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Inside...

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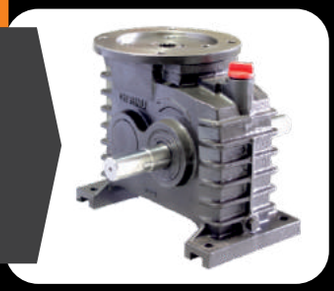

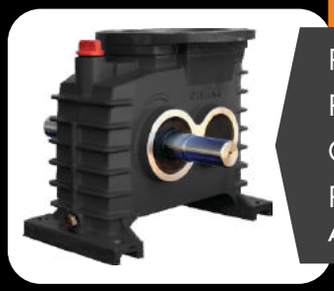

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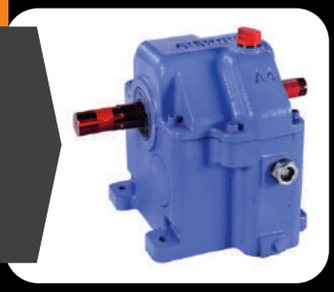

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Farmer has to be safe in the interest of all in the industry

Dear Readers,

The April 2021 issue of ***Aqua International*** is in your hands.

In the News section, you may find news about – India's Farmed Shrimp Sector in 2020: A White Paper by The Society of Aquaculture Professionals, India. SAP recently concluded a review of shrimp farming in India in 2020. In a series of virtual meetings held among industry stakeholders on January 29 - 30, 2021, the unanimous opinion was that farmed shrimp production declined from a record production of nearly 800,000 tonnes in 2019 to about 650,000 tonnes in 2020, a 19% drop. The present review also highlighted that while the Corona virus pandemic and related lockdown contributed to the decline, continuing production challenges due to a host of disease problems impacted the production quite significantly. Action by the stakeholders and the government is needed to address the challenges for the sustainable growth of the sector in the future.

A 2-day exhibition and interaction meet on aquaculture titled as Aquaculture Expo 2021 was held by Aqua International at Nellore, Andhra Pradesh, India, on 9 & 10 March 2021 with effective maintenance of Covid pandemic protocols. Issues of aquaculture sector in India were discussed in the deliberations during inaugural session and the interaction meet. The speakers in the expo strongly felt that Aquaculture farmer has to be safe in the interest of all in the industry, hence it is a must to make available quality seed, feed, other inputs, raw material storage facilities and a remunerative price to his produce – shrimp, fish, crabs etc species.

Coastal Aquaculture Authority opened CAA Facilitation Centre at Vijayawada on 18 March 2021.

The revolutionary policies taken by the Andhra Pradesh State Government for the last two years for the sustainable development of aquaculture sector stand as an ideal in the country, said Coastal Aquaculture Authority (CAA) Member Secretary Dr V. Kripa. Aquaculture Laws brought in for quality aqua products, registration process with deemed terms by 'E-Fish, E-Matsyakara' for aquaculture registration is very much appreciated. In Andhra Pradesh, which is No. 1 in cultivation, production and productivity, the rest of the states need to adopt the infrastructure provided by the Rythu Bharosa Kendralu (Farmer Assurance Centers) for the expansion of the aquaculture sector.

Even if you have required infrastructure facilities for manufacture of products in any sector, unless the promoter is open, creates awareness and takes up appropriate promotional activities, it is difficult to get established and prosper under today's circumstances and competitive nature of the business. Dr T. Chalamaiah Naidu, Chairman & Managing Director, Doctor's Vet Pharma Pvt Ltd took much time to identify the things and the factors, and now doing it the way it is required. He made the facilities in the factory in good standards. I had an Interview with Dr Chalamaiah who always insists that the policy makers, its implementing government agencies and the consumers should encourage the only companies who maintain label claims of health and nutrition products on the product containers.

Skretting invests $ US 6.1 million in construction of new shrimp research facility in Ecuador. Shrimp is the fastest growing aquaculture protein and is expected to grow globally around 4-5% per annum over the coming years. To support the sector with the latest R & D, Skretting is constructing a new facility in Ecuador to complement the Skretting Aquaculture Research Centre network.

Telangana government flagged off mobile fish outlet vehicles. Seventy vehicles will head for districts, says Talasani on 27 March 2021. Finance Minister Mr T. Harish Rao said the State government has brought about a paradigm shift in fisheries by developing it from import of fish to export. Earlier, the fisheries industry was understood as limited to Coastal Andhra, a notion which has been turned on its head by the Telangana government. Along with the Minister for Animal Husbandry and Fisheries Mr Talasani Srinivas Yadav, he flagged off 117 vehicles, which had been distributed to women beneficiaries from self help groups for them to run mobile fish retail outlets.

Telangana's fish will have higher demand as they are fresh water fish, Mr Harish Rao said, and elaborated that all the tanks in the State are being filled with water from Krishna and Godvari rivers

Contd on next page

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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which will help in fish yield. Government is determined to give a fillip to vocational trades, and for fishermen, so far ₽ 1000 crore have been spent.

The Online Training 'Application of Drugs and Chemicals in Aquaculture' was organized by Kolkata Centre of ICAR-CIFE on 27 March 2021. Dr S. N. Ojha, Principal Scientist, ICAR-CIFE, Mumbai delivered introductory lecture on PMMSY; 1st main speaker was Dr S. K. Manna, PS, ICAR-CIFRI, Barrack pore who spoke on 'Antimicrobial drugs and chemicals applied in aquaculture'. He mentioned that in India, viral disease occur in Tilapia nilotica, fungal diseases in carps mostly in reservoirs and wetlands; bacteria and fungus cause disease in winter when fishes are stressed; fish disease uncontrollable when pond water quality is bad with more organic matter and subsequently NH3 (H2S in shrimp ponds).

In the Articles section the Article titled Nursery System- An emerging concept to mitigate risk in shrimp culture written by Mr Ravi Kumar B. highlighted that shrimp nursery and its importance. How profitable shrimp culture can be carried out with the help of nursery. How to successfully handle nursery system. Take away message- using nursery system can lessen the burden on both culture and ecosystem, besides lowering the risks of outbreaks and losses.

Another article titled Sea Pen – An Unique form of Soft Coral written by R. Hamsavalli and other authors highlighted that "Sea Pens"are one of the most unique forms of "soft corals" or octocorals, belonging to the order Pennatulcea, which are colonial invertebrate marine animals. Morphological diversity within the Pennatulacea is remarkable which includes an excellent sort of growth forms such as plumose, umbellate, clavate, foliate, capitates, digitiform, whip-like, or vermiform.Sea Pens possess a cosmopolitan distribution, that means theyare encountered across world's ocean from poles to equator in tropic and temperate waters, virtually at all depths (intertidal to over 6100 meters).Species from the order Pennatulacea are known for the production of briarane, cembrane and similar diterpenes.Molecular aspects of Sea Pen related to their phylogeny, evolution etc., are still remains unexplored areas and it will also be beneficial if molecular markers are developed for Sea Pen for accurate identification.

Article titled The Nutritional benefits and commercial significance of seaweeds written by S. Sundhar and other authors highlighted that Sea weeds are macro algae growing abundantly in the shallow stretches of the marine coastal environment. They grow attached to substrates such as sand, mud, rocks, and shells and common in tropical and temperate parts of the globe. Depending on their pigmentation sea weeds areclassified into Rhodophyta (red), Phaeophyta (brown) and Chlorophyta (green). Seaweeds are ecologically significant as theyprovide a unique habitat for essential nursery for fishes and other marine organisms. Seaweeds are also nutritionally valuable as fresh, dried and ingredients in different foods.

Readers are invited to send their views and comments on the news, special feature and articles published in the magazine which would be published under "Readers Column". Time to time, we shall try to update you on various aspects of Aquaculture sector. Keep reading the magazine regularly and update yourself. Wish you all fruitful results in your efforts

M.A.Nazeer
Editor & Publisher
Aqua International

India's Farmed Shrimp Sector in 2020:
A White Paper by The SAP, India

22 February 2021:

Summary

Society of Aquaculture Professionals (SAP) recently concluded a review of shrimp farming in India in 2020. In a series of virtual meetings held among industry stakeholders on January 29-30, 2021, the unanimous opinion was that farmed shrimp production declined from a record production of nearly 800,000 tonnes in 2019 to about 650,000 tonnes in 2020, a 19% drop. Earlier forecasts in meetings organized by SAP in 2020 were nearly 30%, so the actual decline was less than what was predicted. The present review also highlighted that while the coronavirus pandemic and related lockdown contributed to the decline, continuing production challenges due to a host of disease problems impacted the production quite significantly. Action by the stakeholders and the government is needed to address the challenges for the sustainable growth of the sector in the future. Following are needed if India needs to grow to the targeted production of 1.4 million tonnes by 2024:

- Resolve shrimp health issues on a priority basis:
  - Continue to fund, strengthen and make relevant and accountable the national aquatic animal disease surveillance with an exclusive focus on shrimp
  - Undertake epidemiological and other studies to understand the extent and underlying cause of white fecal disease, running mortality syndrome and other emerging diseases in shrimp farming and development treatments for the diseases
- Increase carrying capacity of the ecosystems that support shrimp production:
  - Educate farmers about the best aquaculture practices that enhance carrying capacity of their production systems and minimize organic loading of the ecosystem that supplies their water
  - Dredge the creeks supplying water for the farms and keep the bar mouth open for tidal action that improves water quality along the creeks
- Expand and diversify the markets:
  - Develop or participate in a global program to promote shrimp consumption in the major markets, especially USA, where consumption has remained stagnant while global production of farmed shrimp keeps increasing
  - Regain markets in Europe, Japan, and other countries
  - Invest in the Made in India shrimp branding
  - Develop the domestic market for shrimp in India

Farmed Shrimp Production in Major Regions

Drawing the knowledge of SAP's members who live in major shrimp farming regions of the country, the organization estimated regional production figures which are as following:

Region	Estimated Production in 2020 (in Tonnes)
West Bengal	50,000
Odisha	55,000
Northern Andhra Pradesh (Srikakulam to East Godavari districts)	126,000
West Godavari District in A.P	135,000
Krishna District in A.P	70,000
Southern Andhra Pradesh (Guntur to Nellore districts)	106,400
Tamil Nadu	21,000
Gujarat	23,400
Other States*	7,000
Unaccounted**	56,125
Total production in India	650,000
Total of Andhra Pradesh	4,37,400

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Probiotics
for water treatment

1. WATER QUALITY CONDITIONING

Best choice of *Bacillus* spp. that rapidly decompose uneaten feed, feces and other organic substances in pond water, keeps water quality optimal

2. HIGH ACTIVITY OF SPORES

No cultivation is needed. Easily adapt to the changes of surroundings and grow fast in freshwater or seawater culture farming, even under low oxygen environment

3. DECREASE AMMONIA CONTENT

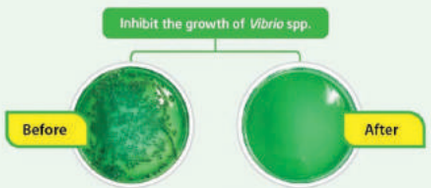
Prevent the accumulation of toxic substances such as NH_3, NO_2, etc.

4. IMPROVE WATER COLOR

Improve water color regulate the algae and bacteria balance in water, turning your pond from green to clear

5. ESTABLISH BALANCED POND BACTERIA SYSTEM

Compete nutrition with vibrio and inhibit them to grow. Provide nutrition for probiotics in the pond, to establish a well-balanced farming system.



6. INCREASE AQUACULTURE PRODUCTION

Good quality of water prevents fish/prawn infections, making high profit of production

* COMPOSITION:

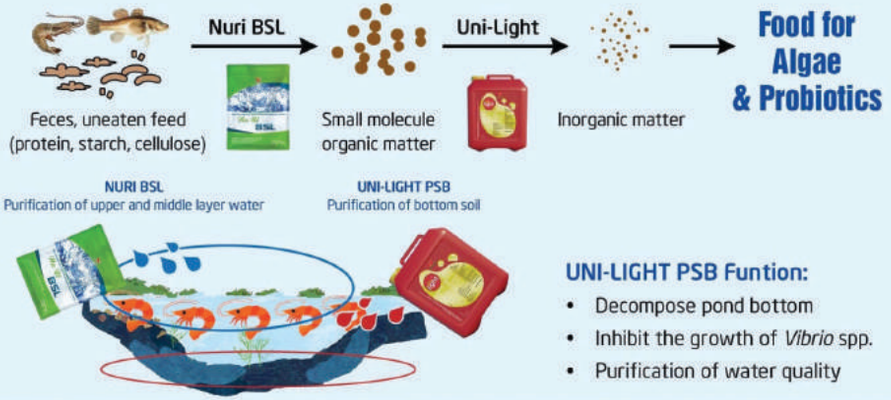
Bacillus spp. > 1x 10^{11} cfu/kg	15%
(Bacillus subtilis, Bacillus amyloliquefaciens, Bacillus licheniformis)	
Carrier (rice bran, corn gluten)	75%
Moisture	10%

* STORAGE:

Keep at dry, well-ventilated condition. Avoid direct sunlight exposure and use as soon as possible once opened for best quality.

* DIRECTION OF USE:

No cultivation is needed. Apply Nuri BSL with water-soluble bag near to the working water wheel or pour into the pond evenly. Recommend apply Uni-Light PSB together with Nuri-BSL on sunny day to achieve a clear pond more efficiently.



UNI-LIGHT PSB Funtion:

- Decompose pond bottom
- Inhibit the growth of *Vibrio* spp.
- Purification of water quality

BSL Dosage:

/10,000 m² Quantity	10 - 30 pl/m² tiger prawn or < 80 pl/m² Vannamei	For >30 pl/m² tiger prawn or > 80 pl/m² Vannamei	For > 150 pl/m² Vannamei
7 days before stocking	800 g - 1,000 g	1,200 - 1,500 g	1,200 - 1,500 g
Day of stocking	300 g - 500 g	800 g - 1,000 g	800 g - 1,000 g
Every 7 - 10 days after stocking	300 g - 500 g	800 g - 1,000 g	3 - 5 days / use 1,000g - 2,000g

****Dosages can be adjusted according to the water conditions and practices.*

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* The states of Kerala, Karnataka, Goa, Maharashtra, Punjab, Haryana and Rajasthan. Specific reviews of farmed shrimp production in 2020 in these states were not conducted in 2021. Instead production estimates for 2019 were used to arrive at the 2020 figures.

** SAP estimates from the export figures published by the Government that the total farmed production would have been between 630,000 to 670,000 tonnes. The large variance is due to the uncertainty in production that reaches domestic markets. The average figure of 650,000 tonnes is taken as a reasonable estimate of national production in 2020 and the difference between what was estimated for all production regions and 650,000 tonnes is presented as the unaccounted figure.

Presenting information from the states of West Bengal and Odisha, Mr Shrinibas Mohanty of Avanti Feeds estimated that the two states registered a decline of 15-20%, and West Bengal was more impacted than Odisha. Whereas stocking in these states normally commenced in mid-February and continued on till the end of April, reduced seed availability during the lockdown meant that major stocking happened during the May-June period in 2020. The incidence of the White Spot Syndrome Virus (WSSV) was higher and more severe, and there was a high incidence of the Running Mortality Syndrome (RMS) in the second half of the year resulting in lower production.

In the Northern Andhra Pradesh districts ranging from Srikakulam to East Godavari, farmed shrimp production declined by about 16% in 2020 according to Mr V. Punnaivanam of The Waterbase Limited. Panic harvesting during the early stages of lockdown and subsequent disruptions accounted for most of the production loss. The region actually performed better in the last six months of 2020 when compared to the first months of the year and the last six months of 2019. However, *Enterocytozoon hepatopenaei* (EHP), the microsporidian that causes stunted growth, was spreading in the mostly low saline areas of the region. But, farmers investing in infrastructure for improved biosecurity were seeing good results in the control of EHP as well as White Feces Disease (WFD) even in seawater farms. Farmers were anyway switching to shorter and more frequent crops. Combined with controlled feeding this practice reduced the Feed Conversion Ratio (FCR), and production costs.

In West Godavari, the district of Andhra Pradesh that produces more shrimp than any other district and more than even entire states outside of AP, saw about 20% drop in production in 2020. In the adjoining district of Krishna which also produces large quantities of shrimp, the drop is estimated to be about 10%. As per Mr Bangaru Ravikumar of Growel Feeds who presented the data from these two districts, arriving at precise production estimates in both districts is challenging due to the prevalent practice of polyculture of shrimp with fish in low salinity waters. While the pandemic-related lockdown was partly to blame for the production losses, weather-related events, particularly the premature drop in temperature in the last six months of the year and associated increases in the incidence of WSSV and decreased growth contributed to the decline. However, persistence of EHP and WFD in the two districts was more a concern than WSSV. While the problems were less in low salinity waters, the practice of many farmers to attempt multiple crops without draining the water and drying the pond bottom in between the crops was leading to production challenges.

Mr A. Kumaresan of Sheng Long Bio-tech India Pvt Ltd reported that the southern districts of AP which had seen lack of rains for a number of past years and resulting decline in the quality of water in creeks and borewells experienced good rainfall in 2020. The overall production from the region increased due to this reason, although premature harvest prior to the cyclone Nivar, damage to some farms due to the cyclone, and the high incidence of WSSV post-cyclone reduced production to some extent in the second crop.

Reporting on the state of Tamil Nadu, Mr Kumaresan said that the state saw about 17% increase in the farmed production of shrimp in 2020 which was attributed to sufficient rains in the state. With only about 2700 hectares in production, higher than national average in stocking density where 41-60% of the farms stocked at 40-60 shrimp/sq.m., and lower disease incidences, the state recorded a high productivity close to four tonnes per hectare per cycle.

Mr Jignesh Contractor of Vaishnavi Aquatech presented data from Gujarat, the only major shrimp farming state in the west coast of India which has seen dwindling fortunes in shrimp farming in the past few years. From its peak of nearly 50,000 tonnes in 2017, the state has dropped to nearly 23,000 tonnes in 2020 causing a grave concern. Due to cooler weather, rains in the middle of the growing season, the state mostly raises only one crop a year. Its dependence on seed supplies from hatcheries on the East Coast and shortage of migrant labour during the pandemic caused part of the production decline. Continuing production challenges due to the rapid expansion of farming in the past decade caused the other part of the decline. Many farmers practiced nurseries and some of them were highly successful. Introduction of disease resistant lines of shrimp in 2020 resulted in the management of crops amidst diseases in the state. Black tiger shrimp due to its ability to grow fast to reach a large size was always favored in the state due to the crop in Gujarat being restricted to a single crop a year. The availability of Specific Pathogen Free black tiger shrimp in 2021 would result in large scale trials with the shrimp, but farmers would still prefer to go for shorter crops of 110-120 days to minimize their risk, Mr Contractor predicted.

Production Factors in 2020

A survey of the regional trends in production factors among the contributors of the 2020 review revealed the following:

- Stocking densities in most regions are primarily in the 20-40 shrimp/

sq.m. range. Only in the southern districts of AP and in the states of West Bengal and Tamil Nadu, stocking densities of 41-60 shrimp/sq.m. occur as widely or in greater proportion than 20-40 shrimp/sq.m.

- Length of crops have shortened to 110 days and even 90 days in most production regions. Wherever it is feasible, farmers go for three crops a year and even four crops.
- Most of India produced shrimp in the size range of 10-16 g (61-100 count) while the states of West Bengal and Odisha produced primarily 16-25 g shrimp (41-60 count), and Gujarat mostly targeted the production of 25-33 g shrimp (31-40 count).
- All regions reported that Diseases were the Most Challenging aspect of their shrimp production. Less than 25% of the lost production was due to diseases, said respondents from West Bengal, Odisha, southern AP and Tamil Nadu, but respondents from Gujarat, Northern AP, West Godavari and Krishna said that 25-50% of the production losses were due to diseases. WSSV was considered to be most menace by a majority while EHP and WFD were ranked to be # 2 and # 3 concerns by those in Andhra Pradesh, and Tamil Nadu while Running Mortality was ranked to be the # 2 concern in West Bengal and Odisha where EHP was ranked to be the # 4 concern.
- Lockdown and farm gate prices of shrimp were flagged to be the most challenging aspects of production in 2020 by 75% of the respondents.
- Cost of production was considered as a key constraint by 50% of the respondents. Those in West Godavari, southern AP, Tamil Nadu and Gujarat said cost of production was a challenge.
- Availability of credit was identified as a major challenge by respondents from Gujarat, West Bengal, and Odisha.
- The respondents predicted that West Bengal, Odisha, Northern AP, Krishna, Southern AP and Tamil Nadu to produce more shrimp in 2021 when compared to 2020; West Godavari to maintain its shrimp production as in 2020; and Gujarat to register a further decline in 2021.

Sectoral Assessments: 1. Hatcheries

Mr Ravi Kumar Yellanki, the immediate Past President of SAP as well as the Managing Director of one of the largest shrimp larval producers in India (Vaisakhi Bio-marine Pvt. Ltd. & Vaisakhi Bio-resources Pvt. Ltd), presented on the status of the hatchery sector in India in 2020. He said that 500+ shrimp hatcheries in India produced 70 billion PL in 2020 despite the lockdown causing disruptions in the import of broodstock and vital supplies like the bloodworm. About 70 large hatcheries belonging to one of twenty firms in the business accounted for about 57% of the production indicating the degree of consolidation happening in a presently fragmented market. The sector imported 252,000 broodstock in 2020 despite the lockdown stopping imports in April and May, the peak production periods for the hatcheries. Broodstock supplies were dominated by the Shrimp Improvement Systems (150,000 broodstock) and Kona Bay Marine Resources (90,000 broodstock). Due to the reduced shrimp production in 2020, shrimp productivity expressed as tonnes/million PL production fell from 11.18 in 2019 to 9.28 in 2020. The continuing drop in this productivity index is a cause of concern, he warned. In 2021 he expects the hatchery sector to produce about the same quantity of PL as in 2020, the PL prices to be stable but remain low, and performance verdicts to be pronounced on the newly introduced disease tolerant and balanced lines.

Sectoral Assessments: 2. Shrimp Health Management

Some of India's well known shrimp health experts from both public research and private sector participated in the panel discussions on the status of shrimp health in 2020.

Dr Shankar Alavandi of the Central Institute of Brackishwater Aquaculture (CIBA) informed that disease surveillance by CIBA has shown a rise in non-infectious diseases like WFD and RMS in farmed shrimp in 2020 and these diseases previously seasonal now occur throughout the year. The occurrence of Infectious Myonecrosis Virus (IMNV) in a landlocked state like Haryana means that infected post-larvae are entering into the production systems. He said that CIBA has estimated that EHP and WFD cause losses of about Rupees 4000 crores (551 million USD) and 1700 crores (234 million USD), respectively. He expects the second phase of the shrimp disease surveillance to be funded.

Dr A.S. Shahul Hameed of the OIE Reference Lab at the Abdul Hakeem College spoke about a new strain of WSSV discovered in 2015. Genomic analysis of this strain shows large deletions of the typical WSSV genome. The new strain is the smallest of all WSSV strains and appears to be unique to India. It has a short replication time and therefore is highly virulent. Subsequent studies show that this strain has fully replaced the previous strain in India.

Mr D. Ramraj, the President of the All India Shrimp Hatchery Association and a renowned shrimp pathologist from the private sector drew attention to the increasing occurrence of shrimp showing necrotic muscle tissues. He also expressed concern about the emergence of slow growth in many farming areas. He said that diseases are the primary cause of production decline and urged surveillance programs to seek private sector support and in turn support the private sector with their findings. He asked the farmers to go back to the basics like pond preparation. He cautioned against the indiscriminate adoption of the biofloc technology which may actually create the breeding grounds for many pathogens. He asked the government to facilitate SPF polychaete production which would improve biosecurity in hatcheries, and therefore in farms too.

Mr Bangaru Ravikumar of Growel Feeds shared data from the shrimp samples submitted to his company's diagnostic labs and highlighted how the incidence of EHP is rising in the last three years while WSSV has been in retreat in the West Godavari and Krishna districts. He said that in

polyculture, shrimp do well when stocked in low densities. But, when stocked at high densities, diseases proliferate.

Dr Patchala Srinivas of Avanti Feeds shared the disease occurrence data from southern AP showing that WFD, EHP, RMS and White Muscle Disease are major reasons for the loss of shrimp in farming. He also noted the increasing occurrence of white muscle disease. Dr Amerneni Ravikumar of Alpha Biologicals mentioned that histopathological analysis of vannamei showing symptoms of loose shel point out that the animals may have the Idiopathic Hyaline Granulomatous Syndrome (IHGS).

The panel recommended the continuation of the national surveillance program on shrimp diseases and include in it stakeholder participation. It also urged the private sector to follow basic principles of biosecurity and Good Farming practices.

Sectoral Assessments: 3. Shrimp Processing & Exports

In a panel discussion participated by Mr Anil Kumar, the Joint Director of the Marine Products Export Development Authority (MPEDA), Mr Elias Sait, the Secretary General of the Seafood Exporters Association of India (SEAI), Mr Nitin Awasthi of East India Securities, Mr Abdul Razzak Ganj of Liberty Seafoods, Mr Pawan Kumar Gunturu of Sprint Exports, and Mr Ravi Kumar Yellanki, the Immediate Past President of SAP, and moderated by the Founder President of SAP Mr S. Santhanakrishnan, concerns related to the competitiveness of India's shrimp exports were addressed.

Mr Nitin Awasthi highlighted the overdependence on the US market by India and that the US market itself has not grown much. Ecuador, losing the penetration of its favorite market, China, now directs its products to the US. India's cost of production is expected to rise in the face of rising cost of feed ingredients. Government's export incentive policy has been changed and there was an apparent lack of clarity that was detrimental to investments in the export-oriented business in the short term.

Mr Elias Sait expressed that he was optimistic on the outlook for India's export market. Admitting that 2020 has seen fallen production and the export sector had to tackle several challenges such as migrant labor crisis, shortages in the availability of containers, and reduced access to the China market due to the pandemic and lockdown, he expressed supreme confidence on the enterprising nature of India's farmers to keep the cost of production under control. He said that the alternative to the export incentive scheme looks equally attractive and exhorted the stakeholders and the Government to come up with a plan to support achieving the target of 1.5 million tonnes of farmed shrimp production and total marine product export revenue of 15 billion USD (approximately 108,000 crore rupees) by 2025.

Mr Ravi Kumar Yellanki opined that Ecuador is not well placed to supply the US market because the country's high labor cost does not allow it to cost effectively do value addition. Mr Pawan Kumar Gunturu endorsed the view saying that shrimp prices in Ecuador have fallen. Once Ecuador is able to access the China market, the country will redirect from the US to the China market. He predicted a V shaped recovery of the markets and things beginning to normalize in the middle of 2021.

Mr Anil Kumar said that the recent inclusion of seafood in the US dietary guidelines is a positive step towards increasing seafood consumption in the USA and Indian shrimp exports can definitely gain from this development. The MPEDA is implementing National Residue Control Programme (NRCP) and under the NRCP antibiotic residues in over 7,000 samples collected across the farmed shrimp value chain from hatchery, farm, feed and processing units are monitored. MPEDA has found good progress in the reduction of antibiotic residues in farmed shrimp in the last three years. There is a decline in rejection due to antibiotic residue in shrimp exported to the EU. The rejections have come down to just four shipments from the high of 13 shipments in 2018 and there have been no rejection during the last 6 months. Recently Japan has removed the antibiotic testing for export of Black Tiger shrimp from India which is a positive development. However the requirement of many markets for frozen shrimp to be free of WSSV and other OIE listed diseases is emerging as a new market access challenge. Continuation of the National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) and identification of disease free zones in the future will be crucial for the sustainable growth of shrimp farming in the future.

Priority Actions Needed for Sustainable Growth of Farmed Shrimp in India

1. Resolve shrimp health issues on a priority basis:

The stakeholders unanimously agree that shrimp health issues are the most challenging to manage in shrimp farming. Productivity of shrimp farming has fallen precipitously due to diseases until Specific Pathogen Free vannamei shrimp were introduced in India. After nearly a decade of the introduction, productivity is again falling for the past few years due to diseases. Without proper control, diseases will derail the progress in shrimp production. It is in this background that a focused disease surveillance becomes critical for the sustenance of the shrimp sector.

The Government of India had put in place the National Surveillance Program for Aquatic Animal Diseases (NSPAAD) with substantial financial support but this program was broad-based covering all aquatic animals and involving about 25 institutions. Unfortunately, NSPAAD has not given substantive outputs for the benefit of the shrimp sector which is the most important aquaculture sector in the country.

SAP recommends that the future surveillance programs should be centred around the following:

- Have a separate and exclusive surveillance program for shrimp diseases
- Limit the number of institutions for the surveillance: perhaps one nodal institute with 4-5 supporting institutions
- SAP with its 500+ member base and most members being professionals

in the private sector offers itself as the industry's strategic partner for real time disease information and sample collection
- Channel the financial resources to sample collection and diagnosis rather than replicating infrastructure available in the institutions as India has a multitude of diagnostic facilities in both the Government and the Private sector
- The Shrimp disease surveillance program should have an association with a network of leading disease research labs abroad to share and benefit from their expertise (That in 40 years of Shrimp farming, no new diseases have ever been reported from India points to the fact that there is a gap in the diagnosis of emerging and new diseases)
- The Surveillance program should come out with models of disease outbreaks and and directives on crop planning to mitigate diseases.

Additionally, research institutions are urged to take up epidemiological studies and other field studies to understand the extent, patterns, cofactors and underlying causes of white fecal disease, running mortality syndrome and other emerging diseases in India. If these diseases are caused by a pathogen, diagnostic methods need to be developed. Treatments and control measures for the diseases should also be developed based on research.

2. Increase carrying capacity of the ecosystems that support shrimp production:

Data from India and other major shrimp producing countries of the world have established that shrimp farming is limited by the capacity of the ponds' as well as the surrounding environment to maintain water and soil quality to sustain production. When the environment is polluted, shrimp farming is greatly affected. A pond ecosystem has a defined capacity in terms of how many animals it can hold at a maximum. A creek ecosystem has a defined capacity in terms of how many hectares of ponds it can host at a maximum. This carrying capacity can be increased by technology, for example, by installation of aerators to increase oxygen content in pond water or by remediation of wastes in the pond.

SAP recommends that the following steps are taken to address carrying capacity concerns in shrimp farming:
- Farmers need to be educated about and trained on the principles of carrying capacity of not only their ponds but the ecosystem from which their resources, most importantly water, are drawn. These principles are already incorporated in the best aquaculture practices recommended by national and international agencies and certification programs. SAP will strive to reach out to the farmers on the importance of understanding and applying the best aquaculture practices in their operations while it requests other stakeholder organizations, commercial and government institutions to emphasize the same in their farmer outreach programs.
- We would like the state and central government agencies to undertake activities such as dredging the creeks that supply water to the farms and keeping the bar mouth open for tidal action that improves water quality along the creeks. Funds from the Centrally Sponsored Schemes of the Pradhan Mantri Matsya Sampada Yojana may be directed towards this purpose. Additionally, the beneficiary-oriented schemes of PMMSY and the Fisheries Infrastructure Development Fund should be allocated for farmers who want to upgrade their farm infrastructure for the purpose of enhancing the carrying capacity of the farms.

3. Expand and diversify the markets:

The coronavirus pandemic saw global seafood production and demand being impacted in an unprecedented manner. Though the prices of shrimp plunged in the early days of the lockdown, they resumed to reasonable levels later. But, market volatility and uncertainty continue to influence prices as global shrimp production has more or less remained steady. Expansion of the market is required for further growth of the farmed shrimp sector in India. SAP recommends the following actions:
- India's shrimp is highly dependent on the USA market which has remained stagnant. So, India has to either develop on its own program or participate in a global program to promote shrimp consumption in the major markets, especially the USA. Global Aquaculture Alliance (GAA), an international body that promotes sustainable aquaculture, has put forward the idea of collective promotion of shrimp in the USA market by major producers by using a model used successfully by the avocado fruit producers in the market. SAP urges the government to study GAA's proposal and decide whether it wants to support the proposal or develop an alternative plan.
- Support efforts to regain markets in Europe, Japan, and other countries
- Invest in a Made in India shrimp branding that can distinguish our shrimp in a global market
- Develop the domestic market for shrimp in India. With a large population and increasing economic prosperity, shrimp is a tasty, healthy, and easy-to-prepare food that will win wide consumer acceptance provided there is adequate promotion and accessibility to the products in the marketplace. A national plan for promoting shrimp consumption and ensuring logistics for the supply is needed now.

Conclusions

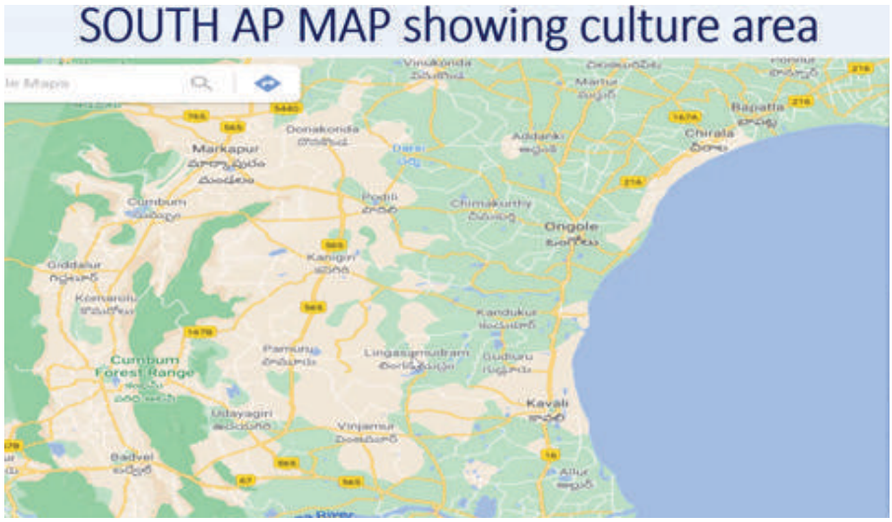
Farmed shrimp production in 2020 declined by about 19% to reach an estimated level of 650,000 tonnes. Covid-19 pandemic and the lockdown of 2020 had an immediate as well as lasting negative impact on shrimp farming, processing and exports. However, production losses due to diseases continue to mount and require urgent attention. While farmers are adapting measures such as short crop cycles, nurseries and the use of functional feeds to counter the problems, much productivity loss can be averted if diseases are managed well. National level surveillance of shrimp diseases needs to continue but with greater focus and accountability. Producers need to follow the principles of sustainable farming, especially in the areas of

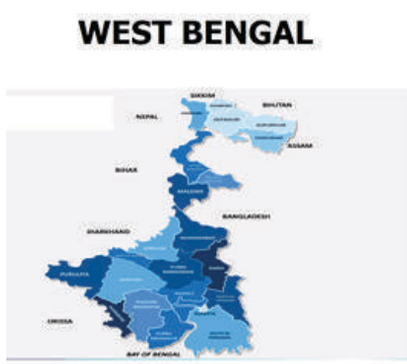
pond preparation, on-farm biosecurity measures, seed selection, stocking and farm management. At a higher level, understanding the carrying capacity of the ecosystem that supports the farming as well as the individual farming units themselves is of utmost importance. Investments in the improvement of infrastructure to support the farming intensity, and choice of the right genetics for the production systems would be critical to success in challenging times. Aquaculture professionals will need to familiarize themselves with the science and practices behind these requirements and carry the messages to other stakeholders in an effective manner. Sectorally, India has some of the best-in-class infrastructure for seed production, feeds and seafood processing. Progress has been made in lowering antibiotic residues in shrimp and value addition at considerable cost efficiency. Excessive reliance on the US market for frozen shrimp is a cause of concern and market expansion and diversification, including investment in a global campaign to promote shrimp consumption and the development of a domestic market, are needed to reach the targets of 1.5 million tonnes of farmed shrimp and a total marine product export revenues of about 15 billion USD (approximately 108,000 crore Indian Rupees) by 2025.

Acknowledgments: SAP thanks S. Chandrasekhar (Past President), Ravi Kumar Yellanki (Immediate Past President), S. Santhanakrishnan (Founder President), K. Madhusudan Reddy (Vice President, Events) and Senthil Kumar (Coordinator) for the organization of the review that led to this white paper. Gratitude is expressed to all review contributors who have been identified in the white paper. D. Ramraj (President of the All India Shrimp Hatchery Association) and Elias Sait (Secretary General of the Seafood Exporters Association of India) contributed substantially to the development of the white paper. Questions and comments on the report shall be addressed to Victor Suresh, President of SAP for the 2020-22 term at President@aquaprofessional.org

Predominant Size of Shrimp Produced	
Period	**Count**
January - June 2020	50-100 Count
July- Till Date 2020	60-100 Count

Ranking of Production Problems in 2020	
Rank	**Problem**
1(Most Severe)	WSSV
2	White Faeces
3	Weather-related events like rains, floods
4	Covid 19 Crisis
5	EHP / Running Mortality
6 (Least Severe)	Others





IDMA and VICTAM EMEA 2021 will take place in May 2021 at Istanbul

26 February 2021, Istanbul, Turkey: As the world cautiously attempts to retake momentum at the tail-end of the pandemic, Victam Corporation and Parantez Group are excited to announce that the IDMA and Victam EMEA exhibition and conference will be held from May 27th – 29th of 2021 at the Istanbul Expo Center in Istanbul, Turkey.

The decision to proceed was based on several factors, primarily the relative stability and positive forecasts of the Covid-19 situation in Turkey. Vaccination programs currently underway in several countries across the globe are expected to bring some global relief in the second quarter of this year. As such the Turkish government has allowed business events to proceed biding all measures are taken.

Uncertainty as to whether the event would take place, has led to hesitation amongst international exhibitors. Turkish companies however, are noticeably more positive and many have confirmed their participation. In spite of the global uncertainty, the event has sold over 5.000 square meters, surpassing its pre-pandemic expectation.

In light of the positive market reception and with the event three months away, we have created an alternative exhibition format for international companies keen on being present, yet unable to commit to travelling. We are offering a hybrid on-line/off-line presence which allows companies to exhibit with a fully-branded and equipped stand including a local bi-lingual host to welcome and connect visitors to the exhibiting team at the office via live-stream.

We are confident that this hybrid participation format will enable international exhibitors to tap into this market potential with the brand presence and personal contact with targeted industry contacts (via live-stream) that one is accustomed to at events, whilst not bearing risk. Exhibitors will be 100% refunded should the event not be able to take place at this date.

Throughout the challenging circumstances at present, we uphold our mission to present a strong and value-adding industry event with high benefits for all parties involved. The IDMA and Victam EMEA event is strongly supported by associations from Turkey and many other countries in the Middle East and North Africa.

The event will take place in accordance with the Turkish Covid-19 safety measures to ensure the safety of all participants.

For more information about the event or to find out more about the hybrid on-line/off-line participation, please >> e-mail:expo@victam.com, call: +31 33 246 4404 or visit the official websites: www.idmavictam.com.

Sebas van den Ende, General Manager, VICTAM Corporation and Mrs Zübeyde Kavraz, Chairwoman, Parantez Group.

For more information, please contact:

Mr Ahmet Acikgoz (Parantez), ahmet@parantezgroup.com

DRAFT PAPER ON BLUE ECONOMY

Politicos, fishery experts in Kerala voice concern

Kochi, 18 March 2021: The draft paper on Blue Economy released by the Ministry of Earth Sciences had stirred a controversy with political parties and experts in the fishery sector in Kerala voicing concern.

The draft policy has outlined the scope and strategy to exploit the rich oceanic resources.

Kerala Opposition and senior Congress leader Mr Ramesh Chennithala has urged Prime Minister Narendra Modi to abstain from implementing it until the provisions detrimental to the fishing community are reviewed. Foreign direct investment (FDI) in the fishery sector would be favourable to capital intensive enterprises and the opening up of deep-sea fishing to multi-nationals would reduce the fishermen community to become mere workers.

The draft proposal aims at creating a National Placer Mission to harness the coastal and offshore placer minerals including strategic ones such as nickel, uranium, copper, thorium, titanium, poly-metallic sulphides among others.

According to experts in the fishery sector, the period granted for sending suggestions and ideas is too short and the dates of submitting suggestions must be extended to April 27. The draft policy was published on 17 February 2021 and the last date for giving views was 27 February 2021.

Mr B. Madhusoodana Kurup, founder Vice-Chancellor, Kerala University of Fisheries and Ocean Studies, said, the mining will cause the dispersal of slurry and plumes that can spread over extensively which would reduce the primary productivity alarmingly and also affect the growth and survival of living organisms, he said.

A fishery expert in a government agency told *Business Line* that the Blue Economy is a broad concept that and "the current controversies are related to other sectors like mineral explorations in the seas, allowing FDI etc," he said.

Courtesy: *The Hindu Business Line*

CAA Facilitation Centre inaugurated at Vijayawada

Dr V. Kripa presenting the CAA Registration Certificate to a female Aqua farmer

Amaravati, 18 March 2021: Commissioner of Fisheries K. Kannababu and Coastal Aquaculture Authority (CAA), Chennai, Member-Secretary V. Kripa inaugurated the Extended Office of the CAA, a facilitation centre, on the premises of the office of the Fisheries Commissioner at Poranki,Vijayawada on 18 March 2021.

The revolutionary policies taken by the Andhra Pradesh State Government for the last two years for the sustainable development of aquaculture sector stand as an ideal in the country, said Coastal Aquaculture Authority (CAA) Member Secretary Dr V. Kripa. Aquaculture Laws brought in for quality aqua products, registration process with deemed terms by 'E-Fish, E-Matsyakara' for aquaculture registration is very much appreciated. In Andhra Pradesh, which is No. 1 in cultivation, production and productivity, the rest of the states need to adopt the infrastructure provided by the Rythu Bharosa Kendralu (Farmer Assurance Centers) for the expansion of the aquaculture sector.

On 18 March 2021, she inaugurated the first AP Facilitation Center in the country set up at the Vijayawada Fisheries Commissioner's Office. On this occasion, she said that with the establishment of the Facilitation Center, 100 percent registration / entry / enrollment of aquaculture cultivation and business activities is possible. The center will monitor the use of brooder, seed, feed, aqua related products, inputs quality, control and use of antibiotics in the hatcheries.

- A.P is leading in cultivation, productivity & exports.
- The first CAA Facilitation Center in the country started in Vijayawada.

Rs 720 crore electricity subsidy for Aqua farmers

Commissioner of Fisheries of Andhra Pradesh, Mr Kannababu said the state has enacted the A.P State Aquaculture Development Authority (APSADA), A.P Fish Feed and Aquaculture Seed Acts to regulate aquaculture and commercial activities. The state government is paying a subsidy of Rs 720 crore annually to provide electricity per unit at Rs. 1.50 per for aqua farmers. Cooperation is being provided to aqua farmers in all ways. He said that as a result of the efforts made by the state government for two years, the first facilitation center has been set up by CAA in our state. The Center would be very useful in promoting the cultivation of Pasupupeeta and Pandugappa along with Vannamei prawns which grow only in salt water ponds. Identity >>

>> cards were given to aqua farmers who registered at the facilitation center. In the program, Additional Directors M. A. Yakub Basha, P. Koteswara Rao, Joint Director P. Shankar Rao, All India Shrimp Hatcheries Association President D. Ramraju, Secretary Madhusudhana Reddy, Dr Nagesh of Bapatla and others took part.

'Agri laws allow farmers to invoke force majeure'

Mangaluru, 19 March 2021: The Union Minister for Agriculture and Farmers Welfare has said that the Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020 ensures that no recovery shall be made from the farmer if the default by the farmer is due to force majeure.

In a written reply to a question by Anand Sharma, Member of Parliament, in Rajya Sabha on Friday, Tomar said the Act stipulates that the farmers can enter into a written agreement to sell their produce even before sowing their crops which will guarantee them to get assured price of their crop or produce. Hence, it mitigates the risk for the farmers and enhances their income.

"Agreement will cover only the crops of the farmers and not the land, and hence the sale of land, lease or mortgage is completely prohibited. Farmer's land is protected against any recovery," he said.

Penalty against sponsor for non-payment may be extended to one-and-half times of amount due, the Minister, adding: "The farmer's liability is being limited to the extent of advances given by the sponsor or cost of farm services provided to farmer by the sponsor. No recovery shall be made from the farmer if the default by the farmer is due to force majeure."

Further, provision has been made for resolution of disputes through conciliation. In case of failure of conciliation, any party may approach the Sub-Divisional Authority for resolution of dispute as per prescribed procedure, he said.

The Act aims to protect and empower farmers to engage with agri-business firms, processers, aggregators, wholesalers, large retailers and exporters etc. for farm services and sale of future farming produce at a mutually agreed remunerative price framework in a fair and transparent manner.

Farming agreements cannot be entered, if they are in derogation of the rights of a share cropper. Thus the said Act strengthens the negotiating power of the farmers with regards to large buyers / corporate consumers while conducting transactions, he added.

Courtesy: *The Hindu Business Line*

Why mechanised farming is the mantra for higher yield

Savings seen in terms of time, cost and labour

Mechanisation helped in the overall increase of 17.9 per cent in productivity and 14.1 per cent in seed germination

Pune, 18 March 2021: Groups of sugarcane cutters from the Marathwada region of Maharashtra who migrate to the sugar belt during the cane cutting season are not sure they would be back next season.

Many mills and farmers are opting for mechanised harvesting and are purchasing sugarcane harvesters in big numbers, according to the National Federation of Cooperative Sugar Factories.

But this is not the only case, with sugarcane.

Tillage, sowing, planting, harvesting, reaping, threshing, plant protection, inter cultivation and residue management in all crops are getting mechanised across States, with the Union government pushing for mechanisation of farming in a big way. During the years 2017-18, 2018-19 and 2019-20 fiscals, the Centre released funds amounting to ₹1,591.02 crore, ₹2,502.69 crore and ₹2,101.93 crore, respectively, to the State governments towards farm mechanisation.

"We have purchased our own sugarcane harvesting machine and it has helped in many ways. It has saved our money and energy. Now we can cut our sugarcane without waiting for cutters. Many times, sugarcane extract used to get reduced because of non-availability of cane cutters," says Dilip Jadhav who has taken the benefit of the government's scheme to purchase a sugarcane harvester.

He insists that mechanisation of farming is key to make agriculture profitable.

Benefits of mechanisation

Union Ministry of Agriculture and Farmers Welfare Narendra SinghTomar told the Lok Sabha on 16 March 2021 that impact evaluation studies highlight the overall positive impact of mechanisation on farming. It was reported that mechanisation helped in the overall increase of 17.9 per cent in productivity and 14.1 per cent in seed germination.

"Mechanisation also helped in saving nearly one-third of the time of operations, 30 per cent reduction in labour requirements, 11 per cent reduction in seed rate, 26.6 per cent reduction in weed instances, 22.4 per cent reduction in diesel consumption and 12.7 per cent reduction in fertiliser requirements," the Ministry said.

According to government data, 12,66,844 numbers of machines and equipment have been provided to farmers on subsidy; 14,182 custom hiring centres, 310 high-tech hubs and 13,080 farm machinery banks have been established across the States.

To boost farm mechanisation, a special dedicated scheme, Sub Mission on Agriculture Mechanization (SMAM), has been introduced by the Centre under which subsidy is provided for the purchase of various types of agricultural equipment and machinery to the extent of 40-50 per cent.

Labourers & livelihood

There are 263.1 million agricultural workers in the country, as per Census 2011, comprising 118.8 million cultivators and 144.3 million agricultural labourers.

"No doubt mechanisation is the need of the hour but at the same time, there is a big question mark on the livelihood of farmworkers. Already many farm labourers are migrating to cities for work but a huge amount of people are still dependent on agriculture work", says agriculture expert Sampatrao Pawar.

According to Anil Ghanwat of Shetkari Sanghatana, the agriculture sector could provide employment if farmers are given market and technology freedom.

Courtesy:
The Hindu Business Line

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Skretting invests $ US 6.1 million in construction of new shrimp research facility in Ecuador

Shrimp is the fastest growing aquaculture protein and is expected to grow globally around 4-5% per annum over the coming years. To support the sector with the latest R&D, Skretting is constructing a new facility in Ecuador to complement the Skretting Aquaculture Research Centre (ARC) network.

Ecuador: The new facility, named Skretting ARC Guayas Research Station, will be located next to the recently completed Skretting Ecuador feed manufacturing plant. The new R&D facility, centrally coordinated by Skretting ARC in Norway, will comprise fully equipped laboratories and state-of-the art experimental units to carry out trials under controlled conditions. In addition, green-water tanks will ensure maximum applicability under production conditions.

"We are committed to supporting the growth of the shrimp industry globally," says Alex Obach, Skretting R&D Director. "We also know the importance of optimal diets, combined with high post-larvae quality and professional farming practices. The development of solutions requires world-class R&D facilities, combined with local expertise."

Carlos Miranda, Skretting Lat Am General Manager says, "In Ecuador, Skretting is recognised by our customers for our high performance diets and expert technical service, including our Skretting 360+ program. We have best-in-class feed facilities, supported by the best R&D, not to mention a world-class genetics program together with Hendrix Genetics and supported by Nutreco. However, we do not rest. We are serious about our commitment to drive the Ecuadorian shrimp industry further and help our clients deliver to the most demanding global shrimp markets."

Skretting ARC currently has research facilities in Norway, Italy, Japan, Chile and China, and additional validation facilities around the globe. With experts in the field of shrimp research, a team of 140 highly skilled specialists and an annual R&D investment of $18 million, Skretting ARC is perfectly positioned to drive innovation in the sector even further.

"Over the years our scientists, together with our extensive research network, have contributed to the launch of important feed solutions for all the shrimp life stages," continues Obach. "Now, we want to go further. This new world-class shrimp research facility will drive our knowledge of shrimp nutrition in Skretting and deliver new solutions to improve shrimp performance: faster growth, shorter production cycles and higher survival rates. We are excited to see where our curiousity takes us on the next part of our journey."

About Skretting

Skretting is the global leader in providing innovative and sustainable nutritional solutions and services for the aquaculture industry. Skretting has production facilities in 19 countries on five continents, and manufactures and delivers high quality feeds from hatching to harvest for more than 60 species. The total annual production volume of feed is more than 2 million tonnes. The head office is located in Stavanger, Norway. Skretting is the aquaculture division of Nutreco, a world leader in animal nutrition. Our mission is Feeding the Future. More information can be found on www.skretting.in

Skretting ARC Guayas Research Station

USDA ends 15-year agreement with APEDA on organic products certification

The Commerce Ministry arm accredited certifying agencies for exports to the US cost and labour

Chennai, 19 March 2021: The US Department of Agriculture (USDA) has ended its agreement with the Agricultural and Processed Food Products Export Development Authority (APEDA) that allowed the latter to accredit agencies certifying exports of organic products to the US.

In a statement, the USDA said that it was changing its approach towards organic "oversight" in India and ending its agreement with APEDA that was in force since 2006.

Revised approach

The USDA said its Agricultural Marketing Service (AMS) decided that a more active oversight presence in India was required to "directly protect organic integrity". The US National Organic Program (NOP) has come up with an 18-month transition period for certified organic operations in India to become USDA-certified, it said.

From July 11, exporters of organic products from India to the US will have to apply for certification with a USDA-accredited organic certifier.

From July 12 next year, it will be mandatory for Indian exporters to have USDA organic certification from a certifier accredited by it.

When contacted, an USDA spokesperson told

Business Line that as per the 2006 agreement, the USDA "did not have direct enforcement authority over many of the organic certifiers and operations in India that export products to the US". The "revised" approach would allow APEDA-accredited certifiers to apply to the NOP for direct accreditation to the USDA organic standards. "It allows organic farms and businesses in India to apply for direct certification through a USDA-accredited certifier," she said.

When contacted, an APEDA official asked *BusinessLine* to send any query by email. No response was received until this report was filed. An organic product exporter from the South said that APEDA could try and rectify the situation since it might not wish any outside agency overriding its authority.

APEDA was asked if any efforts were made to extend the agreement and whether there was any difference of opinion between it and USDA. The USDA spokesperson, too, did not respond to this query.

Costs may go up

According to Pankaj Sharma, an organic products exporter, the change in the certification method would increase the cost for all stakeholders, beginning from farmers.

"However, those who do 'good' work will not have any problem," he said, adding that it could, however, increase the paperwork for exporters.

According to Sharma, there are different stages for organic products certification starting from farm to processing to exports."If many farmers or exporters or seek certification as a group, the cost comes down," Sharma said.

According to Mukesh Gupta, Executive Director, Morarka Foundation, there are a couple of reasons for USDA ending its pact with APEDA.

"One, the US market is inundated with India products that affect US businesses. So, in regulating certification exports from India could be curbed," he said.

The second reason could be that the USDA believes there is a gap in the oversight of organic certification, particularly with regard to quality.

The third reason could be that no US agency is getting the business of certifying Indian products that are shipped to Washington. "The certification business is worth ₹150-200 crore. Now that the agreement is ending, it could pave way for the entry of US entities," said Gupta.

An organic products exporter from the North said the Indian industry "will be happy to be out of APEDA clutches".

"There are a lot of hassles with regard to the APEDA procedure and it seems to be interested only in the process and certification than farming," said the exporter, who did not wish to be identified.

The exporter, who had worked with a US project in India on an organic product, said the USDA does not need even 10 per cent of the procedure that APEDA insists on.

Courtesy: *The Hindu Business Line*

CIFE's Kolkata Centre Organizes Online Training on Application of Drugs and Chemicals in Aquaculture

Kolkata, 27 March 2021: The Online Training 'Application of Drugs and Chemicals in Aquaculture' was organized by Kolkata Centre of ICAR-CIFE on 27 March 2021. Dr S. N. Ojha, Principal Scientist (PS), ICAR-CIFE, Mumbai delivered Introductory lecture on PMMSY; 1st main speaker was Dr S. K. Manna, PS, ICAR-CIFRI, Barrack pore who spoke on 'Antimicrobial drugs and chemicals applied in aquaculture'. He mentioned that in India, viral disease occur in Tilapia nilotica, fungal diseases in carps mostly in reservoirs and wetlands; bacteria and fungus cause disease in winter when fishes are stressed; fish disease uncontrollable when pond water quality is bad with more organic matter and subsequently NH3 (H2S in shrimp ponds).

Dr Manna discussed about control measures of important microbial diseases Dropsy, Ulcerative diseases, Tail and fin rot (No. 1 fish disease in Indian ponds) with black gill spots, Columnaris (in ponds with uneaten feed and sewage entry), Eye disease of Catla, Enteric red mouth disease, Edwardsiellosis in Pangasius sp. Young Pangas can't tolerate winter temperature, maxm disease occurrence in ponds in North India, 30 – 50 gm fingerlings preferred in cages and ponds which survive if stocked in winter. Mouth fungus Saprolegnia sp more prevalent in wetlands with decomposing macrophytes. EUS prominent in acidic pH of pond water and sediment, liming done @ 100 – 600 kg/ha; EUS ulcers deep (only on dorsal part) in benthic fishes and Puntius sp grazing on periphyton of macrophytes and Aeromonas ulcers small; liming increase pH and fungus growth halted. Medicated feed with oxytetracycline (OTC) less effective in major carps compared to Pangasius sp which eat supplementary feed quickly; carps do it slowly and medicine dissolves in water. For ulcerative diseases, 80gm OTC (active ingredient AI) required per tonne fish and 7-8gm AI per 100gm feed for 10-12 days, total 800gm OTC for 1 tonne fish daily if 10% is AI, 8kg required for 10 days. It is costly, should never be used in pond water. Withdrawal period of 15 days maintained for medicated feed-treated fishes. Bacterial or parasitic load in water/sediment recovers in few weeks after treatment ends, antibiotic (Ab) resistance may develop in pathogens.

Dr Manna explained mechanism of action of antibacterial agents; Ab active substance with permissible residual limits (nil for most Abs and never be used in shrimp ponds; only tolerable limits for OTC, tetracycline, trimethoprim, oxonilic acid); potential toxic effects / hazards of drugs & chemicals (anaemia, allergy, etc.); discussed approved list of Abs, Vit - Mineral, chemicals for use in fish/shrimp culture, very cautiously to be used in shrimp ponds meant for export. Dose of Endofloxacin is one-tenth of OTC but still not approved in India. KMnO4 dosage is1 ppm or 10kg/ha in ponds that leads to diminished plankton population; it must be 3 – 5 kg/ha or 300gm/33dec. In 33dec pond, mixture of 300 – 400 gm KMnO4, 3 - 4kg NaCl and 20 - 25kg mud kept as dough balls (3 - 4 bundles) inside cotton cloth, kept suspended in 3 - 4 areas of pond; ingredients leach out in water, stays for 4 - 5 days, repeated at 5 days interval, 3 - 4 times. It should begin on day of carp fingerling stocking; will control fin, tail and gill rots and ulcers. In dewatered shrimp pond (1ha), application of 5 kg KMnO4 or bleaching powder and 10 times NaCl over dried earth degrades organic matter, prevents future occurrence of disease. If carp fingerlings before stocking treated with NaCl @ 30gm/lit, parasitic infection on gills controlled. Mixture of KMnO4 150 – 200 gm and NaCl 3 - 4kg in Hundi water may be applied over fishes netted at pond side (33dec), released after 10 mins. Finally Dr Manna highlighted trade names and dosage of common antimicrobials used by Assam and WB fish farmers as surveyed.

As 2nd main speaker, Dr G. Dash, Professor at Faculty of Fishery Sciences, WBUAFS spoke on 'Use of drugs and their methods of administration in aquaculture'. He discussed about judicious use and importance of drugs in fish disease & mortality control, increasing production; overdose harmful and less dose ineffective; basics of pharmacokinetics and pharmacodynamics; inorganic, organic drugs, of natural and synthetic sources; routes of drug administration; binder or edible oil used to make best use of antibacterial and antiparasitic medicine in feed medication, bath treatment (short, medium and long) for aquarium fishes, immersion/dipping medication (for OTC, formalin, H2O2), flushing, hyper osmotic infiltration; spray medication of pelleted feed; injection method for costly medications; drugs used during pond preparation, for fish growth promotion, increasing O2 concentration, as disinfectants, water quality management, probiotics; pH should be above 7.5 when drugs used in ponds; only approved (eg. OTC approved by Coastal Aquaculture Authority) and branded products to be used.

Dr Dash emphasized that diagnosis is more important than treatment, correct application of chemicals in pond water/soil, real problems to know that occurred in water, soil or fishes. Chopped banana trunks used in ponds to increase O2 (when fishes start surfacing) and alkalinity concentrations, taken out

before decomposition. Commercially-available growth promoters; anaesthetics, glucose, clove oil (5ml/100lit) used during fish seed transportation; malachite green and formalin control fungal attack and white spots (also ectoparasites) on fish body respectively. In ponds 1 – 2 ha in area, fishes drag-netted at one side, chemicals in correct concn sprinkled over it, plankton crush wouldn't occur, all fishes will get treatment, paddle-wheel aerators operated subsequently. White spots and external parasites in major carps and aquarium fishes cured nicely when 15 - 20ml formalin diluted to 20lit sprinkled over fishes in net, bathed and released back. H_2O_2 applied @ 1.0-1.5lit/acre pond, 3feet deep during O_2 shortage. Liming @ 250-300kg/ha/month done in ponds with low pH; chloramphenicol, nitrofurans and other banned Abs should never be used in fish/shrimp ponds. As pre-treatment factors, characteristics of fish, water quality, chemical, pathogen and disease must be known, how much fish need treatment, its economics, mortality rate low or high.

Dr Dash explained calculation method of dose (amount) of chemical/drug; measures to be taken before medication (good aeration, feeding stopped before 24 hrs of medication); proposed model of development of new drugs if company to be newly set up; approved and unapproved drugs, mode of action and how pathogenic bacteria are killed; mechanism of action of Abs; administration methods of different Abs / drugs and fish diseases that are controlled. Participants were informed about common medicines used to combat bacterial diseases and pond environmental problems, those against parasitic infestations, commercially - available herbal medicines used by farmers to control fish parasites, some company - produced drugs for viral diseases in aquaculture, branded medicines and chemicals commonly used by fish and prawn/shrimp farmers in WB, variability in drug response, safety (pre-cautionary) rules for using fish drugs. To prevent disease occurrence, bleaching powder @ 200 – 250 kg/ha and urea @ 100 kg/ha to be used during pond preparation (pre-stocking phase). Names, composition, main benefits and dose of application of 16 aqua-products were discussed. Soil, water and feed probiotics should be used @ 1.5 kg/acre or 100 kg/ha in total culture period, 0.5 - 1.0kg powder/ha/week and 0.01 - 0.40 gm/kg feed with binder respectively. As future perspectives, Indian aqua-industry wants chemotherapeutants, vaccines, ectoparasiticides, immunostimulants (β-glucans @ 100mg/kg feed, Levamisole @ 5 – 10 mg/kg body weight), alternative treatments, disease diagnostic kits. Vitamin @ 10 gm/kg feed once daily, minerals, trace metals also required. Above 50% fish diseases are controlled if O_2 concn is between 5-8ppm. Presentations of both speakers were very useful, News communicator Subrato Ghosh could learn important aspects.

Telangana flags off mobile fish outlet vehicles

Seventy vehicles will head for districts, says Talasani, Fisheries Minister, TS

27 March 2021: Finance Minister of Telangana State Mr T. Harish Rao said the State government has brought about a paradigm shift in fisheries by developing it from import of fish to export.

Earlier, the fisheries industry was understood as limited to Coastal Andhra, a notion which has been turned on its head by the Telangana government. Along with the Minister for Animal Husbandry and Fisheries Talasani Srinivas Yadav, he flagged off 117 vehicles, which had been distributed to women beneficiaries from self help groups on 27 March 2021, for them to run mobile fish retail outlets. Telangana's fish will have higher demand as they are fresh water fish, Mr Harish Rao said, and elaborated that all the tanks in the State are being filled with water from Krishna and Godvari rivers which will help in fish yield. Government is determined to give a fillip to vocational trades, and for fishermen, so far ₹1000 crore have been spent.

Check dams are being built with an expenditure of ₹1,200 crore, where fish can be grown.

Vegetable and non-vegetarian markets are being set up in each town for which the government has allocated ₹500 crore in the State budget, Mr Rao said.

Finance Minister T. Harish Rao flagging off mobile fish retail outlets in Hyderabad on 27 March 2021

The Minister handed over Revolving Fund cheques worth ₹45 lakh to 13 fisherwomen's self help groups during the same event, attended by Members of Parliament B. Prakash, B.B. Patil, legislators Danam Nagender, Muta Gopal, Arikepudi Gandhi, Bethi Subhash Reddy, MLC Farooq Hussain and others.

Each vehicle distributed to the women costs ₹10 lakh, of which government and National Fisheries Development Board together contributed ₹6 lakh and the beneficiary, ₹4 lakh. The vehicle has facilities to sell fish delicacies on one side and raw fish on the other.

Mr Srinivas Yadav said Chief Miniser K. Chandrashekhar Rao has increased allocations to the fisheries sector to ₹100 crore.

The distribution will be enhanced to 500 in the coming days, and 70 of the already distributed vehicles will head for districts, he said.

"Aquaculture is the Great Industry; Let us Protect it"

Nellore is the birth place of Vannamei: BMR

Aqua International organises 35th Aquaculture Expo at Nellore

B. Masthan Rao, Ex MLA Inaugurating Aquaculture Expo 2021 at Nellore on March 9.
Seen from left: Konduru Anil Babu, N. Nageswara Rao, M.A. Nazeer and others.

B. Masthan Rao
Ex MLA and Chairman & Managing Director, BMR Group of Companies

Konduru Anil Babu
Chairman, Andhra Pradesh Fisheries Cooperative Federation (AFCOF), Nellore

Nellore: A 2-day exhibition and interaction meet on aquaculture farming and its practices titled **Aquaculture Expo 2021**, was held at P V R Kalyana Mandapam, Nellore, Andhra Pradesh, India, on **9 & 10 March 2021**.

In his welcome address Mr M.A. Nazeer, Chief Executive of the Expo and Editor, Aqua International said that over 60 % of Shrimps produced in India are from Andhra Pradesh state and about 75 % of fish produced in the country is from this state. The state has over 40,000 farmers engaged in the production of shrimps, fishes, crabs and other species.

COVID-19 pandemic had shaken the world and people across the globe had tough time since March 2020 and we all paid the price for the bad and wrong way we all behaved with the nature. But, I feel, one way, the COVID-19 pandemic helped us all to give priority and focus on personal hygiene, cleanliness, maintenance of social distance and immunity building of human body to fight against viral and bacterial diseases. Here, the science has authenticated food items like Fish, Shrimps, Eggs and Chicken as the valuable protein for human diet under the present circumstances. And people of all ages are nicely consuming aquaculture products in their diets, said the Editor.

Producers in aquaculture should focus on producing quality Shrimps, Fish, Crabs etc to provide quality protein food for the domestic as well as export market, Nazeer stated.

Mr B. Masthan Rao, Ex MLA, and Chairman & Managing Director of BMR Group of Companies, Nellore inaugurating the expo said, "Aquaculture is the Great Industry; Let us Protect it. Aquaculture sector in India is in crisis today. In 2019 India produced 900,000 tonnes of shrimps and the production came down to 600,000 tonnes in 2020.

VIPs on the stage

M. A. Nazeer
Chief Executive,
Aquaculture Expo 2021

K. Polisetty
Secretary, APPFWA

N. Nageswara Rao
JDF, Nellore, A.P.

It is important that farmers have to be safe in the interest of all in the industry. The prices of inputs and the cost of production of shrimp is going up. WSSV is affecting the production badly".

Due to government initiative only something good is happening to the farmers in Andhra Pradesh such as lower electricity tariff, introduction of Aquaculture Act for the welfare of the industry. The union government has created separate ministry for fisheries with budget allocation 25,000 crores mainly for coastal states, he stated.

Masthan Rao said that Nellore is the birth place of Vannamei and I thank Aqua International for organizing the expo at Nellore after a long time. It was the expos which makes the stakeholders of the industry to join together at one place and discuss about the industry and its future.

Central government is giving insurance to other segments, but not to Aquaculture farming. After agriculture, Aquaculture gained importance and recognition as this sector provides protein food, he told.

Masthan Rao advised farmers to go for reasonable percentage of protein feed for shrimp culture. High protein is not safe and do not increase cost unnecessarily. Cost of production of shrimp is in your hands and please give attention to it. Farmers should give emphasis in selection of quality seed, feed, probiotic inputs and good management practices. He advised farmers and technical persons to choose Nursery system to get better sustainability and production.

Mr Konduru Anil Babu, Chairman, Andhra Pradesh Fisheries Cooperative Federation (AFCOF), addressing the Expo stated that he will put efforts to solve the issues of the farmers and to promote the sector in the state. He has been in aquaculture sector since 1993 and when the sector was in deep crisis in 2007 to 2008, Mr B. Masthan Rao protected this sector by introducing Vannamei in the industry.

Mr K. Polisetty, basically a fisherman and Secretary, APPFWA said, aquaculture is our life and we cannot leave shrimp farming, this sector helps us to grow. This state is exporting 600,000 tonnes of shrimps annually. He requested healthcare companies to produce quality products. Till 2018 it was the golden days for Vannamei and later farmer started facing problems.

A view of participants in the inaugural function of Aquaculture Expo 2021 at Nellore on March 9

Mr N. Nageswara Rao, Joint Director of Fisheries, Andhra Pradesh said that Nellore district has over 18,000 hectares. It needs quality seed and feed for the sector to grow.

BMR Group hosted a get-together dinner to the participants of the Expo and the farmers on the evening of March 9 at hotel Minerva Grand.

The objective of the expo was to bring awareness among aquaculture farmers on shrimp, fish and crab culture and various products, technology and services available to get better yield and results in aquaculture farming. The expo was an opportunity to the farmers to update their knowledge on various aspects in aquaculture. The event was also an opportunity for buyers and sellers in the sector. Companies dealing with manufacture and supply of products and services related to aquaculture sector displayed their products in the expo. The expo was organized by Aqua International, English monthly magazine on aquaculture sector, based at Hyderabad.

Farming issues discussed in "Experts – Farmers Interaction Meet"

In connection with Aquaculture Expo, there was an Interaction Meet held on both the days of expo, March 9 & 10, between Technical Experts and Aquaculture Farmers on different topics of Aquaculture. The below experts took part in the deliberations.

The Experts were:

Dr T. Neeraja, M.F.Sc., Ph.D.,
Senior Scientist,
College of Fishery Science,
Sri Venkateswara Veterinary University,
Muthukur, Nellore.

Mrs R. R. Anupama, M.F.Sc.,
Assistant Professor & Head,
College of Fishery Science,
Sri Venkateswara Veterinary University,
Muthukur, Nellore.

Technical Experts on the dais

Dr Anand Prasad Paturi,
M.F.Sc., Ph.D.,
Assistant Professor & Head,
Department of Aquaculture,
College of Fishery Science,
Muthukur, Nellore.
Andhra Pradesh.

Mr Arivukkarasu, M.F.Sc,
Asst. Director, AP Region,
The Marine Products Export Development Authority,
Vijayawada,
Andhra Pradesh.

Mr Subramaniam,

Aquaculture Expo held in Nellore on March 9 & 10 is one of its kind comprehensive event of national level, which was aimed to bring all the needs of every facade of industry at a single platform during expo period, and brought buyers, suppliers of different medicines, feeds, probiotics, other supporting accessories suppliers as well as corporate farmers, scientists, consultants, educationalists, enthusiast aquaculturists and various prosperous entrants who are planning to try aquaculture this year. This year it had a unique central dome which was made for "Farmers - Technical Experts Interaction Meet" which was aimed to make easy understanding of various aspects of aquaculture and getting a clear idea of various do's and dont's of aquaculture to attain the goal of sustainable aquaculture for which a panel of 5 subject specific experts (from site selection, pond preparation until harvesting) gave their advices and services as volunteer during whole Expo period.

Questions answered by Dr P. Anand Prasad during Interaction Meet in Aquaculture Expo 2021 at Nellore:

1. *How to know the seed quality from hatcheries?*

A: By conducting Stress tests

2. *What are the precautions for growth differentiation in cultivable animals?*

A: Partial harvesting

3. *How the mysids can be controlled in culture ponds?*

A: Using filtered water

4. *What are the best suited as feed for the shrimp larvae?*

Arivukkarasu

A: Diatoms and Artemia Nauplii.

5. When to add jaggery in the ponds?

A: When pH is not stabilized.

6. How to control pH fluctuations in ponds?

A: Lime application and Jaggery / sugar with yeast application.

7. Can Seabass cultured with other fishes?

A: By applying sufficient feed to avoid cannibalism and predation

8. Is it possible to go carnivorous fishes intensive culture?

A: By applying sufficient feed to avoid cannibalism

9. How to reduce bottom spoilage in ponds?

A: Maintenance of water quality and disturbing the pond bottom weekly one side.

10. Can fungal diseases happen in shrimp culture?

A: Zoothamnium, Epistylis (Protozoans are considered as fungus by farmers).

11. What are the new varieties of finfish and shellfishes suitable for aquaculture?

Dr Anand Prasad Paturi

A: Cobia, Pompano, Yellowtail, Pomfrets, Snappers, Groupers in fishes and Indian white shrimp, Mussels, Clams, Edible oysters, Pearl oysters, Crabs, Seaweeds etc.

12. Can mysids carry disease causative agents?

A: Yes, feed also can be consumed by mysids

13. Can HDPE lining in ponds creates any problem to the cultured animals?

A: Drying after harvesting can avoid problems.

14. What are the alternative species for Vannamie?

A: Green tiger and Indian white shrimp.

15. How the biofloc system can work out for farmers?

A: Reduces feed cost, space with high stocking densities.

16. How much distance should be there for industries and hatcheries location?

A: Far way (Not less than 100 Km).

17. Recirculatory systems are useful or not? Why farmers are not adopting?

A: Very useful, because of high investment cost in the beginning.

18. How the environment is affected by aquaculture?

A: Dumping of antibiotics, releasing water after harvest without treating, stocking animals without drying the ponds.

Dr T. Neeraja

Dr T. Neeraja, Associate Professor & Head, Department of Aquatic Animal Health Management, College of Fishery Science, Muthukur has discussed about shrimp, Penaeus Vannamei diseases being encountered in Andhra Pradesh. She discussed about major diseases which are causing huge economic losses like white spot virus disease, which became major threat from 15 to 20 days post stocking of PLs in farmers ponds.

Secondly, the white fecal disease is the major threat to Vannamei culture. Due to white fecal disease the cultured shrimp 40 days post stocking in ponds, reduced

Subramaniam

Stakeholders Interacting with Experts

feeding, loose shell, mortalities are happening.

Thirdly, greater reduction in growth rates of Vannamei becoming major issue due to which shrimp are not growing beyond 6 - 7 gm even after 75 days of culture. Further, Vibriosis became major problem in creek based shrimp farms resulting in white fecal syndrome, surfacing of shrimp, running mortality, loose shell, mortalities etc. Dr Neeraja discussed about good management practices in Vannamei farming, so as to prevent the diseases.

During Interaction meet, farmers expressed unhappiness about supply of poor quality of shrimp seed from hatcheries, resulting in poor growth rate and susceptibility to diseases and mortalities during culture period. One farmer asked about Crab, Scylla serrata mortalities in tide fed farm during fattening. Dr Neeraja explained that, the water crabs captured from wild, there is a chance for barnacle infestation on the gills of crabs. When these crabs are stocked in ponds, there will be a possibility of mortality during low DO condition & high ammonia levels in ponds. Another farmer clarified him about regarding application of Caustic soda in pond soil for killing EHP spores in pond soil.

Dr R. R. Anupama

Dr R. R. Anupama answered below questions:

1. What is zoasis. How it can be cured?

Ans: During Conversion from naupli to zoa, considerable mortality in the shrimp seed is Zoasis. It can be managed by selection of brooders and maintaining optimum conditions for seed and also optimum density of seed in hatchery tanks

2. Why advanced feeding equipment is not being used widely in shrimp culture?

Ans: Demand feeding is always suggested in shrimp culture to maintain good water quality as well as minimising feed wastage. Advanced equipment utilization and management must be economically viable even for small farms. More awareness among farmers community is required.

3. How to overcome the problem with foulers in crab culture?

Ans: Maintaining water quality and adopting biosecurity measures are the betterways for the problem. Application of chemical may harm our culture species also

4. Which is the better Alternative species for Vannamei?

Ans: Indian white shrimp is identified as better alternative species of Vannamei. Indian white shrimp P. indicus culture is standardized through research.

5. How to control Fish lies?

Ans: Fish lies can be controlled by good management practices and not providing any substrate for the attachment of eggs.

Deliberations on better management practices like water quality management and feed management in shrimp culture. Technical suggestions on Crab fattening has been given to farmers.

Muthukur, Nellore Fisheries college students in a joyful mood during Interaction Meet

A view of Aquaculture Expo 2021 held at Nellore, A.P on March 9-10

Expo Chief Executive and Editor, Aqua International, M. A. Nazeer Presenting Mementos to Exhibitors at Aquaculture Expo 2021 in Nellore on March 10.

35th Edition

Aquaculture Expo 2021

9 & 10 March 2021, Nellore, A.P, India

NRS EVENTS

Dr Chalamaiah's Doctor's Vet Pharma is set to Grow: Makes Good Production Facilities

Doctor's Group makes products for Aquaculture Healthcare, Human Healthcare, Veterinary Healthcare, Poultry Healthcare and Pet Healthcare

Even if you have required infrastructure facilities with location for manufacture of products and with appropriate efficacy of the products in any sector, unless the promoter is open, creates awareness and takes up appropriate promotional activities, it is difficult to get established and prosper under today's circumstances and competitive nature of the business. My good friend Dr T. Chalamaiah Naidu took much time to identify the things and the factors, and now doing it the way it is required. Excerpts of the interview M. A. Nazeer, Editor, Aqua International had with Dr T. Chalamaiah Naidu, Chairman & Managing Director, Doctor's Vet Pharma Pvt Ltd at Nellore, Andhra Pradesh, India.

Dr T. Chalamaiah Naidu, Chairman & Managing Director, Doctor's Vet Pharma Pvt Ltd

Dr T. Chalamaiah Naidu, born in Krishnam Nayini Palli, C.S Puram Mandal, Prakasam District in Andhra Pradesh did his B.V.Sc & A.H as well as M.B.A. He has setup healthcare products manufacturing factory by name Doctor's Vet Pharma Pvt Ltd at Survey No. 263/1, 264/1, Pothireddy Palem, Kovur Mandal, Nellore District, Andhra Pradesh, India manufacturing products for Aquaculture Healthcare, Human Healthcare, Veterinary Healthcare, Poultry Healthcare and Pet Healthcare. While Dr T. Chalamaiah Naidu is the Chairman & Managing Director, Mrs T. Sri Lakshmi is the Director.

Doctor's Group of Companies have tied up with JSK Company, South Korea and Vet Med Company, Singapore.

Dr Chalamaiah told, we are among the top 10 by manufacturing nearly 100 critical care human healthcare products, 250 all categories of veterinary healthcare products, 50 pet healthcare products and 50 to 60 aquaculture healthcare products. We are also exporting products to 7 to 8 countries like Singapore and South Korea, and added that the company is providing employment to over 500 people both in factory and in sales as well as marketing.

The company is having sophisticated R&D facility with more than 50 members of qualified M. Pharmacy, B. Pharmacy and M.Sc and experienced professional for research, products development, manufacturing of products, analysis and RD wing.

A view of Doctor's Group of companies production facilities at Nellore, Andhra pradesh, India.

"We are among the top 10 by supplying the all Human Healthcare, Veterinary Healthcare, Poultry Healthcare, Pet Healthcare & Aquaculture Healthcare"

Doctor's Group is having four WHO, GMP standard manufacturing units with a built up area of 1.25 lakhs sft. Each unit is dedicated for manufacturing of human healthcare products, veterinary, poultry, pet healthcare products and aquaculture healthcare products. For human and veterinary, we have small volume injections too, he stated. We maintain quality of products by using raw material of standard and certified companies, he stated.

They are also doing contract manufacturing to multinational companies. Products are being supplied to various State Governments in the country.

Doctor's Vet Pharma has Sales and Distribution network in Andhra Pradesh, Telangana State, Orissa, West Bengal, Gujarat, Maharashtra, Kerala, Karnataka and Tamilnadu.

Doctor's Vet Pharma is providing private medical and accidental insurance policies and other statutory benefits like EPF, ESIC etc, to their employees and maintaining safety and welfare of the people working in the factory and in the field.

Doctor's Group has a business turnover of Rs 100 crores. Our future plans and targets are to export our products to European countries and getting job works from leading companies at national and international, said Dr Chalamaiah.

He said that companies like Icon Biologicals, Neospark, Synergy Biotechnologies, Sanzyme Biologicals Pvt Ltd, Virbac Animal Health, Hitech Pharma and BMR Hatcheries are the few companies among the others who made a mark in Aquaculture sector.

His advise to stakeholders of the industry

Dr Chalamaiah requested all the companies to give best quality and hygienic healthcare products and maintain good relationship with the customers.

Micro Biology

Labeling and packing area

QC Laboratory

Dr Chalamaiah insisted that the policy makers, its implementing government agencies and the consumers should encourage the only companies who maintain label claims of health and nutrition products on the product containers.

Constructing a temple, home for old age people etc

As a social service, Dr Chalamaiah Naidu is also constructing Shri Venkateswara Swamy temple at his birth place Krishnam Nayini Palli in Andhra Pradesh along with old age home and home for physically handicapped people, mentally retarded people, Annadana Satram and a hospital with 100 beds. He is motivating people and mobilising funds for completing the construction of his ambitious project.

"Our future plans and targets are to export our products to European countries and getting job works from leading companies at national and international."

Oral Liquid Manufacturing Area

Powder Filling Area

Vials Inspection Area

Tablet Granulation Area

Powder Manufacuring Area

An Overview of the Plant

Nursery System- An emerging concept to mitigate risk in shrimp culture

ravi.kumar@skretting.com

Mr Ravi Kumar B

Product Manager Feed- South Asia, Skretting

Highlight Points

Article is about SHRIMP NURSERY AND ITS IMPORTANCE. How profitable shrimp culture can be carried out with the help of nursery. How to successfully handle nursery system.

Take away message- using nursery system can lessen the burden on both culture and ecosystem, besides lowering the risks of outbreaks and losses.

Introduction:

The nursery phase for shrimp production was first introduced in 1974 (Parker et al., 1974)

Although, in the 1990s most farmers had reverted to direct stocking, at present again with L.Vannamei boom and multiple emerging and new disease threats the use of nurseries is on the rise.

Because a nursery phase can intersect the disease transmission and contributes to the rapid growth of the cultured organisms.

Nursery system existing in India but was not in much focus till 2016 and since then attention been given to it. In the nursery phase, it is possible to manage higher stocking densities and increase the number of crops per year in shrimp farms

Benefits of Nursery Systems:

Stocking post larvae (PL) after a nursery phase (usually >PL45) instead of PL10-12 direct from hatcheries will reduce the duration in the grow-out ponds by 20-30 days and feed conversion ratio (FCR) by 10-30%. In Mexico and Asia, this is now one of the strategies used to mitigate early mortality syndrome (EMS) by stocking larger size post larvae into grow-out ponds.

Shrimp nursery systems can provide several advantages over direct stocking to include: More efficient facility utilization, Greater Bio security, water quality, feed, and feed management, Supply of larger &robust shrimp with high compensatory growth, and overall better survival of shrimp, Decreased grow-out cycle with more crops per year and most importantly serve as primary quarantine period when needed.

Phases in Nursery system:

Shrimp production can take place in single-, two-, or multi-phase systems.

In a single-phase system, PL are stocked directly into grow-out tanks and stay there until the harvest.

In two and three-phase systems, grow-out tanks are stocked with juvenile shrimp cultured previously in other tanks under high stocking densities - a stage referred to as the nursery phase. The three-phase system has its own benefits in the supply chain by having constant control of water parameters and health of shrimp. Also chances of better feeding efficiency.

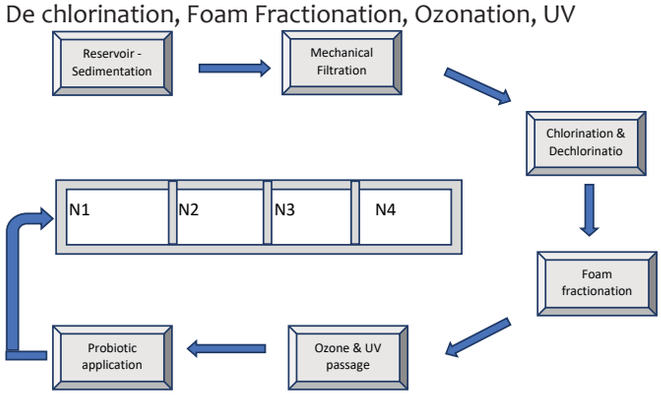
The whole concept of nursery revolves around producing strong and healthy post larvae/juvenile which have been acclimated almost to the pond environment. As a result, producer can get a better survival, less disease risks, increase in crops which in turn helps the whole chain of shrimp production to be on an incremental path.

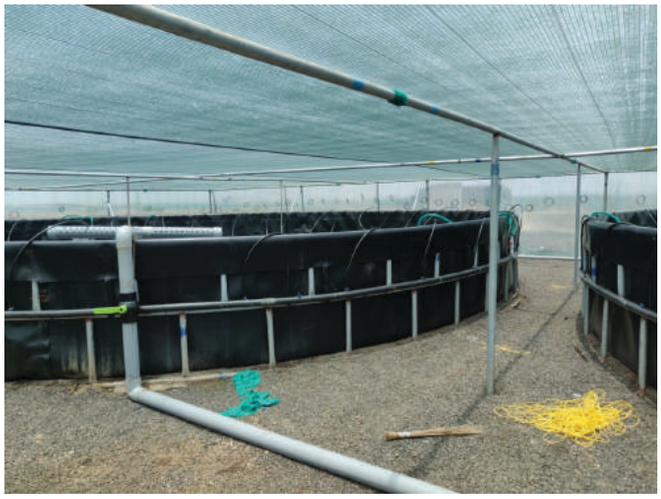
However, all of this can be achieved only with the use of proper technology and with full control of the culture system. In poorly constructed or managed nursery systems, low survivals may result, and weak animals are likely to be transferred to ponds.

Nursery system design and operation:

Initial Water Treatment/Preparation

Use of Sedimentation, Mechanical Filtration, Chlorination-De chlorination, Foam Fractionation, Ozonation, UV





The ideal location for a nursery is near growout farm with an accessibility to high water quality. To minimize the risks of power failures, it is advisable to use power back up sources and the travel distance to the farthest pond in the farm also to be considered.

Nursery tank shape can be circular, square , rectangle etc., BUT the round shape tanks gives more benefits than the rest, such as – easy to manage, uniform distribution of water and aeration, central drain system with an accumulation of waste which can be siphoned easily.

Basic parameters to monitor in Nursery System:

Temp ©, DO (mg/L), Alkalinity (mg/L), NH3- N (mg/L), TAN (mg/L), NO2-N (mg/L), NO3-N (mg/L), Average weight (g), Biomass (kg/m2) and (kg/m3)

Nursery management

In general shrimp are usually stocked in nursery tanks as PL-8 or PL-10. Whereas in multiphase, 5-day old PL`s can also be stocked. Initial stocking densities vary from 15-25 PLs per liter in multiphase and 4-12 in two phase and the normal survival rate would be > 95 percent in both the cases (depends on other criteria).

Prior to stocking, nursery tanks, hoses and air stones are disinfected with sodium hypochlorite at 20 ppm, brushed and washed with running water, and dried for 24 hours. After filling the tank with seawater, inorganic fertilizers are applied. Phytoplankton inoculation can be used when faster blooms are required.

PLs need to be acclimated to water pH, salinity and temperature in 1,000-L fiberglass tanks before stocking in the nursery tanks. When acclimation exceeds more than two hours, feedmust be provided.

During the nursery stage, shrimp are fed high-quality starter diets with >40 percent or more crude protein content and less than 800-µ size. Larval diets are used to minimize the risk of disease transmission. Dried feed is broadcast in the first days after stocking and then delivered in feeding trays.

General water exchange should be done not more than 10 percent a day over the first week of culture to maintain a high phytoplankton biomass. After wards, water can be exchanged up to 30% daily. Wastes on tank bottoms are to be siphoned away.

In nursery system the most critical part is the transfer of juveniles to grow out ponds. Before transfer, the health and digestive tract are to be checked.

Management of NURSERY is a key for successful operation; and adequate tank preparations (cleaning, disinfection, probiotic applications) are crucial to avoid Vibrio &Pseudomonas outbreaks in the nursery tanks. Probiotics are added during tank preparations & during production, with efforts to identify optimal blends to increase survival, reduce *Vibrio&Pseudomonas*

Control of water quality and feeding

The main criterion is control of water quality. Probiotics are applied according to the target; the protocol of the different probiotics is adjusted depending on the biomass, water quality and animal health conditions. The objective is to maintain optimal conditions in order to keep the animal healthy for it to express the compensatory growth potential when transferred.

In the case of feeding, lower quality feeds with fines will affect water quality and shrimp performance. As such,

higher quality hatchery feeds with less fines are most desirable.

Especially feeds with a 42% crude protein and high energy feeds are fed at 2-hour intervals. Feed amounts are adjusted depending on feed trays, water quality and animal growth.

Use of Limited Discharge Practices:

Studies showed that *L. vannamei* can be raised with reduced water exchange without adverse effect on its growth, survival and yield. In limited discharge systems, shrimp depend on commercial feed as the primary source of food, use of high-quality feed with adequate management can significantly improve shrimp performance, water quality and the Economics. Microbial communities in these systems can serve as a source of single cell protein that provides supplemental food source.

Conclusion

The reintroduction of shrimp nurseries in many South-east Asian countries is an important step in managing the new normal for the shrimp industry. The emergence of new diseases will not stop and the industry has to adapt to current and future diseases through adapting management practices and focusing on quality feed and feed supplements to ensure robust animals. Shrimp nurseries are already being implemented on a commercial scale by farmers in Thailand, Vietnam, Indonesia and in India it is on a progressive mode.

Farmers setting up shrimp nurseries should focus on using high quality diet and feed supplements that are specially designed to be used at this stage of shrimp production. Must keep in mind that – DO NOT COMPROMISE ON QUALITY.

Nursery functions as temporary controlled reservoir where shrimps are allowed to a slow acclimation to the farm conditions. These systems reduce the exposure of shrimps to potential threat (disease, stress factors etc.,) and allow early detection of any health-related issues.

Nursery - If not managed properly, the following issues can arise:

Nursery systems also have a few downsides, including greater infrastructure investment (higher construction costs than conventional pond systems) higher operational costs, and increased labor requirements as it requires trained biologists. As stocking densities increase and water exchange decreases, higher organic loads increase the risks to adequate water quality and animal health. And there is increased stress to animals due to more handling and transferring, which can increase susceptibility to several diseases. Therefore, **proper management** of nursery systems is a critical prerequisite for their success.

Views of round nursery tanks, including outdoor covered units in Ecuador (left), built with a frame and plastic liner; and concrete, uncovered units in Brazil (right).

Business Startups: *The Catalyst of Change in Indian Aquaculture*

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Highlight Points

This paper provide a comprehensive understanding of business startups as a growth driver in Aquaculture as well as the challenges faced by Indian startups. Further, the paper investigates how the startup ecosystem has developed over the years and describes the opportunities for investment with innovative ideas and solutions for starting a Business startups in Aquaculture.

Phenomenal growth of Fisheries & Aquaculture sector in India

Fisheries and aquaculture are an important source of food, nutrition, employment and income in India. The sector provides livelihood to about 16 million fishers and fish farmers at the primary level and almost twice the number along the value chain. Fish being an affordable and rich source of animal protein, is one of the healthiest options to mitigate hunger and malnutrition. The Gross Value Added (GVA) of fisheries sector in the national economy during 2018 - 2019 stood at Rs 2,12,915 crores (current basic prices) which constituted 1.24 % of the total National GVA and 7.28 % share of Agricultural GVA. The sector has immense potential to double the fishers and fish farmers' incomes as envisioned by government and usher in aqua-economic prosperity. Fisheries sector in India has shown impressive growth with an average annual growth rate of 10.88 % during the year from 2014 - 2015 to 2018 - 2019. The fish production in India has registered an average annual growth of 7.53% during last 5 years and stood at an all-time high of 137.58 lakh metric tons during 2018 - 2019. The export of marine products stood at 13.93 lakh metric tons and valued at Rs 46,589 crores (USD 6.73 billion) during 2018 - 2019. Thus the fisheries and aquaculture sector is registering a rapid and healthy growth for the past two decades.

Startup-India & Startup-Ecosystem

With an aim to operationalise its action plan towards a 'pro-entrepreneurship' attitude, Start-up India has created a three-pronged strategy i) To facilitate a common platform to connect the entire ecosystem while reducing information asymmetry, ii) To provide benefits and other necessary support, and iii) To engage regional entrepreneurs in transforming their ideas into business ventures.

While the first two are aimed at providing a one-stop shop for startups, including availing financial incentives and other benefits, the objective of the third point is to be achieved through outreach and awareness programs by taking the message beyond metros to tier- 2 and tier-3 cities and engaging regional governments in overall transformation. The Action Plan under the Start-up India Initiative was primarily focused on addressing the most vital issues faced by entrepreneurs during various stages of their businesses and developing the Indian start-up ecosystem to one of the biggest startup ecosystems globally. Since the launch of Start-up India and subsequent implementation of various initiatives, substantial improvement has been created in the overall start-up environment. Moreover, the Ease of Doing Business Index(EDBI) for India has made a significant leap from 130 in 2016 to 63 in 2020, further encouraging the proliferation of start-up's in India.

Challenges in Aqua Opportunities for start-up's

1. Inefficient Supply Chain: Powerful incumbents control farming resources such as finance, seeds, chemicals, distribution, and supply chain. These systems have complete access to the distribution networks that supplies to about 8 Mn kiranas across the country too.
2. Middlemen and Agents: The farmer needs on the demand-side are controlled by middlemen and agents who own the fragmented supply chains. They also control the produce pricing. For instance, organized retailers are estimated to source 20% of their produce directly from farmers, the rest of from mandis. But mandis are not ideal farmers' markets, Traders require a license to operate within a mandi but wholesale and retail traders and food

processing companies cannot buy produce classified as notified agricultural products (cereals, vegetables etc.) directly from a farmer. Notified products are to be brought to the market committee and auctioned in the farmers' presence. Most of the market committees have failed to provide a competitive platform to farmers and lack transparency and technology intervention to ensure smooth and just trading.

3. Lack of financing: Distributors usually double up as lenders and mostfarm-debt is created because of using chemicals and seeds that are not pest-resistant. Additionally, domestic subsidies and investmentsannounced in policies rarely reach the end customer – the farmer.
4. Inadequate Irrigation: Agriculture in India is a fragmented activityspread across 600,000 villages and most of the regions still depend onrainfall for water (~70%). While at the same time, groundwater levels areslowly receding from the 1,000 ft. avg. depth yearly.
5. Farm size vs Productivity: Studies have shown that there is an inverserelationship b/w farm size and productivity. Indian farms are fragmentedand small; 70% are less than 1 Hectare, while national average is lessthan 2 Hectares, resulting in significantly low farm yields. In Europe andUS, avg. sizes are 30x and 150x of those in India.

Smart way of starting Business Startups in Aquaculture

The best business one can start with low investments are opting a franchise of a good company, they are best because the British Franchise Association (BFA) lists this as one of the main reasons that makes franchising an attractive option. Franchisors carefully choose the location of their outlets to gain the largest possible amount of custom and to avoid treading on each other's toes.

Also, unlike starting a business from scratch, many franchisors can afford prime trading premises, such as on the high street and popular shopping centres. If your franchisor is reluctant to part with vast amounts of cash for your start-up costs, there is no need to panic because banks will be there to help you out.

As a franchisee, you are looked upon more favourably when it comes to bank loans and overdrafts than if you were a struggling entrepreneur trying to kick-start your own firm from scratch. The increased security and reliability of a large firm behind you means that banks will often offer you substantial loans to aid your start-up costs.

The best franchises we suggest you now a days are Online services, they are the franchise options for many reasons, low cost and less initial space are the two important features of it.Look out for a company like Phixman! This company is India's one of the best On-line Mobile Repair Company, this is the best investment because smartphones are becoming a basic need in everyone's life and onecannot live without mobile phone for a few hours. Phixman is the company that takes your smartphone from your doorstep, repairs it and then delivers it back to your doorstep, all you have to do is place your order on -line. It is India's one of the most fastest growing franchises and is the best franchise to start in 2019.

Watch out for a few Successful Agri- Start-ups as Models for Aquaculture

Besides, a general outlook of few agristartups and what they are into is also discussed below:

- Inputs & Marketing: Green Agrevolution (Leveraging technology to connecting the remote interior small farmer to the best inputs & biggest buyers)
- Farm Mechanisation: EM3, Agri services, MITRA, Khetigaadi, OXEN.
- Post-harvest management: Ecozen (On-farm solar powered cold storage -downscaling technologies to be accessible to small farmers)
- Eco-friendly Crop protection: Barrix Agro Science
- Precision Farming: Fly bird Innovations (Smart Irrigation systems)
- Farm Automation in Dairy Management: Stelapps
- Weather Forecasting: Sky met (Real-time weather forecast & crop advisory & risk cover)
- Agriculture Services infrastructure leveraged to deliver: Telemedicine services, Agrobook
- Drones in Agriculture

Focus of IT - Private Firms in Aquaculture

- **TCS** has a mobile delivery based advisory platform 'mKrishi'. It provides information system for farmers which help them access localised information and advice on agricultural issues. It is an easy tool to shrimp growers in stocking, pond management, feed and water test management and sampling in addition to providing weather forecast and graphical records.
- **Tech Mahindra** enables companies to transport produce and meat grown at farm and deliver it as fresh. This enables real time alerts/notifications on threshold violations. It also helps to monitor storage temperature and humidity levels ensuring food quality to comply to food safety regulations
- **Infosys** helps in connecting the dots between on-field data and business insights of the farming ecosystem to transform operations across the agriculture lifecycle. Infosys mobility solutions integrate geospatial imagery and data for smart agriculture, livestock management and logistics. It also offers precision farming solutions for site-specific crop management.
- **Cognizant** helped AQUATEK, a brand of Monsanto Corporation to improve their product. Cognizant prepared an intuitive interface that can be viewed across a wide range of devices. The solution involved satellite-linked, soil moisture probes to monitor water usage and crop health maps to monitor possible risks to crop health.
- **Cognizant and AQUATEK** have brought the labour-intensive business of agriculture into the digital fold
- **Accenture** offers various digital architecture services. Their solution consists of generating vital insights for large farms, improving the productivity and effectiveness of agro input company field agents. Accenture

Connected Crop Solution connects the 3 stakeholders viz. field agent, agro input company and farmers.

- **The e-Choupalis** a unique web-based initiative of **ITC Limited** [a large multi business conglomerate in India] offering farmers required information, products and services they need to enhance farm productivity, improve farm-gate price realizations and cut transaction costs
- **e-Choupalensures** world-class quality in delivering all these goods and services through several product / service specific partnerships.

Focus areas for Aquaculture start-ups'

1. Development of simplified, sensor based quick testing method to test water quality parameters & nutrients in soil
2. Real time assaying and quick grading solution for eNAM to effectively handle huge lots of aquaculture commodities
3. Development of e-marketplaces to connect food processors with aquapreneur/farmers to bridge the value gap – Farm to Fork model
4. Price forecast system for Fish/Shrimps at the time of harvest
5. Dissemination of information to the last mile – Fisheries Extension, Scheme information, processes, hand holding support for benefit under different Government schemes
6. Yield estimation modelling at village or farm level
7. Use of technology in sorting/ grading/ increasing shelf life of aquaculture produce
8. Use of technology to test adulteration of fresh produce
9. Availability of small aquacultural implements/ micronutrients/certified quality seeds through online/ call centre interface – Custom Hiring Centres
10. Alternate usage of culture water (left in ponds after harvest) to encourage the farmers for the efficient use of resources.
11. Technology to substitute the use of antibiotics to prevent pre-harvest losses
12. Seeking affordable, accessible, easy-to-use technologies, products or services to enhance aquaculture productivity in India

Conclusion

India is often described as "the posterchild of emerging markets" for its vast commercial potential for start-ups'. In a country with a population of nearly 1.3 billion people, even niche products can have significant market potential. Over the last decade, the sector is being streamed with the stream of educatedyouth, fired by the ideas, passion and innovations to launch newer kinds oftechnology and business models to lift the face of aquaculture from primitiveto hi-tech one. Therefore, the Indian aquaculture sector is perceived as being capable of offering an abundance of opportunities for start-ups and pursue promising avenues at the frontier of the technology. It will providestart-ups with access to priority infrastructure, and make Aquaculture anattractive sector for the country's best brains.

SEA PEN – AN UNIQUE FORM OF SOFT CORAL

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Highlight Points

1. "Sea Pens"are one of the most unique forms of "soft corals" or octocorals, belonging to the order Pennatulcea, which are colonial invertebrate marine animals.
2. Morphological diversity within the Pennatulacea is remarkable which includes an excellent sort of growth forms such as plumose, umbellate, clavate, foliate, capitates, digitiform, whip-like, or vermiform.
3. Sea Pens possess a cosmopolitan distribution, that means theyare encountered across world's ocean from poles to equator in tropic and temperate waters, virtually at all depths (intertidal to over 6100 meters).
4. Species from the order Pennatulacea are known for the production of briarane, cembrane and similar diterpenes.
5. Molecular aspects of Sea Pen related to their phylogeny, evolution etc., are still remains unexplored areas and it will also be beneficial if molecular markers are developed for Sea Pen for accurate identification.

INTRODUCTION

The ocean upholds more than 15 % of the earth's species, with most of them are rare and bizarre. Such as tardigrades, giant tube worms, sea cucumbers, siphonophores, Christmas tree worms etc. Of all this mesmerizing creatures,information about Sea Pen is discussed in the article. "Sea Pens"are one of the most uniqueformsof "soft corals" or octocorals, belonging to the order Pennatulcea, which are colonial invertebrate marine animals.The name "Sea Pen" is derived from their resemblance to quill pens. Sea Pens are long, slender colonial organism of the same phylum as the jellyfish. Sea Pens are a type of octocoral, named for the eight stinging tentacles which are used to capture plankton, a feed material. Since Sea Pens are basically a type of corals their life starts as a polyp, which consists of a sac-like body cavity enclosed by a mouth and surrounded by a ring of tentacles. Perfect substrate for Sea Pen is sand, mud, rubble or, in a few cases, solid rock.The Sea Pen larva settles down and becomes the primary polyp. Then it grows by budding of into secondary polyp. All parts of the Sea Pen are supported on a stem-like structure. Sea Pens differ from the closely related sea pansies and sea feathers by the form of the colony structure.

TAXONOMICAL CLASSIFICATION

The order Pennatulacea includes 14 families, 35 genera and approximately 450 species of with an estimated 200 are considered valid. A total of 53 species of Sea Pen belonging to 15 genera and 10 families are found in Indian waters (Tudu et al., 2018).

SYSTEMATIC CLASSIFICATION

Kingdom: *Animalia*
Phylum: *Cnidaria*
Class: *Anthozoa*
Subclass: *Octocorallia*
Order: *Pennatulacea*
Suborder: *Subsessiliflorae*
Family: *Pennatulidae*

Sea Pen

SALIENT IDENTIFICATION FEATURES

Morphological diversity within the Pennatulacea is remarkable which includes an excellent sort of growth forms such as plumose, umbellate, clavate, foliate, capitates, digitiform, whip-like, or vermiform (Williams, 2011). General morphology of Sea Pens possesses a central stalk, that consists of a peduncle and rachis, the peduncle is the lower part which anchors the colony in mud or sand. The rachis are the upper part that bears polyps or branches bearing several polyps. Colonies of some genera bear few polyps where as others bear as many as 35,000 polyps. Not all the pennatulaceans, resemble pen structure for example, Renilla a kind of Sea Pen found along the Pacific and Atlantic coasts of North America, may be a flattened kidney-shaped plate consisting of two fused halves. The slender rod-like members of the genera *Anthoptilum, Funiculina, Balticina, Stylatula, and Virgularia* may grow to a length of two metres. Genus *Leioptilus* are considered to be shorter forms of Sea Pen that barely grows to 8 inches and have a couple of relatively large leaves

extending from the central stalk.Sea Pens are available in multi-colors such as red, blue, yellow etc., most Sea Pens luminesce, or glow, once they are touched or otherwise stimulated.

DISTRIBUTION

Sea Pens possess a cosmopolitan distribution, that means theyare encountered across world's ocean from poles to equator in tropic and temperate waters, virtually at all depths (intertidal to over 6100 meters). Intertidal habitats in west coast (Gujarat) and east coast of India were considered to be the major territories of Sea Pen in India. A few species such as *Anthoptilum* sp. has some special features that permit them to inhabit rocky surfaces. Pennatulaceans occupies really large areas of benthic marine environments. It includes mud flats, sandy areas on or near coral reefs, shallow-water areas of mud or rubble, continental shelves and slopes, rocky outcrops, abyssal plains, and hadal trenches. Most species have a muscular peduncle for anchoring in soft sediments, and thus are able to inhabit vast areas of relatively uniform benthic environments such abyssal plains. Deeps-sea pennatulaceans are often exhibit patchy distributions and found in relatively eutrophic conditions in moderately high energy environments. Deep-sea pennatulaceans are often most common in more active areas such as sea mounts, escarpments, continental slopes, and along the bases of ridges due to well established water current system.

REPRODUCTION

There are two types of secondary polyps namely siphonozooid and autozooid. Siphonozooids uses the colony canal system to draw a current of water. Autozooids feed and produce eggs and sperm. These gametes are expelled through the mouth into the open water, where fertilization takes place. Then the ciliated planula, or free-swimming larva, settles to the bottom and metamorphoses to form the axial polyp of a new colony. The populations exhibit an approximate 1:1 sex ratio (Edwards and Moore, 2009).

CONSERVATION IMPORTANCE

Sea Pen possessescrucial conservation importance. The description of species distribution is a key requirement for the conservation and management of marine biodiversity. Physical disturbance from demersal fishing and other anthropogenic activities may have a modifying effect on Sea Pen distribution. As a consequence, Sea Pens are regarded as an important indicator of the quality of mud habitats and associated communities.

COMMERCIAL APPLICATIONS

Species from the order Pennatulacea are known for the production of briarane, cembrane and similar diterpenes. They exhibited a wide range of biological activities, including cytotoxicity, anti-inflammatory, antiviral, insecticidal and immune-modulatory activity. Sea Pen of the genus Vigularia have been studied by marine natural products research groups and have yielded numbers of various novel secondary metabolites, including steroids and fatty acid derivatives. The essential fatty acids (eicosanoids) extracted from the Sea Pens possess antibacterial, antifungal and anti-inflammatory activity and prevent the release of compounds that involve in blood coagulation and vasoconstriction.

FUTURE PROSPECTIVE

Studies explaining the environmental preferences and broad scale distribution of Sea Pens are scant, with the majority of accounts on distribution, environmental preferences. So there is more scope in developing cost effective model for exploring sea pen. Molecular aspects of Sea Pen related to their phylogeny, evolution etc., are still remains unexplored areas and it will also be beneficial if molecular markers are developed for Sea Pen for accurate identification.

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The Nutritional benefits and commercial significance of seaweeds

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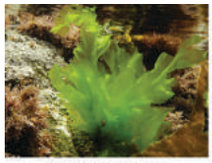
Highlight Points

- Seaweeds have good nutritive value contain protein, amino acids, fiber, vitamins A, C, E, K, and B complex, minerals such as iodine, selenium, potassium, calcium, magnesium, and iron.
- Besides having nutritional valuve also contain medicinal uses like antioxidant, antimicrobial, and high healing properties.
- Seaweeds used as food directly also added as an ingredient in food products.

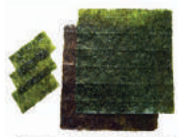
Introduction

Seaweeds are macro algae growing abundantly in the shallow stretches of the marine coastal environment. They grow attached to substrates such as sand, mud, rocks, and shells and common in tropical and temperate parts of the globe. Depending on their pigmentation seaweeds are classified into *Rhodophyta* (red), *Phaeophyta* (brown) and *Chlorophyta* (green). Seaweeds are ecologically significant as theyprovide a unique habitat for essential nursery for fishes and other marine organisms. Seaweeds are also nutritionally valuable as fresh, dried and ingredients in different foods. Further, they also find applications in chemical, textile, agriculture industries including pharmaceuticals. Seaweeds are rich in dietary fibers, minerals, and vitamins but low in energy making them an ideal health food. Seaweeds have been used for human consumption in many parts of the world since ages, in different forms such as dried sheets, salads, soups,and food additives. Dried sheets of *Porphyra* are used in soups, sushi or onigiri (rice balls), known as Gim in Korea, nori in Japan and zicai in China. Irish moss or carrageenan (*Chondrus crispus*) is used as food additive along with *Kappaphycus*and *Gigartinoid*. *Porphyra* is traditionaly used in Wales to make laver breadwith oat flour. In northern Belize, seaweed is used with milk, nutmeg, cinnamon, and vanilla to make a sweet delicacy known locally as "*dulce*". Gelatinous seaweeds are extracted for their hydrocolloids or phycocolloids for the production of products such as alginate, agar, and carrageenan. Agar is widely used in confectioneries, meat products, poultry products, desserts, beverages and molded foods. Carrageenan is used in salad dressings and sauces, dietetic foods, and as a preservative in meat, fish, dairy products and baked goods. The food industry used carrageenan for gelling, water-retention, emulsifying and modifying other physical properties of food products.


Green Seaweed


Brown Seaweed


Red Seaweed


Nori – dried edible red seaweed (*Porphyra* sp.)


Ongiri rice ball encircled with Nori


Welish Laver bread with cooked seaweed

Nutritional Quality of seaweeds

The nutritional quality of seaweed varies with species, geographical location, time of harvesting and external conditions such as temperature, light intensity and nutrient availability in water. Seaweeds contain protein, amino acids, fiber, vitamins such as A, C, E, K, and B complex;also rich in minerals such as iodine, selenium, potassium, calcium, magnesium, and iron like most land vegetables.

Protein and amino acids

Proteins with adequate amounts of essential amino acids are the main factors in assessing nutritional value of any food product. Seaweeds provide a significant amount of nitrogen compounds such as proteins that contain all the major amino acids depending on the seasonal period. In general, the highest protein in seaweeds occur during winter–early spring and the lowest during summer-early

autumn. The protein content of seaweeds dependsupon species and growout conditions. Generally, Red and green seaweed have high protein content compared with brown seaweed and the average levels range between 10-30% of dry matter. The average protein levels inbrown seaweeds is low about 3±15% of dry weight, moderate in green seaweeds about 9±26% of dry weight and high for red seaweeds viz., Dulse (*Palmaria palmate*)8-35% and Nori (*Pyropia*) 47%. Amino acids are structural units of protein, which play important roles in many metabolic pathways. Generally, the protein content decreases in the order of the seaweed group: red > green > brown. The high amounts of essential amino acids, viz., Glycine, alanine, arginine, proline, glutamic, and aspartic acids occurred in green seaweeds than in red and brown, whereas tyrosine, methionine, and cysteine occurred in a comparatively lower amount. Non-essential amino acids,glutamic and aspartic acid constituted a predominant quantity in all seaweed types, ranging from 20–44%in brown seaweeds, 26–32% in green seaweeds, and 14–19% in red seaweeds.

Carbohydrates

Seaweed contains a large amount of carbohydratesranging from 20% to 76% of dry weight. Basedon the chemical structure and function they can be classifed as structural, storage, and functional polysaccharides. Starch is the major form storage polysaccharide found in green seaweed, Floridean starch in red seaweeds and Laminarin starch in brown seaweeds. They are an excellent source of dietary fiber and polysaccharides such as alginates, agar, agarose and carrageenans. These fibre and polysaccharides function as an important pre-biotic agents, enhancing gut health and improving bacterial populations, in addition to providing bulking effects, facilitating smooth passage through the gastrointestinal tract. From the nutritional point of view, seaweed polysaccharides play an important role as dietary fiber depends on types of species. Though the carbohydrate content in seaweed is considerably high, its greater portion is available as polysaccharide dietary fiber, which cannot bet taken up by the human body. Therefore, in terms of bioavailability seaweed is not considered as a good source of carbohydrate.

Lipids

The lipid content of seaweeds is relatively low and mainly consists of lipids or fatty acids ranged from 1 and 5% of dry seaweed matter. However, these lipids are rich in essential n-3 polyunsaturated fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA)which can effectively reduce the risk of diabetes, osteoporosis and cardiovascular diseases. Significantly, the ratio of n-6 to n-3 in seaweeds and fish is approximately 1:1, very similar to the proportions of the fatty acids in the human brain. Red and brown seaweed predominantly include the polyunsaturated 20 carbon-fatty acids eicosapentaenoic acid (EPA, ω-3, C 20:5) and arachidonic acid (AA, ω-6, C 20:4).

Minerals

Seaweeds are good source of minerals, their levels depend on type of seaweeds and the available composition depends on exogenous and endogenous factors. Seaweeds can absorb inorganic substances from the environment. However, differences in mineral levels in seaweed tissues depends on the stage of the living cycle and the age of seaweed. The mineral composition of seaweed varies according to different factors including the environmental conditions and specific behavior of each seaweed genus. Seaweeds are excellent contributors for microelements I, Fe, Mn, and Zn to RDIs. Brown seaweedshave been used for the production of soda and potash and it has also been a source for iodine production for many years. Due to high iodine concentration brown seaweeds Sargassum, Laminaria, Ecklonia, Macrocystis, Undaria, Ascophylum, and Durvillaea; red seaweed such as Gracilaria, Palmaria, Chondrus, Laurencia, and Gelidium; and green seaweed such as Enteromorpha, Ulva, Codium, and Monostroma have been utilized as natural sources for the production of iodine nutraceuticals.

Vitamins

Seaweeds are a good source of water soluble - (B1, B2, B12, C) and fat-soluble (β-carotene with vitamin A activity, vitamin E) vitamins at varying levels. Green and brown seaweed contain high amounts of vitamin C on average between 500 and 3000 mg/kg dry matter. The majority of red and brown seaweeds contain other water-soluble vitamins of the B group, particularly thiamine and riboflavin. Seaweed is a significant source of fat-soluble carotenoids (as provitamins of vitamin A) and vitamin E. Vitamin E has strong antioxidant activity and its unique function is lipid membrane protection from peroxidation. It exists in eight forms: α, β, γ, δ-tocopherols and α, β, γ, δ- tocotrienols, with the α-forms showing the highest antioxidant effect. Carotenoids are represented by different pigments that form the seaweed color together with chlorophyll. The main forms of carotenoids present in brown seaweeds are Fucoxanthin, β-carotene and violaxanthin. The main carotenoids of red seaweed are α- and β-carotene and their derivates such as zeaxanthin and lutein. Green algae have a similar composition of carotenoids in comparison to higher plants. 100 g of seaweed provides more than the daily requirements of vitamin A, B_2, B_{12}, and two-thirds of the vitamin C requirement. Most of the red seaweeds (Palmaria, Porphyra) and green seaweeds contain large amounts of provitamin A and a small amount of vitamins B_1, B_2, and B_{12}. The vitamin content of brown seaweeds (Undaria, Laminaria) are lesshowever they havea high content of vitamin C. The highest amount of vitamins B_1 and B_2have beenobserved in brown seaweeds, wakame and Kombu—0.3 and 0.24 mg /100 g dw; 1.35 and 0.85 mg /100 g dw, respectively. Lower levels of these vitamins are present in brown seaweeds, Arame (0.06–0.12 and 0.65–0.92 mg/100 g dw, respectively), *Caulerpa lentillifera* and *Ulva reticulata*. In general, brown seaweeds contain higha-tocopherol (also β- and δ-tocopherols) but red and green contain only α-tocopherol, with higherlevels of vitamin E in kelp Macrocystis *pyrifera*, 132.77 mg/100 g fat (α-tocopherol) and in *Ulva lactuca* with δ-tocopherol value 96.35 mg/100 g fat.

Dried purple seaweed Dulce rich in Mineral

Aonori – dried seaweed flakes used in garnishing of Japanese food. Rich in vitamins and minerals

Wakame - *Undaria pinnatifida*, used in soups and salads in Japan, good low calorie diet

Kombu – dried kelp, used in soups in Japan, China and Korea. Rich in iodine and glutamates

Hijiki – dried brown Sargassum, rich in fibre and certain mineral, used in Japan, Korea and China

Irish Moss - rich in Potassium, Anti-bacterial and Anti- viral properties

Dashi – a clear soup made from Kombu, dried sardine and mushrooms. Provides anti-aging effect

Tsukudani – is small fish, shellfish or seaweed cooked in Sugar and Soy Sauce

Medicinal uses

Seaweeds exhibit antioxidant, antimicrobial and high healing properties against various diseases like chronic inflammation, atherosclerosis, cancer, cardiovascular disorders and ageing processes which explain their considerable commercial potential in medicine. Algin has great therapeutic value, it can bind with heavy metals present in the food stream and carry them out with the stool since algin is generally not digestible. The presence of Iodine, selenium, and Tyrosine helps thyroid functions in humans. The high content of iodine are present in Kombu 2523 mcg/gram, 139 mcg/gram in Wakame and 37 mcg/gram in Nori.Seaweeds also reduce heart diseases. Fucoidans in brown seaweeds reduce the intensity of the inflammatory response, increases tissue healing such as sports injuries, bruising falls, muscle, and joint damage, and deep-tissue cuts, etc. It also interferes with viral attack, cell attachment, cell penetration, and intracellular virion production by stimulating the production of antiviral cytokines elucidating stronger therapeutic responses in the host. Carrageenan in red algae is being used as treatments for respiratory ailments, especially intractable sinus infections and lingering pneumonia. Sulfated saccharides from red and green algae inhibit some DNA and RNA-enveloped viruses. Seaweed extract is used in some diet pills, gastric banding, that expanding in the stomach to make the stomach feel more full and help in diet control and weight loss.

Common seaweed food products in the world

Seaweed is most commonly eaten in Asian countries such as Japan, Korea, and China. It can be used in many dishes such as sushi rolls, soups, stews, salads, supplements, and smoothies. Products of Algin or alginates and agar from seaweeds are used in bakery products, candies, dairy products, salad dressings, ice creams, and creams and jellies, also in processing meats, sausages, and fish and in clarifying beers and wines. The common seaweed food products used in the world is Wakame,Kombu, Nori, Dulse, Hijiki, Irish moss, Sea lettuce, seaweed salad, Dashi Tsukudani, and Seaweed smoothie. Wakame is also known as sea mustard, is a dark green seaweed found in miso soup, a taste enhancer, a silky smooth texture and a good source of omega-3 fatty acids. Kombu is one of the most popular edible seaweeds in East Asia. It cooked in water with bonito (skipjack tuna) flakes, the main ingredient of dashi, soup such as miso soup and ramen in Japanalso enjoyed directly, softened in hot water and served with mirin that called Japanese rice wine and soy sauce, steeped in water to make kombucha called a Japanese tea that different from the fermented drink products in the U.S.

Nori is also known as purple laver, roasted and pressed into dried nori sheets popular in the western countries. Dried nori sheets used to wrap sushi rolls and onigiri (rice balls) in Japanese restaurants. The powdered product of Nori names as Aonori used as a flavor enhancer in traditional Japanese dishes like okonomiyaki (pancakes) and yakisoba (buckwheat noodles).Dulse harvested from Scotland and Iceland. It has a soft, leathery texture. It has a taste reminiscent of bacon and cooked up in oil until crispy to make bar snacks in Canada also is sold in different forms such as dry flakes, shredded and powder. It also used in soups, baked into chips, meat seasoning in Canada and the Irish use dulse to make soda bread. Hijiki is a brown seaweed collected from China, Japan, and Korea. Hijiki is first boiled then dried often cooked in stir-fries also served with fish. Irish moss is used in the U.S. and Europe. Mostly used as thickening agents. Sea lettuce is also called green norifrom the genus of *Ulva,* found along coastlines.

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