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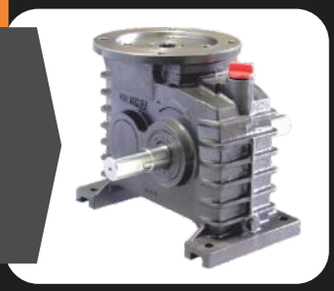

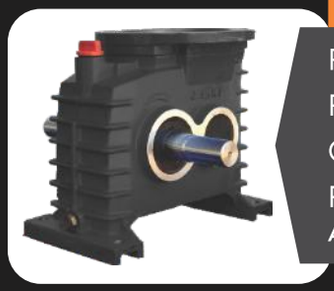

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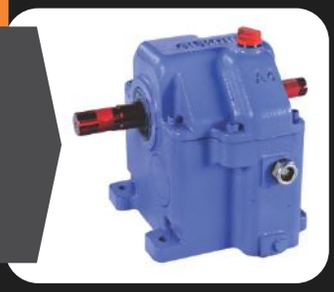

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There is a need for the Fisheries sector to focus on Domestic market Consumption along with Exports

The ability to maintain optimal and constant water quality conditions throughout the culture period leads to gain more attention for aquaculture farmers.

"We are dealing with a growing number of fish species we farm, all having different nutrient requirements, intestinal morphologies and raising conditions. This has consequences for the speed of innovation within the field of fish nutrition and science". Yet, Lyons sees a lot of catch-up in the field of fish nutrition in the last few years, moving aquaculture up on the so-called R & D / innovation ladder.

Dear Readers,

The June 2022 issue of Aqua International is in your hands. In the news section you may find news about ...

Aqua International presented 18 Awards to the individuals, institutions and organisations who have excelled in their profession and contributed to the development of Aquaculture industry in all aspects in India at a function held during India International Aquaculture Expo 2022 held at Chennai on 6 April 2022. A report on it with details of award recipients may be seen in the inside pages of this issue.

Evoqua Water Technologies says that India is the 2nd largest producer of fish in the world and is one of the largest shrimp exporters in the world. And India is pushing it big way, as the marine-based industries have a great dollar potential. Aquaculture production has increased dramatically over the past few decades. To achieve the objective of increasing the fish production in local fish farms, fish farms nowadays evolve

rapidly from labour-demanding and inefficient traditional fish farms to high-tech modern mass production

fish farms. It is predicted that by 2030 an additional 40 million tons of aquatic food will be needed to maintain the current per capita consumption, and to produce more food from the same area of land and water at the same time reducing the environmental impacts requires more sustainable intensification methods for feeding 9 billion people. The ability to maintain optimal and constant water quality conditions throughout the culture period leads to gain more attention for aquaculture farmers.

Alltech ONE Conference was held in Lexington, Kentucky and speaking at this session, Philip Lyons, global manager, Aquaculture Research at Alltech Coppens emphasized the complexity of fish nutrition, compared to monogastric or ruminant nutrition. "We are dealing with a growing number of fish species we farm, all having different nutrient requirements, intestinal morphologies and raising conditions. This has consequences for the speed of innovation within the field of fish nutrition and science". Yet, Lyons sees a lot of catch-up in the field of fish nutrition in the last few years, moving aquaculture up on the so-called R & D / innovation ladder. **Mr Parshottam Rupala,** Minister of Fisheries, Animal Husbandry and Dairying said there is a need to for the fisheries sector to focus on domestic market consumption along with exports, deploying more scientific methods of production. Realising the sector's potential, the Government has committed to a national target to increase fish production to 22 million metric tons by 2024-2025, which will have a positive impact on 28 million fishers and fish farmers and almost twice that number along fish-related value chains, the minister said at an event organised by Confederation of Indian Industry in collaboration with the Ministry of Fisheries, Animal Husbandry and Dairying, National Fisheries Development Board and the Marine Products Export Development Authority on "Showcasing India as a hub for Aquaculture and fisheries Investment" on January 21, 2022.

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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The Department of Fisheries at KhonKaen University is carrying out a farming project with vannamei white shrimp that uses a low-saline water circulation system. The project is the collaboration between the department and Thai Union Feed Mill. To be sustainable, shrimp farming systems need circulating water and a way to drain sewage and wastes in the pond. Waste from shrimp farming can be converted into fish feeds, while the circulated water can be treated in a closed system to reduce waste discharges in the environment. This allows shrimp farmers to achieve stocking densities that are four to five times higher than those seen in earth-pond farming. A typical farm cycle in a circulating system lasts 70 days and can produce 60 shrimp per kg.

Bühler Group is opening its world-class Insect Technology Center (ITC). Located in Uzwil, Switzerland, the facility brings together Bühler's expertise and the best infrastructure to help the industry further develop. In the ITC, Bühler and its customers can conduct larvae growth trials with various feedstock, develop product samples, evaluate breed solutions, and run training. The ITC, which obtained funding from Switzerland's Federal Office for the Environment (FOEN) due to its contribution to a more sustainable food system, is already in operation.

In the Articles section – *Health Benefit & Medicinal Value of Sea Cucumber,* *authored by* Abhay Kumar, Mumbai Research Centre of CIFT, Vashi, Navi Mumbai and S.M. Shaikh, College of Fisheries, Shirgaon (Dr B. S. Konkan Krishi Vidyapeeth, Dapoli), Ratnagiri, discussed that Sea Cucumber is an interesting natural source of novel functional materials with biological activities that could be used in food as well as biomedicine industries. Sea cucumbers are soft bodies marine invertebrate from the class Holothuroidea. Sea cucumbers have a leathery skin and an elongated body containing a single branched gonad. These organisms constitute 1716 species with the greatest biodiversity being in the Asia Pacific region. Sea cucumber is also known as "teripang or trepang" in Indonesia; "beche-de-mer", a new environmental conditions to survive, and produce secondary biologically active metabolites which cannot be found in other organisms. Sea cucumbers are organisms that live in complex environmental conditions, therefore, sea cucumber had same medicinal properties as the herb ginseng and its also called as "haishen" which means "ocean ginseng".

Another article titled ***Role of Optimal Formulated Feeds for Efficient Shrimp Larval Development with reference to L. Vannamei,*** *authored by* Dr Raghavendrudu, Product Manager, Skretting India, Hyderabad, said that Role of optimal Formulated Feeds for efficient Shrimp Larval Development with reference to L. Vannamei. Successful production of robust post larvae for stocking in grow-out ponds largely depends on feed quality and the feeding schedule that is applied in the hatchery. Formulated feeds have similar composition similar to micro algae and zooplankton with high levels of essential nutrients such as vitamins, minerals, pigments like astaxanthin, highly unsaturated fatty acids, cholesterol and lecithin. Good practice in feeding and management of shrimp larvae is essential in ensuring optimum health, welfare and growth of farmed shrimp. Effective feeding management includes monitoring of swimming activity, mortality, morbidity and disease symptoms. Microscopic observations of length, gut, hepatopancreas, muscles etc are also important for better feeding management.

Article titled ***Fish kills during summer: Causes and Prevention,*** *authored by* Monica K S, Detty Nebu, Rakesh K and Ganapathi Naik M, Department of Aquaculture, College of Fisheries, Mangalore, Karnataka

discussed that summer temperatures can put a burden on aquatic ecosystems, pushing creatures like fish to their limits. As the temperature rises, so does the risk of a fish kill. Most fish kills, on the other hand, are a natural event that can occur as the water heats and dissolved oxygen levels drop. While nature is often to fault, communities can take steps to improve the summer conditions of their water bodies.

Temperature is the primary factor that controls the metabolism of many organisms. It interacts with other parameters and influences oxygen solubility, respiration rates, feeding, assimilation, growth, behaviour and reproduction. Fishes are poikilotherms, they have the same body temperature as that of their surroundings. Acclimatization is the process by which fish physiology is slowly altered so that it can adapt to environmental changes such as temperature, pH, salinity etc. Eurythermal fish have evolved to thrive in a wide range of temperatures, whereas stenothermic fish have developed to stay within a small temperature range. By the drastic changes in temperature, enzymes become inactive and organs might fail resulting in the death of the organism.

Another article titled ***Development of Tilapia Feed – A Cost Efficient Quality Choice for Tilapia Farmers,*** *authored by* E. Prabu, N. Felix, Mir Ishfaq Nazir, K. Manikandan and G. Sathishkumar,

Tamil Nadu Dr J. Jayalalithaa Fisheries University, Directorate of Incubation and Vocational Training in Aquaculture, Muttukadu, Chennai, Tamil Nadu, said that Nile tilapia, Oreochromis niloticusis considered as one of the most important species of fish in tropical and sub-tropical aquaculture. The mono-sex male population of tilapia are well recognized for increased production potential and low management requirements. Approximately 40% of fish from aquaculture originates from tilapia production. Today, tilapia has become the shining star of aquaculture and also popularly known as 'aquatic chicken' and the rate of consumption has increased across the globe. Annual global production of cultured tilapia has increased consistently in recent years. The GIFT strain was developed by International Centre for Living Aquatic Resources Management (ICLARM; presently World Fish Centre, WFC) through several generations of selection from the base population involving 8 different strains of Nile tilapia Oreochromis niloticus.

Proteins are long chains of amino acids linked by bonds called peptide bonds. All amino acids contain nitrogen, so all proteins contain nitrogen. In fact, measuring nitrogen content is a method of calculating protein content. Metabolism of protein for energy produces nitrogen end products. Fish eliminate these through gills, faeces and urine. These nitrogen end products can cause problems in fish ponds. Protein is the major concern during formulation of fish feed. It is the most expensive for fish feed and the important factors that contributing to the growth performance of cultured species.

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 Aqua International regularly and update yourself. Wish you all fruitful results in your efforts.

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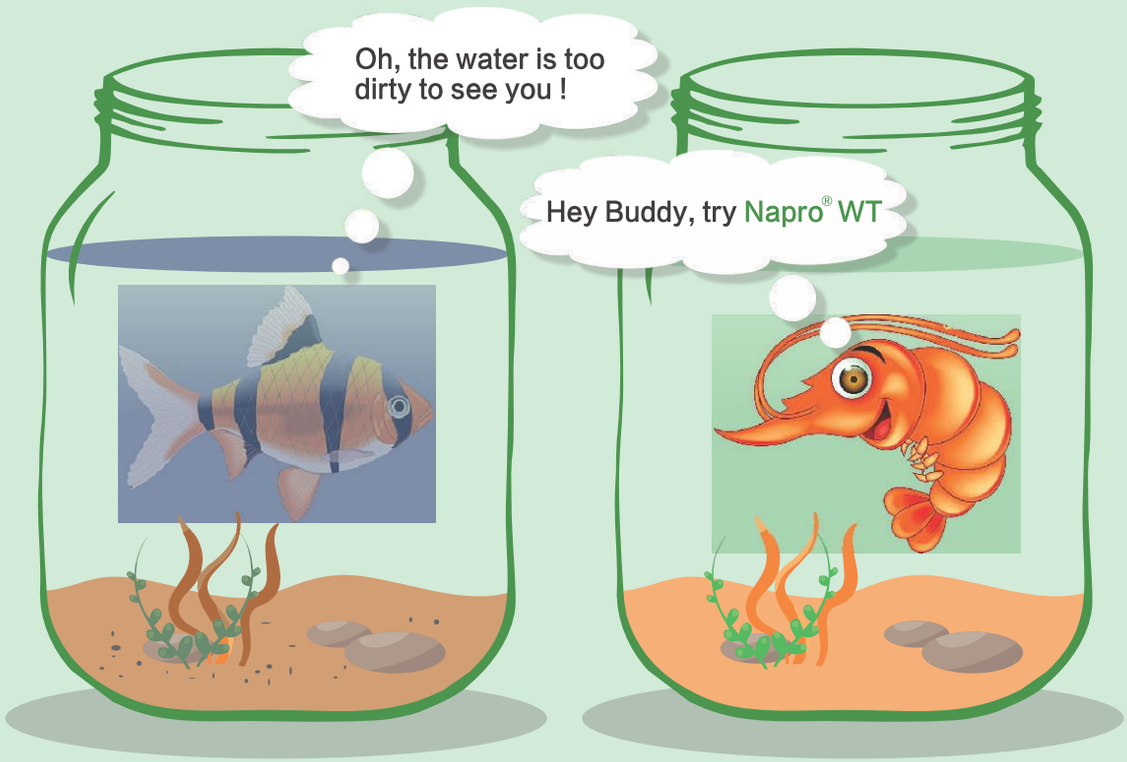

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Aquafeed Progressing on Innovation and Sustainability

May 25, 2022:

We have to stop searching for single magic bullet ingredients to replace fishmeal, but rather apply flexible formulation, utilizing all the raw materials we have available. Combined with precision nutrition and life cycle assessment tools, we can also do this in a more sustainable way.

This was said at the aquaculture sessions at the Alltech ONE Conference, held this week in Lexington, Kentucky. Speaking at this session, Philip Lyons, global manager Aquaculture Research at Alltech Coppens emphasized the complexity of fish nutrition, compared to monogastric or ruminant nutrition. "We are dealing with a growing number of fish species we farm, all having different nutrient requirements, intestinal morphologies and raising conditions. This has consequences for the speed of innovation within the field of fish nutrition and science".

Yet, Lyons sees a lot of catch-up in the field of fish nutrition in the last few years, moving aquaculture up on the so-called R&D/innovation ladder. Lyons explains: "This 'ladder' - or research trajectory - has 8 phases, going from phase 1 (simple formulation using crude nutrient and gross energy values) to more advanced formulation using precise growth modeling and ileal protein digestibility (phase 5) all the way up to nutrigenomics, automated feeding, data analytics and computer vision (phase 8).

While pigs and poultry have already reached phase 8, the innovation level of Nile tilapia, rainbow trout and Atlantic salmon is still around phase 5. If we combine all aquaculture species, we are even at phase 3-4. But we are now moving into the next phases fast with many fish species, which is really exciting."

From net energy to functional diets

A great example of innovation development is the use of net energy models instead of working with digestible energy values. "Working with digestible energy means you basically assume that all the protein, fat and carbohydrates within the diet are utilized in the same way. Net energy takes that step further and actually assumes that these nutrients are utilized differently, resulting in a far more precise measurement of growth performance. This gives the farmer a clear model of what to expect from a given feed. For rainbow trout, we are already using the net energy values in our formulation, and there are a number of exciting projects in this field that are developing net energy models for more fish species. It is complicated because all species are different, but the impact is huge, both from a performance and sustainability standpoint," Lyons explained.

Lyons also sees a lot of opportunity in the field of the microbiome (what is the function of the gut bacteria, for example), the use of enzymes in fish diets (can we apply them more often) and the development of functional diets (designing specific/precision diets for different conditions or varieties within one species). Lyons explained that "enzymes are still an underutilized technology within aquaculture, because of the challenges around enzymes during extrusion. Yet, if we are able to overcome this and include more enzymes, there is huge potential to make fish diets more digestible and sustainable".

In the field of functional diets, Alltech Coppens developed a tailored diet for rainbow trout to improve fat digestibility during winter conditions. "As trout diets have a fair amount of fat, cold temperatures lead to solidification of the fat and lower digestibility of the feed. With our feed, we managed to get a 7% increase in fat digestibility during low temperatures, directly improving feed conversion ratio levels," said Lyons.

Focus on Flexibility and Sustainability

Improving digestibility and more precise feeding all lead to more efficient diets and better use of the raw materials we use. When it comes to the replacement

of marine ingredients in the road to more sustainable diets, Lyons had a clear message. "We have to stop searching for single magic bullet ingredients to replace fishmeal. It should be about flexible formulation, using all the raw materials we have available and doing this in a more sustainable way at the same time. It is more a case of adding ingredients instead of replacing ingredients. We really have to change this narrative and perception that persists through the industry."

Maud Valkenaars, nutritional researcher at Alltech Coppens, and also speaker at the event, delved a bit deeper into this topic and explained that "in the past, fish diets were formulated on crude protein and fat levels, wheat, fishmeal and fish oil. But at the moment, the formulation is based on nutrient digestibility levels and amino acid profiles among others, coming from a wider range of protein sources."

Valkenaars addressed that the novel ingredients on the market, such as single-cell protein, insect meal and algae, are considered sustainable options for fish diets, although the price is still relatively high for these new ingredients. "But we shouldn't forget the opportunity of replacing marine ingredients from the wild catch by using more fish trimmings (fish byproducts). This is a

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sustainable and circular way of looking at marine ingredients and awareness of using these byproducts is growing. At Alltech Coppens, we have already replaced 80% of our marine sourced ingredients with fish trimmings," Valkenaars said.

LCA: A necessity in the future

According to Valkenaars, the aquaculture sector is moving towards using more Life Cycle Assessment (LCA), a method to quantify the environmental impact of a certain product and to support sustainable decision making. Valkenaars explained that "there is an increased focus on transparency and sustainability of food production. And we need to be able to quantify the effect that global food production has on the planet. At Alltech Coppens, we started by calculating the carbon footprint per raw material. But sustainability is much more than carbon footprint only, it should also include things such as damage to human health, ecosystems and resource availability. For our LCA calculations, we even added an extra one: the damage to marine resource sustainability. This allows us to also take into account the fish stocks depletion. When we add this data to our feed formulation software, we can quantify the total sustainability score for all the feeds we produce and investigate the potential of the diets in real farm conditions. If you have a sustainable diet, but still have a high FCR in your fish, it is still not sustainable."

Valkenaars foresees that using LCA in aquaculture will become a necessity in the near future, instead of a luxury. "This requires that we all move in the same direction, are transparent and develop a standardized quantification system in sustainability scoring. Now it is our time to take our position in this as a sector," she concluded.

Aquaconnect to Expand Footprint, Increase Aqua Partner Network

May 1, 2022, Chennai: Full-stack aquaculture technology venture and marketplace Aquaconnect is looking to move beyond the three states that it operates in to expand its footprint in other geographies in India while planning to increase its aqua partner network to around 1000 by the end of this year from the current 150 partners on the platform, Rajamanohar Somasundaram, founder and CEO of Aquaconnect told.

The Chennai-based company offers real-time, tech-based farm-monitoring solutions, consultations, aquaculture expertise, and export market access to coastal farmers. Aquaconnect claims to have grown 15x in revenue and has raised $4 million in pre-Series A from Omnivore, Rebright Partners, Flourish Ventures, AgFunder, Hatch Blue, 6G Capital. Last month, Aquaconnect raised Rs 60 crore in a venture debt funding round led by venture debt firm Trifecta Capital.

"We are currently operating in three states in India - Tamil Nadu, Andhra Pradesh and Odisha," Somasundaram said. "With our latest fundraise, we are looking to expand into other geographies such as West Bengal and Gujarat. We are looking to improve our aqua partner numbers to about 1000 by the end of this year. Currently, we have about 150 so we will be growing about 7x of that which means we'll be able to serve close to 150,000 fish and shrimp farmers in India."

He said the company is adopting a risk mitigation strategy that is called "boots on the ground and eyes in the sky." With this technology solution, Somasundaram said that Aquaconnect can identify whether a pond is an aquaculture pond or not, whether it is a fish pond or a shrimp pond and can even find out how long the farmer has been doing aquaculture in that pond and what is the date of culture in addition to a number of other pointers. Through Aquaconnect's solutions, he said farmers have gotten better value realization for their produce by 5-10%.

"With this, we are able to come up with stronger business use cases, something like now the feed producing company can understand what is the demand and the buyers can now understand where they can buy the shrimp or fish using the data satellite remote sensing. And finally, the data insights for the financial institutions can be provided," he said.

He said that this provides underwriting capabilities for the bankers and financial institutions to lend credit products to the farmers, input retailers and buyers. Somasundaram said that financing is one of the major challenges in the aquaculture value chain and despite it being a multi billion dollar value chain, banks and financial institutions are staying away from the opportunity largely due to the challenges in underwriting.

"There is a lack of formal capital and because of that, the value chain stakeholders are borrowing at a very high interest rate which can go up to 36% or 48% interest," he said. "Formal financial institutions can offer a lower interest rate which can be up to 12% or 15%," he said. "With our deeper integration with the farmer network as well as the buyer and retailer network, we are now able to bring in certain transparency in this value chain. So with this transparency, we will be able to bring in better risk mitigation for financial institutions."

He added that the company has partnered with over five financial institutions and two insurers to accelerate fintech inclusion and risk mitigation in aquaculture. All in all, Aquaconnect has assisted over 60,000 aquaculture farmers with a 5x increase over the last 12 months, he said.

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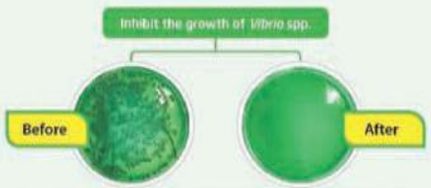

6. INCREASE AQUACULTURE PRODUCTION

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Bacillus spp. > 1x 10^{11} cfu/kg	15%
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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

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Indian Fisheries Sector should deploy more Scientific Methods of Production: Parshottam Rupala

Indian Fisheries and Aquaculture sector registering an average annual growth of 7.53% during last 5 years.

Jan 21, 2022: There is a need to for the fisheries sector to focus on domestic market consumption along with exports, deploying more scientific methods of production, said Parshottam Rupala, Minister of Fisheries, Animal Husbandry and Dairying.

Realising the sector's potential, the Government has committed to a national target to increase fish production to 22 million metric tons by 2024-2025, which will have a positive impact on 28 million fishers and fish farmers and almost twice that number along fish-related value chains, the minister said at an event organised by Confederation of Indian Industry in collaboration with the Ministry of Fisheries, Animal Husbandry and Dairying, National Fisheries Development Board and the Marine Products Export Development Authority on "Showcasing India as a hub for Aquaculture and fisheries Investment" on January 21, 2022.

"(At present) 74% of India's export is shrimp; however the share of value added products is low at 7%. Thus, there is a huge scope to increase value added exports and in tandem increase price points for fishermen. Towards this, India must focus on strengthening seed quality and availability, smart farming and food safety standards," Rajnikant Rai, Chief Executive, Agri Businesses Division, ITC said.

Indian Fisheries and Aquaculture sector registering an average annual growth of 7.53% during last 5 years. The country exported 12.89 lakh metric tons of fisheries products valued at Rs 46,662 crore (USD 6.68 billion) during 2019-20.

"Technology will allow wastelands to be converted to wetlands and thus drive up production towards reaching the target; and also unlock new avenues of investment in high demand segments such as seaweed farming," Dr L Murugan, Minister of State for Fisheries, Animal Husbandry and Dairying said.

The Fisheries and Aquaculture Infrastructure Development Fund (FIDF) has been set up with a fund size of Rs 7,522.48 crore towards creation of fisheries infrastructure facilities both in marine and inland fisheries sectors and augment the fish production.

Further, the Pradhan Mantri Matsya Sampada Yojana (PMMSY) was launched with an allocation of Rs 20,050 crore, the highest ever investment for fisheries sector. The PMMSY will be implemented over a period of 5 years from FY 2020-21 to FY 2024- 25 in all States/ Union Territories. As of January 2022, proposals worth Rs 5,234 crore have been sanctioned, impacting around 16 million beneficiaries.

Thai research collaboration makes additional progress towards low-saline shrimp aquaculture

A research partnership between Khon Kaen University and Thai Union Feed Mill has successfully trialled a new low-saline circulating system for farmed shrimp.

The Department of Fisheries at Khon Kaen University is carrying out a farming project with vannamei white shrimp that uses a low-saline water circulation system. The project is the collaboration between the department and Thai Union Feed Mill.

To be sustainable, shrimp farming systems need circulating water and a way to drain sewage and wastes in the pond. Waste from shrimp farming can be converted into fish

feeds, while the circulated water can be treated in a closed system to reduce waste discharges in the environment. This allows shrimp farmers to achieve stocking densities that are four to five times higher than those seen in earth-pond farming. A typical farm cycle in a circulating system lasts 70 days and can produce 60 shrimp per kg.

Khun Kamphon Thaiso, the manager of the fishery unit at Khon Kaen University's faculty of Agriculture says that vannamei white shrimp is Thailand's most economically important marine shrimp and has great potential to be reared in low-saline environments. The department has been working to create a circulation system that allows the shrimp to be farmed in freshwater with low salinity. The system is designed to have zero water discharges, making it environmentally friendly. It has the capacity to farm 300 shrimp per square metre of space and has similar production outputs to conventional systems (70 day cycle, producing 60 shrimp per kg). Researchers say that these outcomes can be used to promote the new freshwater recirculation system to shrimp farmers across Thailand.

Evoqua's RAS Application Guide in India's Aquaculture Industry

Environmentally friendly and highly productive sea farming RAS system from Evoqua

Introduction

India is the 2nd largest producer of fish in the world and is one of the largest shrimp exporters in the world. And India is pushing it big way, as the marine-based industries have a great dollar potential. Aquaculture production has increased dramatically over past few decades.To achieve the objective of increasing the fish production in local fish farms, fish farms nowadays evolve rapidly from labor-demanding and inefficient traditional fish farms to high-tech modern massproduction fish farms. It is predicted that by 2030 an additional 40 million tons of aquatic food will be needed to maintain the current per capita consumption, and to produce more food from the same area of land and Water at the same time reducing the environmental impacts requires more sustainable intensification methods for feeding 9 billion people. The ability to maintain optimal and constant water quality conditions throughout the culture period leads to gain more attention for aquafarmers. In this context Recirculatory Aquaculture system (RAS), which requires limited resources for greater production and provides environmental gain significant importance. RAS is used for fish production in the indoor tank-based systems where water exchange is limited and the use of biofiltration is required to reduce ionized and nonionized ammonia level. RAS are designed in such a way that minimize the water consumption, control culture conditions and allows waste streams to be fully managed. This system filters the water through a series of biological and mechanical filtration systems and makes it clean for recycling back through fish culture tanks and more than 90% of the water is re-circulated through the culture units. In RAS system most outflow from the fish tank is recycled and treated. For advanced fish farms the complete RAS system with mechanical filter, biological filter, aeration system, oxygen supply is included. There are many benefits of using advanced RAS systems over the traditional RAS system, for e.g., advanced RAS system allows fish farmers to have complete control over water quality parameters during production, reduces direct operational costs of feed, reduces dependency on antibiotics generates high quality safe sea food.

Mechanical Filtration:

This includes Drum Filter which can be potentially replaced by VAF™ System V-Series for particle removal. The drum filter is the essential component of RAS tech needed to remove fine solids. The drum filter comes with several benefits firstly it reduces the overall organic load of the RAS and secondly it increases the clarity of culture water by removing the organic particles. VAF™ System V-Series automatic self-cleaning screen filters can remove suspended solids. The V-Series filter bodies are manufactured in 316L Stainless steel, assembled in the USA and are competitively priced. The cleaning cycle takes less than 15 seconds and does not interrupt in the filtration process. It can be potential replacement for the drum filter in the RAS Application technology.

Ozone Disinfection:

The disinfection process in RAS tech can be further enhanced with the dosing of ozone in the skimmer process, protein skimming is the process of removing extremely fine solids, dissolved organic compounds, microalgae, and small suspended solids. Ozonation can kill pathogens such as bacteria, viruses, parasites, and algae, that exists in aquaculture system.

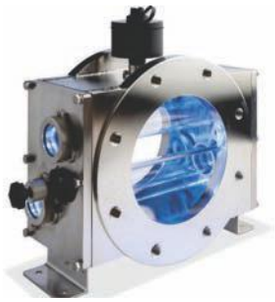
Ultraviolet Disinfection:

This includes ATG™ UV and Pacific Ozone™ products. In most of the case the bacteria count does not decrease even after UV installed due to the lamp sometimes gets covered with micro-organism which effects the effectiveness of the process, However Evoqua's ATG™ UV system with automatic wiping can help in such situation to remove the microorganisms covered on the top layer. Evoqua's ATG™ UV system is best used in combination with the mechanical filtration of VAF™ V-Series system technology for effective removal of bacteria and organic matter from the water, which otherwise is not possible with UV disinfection alone.

Future of RAS Technology:

Climate change, scarcity of fresh water, and sudden outbreaks of diseases are the issues which pose

severe threat to future of Aquaculture Industry. World Population is growing at a pace of 1.1% per year and expected to reach 8.5 billion by the end of 2030. FAO (Food and Agriculture) association has projected 1.8% increase in the per capita consumption of the food fish by 2030. This in turn will put additional burden



on the farm production as marine capture fisheries are also expected to decline over the period due to overfishing. To keep up the present growth of the aquaculture industry, an innovative approach is required to address all the ongoing issues. RAS technology in recirculatory aquaculture system is a highly intensive culture techniques and uses very little amount of fresh water and facilitates full control over the disease outbreak and other external factors affecting the fish culture. With RAS, 30-50 times more fish production is possible and per unit area compared to traditional fish farming with limited use of water. Effective use of reusable resources is the key to meeting future challenges and generate sustainable blue economy.

Deep Branch to Accelerate Production of Alternative Proteins in Iceland

May 24, 2022:

Feed ingredient creator, Deep Branch, signed a memorandum of understanding with Landsvirkjun, the National Power Company of Iceland, to determine the feasibility of constructing Deep Branch's first commercial-scale plant in Iceland. The facility will help scale the production of Proton™, a single cell protein developed by Deep Branch for the animal feed industry.

Having already decarbonized 85% of its energy system, Iceland has the potential to utilize its abundant renewable resources to become the first fully green hydrogen economy. Landsvirkjun, the country's largest electricity generator producing electricity with hydro, geothermal and wind power, is aiming to take a leading role in decarbonizing the Icelandic economy and developing the country's eco-industrial economy by collaborating with hydrogen-utilizing industries and potential investors.

The agreement will see Deep Branch and Landsvirkjun collaborating to conduct a life cycle assessment (LCA) and techno-economic analysis (TEA). It will also affirm the companies' commitment to work together and further explore the potential of eco-industrial clusters in Iceland. The outcomes of the TEA and LCA are expected to be delivered by the end of 2022.

Following the construction of its pilot plant in the Netherlands, Deep Branch is now evaluating potential locations for future commercial-scale facilities to be built within the next five years. The availability of hydrogen – the required energy source for the company's continuous fermentation process – will be a crucial factor in the selection process, as well as the proximity of downstream markets, such as feed producers and aquafarmers. Alongside the TEA, identifying a suitable location will be determined by the outcome of comparable LCA studies.

Commenting on the new partnership, Pete Rowe, Deep Branch's CEO, said that "collaborating with Landsvirkjun, a leading innovator in the energy industry, is a deliberate step in our process of determining the optimal location for our first commercial production facility. Iceland is a strong example of how renewable energy can power a modern economy and be utilized as a resource in the agriculture industry. The prospect of both upstream and downstream synergies makes this an exciting starting point for collaborative innovation, especially as we expect the first commercial production unit for our single-cell protein Proton™ to go live in 2027."

Sigurdur Markusson, executive director of innovation at Landsvirkjun, added, "our collaboration with Deep Branch is a very exciting step in Iceland's eco-industrial development and a positive contribution to the early development of the country's hydrogen economy. We believe that Iceland can play a big role in powering new and innovative solutions for the food system with our unique access to renewable resources. Deep Branch is a great fit as a partner as its distinctive production process could promote new circular opportunities and create value for Iceland's rapidly expanding land and sea-based aquaculture industry."

Buhler opens Insect Technology Center to support customers in the feed and food industries

Uzwil (Switzerland), May 25, 2022 - Bühler Group is officially opening its world-class Insect Technology Center (ITC). Located in Uzwil, Switzerland, the facility brings together Bühler's expertise and the best infrastructure to help the industry to further develop. In the ITC, Bühler and its customers can conduct larvae growth trials with various feedstock, develop product samples, evaluate breed solutions, and run trainings. The ITC, which obtained funding from Switzerland's Federal Office for the Environment (FOEN) due to its contribution to a more sustainable food system, is already in operation.

"The opening of the Insect Technology Center is a major milestone in our journey. Over the last years, we have gained expertise and maturity to serve different customers in the insect industry with the most adequate and reliable solutions. With our new facility, we extend our services and can even better support our customers in installing an industrial insect plant," says Andreas Baumann, Head of Market Segment Insect Technology at Bühler.

At the heart of the Center there are two insect growth chambers that can mimic industrial production conditions. These chambers have a sophisticated climate control system and are equipped with numerous sensors that give valuable process insights. Based on the collected data, the right parameters and practices can be determined to finally ensure an efficient insect production at industrial scale. At the ITC, it is possible to work with the two most relevant insect species for industrial production, namely black soldier flies and mealworms.

"A company that wants to build an industrial insect plant needs to cover several operational aspects. It includes finding the correct feedstock to rear the larvae, making sure that there is a strong and suitable insect strain to grow, defining suitable climate settings in relation to the larvae growth cycle, or getting emission data required for the permitting process," says Andreas Baumann. All these topics are essential for a successful insect plant project and can be addressed in Bühler's new Insect Technology Center. In addition to the services offered to customers, Bühler's team will run its own tests, thereby constantly improving the technology and services for the insect market.

Accelerating insect plant projects

The ITC aims to accelerate large-scale insect plant initiatives. By using the new test facility, customers might not need to invest into expensive pilot plants to demonstrate technological feasibility. Seeing the industrial insect technology in action makes it tangible, which allows customers to directly envision commercially attractive plant sizes. Since the insect growth chambers are mobile, they can be sent to any location, thus making the infrastructure accessible to customers worldwide. "In combination with the operational know-how exchange, we see enormous potential to reduce the overall time from the project idea to a successfully performing plant," says Andreas Baumann.

Contributing to a circular economy

Bühler is committed to ambitious targets that will help mitigate climate change and build a more sustainable food system. Insects are a healthy and sustainable source of protein for food and feed. In addition, their frass can be used as a fertilizer, contributing to a circular economy model of production. The insect feed protein market is expected to reach half a million metric tons in 2030. By then, the pet food sector is projected to take 30% and aquaculture 40% of the total insect protein volumes. "We are devoted to supporting the industry in reaching its full potential. Over the last years we have gained maturity and built the skills for helping the industry to further develop. With proven technologies in our portfolio, we are ready to enable our customers in bringing insect-based products to the market," explains Andreas Baumann.

INVITATION

12th Edition From NRS Group

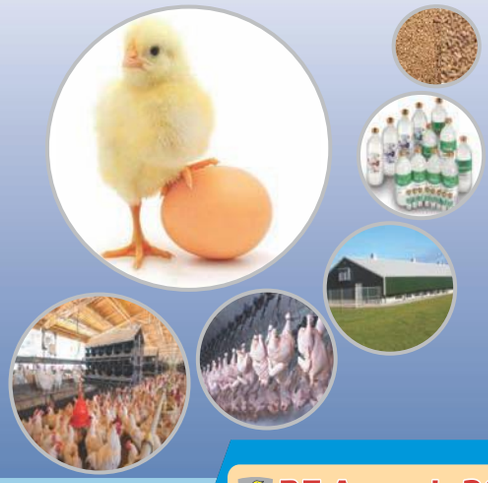
India International Poultry Expo 2022

IIPE

Exhibition & Conference on Poultry

19 & 20 JULY 2022, Mumbai

Exhibition and Conference on Poultry Industry
to Update Knowledge & for Better Business Opportunities.
Also Awards Presentation for Excellence & Contribution to Poultry.



UPDATE
Knowledge on Poultry
A One Day Conference

PF Awards 2022
For Excellence & Contribution to Poultry Sector

VENUE:
Bombay Exhibition Center, NESCO,
Goregaon East, Mumbai, India.

Entry FREE into Exhibition

Advantages of Farmers' Participation in the Expo

Farmers can directly meet and talk to the companies, who exhibit their products & services in the stalls and know about the products and their usefulness in Layer and Broiler farming.

Companies (Exhibitors) can meet farmer-customers and get the feedback on their products and their performance as well as services. This will enable the companies / manufacturers to know farmers' feed back and suggestions to further improve the quality of their products and serices.

Every product displayed in the Exhibition and every word spoken in the inaugural session and during the technical interaction are meant for farmers and to benefit in the Farming.

Farmers may also interact with experts on various aspects and get solutions for different problems in Poultry farming.

This Expo is a very good opportunity to the enterprising people who would like to take up Poultry as a profession.

PROGRAMME: Exhibition, Conference & Awards Presentation

Venue:	**Bombay Exhibition Center, NESCO, Goregaon East, Mumbai, India.** 6.5 kms to the Domestic / International Airport
Dates:	**19 & 20 JULY 2022**
Day 1: **19-7-2022**	**Exhibition** - 10:00 AM to 6:00 PM **UPDATE Knowledge on Poultry** **Conference** - 3:00 PM to 6:00 PM **AI Awards Function** - 6:30 PM to 8:00 PM
Day 2: **20-7-2022**	**Exhibition** - 10:00 AM to 6:00 PM

For Stalls booking and information, please contact:

The Chief Executive, IIPE 2022, NRS Publications,
BG – 4, Venkataramana Apts.,11-4-634, A.C. Guards, Hyderabad, India.

Tel: 040 – 2330 3989
M: +91 70329 19554

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www.poultryfortune.com

Registration Fee for Conference: INR 3500

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Poultry Fortune
English Monthly Since 1991

Entry FREE into Exhibition

India International Poultry Expo 2022

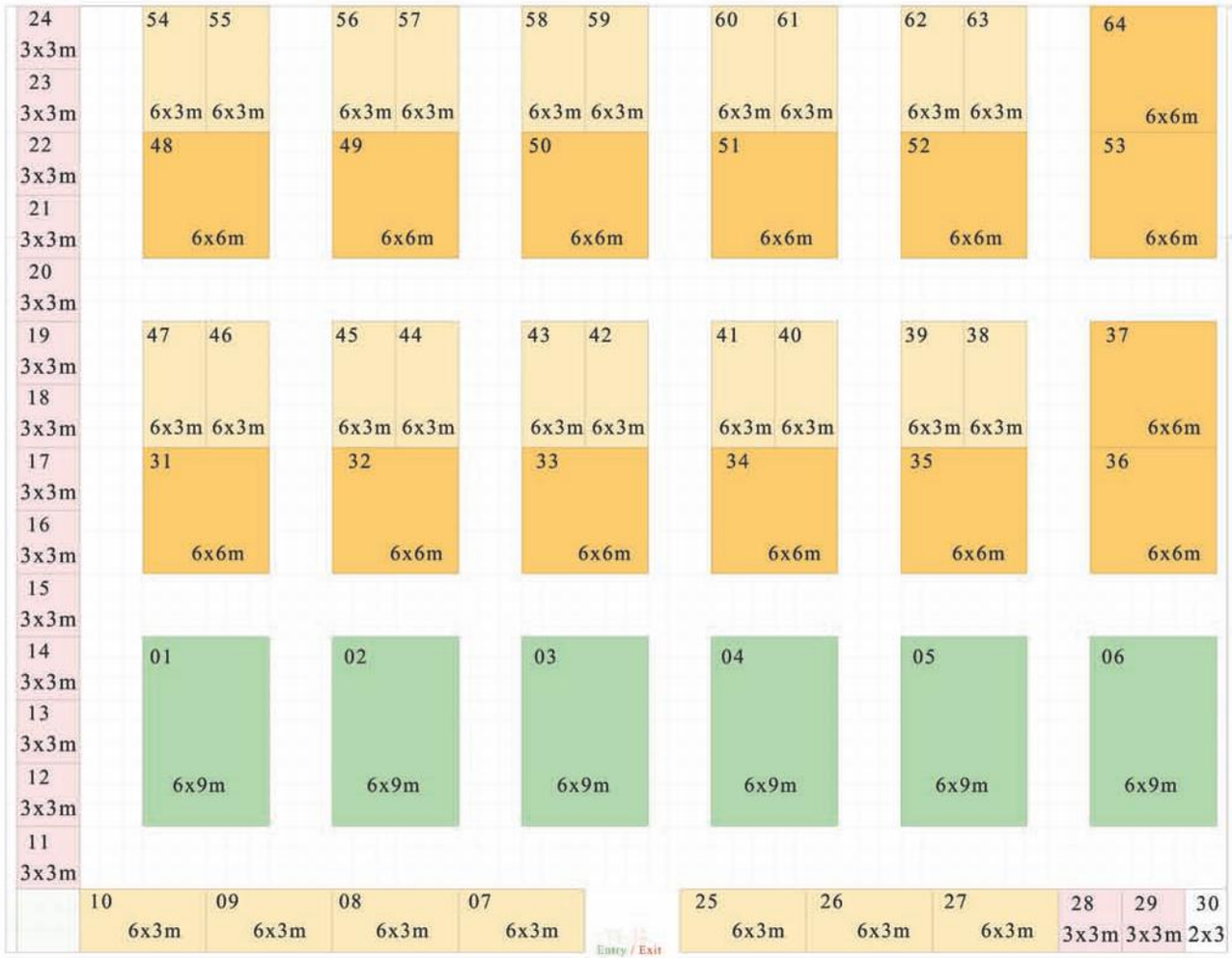
19 & 20 JULY 2022, Mumbai

Bombay Exhibition Center,NESCO, Goregaon, Mumbai, India.

UPDATE Knowledge on Poultry — A One Day Conference

PF Awards 2022 — For Excellence & Contribution to Poultry Sector

Layout of Stalls, Hall - 4



Stall Rental Rates:
INR 7300 per sqr mtr
3x3 mtr Stall - INR 65,700
6x3 mtr Stall - INR 131,400
6x6 mtr Stall - INR 262,800
6x9 mtr Stall - INR 394,200
Please add GST 18% on it

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BG-4, Venkataramana Apts,
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AI Awards 2022
For Excellence & Contribution to Aquaculture Sector

Aqua International presented 18 Awards to the individuals, institutions and organisations who have excelled in their profession and contributed to the development of Aquaculture industry in India at Chennai on April 6.

B. Masthan Rao, Managing Director, BMR Group honoured with **Life Time Achievement Award 2022**

Manoj Beeda and Madhuri Beeda, son and daughter of B. Masthan Rao, Managing Director, BMR Group, receiving Aqua International Life Time Achievement Award 2022 on behalf of B. Masthan Rao from Vice Chancellor, Tamil Nadu Dr. J. Jayalalitha Fisheries University, Dr G. Sugumar; Chairman – CLFMA of India, Neeraj Kumar Srivastava and Aqua International Editor M.A. Nazeer during AI Awards presentation function held on April 6, 2022 at Chennai Trade Centre, Chennai, India.

AI Awards 2022
For Excellence & Contribution to Aquaculture Sector

Completed MSc. In Mariculture from CMFRI, Cochin affiliated to CUSAT in September 1982. Started his career in Tata Oil Mills shrimp culture trial project near pullicat lake in the year 1983. Then moved on to MPEDA, Vallarpadom project , near Cochin, then moved on to the private sector again in the year 1994. Since then he had worked in a few other private companies in India.

Easwaraprasad has worked abroad in Iran, Madagascar, Brunei etc. In Iran he worked in the production of P. indicus PLs, In Madagascar producing SPF P. Monodn PLs, Nursery rearing of juveniles and pre-growing of Juveniles etc.

In Brunei he managed a P. Monodon Broodstock Multiplication Centre (BMC). More recently, he had helped modernize and expand shrimp hatchery production facilities on the West Coast and was also instrumental in managing and completing construction work of BMR Blue Genetics BMC near Kavali. Currently he is working as Consultant, Quality Control for Unibio Hatcheries (India) Pvt Ltd based at Chennai.

P. Easwaraprasad receives **Best Executive with Long Service in Aquaculture Award 2022**

P. Easwaraprasad, Consultant , Quality Control, Unibio Hatcheries (India) Pvt Ltd receiving Best Executive with Long Service in Aquaculture Award 2022 from Dr G. Sugumar and Ms Madhuri Beeda during AI Awards presentation function held on April 6, 2022 at Chennai, India.

Mr P. Easwaraprasad is a seasoned professional with almost four decades of rich and qualitative experience in conception, planning, construction, production planning and control, stock management, human resource management and quality control in shrimp aquaculture especially in shrimp Broodstock Multiplication Centres (BMC) hatcheries, nurseries and pre-grow – out projects.

CPF (India) Private Limited receives **Most Valuable Company in Indian Aquaculture Industry Award 2022**

CPF (India) Private Limited team headed by Sittichai Sae-ho, Senior Vice President, receiving Most Valuable Company in Indian Aquaculture Industry Award 2022 from the Vice Chancellor, Tamil Nadu Dr. J. Jayalalitha Fisheries University, Dr G. Sugumar during AI Awards presentation function held on April 6, 2022 at Chennai, India. Also seen from left are Anandhan, Maki Robles Clemente, Dr Sawang Klinhom, Madhuri, Manoj, Wirote Manee-on, Suphot Laotanon, Neeraj, M.A. Nazeer, W.R. Mansingh and Dr Rajkumar Singh.

CPF operates in 17 countries and exports to over 30 countries in five continents, covering more than 3 billion people

Chennai: Charoen Pokphand Group (CP Group) is one of the largest group companies of Thailand.

The CP Group, as an International Private Enterprises of Thailand and has prospered from Agro-Industrial business and has researched, developed and spread technology for the past 100 years to provide the highest benefits to both the producers (especially farmers) and consumers. During over a century, CP Group has expanded worldwide and can be considered the number one international corporation in Thailand.

Sittichai Sae-ho answering to the Honour of the Award

In the year 1992, honouring the invitation by the then Prime Minister of India Mr P V Narasimha Rao, CP Group started investing in India. CPF (India) Private Limited started its first feed mill in Chennai in 1994 and started its operation from the year 1996 with a clear vision and dedication over the years. CPF expanded its wings throughout India especially in Southern (Andhra Pradesh & Tamil Nadu) and Northern (West Bengal, Odisha & Gujarat) parts of India.

CPF from its incorporation in India remained the market leader in Aquaculture Feed production as well as Updated and Latest Aquaculture technology in India and expanded its operations into Hatchery, Farms and Processing Plant. Our key success lies in our ability to provide One Stop Solution for aquaculture business with its integrated process through extensive research and adapting innovative technology in the system to provide to the customer high quality product.

From left: Wirote Manee-on, Dr Sawang Klinhom, Suphot Laotanon, Dr G. Sugumar, Sittichai Sae-ho, M.A. Nazeer and Maki Robles Clemente

K. Ravikumar, Managing Partner, Golden Marine Harvest receives **Best Shrimp Hatchery Award 2022**

A.D. Saravanan Babu, Managing Partner, K Harshavardhana Reddy, Managing Partner, Golden Marine Harvest receiving Best Shrimp Hatchery Award 2022 from the Vice Chancellor of TNJFU Dr G. Sugumar and Ms Madhuri Beeda, during AI Awards presentation function held on April 6, 2022 at Chennai, India.

GMH stands ready to execute, supervise and provide expertise on turnkey projects related fisheries and aquaculture in a large scalecovering fish feed, seed, probiotics, medicines, aeration systems and industry related equipments

Golden Marine Harvest promoted by Mr K. Ravi Kumar was incorporated in 2008 with the intent of catering to the ever-growing aquaculture industry. With humble beginning, we have grown to setting up 8 shrimp hatchery facilities in Tamil Nadu on the east coast and one shrimp hatchery in Velan, Gujarat named Gujarat Golden Marine which is a sister concern of Golden Marine Harvest.

We use state of the art technology at all our facilities and we endeavour to adhere to best industry practices. We cater to

In the next few years, Golden Marine Harvest envisage to be the leader in Shrimp Seed production with an ambitious target of 6 Billion Seeds

shrimp farmers' needs on the east and west coast of India providing them the highest quality of shrimp seeds. With our foundation built strongly on excellence, quality and service, Golden Marine Harvest since inception has evolved into a progressive and innovative company, said Mr K. Ravi Kumar, Managing Partner, Golden **Marine Harvest Group.**

With a mission and commitment to uphold our values and serve customers seamlessly with ever-changing scenarios and the dynamics of aquaculture, Golden Marine Harvest focuses on human resource development thus enabling us to create a win-win situation for the organization and all the stakeholders, he stated.

Nationwide Network:
Our teams of Sales and Service representatives across all the coastal states not only facilitate timely delivery of seeds, but also ensure quality & quantity. This enables us to delight our customers and win their loyalty. We strive to improvise the product and service standards from the feedback we receive from the farmers.

Moment of Truth:
Golden Marine Harvest wins the Best Shrimp Hatchery in India Award for the year 2017 and 2018 by Aqua International magazine at the function held in Hyderabad.

STRENGTH & CAPABILITIES
We set industry standards by using state of the modern technologies to ensure safe seafood production for our customers. In the next few years we envisage to be the leader in shrimp seed production with an ambitious target of 6 Billion seeds.

The company has established record and experience in the field of aquaculture and its verticals and therefore stands ready to execute, supervise and provide expertise on turnkey projects related fisheries and aquaculture in a large scale covering fish feed, seed, probiotics, medicines, aeration systems and industry related equipments.

Megaplast (India) Pvt Ltd receives **Best Aquaculture Equipment Award 2022**

C.V. Rajesh, Deputy General Manager - Marketing, on behalf of Gaurav Jain, Director, Megaplast (India) Pvt Ltd, Pond Liner Manufacturers, receiving Best Aquaculture Equipment Award 2022 from Dr P. Jayagopal, Deputy Director, MPEDA, Nagapattinam, Tamilnadu and Manoj Beeda during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr G. Sugumar is also seen.

Biostadt India Ltd receives **Best Aquaculture Healthcare Products Manufacturer Award 2022**

Huzefa Khorakiwala, Director, Biostadt India Ltd receiving Best Aquaculture Healthcare Products Manufacturer Award 2022 from Dr G. Sugumar and Mr Manoj Beeda during AI Awards presentation function held on April 6, 2022 at Chennai, India. Neeraj Kumar Srivastava is also seen

Biostadt is a young and dynamic organization always striving for innovative solutions to improve farm productivity in both Agriculture and Aquaculture. Backed by a strong R&D support and international marketing alliances with reputed MNCs, we are amongst the leading companies in our Business. Our business is making rapid strides year after year not only in India, but also in other 27 countries in the globe comprising Asia, Africa, Europe and South America.

Biostadt India Limited is a renowned name in the Global Aquaculture industry. The organization has been providing complete and successful health solutions to aquaculture industry for more than two decades. Biostadt is the first corporate house to introduce aquaculture products in Indian market. These products are known for their good quality, efficacy, affordability and well accepted in India, Vietnam, Thailand, Philippines, Sri lanka, Nepal, Iran, Tanzania, Ecuador, Malaysia, Taiwan, Ghana, and Bangladesh markets.

Biostadt India has multi - location manufacturing facilities at Aurangabad, Bhavnagar, Vadodara and Jammu. Our Manufacturing facilities are equipped with outstanding Research and Development professionals, state-of the-art machinery, processes and testing equipment to produce quality products and ever committed to manufacture the products of high quality standards and proven performances.

Biostadt India areas of expertise are:

1. Promoting an Environmental and Consumer Friendly Aquaculture incorporating the best principles of food safety with great emphasis on the probiotic farming concept.
2. Focusing on enhanced biosecurity measures in the aquaculture farming systems to control and combat the disease out breaks.
3. Customized complete farm solutions by the expert technical support teams.
4. Ensuring the success of the farming operations with improved survival rates, scientific pond management, feed efficacy leading to enhanced productivity and profitability.

The Company is certified as ISO 9001: 2015 series for Quality Management System. These products are eco-friendly in nature and the Company has been assessed as ISO 14001: 2015 Standard of International Environmental Management System. Our Joint venture company at Vietnam, Vinh Thinh Biostadt JSC was Awarded of "Best Quality Aqua Products" for last many years from Government of Vietnam. Biostadt India Limited has also been awarded with the Best Aquaculture Healthcare Product Supplier Award 2015, Best Aquaculture Scientist Award 2015, Best Aquaculture Products Exporter Award 2017 and Best Aquaculture Health Care Products Manufacturer Award 2019 from Aqua International, India.

Prof. S. Jayaraman Subramaniyan, Proprietor, Annai Abiraami Aqua Agencies receives **Best Shrimp Feed Distributor Award 2022**

Prof. S. Jayaraman Subramaniyan, Proprietor, Annai Abiraami Aqua Agencies, Sirkazhi, Tamilnadu receiving Best Shrimp Feed Distributor Award 2022 from M.A. Nazeer, Editor, Aqua International, during AI Awards presentation function held on April 6, 2022 at Chennai, India.

Dr Akshaya Panigrahi, Principle Scientist, ICAR - CIBA, receives **Best Aquaculture Scientist Award 2022**

Dr Akshaya Panigrahi, Principle Scientist, ICAR - CIBA, Chennai, receiving Best Aquaculture Scientist Award 2022 from Dr G. Sugumar and Neeraj Kumar Srivastava during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr Satender Arya is also seen.

Dr Akshaya Panigrahi had pursued his graduation from O.U.A.T., Odisha, followed by Masters in 'Mariculture' from CUSAT, Cochin and Doctoral degree in 'Aquatic Bioscience' from Tokyo University of Marine Science and Technology, Tokyo (Japan) and working in ICAR since 1997. He had research experience in the prestigious Institutions like Scottish Fish Immunology Research Centre (UK) on Molecular Immunology aspects in Aquaculture. He was pioneer in establishing probiotic induced immunomodulation and the immune mechanism in shrimps, trouts and carps.

Dr Panigrahi has contributed immensely on the diversification of species and farming systems, crustacean breeding, seed production, disease surveillance and adoption of better management practices. He has established native species and eco-based sustainable aquaculture practices like organic farming, aqua mimicry and biofloc / periphyton, RAS for sustainable intensification.

Dr Panigrahi is credited for the development of immunostimulants, biofloc consortium, aquaculture database system, ITK and fish germplasm resources. He has been a first ranker in JRF (1991) and Agricultural Research Service Exam (ICAR, 1997) in his subject and some prestigious awards including Japanese Govt. Fellowship, Hiralal Choudhury award & Gold medal (ICAR-CIFE); Prof. J.S. Dattamunshi Medal of ZSI, Best Aquaculture Scientist award (David Foundation & FTF) for outstanding research. His publications (130+ in peer-reviewed journals) are being highly cited (citation score of 2780+) with 'i' index of above 39. He has several technologies commercialization to his credit, an illustrious career and farmer friendly attitude, and presently leading several eco-based projects.

DCM Shriram Ltd receives **Best Disinfectant Product Manufacturer Award 2022**

Pradeep Kumar Sitani, Vice President and Head – Marketing, DCM Shriram Ltd receiving Best Disinfectant Product Manufacturer Award 2022 from Neeraj Kumar Srivastava, Dr Satender Arya during AI Awards presentation function held on April 6, 2022 at Chennai, India.. M.A. Nazeer is also seen.

T. Saravanan, Proprietor, Nandini Gears receives **Best Aquaculture Aerator Award 2022**

T. Saravanan, Proprietor, Nandini Gears receiving Best Aquaculture Aerator Award 2022 from Dr G. Sugumar & Neeraj Kumar Srivastava during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr Satender Arya is also seen. Nandini Gears are one of the leading manufacturers of aerators, aerators parts such as floats, paddle fans and aquaculture equipments.

Dr B.M. Hasan, Head, Sales & Technical, Anmol Feeds Pvt Ltd receives **Best Aquaculture Online Training on Digital Platform Award 2022**

Dr B.M. Hasan, Head, Sales & Technical, Anmol Feeds Pvt Ltd receiving Best Aquaculture Online Training on Digital Plat form Award 2022 during AI Awards presentation function held on April 6, 2022 at Chennai, India.

Dr B.M. Hasan is renowned for his vast and enriched aquaculture experiencesin India and abroad. Heservedthe National Aquaculture Group (NAQUA) in KSA (world' slargest vertically integrated BAP certified company) in varied positions of senior management for a decade, and accomplished benchmark performances in production and operations. Significantly contributed in the field of project strategy, business diversification and planning; he always promotes global best aquaculture practices. Dr Hasan has many achievements to his credit; and being an expert in Project management, Biosecurity, R&D, Hi-tech Aerations,Bioflocs, Nursery & three-phase culture, and technology development, he played great roles towards its continuous success and branding it top in the industry. Earlier Dr Hasan was employed in Gujarat (Onaway Industries Ltd, Bilimora) and West Bengal; followed by PVS Laboratories at AP &Nippai Shalimar Feeds Pvt Ltd at WB in lead roles.At present he is Head of Sales & Tech in Aqua division for Anmol Feeds Pvt Ltd (Kolkata) for its commitment to aqua society (marketing of quality feeds).

Dr Hasan is instrumental in providing online & offline training on advanced aquaculture with aim to make farmers & entrepreneurs much more skilled making it sustainable and profitable business. He is imparting very productive online training to aqua entrepreneurs & farmers for best pond management and better results. For the welfare of farmers during Covid times, he initiated various learning activities through training programs in digital media (Facebook Live, Linkedin, Whatsapp, Zoom meeting, Google meet etc). Training focused on learning to plan, strategize, analyze and optimize for the output results in relation to sustainable production and profitability.Freshers from university has been included for training on industry knowledge and market needs. The aim is to instill technical and managerial skills in the business of Blue economy, to enable self-decision maker for their own business and grow even with odd situation & market challenges.

Dr Hasan pursued his M.Sc. (Fisheries Major) in Zoology from Kalyani University (1992); and Ph.D. on Sustainable aquaculture (Kolkata).He is also technical member in FOS(Friend of the Sea) Australia;AISP (Association of International Seafood professionals) Italy; SAP (Sociaty of aquaculture professionals) India; WAS (World Aquaculture Society) USA, and Urmiaqua magazine, Kalyani in relation to his expertise in sustainable sea food certification, technical innovations& advanced aqua development.

G. Calraj, Proprietor, Royal Hatcheries receives **Best Upcoming Shrimp Hatchery Award 2022**

G. Calraj, Proprietor, Royal Hatcheries, receiving Best Upcoming Shrimp Hatchery Award 2022 from Dr G. Sugumar during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr Satender Arya is also seen.

AI Awards 2022
For Excellence & Contribution to Aquaculture Sector

Foundation for Aquaculture Innovations & Technology Transfer (FAITT) receives **Best Startup Company in Aquaculture Award 2022**

Dr A. Jesu Arockia Raj, Director, Foundation for Aquaculture Innovations & Technology Transfer (FAITT) receiving Best Startup Company in Aquaculture Award 2022 from Dr Satender Arya during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr G. Sugumar and M.A. Nazeer are also seen.

FAITT is a nascent and highly unique Non-profit Private Research and Development (R&D) Foundation in the field of Aquaculture. It is established in Chennai, Tamil Nadu, India in 2021 to uniquely focus on "AQUACULTURE RESEARCH and DEVELOPMENT" both nationwide and globally. Considering the necessity and importance of such a potentially vast food resource sector, FAITT has been established to initiate and fulfil the R&D as well as Training requirements in aquaculture to innovatively and scientifically support the farmers in multifunctional processes and development aspects. FAITT was established as a unique and pioneer corporate sector Non-profit Foundation, the "First of its kind in India" by a group of eminent scientists who have considerable expertise both academically and industrially in aquaculture sector.

FAITT has signed many MoUs for research collaboration with many Academic Institutes and Industries at both national and international level. The technical team of FAITT are well qualified, highly educated and technically sound in the field operations, who understand the farmers problems and the day today issues in aquaculture industry. Hence, the team can easily grasp and observe the problem and immediately focus on the R & D aspects in order to find out readily applicable and highly reliable solutions for the industry, said Dr A. Jesu Arockia Raj, Director, FAITT.

MISSION

1. The Mission of the FAITT is to facilitate R & D, Education and Training across various scientific disciplines to aquaculture farmers, technicians, stakeholders and entrepreneurs.
2. In juxta position with this, FAITT would endeavour to provide scientific and innovative, sustainable and environmental friendly solutions to foster a great and vibrant aquaculture food industry in India by 2030.

VISION

1. To enhance the human cognizance on Eco-friendly aquaculture practices by Education, training and demonstration.
2. To develop novel and innovative aquaculture technology solutions in a sustainable and eco-friendly manner, to address the variety of aquaculture and marine seafood farming and production issues.

The R & D unit of the FAITT is primarily focused to develop new, novel and eco-friendly innovative formulations on aquafeed and various feed additives. FAITT has its own team of eminent research consultants, collaborators and advisors from reputed national and international Colleges, Universities, Research Institutes and Industries from South Korea, Israel, China, USA, Germany, Malaysia and so on. The R & D solutions carried out at FAITT emanate from the accumulated best ideas of such potential experts that leads to training and technology transfer.

Narayana Enuganti, receives **Best Sales & Customer Service in Aquaculture Award 2022**

Narayana Enuganti, Business Head – Aquaculture, Intron Life Sciences Pvt Ltd receiving Best Sales & Customer Service in Aquaculture Award 2022 from Dr G. Sugumar during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr Satender Arya is also seen.

Subrato Ghosh, Fishery Extension Officer, West Bengal receives **Best Aquaculture News Contributor Award 2022**

Subrato Ghosh, Fishery Extension Officer, Dept of Fisheries, Govt. of West Bengal, Kolkata receiving Best Aquaculture News Contributor Award 2022 from M.A. Nazeer, Editor, Aqua International at NRS Publications office, Hyderabad, as he could not attend the awards function at Chennai.

Subrato Ghosh completed his B.Sc. in Industrial fish and fisheries from University of Calcutta in first division and M.Sc in applied aquaculture from Barkatullah University, Bhopal in 2003 securing first position in first class. He worked as Junior Research fellow at department of fishery pathology and microbiology, WB University of Animal and Fishery Sciences; as Senior Research fellow both at ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar and ICAR-Central Inland Fisheries Research Institute, Barrackpore; as Part-time Lecturer in M.Sc Fishery and Aquaculture course at Department of Zoology, Utkal University, Bhubaneswar. He participated in 6 state level, 16 national level and 3 international conferences in India and presented scientific papers on freshwater aquaculture in all of them.

He has authored 11 papers published in Aquaculture Asia, published by Network of Aquaculture Centres in Asia-Pacific, Thailand and in Journal of World Aquaculture Society, USA. He joined Directorate of Fisheries, Government of West Bengal as Fishery Field Assistant in January 2013 securing first position in merit list in WBPSC exam and presently working as Fishery Extension Officer under this Directorate since June 2017.

Subrato Ghosh contributes news oriented articles on fishery, aquaculture and sometimes elementary molecular biology descriptively to Science and Culture journal, publication of Indian Science news association, Kolkata; to Aqua International magazine of NRS Publications, Hyderabad and in two leading Bengali science magazines in West Bengal. He is interested in conversing with fish farmers at farm site and documenting the lesser known Indigenous Technological Knowledge wealth of rural elderly fish farmers.

Dr A. Karuppasamy, M.Sc, Ph.D (Aquaculture) receives **Best Corporate Shrimp Farmer Award 2022**

Dr A. Karuppasamy, M.Sc, Ph.D (Aquaculture), Ramanathapuram, Tamilnadu, receiving Best Corporate Shrimp Farmer Award 2022 from Dr G. Sugumar, Vice Chancellor, TNJFU during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr Satender Arya and Manoj are also seen.

L. Vijay Kumar Reddy, Nellore receives **Best Shrimp Farmer Award**

On behalf of L. Vijay Kumar Reddy, Nellore, Andhra Pradesh, Maki Robles Clemente receiving Best Shrimp Farmer Award 2022 from Dr G. Sugumar, Vice Chancellor, TNJFU during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr Satender Arya is also seen.

Dr N. Inayathullah, Shrimp Care Solutions receives **Best Technical Services Provider in Aquaculture Award 2022**

Dr N. Inayathullah, Shrimp Care Solutions receiving Best Technical Services Provider in Aquaculture Award 2022 from Dr G. Sugumar, Vice Chancellor, TNJFU during AI Awards presentation function held on April 6, 2022 at Chennai, India. Dr Satender Arya is also seen.

Dr N. Inayathullah is the Founder and CEO of Shrimp Care Solutions. He did his schooling in government schools in various states particularly in Tamil Nadu and Pondicherry.

He did his under graduation in 1994 in the department of Zoology in Chidambaram Government Arts College and achieved First class in 1997. In the same college there came an External Examiner to conduct the practical exams who had suggested him to join in the aquaculture group in Centre of Advanced Studies in Marine Biology. His father advised him to become a school teacher, but he strongly believed his external examiner's advice and sticked to that. His father also supported him a lot and told him "if you get first class in your graduation, I will present you a bike". He worked for it and his staff and friends helped him to achieve his goal. At last, he got first class and his father presented him a bike as promised.

A dull mind gets bored easily, a curious mind expands forever. So, he continued and completed his post graduation successfully and got first class in 1999. In his post graduation, He did his research work on the topic Biodiversity of Shrimp Seed in Pitchavaaram mangroves visa vis Shrimp Farming, (that is comparative study of National Environmental Engineering Research Institute).

Dr Inayathullah expressed his gratitude and also proud to be the student of Dr Syed Ajmal Khan, Professor in Indian Biodiversity Scientist in Annamalai University who was his research guide and who had identified four species of bacteria which have been discovered on board, the International Space Station (ISS), one of which has been named after Indian Biodiversity Scientist Sayed Ajmal Khan.

"Success does not come to you. You need to go to it shoot for the moon, even if you miss you will land among the stars. Like that I started my career and got into the field work and joined as a Field Service Officer in Wockhardt Ltd, Andhra Pradesh. Then I got promotion and served as a Technical Sales Officer in Salem Microbes Private Ltd", said Dr Inayathullah.

Life itself is your teacher and you are in a state of constant learning. So, I have joined and completed my Master of Philosophy in Zoology in 2008 and I have completed it in 2009 and became a Specialist in Aquaculture. In that, my research work is on Penaeus Monodon- Black Tiger Shrimp Farming activities in Nagapattinam District and also Comparative Study of Probiotic Application and Postform, he stated.

I am glad to remember my joyful moments and discussions with my guide Dr S.M. Rafi, Associate Professor in the Department of Aquatic Biology and Fisheries, University of Kerala. After that I have joined in Biomin Singapore Pvt. Ltd., as a Business Development Manager. Later I worked in Nexus Feeds Ltd., Bhimavaram as Incharge for Tamil Nadu and Andhra Pradesh.

Good things come to those who hustle. I got promotion from Assistant Manager to Regional Manager.

If you offered a seat on a Rocket or a Ship, don't ask what seat! Just get on. As per I have joined and dedicated my hard work in RNK Agro and Chemicals Pvt. Ltd., Hyderabad as a Regional Manager and later got promoted as a Senior Regional Manager.

I did Aquaculture special training course in 2009, 2011 in Hyderabad under NABARD by MANAGE (National Institute of Agricultural Extension Management license no. TN1683. I am doing Aquaculture Project Panel Values for Commercial Bank sectors. (Project preparation for economic and production forecasts)

Always walk-through life as if you have something to learn, and you will. In that way I have registered my Ph.D. and awarded in the year 2019. My research topic is Culture of Pacific White Leg Shrimp Lito Peneus Vannamei. (boone 1931) using Auto Feeder Technology. I had gained more knowledge from my Ph.D guide Dr P. Vijayanand, Assistant Professor in Centre of Advanced Study in Marine Biology, Protonovo, Annamalai University, Chidambaram. Besides, I served in Sonac Feeds, Nellore, as Assistant General Manager for four states.

I had developed a passion for learning. If you do, you will never cease to grow. So, I have joined and completed Diploma in Aquaponic Systems (Gardening & Fish culture & Veggies) (Online Certification course) in Udemy- Institute of The Aquaponics Source – in the guidance of Sylvia Bernastein British Columbia online course.

In my career I have successfully completed twenty three years of my pleasant life in various vital way and still it is going on. Believe in yourself, work hard, work smart and passionately present yourself to the world and that is the Moto of my life, he conculded.

HEALTH BENEFIT & MEDICINAL VALUE OF SEA CUCUMBER

Email: kumarabhay275@gmail.com

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[1]Mumbai Research Centre of CIFT, Vashi, Navi Mumbai.
[2]College of Fisheries, Shirgaon
(Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli), Ratnagiri.

Highlight Points

- Sea cucumbers have long been used as food and traditional medicine in Asian countries with *Stichopus hermanni, Thelenota ananas, Thelenota anax, Holothuria fuccogilva,* and *Actinopyga mauritiana* as most highly-valued species.
- These organisms are potential source of high value-added compounds with therapeutic properties such as triterpene glycosides, carotenoids, bioactive peptides, vitamins, minerals, fatty acids, collagens, gelatins, chondroitin sulfates, amino acids.
- Sea cucumbers have an impressive profile of valuable nutrients such as Vitamin A, Vitamin B1 (thiamine), Vitamin B2 (riboflavin), Vitamin B3 (niacin), and minerals, especially calcium, magnesium, iron and zinc.
- Unique biological and pharmacological activities including anti-angiogenic, anticancer, anticoagulant, anti-hypertension, anti-inflammatory, antimicrobial, antioxidant, antithrombotic, antitumor and wound healing have been ascribed to various species of sea cucumbers. These functional materials lead to potential development in various foods and biomedicine industries.

INTRODUCTION

In recent decades, the concept of functional foods has offered a new and practical approach to achieving optimal health by promoting the use of natural products with physiological benefits thus reducing the risk of various chronic diseases. Most of the currently available functional foods and therapeutic agents are derived either directly or indirectly from naturally occurring sources, especially, the terrestrial food plants and marine species (Shahidi, F. 2009 and Venugopal V. 2009). Due to the rich oceanic biodiversity, marine organisms are valuable sources of nutritious foods as well as represent novel reservoirs of biologically active components, in particular bioactive peptides, and antimicrobial, anti-inflammatory and anticancer agents (Venugopal V. 2009 and Blunden G. 2001).

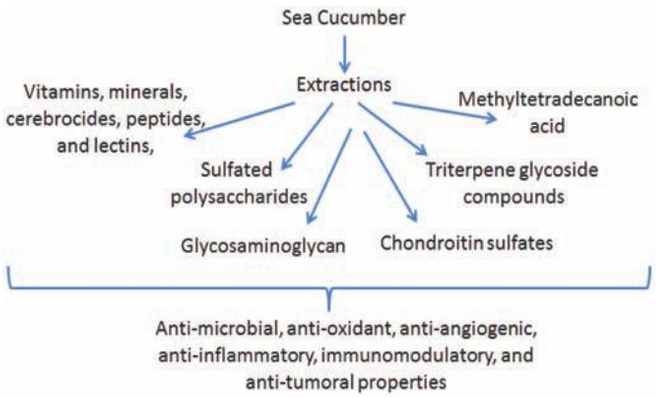
Among marine organisms, sea cucumber is an interesting natural source of novel functional materials with biological activities that could be used in food as well as biomedicine industries. Sea cucumbers are soft bodies marine invertebrate from the class Holothuroidea. Sea cucumbers have a leathery skin and an elongated body containing a single branched gonad. These organisms constitute 1716 species, with the greatest biodiversity being in the Asia Pacific region. Sea cucumber is also known as "teripang or trepang" in Indonesia; "beche-de-mer", a new environmental conditions to survive, and produce secondary biologically active metabolites which cannot be found in other organisms. Sea cucumbers are organisms that live in complex environmental conditions, therefore, sea cucumber had same medicinal properties as the herb ginseng and its also called as "haishen" which means "ocean ginseng" (Bahrami *et al.,* 2014).

The sea cucumber, *H. scabra,* contained high quantity of protein and very low lipid. It contained high essential amino acids, essential fatty acids, nervonic ,arachidonic acids, and collagen, which also contained GABA (gamma-Aminobutyric acid), vitamin C, and vitamin E. (Morakot Sroyraya *et al.,* 2017) Moreover, sea cucumbers contain high amount of bioactive compounds such as peptides, polyunsaturated fatty acids, triterpene glycosides (Zou *et al.,* 2003), and chondroitin sulfates (Zhong *et al.,* 2007). Various studies reported that sea cucumber extracts have the abilities to cure asthma (Kiew *et al.,* 2012), and are also anticancer (Zou *et al.,* 2003), anti-inflammatory (Collin *et al., 1998*), and antioxidant (Althunibat *et al., 2009*).

SEA CUCUMBERS ARE AN EXCELLENT SOURCE OF NUTRIENTS:

Four ounces (112 grams) of the Alaskan yane sea cucumber delivers		
Calories	:	60
Protein	:	14 grams
Fat	:	less than one gram
Vitamin A	:	8% of the Daily Value (DV)
B2 (Riboflavin)	:	81% of the DV
B3 (Niacin)	:	22% of the DV
Calcium	:	3% of the DV
Magnesium	:	4% of the DV

THE BENEFITS OF SEA CUCUMBER



1. High in Protein

The first health benefits provided by sea cucumber are the way it has the great source of protein. Even, it is known that sea cucumber provides higher protein than egg whites. As we know, the protein has important roles in the human body, including regulation cell division, providing structure, strength to cell and tissue, controlling biochemical reactions, aiding the immune system, etc. As a result, protein is the essential nutrient for human body as it can help to regenerate the broken cells and build the new cells. Moreover, protein can help to build the energy for daily activities. For the tips, you can fulfill the protein needs by consuming sea cucumber.

2. Cancer prevention potential

Surprisingly one of the great health benefits of sea cucumber is its way to prevent cancer. Eating sea cucumber may help prevent the growth and spread of cancer cells. This is because sea cucumbers contain high amounts of compounds known as triterpene glycosides, which have antitumor activity. This benefit is linked to the presence of a saponin component in sea cucumber. As a result, it may lead to the presence of antitumor effects to prevent cancer as well. Not only for that, is it known that sea cucumber has the Philinopside A compound that can be a valuable anti-cancer agent that has dual cytotoxic and anti-angiogenic effects. Next, it is known that sea cucumber is being immunomodulatory and cytotoxic. At this point, this benefit has been shown in many studies that stated sea cucumber has the positive result to prevent the breast, colon, prostate, and pancreatic cancer.

3. Improving Gum Disease

Toothpaste made with sea cucumber extract was shown to be effective at treating gum disease, according to a (Tara Bai Taiyeb-Ali *el al.,* 2003) reported that the sea cucumber is anti-inflammatory, wounds healing (due to arachidonic acid), and is antibacterial. Sea cucumbers are higher in protein than almost any other food, except for egg whites.

4. Anti-Coagulant

Sea cucumbers contain a compound known as **chondroitin sulfate**. The chondroitin sulfate has anticoagulant activity. Its helps to prevent blood clots. Sea cucumbers also contained glucosamine, and the combination of chondroitin sulfate and glucosamine is a popular "tag team" to help relieve arthritic pain, due in large part to their regulation of prostaglandins (Paulo *et al.,* 1996)

5. Provides Minerals

Sea cucumber is the great source of minerals such as magnesium, iron, and calcium. These beneficial minerals are take part in regulating the body function. For instance, the iron nutrient can help you to promote the blood regulation for other body parts while calcium is the major one to promote the strong bones. Next, there is magnesium to promote the building of strong bones. It can't be denied that sea cucumber offers you numerous health benefits by providing the best nutrients.

6. Vitamins

Not only for providing source of minerals, but sea cucumber also provides the vitamins. In fact, sea cucumber contains the vitamin A, B1, B2, B3 & C. These are valuable vitamins to promote the healthy body. Vitamin A can help you to have the healthy vision while vitamin B can promote the work of body functioning. Then, there is vitamin C which can boost the immunity system. Therefore, as you can get the benefits of vitamins, then adding sea cucumber to your diets will not disappoint you then.

7. Prevents Blood Clotting

Sea cucumber can help to prevent the blood clotting. This is due to the presence of a compound called as chondroitin sulfate. Moreover, it is also shown in September 1996

in the "Journal of Biological Chemistry" that stated sea cucumber has anticoagulant activity due to the presence of this compound. As a result, sea cucumber can prevent the excessive bleeding when there are injuries in the body and prevent the blood clots. If we left it untreated, blood clotting could be very dangerous for our health since it will lead to pulmonary embolism, a condition where the blood clots accumulated in the lungs and thus, it will restrict the blood flow which is very fatal. So, consuming sea cucumber is one of the best ways to protect you from blood clotting.

8. Anti-Inflammatory

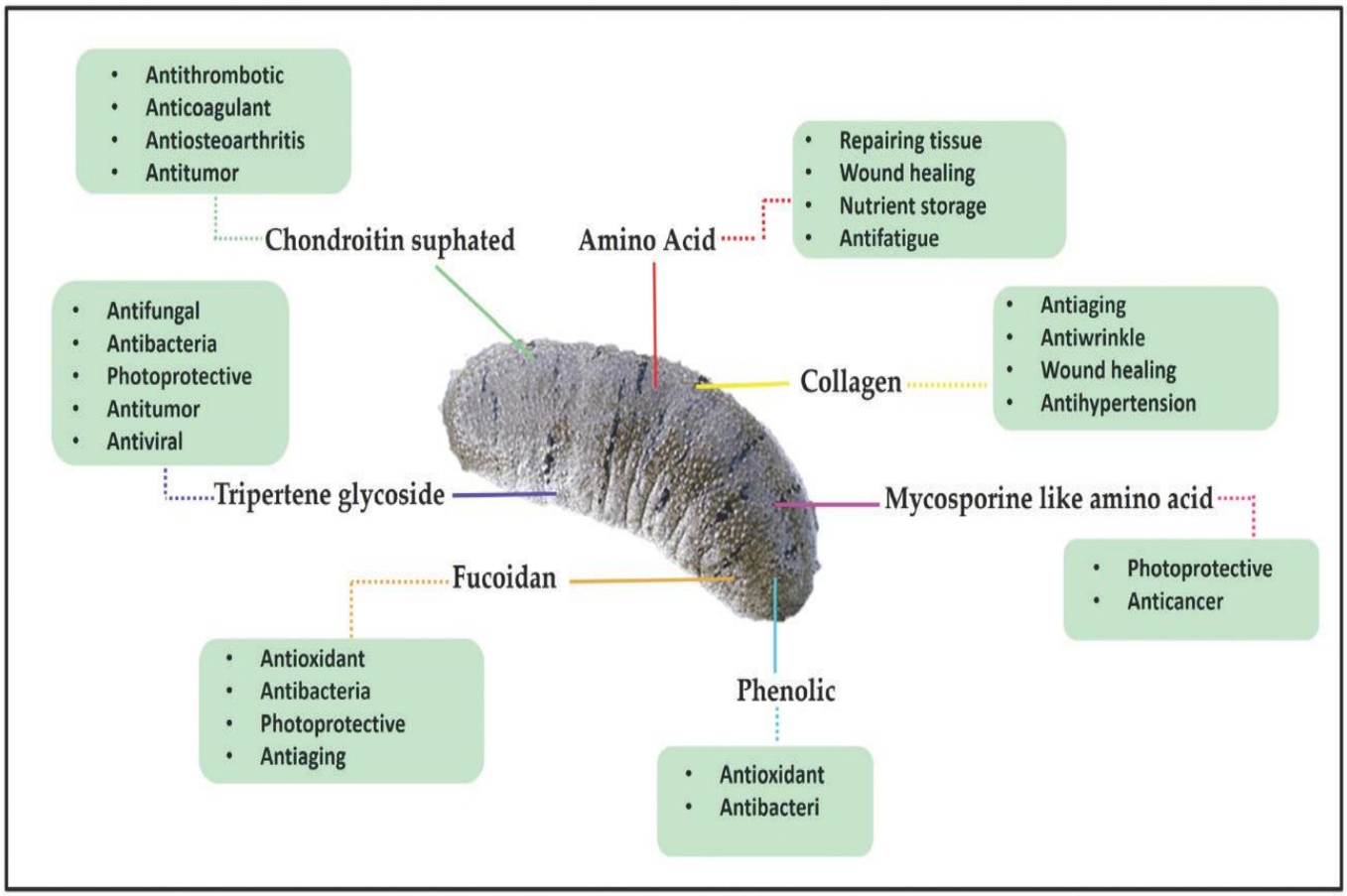
Sea cucumbers have potent anti-inflammatory effects, which may help alleviate pain in patients with conditions such as arthritis. Although several anti-inflammatory agents, like non-steroidal anti-inflammatory drugs (NSAIDs), are available, their use is restricted in dosage or intervals and special precautions are advised due to their gastrointestinal toxicity. Therefore, there is a need for the development of natural anti-inflammatory agents that have the potential to self-limit or resolve inflammatory events, without progressing into chronic inflammation. This sea animal contains compounds such as mucopolysaccharides, chondroitin and glucosamine, which can help relieve arthritis disorders. Such compounds help in the regulation of the balance of certain lipids known as prostaglandins. Patients with rheumatoid arthritis usually have high concentrations of certain prostaglandins, Due to the presence of anti-inflammatory properties in sea cucumber, then it is beneficial to cure a common cold. Indeed, sea cucumber can act as a powerful protectant to the body. What is even greater, sea cucumber has been used in Chinese traditional medicine to treat constipation, impotence, and fatigue as well. Thus, as sea cucumber offers you the great natural treatment.

9. Antibacterial Properties

Sea cucumber has the rich content of chondroitin sulfate and triterpene glycosides that provides the antibacterial and antiviral properties. As a result, sea cucumber can help the body to prevent the infection. This is very beneficial as you can prevent certain diseases such as cancer.

10.Wounds healing Properties

In fact, sea cucumber can regenerate its own body tissues quickly when it is broken or injured. The "Marine Drugs" study in 2011 has also shown the ability of sea cucumber is related to the presence of fatty acids such as arachidonic acid. As the consequence, it is believed that sea cucumber can speed up the healing process of wound due to its ability. Hence, if you have the wound, scars, or burns, then using the sea cucumber extract will help recover soon.



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Bahrami Y, Zhang W, Franco C. Discovery of novel saponins from the viscera of the sea cucumber Holothuria lessoni. Mar Drugs. 2014;12(5):2633e2667. ***More references can be provide on request***

Role of Optimal Formulated Feeds for Efficient Shrimp Larval Development with reference to *L. Vannamei*

Dr Raghavendrudu, Product Manager, Skretting India, Hyderabad.
Email: raghavendrudu.gullipalli@nutreco.com

Highlight Points

- Role of optimal Formulated Feeds for efficient Shrimp Larval Development with reference to L. Vannamei.
- Successful production of robust post larvae for stocking in grow-out ponds largely depends on feed quality and the feeding schedule that is applied in the hatchery.
- Formulated feeds have similar composition similar to micro algae and zooplankton with high levels of essential nutrients such as vitamins, minerals, pigments like astaxanthin, highly unsaturated fatty acids, cholesterol, and lecithin.
- Good practice in feeding and management of shrimp larvae is essential in ensuring optimum health, welfare, and growth of farmed shrimp.
- Effective feeding management includes monitoring of swimming activity, mortality, morbidity and disease symptoms.
- Microscopic observations of length, gut, hepatopancreas, muscles etc are also important for better feeding management.

The Pacific white shrimp, *Litopenaeus vannamei* is originated from the Western Pacific coast of Latin America stretching from the south of Peru to the north of Mexico. This species was introduced commercially into China and Taiwan in 1996 and other coastal Asian countries started to culture this species in early 2000. Since then, *L. vannamei* became one of the important penaeid species farmed worldwide. Shrimp larvae quickly go through major changes in body structure requiring a series of different feeds and environmental conditions to meet their needs.

Good practice in feeding and management of shrimp larvae is essential in ensuring optimum health, welfare, and growth of farmed shrimp. Fry and larvae quality is one of the main drivers for successful fish and shrimp farming.

The feeding and nutrition of shrimp larvae is based on supplying feeds that are ingested by the larvae and meet the nutritional requirements of the different larval stages. Feed uptake and nutritional requirements vary because of biological differences between larval stages and a knowledge of shrimp larval biology helps in successful feeding.

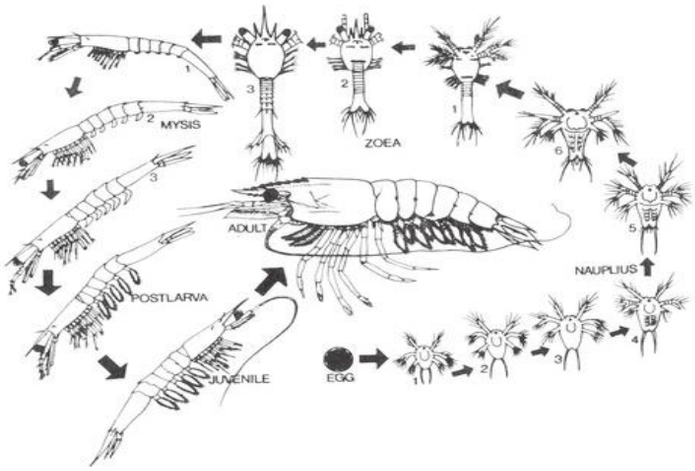


Fig :1 Larval stages of Shrimp (*L. Vannamei*)

Types of Larval feeds

Algae and Artemia

Live algae and Artemia nauplii pose high with respect to introduction and thereafter and spread of pathogens.

Formulated Feeds

Larval feeds should originate from trustworthy suppliers that certify absence of pathogens in the product and raw materials. Successful production of robust post larvae for stocking in grow-out ponds largely depends on feed quality and the feeding schedule that is applied in the hatchery. The metamorphosis of *L. vannamei* through larval stages into postlarvae is a complex process (see Figure 1, life cycle), which in the wild is characterized by migration to inshore, brackish estuaries. This shift from pelagic to bottom-dwelling benthic behavior is accompanied by a change in feeding habit from an herbivorous to an omnivorous died Growth and development of the digestive system affects digestive capability, mainly due to qualitative and quantitative fluctuations in digestive enzyme production. Larval stages, therefore, differ in nutritional requirements. Feed formulation and feed processing are tailored to the specific needs of each stage (Table 1)

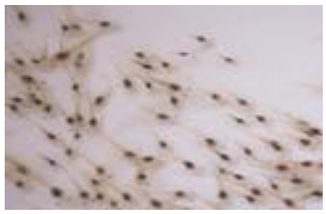
Feeding characteristics of Shrimp larvae

Zoea Stages	Feed Character
Z1, Z2, Z3 First feeding Stages	Size range 5–30µm
Pelagic filter-feeder	High density of feed particles or Slow sinking
High energy turnover, 10–20 minutes gut passage time	Dry feeds are algal replacement diets
High lipase activity	Highly digestible feed
Mysis Stages	
M1, M2,M3	High density of feed particles
	Size range: 30–90µm
Pelagic filter-feeder	Neutrally buoyant or slow-sinking particles
10–20 minutes gut passage time	Highly digestible feed
High protease and medium lipase activity	Moderate lipid level: 10–15% high protein 50-60%
Early post larval stages	
PL1, PL2, PL3,PL4	Size range: 90–250µm
Omni / carnivorous, active, hunting behavior	Co-feeding of Artemia tolive nauplii and formulated feed
15–20 mins gut passage time	Highly digestible feed
Low enzyme activity	Moderate lipid level 10-15% high protein 45-55%
Post Larval stages	
PL5 to PL 15	Size range: 300–500/800µm
Benthic feeder	Sinking feed
30 mins gut passage time	Moderately digestible feed
Increased digestive capacity	Low lipid level: 5–10% Moderate protein 40-45%

Different phases of shrimp larvae

Zoea

Mysis



Early post Larvae

Post larvae

Features of Hatchery Feed Nutrition

Formulated feeds have similar composition similar to micro algae and zooplankton with high levels of essential nutrients such as vitamins, minerals, pigments like astaxanthin, highly unsaturated fatty acids,cholesterol, and lecithin. Good quality feeds use highly digestible raw materials with good nutritional value. Shrimp larvae develop through a series of stages each requiring a different mix of feed type, size, and texture. Their feed intake depends on several factors such as temperature, water quality and growth potential of the strain amongst others.Formulated feed has been developed to meet the needs of shrimp larva and reduce the need for live feed.Variation in feed quality can also influence the amount of feed required.

Effective feeding Management for Hatchery Diets

Monitoring at each Feeding

Monitoring	**Observation**
Swimming Activity	Highly active to inactive
Mortality	Zero, low or high numbers of dead larvae
Morbidity	Zero, low or high numbers of morbid larvae
Disease symptoms	Zero to high

Microscopic observations for better feeding management

Stage	Optimum Conditions	Recommended applications
Length — from PL onwards		
Small or weak %.		
Gut fullness %.	>90% of population show 80% full gut	Increase feed
Lipid droplets in hepatopancreas %.	>90% of population have lipid droplets	Increase feed
Fouling %.	<5%	Decrease feed and Water exchange
Deformities %.	<5%	
Necrosis %.	<5%	Water exchanges and adjust feed levels
Muscle: gut ratio 6th tail segment PL8	Normal is 1:4.	
Tissue pigment and condition %	PL < 5% white or milky color or transparent	Check microbial loads apply probiotic
Molting problems %.		Lower salinity gradually by 2ppt apply Mineral

About Skretting Marine Hatcheries Feeds

A wide range of commercial feeds are available for larval shrimp. Extensive investment in research and development and various associated scientific and commercial trails carried out by Skretting has resulted in development of feeds and feeding protocols designed to meet the needs of all stages of larval shrimp. Skretting is world leading producer of feed for shrimp and fish with a capacity of 2million metric tons worldwide.

White Tiger

White Tiger is afeeding programfrom Skretting engineered to offer advanced nutrition to shrimp hatcheries and it's a highly digestible diet formulated with blend of specific hydrolyzed proteins, HUFA, phospholipids, minerals and vitamins and each micro particle is carefully designed to offer a stable and nutritious platform and White tiger is utilized from Zoea stages to nursery stages its available in 5 particle sizes depends on larva and post larva sizes and paves away for significant reduction of artemia over all shrimp health helps to shrimp manage adverse environmental impacts.

Vitalis 2.5

Vitalis 2.5 is an innovative feed solution for shrimp Bloodstock. It has been developed to partially replace the use of moist feeds while at the same time providing the correct level of essential nutrients in a stable form also provides specific nutrition and biosecurity for egg and nauplii production. Its formulation based on a high inclusion of hydrolyzed marine proteins like DHA and EPA it gives high support the high fecundity rate.

PL

PL is our high-quality shrimp starter diet designed to offer advanced nutrition to shrimp hatcheries PL is highly digestible and is formulated with specific hydrolyzed proteins, highly unsaturated fatty acids (HUFA), phospholipids, marine algae vitamins, and minerals to provide a complete nutritional profile for larval shrimp. PL is a sophisticated and innovative feed solution designed for shrimp from zoea to nursery stages of the life cycle.

Summary

The nutrition of marine larvae involves an understanding of the behavioral, mechanical, and physiological processes of feeding in the target animal. These are likely to be very different in the larval stages compared to adult forms. Feeding habits in many species show distinct changes as the larvae development. Although basic knowledge exists to enable the proper formulation of larval shrimp feeds, continued research is needed to make further progress. Also, feed particle characteristics should be designed to respond to the specific needs of different species, stages, and culture conditions by the correct choice of feed-processing technique.

Fish kills during Summer: Causes and Prevention

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Highlight Points

Summer temperatures can put a burden on aquatic ecosystems, pushing creatures like fish to their limits. As the temperature rises, so does the risk of a fish kill. Most fish kills, on the other hand, are a natural event that can occur as the water heats and dissolved oxygen levels drop. While nature is often to fault, communities can take steps to improve the summer conditions of their waterbodies.

Introduction

It is common after a spell of hot weather to see dead fish floating on lakes or washing up on beaches. Summer kill is referred as a sudden and unexpected death of fish or other aquatic animals over a short period of time and often within a particular area. Most fish kills occur as a result of fluctuations in the natural environment. The most common cause being raising temperature during summer months which results in algal blooms and other water quality issues such as low dissolved oxygen.

Fish kills during summer

Importance of temperature

Temperature is the primary factor that controls the metabolism of many organisms. It interacts with other parameters and influences oxygen solubility, respiration rates, feeding, assimilation, growth, behaviour and reproduction. Fishes are poikilotherms, they have the same body temperature as that of their surroundings. Acclimatization is the process by which fish physiology is slowly altered so that it can adapt to environmental changes such as temperature, pH, salinity etc. Eurythermal fish have evolved to thrive in a wide range of temperatures, whereas stenothermic fish have developed to stay within a small temperature range. By the drastic changes in temperature, enzymes become inactive and organs might fail resulting in the death of the organism.

During summer months, low water level coupled with poor run off in the rivers drive the fishes to assemble in particular areas, where usually the fish kills are frequent This making many migratory species vulnerable to fish kill.

Causes of summer fish kills

1. Lack of Dissolved oxygen

Dissolved oxygen is a major limiting factor in a pond. Solubility of oxygen decreases with increase in temperature and salinity. The ideal DO is > 5ppm for warm water species and >6ppm for cold water species. The main source of DO in aquaculture pond is due to photosynthesis by phytoplanktons and plants and by diffusion from atmosphere. The loss of oxygen is mainly due to respiration and decomposition of organic matter. DO is lowest in early morning just after sunrise, increasing during daylight hours to maximum in late afternoon and decreases again during night. Ponds with dense plants and heavy algal blooms will have low oxygen levels in the early morning results in fish mortality due to lack of photosynthetic oxygen production and respiration by plants and animals during night. When aquatic species consume more oxygen than they produce, oxygen levels can become reduced, resulting in fish kills. Moreover, extended periods of cloudy weather may result in dangerously low DO levels.

Fish mortality due to depletion of dissolved oxygen

2. Excessive Vegetation

Summer kills are most likely to occur in fish ponds that are 60 to 80 % covered by bigger aquatic vegetation and have shallow water levels. Long durations of hot, gloomy, still (windless) weather conditions with water temperatures above 29 °C might cause issues in these conditions. High

Excessive vegetation in culture ponds

temperatures limit the amount of dissolved oxygen, gloomy skies prohibit plants from creating enough oxygen through photosynthesis, and calm breezes reduce turbulence and mix atmospheric oxygen into the surface layers of the water. Ponds can normally endure several hot days and nights, but if these conditions persist, oxygen levels may drop to dangerous levels for fish. Larger fish typically die first because their oxygen requirements are greater than those of smaller fish.

3. Phytoplankton Crash

Phytoplankton bloom

Eutrophicated ponds often produce dense blooms of microscopic algae (called phytoplankton), giving them a deep green coloured appearance. High temperatures cause algae to bloom and then suddenly die out. When an algal bloom "crash" occurs, the water will appear to have turned black or clear overnight suddenly. The quick death of algae will cause a rapid drop in dissolved oxygen as bacteria consume the oxygen to breakdown the dead algae. This can result in a lack of dissolved oxygen, which can lead to fish fatalities.

4. Overuse of herbicides during summer

Aside from the afore mentioned causes, usage of herbicides during the summer months could result in large mortality of algae or aquatic weeds, resulting in fish fatalities. Pond owners frequently wait until their ponds are completely overgrown with aquatic plants or algae before taking any action. When all of the vegetation is treated with a herbicide/ algaecide at the same time, there will be a huge die-off of the foliage shortly after the treatment. If this occurs, bacteria will quickly begin decomposition by breaking down the dead plant materials, causing dissolved oxygen levels to drop fast. Still no longer oxygen production by the destroyed vegetation. Under these stressful conditions, oxygen consumption vastly outnumbers production, and levels rapidly drop, resulting in fish deaths.

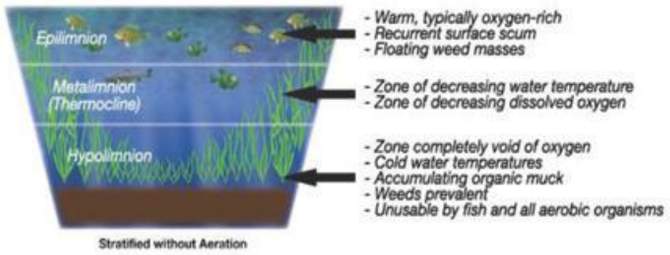
5. Stratification

Thermal stratification is the separation of water into distinct layers. The surface layer, epilimnion is warmer and less dense than the bottom layer hypolimnion. A thin layer of rapidly changing temperature (thermocline) exist between the two layers. Thermocline acts as a physical barrier and inhibits oxygen and nutrient exchange between surface and bottom layers. During summer months, the depth of thermocline increases and resulting in severely low oxygen levels which leads to fish asphyxia, and possibly fish deaths.

Methods to prevent summer fish kills

Dissolved oxygen depletion is the leading cause of fish deaths in all of the scenarios discussed above. It's tough to avoid oxygen depletion, but appropriate pond management and construction can help reduce fish fatalities. Following of below mentioned steps helps in overcoming this problem.

1. The culture pond should be checked periodically in the early morning during hot weather for signs of stressed fish. If the fishes are found gulping air at the surface during early morning hours, feeding should be stopped and aeration should be started immediately.



Thermal stratification in fish ponds

2. Water mixers and aerators break thermal stratification in ponds. It is recommended to install an aeration system to circulate and aerate oxygen-deficient water. Aerators must be switched on early in the spring and operated nonstop throughout the summer until the temperatures begin to cool to be effective. Aeration also helps to reduce hazardous gas emissions by hastening the breakdown of organic materials.

Paddle wheel aerators

3. To prevent aquatic vegetation growth and improve water volume, cultural measures such as adding fresh water and deepening shallow water area (where practicable) are also recommended.
4. Limit animal waste from entering the pond to prevent excess organic matter accumulation; additional organic matter can utilise oxygen for bacterial breakdown
5. Allowing aquatic weeds to accumulate to dangerously high levels will deplete oxygen levels as they disintegrate. There are a variety of strategies for removing these plants, including mechanical and chemical treatments. If a herbicide application is required, treat not more than 25% of the pond at a time, with a 10 to 14 day interval between treatments to avoid oxygen depletion.
6. Nutrient management measures like beneficial buffers, biological augmentation and application of phosphorous locking technologies can help to limit excess nutrients in the waterbody that are known to promote undesirable algae and vegetative growth.
7. Conduct regular water quality tests.

Conclusion

During the summer session, excessive aquatic vegetation in the cultural pond may affect dissolved oxygen levels resulting in fish asphyxia and eventually fish mortality. Changes in water quality (Temperature, Dissolved oxygen, and pH) in the aquatic system may have a direct or indirect impact on aquatic species. However, better pond management is foremost essential to prevent summer kills to a certain extent. During summer, fish farmers are required to take certain preventive measures to avoid fish kills.

Development of Tilapia Feed – A Cost Efficient Quality Choice for Tilapia Farmers

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Highlight Points

- Fish feed constitutes 40-60% of total cost of aquaculture production which is expensive and led to extensive studies on replacing costly fish meal in the diets
- Dietary nutritional requirements of fish species must be considered during feed formulation to achieve high fish growth performances
- The Nile tilapia is cultured under diverse rearing conditions in many countries due to its high growth rate and yield
- The GIFT (genetically improved farmed tilapia) strain of Nile tilapia is an emerging selective bred fish from the base population involving 8 different strains of Nile tilapia, *Oreochromis niloticus*

Introduction

The Nile tilapia, *Oreochromis niloticus*is considered as one of the most important species of fish in tropical and sub-tropical aquaculture. The mono-sex male population of tilapia are well recognized for increased production potential and low management requirements. Approximately 40% of fish from aquaculture originates from tilapia production.

Today, tilapia has become the shining star of aquaculture and also popularly known as 'aquatic chicken' and the rate of consumption has increased across the globe. Annual global production of cultured tilapia has increased consistently in recent years.The GIFT strain was developed by International Centre for Living Aquatic Resources Management (ICLARM; presently World Fish Centre, WFC) through several generations of selection from the base population involving 8 different strains of Nile tilapia *Oreochromis niloticus.*

The Inland fish farmers are striving hard to reduce the cost of fish feed since fish feed accounts for over 50% of the total cost of fish production. Supplementary feeds providing additional quantities of nutrients are needed when the productivity of a water body cannot provide for the fish growth desired. Low-cost, high quality feeds are needed in ponds when farmers wish to produce more fish than can be supported from fertilized systems and in instances where cages are stocked with fish which do not have access to the entire water body for feeding. Many small-scale farmers have been encouraged to build and utilize cages to increase their household income and nutrition. After construction of the cage, cost of feed becomes the major input cost for fish production. Commercial feeds are widely used around the world, mostly for cage farms which require a fairly complete diet.

Nutritional requirements of Nile Tilapia

Protein requirements

Proteins are long chains of amino acids linked by bonds called peptide bonds. All amino acids contain nitrogen, so all proteins contain nitrogen. In fact, measuring nitrogen content is a method of calculating protein content. Metabolism of protein for energy produces nitrogen end products. Fish eliminate these through gills, faeces and urine. These nitrogen end products can cause problems in fish ponds. Protein is the major concern during formulation of fish feed. It is the most expensive for fish feed and the important factors that contributing to the growth performance of cultured species.

Protein serves three purposes in the nutrition of fish:

1. Provide energy
2. Supply amino acids
3. Meet requirements for functional proteins- enzymes and hormones and structural proteins

The requirement for protein in fish diets is essentially a requirement for the amino acids in the dietary proteins. Some amino acids the fish cannot synthesis are called indispensable or essential amino acids. The essential amino acids required by the tilapia includes Arginine, Valine, Histidine, Isoleusine, Leucine, Lysine, Methionine, Threonine, Tryptophan and Phenylalanine.

Carbohydrates: Carbohydrates are the most economical and inexpensive sources of energy for fish diets. Although not essential, carbohydrates are included in aquaculture diets to reduce feed costs and for their binding activity during feed manufacturing. Dietary starches are useful in the extrusion manufacture of floating feeds. Cooking starch during the extrusion process makes it more biologically available to fish. Each gram of carbohydrate provides 4.6 Kcal of energy to the cultured fishes.

Fat: Fats serve as an important source of energy. Each gram of fat contains 9.3 Kcal of energy. Too much dietary fat can result in an imbalance of the digestible energy to crude protein ratio and excessive deposition of fat in the body cavity and tissues. Besides being an important source of energy for fish, dietary fats provide essential fatty acids (EFA) needed for normal growth and development. Fish cannot synthesize these fatty acids. Also, dietary fats assist in the absorption of fat-soluble vitamins. Freshwater fishes like tilapia requires dietary source of linoleic acid and linolenic acid.

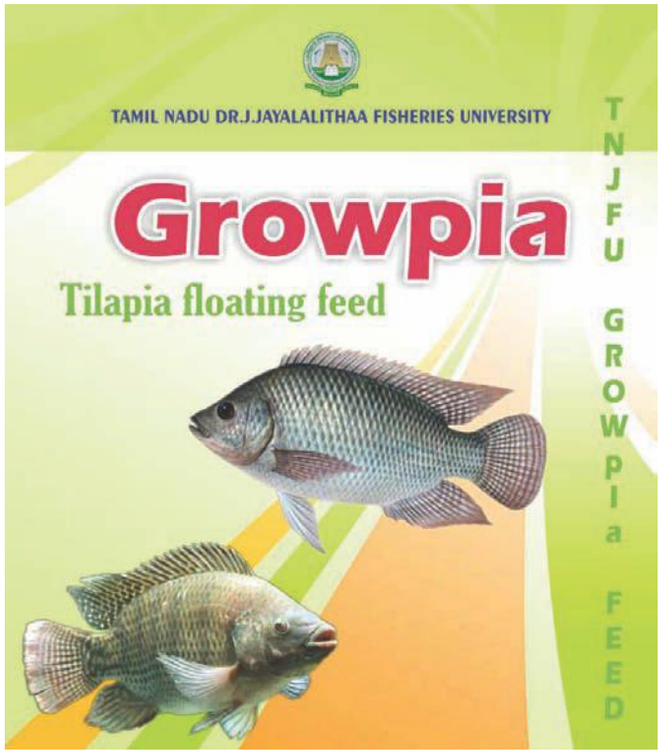
Vitamin requirements: Vitamins are organic compounds required in the diet for normal growth, reproduction and health. They function in a variety of chemical reactions in the body. The simple digestive system of the fish establishes a definite need for the supplementation of vitamins in fish diets. Vitamins are divided into two categories, water soluble and fat soluble. Water-soluble vitamins include thiamine, riboflavin, pyridoxine, pantothenic, niacin, biotin, folate, vitamin B12, choline, myoinositol, vitamin C. The fat soluble vitamins are Vitamin A, D, E and K.

Mineral Requirements: Fish can absorb a number of minerals directly from the water: calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), iron (Fe), zinc (Zn), copper (Cu) and selenium (Se). This reduces the mineral requirement in the diet. But this also makes research on dietary mineral requirements difficulty and inconclusive. Most researchers agree that fish require all of the minerals required by other animals. Based on their requirement or use by an animal, minerals are divided into two groups: macrominerals and microminerals. Macrominerals are present in the body in relatively large quantities. The macrominerals include: Calcium (Ca), Chlorine (Cl), Magnesium (Mg), Phosphorous (P), Potassium (K), Sodium (Na).

Table 1: Nutritional requirements of Nile Tilapia

Nutrients	Recommended level
Energy (Kcal DE/Kg diet)	3000
Crude protein (%)	32 (28)
Crude lipid (%)	10 - 15
Carbohydrate (%)	35 - 40
Amino acids (% of protein)	
Arginine	1.18
Histidine	0.48
Isoleucine	0.87
Leucine	0.95
Lysine	1.43
Metheonine + Cysteine	0.90
Phenylalanine+ Tyrosine	1.55
Threonine	1.05
Tryptophan	0.28
Valine	0.78

GROWPIA: Growpia is a formulated floating feed developed for the nursery and grow out culture of tilapia,developed by Fish feed production unit, Directorate of Aquaculture Technology Training and Incubation, Tamil Nadu Dr. J. Jayalalithaa Fisheries University. The newly developed growpia feed is readily accepted by tilapia and has very good palatability, water stability and nutrient rich. Growpia is a standard feed containing 30% protein designed and



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Skretting's Premium Range of Shrimp Hatchery Solution

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- Reduced disease risk
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WHITE TIGER

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- Natural functional ingredients
- Protection against pathogenic bacteria

PL

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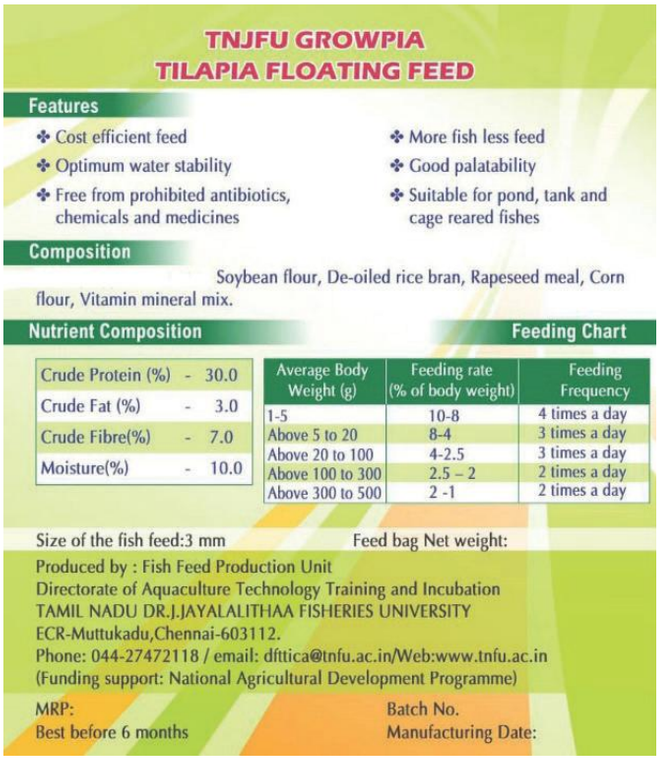

TNJFU GROWPIA
TILAPIA FLOATING FEED

Features

- Cost efficient feed
- Optimum water stability
- Free from prohibited antibiotics, chemicals and medicines
- More fish less feed
- Good palatability
- Suitable for pond, tank and cage reared fishes

Composition

Soybean flour, De-oiled rice bran, Rapeseed meal, Corn flour, Vitamin mineral mix.

Nutrient Composition

Crude Protein (%)	30.0
Crude Fat (%)	3.0
Crude Fibre(%)	7.0
Moisture(%)	10.0

Feeding Chart

Average Body Weight (g)	Feeding rate (% of body weight)	Feeding Frequency
1-5	10-8	4 times a day
Above 5 to 20	8-4	3 times a day
Above 20 to 100	4-2.5	3 times a day
Above 100 to 300	2.5 – 2	2 times a day
Above 300 to 500	2 -1	2 times a day

Size of the fish feed:3 mm Feed bag Net weight:

Produced by : Fish Feed Production Unit
Directorate of Aquaculture Technology Training and Incubation
TAMIL NADU DR.J.JAYALALITHAA FISHERIES UNIVERSITY
ECR-Muttukadu,Chennai-603112.
Phone: 044-27472118 / email: dfttica@tnfu.ac.in/Web:www.tnfu.ac.in
(Funding support: National Agricultural Development Programme)

MRP: Batch No.
Best before 6 months Manufacturing Date:

Fig. 1 : TNJFU Growpia – Tilapia floating feed

Fig. 2 : GIFT tilapia produced in Poondi reservoir, Tamil Nadu, India

Fig. 3: Cage culture of GIFT tilapia at Poondi reservoir, Tamil Nadu, India

developed to meet the dietary requirements of tilapia for optimum growth and good feed efficiency. Growpia provides essential nutrients generally lacking in other conventional feed or in natural fish food organisms. Growpia feed advances feed conversion ratio (FCR), feed efficiency ratio (FER), protein efficiency ratio (PER), specific growth rate (SGR), mean weight gain and survival of tilapia. Growpia is a cost efficient.

Feed formulation: Increase in intensive culture of many freshwater fishes places a great demand on efficient diets. Nutritionally faulty feed impairs food productivity and has substantial impact on the environment through accumulation of wasted feed there is therefore the need to produce least cost diet having optimal nutritionally ingredients. Good

Fig. 4: Cage culture of GIFT tilapia at Kulavai lake, Tamil Nadu, India

Fig. 5: Production of tilapia floating feed using single screw extruder

nutrition in production systems is essential to economically produce a healthy, high product the first consideration for formulation of feed is the quality of the feed ingredients. Feed formulation is essentially applied nutrition. A number of terms and expressions are introduced that will be put to practical use as information is presented on the nature and qualities of various feedstuffs and the information presented on the nutrient requirements of fish. Precise understanding of these terms is essential to their correct application.

Table 2: Ingredient composition of the formulated feed

Sl. No	Ingredients	Inclusion level
1	Soybean meal	34
2	Rapeseed	32
3	Corn flour	23
4	Rice bran	10
5	Vitamin premix	0.5
6	Mineral premix	0.5

Production of tilapia floating feed using single screw extruder: Extrusion cooking is a high-temperature short-time process in which a final product is obtained by heating, mixing,shearing, and forcing material through a die. The rate and extent of heating, mixing, shearing, and compressing of the materials inside the barrel and subsequently the die is strongly related to the properties of the raw materials and process conditions used. All the ingredients are preconditioned with steam before extrusion. Hence,understanding the physical, rheological, and chemical properties of an ingredient melt inside the barrel is very important for product development, process control, final product quality and scaling up operations. Each material exhibits distinct behaviour during processing and is often quantified by determining temperature and pressure responses, mass flow, and energy consumption.

Selection of feed ingredients:

To select the feed ingredients, the following major factors are considered to manufacture tilapia feeds in both commercial as well as on farm levels.

1. Supply of regular and locally available ingredients
2. Suitability of ingredients as per nutritional requirements and species.
3. Effective cost of feed ingredients (cost of raw materials, transportation charges etc)
4. Handling and processing requirement prior to feeding, including transportation should be minimal or negligible.
5. Freshness of the ingredients should be fresh and should not have any off flavour. The moisture content of the ingredients should be within a range of 10-13 %. Above this moisture level fungus growth may take place.

Good feed depends on the quality of the ingredients. So

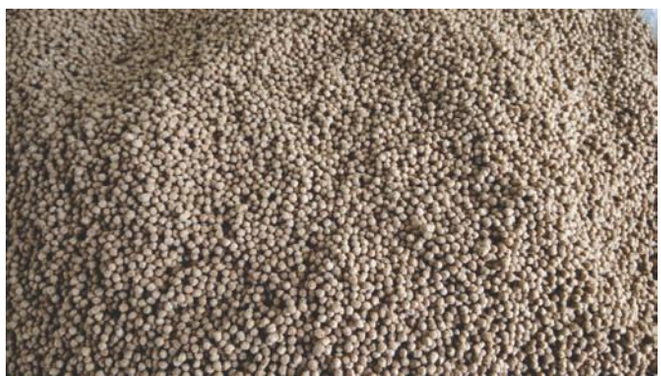

Fig. 6: Tilapia floating feed

consumer decision for selection of the ingredients play a major role to extract more profit from the culture system.

Locally available ingredients: Regular supply of ingredients is very important for reducing the cost of feed. Locally available ingredients further reduce the cost of manufacturing.

Suitability of ingredients: A wide range of various available ingredients can be used applying trial and error methods. Main sources of high protein ingredients are available in animal as well as in plant origin. Each species requires different energy as well as dietary requirements and to meet this, a suitable diet must be prepared. To prepare a suitable balance feed the assessment of ingredient quality is very much desired. A real as well as theoretical analysis of ingredients should be known to decide the suitability of ingredients to fish.

Effective cost of ingredients: The cost of the ingredients varies depending on various factors, eg, availability of ingredients on different locations, moisture content of plant ingredients, regular supply and demand etc.

Feeding techniques in culture of tilapia: The most important aspect of tilapia culture is providing good quality nutritious feed in the correct amounts to the fishes. Feed must be nutritionally complete and kept fresh. Feed must provide all necessary proteins, essential amino acids, carbohydrates, fats, essential fatty acids, vitamins and minerals for maximum growth. Nutrients start to deteriorate quickly when exposed to heat and moisture.

Floating feeds allow observation of the feeding response of the fishes. Because it takes about 24 hours for high quality floating pellets to disintegrate, fish may be fed once daily in the proper amount, but twice daily feedings are better. Sinking pellets can be used but extra care must be taken to ensure that they are not wasted. Sinking pellets disintegrate quickly in water. More than one feeding is needed each day. Fish of less than 25 grams should be fed at least three times a day.

Sinking pellets may be

- Slowly fed by hand which allowing time for the fish to eat the feed before it sinks
- Placed in shallow submerged trays
- Placed in demand feeders

Feeding slowly by hand is inefficient. Use of a tray allows quick placement of feed onto the tray, but multiple daily feedings are still required. The correct amount of feed must be weighed daily. Feeding rate tables or programs are required to make periodic increments in the daily ration. Feeding adjustments can be made daily, weekly or every two weeks. The fish should be sampled every four to six weeks to determine their average weight and the correct feeding rate for calculating adjustments in the daily ration. Adjustments can be made between sampling periods by estimating fish growth based on an assumed feed conversion ratio.

Table 3: Recommended daily feeding rates, expressed as percentage of body weight for tilapia of different sizes

Sl.No	Average Body Weight	Feeding rate (% of body weight)	Culture Phase
1	1-5	8	Nursery Rearing
2	6-10	6	
3	10-15	5.5	
4	15-20	4	
5	20-50	4.0-2.5	
6	50-100	2.5-1.7	Grow out Rearing
7	100-200	1.7-1.3	
8	200-300	1.3-1.0	
9	300-500	1.0-0.9	
10	500-700	0.9-0.8	
11	>700	0.8-0.6	

Feeding rate tables serve as guides for estimating the optimum daily ration, but they are not always accurate under a wide range of conditions, such as fluctuating temperatures or dissolved oxygen. Demand feeders can be used to eliminate the work (feed weighing, fish sampling, and calculations) and uncertainty of feeding rate schedules by letting the fish feed themselves. Fish quickly learn that feed is released when they hit a rod that extends from the funnel into the water. Demand feeders and feeding rate schedules produce comparable growth and feed conversion, but demand feeders reduce labour by nearly 90 percent. Feeding rate schedules may still be used with demand feeders by adding a computed amount of feed daily instead of refilling the feeder whenever it is nearly empty. With high quality feeds, good growing conditions and effective feeding practices, feed conversion ratios as low as 1:3 have been obtained. Generally, feed conversion ratios will range from 1.3 to 1.5 kgs of feed per 1kg of fish.

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