

TCS is reported to readily biodegradable under aerobic conditions but under anaerobic conditions and in the dark, triclosan is quite stable. Recently, evaluation of TCS toxicity under different temperature regimes showed modulation in blood profiles, blood indices, serum and tissues biochemical parameters and evoke statistically significant DNA damage in experimental pangasius fish (Paul et al., 2019). Further it has proved that toxicity of TCS elevated with lowerpH of the water. So, keeping in concern of climate changeparticularly decrease in pH of water body with increase in CO_2 level, TCS possess a serious threat to aquaculture system.

4. Conclusion and future prospects

The expanded use of TCS as a multi-purpose antimicrobial agent in common ingredient of everyday household personal care and consumer products and its consequent entry into aquatic environment tend to enter in to the aquaculture system is of imminent concern. TCS is persistent in water and has higher bioaccumulation potential in aquatic organism. The more concern of TCS in sewage fed aquaculture system where it may reach to toxic level through incomplete removal of personal care products and medical wastes from waste water treatment plants (WWTPs). It has become steadily serious problem as it has potentiality to change the physiology and in some cases mortality to the aquatic organisms. Therefore, mapping of emerging pollutants to different water bodies and risk assessment should be evaluated towards application of water contaminated with biocides for aquaculture. Another key point is to determine the impacts of TCS on aquatic microbes community and functional dynamics specially related to antibiotic resistance pattern. In concern of climate change and adaptation in aquatic organisms, future studies and research are needed to develop sustainable bioremediation processes for the reduction or elimination of triclosan from aquatic environment. Further framework regarding use and discharge of TCS in aquatic environment need to be established so that its effect can be minimized upto next generation.

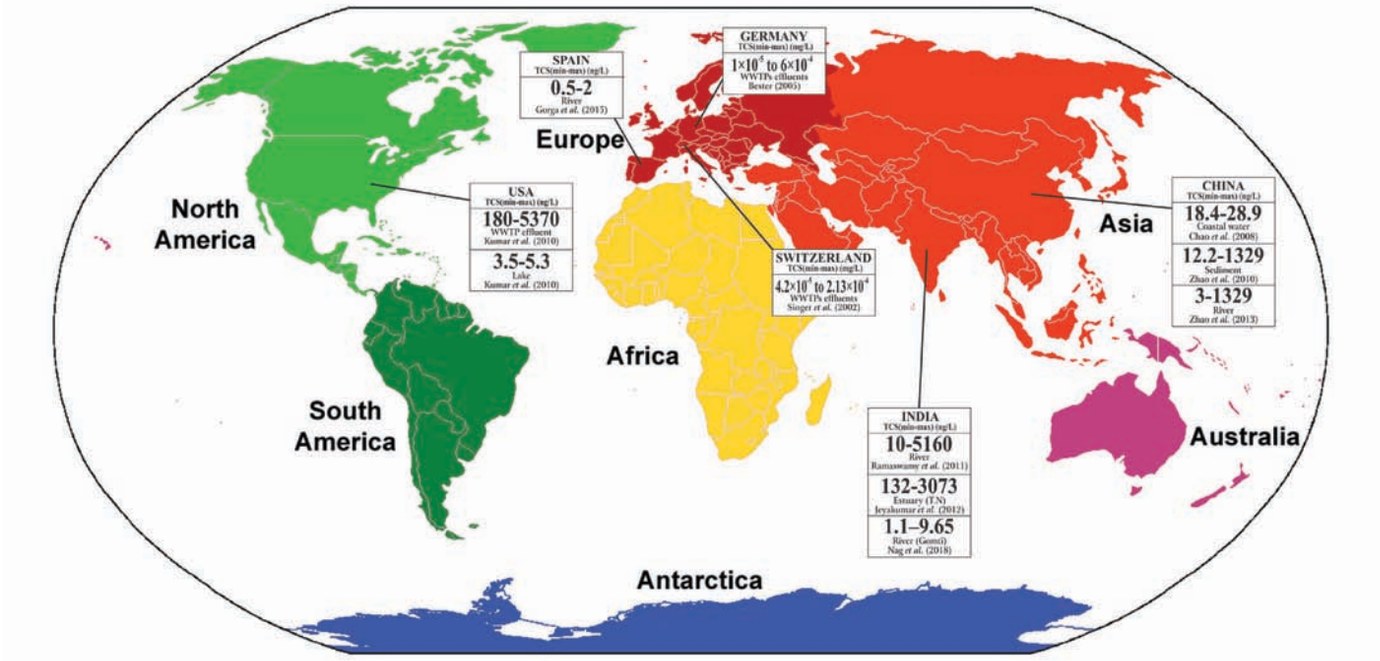


Fig. 1: International and National scenario on occurrence of triclosan

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

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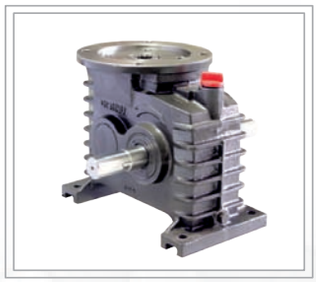

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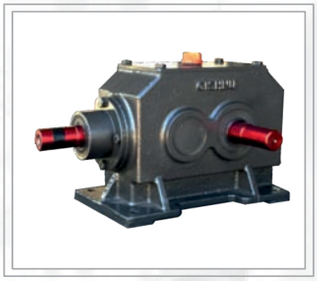

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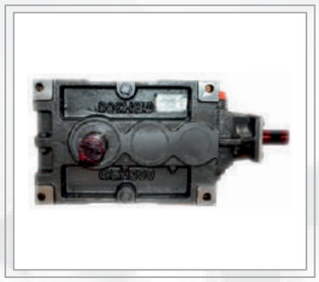

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Stranding of Whales: its causes and measures to protect stranded animals

Suyani Nitin Kanji[1], Mridula Rajesh[1] and K. M. Rajesh[2],

[1]Department of Fisheries Resources and Management,
Karnataka Veterinary, Animal and Fisheries Sciences University, College of Fisheries, Mangaluru

[2]Research Centre of CMFRI-ICAR, Mangaluru

Introduction

Cetaceans are aquatic mammals constituting the infraorder Cetacea. There are around 89 living species, which are divided into two parvorders. The first is the Odontoceti, the toothed whales, which consist of around 70 species, including the dolphin (which includes killer whales), porpoise, beluga whale, narwhale, sperm whale, and beaked whale. The second is the Mysticeti, the baleen whales, which have a filter-feeder system, and consist of 15 species divided into 3 families, and include the right whale, bowhead whale, rorqual, pygmy right whale, and gray whale. Marine mammals – such as whales, dolphins, porpoises and sea cows have long been considered to be some of the most spectacular and majestic mega fauna on earth. But due to the direct and indirect impacts of human activities on the majestic beauty and inspiring species of marine mammal, they have been listed as threatened or endangered in the last several years.

Strandings are a natural phenomenon when whales get "stranded" or stuck on a beach. Most stranded cetaceans are already dead or very ill; however some cetaceans are alive and seemingly healthy. Cetacean stranding, commonly known as beaching, is a phenomenon in which whales and dolphins strand themselves on land, usually on a beach. Beached whales often die due to dehydration, collapsing under their own weight, or drowning when high tide covers the blowhole (Blood, 2012). Of 78 species of cetacea, only 10 species regularly mass strand and another 10 species occasionally strand. Interestingly enough, most mass strandings occur in toothed whales species (such as sperm whales, beluga whales and pygmy sperm whales). National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Services (NMFS, 1992) defines a stranded animal as any dead marine mammal on shore, any live dolphin or whale cast ashore or unable to return to its natural habitat, or any live seal that cannot leave shore due to injury or poor health.

Stranding of whales in India and abroad

Stranding incidents of marine species along the Indian coast are not a recent phenomenon. However, with increasing social awareness and interest in marine science, there has been an increase in reporting such incidents.

New Zealand has one of the highest stranding rates in the world. On an average, about 300 dolphins and whales strand each year. Most stranding is of individual animals, but mass strandings are common and can involve hundreds of animals at a time.

Strandings of whale and dolphin are also found along the coastline of Cape Cod, Indonesia, Ireland and Scotland.

Types of strandings

Single Strandings

Single strandings occur when one cetacean strands on a beach. This can include a living or dead baleen or toothed whale species and includes either a single individual or a mother and her calf. Since a calf is still dependent on his or her mom, stranding with mom is considered a single event. Single live strandings are often the result of illness or injury. This means that the cetacean died of natural causes and then tides and winds washed them ashore, which almost inevitably end in death in the absence of human intervention. Sometimes the cetacean is alive when it strands but usually it dies soon afterward.

Mass Strandings

Mass or multiple strandings are rare. Mass strandings primarily occur when 2 or more (not including a mom and calf) whales or dolphins strand together. These are typically social groups of toothed whales (dolphins, pilot whales, sperm whales, etc.) who are usually alive when the stranding occurs. Occasionally the animals can be saved by refloating the entire group and releasing them all together. Cetaceans in a mass stranding that are released one by one tend to re-strand themselves--possibly because of the attachment that they feel towards the rest of their groups.

Highlight Points

- **Whales are living creatures of the open ocean belonging to cetaceans group.**
- **Cetacean stranding is a phenomenon in which whales and dolphins strand themselves on land, usually on a beach.**
- **Baleen whales are commonly stranded along the Indian coast in different coastal regions.**
- **Strandings are complex events and may be due to extreme tidal fluxes, extreme weather condition, solar storms, human activities, illness or injury or pollution (toxic effects of oil spills).**

Date	Location	Species	Notes	Reference
27th Nov 1960	Gulf of Mannar, Tamil Nadu	Blue whale (Balaenoptera musculus)	20.8 feet long	Marichamy et al., 1984
30th April 1979	Gulf of Mannar, Tamil Nadu	Male Sperm Whale (Physeter macrocephalus)	26.5 feet long; no visible injury on the body of the whale; Blood was oozing out through the mouth, eyes and genital opening.	James and Soundararajan, 1979
25th Nov 1994	Gulf of Mannar, Tamil Nadu	Blue whale (Balaenoptera musculus)	43.6 feet long; having 80 thorat grooves.	Lipton et al., 1995
21st Dec 2001	Guijerbettu beach, Udupi, Karnataka	Blue whale (Balaenoptera musculus)	40.3 feet long	Anoop et al., 2004
13th April 2004	Padubidri, Udupi, Karnataka	Baleen whale	32.1 feet long; vertebrae and baleen plates were found exposed	Anoop et al., 2004
11th Aug 2004	Kota beach, Udupi, Karnataka	Baleen whale	35.1 feet long	Anoop et al., 2004
17th Sep 2009	Devbagh beach, Karwar, Karnataka	Female Sperm Whale (Physeter macrocephalus)	32.91 feet long; it is VU mammal (IUCN 2008)	Naik et al., 2010
15th Feb 2013	Keni beach, Ankola, Karnataka	Cuvier's Beaked Whale (Ziphius cavirostris)	16 feet long	Naik et al., 2015
23rd July 2015	Ullal beach, Mangalore, Karnataka	Baleen whale	39 feet long; decomposed condition	CMFRI, 2015
30th July 2015	Thannerbhavi beach, Mangalore, Karnataka	Baleen whale	44.2 feet long; decomposed condition	CMFRI, 2015
6th Aug 2015	Malpe beach, Udupi, Karnataka	Baleen whale	49 feet long; decomposed condition	CMFRI, 2015
27th July 2016	Hollangadde, Kumta, Karnataka	Baleen whale	46 feet long; decayed condition	Vaidya, 2017
20th July 2016	Ramangindi, Dhareshwar, Kumta, Karnataka	Bryde's whale (Balaenoptera edeni)	44 feet long; decomposed condition	Vaidya, 2017
13th Aug 2016	Pavinkurva-taribagilu Honnavar, Karnataka	Blue whale (Balaenoptera sp.)	40 feet long; decayed condition	Vaidya, 2017
27th Aug 2016	Agatti Island, Lakshadweep.	Dwarf Sperm Whale (Kogia sima)	6.2 feet long; decayed condition	Aneesh et al., 2019

Unfortunately, most whales are already dead or do die when stranded. However some stranded cetacea are saved by tides (they just swim away) and some others are saved by human efforts. The carcasses of deceased cetaceans are likely to float to the surface at some point; during this time, currents or winds may carry them to a coastline. Since thousands of cetaceans die every year, many become stranded posthumously. If one gets into trouble, its distress calls may prompt the rest of the pod to follow and beach themselves alongside (Anton, 2003). Most carcasses never reach the coast and are scavenged or decomposed enough to sink to the ocean bottom, where the carcass forms the basis of a unique local ecosystem called whale fall.

Reasons for stranding

Strandings are complex events and there are many reasons why dolphins and whales may strand. In most cases the exact cause is unknown but any one of the following factors, or a combination of them, can be the cause.

1. **Extreme tidal fluxes:** Mass strandings often coincide with full and new moon tidal cycles. The extreme high and low tides during full moons allow animals to swim farther inshore than normal, leaving them high and dry when the tide turns.
2. **Extreme weather:** High winds and stormy seas can cause a storm surge, allowing animals to go farther inshore than usual, making them more likely to become stuck when the tide recedes. It is also thought that these conditions may increase the likelihood that animals become disoriented in complex coastal areas.
3. **Complex topography:** Animals come near shore at different times of the year and may become disoriented and trapped by complex inlets and the hook-like shape of areas such as Cape Cod, Massachusetts. Wellfleet Bay is an additional hook of land within Cape Cod Bay, and this added level of topographic complexity is likely the reason that 60% of all mass strandings in this area have taken place in Wellfleet. Researchers have also found similarities in the substrates of areas around the world with a high propensity for mass strandings: these locations tend to have gently sloping sandy or muddy flats that may inhibit the animals' ability to navigate.
4. **Predators:** Scientists and researchers believe that threats by predators such as sharks and killer whale (orca) may cause marine mammals to swim closer to shore where they are at increased risk of stranding.
5. They might even be influenced by astronomical events. Many cetaceans use the Earth's magnetic field to navigate by detecting differences in the field's strength to find their way. Their internal compasses could be vulnerable to magnetic anomalies, of the kind caused by solar storms which may disturb the whales' ability to navigate, sending them into shallow waters where they get trapped. The large geomagnetic disruptions of the Earth's magnetic field, brought on through solar storms, could be another cause for whale beachings.
6. It's possible that some stranding cetaceans are the victims of natural poisonings. The sei whales are thought to be the victims of toxins released by deadly algae, while similar harmful algal blooms may also be responsible for the fossil whale graveyard.
7. Cetaceans can be disoriented by the underwater din of human activity, from naval sonar to the seismic air guns used in oil and gas exploration. Several stranding events have been tied to military exercises near the United Kingdom, Denmark, Greece, the Canary Islands, Hawaii, and most famously, the Bahamas in 2000. As documented in War of the Whales, that last event led to a string of scientific studies, legal injunctions, court cases, and a formal admission of culpability from the U.S. Navy. Naval sonar is so loud that it can cause internal hemorrhaging. It could also cause gas bubbles to form in cetaceans' bodies, essentially giving them the bends – the same condition that afflicts human divers who surface too quickly. Even low levels of sonar could harm cetaceans by distressing them, forcing them to flee into unfamiliar territory.
8. **Social structure:** Many cetaceans live in large groups. They play together, travel together, and hunt together. And perhaps, as a result, they die together. If one faltering individual, whether through confusion, sickness, injured or disoriented, the entire group may strand instead of just the one affected dolphin or whale.

Disposal

If a whale is beached near an inhabited locality, the rotting carcass can pose a nuisance as well as a health risk. Such very large corpses are difficult to move. The whales are often towed back to sea away from shipping lanes, allowing them to decompose naturally, or they are towed out to sea and blown up with explosives. If the carcass is older, it is buried.

Health risks

A beached whale carcass should not be consumed. In 2002, fourteen Alaskans ate whale blubber from a beached whale, resulting in eight of them developing botulism, with two of the affected requiring mechanical ventilation (Middaugh et al., 2003). This is a possibility for any meat taken from an unpreserved carcass.

Measures to protect a stranded animal

If the animal is newly stranded it may still be alive but physiological stress will be weakening the animal by the minute. Check to see if the animal is alive by watching for breathing through the blowhole at the top of its head. Whales can hold their breaths for up to 15 minutes so you may not be able to tell however if the animal is breathing immediately. Notify the local authorities so that they can call a stranding network or local veterinarian. While waiting for help to arrive, you can keep the animal's skin moist with water or by draping it with a soaked cloth. Do not splash or cover the blowhole and do make sure that the blowhole is clear of water and sand. When help arrives it is possible that they may or may not be able to save the animal. If there is no help available, allow the animal to die in peace by simply leaving it alone and allowing no other people near it. Under no circumstances should you ever try to put the animal out of its misery. Stranding is a sad but very natural part of life.

References can be provided on request.

Bile Acids - Control of WFS on Shrimp

Shandong Longchang Animal Health Product Co.,Ltd ,
Website: www.sdlachance.com Phone/WhatsApp:+8618769722760, Email: fred@sdlachance.com

White feces(WFS) is the biggest headache problem to shrimp farming, the basic reason of WFS is the hepatopancreas problems, pathological tissue observation WFS is not food digestion after the feces. It is ductal epithelium, intestinal mucosal epithelium and proliferative cells. RUNEON bile acids can prevent WFS and improve the survival rate of shrimp, the addition of bile acids can promote the digestion and absorption of fat, improve the utilization of cholesterol and polyunsaturated fatty acids in shrimp, thus reducing the burden of hepatopancreas and ensure the health of hepatopancreas.

1.The symptom of WFS

In case of white feces, most of the excrement floats on the surface of the water. The excrement is white and slender (like cotton thread), which is viscous and easy to observe. However, it is not easy to handle and a large number of stinks are distributed. The shrimps with white feces, their hepatopancreas and instestine are swollen, vibrio infected when bacterial isolation. The shrimp feed normal at the initial stag, but with the aggravating illness, shrimps eat slow or not eat or thin bodied (shell meat separation), and accompanied by swimming and EMS.

2. RUNEON bile acids for shrimp white feces (WFS) control

- The addition of bile acids can promote the digestion and absorption of fat, improve the utilization of cholesterol and polyunsaturated fatty acids in shrimp, thus reducing the burden of hepatopancreas and ensure the health of hepatopancreas.

- Deoxycholic acid and ursodeoxycholic acid in bile acids can promote the secretion of large amounts of thin bile in liver cells, and discharge other harmful substances such as mycotoxins, heavy metals and drugs to the hepatopancreas with bile to reduce the damage of toxic substances to hepatopancreas. In addition, Bile acids can bind or decompose endotoxin in the intestine to prevent endotoxin from entering the liver via the intestinal mucosal barrier via the portal vein, reducing intestinal absorption of endotoxin and increasing the barrier function of the intestine, preventing endotoxin from affecting the intestine, hepatopancreas and even the whole Shrimp body harm.
- On the other hand, bile acids inhibit the excessive proliferation of intestinal bacteria and maintain the intestinal microflora as an effective bactericide. Because of the surface activity of bile acids, deoxycholic acid can destroy the bacterial cell membrane and make the cell integrity affected by Damage, thereby inhibiting the growth of bacteria, and even cause bacterial cell death. Exogenous bile acid supplementation increased bile secretion, so that the capacity of the bile pool in the intestine and liver circulation increased, liver bile acid secretion rate returned to normal levels, so that the intestine with increased concentration of bile acids, combined with bile acid in the intestine of small intestine Bacterial inhibition enhanced, thereby inhibiting intestinal bacterial overgrowth and reduce the incidence of bacterial translocation and endotoxemia;
- In short, the external environment led to shrimp internal liver, intestinal and other digestive organs lesions, is the main reason for white feces. Therefore, to improve water quality, sediment, hepatopancreas, gut health is the fundamental measure to solve the white feces.

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Factory: No. 1, Nanjappa Gounder Street, Therkku Thottam,
Linganur (P.O), P.N.Pudur, Coimbatore 641 041
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