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• **Editor in Chief:** Dr. Farshad Shishehchian
• **Editor:** Amornrat Boonchuay
• **Marketing Communications:** Nathalie Lim, Kanyuta Summart
• **Technical Supports:** Zahra Javidi
• **Designer:** Pipitpan Lerdpipitpon, Jantarothai Sukpai

SINGAPORE ADDRESS:

8 Temasek Boulevard, Suntec Tower 3, Penthouse Level, Singapore

COORDINATION OFFICE:

599/27 Ratchadapisek Road, Jatujak. 10900 Thailand
Tel: +66 (0) 2192787 to 88 | Fax: +66 (0) 21921733 | info@asianaquaculturenetwork.com

Editor's letter

Year 2017 is soon coming to an end, A lot of interesting aquaculture conferences and events occurred this year, VIV Asia (Bangkok, Thailand) in April, World Aquaculture 2017 Cape Town in June, AquaSG'17 in October just to name a few. We hope that the experience in these aquaculture events all over the world had been fruitful and beneficial to our industry.

For this last issue of AQUA Practical in 2017, readers will get more knowledge and updates on all aspects of 'Farming Technology' that applies to the aquaculture industry today. In the Highlight Issue column Imad Patrick Saoud speaks out about the use of Cannabis extract on fish, such as Tilapia as an innovative experiment to reduce stress of animals in super-intensive environments. Read on about the conclusions of his theory on page 12 .

In this issue, we chose to interview, Professor Dean Jerry, Director of the Australian Research Council and Deputy Director of James Cook University's Centre for Sustainable Tropical Fisheries and Aquaculture in Singapore. Speaking from a local perspective, Prof. Dean Jerry shares my view of promoting the industry as cutting edge biotechnology and science, instead of traditional notions of aquaculture of 'farming' so to speak. It is incredibly vital to get the younger generations involved in the innovations in farming technology to ensure sustainable practices.

On a similar note, Blue Aqua International is proud to have launched its first *I. Vannamei* Broodstock Production Center in collaboration with the Oceanic Institute of Hawaii in Singapore. We hope to present the local aquaculture scene with new opportunities while tapping on the expertise present in other countries. Knowledge-sharing has always been a driving force to grow industries and we hope to utilise it fully.
On behalf of the AAN, I would like to wish all our dear partners and readers all the happiness and success in the year 2018. We look forward to a more bountiful year to come.

Farshad Shishehchian, Ph.D.
Editor in Chief

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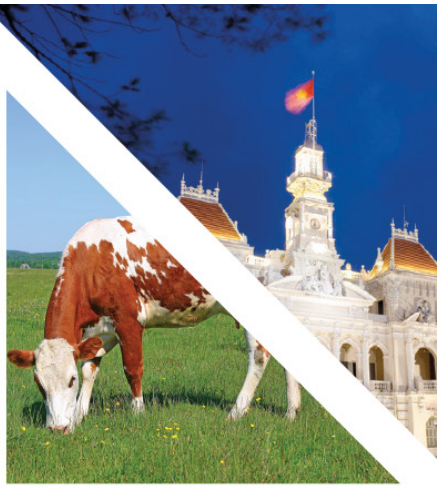
Customized Service.



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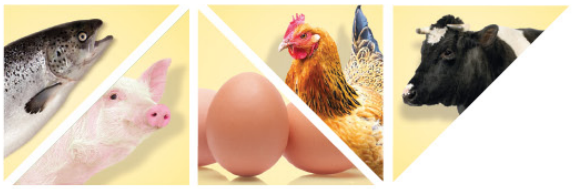

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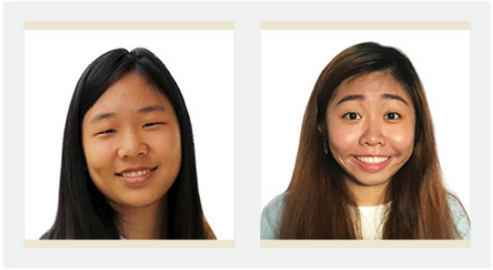
Intensification at a Glance

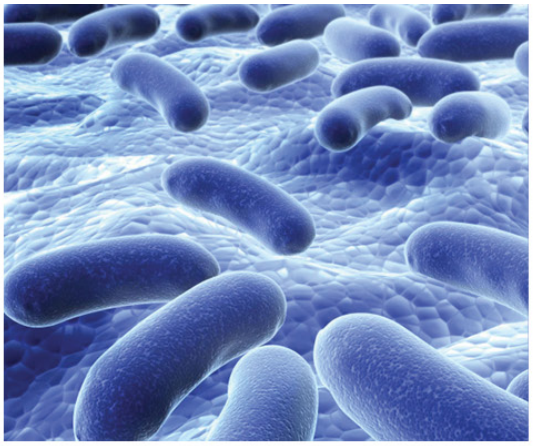


by **Hui Wen-Ting** and **Lim Qian Hui**
Interns of Blue Aqua International

With the population of the world constantly increasing, there is a greater demand for resources to sustain the human population. Inversely, the amount of available resources such as clean water and available land space decreases exponentially. In order to conserve the remaining available land space yet still achieve higher stocking densities and yields, there are many farming systems available in the world and they can be characterised into extensive, semi-intensive or intensive. There are also systems that are even more intensive which are super-intensive, hyper-intensive and ultra-intensive.

Extensive farms usually use traditional aquaculture techniques, mainly depending on natural productivity and there is little control over the stocks (FAO, 1987). In these farms, there is minimal use of artificial feeds, sophisticated technology and lower stocking densities. Extensive farms also require a large area and rely more on natural organisms like zooplankton in the water to sustain the White Leg Shrimp (*Litopenaeus vannamei*).

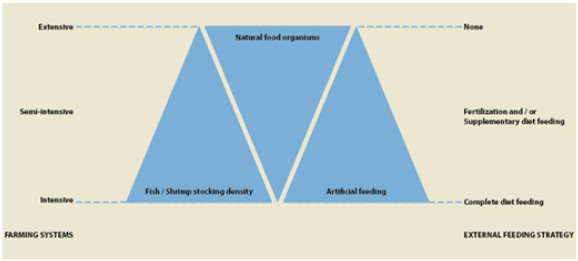
Semi-intensive system is a mix of principles between the extensive and intensive systems. It partially relies on technology and the natural environment to operate. It also uses some supplementary feeds and stock manipulation. The amount of inputs and production is higher than the extensive systems but lower than that of the intensive systems (FAO, 1987). In semi-intensive farms, the stocking density of the shrimps, amount of artificial feed and technology used increases while the land area used for farming decreases. The same trend follows through for intensive, super-intensive, hyper-intensive (Aquaculture.ugent, 2017) and ultra-intensive farms.



Intensive systems are designed for productivity, using scientific pond designs, fertilisers, supplements, stock manipulation, disease control, scientific harvesting and high input levels (FAO, 1987). These systems are at the lowest level of the range of intensive systems that uses tanks instead of ponds for rearing shrimp. Since technology input is needed, personnel must have a relatively good understanding of the species being cultured so that the water parameters, stocking densities and feed are set and maintained at optimal levels, which helps to promote growth, control diseases and reduce stress and mortality. Some of the benefits of implementing these systems is that farms have high yield and harvest of the shrimps, plus the farms can earn profits throughout the year (Aquaculture, n.d.).

However, intensive farms of any kind (eg super-intensive, hyper-intensive, ultra-intensive) have high start up and maintenance costs. Intensive systems also produce effluent that is rich in nutrients like phosphorus and ammonia, which can cause eutrophication and hyper-nutrification at high levels and thus, damage the surrounding environment (Aquaculture, n.d.).

Super-intensive systems allow much greater control over environmental parameters as compared to extensive and intensive farms. These systems are used to rear shrimps at high stocking densities with the use of little land space, hence it can be operated indoor like a greenhouse (Avnimelech, Y., 2012). It can also produce very high yields of 20 000 to 100 000 kg shrimps/ha per year. Despite the high yield, there is a significant possibility of management issues, disease outbreaks, water quality problems etc. According to Rosenberry (1998), producing above 10 000 kg shrimp/ha per year poses much risk. Shrimps reared under super-intensive conditions have a survival rate of 80 to 90% (Aquaculture.urgent, 2017). This system is highly dependent on technology and few trained personnels to manage the system.



Even though feed selection and management is essential for hyper-intensive (nursery) systems, there should be a scientific approach towards three main variables; feed formulation, physical characteristics of the feed and feeding protocols. Excess feed and indigestible nutrients will go directly or indirectly into the water, which will in turn lead to the deterioration of the water and tank or pond bottom. The shrimps will have reduced growth and poor health as a result (Browdy, C. et al, 2016). This system is good for shrimp nurseries and often has probiotics (***bacillus***) which helps to reduce the concentrations of ammonia, nitrite, nitrate and phosphate ions in the water via mineralisation (Lazado, C.C. & Caipang, C.M.A. , 2017).

The advantages of this system include control over the system conditions and feeding which helps to optimise productivity and maximise feed conversion efficiency respectively. The system has minimal demands for space and water, which reduces the volume of water discharges and prevents external predators from entering. Due to the environment the system creates, there is competitive exclusion for nutrient and space which reduces the population of pathogenic bacteria significantly (Lazado, C.C. & Caipang, C.M.A., 2017). However, hyper-intensive systems have high capital costs, use more complex technology and requires good feed design and control over management. Competent personnel are necessary in farms that use this system (Funge-Smith, S. et al, 2001).

Ultra-intensive systems is a step higher than super-intensive systems. They operate using even lesser land and stocking densities of 100 late-postlarvae (PL) or juveniles/m2. The survival rate of the shrimps is similar to that of a super-intensive system. In this system, majority of the feed given in this system is artificial (Aquaculture.urgent, 2017). Supplements like fresh feed can be added to increase the amount of nutrients received by the shrimps. The system is mainly automated.

Despite the limited amount of data that shows how efficient and high yield the more intensive systems are, these systems have proven to help reduce the amount of space used and are able to promote sustainable farming practices.

The concept of super-, hyper- and ultra-intensification is suitable for application in countries like Singapore – a small country with its limited land constraints. We can either utilise whatever space we have or venture out to the sea. However at the rate of which land and sea space is being developed and used, both resources will eventually be completely depleted. Intensification could be the solution to provide constant production for aquaculture.

Known as a center for commerce, education, R&D, science and technology, implementing intensification techniques on aquaculture systems in Singapore will be beneficial for society as a whole. Of course, with increasing intensification, it is not feasible to solely rely on commercial feed for a population of high stocking density. The nutrition provided for the aquatic animals should be looked into as well in order to accommodate the higher stocking density.

Articles:

1. Aquaculture.ugent (2017) Grow-out systems. Retrieved from http://www.aquaculture.ugent.be/Education/coursematerial/online%20courses/shrimp-cd/product/superi.htm
2. Rosenberry, B. (1998). World shrimp farming 1998. Shrimp News International, San Diego, California, USA. 328 pp. Retrieved 2017, September 20 from http://www.aquaculture.ugent.be/Education/coursematerial/online%20courses/shrimp-cd/product/bibprogr.htm
3. Wang, J. & Fast, A.W. (1992). Shrimp pond engineering considerations. In: Fast A.W. and Lester L.J. (Eds). Marine shrimp culture: principles and practices. Developments in aquaculture and fisheries science, volume 23. Elsevier Science Publisher B.V., The Netherlands. Retrieved 2017, September 20 from http://www.aquaculture.ugent.be/Education/coursematerial/online%20courses/shrimp-cd/product/bibprogr.htm
4. Browdy, C., Wyk, P.V., Stock, C., Zeigler, T.R. & Lee, R. (2016, January 5). Zeigler. 05.01.16- Shrimp nursery technology: System design and management for cost-effective results Part 2. Water quality, biofloc technology, feeds and feed management. Retrieved 2017, September 21 from http://www.zeiglerfeed.com/050116-shrimp-nursery-technology-system-design-and-management-for-cost-effective-results-part-2-water-quality-biofloc-technology-feeds-and-feed-management/
5. Avnimelech, Y. (2012). Biofloc Technology - A Practical Guide Book, 2nd Edition. The World Aquaculture Society, Baton Rouge, Louisiana, United States. Retrieved 2017, September 25 from https://www.researchgate.net/publication/264382340_Biofloc_Technology_for_Super-Intensive_Shrimp_Culture
6. Aquaculture (n.d.) Retrieved 2017, September 25 from http://biology.kenyon.edu/stures/Compsnelson/Aquaculturepage.htm
7. Lazado, C.C. & Caipang, C.M.A. (2017, June). Probiotics: Friendly Microbes for Shrimp. Aqua Practical 2(2), 16-18. Retrieved from http://asianaquaculturenetwork.com/magazine/index.php?WP=pQygAUqCGWOghJstqREcFKug

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Review on Advanced Aquaculture production systems: Strategies for improvement

Introduction

The world's appetite for fish is steadily growing. The aquaculture industry has greatly improved performance over the past 20 years, producing more farmed fish per unit of land and water, lowering the share of fishmeal and fish oil in many aquaculture feeds.

However, doubling aquaculture production without further increasing the industry's efficiency could lead to a doubling of environmental impacts. Unless the aquaculture industry is able to boost productivity, the limited availability of land, water, and feed may constrain its growth. The present aquaculture systems face many challenges, mainly, water-quality management, harmful diseases and epizootics, development of appropriate feeds and feeding practices, hatchery as well as grow-out technologies. These all provides considerable scope for the development of new aquaculture systems or technologies to face these challenges. It has wide range of approaches that can improve subsistence and commercial aquaculture production and management. Some of the new development in aquaculture systems for enhancing the aquaculture productions are discussed in the paper viz. integrated farming, aquaponics, recirculatory aquaculture system (RAS), neo-female technology, Compensatory growth Technology, etc.

Recirculation aquaculture system (RAS) technology

Recirculation aquaculture system (RAS) technology is the land-based closed systems in which aquatic organisms are cultured through the minimal use of water which is serially reconditioned. This land-based closed-containment system improves food security and reduces environmental impacts. RAS is consisting of a series treatment processes removes organic and other oxygen demanding materials such as suspended solids, nutrients, fats, oil and pathogens from the waste water so that the water can be safely reused. The larger solid suspended solids, debris and floating materials (wood, paper rags and plastics) are removed by passing the waste through Mechanical filers viz. settlement tanks, sand filter, drum filter, screen filter, etc where most of the solid materials removed.

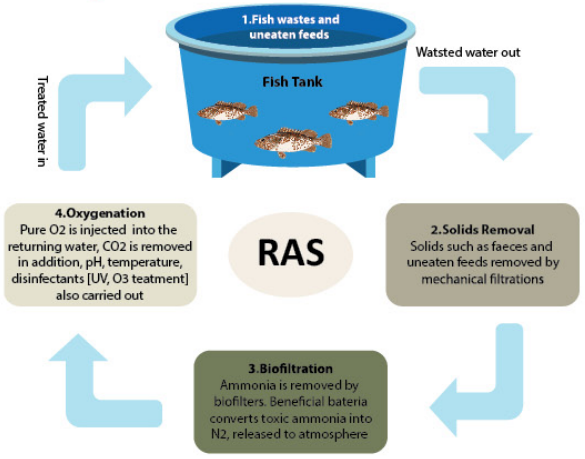

Figure 1. Flow diagram of Recirculation aquaculture system

Then it is treated through a biofilters where the liquid waste is passed through a film of microbial growth develops on the filtering medium (Zoological film) which may be of 0.2-2.0 mm thick. The film consists of bacteria, fungi, protozoa and algae. The naturally occurring microorganisms on the films break down organic the material and purify the liquid (converts ammonia NH_4+and NH_3excreted by the fish into nitrate).

Re-oxygenating the system water is crucial to obtain high production densities. Fish require oxygen to metabolize food and grow. Dissolved oxygen levels can be increased through two methods aeration and oxygenation. In aeration air is pumped through an air stone or an air stone that creates small bubbles in the water column, this result in a high surface area where oxygen can dissolve into the water.

In all RAS, pH must be carefully monitored and controlled. Desirable pH is typically controlled by the addition of lime ($CaCO_3$) or sodium hydroxide (NaOH) etc. A low pH will lead to high levels of dissolved carbon dioxide (CO_2), which is toxic to fish. Desirable pH can also be controlled by degassing $CO_2$with an aerator. All fish species have a preferred temperature above and below which that fish will experience negative health effects and eventually death.

Advantages
- Low water requirements.
- Low land requirements.
- Water quality parameters can be easily rectified.
- Independence of adverse weather conditions.
- High stocking density of desired species and productions.
- Most efficient; feed conversion is near 1:1.
- Reduce or eliminate vaccine, antibiotic and pesticide uses.
- Consistent production.
- Eco-friendly.
- Improve health and performance of the fish species

Aquaponics systems

Aquaponics is a modern food production system combines aquaculture and hydroponics (Raising of plants without soil beds) together symbiotically in a balanced recirculatory environment (Azad et al., 2016)

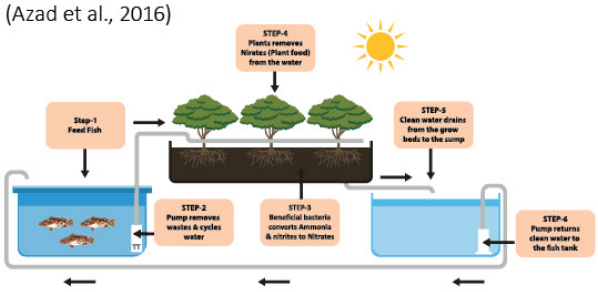

Figure 2. Flow diagrammatic representation of Aquaponics system

In Aquaponics system (Fig.4), nutrient-rich water from fish tanks is used as liquid fertilizer to fertilise hydroponic production beds. These nutrients in the water produced from fish manure, algae, and decomposing fish feed which otherwise increases the toxic levels in the fish tanks affecting the fish growth.

The hydroponic beds function as a biofilter stripping off ammonia, nitrates, nitrites, and phosphorus so the freshly cleansed water can then be recirculated back into the fish tanks. The nitrifying bacteria living in the gravel and in association with the plant roots play a critical role in nutrient cycling. These nitrifying bacteria convert ammonia to nitrate, a form of nitrogen utilised by the plants. Thus when the water returns to the fish tanks, nitrogen level are tolerable for the fish. Unlike that of traditional farming, in aquaponics system there is a constant flow of water and constant supply of nutrients to the plants occurs.

Advantages
- Significant reduction in the uses of water
- No need to use artificial fertilizer
- Provide an artificial filtration system of fish culture environment.
- Does not require farmland with fertile soil.
- Naturally organic
- Tourist attractors in rural communities
- Reduced damage from pests and disease
- No weeding
- Plants grow faster
- Sustainable
- Cleaner form of gardening
- Easy to setup

Mono sex culture or Neo-female Technology

Mono-sex culture is a farming practice based on the culture of fish by producing all males or all females' population depending upon the sex which have better food conversion ratio and growth rate. Generally, monosex culture of all female population of Carp, Salmon and all male population of Giant freshwater prawn and Tilapia is carried out that maximize the production level.

Among freshwater shell fishes culture *Macrobrachium rosenbergii* (Scampi) is gained importance in India. In this case the males reach market size faster than females. Thus, an all-male monosex population culture of the species is desirable. So monosex culture can be carried out by identifying the correct sexual dimorphism of this species and subsequently culture and harvest when attains desirable marketable size. Now-a-days a standardize technology called "neo female technology" where females are obtained through the sex reversal of males and that yield all male progeny. In this techniques the sex of the juvenile males is changed through microsurgical removal of the androgenic gland (AG) or through androgenic gene silencing (RNA interference method) to female (termed "neo-females"-phenotypic females with male genotype) and when it mates with a normal male gives all male progenies (Amir, 2013). In India, this neo-female technology project for the production of male scampi seeds has been undertaken by RGCA, Tamil Nadu and supplies all-male scampi seeds to farmers of the country.

Advantages
- Increase production to 2-flods.
- Better food conversion ratio
- Better growth rate

Integrated fish farming (IFF)

Integrated farming is defined as the sequential linkages between two or more agri-related farming activities with one of farming as major components. When fish becomes the major commodity in the system, it is termed as integrated farming (Ayyappan, 2011). OR, integrated fish farming systems refer to the production, integrated management and comprehensive use of aquaculture, agriculture and livestock, with an emphasis on aquaculture. The linkage of fish farming with agriculture and animal husbandry is considered as sustainable farming system, which offers greater efficiency in resources utilisation, reduces the risk by diversifying t
crops, provides income and increased food fish production for small scale farming.

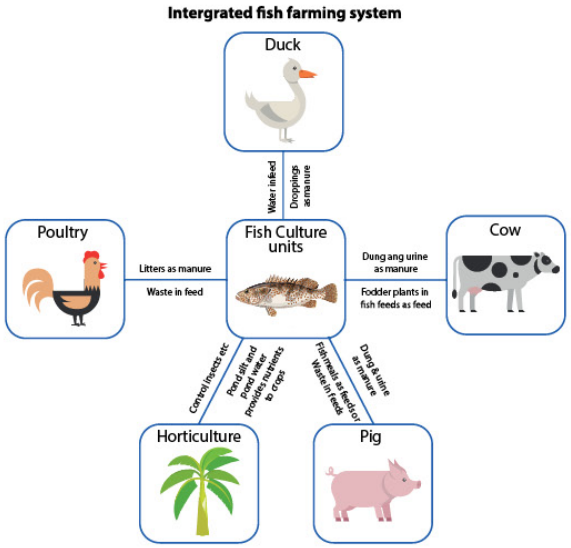

Figure 3. Flow diagrammatic representation of IFF system

In integrated fish farming system, the wastes or by-products obtained from one system i.e. minor commodity becoming an input of fish culture systems. The by-products obtained from fodder plants, fruit plants and agriculture crops i.e. rice bran, rice polish, flour, oil cake, soybeans etc., are used in varied processed forms in aquaculture as a feed input. Besides, the wastes both urine and dung from different live stocks i.e. cows, poultries, chickens, pigs, rabbits, goats, sheep, silk warms etc., are used as a sources of manure to generate fish food organisms and helps in the sustaining of aquatic food web. There are basically two types of IFF followed by the farmers in India. The agri-based system includes paddy-fish, mushroom-fish, seri-fish, vermicompost-fish etc., with aquaculture as major component where as other agriculture practice as minor components. The livestock-fish system includes cattle-fish, pig-fish, goat or sheep-fish, duck-fish, rabbit-fish etc., with an objective to increase the farm productivity maximizing synergies between these components. Thus the IFF provides a new farming approach to increase the food production in a sustainable way which ensures better biodiversity, eco-system and integration of soil-water fertility management practices.

Advantages

- Offers tremendous potential for food security and production
- Optimization the use of available natural resources
- Diversification of income generating activities
- Improvement of soil-water fertilities
- Minimize the use of chemicals (pesticides, fertilizers, antibiotics) Aquatic Biodiversity conservation and sustainable use could be enhanced
- Efficient utilisation of farm space for multiple productions
- Recycling of waste or by-product
- Organic in nature
- Eco-friendly
- No need to use artificial fertilizer
- Reduces the costs of production and economically

Integrated Multi-Trophic Aquaculture

IMTA is a way of farming multiple marine or freshwater organisms from different positions or nutritional levels or trophic levels in the same system at the same time (Barrington et al., 2009). Integrated multi-trophic aquaculture (IMTA) is the farming of aquaculture species from different trophic levels, and with complementary ecosystem functions, in a way that allows one species' uneaten feed and wastes, nutrients, and by-products to be recaptured and converted into fertilizer, feed, and energy for the other crops, and to take advantage of synergistic interactions between species.

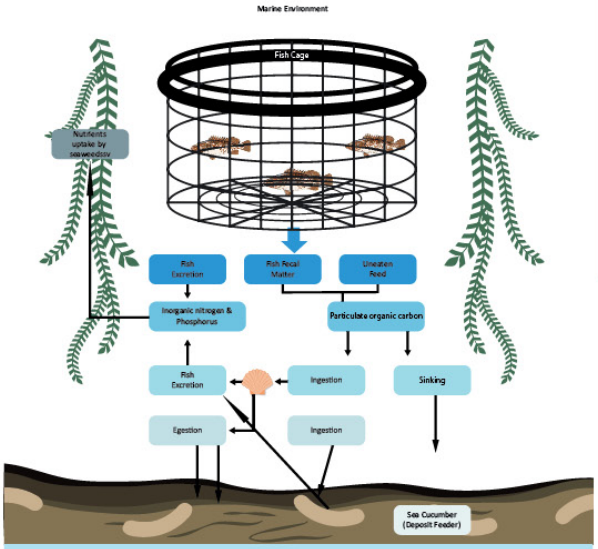

Figure 4. Flow diagrammatic representation of IMTA

IMTA is the practice which combines the cultivation of fed aquaculture species (e.g. finfish/shrimp) with organic extractive aquaculture species (e.g. shellfish/herbivorous fish) and inorganic extractive aquaculture species (e.g. seaweed) to create balanced systems for environmental sustainability (biomitigation) economic stability (product diversification and risk reduction) and social acceptability (better management practices).

Typically, carnivorous fish or shrimp occupies the higher trophic levels of IMTA's. They excrete soluble inorganic ammonia, phosphorus (orthophosphate) and particulate organic carbons (Fish faecal matter). Seaweeds and similar species can uptake these inorganic nutrients (inorganic nitrogen and phosphorous) directly from their environment. The organic nutrients (fish faecal matters and uneaten feeds, POM) are feed by shellfishes and deposit feeders and their excretory inorganic products again uptake by the seaweeds. Thus the IMTA provides a new farming approach to increase the food production by efficient utilisations of trophic levels in a sustainable way which ensures better biodiversity, biosecurity and eco-system.

Integrated Multi-Trophic Aquaculture

= Fed Aquaculture

(Finfish) + Extractive Aquaculture i.e. Organic (Shellfish) Inorganic (Seaweed)

Advantages

- Offers tremendous potential for food production and security
- Promotes economic and environmental sustainability by converting by-products, wastes and uneaten feeds.
- Reducing eutrophication
- Increasing economic diversification
- Reducing negative environmental impacts
- Eco-friendly.
- Efficient utilisation of all the trophic levels

Organic aquaculture

Organic aquaculture refers to the production processes and practices of ecological production management systems that promote and enhance biodiversity, biological cycles and biological activity. It is based on minimal use of off-farm inputs and on holistic management practices that restore, maintain and enhance species diversity and ecological harmony (Prein et al., 2010). Moreover, the primary goal of organic aquaculture is to optimize the health and productivity of interdependent communities of soil life, plants, animals, and ensures that the production system should be socially, ecologically and economically sustainable.

Organic aquaculture based on the principles and practices of Intensive monitoring of environmental impact, use of polyculture, Integration of natural plant communities in the farm management, use of indigenous species as far as possible, without the use of hormones, irradiation and antibiotics and appropriate stocking density for food production in a sustainable way.

Advantages

- Sustainable fish farming system
- Preserves the ecosystem
- Controlling supply and demand
- High nutritional Value
- Eco-friendly
- Creating more job opportunities
- Poison-free
- Food Tastes Better
- Lower Input Costs
- Disease Resistance

Compensatory growth Technology

Compensatory growth is the phase of rapid growth, greater than normal or control growth, which occurs upon adequate refeeding following a period of under nutrition (Ali et al., 2003). Compensatory growth (Stunted Fingerlings) is identified by being significantly faster than the growth rate of control fishes that have not experienced growth depression, held under comparable conditions (Biswas et al., 2016).

The fish to starvation followed by what may be termed compensatory growth once feeding was resumed. In this method, the fish that have been starved for 3 weeks and then fed for 3 weeks show a weight gain equivalent to or greater than that of fish fed normally for the 6-week period.

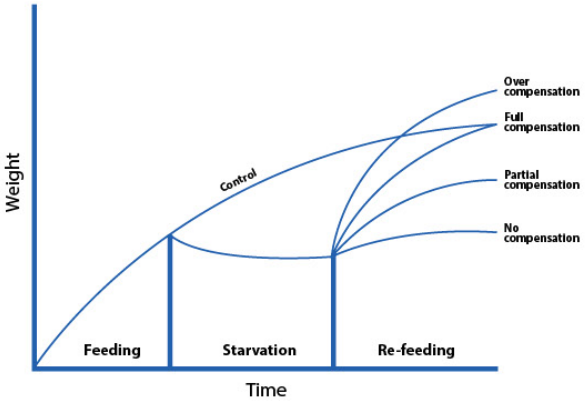

Figure 5. Graphical representation of Compensatory growth technology

Advantages

- Carps are known to grow rapidly during the second year of their age.
- Higher survival rate in grow out ponds.
- More Immune to the diseases.
- More tolerant to environmental fluctuations.
- Require less time to reach marketable size (5-6 months).
- High growth rate & can be sold at higher prize.
- Higher production and productivity.
- Unhealthy seeds are perished during stunting periods, so we get only healthy seeds.

Conclusion

These advanced aquaculture farming systems and other technological innovations are showing a positive impact on aquaculture success, productions, investment and marketing potential. The development of these farming systems in aquaculture should provide a means of producing healthy and fast growing animals, through eco-friendly means. However, this development will largely depend on the desire, willingness, capacity building and infrastructure development of the farmers to work in collaborations with scientists and the international donor community to assist in related farming technologies.

AQUA 2018

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Does **Cannabis extract** work on fish: **Do *Tilapia* get high?**

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American University of Beirut
is08@aub.edu.lb

Aquaculture fish production has grown very rapidly over the last decade, and is still growing at the same rate (FAO 2016). As aquaculture moves away from extensive or semi-intensive pond culture to more complex intensive and super-intensive systems of production in recirculation (RAS) tanks and cages, we observe an increase in poor water quality, stress and disease incidence. Consequently, any farming practices with the ability to mitigate such fish stress would be of great importance to the industry. Marijuana, also known as Indian hemp or hashish, is a well-known derivative product of an annual flowering plant species belonging to Cannabaceae family, Cannabis sativa, indigenous to Central Asia (Adams & Martin 1996; Zuardi 2006). While the stems, seeds, and oil extracts from the plant have been employed in various ways, including industrial and medicinal purposes, the plant is most well-known for its psychoactive and stress reduction effects. Resin produced by the leaves and flowering tops of C. sativa is a source of terpeno-chemical compounds known as cannabinoids, with tetrahydrocannabinol (THC) being the primary psychoactive ingredient responsible for the infamy of the cultivar (Adams & Martin 1996).

Research on the effects of THC in humans and animals provides interesting data which could be of use to aquaculturists. THC is most known for its sedative effect on certain vertebrates, but there is also evidence for such effects as improving appetite and increasing weight gain in humans and animals (Le Foll et al. 2013). There is also anecdotal reference to the fact that cannabis could improve immunity. These effects, coupled with the fact that THC has very low toxicity (Hall & Solowij 1998) provide for a safe feed ingredient/additive that could possibly be used to reduce stress and disease in aquacultured fish.

In the present work, we investigated the possible effects of THC on Nile Tilapia, one of the most widely and most intensively aquacultured fish. We set up a growth trial, with prepared diets incorporating cannabis extract, to assess the effect of THC on growth, metabolism and stress of the fish. Because research suggests that THC might have an immuno-suppressive effect on vertebrates (Klein et al. 1998; Cabral 2001), and because in relation to fish such information is lacking, we also assessed hematological (blood counts) and biochemical parameters (hematocrit, total plasma, lysozyme) in our fish to investigate whether the drug improved immune response.

Our results suggest an increase rather than decrease in metabolism of Nile tilapia juveniles when offered dietary THC, with reduction in growth and increase in FCR, all of which are undesirable outcomes for farmers. Furthermore, we did not observe any improvement in immune function of the blood of fish offered marijuana. However, the results of our research only pertain to fish being given marijuana daily. There is a growing body of scientific literature suggesting that the effects of cannabis on weight gain and food intake actually depend on whether the drug administration is constant or once in a while. While both acute and chronic marijuana use increase appetite and weight gain in humans (Greenberg et al. 1976), this seems to not be the case with animals administered THC in chronic fashion (Le Foll et al. 2013). As the fish in our experiment were given THC chronically, over a period of 2 months, the observed reduction in weight gain is validated, but the possible effects of acute administration are therefore lost to observation.

Something similar was observed in Siamese fighting fish Betta splendens, in which THC was used to suppress aggressive behavior but lost effect after prolonged administration (Gonzalez et al. 1971). Thus it is possible that the fish did experience a sedative phase in the early stages of the growth trial but then developed tolerance to THC in the diet, precluding any further dietary anti-stress effects. As for the hematology, THC did not exhibit any statistically significant effects on blood or biochemical parameters in ***O. niloticus,*** although a marginal decrease in WBC, lymphocyte, monocyte and neutrophil counts was noted.

There is anecdotal information that marijuana increases the appetite of human consumers (the munchies) and results in weight gain. Fish in the present experiment were offered feed at 5% body weight daily. If THC offered in the morning feeding was responsible for an increase in metabolic rate, then it is possible that if fish were offered feed ad libitum, those treated with marijuana extract might have consumed more and thus grown faster. However, even if the fish had grown faster, FCR would have been much higher, resulting in economic loss. Until further research yields different results, we do not believe that marijuana extract should be offered to fish.

The work was performed in the aquaculture research laboratory at the American University of Beirut, Lebanon. Juvenile tilapia where obtained from ***O. niloticus*** broodstock maintained in an outdoor system and fed a commercial diet of 40% protein and 8% lipid (Rangen Inc., Buhl, Idaho, USA). The fish were size-sorted by hand to similar size, and transferred to an indoor environmentally controlled recirculation system, where they were offered commercial feed twice daily to satiation and given two weeks to acclimate. In the meantime, three iso-energetic and iso-nitrogenous (same protein content) diets were prepared, differing only in the source of the oil ingredient: diet 1 (control) using soy oil, diet 2 using industrial hemp oil (no THC), and diet 3 using a 1:1 mix of soy oil and cannabis oil (THC) (Table 1). Because preliminary data showed that the presence of TCH and not the quantity is what affected fish performance, we opted for the simpler presence/absence of THC in the experiment.

The growth trial yielded interesting results (Table 2; Fig.1). With 100% survival in all treatments, the juvenile tilapia offered the diet with soy oil had larger body weight and total length, and consequently lower FCR values, when compared to their counterparts fed diets with industrial hemp oil (no THC) and cannabis oil (THC).

No significant differences where observed either in condition index of the fish nor in weight, length or FCR between the two cannabis treatments. Surprisingly, hematology and proximate body composition analyses showed no significant differences among all three treatments. However, analysis of respirometry data showed that fish offered the THC diet had significantly higher mean respiration rate, and hence greater oxygen consumption rate, when compared to the fish fed soy-oil diet (control) (Fig.2). Industrial hemp (non-THC) treatment (diet 2) yielded no significant differences in oxygen consumption rate when compared to either control or THC-diet.

	Diet 1 Control	Diet 2 Industrial hemp	Diet 3 Cannabis extract
		(g Kg¹ diet)	
Menhaden Fishmeal¹	300.0	300.0	300.0
Soybean meal solvent extracted²	418.0	418.0	418.0
zhvSoy oil	21.3	0.0	10.7
Industrial hemp³	0.0	21.3	0.0
Cannabis extract⁴	0.0	0.0	10.7
Wheat flour	224.7	224.7	224.7
Vitamin & Mineral premix⁵	20.0	20.0	20.0
Choline chloride	5.0	5.0	5.0
Stay C 250⁶	1.0	1.0	1.0
Gelatin⁷	10.0	10.0	10.0
Chemical Composition⁸ (g 100g¹ in dry matter)			
Crude Protein	40.97	40.97	40.97
Crude Lipid	5.50	5.51	5.51
Digestible Energy	404.48	404.52	404.52
Phosphorous	1.23	1.23	1.23

2De-hulled solvent extracted soybean meal, zSouthern Sates Cooperative Inc., Richmond VA, USA.
3Industrial Hemp planted under license by Dr. M. Farran and extracted by cold press of seeds.
4 Ether extracted from police confiscated cannabis.
5The vitamin and mineral premix provided the following per kg of experimental diet: vitamin A retinyl acetate 1 million IU, vitamin D3 cholecalciferol 0.1 million IU, vitamin E alpha-tocoph acet 7 g, vitamin K 0.5 g, folic acid niacin 0. 1 g, niacin 4 g, calcium pantothenate 2.5 g, riboflavin (B2) 0.6 g, vitamin B12 0.001 g, thiamine (B1 nitrate) 0.5 g, pyridoxine (B6 HCl) 0.5 g, biotin 0.0125 g, vitamin C (ascorbic acid) 0.25 g, inositol 5 g, selenium (as sodium selenite) 0.0045 g, iodine (as calcium iodate) 0.25 g, iron (as sulphate monohydrate) 2 g, zinc (as oxide) 5 g, copper (as sulphate pentahydrate) 0.25 g, manganese (as sulphate monohydrate) 3.5 g, chlorine chloride 75, phosphorus (as monodicalcium phosphate) 2.5, sodium chloride (salt) 225 g, and cellulose 75 g. Calcium carbonate carrier to balance.
6250 mg kg – 1 active vit C supplied by Stay C®, (L-ascorbyl-2-polyphosphate 25% Active C), Roche Vitamins Inc., Parsippany, New Jersey, USA.
7Himedia laboratories Pvt. Ltd., 23, Vadhani Ind. Est., LBS Marg, Mumbai, India.
8Based on a calculated value.

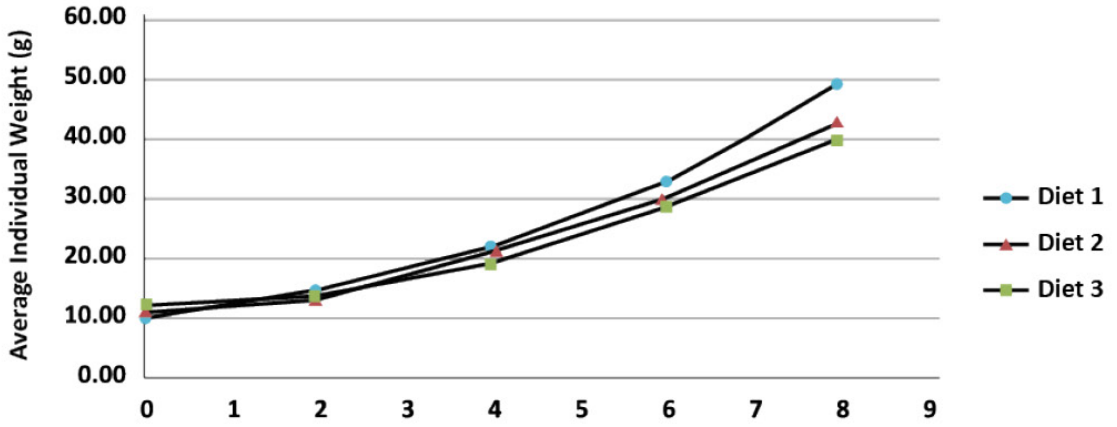

Figure 1. Growth in average individual body weight (g) over 8 weeks of juvenile O. niloticus, offered various diets.

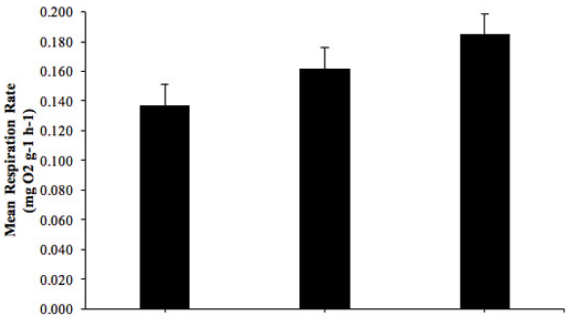

Figure 2. Mean respiration rates (mg O2 g-1 h-1) of juvenile Nile Tilapia, O. niloticus, offered various diets, at 26°C.

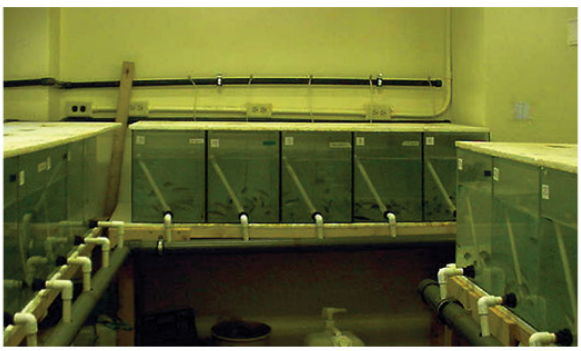

Figure 3. Research tanks with fish.

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7 Questions with Dean Jerry

Dean Jerry
Director
Australian Research Council (ARC)
Research Hub for Advanced Breeding

Deputy Director
JCU Centre for Sustainable Tropical Fisheries and Aquaculture

1. Can you tell us a little bit about your background?

A: I'm the Director of the Australian Research Council Hub for Advanced Prawn Breeding and current Dean of Research at James Cook University's Singapore campus. I have been involved in aquaculture research for 18 years with my speciality in the application of genetic technologies to the improvement of farmed aquatic species.

All my projects involve working with companies to address their important R&D needs and I love this aspect of my job as I can see direct applications of my research to farm productivity.

2. What served as the important stepping stones for your career?

A: I come from an agricultural family that has farmed cattle, sheep and grown wheat for over 125 years, so I've always had an interest in food production. I also loved fishing so when I went to university I studied marine biology and genetics and then got interested into aquaculture which at the time was a young, but growing industry.

Lucky for me I got a research scientist job working with CSIRO whereby I designed a family-based selective breeding program for the freshwater crayfish Cherax destructor and my interest in aquaculture genetics was sparked. It wasn't until I moved to James Cook University though where I was able to create a large research group devoted to developing genetic technologies for aquaculture that my career took off.

3. What are some of the most difficult, enigmatic samples that you have come across?

A: I don't know if it is really difficult, but designing and conducting breeding programs for barramundi Lates calcarifer are tricky due to various biological vagaries of the species. For example, barramundi are all born male and sex change into female a lot later in life which can create difficulties in mate allocations as well as hindering improvement programs as males and females of the same age can't be spawned together as there are usually no females.

The species also is a mass spawner which causes issues in contribution of each brooder to the resultant progeny cohort and large skews in the number of families and individuals in a family. Mass spawns may contain progeny from many families and consequently improvement problems for barramundi need to rely heavily on DNA pedigreeing to identify parentage of seedstock.

4. What is your favourite aspect of your research, specifically in the applicatiton of genetic technologies in aquaculture?

A: I love working closely with industry to develop new genetic tools and knowledge that they can then use to more sustainably manage their genetic resources and improve stocks. I also use genetics for other outcomes like pathogen testing, environmental DNA and bacterial community metabarcoding to identify microbial composition in production systems, and DNA-based provenance testing of products.

Working with industry is an amazing privilege I have as I get to form productive partnerships with lots of energetic, passionate and innovative people. I also get a kick out of educating and training the next generation of aquaculture practitioners and researchers and highlighting to them the power of genetics to boost productivity of aquatic farming systems, just like what has occurred for terrestrial food production.

In fact, not many people realise that only 10% of global aquaculture production is based on improved stocks – just imagine how much food aquaculture could produce if all farmed species were improved so they grow twice as fast and

5. How do you think aquaculture will develop along the way?

A: I believe aquaculture will undergo a renaissance over the next ten years. It will see increased investment by large agribusiness companies, widespread use of genetics and digital technologies, and its social license will grow as wild fisheries continue to decline and the value of farming aquatic species becomes more widely appreciated.

Most exciting of all perhaps and something we are seeing now for many fish and even shrimp, is that intensive, environmentally controlled production systems will be developed that will allow phenomenal amounts of animal protein to be produced from smaller land and environmental footprints. Countries like Singapore can be right in amongst this renaissance as Singapore in particular is in a position to rapidly adopt new technologies that increase productivity and lower risk of fariming

6. In your opinion; How can we save the global shrimp industry from devastating diseases?

A: I believe that we need to change the way we selectively breed for disease resistance in shrimp. Specific pathogen free (SPF) approaches have served the industry well, but this approach isn't conducive to producing specific pathogen resistant (SPR) shrimp.

Currently, most breeding program select for disease tolerance using artificial, lab-based pathogen challenges which for most diseases like white spot syndrome virus haven't led to disease resistance stocks. This is because this type of selection has in my opinion several flaws including issues with actually mimicking how the pathogen infects shrimp in farm ponds (i.e uses unnatural infection pathways, attenuated viruses etc), the fact that the animals actually used as broodstock haven't been challenged to the pathogen itself (because a practice termed sib-selection is used where resistance is based on how their siblings go when challenged to the pathogen, but the breeding candidate themselves remain SPF) and so on. We need to use all the natural variability present in stocks and incorporate the genes for tolerance by breeding from survivors from ponds like now being done in Central America.

The real future, however, will be to use genomic-based approaches which use all the information contained in the genome of the shrimp to predict disease resistance (so called genome selection). At James Cook University my group and other collaborators have been evaluating genomic selection as a selection methodology for both Pacific white shrimp and black tiger shrimp and it shows great potential.

7. How do you think we can promote the aquaculture industry as a positive aspect for the younger generation? What can a newcomer to the industry expect?

A: I think we need to promote the industry as not only about throwing feed into a pond, but an industry that can be based on cutting edge biotechnology, science, and innovation. As a young industry it requires smart young people to come in and continue to innovate and increase use of sustainable practices. Importantly, it is an industry that can do a lot of social good, whilst making money.

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US imported shrimp to be monitored for traceability

News Around the World

09 Aug 2017

The US will include shrimp in its Seafood Import Monitoring Program in future so it can better account for its traceability. It's a move welcomed by America's top shrimp importer, Ecuador, which says that the bill passed by The US Senate Appropriations Committee will allow responsible producers to stand-up for even higher standards in the industry.

"We are very pleased to see the announcement that shrimp will be added to the US monitoring program, as we firmly believe it's time for responsible producers to stand up in favour of strong standards and improved traceability in the seafood industry," said José Antonio Camposano, executive president of the National Chamber of Aquaculture of Ecuador.

"All consumers deserve access to the highest quality products and through this program, US consumers will have improved knowledge and access to shrimp produced to the highest environmental and social standards."

At present, 91% of the seafood consumption in the United States comes from imported products and 25% of this is shrimp.

Ecuador is one of the main importers of shrimp to the United States. Last April, it exported more than 80 million pounds to the country.

Mr Camposano said that Ecuador is already renowned for its preferential aquaculture farming and processing practices, and as a result is recognised globally for its great taste, texture and quality shrimp products.

He added that the sector is now also leading a new antibiotic-free initiative which will further improve the region's position as a provider of premium shrimp.

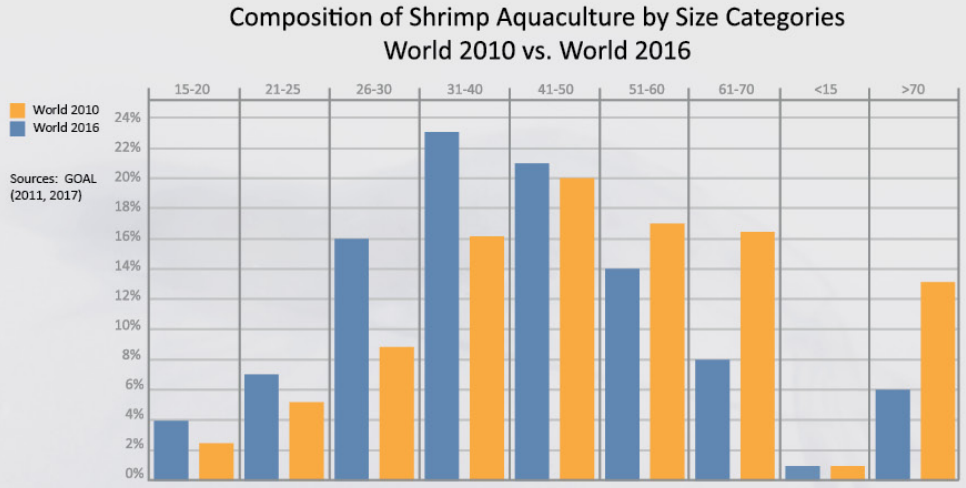
Global shift towards farmed production of **smaller shrimp**

By Louis Harkell Oct. 13, 2017 07:28 BST

DUBLIN, Ireland

"We Americans love big shrimp," said Jennifer Wandler, director of seafood at US Foods during the Global Outlook Aquaculture Leadership (GOAL) conference in Dublin, Ireland. The problemt is, shrimp farmers around the world are producing less of them.

This year, around two thirds of global farmed shrimp production is expected to be 40 count per kilogram or smaller, according to a Global Aquaculture Alliance (GAA) industry survey, presented at GOAL. By comparison, just half of global farmed shrimp produced was of this size in 2010.

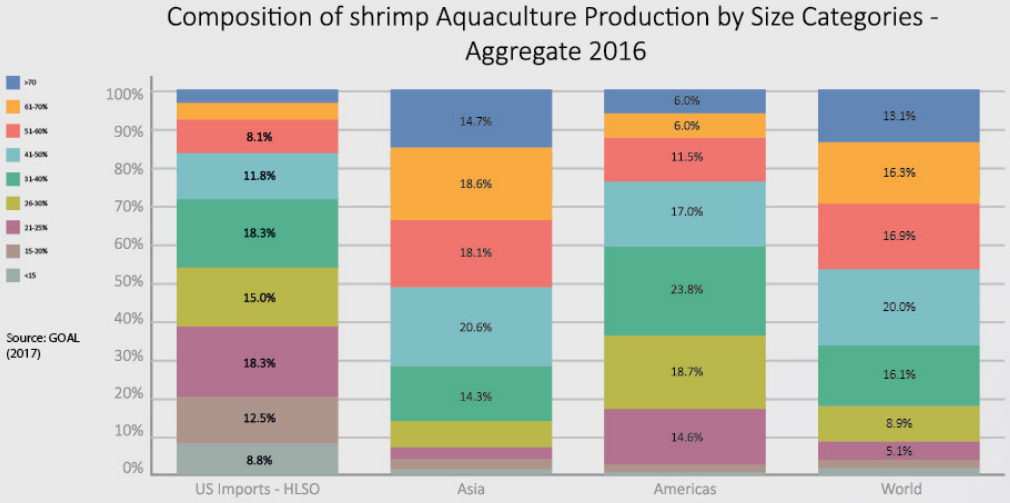


Source: Jim Anderson, Global Outlook on Aquaculture Leadership conference

The shift towards production of smaller shrimp is because farmers are harvesting their shrimp ponds earlier, likely due to increased risks of disease. In some areas of China, farmers harvest shrimp so early shrimp can be smaller than 200 count per kilo.

According to the GAA survey, this year disease ranks number one among concerns in the shrimp industry. The share of very small shrimp produced -- 60 count or smaller -- has gone up significantly, too, according to the figures, which were presented by Jim Anderson, professor at the University of Florida, during the conference. In 2010, just 14% of shrimp were in this size category; in 2017, it is expected 30% will be.

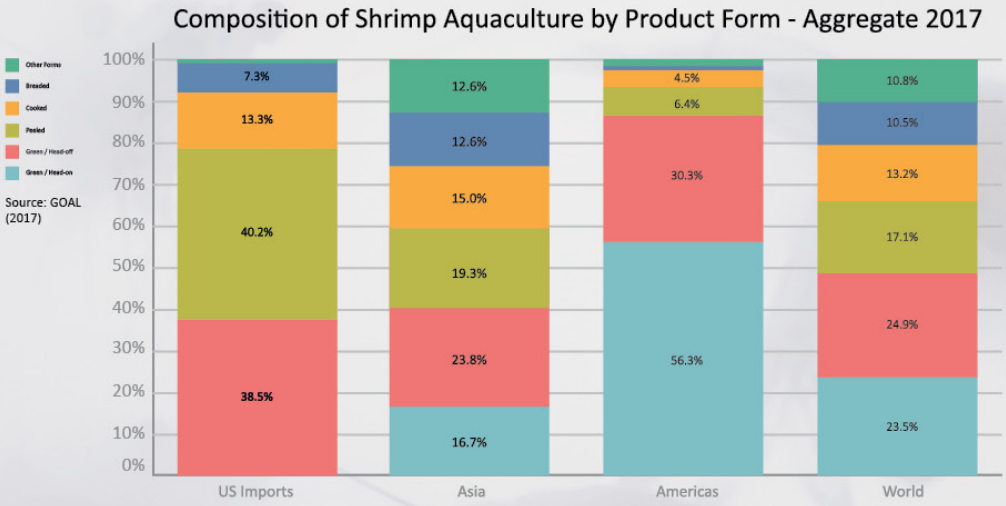
For US importers this trend could be of particular concern; more than 70% of shrimp imported by the country is 40 count or bigger and over half is 30 or bigger.



Source: Jim Anderson, Global Outlook on Aquaculture Leadership conference

Production in the region is of shrimp which are 40 count per kilo or smaller. By comparison, in the Americas, just 40% of shrimp produced is 40 count per kilo or smaller.

As regards shrimp products, on average Asia offers a more even spread of green/head-on and head-off, peeled, cooked and breaded shrimp products. By contrast, more than half of production in the Americas is of green, head-on shrimp.



Source: Jim Anderson, Global Outlook on Aquaculture Leadership conference

"For a number of years, production of green, head-on shrimp for the European and Asian markets has been trending upwards in Ecuador," noted Anderson. According to the survey, looking ahead, the Americas expects to produce more green shrimp, head-on, while Asia expects to produce less.

Sourse: www.undercurrentnews.com

Concerns remain over **EU banning Indian shrimp** as *prices rise*

By Neil Ramsden Sep. 21, 2017 09:21 BST

Indian shrimp raw material prices are on the rise in August and into September as the second main harvest of the year has been met with high demand, sources told Undercurrent News.
On top of this, concerns remain among some that the EU could look to ban Indian shrimp, reportedly due to increasing incidences of traces of antibiotics being found.

Prices hit a low in July but quickly rose in the first part of August; this rise continued into September, though not at such a steep rate.
At the start of September prices had reached INR 450 for 30 count per kilogram, head-on, shell-on raw material; INR 380 for 50 count; INR 325 for 70 count; and INR 270 for 90 count.

For the full update on prices, see Undercurrent's prices portal.
"Landings remain quite weak in India in general," one trader told Undercurrent earlier in September. "Quantities of smaller sizes are more prevalent, as the second crop has just begun in several areas."
This crop was expected to be in full swing by around mid-September, he noted, though this was not expected to stop prices from continuing to rise.

"We heard prices are likely to remain on an upward trend; demand remains quite strong and competition among packers for raw material is still fierce," he said. Some packers still have many loads to be shipped in the next month or so.

In terms of Asian sales, the trader said demand from China was fairly strong as Indian size profiles matched those buyers' needs for small and medium sizes. Vietnamese demand was down significantly in late August and September, as its own harvests picked up, he added.

Rahul Kulkarni, director of Westcoast Group, told Undercurrent he certainly did not consider the second crop anything like a "failure", adding it was early to judge the crop's success yet.
He also said price movements in September, and later into the fall, would be linked as much to rising demand for holiday periods in the EU and US as it would the supply side.

In Tamil Nadu, meanwhile, the upward trend in raw material prices halted early in September, and actually dipped, due to price differences between this province and Andhra Pradesh, where harvesting began slightly earlier, said Durai Balasubramanian, secretary of the Pattukottai Shrimp Farmers Association.

He predicted prices would only begin to rise again after September was over, citing good raw material availability in several states.

Tushar Marde -- a farming source based in Maharashtra, India – also confirmed prices had risen from July's lows, but added that prices to the farmer in his region remained some INR 30-40 below those in Andhra Pradesh.

He cited INR 400 for 30 count; INR 310 for 50 count; INR 240 for 80 count; and INR 200 for 100 count. Profit margins remained far too tight for comfort, he said.

At Vietfish, at the end of August, shrimp producers told Undercurrent they expect Chinese buyers to look to India this fall; Chinese demand is likely to keep prices in all shrimp producing nations relatively stable, they felt.

'Staring at a ban'

The past two months there has been some talk in media, and from Undercurrent sources, of the potential of the EU banning Indian shrimp imports, apparently over increasing incidences of traces of antibiotics being found.
"The EU commission is always considering a ban or restriction on something; I wish to hell they would simply ban or restrict themselves," said Derek Golding, chairman and founder of UK importer Seahawk Marine Foods.

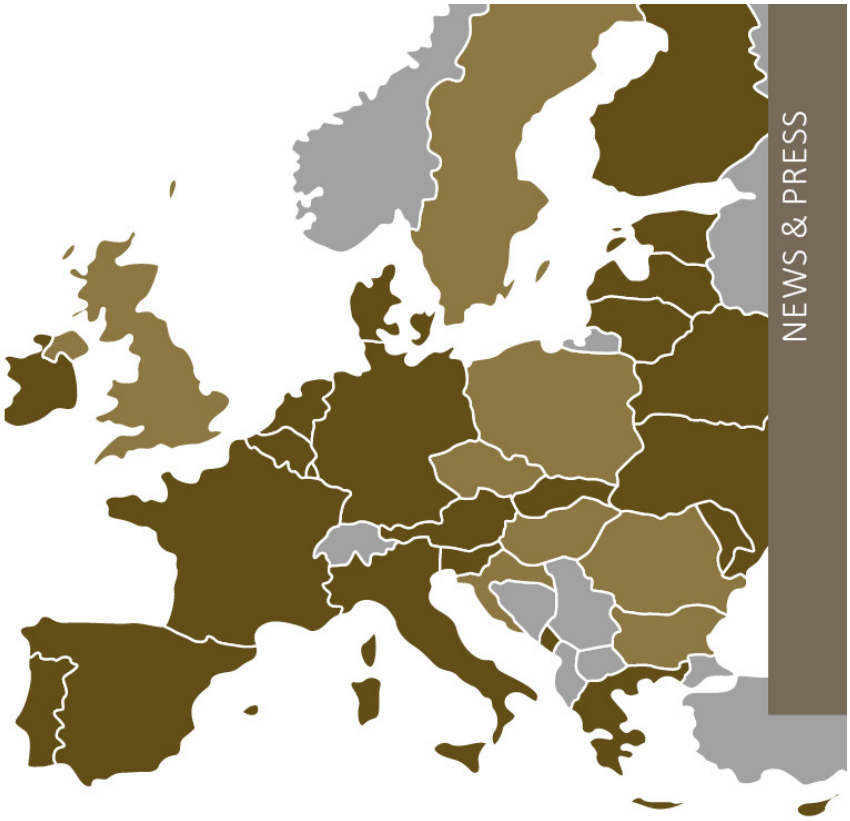
"There are always rumors about such things. For anybody to suggest that Indian shrimp exporters as a whole would not be concerned about the prospect of a ban is utterly moronic."

"There would also be serious governmental concerns, given the massive advances made in Indian aquaculture production standards and controls, and the huge dollar revenues generated for the Indian treasury," he added.

There are some Indian exporters who now refuse to deal with EU importers because of the unfair way they feel which third country imports are treated, he added.

Kulkarni, on Sept. 8, confirmed the Indian industry and government were "in the thick of meetings and discussions" around the topic of a potential ban.

"We are really worried over the eventuality of the EU banning Indian seafood imports. It's more geo-political than actual quality issues, but the sector is suffering and now staring at the ban," he said.



U teams are scheduled to visit and audit several plants in the coming months, and the hope is this should allay fears and allow trade to normalize, Kulkarni said.

"The government and the industry has taken this seriously, and a slew of measures have been planned as well as some implemented."

Balasubramanian, meanwhile, said he felt any ban would be undeserved, as "already lots of efforts have been taken to address the antibiotics issue".

On Sept. 18 the Global Aquaculture Alliance (GAA) also warned India was in trouble with the EU for "continued flouting of its rules regarding the presence of antibiotic residues in export shipments".

Tests undertaken by official EU control laboratories apparently showed the level of compliance of aquaculture products was unacceptable, particularly in regard to the presence of residues of chloramphenicol, tetracycline, oxytetracycline, chlortetracycline and metabolites of nitrofurans.

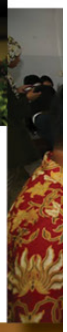
The EU has announced an audit of the country's pre-export control procedures at the end of November, said GAA. "If the results are found to be unsatisfactory, a ban on imports is a very real possibility in the New Year."

Another option is for the EU to ramp up inspections to 100% of shipments, which would place a heavy financial burden on importers, it added. Currently 50% of shipments are inspected, and this has already upped the burden on said importers.

Source: www.undercurrentnews.com

AquaSG'17
Aquaculture Singapore

3 – 7 October 2017
Temasek Polytechnic, Singapore



For the 2nd official consecutive year, Asian Aquaculture Network hosted the annual AquaSG conference and exhibition in Temasek Polytechnic's School of Applied Science last month.

The AquaSG conference brought together experts and practitioners – who literally come to us from east to west, and north to south: Oman (Middle East), Thailand, Singapore, USA, UK, Norway and Australia – to address the state of the aquaculture industry and the challenges across the Asia-Pacific region. With over 200 participants across industries to attend 4 workshops, 15 conference sessions and an industry roundtable discussion over the span of 5 days. Not forgetting the multifaceted displays of latest research and technologies in aquaculture on the exhibition floor. Scientific posters were also on display in the exhibition area, featuring the work of research scientists at Temasek Polytechnic, including the development of the first-of-its-kind algae-based oral vaccine for fish, methods for disease prevention, and early detection of fish and shrimp pathogens.

The theme of AquaSG 2017 was **"Intensification and Disease Management"** with the keynote address by CEO of Blue Aqua Group of Companies, Dr Farshad Shishehchian, on Singapore's direction in Aquaculture. This year's opening ceremony was officiated by Singapore's Senior Minister of State, Dr Koh Poh Koon, witnessing two separate MOU signings including the collaboration between Blue Aqua International and Temasek Polytechnic on the joint Blue Aqua – Temasek Poly Research Center. The MOU states cooperation on R&D in nutrition, disease detection, treatment and prevention, broodstock growth and development for finfish and crustaceans and Skill training of TP staff and students in commercial land based production of finfish and crustaceans at the local and overseas farms.

The three-day conference saw special and informative sessions on sustainable intensification, intensive production systems, biosecurity and disease resistance and also expert views on fish health by friends from the Norwegian Veterinary Institute. The plenary Q&A sessions discussed the trends and prospects in Aquaculture in Singapore and the region with fiery debates on practical issues such as the importance of promoting aquaculture as an industry to the younger generations, to debunk the stereotypical and traditional ideas of 'farming'.

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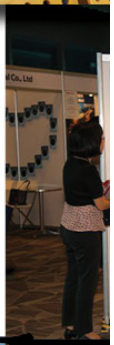
On that same note, next year's event will look to address the world's current innovative strides towards a sustainable aquaculture industry. Joint with investors and industry experts, from both local and international companies and organisations, AquaSG promises to fulfil its goals of an effective knowledge exchange and networking platform for Asia Pacific's aquaculture scene.

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Blue Aqua
Broodstock production center
Opening

The opening ceremony of Blue Aqua International's Broodstock Production Center was held on the 5th of October, 2017.

Senior Minister of State, Dr Koh Poh Koon officiated the opening at the facility in Neo Tiew, Singapore.

The Blue Aqua Broodstock Production Center receives technical support from the Shrimp Department of Oceanic Institute of Hawaii, and aims to produce 70,000 Specific Pathogen Free shrimp broodstock in its first year of production.

Speaking at the opening ceremony, Dr Farshad Shishehchian, CEO and President of the Blue Aqua Group of Companies said that he has goals to bring Singapore's aquaculture scene to new heights.

"Singapore is known to be a centre of innovation and technology, our aquaculture scene, too, needs to catch up to this title,

"Blue Aqua's broodstock production center will serve as the bottle-neck of the industry, bringing in the innovation and skills required for our local scene"

Blue Aqua's broodstock production center will also help to provide SPF *L. vannamei* broodstock to local farmers, who may not have access to quality broodstock.

Speaking at the AquaSG'17 conference on the same day, Senior Minister of State Dr Koh mentioned the importance on educating our youths on industry skills such as aquaculture to bring about more business opportunities and greater food security in Singapore.

"These are areas in which our industry players can continue to work together across different sectors to unlock opportunities,

"It is early days, but we have the potential to become a leader in tropical marine aquaculture" said Dr Koh.

The Blue Aqua Broodstock Production Center will also serve as a training centre for vet-tech students from Temasek Polytechnic, to bring about hands-on experience and industry skills training.

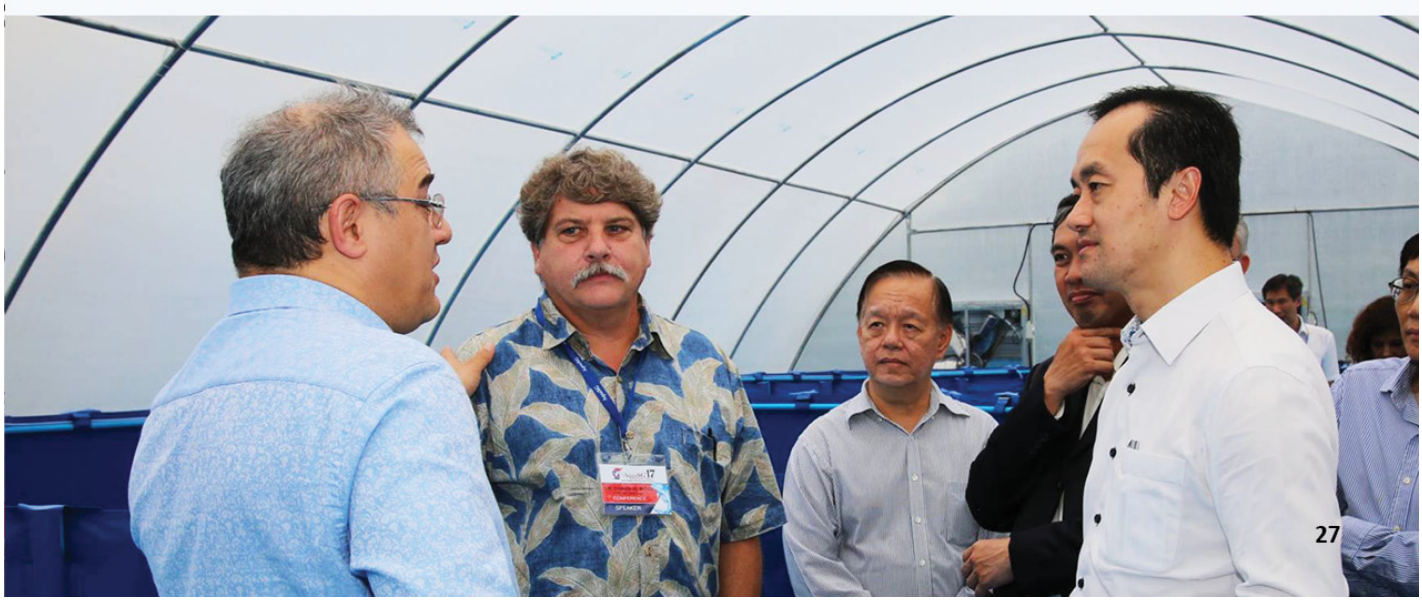
"As our aquaculture industry matures, partnerships between research institutes and industry players become increasingly important.

"There are plenty of synergies if we work collectively, as customised solutions are required for the types of fish grown here in Singapore, tailored to our water conditions" he said.

Blue Aqua has been working closely with institutes like Temasek Polytechnic, to provide learning platforms and overseas training opportunities as part of Temasek Polytechnic's internship programme.

Dr Farshad emphasised that it is incredibly important to educate the youths on the import role aquaculture plays in the current state of the world, with a population of 9 billion to feed by the year 2050.

"Once you're starving, you'll hand over everything you own in exchange for a (fish) burger" he said.



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"Aqua Practical" brings practical knowledge sharing on technical issues and best practices to its network of members and subscribers. Published quarterly by the Asian Aquaculture Network (AAN).

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APRIL / JUNE	Aquaculture Feed Development
JULY / SEP	AquaSG'18 Special Edition
OCT / DEC	Challenges in Asian Aquaculture

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CONTACT INFO:

www.asianaquaculturenetwork.com
info@asianaquaculturenetwork.com
www.facebook.com/asianaquacturenetwork

Tel: +66 (0) 21921787-8
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WHAT WE DO

- Provide the update information and emerging news about aquaculture through magazines and fackbook
- Conduct aquaculture trainings and practical workshops by the team of industry experts
- Hold annual conferences and seminars
- Collaborate with research institutions and universities on research, educational and technological development information exchange and student exchange program
- Assist its members in advocacy to national governments
- Provide latest pioneering and new technological knowledge and other discovery information to its members
- Provide aquaculture supplier directory to the members annually

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- 4 issues of "Aqua Practical" and free access to the online version of the Magazine
- Free online access for supplier directory
- Discount on annual seminar and conference and customized seminar and training

SUPPLIER DIRECTORY

- Asian Aquaculture Network (AAN) Supplier Directory contains a wide listing of aquaculture suppliers from all over the world
- Members get to know suppliers from outside their home country or current location that might be able to offer lower prices at better quality
- They are categorized into specific product and services
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- Network of professionals in aquaculture industry
- Memberships, University Libraries, and Trade Shows

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Aquaculture EVENTS 2017 / 2018

Nov

Taiwan International Fisheries and Seafood Show 2017
9 - 11 Nov 2017
Kaohsiung Exhibition Center, Taiwan
www.taiwanfishery.com

2nd Annual 'Sudan International Agriculture, Livestock & Food Business Conference & Exhibition'
28 - 30 Nov 2017
Grand Holiday Villa Hotel Suites, Sudan
www.sudanagriculture.com

Feb

Feed Tech Expo - India
8 - 10 Feb 2018
Auto Cluster Exhibition Center, India
www.feedtechexpo.com

Aquafarm 2018
15 - 16 Feb 2018
Pordenone Exhibition Center, Italy
http://www.aquafarm.show/

Aquaculture America 2018
19 - 22 Feb 2018
Paris Hotel, USA
www.was.org

Mar

ILDEX VIETNAM 2018
14 - 16 Mar 2018
Saigon Exhibition and
Convention Center, Vietnam
www.ildex-vietnam.com

Apr

Asian Pacific Aquaculture 2018
23 - 26 Apr 2018
Taipei International Center, Taiwan
www.was.org

May

Aquaculture UK Exhibition 2018
23 – 24 May 2018
Macdonald Aviemore Resort, UK
www.aquacultureuk.com

11th Global Summit on Aquaculture & Fisheries
24 – 25 May 2018
Hyatt Regency Osaka, Japan
www.quaculture.global-summit.com

Aug

Nor-Fishing 2018
21 - 24 Aug 2018
Trondheim Spektrum, Norway
www.nor-fishing.no

China International Fishery and Seafood Exposition 2018
24 - 26 Aug 2018
Guangzhou-China Import &
Export Complex, China
http://www.chinafishex.com/

AQUA 2018
26 - 29 Aug 2018
Le Corum, Montpellier, France
www.was.org

Oct

Latin American & Caribbean Aquaculture 2018
23 - 26 Oct 2018
AGORA, Bogota, Colombia
www.was.org

Nov

AQUA FISHERIES
8 - 10 Nov 2018
Rose Garden Hotel, Yangon, Myanmar
www.myanmar-aquafisheries.com

EuroTier 2018 - Germany
13 - 16, Nov 2018
Hanover Messe, Germany

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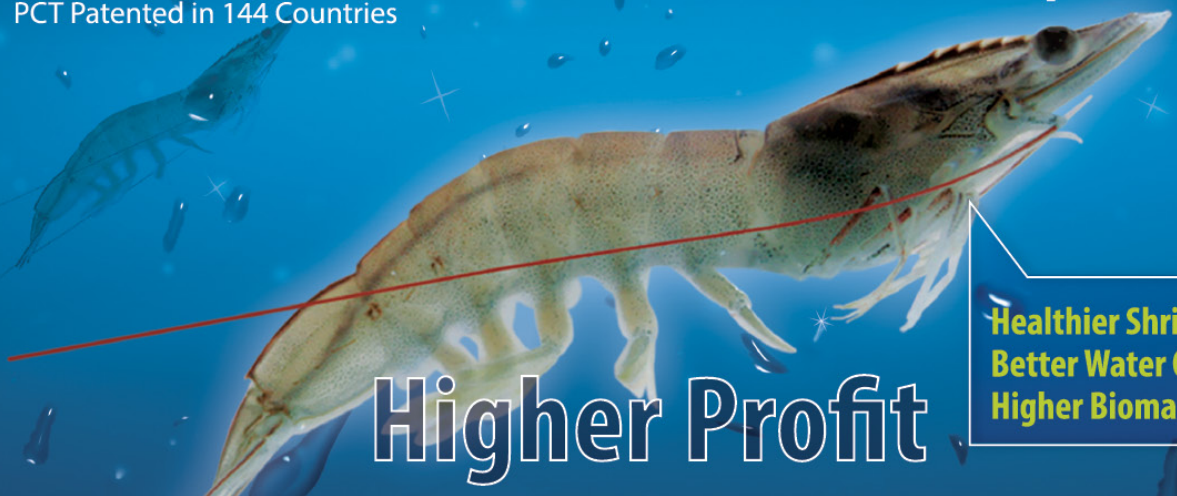

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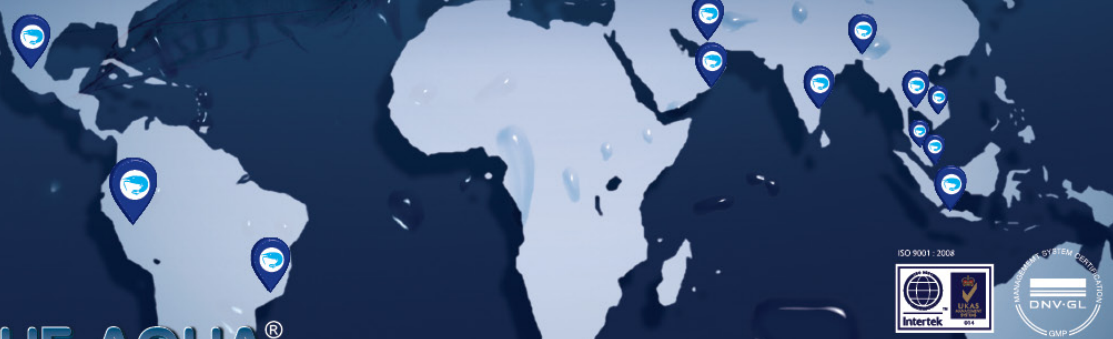

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