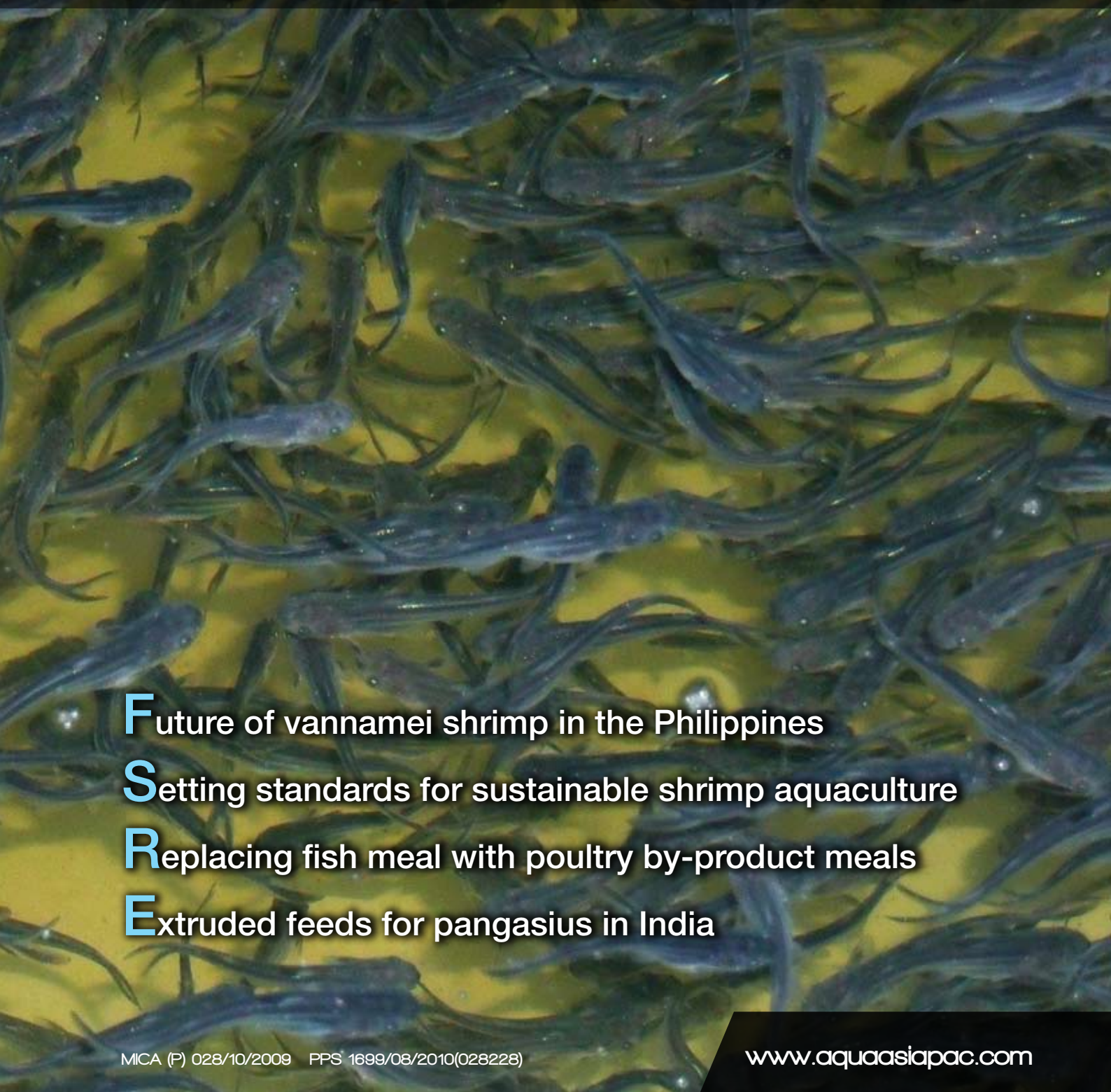
MAY/JUNE2010
Volume 6 Number 3

AQUA CULTURE

Asia Pacific



Future of vannamei shrimp in the Philippines

Setting standards for sustainable shrimp aquaculture

Replacing fish meal with poultry by-product meals

Extruded feeds for pangasius in India

MICA (P) 028/10/2009 PPS 1699/08/2010(028228)

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Volume 6, Number 3 May/June 2010 MICA (P) 028/10/2009 ISBN 1793-0561

Cover picture courtesy of Ben Belton.

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AQUA Culture AsiaPacific is published bimonthly by **Aqua Research Pte Ltd**
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Asia: SGD70
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WRITE TO THE EDITOR

We want to hear from you. Write your comments on the industry to the editor. Letters may be edited prior to publication.

From the editor

Two products, same by word – Sustainability

Ever since there was a farmed shrimp industry, selling shrimp was never a problem. There was a ready market even though the product was sometimes associated with luxury food. The Japanese market always had a demand for shrimp which indirectly started the growth of shrimp aquaculture in Taiwan in the 1970s and later in Southeast Asia. In the past 30 years, there really wasn't much effort placed on marketing; in fact, the effort was directed at production and overcoming disease problems. The year 2002 saw the decimation of the black tiger shrimp in Thailand and consequent years saw the renaissance of the shrimp aquaculture industry with the new vannamei shrimp. With SPF stocks, high stocking densities and output sometimes in excess of 12 tonnes/ha production seemed to require less effort. In less than a decade, Southeast Asia has added a supply of more than 2.8 million tonnes of shrimp to the world, depressing prices along the way. The demand has not risen in tandem and it looks as if the industry has to start paying more attention and effort into marketing today.

The pangasius industry in Vietnam is another story altogether. Seizing an opportunity with the global demand for white fish meat created by the lack of supply from fishing, Vietnam jumped on to this bandwagon in the late 1990s. Positioning itself as a whitefish replacement, Vietnam had to invest heavily on marketing a practically unknown species in the western world. Perhaps, the farming and culture of the species offered fewer production problems that supply was less of an issue. In the decade 2000 to 2009, Vietnam increased its exports by more than 54 times (2001 versus 2009 export data). Pangasius became so successful that it faced retaliation by US catfish farmers such as the antidumping tariffs and negative publicity on its traceability and production methods. Some of this negative publicity may have been merited but through education, industrialisation and marketing, the industry has managed to move to the next step.

The two have taken different paths to reach the European Seafood Exhibition (ESE) in Brussels (27-29 April 2010). The question we pose is what's next for the 2 major products and revenue earners for the Asian aquaculture industry? Europe seems to be leading the world in seafood marketing and the key issues facing any aquaculture species are the same. Apart from price which should be determined by market demand and supply, seafood buyers at the show were focusing on sustainability and traceability. This was clear from the interest shown at presentations on sustainable shrimp production in Madagascar and on efforts by the industry in Soc Trang, Vietnam to achieve sustainable and traceable shrimp production throughout the province.

Seafood buyers have been pushed by consumers concerned with both the environment and food safety and this message has been communicated via the retailers and hypermarkets. Buyers assure the consumers that their concerns are being addressed with certifications. In terms of sustainability, WWF initiated separate shrimp, catfish and tilapia dialogues to address this issue in a pragmatic manner by involving multi-level stakeholders. Each of these dialogues is at different levels of completion but the goal remains the same i.e. to arrive at a set of guidelines and principles that the industry must follow in order to be certified.

The EU General Food Law has led the world on the issue of traceability. ACC's answer is through its Best Aquaculture Practices (BAP) following a star rating system such that an integrated company with a hatchery, farm, processing and feed mill would merit a 4-star certification. GLOBALG.A.P good aquaculture practice standards give assurance of responsibly produced tilapia and pangasius. Asian producers, HQ Sustainable Maritime and Trapia Malaysia have scored firsts with certified tilapia. In Vietnam, the first pangasius farms were certified one year after the launch of the Pangasius GLOBALG.A.P Standard. These efforts will soon follow with certification with the Aquaculture Stewardship Council (ASC) sustainability standards in 2011.

If the first rule of sales is 'the customer is always right', then the first rule of marketing is 'always listen to your customer'. Aquaculture producers are recommended to visit seafood shows to better understand what their consumers need in order to cater effectively to their demands.

Zuridah Merican

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Closing ranks and work towards success

Stakeholders in the Philippine shrimp industry mulled over strategies.

Roberto A Gatuslao, President of Philshrimp Inc., (4th from right) and the committee. From left: Engr Ramon Alegre (Hatchery sector), Lito Lacap (Luzon), Roger Rivera (Mindanao), Atty Jake Vergara (Luzon), Edwin Mercado (Exporter sector), Marlito Uy (Visayas), Hernan Lim (Feedmill sector), Atty German Cruz (Luzon), Christopher Co (Visayas) and Tomas Hautea (Visayas).

Every two years, members of the Philshrimp comprising grow-out, hatchery (Philfry) and feedmill sectors as well as exporters and importers meet to prepare strategies for the next two years. Two years ago in 2008, there were high expectations that vannamei shrimp culture which was allowed in January 2007 would revive the shrimp industry in the Philippines. It was envisaged that the target of 70-100,000 tonnes of both vannamei and black tiger shrimp would be achieved by 2013 and bring production closer to the 90,426 tonnes of the black tiger shrimp produced in 1994, valued at USD 733.84 million (FishStat Plus, 2009).

Instead, some recent estimates of annual production of vannamei shrimp showed production at a mere 10,000 tonnes, far from the 40,000 tonnes envisaged during the 6th Shrimp congress in 2008. Black tiger shrimp production has remained at 25,000 tonnes.

At this 7th shrimp congress, held from 17 to 19 March 2010, the 700 odd stakeholders debated on the future direction. Should the industry limit production of the vannamei shrimp so as to maintain high local prices or should it increase production? The first strategy will benefit a small group of farmers. With the second, to keep prices at current levels, there should be efforts to increase the demand for vannamei shrimp in domestic markets. Production costs must be lowered to compete with regional producers and to gain better access to international markets.

The shrimp industry in the Philippines now has a larger role to play in the economy of the country. Senator Ed Anggara, a strong supporter of the industry said that tuna, the number one export commodity in the fisheries sector, has lost its competitive edge. The Bureau of Fisheries and Aquatic Resources (BFAR) has now entrusted the role to increase foreign exchange revenue to the shrimp sector.

"BFAR shares the optimism of the private sector on the industry's future. We are proud to have an industry that shuns antibiotics in disease control. We need to highlight this unique quality in the appropriate information campaign to attract consumers who are increasingly concerned on food safety. The other big plus for the Philippines is the reported revival of *Penaeus monodon* and the country has the reputation as the last monodon loyalist in the world", said Anggara in his written address.

Roberto A Gatuslao, President of Philshrimp Inc., said, "During the past years we have been challenged by diseases and we have learnt to manage them. The Negros Prawn Producers Marketing cooperative (NPPMCI) will continue to monitor fry quality to avoid the massive disease problems seen in the past. This year, we had expected to produce more but because of the adverse global weather conditions, there is already a delay in stocking. Stocking will only start in end of April or early May 2010 and harvests are expected only in September".

Roberto said, "The government is now allowing imports of *P. vannamei* broodstock from Singapore and Thailand and we expect that this will translate to cheaper post larvae prices for vannamei shrimp producers. In this meeting, one of our resolutions is to ask for lower cost of electricity for aquaculture. We will also ask for lower tariffs on ingredients for feedstuff, be it for aquaculture or other animal production".

With these new regulations, the hatchery sector for *P. vannamei* in the Philippines is a potential new market for several Asia-based

shrimp breeding companies. Three presentations dealt with broodstock supply in the region. David Kawahigashi, Vannamei 101, Thailand said that companies operating multiplication and Nucleus Breeding Centers (NBCs) in Asia, including Shrimp Improvement Systems (SIS), Charoen Pokphand (Thailand), Vannamei 101 (Thailand and Vietnam), SyAqua (Thailand) and Global Gen (Indonesia), have a total broodstock production capacity of over 700,000 pieces per year. The annual demand in China, Thailand, Malaysia, Indonesia, Philippines, India, Vietnam, and Myanmar is estimated to be well over 1 million broodstock and should double or even triple within the next five years.

Shrimp breeding companies in Asia have made a significant contribution to the rapid expansion and high productivity of the Asian shrimp industry. Thailand, the global leader in farming technology and productivity is today almost 100% self-sufficient in their broodstock requirement. Since 2005, Thailand has reduced its imports of broodstock from 70,867 to less than 7,000 in 2009. Other Asian countries are already following its lead in broodstock development.

Vannamei 101 in Thailand specialises in *P. vannamei* hatchery training as well as broodstock multiplication and breeding technology. Broodstock and post larvae from the facilities in Thailand have been certified 'disease-free' by the Thai Department of Fisheries. The joint venture breeding facilities in Vietnam have a total annual capacity of 42,000 broodstock (*P. vannamei* and *P. monodon*). In 2010, the company will initiate broodstock multiplication and breeding centres in Penang, Malaysia (*P. vannamei*) and in New Caledonia (for *P. stylirostris*).

In Singapore, SIS has a multiplication centre which produces 60,000 broodstock annually. These are based on the 12 year old improvement program with pure lines selected for specific traits over 16 generations, said Dr Dean Akiyama and Kenneth Tay. Its nuclues breeding centre (NBC) for the vannamei shrimp is in Florida. SIS is now working on lines that exhibit resistance to multiple pathogens such as TSV and IMNV. Improvements in survival in ponds have reached 75-85% in 2009 in contrast to 70-85% in 2006. Since 2006, growth rate has increased to up to 0.25g/day from 0.14g/day and the coefficient of variation has declined to 15% from 18%. Nauplii output is now 500-800,000 against 350,000 in 2006. SIS also has a monodon shrimp NBC centre in Hawaii.

Charoen Pokphand Thailand's SPF marine shrimp breeding program in Thailand was introduced by Robins McIntosh. There are 3 genetic improvement centres, 2 back-up centres, 4 broodstock farms and one disease challenge facility. The program is family based with

At the technical session. From left Dr Robins McIntosh, CP Thailand, Dr Matt Briggs, Vannamei 101, Thailand, Dr Jan Koesling, Bayer Thailand and Ramon Macariag, Alsons Aquaculture, Philippines.

1,600 genetic and commercial families annually. The 6th generation is the turbo shrimp. The first priority for the breeding program is survival and since July 2006, this has averaged 87% and all have increased resistance to TSV and *Vibrio*. Current growth is now 25g in 72 days of culture with an average daily growth rate ranging from 0.35 to 0.42g.

In two presentations, Ramon Macariag, Alsons Aquaculture and Chingling Tanco, MIDA Trade Ventures International asked industry to reassess their positions in improving competiveness and in marketing, either locally or for export (see page 8). On disease management in the Philippines, Roselyn Usero, NPPMCI, outlined disease monitoring and biosecurity measures at a local black tiger farm, Aquacards, and Maria Abegail Albaladejo gave updates on BFAR's national shrimp health program.

Several presentations covered technology updates. Wim Martens presented INVE Aquaculture's new Sept Art Technology in the hatchery and Oliver Decamp talked on shrimp pond management. Ung Eng Huan, GS Biotech presented some developments in oral delivery additives to combat WSSV. Serge Corneille, Alltech discussed natural ways to improve aquaculture businesses.

"In the next two years, until the next congress in 2012, we will be facing major marketing concerns: how do we market our products, where do we go for better prices and what value added products should we pursue", said Roberto.

First Global G.A.P. for pangasius

The Dutch group Control Union World has awarded Vietnam's NTACO Joint Stock Company, a Global GAP (Good Aquaculture Practice) certificate. Ntaco located in An Giang province is the first pangasius producer in the Mekong Delta to achieve this.

This also allows the company to export to more discerning markets and also increase the value of its products, by some 15%, according to the report by VASEP. Nguyen Tuan Anh, General Director, said the company's certified pangasius products will easily overcome the technical barriers to enter the Japanese, US and European markets. This year, Ntaco will finalise all necessary procedures to acquire new Global GAP certificates for its food processing plant and its fish breeding facilities.

The company has 30ha of farm area and this supplies 35% of its demand for raw material. It plans to expand farming to supply 20,000 tonnes of raw material for its processing plant. According to Vietnam Customs, in 2009, Ntaco exported more than 7,200 tonnes of pangasius, valued at USD 16 million (Vietfish News, February 2010). In the first quarter of 2010, Ntaco recorded an export turnover of USD3.7 million, an increase of nearly 70% over the same period in 2009. The pangasius products are marketed in over 40 countries.

News in Brief

Higher fishmeal prices

In March, first estimates of the amount of damage to the fishmeal industry in Chile, due to the recent earthquake, suggest a shortage of 200,000 tonnes in production and exports, according to globefish.org. As most of the industry is based around Concepción, the epicentre of the earthquake, damage to the industry is substantial. Peru's fishmeal production in 2010 remains at 1.4 million tonnes. Exports are expected to decline slightly to 1.3 million tonnes. Lower availability is expected as the fishing may be delayed. A stronger than expected El Niño is likely to impact the anchovy resource, resulting in a lower quota this year. In mid-March, chinafeed.info reported stocks in Chinese ports at 100,000 tonnes and prices of USD 2,050.65 USD/tonne.

US carp goes to China

In the US, the invasive carp in Lake Michigan described as a possible environmental catastrophe has found a market. Big River Fish, based in Pearl, Illinois has reached a deal to export 30 million pounds (13,600 tonnes) of the carp to China in 2010, according to NBC Chicago news report. Owner, Ross Harano said that "apparently the rivers in China are too polluted to grow quality carp, so the Illinois fish will be sold at a premium to high-end Chinese restaurants." In Asia and China, the carp is a delicacy. The company expects to make USD 20 million/year exporting the carp.

Bite size fillet from basa

Young's Seafood, UK has launched a new bite-size product to add to its popular Chip Shop range - Chip Shop Mini Fillets. Made with 100% basa fillet, with less than 3% saturated fat, these new Mini Fillets offer an ideal mid-week meal option for young families and children. The company said that it uses the best quality basa farmed in Vietnam. The fish are filleted by hand and frozen within one hour of leaving the water to ensure its fresh flavour and healthy nutrients are locked-in at the natural source. "Our new Chip Shop Mini Fillets are a perfect example of how we are constantly looking to create new ideas to deliver to our consumers' needs, serving-up the very tastiest, top quality products at an affordable price," said Charlotte Broughton, marketing controller for Young's Seafood.

Fish feed plant upgrade in Tasmania

The upgrading and expansion of the plant costs EUR 20 million and will enable Skretting to meet future market demand for high quality fish feed for salmon, trout, barramundi and tuna in both Australia and New Zealand. The investment will double the capacity to 120,000 tonnes per annum and includes the installation of a second extrusion line, upgrading of silos, site services and batching equipment and the integration of the existing line with the new plant.

Knut Nesse, Executive Vice-President Skretting Group/Nutreco Aquaculture said: "Our customers in this region have expanded significantly over the past few years. This investment clearly demonstrates our commitment to support their growth and to maintain our market leader position in this fish feed market. Growth is expected to continue at a high rate for all major farmed species in the coming years. This renewed plant will offer our customers greater efficiency and flexibility combined with the highest environmental and feed-to-food safety standards."

Thai shrimp to gain from lower supply

Shrimp exporters in Thailand expect the short supply from the current outbreak of infectious myonecrosis virus (IMNV) in shrimp farms in Indonesia and Brazil to widen the export market for Thai Shrimp, said Arthon Piboonthanapatana, secretary-general of the Thai Frozen Foods Association in the Bangkok Post. In 2009, Indonesia sold 37,297 tonnes of shrimp products to Japan, followed by Thailand with sales of 36,000 tonnes. In the US market, Thailand led the industry with 176,870 tonnes of shrimp products, followed by 90,000 tonnes from Indonesia. However, price is still an issue. "Raw material prices remain strong while the baht has strengthened too much and these factors will lessen the competitiveness of Thai shrimp exports." In March, the price for local shrimp was THB150/kg for 40 pcs/kg, up from THB 140 in early 2010.

The association forecast shrimp exports at 405,541 tonnes comprising 243,324 tonnes of raw shrimp and 162,216 tonnes of processed products. Export revenue is expected to increase 7.6% to USD2.79 billion, comprising USD1.503 billion from fresh shrimp and USD1.288 billion from processed products. The IMN virus has prompted Thailand to ban imports of three types of shrimp from Indonesia and Brazil.

Success with tiger grouper in India

The Rajiv Gandhi Centre for Aquaculture, the R&D wing of the Marine Products Export Development Authority, has developed a technology for captive breeding of the tiger grouper *Epinephelus fuscoguttatus* at its hatchery in the Andaman and Nicobar islands. Spawning was carried out in land-based tanks and sea cages. The larvae hatched from the eggs were grown successfully to the fingerling stage. RGCA officials said that the centre has developed rearing techniques for the consistent production of the fingerlings of 4-8 cm in size, which could be utilised for commercial farming in open sea cages in India. The next step is to develop a package to produce the fish fry in hatcheries, grow-out to fingerlings in cages and finally produce marketable size fish in open sea cages.

Hope to increase exports to US

In their bid to boost seafood exports to the US, there was an increased presence of Chinese seafood exporters at the 28th annual International Boston Seafood Show (IBSS). Out of the 869 seafood exhibitors in the March event, 147 were Chinese, said chinadaily.com. According to the most recent statistics available from the US NMFS, 22% of US seafood imports were from China in 2008, with 60% of the total seafood imports from Asia. It is the lower labour costs that have allowed Chinese companies to keep prices extremely competitive, said Xiao Yanming, of China's Dalian Yingjie Foods Company. Another change is that Chinese companies are starting to do the importing and exporting themselves, cutting out the middlemen, according to Steven Hedlund of seafood.com. However, despite measures to improve food safety, US wholesalers remain extremely cautious.

Jail for illegal import of prawn feed

In Queensland, Australia, both the farm manager and company director of a prawn farm in Mission Beach have been jailed for up to 3 years for illegally importing feed products, an offence contrary to the Quarantine Act 1908. The company Fortune Enterprises was fined AUD 40,000 by the Brisbane District Court. The Australian Quarantine and Inspection Service (AQIS) officers from the Federal Department of Agriculture, Fisheries and Forestry (DAFF) uncovered the breach during an investigation in 2006 called 'Operation Penaeus'. Biosecurity Services Group deputy secretary Rona Mellor said prawn feed, which is imported without proper quarantine checks, could pose a biosecurity risk to Australian seafood industries, through the introduction of exotic prawn diseases or pests.

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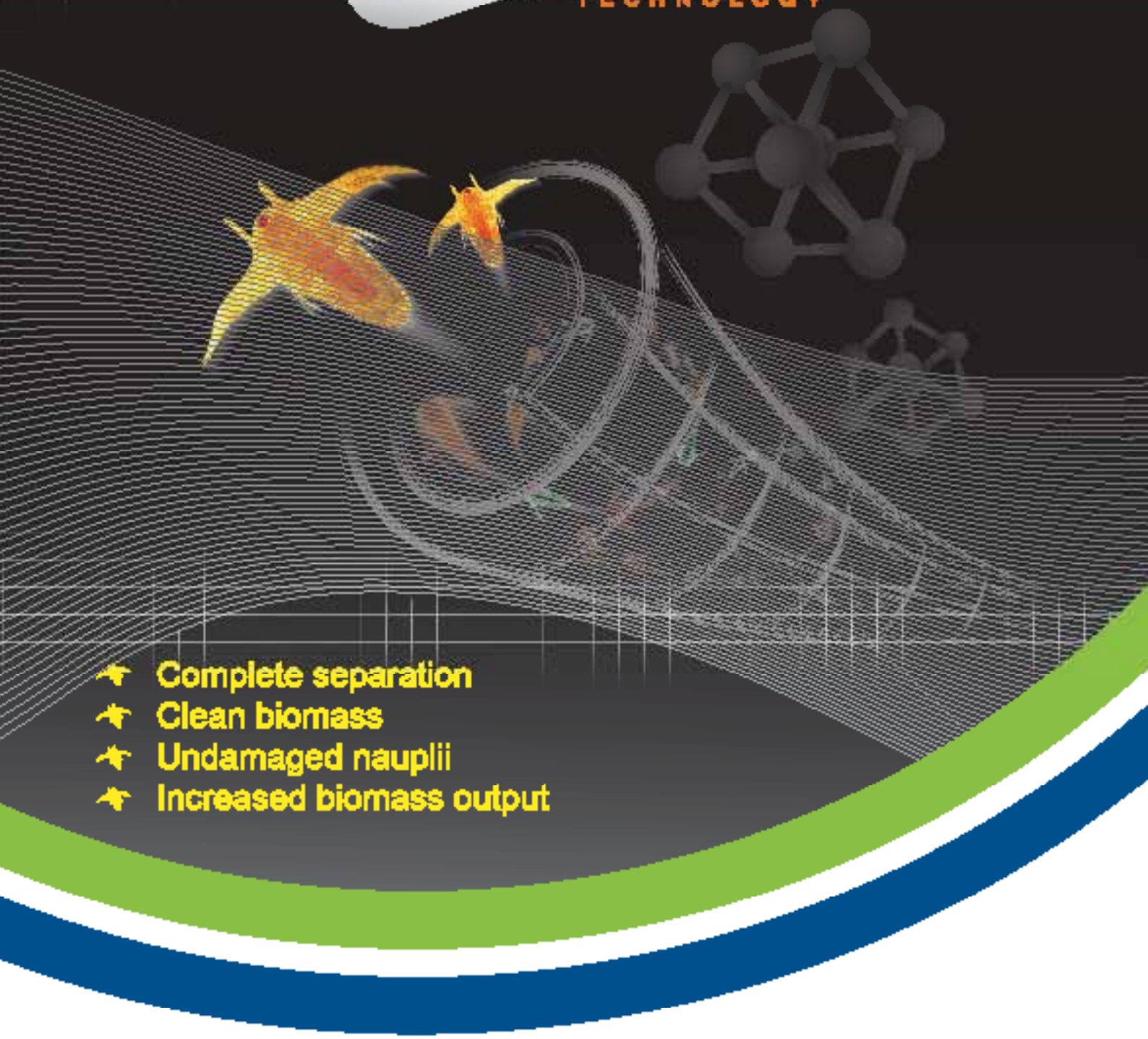

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Catch 22 in vannamei shrimp marketing

In the long term, high prices are not sustainable and production costs need to be competitive to access international markets. During the 7th Philippines Shrimp Congress in March, stakeholders looked at options for the future direction of the vannamei shrimp industry. Reports Zuridah Merican

Philip Cruz

After the removal of the ban on vannamei shrimp culture, initial harvests were from farms in Luzon. Today all vannamei shrimp are sold chilled in the local markets. Ex-farm prices range from PHP 160 to 220/kg (USD 3.56-4.89/kg) for 10-11g shrimp to PHP 200-280/kg (USD 4.48-6.27/kg) for the larger 12 to 15g shrimp sold in Metro Manila markets. Prices are more stable in wet markets in Cebu at PHP 180-190 (USD 4-4.22/kg) for 10-12g shrimp and for 13-15g shrimp, the price range is PHP 200-220 (USD 4.44-4.89/kg). Demand is limited to only 10 to 20 tonnes/day in Metro Manila, Luzon and 0.5 to 1.2 tonnes/day in Cebu, Visayas (Kramer, W, pers. comm). Profit margins range from PHP 10-30/kg and are much lower for producers in the Visayas as they spend PHP 30/kg for sales commission, harvest costs, packing, freight charges to Metro Manila markets in Luzon. The annual demand is estimated at only 10,000 tonnes.

"At the moment, with such good prices for chilled shrimp, farmers prefer this short term strategy rather than committing themselves to any long term contract with fast food restaurants to supply frozen shrimp which buyers/processors will only pay PHP 80-160/kg. There is also a tendency to restrict supply to keep the prices high. To keep producing for the domestic markets only, we need to expand local consumption, just as what Brazil has done, but at the same time we need to reduce costs", said Philip Cruz, Chairman of the organising committee.

"Farmers not only have to face unpredictable price fluctuations but those selling in the main wholesale markets in Metro Manila have to time their shipment during the full moon, low/neap tides and also during festivities. Wholesale market prices are usually but not always better during Fridays and Saturdays evenings. This is a problem when farms are forced to harvest early due to disease outbreaks", said William Kramer, who runs several farms of Hoc Po Feeds Corp in the Visayas.

Marketing options

In her review on the options for the vannamei shrimp industry, Chingling Tanco, Managing Director, MIDA Trade Ventures International, said that the world demand for shrimp is 500,000 tonnes in the US and Europe and 250,000 tonnes in Japan. Demand in the Japanese market is decreasing. Other than the Philippines, most Asian countries, are exporting to the US. Products are mainly IQF, Peeled and EZ peeled shrimp and various value added products. Markets in Europe import vannamei shrimp mainly from Ecuador, Thailand and India. France is the biggest importer of warm water shrimp and her imports are mainly from Ecuador as producers in other countries do not seem to know how to solve the burst hepatopancreas problem, said to be linked to more intensive culture.

"The barrier for producers from the Philippines into export markets is that most of our 25 plants are not ready with accreditation requirements. They lack experience in processing the vannamei, as well as appropriate freezing and packaging expertise. They also have frequent brown outs and higher costs for labour and electricity. Today, like our regional neighbours, we also face a strong currency versus the US dollar", said Chingling. (Conversion rate to one USD:PHP 44.45)

Vannamei shrimp at the wholesale market in Navotas in Metro Manila (left, picture by William Kramer) and (right), black tiger shrimp auction at Hagonoy Consignacion (picture by Chingling Tanco).

From left: Victor Estilo, Hoc Po Feeds, Mike S Uy, shrimp grower in Calatagan, Luzon, Lito Lacap, shrimp grower in Zambales and Director of Philshrimp, Central Luzon and Atty German Cruz, Director of Philshrimp, Luzon.

"We have to learn to produce cheaply, learn how to produce vannamei shrimp correctly and take advantage of modern culture technology. Based on the US shrimp import prices, our ex-farm price must be PHP 126.35/kg for 15g shrimp and PHP 212.88/kg for 28g shrimp to be competitive. Prices in Indonesia are IDR 40,000/kg for 28g shrimp which is equivalent to PHP 200/kg. In the last few years, Thailand and Indonesia have also been producing vannamei shrimp, mostly in the 31/40 pcs/kg and 50pcs/kg category but large ones at 28g and 30g shrimp or 16/20 and 21/25 headless are also produced. In CP Indonesia, 20g shrimp was produced in 90-100 days. If we can, we should do this or else go back to farming the black tiger shrimp".

Status quo or expand local market

If the industry persists with marketing locally, Chingling said that farmers/producers should consider partnership with local processors and distributors and keep prices stable. The local frozen shrimp market for fast food chains such as Jollibee's Pansit Palabok, Tokyo's Watta Tempura promotion and Wendy's Crunchy Breaded Shrimp will require 300 tonnes per year of HO 6-7.5g, 60 tonnes per year of HO 23g, and 25 tonnes per year of HO 25g shrimp, respectively. Currently Jollibee imports their supply from China and the other restaurants source their shrimp from Vietnam and Indonesia. Another option is for these growers to look at exports for perhaps 10-20% of the production and the rest for the higher value local markets. Expanding product forms for local markets as well as producing cooked shrimp is another option".

The Philippines can follow the success of some countries in increasing domestic consumption but for this to happen prices will have to come down. China increased domestic consumption at local prices of USD 3.7/kg, when shrimp exports to the US were banned in 2007, according to Matt Briggs, 101 Vannamei, Thailand in discussing the global trends in shrimp farming. In future, China will most likely be a net importer. Brazil increased local consumption from 10% to 60-70% within 5 years. Domestic consumption is being promoted in Indonesia, Malaysia and Thailand with prices ranging from USD 3-5/kg.

Although it is agreeable that the priority is local markets, the consumer base needs to be expanded. Grow-out producer Stan Tanchan said that the retail prices in local supermarkets are too high for the vast majority of Filipino consumers. Local seafood retail for PHP 350/kg for 12-14g shrimp. Prices go up to as high as PHP 400/kg, during

Chingling Tanco, MIDA (second from right) with from left, Dr Juan D. Albaladejo, Dr Maria Abegail Albaladejo (BFAR) and Andrew Kuljis Aquatic Farms, Hawaii.

festive seasons. Stan has three farms: two in Cebu and one in Negros, all producing black tiger shrimp. He intends to start vannamei shrimp, possibly in a new farm in Negros.

"With these prices, few can afford shrimp. To expand the local market, we should look at how to lower the cost to consumers. I believe that at PHP 220-230/kg, we can double the demand. There should be better cooperation between retailers and farmers. We need to get retailers to reduce their high margins (30-40%). Unlike pork and chicken, we have very few recipes using shrimp. In fact we have only three uses for shrimp, in soup, as gambas and in stir fried, versus perhaps 10 for pork. Thus, we need to encourage chefs to develop more recipes to expand consumption".

"What I find different with vannamei shrimp marketing as compared with the black tiger shrimp, is that the farmers bring the shrimp to the auction market and find out the price on site. In black tiger shrimp farming, we settle prices before we harvest. This is important especially for large farms", added Stan.

Keep to forte of large shrimp

The advent of vannamei shrimp culture in Asia has changed the shrimp market profile in Japan. It imported 139,759 of frozen block shrimp from January to September 2009 and vannamei shrimp is the major species (64 to 74%) for value added products such as ebi fry, boiled sushi and for cooked shrimp. Japan imported 7,500 tonnes of head-on black tiger shrimp, which the Philippines supplied almost 50% at 3,400 tonnes in 2009. The rest came from Vietnam, Indonesia and Malaysia.

Pio S. Raymundo II, Maruha Nichiro Seafoods, Inc said, "In the case of the black tiger shrimp, the Philippines is still a major player for the Japanese market, although production may have been shrinking in the last few years. Maruha actually prefers to buy from the Philippines. Supply has been regular from the Philippines, following the failure in production in Taiwan. In Japan, brand is important as well as consistency of supply. We have been carrying several brands from regular suppliers in the Philippines. Black tiger shrimp is becoming scarce and prices have rebounded significantly in the past few months". Pio has been buying Philippine shrimp, mainly for the Japanese market for the past 25 years.

"However, as the Japanese market will only take 7,000 to 8,000 tonnes/year, we need to penetrate new markets. In November 2009, during the review meeting, I told stakeholders that there will be a supply problem. From now on, I would suggest that the industry should continue to look at Asian markets. Korea is important as it imported 2,000 tonnes/month in 2009. Potential markets for large shrimp such as 25-30g vannamei shrimp and 36g black tiger are in Shanghai and Beijing, China. This is not only for the live and chilled markets, as China will even buy frozen blocks via Hong Kong. Producers should also gear production to meet demand which is especially high during the hot season leading to the Chinese New Year".

According to Stan, prices for 35-40g black tiger shrimp also fluctuate but generally the average prices are still good. Through exporters, his shrimp goes to Japan and Korea and some to Europe as frozen head-on. He does not have any problems in farming this shrimp. Post larvae quality and availability is not an issue and diseases are controlled with checks for the white spot syndrome virus prior to stocking.

Competitiveness

In his analysis on the competitiveness along the production chain, Ramon M. Macaraig, Alsons Aquaculture Corporation said, "At the export side, margins are high for frozen block exports of black tiger shrimp to the niche markets in Japan. The stringent standards for the EU and US markets may mean that production must meet food safety and environmental requirements which require investments. Exporters may need to do value addition to offset costs of accreditation of products etc. Following this, support from the government and academia is critical in developing test methods for chemical contamination, certification and accreditation procedures for products, processing plants, personnel and export companies".

Producers in the Philippines acknowledge that their costs of production (COP) for the vannamei shrimp are high relative to other producers in the region. The major costs are feed, post larvae and energy at 50, 30 and 10%, respectively. Feed costs an average of USD1.2/kg for vannamei shrimp grow-out feed with at least 35% crude protein. This is relatively high in comparison to other countries. In Malaysia, feed with 30% crude protein costs an average USD 0.99/kg. Feed production costs are attributed not only to high costs of imported ingredients but also high tariffs and transportation within the archipelago.

Production costs hover around PHP 130 to 140/kg (USD 2.9-3.13/kg) for shrimp of 10-12g in farms in the Visayas and PHP 130-160/kg (USD 2.9-3.58/kg) for farms in Luzon. As the preference is to produce 10-12g vannamei shrimp (100 pcs/kg), it will be difficult to compete with similar size shrimp from China where the COP is now USD 2.1/kg or from Vietnam (USD 1.98-2.0/kg). However, industry in China expects feed prices to increase in 2010. Feeds account for 52% of COP in China. Production in cost efficient Thailand has been reduced to only USD 2.62 for 71 pcs/kg in 2009, said Robins Mcintosh, CP Thailand. The trend is towards larger shrimp. Matt Briggs said that prices of small shrimp, especially vannamei will remain or may drop in the short term as Asia increases production.

More control on PL costs

Another major concern is the cost of post larvae (PL) which at PHP 0.20 each (USD 4.48/1000) for PL12 is highest in South East Asia. It is USD 2.3/1000 in Thailand (McIntosh, 2010) and USD 3.2/1000 in Malaysia for PL15. According to Ramon, these can be reduced if excess nauplii produced by major hatcheries can be diverted to smaller hatcheries to grow to PL12. Stan said, "When we produce small size shrimp of 60 pcs/kg, our input cost for post larvae is PHP 20/kg. Demand is higher for high density stocking and post larvae costs should come down to 15 centavos per fry. This will help the farmers"

In 2007, when the government permitted the culture of *P. vannamei*, it allowed the importation of specific pathogen free (SPF) or resistant

(SPR) broodstock from the US. The disease status of 10 listed viruses must be certified by the USMSPF shrimp Disease Reference Laboratory, University of Arizona. In 2009, imports were permitted from sources other than the US, provided that the facilities surpass the standards of those in the US and have well documented SPF/SPR breeding programs. This opens the doors to imports from Singapore and Thailand. BFAR shall inspect these facilities at the expense of the interested local accredited hatchery.

"We have been dependent on imports of broodstock from the US costing from USD 25-35 each, excluding freight charges. Our regulations require suppliers to use the most direct route without any transshipment. Imports from Singapore and Thailand will not only lower costs of freight but also prices are lower by as much as 42%. Broodstock are highly stressed by the long journey. Usually we are not compensated by the mortalities on arrival, although there is a provision for mortality allowance," said Cebu based, Christopher Co, Oversea Feeds Corporation, whose hatchery was accredited to produce vannamei shrimp post larvae in 2007.

There was also a push to increase efficiency of production. Currently, in intensive ponds, stocking density ranges from 60-80 PL/m^2 in the Visayas and 100PL/m^2 in Luzon. Survival rate averages 70%, harvest size is 12g and yields range from 5-8 tonnes/ha. In a major farm in Luzon, three harvests/year of 12g shrimp can be obtained. In contrast, extensive farms stock only 10,000 to 15,000 PL/ha and harvest 300kg of shrimp/cycle. In CP farms, the cost of production is PHP 140/kg for 100PL/m^2 and a yield of 15 tonnes/ha/cycle. Survival was 91% and food conversion ratio was 1.34. According to Robins McIntosh, CP has a PL efficiency of 12 tonnes/million PL compared to the average of 9 tonnes/million PL in Thailand and 1.5 tonnes/million PL in China.

Stan Tanchan operates three farms, two in Cebu and one in Negros, all producing black tiger shrimp.

In summary, to be on the world shrimp production radar, Chingling said that for volume sales, the way forward is the export market. If farms are managing well with farming of the black tiger, they should target the large size black tiger shrimp market of 40g. For smaller than 30g vannamei shrimp, learning to be more cost efficient is critical. Growth is critical to keep cost low and Ramon suggested production of 18g vannamei shrimp in 120 days to yield 10-12 tonnes/ha whereas for the black tiger it should be 40g shrimp in 160 days with yields of 5-10 tonnes/ha.

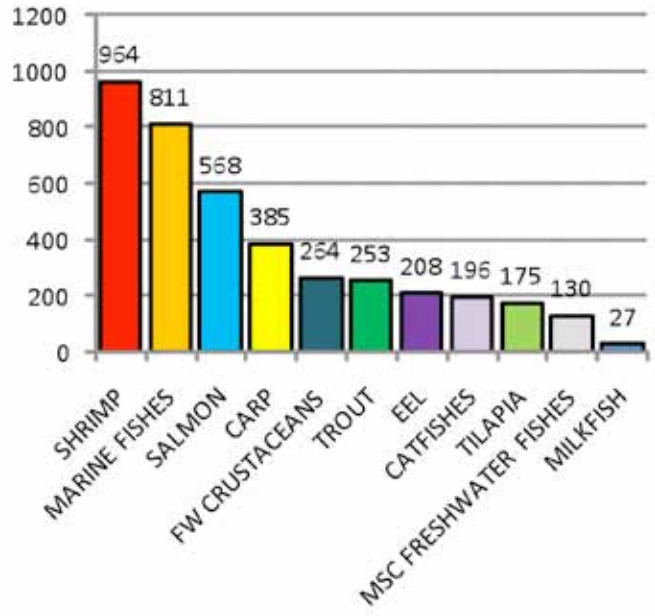
Replacement of fishmeal and marine proteins in practical diets for Pacific white shrimp using terrestrial land animal proteins

By Albert G.J. Tacon, Edi Wahyu Cahyono, Uus Sugema, Choiruz Zaudjat and Sergio Nates

Growth of shrimp was not affected by the lower cost diets containing varying amounts of poultry by-product meal and soybean meal. Growth is affected when diets do not contain any marine meal. Low levels of hydrolysed feather meal require supplementation with lysine and methionine.

At present farmed shrimp are the largest consumers of fishmeal within the aquaculture sector, consuming an estimated 964,000 tonnes of fishmeal in 2007. The aquaculture sector consumed a total of 3.83 million tonnes or 68.4% of the total global fishmeal production in 2007. Apart from the limited supply and availability, there is an urgent need to reduce the dependency of the rapidly growing aquaculture sector upon this limited and potentially food-grade marine fishery resource.

Figure 1. Estimated consumption of fishmeal by the aquaculture sector in 2007 (values given in thousand tonnes).



The present paper summarises the results of a feeding trial conducted with Pacific white shrimp in Indonesia. The overall goal of the study was to improve the economic viability and sustainability of marine shrimp culture operations through the development of cost-effective fishmeal-free feeds using terrestrial animal by-product meals as the main protein source.

Feeding trial

A 10-week feeding trial was conducted with white shrimp (*Litopenaeus vannamei*) from juvenile to market size at the experimental diet testing facilities of PT. Luxindo Internusa, Anyer, Java, Indonesia. Four animal by-product meals and a control marine meal were evaluated as detailed in Table 1.

Table 1. Composition of meals.

Animal by-product meals	Analysed composition	Dietary levels tested
Poultry by-product meal - feed grade (Fornazor International, Hillsdale, NJ)	60.04% crude protein, 10.92% fat, 15.93% ash, 5.62% moisture	15 to 30%
Meat & bone meal – from pure beef (Baker Commodities Inc., Vernon, CA)	50.0% crude protein, 10.5% fat, 28.7% ash, 3.5% moisture	0 to 5%
Hydrolyzed feather meal (Inno Resource, Carolina Byproduct, Winchester, VA)	83.7% crude protein, 5.3% fat, 1.20% ash	5% with and without supplemental limiting amino acids
Blood meal - spray dried (Jackson, New Zealand)	88.8% crude protein, 0.9% fat	0 to 2.5%
Control protein		
Peruvian fishmeal (Austral, Peru)	65.0% crude protein, 7.4% fat, 15.0% ash	0 to 8%

Diet and formulations

Thirteen experimental test diets were formulated, a standard control diet containing 8% fishmeal and 2% squid meal, and 12 diets containing various levels of fishmeal and marine protein/lipid replacement. All diets were formulated to contain 33-35% crude protein and 5.5-6.5% crude lipid (Table 1).

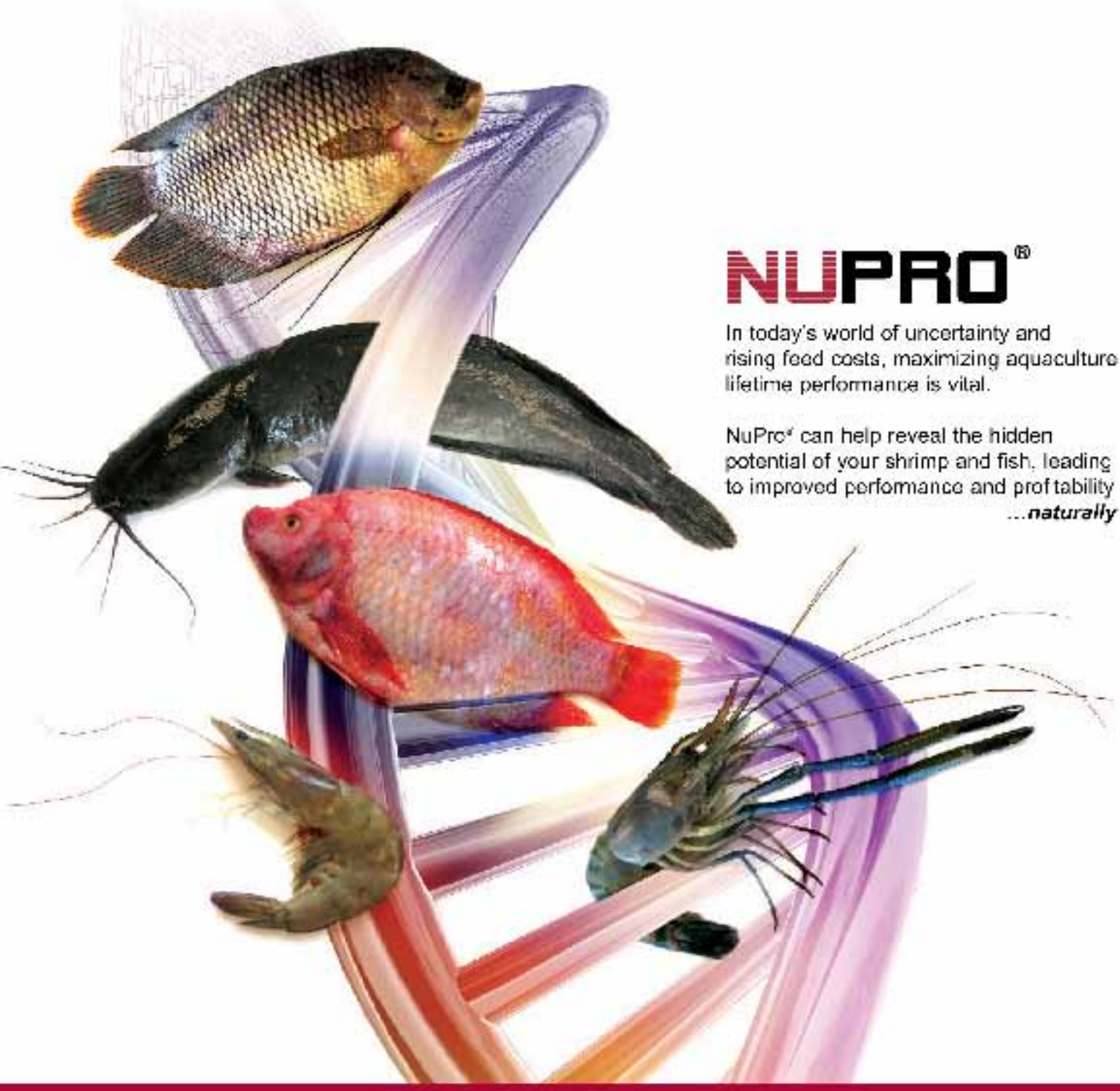
Feed manufacture

All 13 experimental diets were produced at PT Luxindo Internusa in Jakarta (Indonesia) using a commercial shrimp feed mill (IDAH 53SA with triple conditioners), with 1,600 kg of each diet produced and observations taken during the production process so as to ascertain the effect of ingredient use on energy usage, ease of production, physical characteristics, water stability and handling.

Shrimp and experimental culture conditions

Juvenile Pacific white shrimp of the same strain and size, were obtained from a local shrimp hatchery and stocked within 48 round black-coated fiberglass microcosm tanks (1m^3 water volume, with a conical bottom) at an initial stocking density of 75 shrimp/tank (equivalent to a shrimp density of 75/m^3 water volume), with three tanks allotted per dietary treatment (Photo 1).

Reveal the Hidden Potential



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Experimental tank system used for conducting shrimp feeding trial

Water within the microcosm tanks was continuously mixed and aerated using a diaphragm air diffuser placed at the bottom of the tank (so as to keep all particulate matter in suspension) and a zero-water-exchange `green water' management system operated within the tanks for the duration of the 70-day culture trial. Air was continuously supplied to all experimental tanks using a 2HP air blower and freshwater added to tanks as required so as to replace evaporative losses.

In addition to the above mentioned 13 dietary treatments operated on a zero-water exchange management system, a control running water treatment was also implemented using diet 2 (Table 2).

Diurnal water temperature, dissolved oxygen, pH and salinity measurements were made within the experimental tanks throughout the study, together with an estimate of the quantity of suspended microbial `floc' present within the water column of the experimental tanks using a volumetric sedimentation column.

Feeding regime and shrimp weighing

Experimental shrimp were fed at regular 3h intervals over a 24-h period (8 feedings per day) by hand application using the same fixed dietary feeding regime for all treatments. All experimental animals were weighed individually at the start and end of the 70-day feeding trial, and by group weighing at bi-weekly intervals so as to determine average body weight and estimate shrimp survival.

Statistical treatment of results

Data obtained from the experiments, which had a completely randomized design with 3 replicates per treatment, were analysed by one-way analysis of variance (ANOVA) to determine if significant differences existed among treatment means. All statistical analyses were performed using SPSS 16.0 (SPSS Inc., Chicago, Illinois, USA). Differences were considered significant at the 5% level of probability.

The feeding trial commenced on July 3, 2009 and ended on September 12, 2009.

Results of feeding trial

Water quality

Water quality within the experimental tanks was determined at 8.00 am and 4.00 pm over the course of the 10-week experiment and varied as follows in Table 3.

Table 2. Shrimp feed formulations and composition (values expressed on a percent as fed basis).

Ingredient/diet	1	2	3	4	5	6	7	8	9	10	11	12	13
Marine meals													
Fishmeal	8	0	0	0	0	0	0	0	0	0	0	0	0
Squid meal	2	2	0	0	0	0	0	0	0	0	0	0	0
Krill meal	2	2	2	2	2	2	2	2	2	0	0	0	0
Fish oil	1	1	1	1	1	1	1	1	1	0	0	0	0
Animal meals													
Poultry meal	15	23	20	25	30	20	20	20	20	30	20	30	30
M & B meal	0	0	0	0	0	5	0	0	0	0	10	0	0
Blood meal	0	0	0	0	0	0	0	0	2.5	1	1.5	1	1
Feather meal	0	0	0	0	0	0	5	5	0	0	2.5	0	0
Plant meals													
Soybean meal	16	16	25	20	9	20	14	15	20	10	10	10	10
Plant oils													
Palm oil	0	0	0	0	0	0	0	0	0	1	1	1	1
Amino acids													
Methionine	+	+	+	+	+	+	+	-	+	+	+	+	+
Lysine	+	+	-	-	-	-	+	-	-	-	-	-	-
Ca/P													
MDP 16/20	1.25	1.25	1.5	1	0.56	0.16	1.50	1.50	1.50	0.78	0	0	0
Vitamins/minerals													
Premix	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0
Others1	54	54	50	50.5	57	51.3	55.7	55.2	52.5	56.7	54.5	57.5	57.8
Cost (IDR/kg)2	6,128	5,936	5,644	5,779	5,874	5,733	5,810	5,611	5,728	5,671	5,694	5,652	5,565
Composition													
Moisture (%)	10.7	9.7	9.7	9.5	9.1	9.1	9.2	9.1	9.2	9.3	9.5	9.5	9.7
Crude protein	35.5	35.6	33.6	33.6	34.3	35.1	35.3	34.5	34.5	34.8	34.1	35.4	35.7
Crude fat	6.0	7.4	6.6	6.6	6.8	6.6	5.9	6.0	5.7	5.5	6.4	6.9	6.6
Crude fiber	3.1	3.0	3.1	3.1	3.2	2.9	3.0	3.0	2.9	3.1	2.8	2.9	2.8
Ash	8.5	10.1	9.2	9.4	9.1	9.0	8.7	8.5	8.4	8.5	9.0	9.0	9.0
Calcium	1.8	2.8	2.1	2.5	2.2	2.1	2.0	2.0	1.8	2.1	2.3	2.4	2.4

[1] Others include wheat flour and byproducts, rice bran, yeast, soy lecithin, anti-mold agents, antioxidants

[2] Raw material costs in ID2 IDR per kg (June 2009, conversion: one USD=approx IDR10,000)

Table 3. Water quality parameters.

	Zero-exchange tanks (treatments 1 to 13)	Running water tank (treatment 14)
Water temperature	range 27.9 to 33.9°C, mean 29.2 °C (am) to 31.6 °C (pm)	range 26.0 to 30.3°C, mean 27.6°C (am) to 29.2°C (pm)
Oxygen	range 5.04 to 6.89 mg/l, mean 5.90 mg/l (am) to 5.64 mg/l (pm)	range 5.61 to 6.97 mg/l, mean 6.32 mg/l (am) to 5.96 mg/l (pm)
Salinity	range 32 to 36 ppt, mean 34 ppt	range 30 to 35 ppt, mean 33 ppt
pH	range 7.2 to 8.2, mean 7.7	range 7.4 to 8.2, mean 7.9
Alkalinity	range 87 to 144 mg/l as $CaCO_3$, mean 116 mg/l	range 81 to 140 mg/l as $CaCO_3$, mean 114 mg/l
Total ammonia nitrogen (TAN)	range 0 to 1 mg/l, mean 0.20 mg/l	range 0 to 1 mg/l, mean 0.13 mg/l
Suspended solids (floc)	1.50 to 4.83 ml, mean 3.45 ml	

Growth

The growth performance of shrimp fed the experimental test diets is shown in Table 2 and Figures 3 to 5.

Figure 2. Mean weekly growth response of experimental shrimp fed experimental diets.

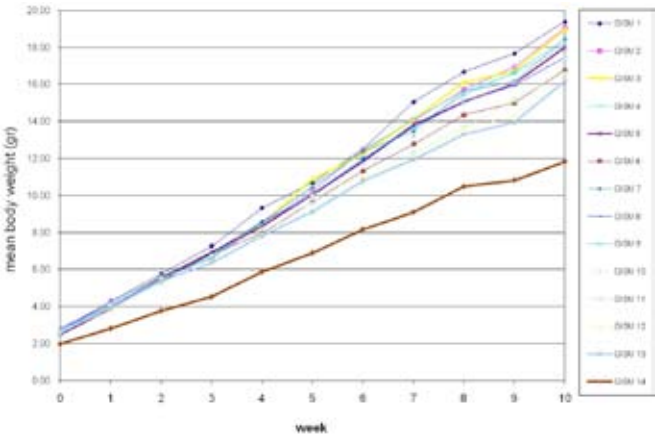
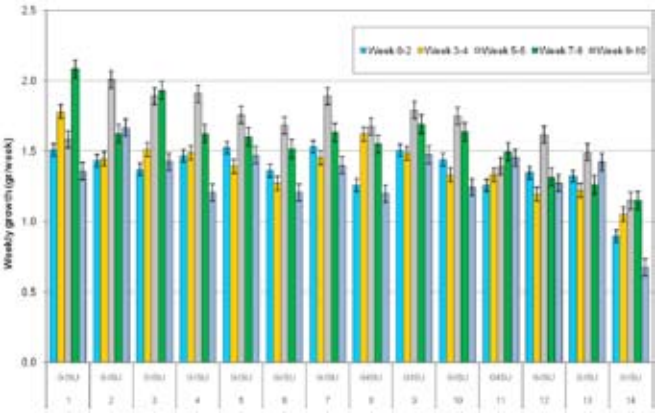


Figure 3. Mean biweekly growth response of experimental shrimp fed experimental diets.



Excellent shrimp growth and survival was observed over the course of the feeding trial, with animals reaching a final body weight of 17.6 to 18.9g (commercial size), with no significant difference observed

Table 4. Growth performance of shrimp fed the experimental diets over a 10 week feeding period.

Dietary Treatment	GISU 1	GISU 2	GISU 3	GISU 4	GISU 5	GISU 6	GISU 7	GISU 8	GISU 9	GISU 10	GISU 11	GISU 12	GISU 13	GISU 14	SEM
Shrimp weight (g)															
Mean initial body weight	2.75^{b}	2.70^{b}	2.70^{b}	2.65^{b}	2.49^{b}	2.68^{b}	2.61^{b}	2.83^{b}	2.50^{b}	2.65^{b}	2.72^{b}	2.70^{b}	2.73^{b}	1.98^{a}	0.04
Mean final body weight	18.93^{f}	18.06^{ef}	17.80^{ef}	17.68^{ef}	17.33^{de}	15.97^{bcd}	17.78^{ef}	16.78^{cde}	17.90^{ef}	16.73cde	15.59^{bc}	14.87^{b}	15.58^{bc}	11.16^{a}	0.31
Shrimp growth response															
Mean daily weight gain (g/d)	0.22^{g}	0.21^{efg}	0.21^{efg}	0.21^{efg}	0.21^{defg}	0.19^{bcd}	0.21^{defg}	0.19^{cde}	0.22^{fg}	0.20^{cdef}	0.18^{bc}	0.17^{b}	0.18^{bc}	0.13^{a}	0.003
Mean weekly weight gain (g/wk)	1.57^{e}	1.49^{de}	1.47^{de}	1.46^{de}	1.44^{de}	1.29^{bc}	1.48^{de}	1.36^{cd}	1.50^{de}	1.37^{cd}	1.25^{bc}	1.18^{b}	1.25^{bc}	0.89^{a}	0.03
Feed Conversion Ratio	1.67^{a}	1.87^{ab}	1.90^{ab}	1.67^{a}	1.87^{ab}	1.95^{ab}	1.88^{ab}	1.85^{ab}	1.65^{a}	1.85^{ab}	2.20^{bc}	2.52^{bc}	1.99^{ab}	2.41^{bc}	0.05
Shrimp feed utilization															
Apparent feed efficiency (%)	60.1^{de}	53.6^{cde}	52.8^{cde}	59.6^{de}	53.7^{cde}	51.4^{cde}	54.6^{cde}	54.8^{cde}	60.9^{e}	54.7^{cde}	46.3^{abc}	39.7^{a}	50.4^{bcd}	41.7^{ab}	1.15
Total shrimp production															
Total initial shrimp biomass (g)	206.50^{b}	202.25^{b}	202.75^{b}	199.00^{b}	187.00^{b}	201.00^{b}	195.50^{b}	212.50^{b}	187.75^{b}	199.00^{b}	203.75^{b}	202.25^{b}	204.75^{b}	148.75^{a}	3.38
Total final shrimp biomass (g)	1205.00^{e}	1,089.00b^{cde}	1,037.00^{bcd}	1,173.00^{de}	1,051.70^{bcde}	1,001.70^{bc}	1,007.00^{bcde}	1,075.70^{bcde}	1,163.30^{cde}	1,041.30^{bcde}	926.67^{b}	768.67^{a}	956.00^{b}	689.00^{a}	24.48
Total biomass increase(g)	998.50^{c}	886.75^{bc}	834.25^{bc}	974.00^{c}	864.67^{bc}	800.67^{b}	874.50^{bc}	863.17^{bc}	975.58^{c}	842.33^{bc}	722.92^{b}	566.42^{a}	751.25^{b}	540.25^{a}	23.67
Total feed offered (g)	1663.30^{d}	1,656.70^{d}	1,585.00^{cd}	1,633.30^{cd}	1,613.30^{cd}	1,556.70^{bcd}	1,610.00^{cd}	1,570.00^{bcd}	1,603.30^{cd}	1,538.30^{bcd}	1,555.00^{bcd}	1,425.00^{b}	1,491.70^{cd}	1,291.70^{a}	
Survival Rate (%)	84.9^{b}	80.4^{b}	77.8^{a}	88.4^{b}	80.9^{b}	83.6^{b}	80.4^{b}	85.3^{b}	86.7^{b}	83.1^{b}	81.8^{b}	68.9^{a}	81.8^{b}	83.1^{b}	0.97

Figure 4. Final feed conversion ratio observed for shrimp fed the experimental diets after 10 weeks.

Figure 5. Final survival observed for shrimp fed the experimental diets after 10 weeks.

between treatments 1, 2, 3, 4, 7 and 9 in terms of final body weight and treatments 1 through 10, and 13 (Table 4). Moreover, the best overall food conversion ratios were observed for treatments 1, 4 and 9, respectively; overall trial FCRs ranging from 1.65 (treatment 9) to 1.67 (treatment 1 and 4).

Economic performance

From Table 2 it can be seen that the most expensive diet in terms of raw material cost was the control fishmeal containing diet (treatment 1; IDR 6,128/kg), with the best equally performing diets being 7.9% cheaper (treatment 3; IDR 5,644/kg), 6.5% cheaper (treatment 9; IDR 5,728 /kg), 5.7% cheaper (treatment 4; IDR 5,779/kg), 5.2% cheaper (treatment 7; IDR 5,810/kg) and 3.1% cheaper (treatment 2; IDR 5,936/kg).

Discussion

The results clearly show the nutritional and economic efficacy of totally replacing fishmeal and squid meal within commercial shrimp feeds by using.

Feed grade poultry by-product meal (60/10.9/15.9/5.6 CP/EE/Ash/Moisture): up to a dietary inclusion level of between 20 and 25% of the total diet (treatment 3 and 4), with supplemental methionine, and increasing dietary soybean levels from 16% to between 20 and 25%, with ingredient cost savings of between 5.7 and 7.9% compared with respect to a similar diet containing 8% fishmeal and 2% squid meal.

Hydrolyzed feather meal (83.7/5.3/1.2 CP/EE/Ash): up to a dietary inclusion level of 5% (treatment 7) of the total diet, with supplemental lysine and methionine, and decreasing dietary soybean levels from 16% to 14%, with ingredient cost savings of 5.2% compared with respect to a similar diet containing 8% fishmeal and 2% squid meal. Surprisingly, shrimp fed the same diet with no supplemental amino acids (treatment 8) showed no significant differences in final body weight or feed efficiency with animal fed the supplemented diet, with consequent ingredient cost savings of 8.4% compared with a diet containing 8% fishmeal and 2% squid meal.

The PT Luxindo Internusa team; Uus Sugema (left), Adi Nugroho (middle) and Choiruz Zaudjat (right).

Spray dried blood meal (88.8/0.9 CP/EE): up to a dietary inclusion level of 2.5% of the total diet (treatment 9), with supplemental methionne, and increasing dietary soybean levels from 16% to 20%, with ingredient cost savings of 6.5% compared with respect to a similar diet containing 8% fishmeal and 2% squid meal.

Meat & bone meal from pure beef (50/10.5/28.7/3.5): results with 5% meat and bone meal (treatment 6) were disappointing, with shrimp displaying significantly lower final body weight ($P<0.05$) and poorer FCRs compared with the other treatments.

The results obtained with rations devoid of all marine protein and lipid sources (treatment 10 to 13) were disappointing, with the best results obtained with the diet containing 30% poultry by-product meal and 1% blood meal with supplemental lysine; the other treatments displayed significantly reduced shrimp growth and feed efficiency compared the control diet (Table 2). Surprisingly, there was no significant difference between shrimp fed diet 12 and 13; the former containing a complete vitamin and trace mineral premix and the latter containing no vitamin or mineral premix. It is also important to note that treatment 13 also recorded the highest floc concentration within experimental tanks.

Finally, as expected, shrimp reared in running water (treatment 14) displayed the worst growth response and feed efficiency compared with shrimp fed the same diet under zero-water exchange conditions (diet/treatment 2). However, it is also important to note that the water temperature within the clear running water tanks were at least 2 degrees lower than tanks with a zero-water exchange management system.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Acknowledgements

This research study was financed by a grant from the Fats and Proteins Research Foundation Inc., (FPRF), 801 N. Fairfax Street, Alexandria, VA 22314 USA (http://www.fprf.org).

Extruded feeds to improve culture **efficiency for catfish in India**

In August 2008, the family company Uno Feeds opened India's second extrusion plant for the production of feeds for carps and pangasius catfish. Feeds are for its farming operations but moving to floating fish feeds, the vision for the future is niche marketing.

T.C.V Narasimha Rao, partner in Uno Feeds started the feed business of this 20-year old family company involved in fresh water fish culture, trading and other related activities in 2008. A stint as a management graduate with Unilever is helping Rao who has been in this family business for the past 12 years, improve domestic marketing of both feeds and processed fish.

"Fish farming in India is dominated by Indian carps and the pangasius catfish was introduced only in 2000. Freshwater fish production is concentrated in the Godavari and Krishna delta region in the southern state of Andhra Pradesh and we saw that there was not a single manufacturer producing extruded feed until mid 2008. So after visiting pangasius catfish farms in Vietnam, we decided to set up our own plant to produce good quality extruded feeds. Our major focus is to improve efficiency of fish culture and reduce the long culture period common in India. In low intensity fish culture systems, the major cost is feed. We believe that all other expenses such as fertilization, medications, labour etc can be greatly reduced by using efficient feeds. Using extruded feeds also has a positive impact on water quality as compared to using traditional mash feeds".

Freshwater fish production is large in India at 3.1 million tonnes and after Vietnam, India is the second largest producer of the catfish *Pangasius hypophthalmus*. In contrast to the carps, production of this catfish has been rising rapidly. In 2006, it was 150,000 tonnes and in 2007, the volumes reported were 207,346 tonnes. The main culture areas are in Andhra Pradesh. West Bengal is the main market for carps, sold live or chilled in ice at sizes of 700g to 1 kg. The consumption of pangasius catfish is becoming popular in all other states especially in Bihar and Uttar Pradesh. According to Corsin (2008), the vision for the industry in India is to produce 500,000 tonnes of fish with improved and standardize culture systems and export 150,000 tonnes of fillet valued at USD 450 million.

Since its introduction into India, the feeding of the catfish followed closely that of the carps. Farm made feeds comprising a mixture of nutrient-poor deoiled rice bran, broken rice and maize in a perforated bag are placed at strategic locations in the pond. Ponds are fertilized to enhance natural food organisms which form additional sources of nutrition for fish. In comparison to China and Vietnam, the farming industry in India has been slow in adopting commercially produced feed. In 1997, three feed companies produced pelleted feeds and by 2006, this rose to 10,000 tonnes annually.

The drastic change in the industry only came in 2006 with a rapid development in the production of soy-based extruded floating feeds for various freshwater fish species. Credit for this significant development goes to the Soy-In-Aquaculture program of the American Soybean Association-International Marketing (ASA-IM). From 2004 to 2007, the group carried out trials in using extruded feeds with soybean meal as the protein source. The various marketing programs to popularize extrusion, feed-based fish farming and soy-based fish feeds also played a significant role in convincing the industry to adopt modern technologies. The formulation was 32% crude protein and 6% fat. Interest spread and since 2007, six extruders have been installed, mainly by poultry and shrimp feed mills diversifying into fish feed production. The ASA-IM team in India, P.E Vijay Anand (who heads the animal feed and aquaculture program for ASA-IM in India) and G. Ramesh (Technical Manager-Aquaculture, ASA-IM) said that the current capacity is now 43 tph of extruded feeds with the opening of new feedmill (see page 39).

It is against this scenario that Uno Feeds opened India's second extrusion plant in August 2008 in Komarada, Bhimavaram, West Godavari Dist. Andhra Pradesh, India. In this article, **T.C.V Narasimha** Rao talks on the company's foray into feed production, the challenges during the first year and the future for the industry in India.

AAP: As a new entrant to the aqua feed production business, what were the difficulties faced during the initial years?

Rao: Prior to feed production, our farming operations have been semi integrated. In our own and leased farms comprising about 20 ponds with total water area of 120 ha, we produce carps and pangasius catfish. We market the fish domestically as chilled fish. We have a fish hatchery where we try out breeding of indigenous species which are currently not commercially bred.

We began the production of extruded feed production mainly to supply our farms. The feeds are marketed as UNO feeds. Initially we started with a 2.5 tph Chai Tung, Taiwan single screw extruder and we are now adding a second line of 5 tph capacity. We will soon re-commission the old extruder into a dedicated starter feed line. Our average production is around 2,000 tpm. We also do fat coating for feeds with more than 4% fat.

Since we were new to aqua feed manufacturing, we needed help on technical aspects such as production and formulation. This came from employees we hired with prior manufacturing experience, consultancy from ASA-IM and from the equipment supplier. Initially, we faced the difficult challenge of how to produce a good quality product on a continuous basis. We needed to ensure that pellet appearance, drying etc remained consistent.

Our entry into feed production itself also coincided with the period when soy meal prices were at their historic high. This was compounded by the fact that our formulation support was from ASA which relies on soy protein as the major protein source. Now in our second year although soy meal prices have corrected to some extent but the gain has been offset by increases in fish meal prices. It is only now we are beginning to build relationship with suppliers. Quality evaluation of ingredients such as fish meal is still a problem area.

The common belief is that pelleting is much cheaper than extrusion. Why did you opt for extrusion?

In India a number of shrimp feed manufacturers have excess capacity in pellet lines, so naturally they have been utilizing some of these to produce sinking pellets for fish. Since we had to invest in a brand new line, we found that the difference in investment for an extruder line was not very high compared to a pellet line. Also the manufacturing cost of extruded feed (> 6mm) is only marginally higher than sinking pellets. The additional expense required for extruded feed is more than compensated with the significant gains obtained in sterilization, better digestibility and reduced wastage in farms. Also, when we started there was only one other extruded feed manufacturer compared to the many players in sinking feeds. This allowed us to build our new brand.

And in five years, where will you be?

We shall expand our feed production capability, but limited to a target of 40,000 tpy. Uno will continue to remain a niche producer of high quality extruded feed with the bulk of the sales to the coastal areas of Andhra Pradesh. The focus would be on niche markets which will remain out of the scope of the other very large feed mills under construction. In five years, we expect that a significant portion of our feed production (25%) will be used in our own farms. We will also put in place a supply chain for retail marketing of fish domestically.

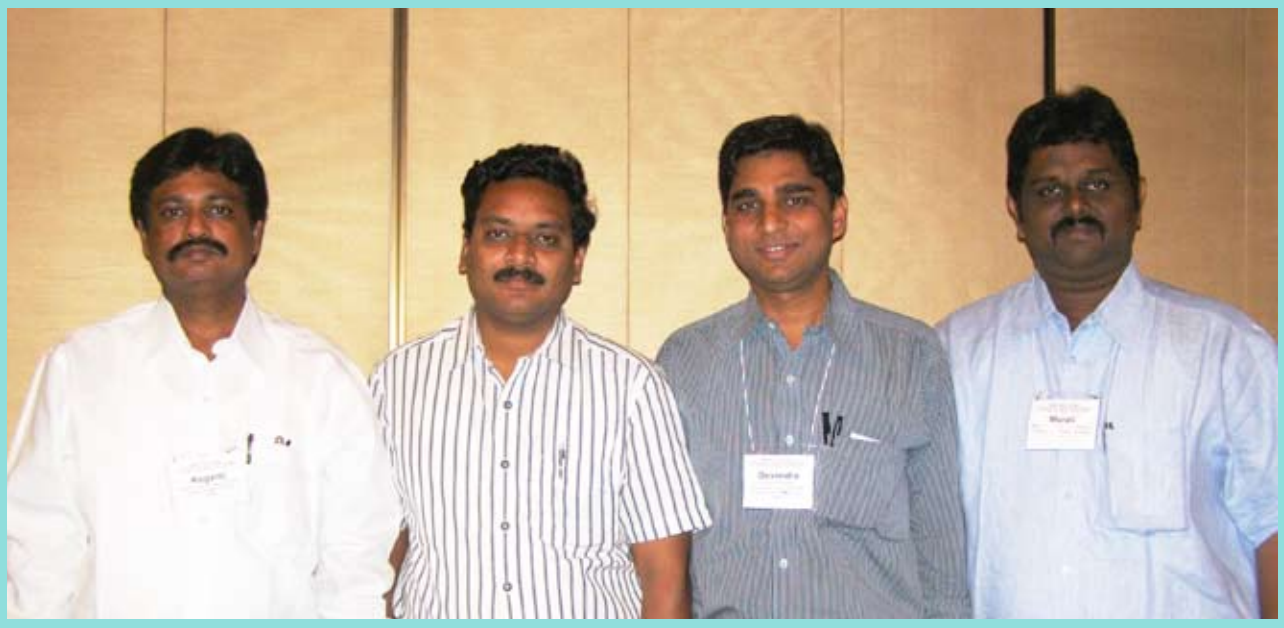
Our feeds have higher crude protein levels; 32% crude protein and 6% fat for the starter/grower stages and 28% crude protein and 4% fat

fat for the finisher stage. The feed conversion ratio (FCR) of our 32% crude protein feed for the Indian carps in ponds with a fair amount of natural productivity varies from a low of 0.9 to 1.1. For pangasius, the FCR of the 28% crude protein for a harvest size of 1 kg is generally from 1.1 to 1.3.

What do you see as the trends and challenges in the feed industry in India for the next three years?

The main challenge for the feed industry in India is with the carps. For the pangasius catfish, it is well accepted that formulated feeds (floating/sinking) are more efficient than traditional mash feeds. However, in case of carps, due to their reliance on natural productivity of ponds, the benefits of formulated feeds over traditional feeds are still marginal. In spite of the large area available for aquaculture and the extremely suitable climate, export of fresh water fish from India is almost zero. Once the domestic market (which fortunately is growing at a good pace) is saturated, further growth can only occur if India can begin to export fish.

The other challenge for us is the number of new plants under construction. Compared to 2008, when there was no extruded feed available in India, in 2011 we can expect an installed capacity of 750,000 tonnes per annum of extruded feed. This should be the fastest growth anywhere in the world. As almost all of this capacity is from players (mostly large farmers) with no prior experience in this field, how they perform will be interesting to watch. International players like Cargill, Grobest and Godrej Goldcoin with manufacturing presence in India have still not firmed up plans to start extruded feed production.



In January, some of the leading fish feed producers in India attended the 9th Practical Short Course on Aquaculture Feed Extrusion, Nutrition and Feed Formulation in Ho Chi Minh City, Vietnam. They are pictured here with TCV Narasimha Rao. From left: KV Gopala Krishna, Kwality Feeds Limited, TCV Narasimha Rao, Dr Devendra Dubey, Indian Broiler Group and U. Murali Anand Varma, Ananda Enterprise (India).

According to them, the current total capacity for fish feeds is estimated at 1,500 tpd. Indian Broiler was the first to produce extruded feeds using a single screw extruder from Muyang, China in 2007 and they have now invested in an 18 tph Wenger machine set to produce feed in April 2010. Single screw extruders from Chia Tung, Taiwan are also popular and new plants with extruders from Wenger/Extrutech are under construction. Major players in fish feed production are shrimp feed producing companies like Luxindo, Avanti, Godrej Gold Coin and CP, but they are all producing pelleted feeds. In general, feeds are sold at USD0.50/kg and the future will see farmers moving away from single component feeds and towards marketing of frozen catfish to urban markets.

How do you plan to optimize opportunities and mitigate the risks in the future?

The small production capacity with very limited overheads and captive consumption should minimize risks in future. Investing in a decent research facility in order to optimize our formulation to be cost efficient and effective will be our strategy to be competitive. We have a small laboratory for water quality testing and disease identification. It is headed by Dr.K.Gopal Rao who has retired as Dean of a fisheries college and has more than 20 years field experience in fish farming in India.

As a small player, we are not interested in knowing what our current market share is. Our focus is to sell whatever our plant can produce and to, more importantly, ensure that our limited customer base is satisfied and do not ever feel the need to look elsewhere. Our feeds for carps and pangasius are almost entirely formulated from plant ingredients (soy meal and corn gluten). Currently, our feeds result in lower feed costs compared to traditional mash feeds. Other benefits of extruded feeds such as faster growth, higher stocking density, ease of labour/management, consistency of nutrient delivery through feeds and better water quality are a bonus.

The farmers are happy with our feeds. If the ex-farm fish prices go down they do demand lower feed prices, but, it is just not possible to lower feed prices without affecting the performance. So in times of severe low ex-farm prices we do offer feeds with lower protein at a lower price to help farmers reduce their costs even at the expense of slightly reduced growth rates.

What is your view on the catfish industry in India and what needs to be done to move the industry forward?

The acceptance of catfish in the domestic market is increasing. This can be boosted further if value added forms like fillet, nugget etc can be produced and marketed domestically. It is still not clear if pangasius from India can compete with Vietnam's pangasius in the global markets. Currently, our farm gate price in India is much higher than in Vietnam (USD 1.0/kg compared to about USD 0.8/kg in Vietnam). In terms of feed production to meet increasing demand, I believe that additional capacities will continue to be set up. The industry will definitely have enough extruded feed or more than required by 2011.

Improving health status and growth **performance in Pangasius catfish** in Vietnam

By Le Thanh Hung, Tran Thi Nga, Dao Thi Thu Hang Nguyen Huu Thinh

Feed supplemention with a multifunctional additive also allows the catfish to cope with stressful culture conditions.

In intensive tra catfish farming in the Mekong Delta of Vietnam, fish diseases regularly cause major fish mortalities, sub-optimal production parameters such as low growth rate and high FCR. Fish farmers spend a considerable amount of money on treatments such as antibiotics (Hung et al., 2007) of which residues in the final product raises food safety concerns. In the absence of reliable vaccination programs, the use of feed additives has become the preferred way to stimulate the immune system, improve gut integrity and enhance the liver function. The general objective for including these additives in the feed is to promote fish health.

With this background information, Provimi Vietnam (a subsidiary of the Provimi Group) has developed a product called Nutribull. Nutribull contains a balanced blend of nucleotides, β-glucans, glucoronolactone and amino acids. Each of these components is widely used as a single feed additive to contribute to the fish growth performance through different mechanisms. Earlier trials with Nutribull in the tilapia and black tiger shrimp (*Penaeus monodon*) showed improved growth performance, health status and survival rates. The present trial was conducted to determine the effect of Nutribull on growth performances and fish health in the tra catfish, *Pangasianodon hypophthalmus*.

Feeding trials

Three experimental floating diets containing 28% protein and 8% fat were produced according to a commercial feed formulation in a feed mill in Vietnam. The formula contained: fish meal, soybean meal, rice bran, meat and bone meal, cassava meal, fish oil, methionine and premix. The difference between the diets was the addition of 0 % (control), 0.1 % or 0.2 % Nutribull (N1 = 0.1% Nutribull and N2 = 0.2% Nutribull). The feeds were fed for a period of 70 days to pangasius catfish fingerlings of initial average weight of 17g in 12 (1x1x1 meter) hapas at a stocking density of 150 fish per hapa at the laboratory of Nong Lam University.

Growth performance

The growth performance is shown in Table 1. The growth rate of the fish responded linearly to the inclusion of the additive at 0.1% and 0.2%. The difference was statistically significant for the fish fed the N2 diet compared to the control diet. Feed intake was not significantly different. However, the FCR of the fish fed the N2 diet was significantly lower than the other groups (Table 2). The additive showed a tendency to improve feed intake and reduce FCR significantly at the same time. The final result was a clear improvement on performance.

Table 1. Growth performances and survival rates of fish fed the three diets in 10 weeks.

Treatments	Control	N1	N2
Initial weight (g)	17.28^{a} ±0.10	17.26^{a} ± 0.10	17.24^{a} ± 0.10
Final weight (g)	82.43^{a} ± 5.59	89.09^{ab} ± 6.79	93.73^{b} ± 2.8
Weight gain (%)	377.03^{a} ± 67.35	416.16^{ab} ± 79.12	443.68^{b} ± 56.12
SGR (%.day^{-1})	2.37^{a} ± 0.10	2.48^{ab} ± 0.12	2.56^{b} ± 0.05
Survival rates (%)	97.00^{ab} ± 2.8	92.67^{a} ± 3.93	99.17^{b} ± 1.26

Figures in the same row with the same superscript letter are not significantly different (P>0.05)

Note: In Table 1-5, N1 refers to diets with 0.1% Nutribull and N2 to diets with 0.2 % Nutribull. The control contains 0% Nutribull.

Table 2. Feed intakes, feed conversion ratio (FCR), fat accumulation in fish fed three diets in 10 weeks.

Treatments	Control	N1	N2
Feed intake (g/fish/day)	1.15^{a} ± 0.14	1.25^{a} ± 0.10	1.24^{a} ± 0.06
FCR	1.17^{a} ± 0.10	1.18^{ab} ± 0.08	1.07^{b} ± 0.02
HSI (%)	1.94^{a} ± 0.31	1.94^{a} ± 0.29	2.00^{a} ± 0.37
ASI (%)	2.76^{a} ± 0.41	2.79^{a} ± 0.33	2.81^{a} ± 0.17

HSI (Hepato-somatic index); ASI (Adipose-somatic index) Figures in the same row with the same superscript letter are not significantly different (P>0.05)

The hepato-somatic index (HSI) and adipose-somatic index (ASI) were measured to evaluate the effect of the product on liver function and fat accumulation. In the experiment, HSI and ASI were not significantly different between the three treatments (Table 2)

Health status

Blood samples

To assess the non-specific immune response blood samples were randomly collected at the end of the experiment. Addition of Nutribull

did not significantly affect the number of white blood cells. The lysozyme activity however increased significantly with increasing inclusion of Nutribull in the diet. (Table 3)

Table 3. White blood (leucocytes) counts and lysozyme activities in fish fed three diets.

Treatments	Control	N1	N2
Leucocytes counts (x103 cells/ml)	$215.4^{a} \pm 29.6$	$258.7^{b} \pm 26.5$	$252.4^{ab} \pm 21.3$
Lysozyme (units/ml)	$12.5^{a} \pm 2.0$	$19.4^{b} \pm 1.2$	$26.9^{c} \pm 3.1$

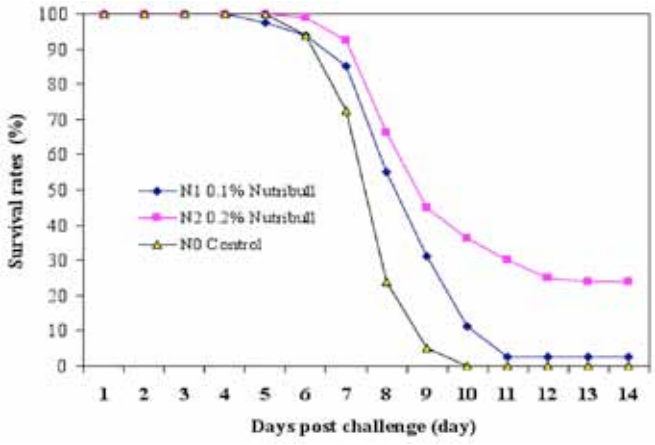
Figures in the same row with the same superscript letters are not significantly different (P>0.05)

Bacterial challenge

After the feeding trial, 20 fish from the experimental groups were submitted to a challenge test with *Edwardsiella ictaluri*, a common bacteria causing regularly severe losses in Pangasius culture in the Mekong delta in Vietnam. In the bacterial challenged groups the fish showed symptoms of white spots in the liver and kidney as a result of infection with *E. ictaluri*. Mortality was 5 days after exposure to the bacteria. The fish in the non-challenged groups did not have any symptom of the disease and no mortalities were observed during the 14 days of the test (Figure 1).

The survival rates of fish recorded on the 10th and 14th day post challenge (Table 2), showed that fish fed N1 and N2 diets had higher survival rates as compared to the control. The difference was significant for fish fed N2 diet. This showed an improved resistance to bacterial disease.

Figure 1. Survival rates of fish fed three diets after challenge with *E. ictalurii.*



Environmental challenge

The environmental stress tolerance was evaluated after the feeding period by exposing 15 fish per test group to a high ammonia level (150 mg/l) and another 15 fish per group to high salinity (15 ‰ or 15 g/l) during 24 hours.

At 150 mg/l ammonia concentration, mortality rates of fish 24 hours post challenge were highest (61.7%) in the groups fed the control diets. Mortality was reduced in the N1 diet group to 33.3% and to further to 16.67% in the N2 diet group. Similarly ater 24 hours post challenge the mortality rates of fish exposed to high salinity were reduced from 50% in the control treatment to 18.33% and 3.3% in the N1 and N2 diet treatments respectively. The supplementation of the additive clearly helps fish to cope with environmental stress (Table 4).

Table 4. Mortality rates (%) of fish challenged with high ammonia solution and a high salinity.

Treatment	% Mortality of fish challenged with high ammonia	% Mortality of fish challenged with high salinity (%)	
	24 hours post challenge	24h post challenge	48h post challenge
Control	$61.67^{a} \pm 10$	$50.0^{a} \pm 11.38$	$75.0^{a} \pm 1.67$
N1	$33.33^{b} \pm 9.43$	$18.33^{b} \pm 1.67$	$65.0^{a} \pm 12.28$
N2	$16.67^{b} \pm 3.85$	$3.33^{b} \pm 3.33$	$55.0^{a} \pm 9.57$

Figures in the same column having same superscript letters are not significantly different (P>0.05)

Conclusions

The additive is a combination of three products each with its own function in fish metabolism, immune-stimulation and stress response. The present feeding trial and subsequent bacterial and environmental challenge tests clearly shows that Nutribull inclusion at 0.2% and to a lesser extent at 0.1% in catfish diets leads to major improvements in growth, feed conversion and in specific immune responses as well as in the ability to cope with environmental stress.

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Part 2: User and producer perceptions of quality in nursery and grow-out farms

Pangasius catfish seed quality in Vietnam

By Ben Belton, David C Little and Le Xuan Sinh

Feeding time at a catfish grow-out operation

Management and external environmental parameters determine the performance and quality of seed although prevailing market conditions may also exert influence.

In 2008, the British Council funded a research project implemented by Can Tho University (Vietnam) and the University of Stirling (UK), titled 'Promoting sustainable high quality river catfish seed production in Vietnam'. The project's goals were: to investigate the status of catfish seed quality in the Mekong Delta and to identify any emerging problems with seed quality which might impact the industry's development in future. A survey of hatcheries, nurseries and grow-out farmers in the three main catfish producing provinces was conducted to determine user perceptions of seed quality and to identify practices which might affect it. The results of the survey of hatcheries were described and discussed in Issue 6 Vol. 2 (March/April, pp36-38).

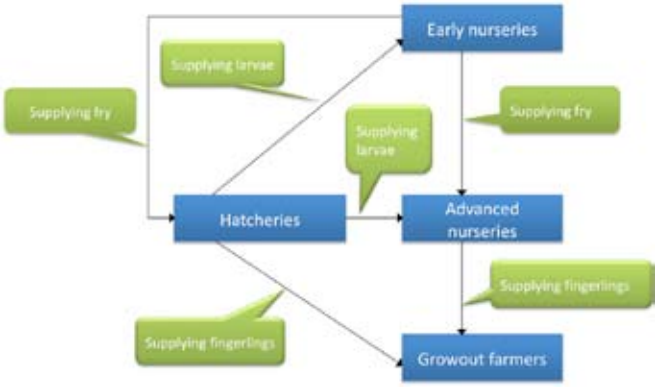
In part two, the findings relating to perceptions of the quality of seed among its main users, nurseries and grow-out farms are detailed.

Nurseries

Pangasius nurseries can be divided into two main groups. These can be described as early and advanced. Early nurseries stock one-day old larvae purchased from hatcheries and nurse them for around 30 days, before selling the fry to advanced nurseries or back to hatcheries. Many hatcheries also have advanced nursing facilities and buy back fry from their early nursing customers to reduce the length of the production cycle. Advanced nurseries will stock either larvae from hatcheries or fry from early nurseries, and nurse for between two and six months to a weight of between 5 and 60g.

Nursing is a fairly simple process, particularly in the advanced stages, and there is relatively little variation in the techniques used from operation to operation. The nursing period during advanced nursing depends largely on market demand. When demand is low, feed rations will be reduced, allowing fish to be kept for several months until prices improve. Conversely, during periods when demand is high, feeding rates may be increased and fingerlings sold at sizes smaller than usual.

Figure 1. Linkages in the catfish seed supply sector.

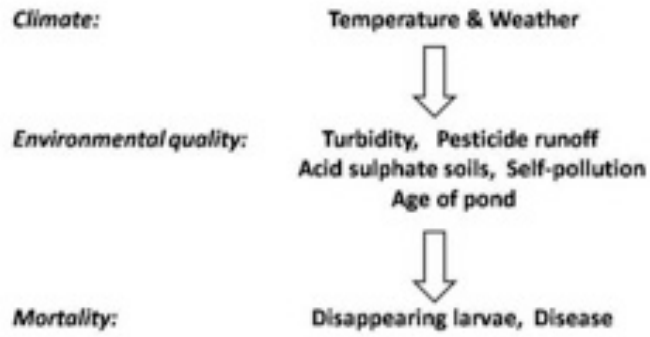


Nursery operators reported a variety of interlinked factors affecting the performance of seed. These are represented in Figure 2. There is an important seasonal element to nursing. Low temperatures and heavy rainfall are associated with poor survival. Heavy rain causes turbid water, leaching in acid sulphate soils, and pesticide runoff from rice fields. These factors have been linked to elevated incidences of disease and poor growth, although the relative importance of these factors and their interactions remain unknown. In areas with many nursing or grow-out operations, interviewees reported that water quality and survival had declined. Interviewees also reported that survival in locations such as Hong Ngu, where ponds have been used for nursing for many years, was lower than in areas where nursing was a relatively new activity and ponds were freshly dug.

Mortality is highest in the first 30 days of nursing and particularly in the first week after larvae are stocked. Reasons for mortality at this stage of development are unclear as stocked larvae are difficult to observe, but many interviewees reported that they seemed to disappear spontaneously. Following such an event it is usual to drain, dry, lime and restock the pond. Mortality rates for fry and fingerlings, attributed to a variety of common infections, are generally lower than for hatchlings. In most cases these can be treated successfully if diagnosed on time. As a result of these factors many hatcheries in Hong Ngu (most of which also have their own nursery operations) outsource early nursing to customers in other districts and then buy back fry for advanced nursing. In addition to avoiding the lower survival linked to the use of old ponds, this system provides quicker turnover.

A nursery operator feeds his fish.

Figure 2. Factors affecting the performance of Pangasius seed after stocking.



Varying perceptions of seed quality

Nursery operators' perceptions of the quality of catfish seed they purchase vary considerably. In Cao Lanh (Dong Thap) where there are many nurseries, most interviewees felt the quality of hatchlings produced by the government's provincial seed centre to be superior to those from the private sector. They attributed the higher survival rates to good management practices at the centre and that staff do not force brood stock to spawn before their eggs are fully ripened. Seed produced in the centre cost around 50% more than those available from private hatcheries (VND1.5 each versus VND1 per hatchling at the time of the research). A similar price differential was reported for fingerlings. However, many producers were willing to pay a premium for seed originating from Cao Lanh.

Some interviewees felt that well-renowned hatcheries, or hatcheries in certain districts with a long history of seed production, produced the highest quality seed. Others, however, felt that seed produce locally performed best, regardless of source, because it was acclimated to local water quality, and because mortality and stress during transport was low.

Another group of interviewees felt that there was little difference in seed quality regardless of source, and that performance was a function of climatic conditions during the nursing period. Yet others felt that the quality of larvae fluctuated according to demand for table-sized catfish, claiming that hatcheries forced brood stock to spawn prematurely (thus resulting in low quality larvae) when demand for seed was high, causing cyclical variations in seed quality.

Most of the interviewees, who responded that there is little or no variation in the quality of seed among hatcheries, still had a preferred hatchery or hatcheries where they purchased regularly. This usually reflected a good, longstanding relationship with the owner and a level of mutual trust. This meant that in the event of heavy mortality in the week after stocking they could usually claim some compensation, and this special relationship gave the nursery operators confidence that they were receiving good quality larvae. These relationships were often arrived at after trying a number of hatcheries. The guarantee of service that hatchery operators provided was an important consideration in choices about where to buy seed.

Grow-out farms

The experiences and perceptions of growout farmers relating to seed quality are similar in many ways to those expressed by nursery owners. Mortality is heaviest for recently stocked, smaller fish, and survival is closely linked to climatic and associated environmental factors. Survival is poorest in early and late rainy season and cold season when water temperatures and/or water quality are lowest. Adverse temperature and water quality result in increased levels of infection. Declining survival attributed to declining water quality was also reported in locations with very high densities of grow-out ponds.

Farmers in districts close to An Giang's provincial Seed Centre expressed a clear preference for fingerlings produced there, despite their high cost relative to seed from the private sector. Many interviewees reported little or no difference in the quality and performance of seed, regardless of source. However, many farms, particularly the larger ones, purchased seed from traders who collected and redistributed seed from multiple sources, so its exact origins were unknown. This practice means that one crop may contain fish of a variety of origins.

A number of farm operators, particularly in Can Tho province, believed that seed quality mirrored market demand. They stated that when demand for seed was high hatcheries would force broodstock to spawn before their eggs were fully mature in order to meet demand, and that this impacted the performance of fingerlings later in life. The same respondents also felt that when demand was low nurseries would keep fingerlings longer and stop treatments against diseases in order to reduce costs, with the effect that only the most disease resistant fish survived, and thus ultimately performed better under grow-out conditions.

Some consistent reports of long term declines in performance came from farmers in Can Tho, where respondents stated that growout periods had lengthened and FCRs had increased as a result of declines in seed quality. However, virtually all of these farmers also reported serious declines in water quality since the start of the decade (when most of them had begun their operations). A large number of these producers had also increased their use of homemade feeds in the last two years in order to reduce production costs. Since these trends were not consistently reported in other areas, it seems probable that declining water quality and less complete diets were the main contributing factors in the poorer performance of seed.

Conclusion: Is seed quality changing?

The results reported here are fairly inconclusive as to any long term trends in catfish seed quality, because user perceptions of seed quality were highly variable. Some nurseries and growout farms believe that there is no overall variability in the quality of seed, irrespective of source, whilst others express strong preferences for seed produced by particular operators or in particular areas based on what they perceive to be significant differences in quality. Many interviewees reported dissatisfaction with what they believed to be poor management at hatcheries during periods of peak production. Interviews with hatchery owners confirmed that poor management did indeed happen in some cases. However, our interviewees reported receiving this information from seed traders, whom, it might be argued possess an interest in passing blame for poor quality seed to hatcheries.

There was also a general preference for using seed produced by the public sector amongst those who could afford to pay the higher price. Farmers in Can Tho, which has no dedicated provincial centre for the production of fish seed, also expressed the wish to access a public source of seed supply because they felt that the quality would be assured. Good relations between buyer and seller and confidence in the level of service provided are very important when purchasing seed. One interviewee explained that there were two things that would make him consider buying from a different hatchery. The first was poor survival, and the second poor ethics. A combination of these would make him seek a new supplier, but business ethics was the more important of the two.

Seasonality affects all aspects of catfish seed production – output, value, and survival. However, the market for growout fish is the most significant determinant of both output and financial returns in the hatchery and nursery sector overall. Declining water quality appears to be negatively impacting survival and performance in both nursing and growout in areas where there is a large concentration of either type of operation. Use of homemade feed on growout farms to reduce costs may also contribute to poor performance.

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Phytogenics in aquatic species: A new tool to improve performance

By Pedro Encarnação

These essential oils show prophylactic and therapeutic effects as well as better growth performance and feed conversion in red tilapia, tra catfish and vannamei shrimp.

Phytogenics is a relatively young class of feed additives. The knowledge on their mode of action and application strategies is still rather fragmented. They are plant derived products which are added to the feed in order to improve animal performance. These plant active ingredients such as phenolic and flavanoids, can exert multiple effects on the organisms, including improvement of feeding efficiency and digestion, reduction of nitrogen excretion and improvement of gut flora and health status (Kroismayr, 2007).

Many mechanisms have been proposed for the beneficial actions of plant extracts in different species. These range from direct reduction on gut bacteria to stimulation of growth and acid production by beneficial species such as *Lactobacillus*, and enhancement of specific elements of both humeral and cell-mediated arms of the immune-system (Cardozo et al., 2008).

Phytogenic feed additives (phytogenics) are an extremely heterogeneous group of feed additives originating from leaves, roots, tubers or fruits of herbs, spices or other plants. They are either available in a solid, dried or ground form or as extracts or essential oils. Within phytogenic feed additives, the content of active substances in products may vary widely, depending upon the plant part used (e.g., seeds, leaf, root, and bark), harvesting season, and geographical origin (Steiner, 2006). Phytogenics can have antioxidative and/or antimicrobial activity. Additionally some phytogenics are used to increase the digestibility of diets, which could also lead to higher growth rates of animals (Steiner, 2006).

Essential oils

Essential oils are odoriferous, secondary plant products which contain most of the plant's active compounds (e.g. alcohol, aldehydes, ketones, phenolic compounds, etc). Processing such as cold expression, steam distillation, or extraction with non aqueous solvents modifies the active substances and associated compounds within the final product.

The plant family of *Labiatae* has received most interest with thyme, oregano and sage as the most popular representatives (Steiner, 2006). Research on the antimicrobial activity of essential oils demonstrated their beneficial effects on *Samonella*, *Typhimurium*, *E. coli*, *Listerela monocytes* among others (Rojas 2007). Higher inhibitory capacity has been observed in the oils with higher percentage of phenolic components (carvacol and thymol) in comparison with oils containing monoterpenic alcohol linalol (Rojas 2007). These phenolic compounds are known to be powerful antimicrobial agents due to their toxic effects on the bacterial cell wall. The antimicrobial mode of action is considered to arise mainly from the potential of hydrophobic essential oils to intrude into the bacterial cell membrane, to disintegrate membrane structures and cause ion leakage (Kroismayr, 2007).

Many essential oils components are generally recognized as safe (GRAS) and have been used for many years in the food, cosmetic and pharmaceutical industries. Among the herbs and spices used in animal nutrition, oregano is probably used most frequently, it is rich in carcavol and thymol, known to have strong antibacterial and anti oxidative properties and described as acting synergistically (Burt, 2004). Essential oils extracted from rosemary (*Rosmarinus officinalis*) also seem particularly interesting due to their high concentration of components such as carnasol and carnosic acid, which have high antioxidant properties (Abutbul, et al., 2004).

Effects of essential oils in aquaculture species

In animal nutrition, phytogenics are an interesting category of feed additives due to their different effects. Most studies on application of essential oils in animal nutrition have been conducted in swine and poultry. However, there is increasing evidence that the application of phytogenics can also be beneficial for some aquaculture species, such as fish and shrimp.

Several scientific studies have tested the application of essential oils of different sources in aqua species. These studies, focused mainly in the therapeutic effects of essential oils against pathogenic bacteria and parasites.

Rojas (2007) reported that application of thyme essential oil through feed using a preventive dosage (dosage not stated in report) improved the survival of Atlantic salmon (*Salmo salar*), when challenged with *Saprolegnia parasitica* after 30 days of feeding compared to the control (8 % vs 48 % mortality). A curative dosage of thyme essential oil applied after the appearance of the first signs of disease was not as effective as the preventive treatment but still better than the control (8 % vs 23 % mortality).

In another study, Abutbul et al (2004) tested the effects of rosemary *R. officinalis* extracts as a treatment for *Streptococcus iniae* in tilapia. The *in vitro* bactericidal tests revealed that all tested *R. officinalis* extracts showed antibacterial activity against *S. iniae* with the ethyl acetate extract giving the strongest inhibitory effect. A significant reduction in mortality of infected tilapia was then obtained when fish were fed a diet containing ethyl acetate extract of *R. officinalis* (1:24 w/w) or leaf powder. Moreover, no significant differences in mortality

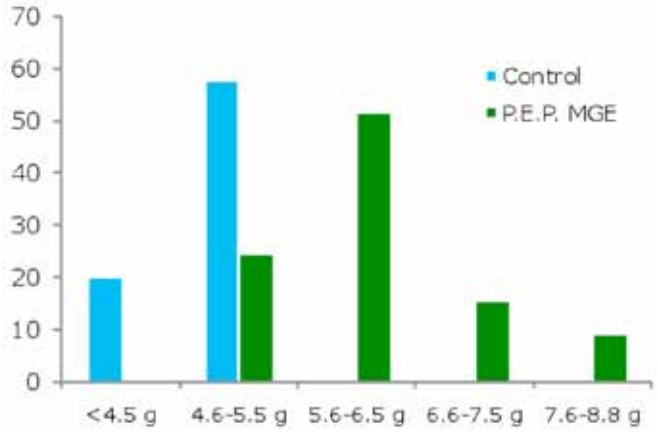
of fish were found between the two *R. officinalis* treatments and the oxytetracycline treatment (p>0.05) (Abutbul et al., 2004).

A series of trials conducted at the Aquaculture Center of Applied Animal Nutrition (ACAN-Bangkok) focused on the effects of different phytogenic blends in growth performance and feed efficiency in different aquatic species. Results confirmed that essential oils (Biomin® PEP125) have a positive effect on Tra catfish (*Pangasius hypophthalmus*) (Fig. 1) and red tilapia (*Oreochromis niloticus x O. mossambicus*.) growth performance (Table 1).

Table 1. Growth performance (weight gain, FCR) of red tilapia after fed different concentrations of Biomin® PEP125 during a 8 week trial.

Diet	IBW g/fish	FBW g/fish	Gain g/fish	Feed g/fish	FCR	DGC%
Control	63.3	130.4	67.0	102.2	1.53	1.94
PEP-125	63.2	134.2	71.0	102.9	1.45	2.03

Figure 1. Effect of an essential oils based product (Biomin® PEP125) on growth performance of *Pangasius hypophthalmus* after 4 week trial.



The positive effect of application of phytogenics in aquafeeds was also confirmed in field trials with tra catfish in Vietnam. When a phytogenic product (Biomin®PEP125) was included in a pangasius commercial feed at a level of 150g/tonne and fed during a 6 month period, the fish fed the phytogenic supplemented diet showed significant (P<0.05) improvements in weight gain and FCR (Table 2). This improved feed utilization and growth performance ultimately resulted in increased profits and economical benefits for the farmer.

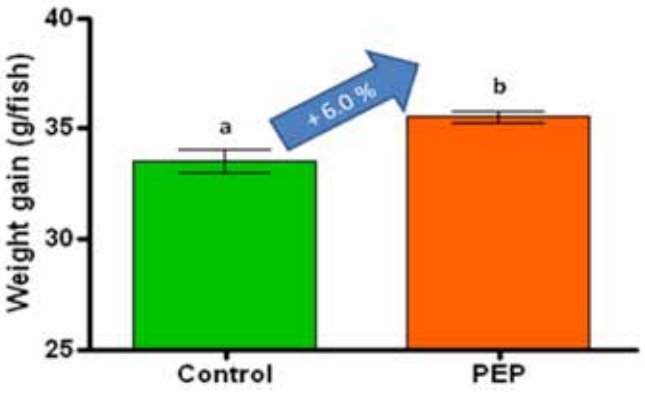
Table 2. Effect of PEP125 (150g/tonne) on growth performance of Tra catfish under field conditions in Vietnam.

	Control group	Biomin® P.E.P. 125
No. of fish	6000	8000
Initial body weight, g	52.6	52.6
2nd Month body weight, g	184.2[a]	211.4.0[b]
6th Month body weight, g	641.31[a]	724.56[b]
Weight gain (d 180-d 1), g	588.7[a]	671.9[b]
FCR	2.12[a]	1.83[b]

The positive effect of phytogenics on growth performance and feed conversion was not only observed in omnivorous species such as catfish and tilapia but also in carnivorous fish. Gianneas et al, (unpublished) reported that supplementation of trout feed with a phytogenic product (Biomin®PEP125) at a level of 150 g/tonne feed improved growth and significantly (P<0.05) reduced FCR (1.60 as compared to 1.72).

In shrimp, in a recent study at Kasetsart University, Orapint et al., (unpublished) observed that application of an encapsulated essential oil product (Biomin PEP-MGE) in shrimp feed at a dosage of 150 g/tonne feed resulted in a higher growth, lower mortality (<20 %) and bigger size distribution in shrimp (*Litopenaeus vannamei*) (Figure 2). Analysis of immune-parameters (hemocyte and granulocyte) revealed no significant differences between shrimp fed the control compared to those fed the phytogenic product.

Figure 2. Size distribution of shrimp fed a control diet and a diet supplemented with a phytogenic product (PEP-MGE) at a concentration of 150g/tonne feed after 8 weeks trial.



Also in *L. vannamei* shrimp, Cardozo et al. (2008), tested the application of an encapsulated combination of two active ingredients of oregano (tymol and carvacol 1:1 at a concentration of 30 ppm), under normal and stress challenge conditions. After a 28-day feeding trial, there were no significant differences in growth but the group fed the phytogenic substances showed an improved FCR (1.21 vs 1.29). On day 29, the shrimp were then exposed for 24 hours to virulent *Vibrio harveyii* (10^6 CFU/ml). On day 56, the shrimp fed the tymol:carvacol diet showed significantly higher survival rate than the control group (96.9 % vs 84.4 %). Shrimp fed the phytogenic diet had also had a significant better FCR and average daily gain when compared to the control diets (Cardozo et al., 2008). The performance and survival benefits of the tymol:carvacol mixture correlated directly with improvements in the immune parameters with a significant increase on shrimp phagocytosis index and prophenoloxidase activity, indicative of a more resistant immune system against *V. harveyii* (Cardozo et al., 2008).

Conclusions

Sustainable aquaculture development requires the use of safe and effective solutions to tackle the industry challenges. There is increase evidence that natural products like essential oils could have a beneficial application in aquaculture, including improvement in feed utilization and growth and possibly as prophylactic and therapeutic agents to control some major bacterial and fungal diseases.

References are available on request.

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Impact, environment and standards

Shaping sustainable shrimp aquaculture with the Shrimp Aquaculture Dialogue standards. Changing the public perception on farmed shrimp will show consumers that industry can deal with these issues.

The meteoric rise of shrimp aquaculture from production of a mere one million tonnes in 1998 to more than 3 million tonnes in 2009 is impressive. In Asia, the industry has moved from traditional small scale 'tambak' systems of native black tiger shrimp to industrial high density culture of the exotic white vannamei shrimp. Even when the industry was mainly traditional, it often had a negative image, as some nonprofit organisations raised concerns on the social and environmental impact of shrimp farming. These ranged from destruction of the coastal ecology and mangrove habitats, salination of inland areas to social conflicts.

Long overdue are efforts toward responsible shrimp farming, which focus on key impacts including: habitat conversion, water pollution, reduction of wild stocks, disease outbreaks, biodiversity, unfair labour practices and loss of access to natural resources for local people. In 1999, World Wildlife Fund (WWF) partnered with FAO, the World Bank, the United Nations Environment Program and the Network of Aquaculture Centres, Asia-Pacific to create the Shrimp Aquaculture and the Environment Consortium. In 2006, it published the International Principles for Responsible Shrimp Farming. The eight principles contained in this document formed the basis of a global multi-stakeholder process of this Shrimp Aquaculture Dialogue which WWF initiated in 2007. The dialogue aims to create performance based standards for shrimp farming. It deals with planning, development and operation of the global shrimp aquaculture industry. More importantly, working with NGOs, it addresses the significant environmental and social impact of shrimp aquaculture.

The process

A crucial phase is the multi stakeholder and transparent approach that underpins standard development. In 2007 and 2008, three regional committees were set up to represent industry in the Americas, Africa and Asia. In 2009, a Global Steering Committee (GSC, see box) was formed comprising 14 members representing 9 countries; 3 are producers (Madagascar, Honduras and Belize), 1 producer cum distributor (Madagascar), 1 distributor (UK), 1 certifier (France) and 8 NGOs (Bangladesh, Philippines, Netherlands, USA). The GSC has been charting the road map, reaching out to stakeholders and developing draft criteria, indicators and standards. To do this, several meetings were held close to the producers in Madagascar, Belize, Ecuador, Indonesia and Thailand from April 2007 to March 2010.

Among the members in the Asian regional committee is a producer (Thailand), two government representatives (Thailand and Vietnam) and a certifier (Vietnam). Eric Bernard, coordinator said, "Initially we did not have any volunteers from the Americas and Asia. Later, two from the Americas joined the GSC. Having the direct participation of at least one shrimp producer from Asia in the GSC would have been ideal. However, even though an Asian producer is not on the decision making body, it is the responsibility of the GSC to address the concerns of all stakeholders, including Asian producers. There is still room to contribute through direct communication with the GSC members and during the public comment periods".

Marc Le Groumellec from UNIMA (a GSC member) said, "The diversity of GSC members and other participants, all with vast experiences in shrimp farming and with a passion for the industry, helped us to have a global vision. We see new concerns which otherwise would not have emerged if there were no industry stakeholders. All these have resulted in an interesting combination of standards, presented here for the first public comment period."

Vannamei shrimp farmed in Indonesia. Picture courtesy of Gold Coin Indonesia.

On March 1, 2010, the draft standards in English and Indonesian were posted at http://wwf.worldwildlife.org/site/PageNavigator/ShrimpDraftStandardsForm, for the first of two 60-day public comment periods. The first public comment period ended on 30 April.

"This is the first of the two public comment periods. Consequently GSC will address the comments and go back to the stakeholders with a second version perhaps later in 2010. After the second comment period, the GSC will revise and finalise standards by the end of 2010", said Bernard.

Raising the bar

The philosophy behind the standards is that they are attainable to responsible industry producers. It aims to leverage the experiences of industry leaders and their better management practices and move the performance bar up gradually. The initial target is to certify the top 20% best producers globally. As the industry improves, these numbers will increase. The standards should encourage innovation and national laws will help to control the worst performers in the industry. The label from the Aquaculture Stewardship Council (ASC) will increase market access and gradually increase certification to the top 50% and more.

"The standards are not meant to reward the status quo but it is about 'improvement'. It is to achieve an industry that meets the sustainability objective. This is our ambitious role", said Sian Morgan, FishWise, USA.

Some Asian stakeholders; from left; Rubi Haliman, Senior Manager, PT Central Proteinaprima, Indonesia, Pinyo Kiatpinyo, President, Federation of Shrimp-Farmer Cooperative of Thailand and Ernest Chiam, Senior Program Officer, WWF Malaysia.

Mathias Ismail from OSO, in his presentation on the process emphasised that this is a business to consumer process which belongs to the industry. "Creating a better shrimp farming industry is the absolute goal which all members share. We need to find the best locomotives in the production sectors and show the way towards a better farming industry worldwide."

The overall objective can be seen as improving the average of the industry and move upwards, said Le Groumellec. "Production costs will be expected to increase but that is why the focus is on performances".

Third party certification

By the end of 2010, the standards developed will be handed over to a separate entity, i.e. the Aquaculture Stewardship Council (ASC). It will be the responsibility of ASC to work with independent third party entities to certify farms. It is important that in accreditation, there is no conflict of interest between the entities creating the standards and those that undertake audits. Physically, auditors should not be housed in with the certification body. This third party certification is the most robust and credible process.

On whether the standards, rigorous as they may be, will crowd out small producers, Le Groumellec said, "The standards are designed specially to allow small farms to be certified. It is mostly based on obtaining results more than on best management practices. The cost of the certification is always on our minds. The big challenge for small farmers will be to record and be able to show reliable documentation when they are being audited".

"The standards will not be written in stone and our mandate to the ASC is to review the standards every 3-5 years", said Bernard.

What they say in Jakarta

These were comments on the draft standards given over two days in March in Jakarta by 120 stakeholders; 60% of them from Indonesia and the rest from Bangladesh, Indonesia, India, Madagacar, Malaysia, Philippines, Singapore, Thailand, Vietnam, Netherlands, France, UK and USA. The GSC presented impact and indicators, grouped under the 7 principles. Principle 1 is to comply with all applicable laws and local regulations. However, the role of the shrimp aquaculture dialogue is to produce more rigorous standards than existing ones, as long as the laws of the country are respected.

"Therefore, I hope that at the end of this dialogue, the standards are more credible because of the process, transparent and addressing the key issues, doable and affordable and do not exclude any kind of farm, whether small scale or large", said Bernard.

"We believe that measurable standards will help farmers and the certification body. If the standards are vague, it does not help the auditors as it will be subjected to interpretation and also lose control of what you want to address."

The Indonesian feedback

In opening the dialogue meeting, Professor Ketut Sugama, Head of Seed Production at the Department of Marine Affairs, Aquaculture and Fisheries, Indonesia said that the area for shrimp aquaculture has increased from 420,000ha in 2007 to 450,000ha in 2008, some with concurrent loss of mangrove areas. However, intensive shrimp farming has also expanded more in marginal land areas rather than in former mangrove areas. In 2001, the vannamei shrimp was introduced and it is now farmed throughout the country, mainly in Lampung, East Java, Bali, NTB and North Sumatra. The national plan is to expand production to 400,300 tonnes in 2010 and to 699,000 tonnes by 2014 but this will be through the use of existing ponds rather than expand to new areas. Revitalisation of ponds will be with vannamei shrimp farming instead of the monodon shrimp. Extensive culture will be '3 in 1' shrimp polyculture with marine fish species. Production of the smaller shrimp of 100-150pcs/kg will be encouraged for the domestic market.

Professor Ketut Sugama

Within the Indonesian group represented by 60% government and 40% industry, concerns were raised mainly on how the small scale farmers can comply with the standards. Discrepancies in definitions and regulations abound. Small scale was defined as 2-5ha in East Java but 5-15ha in Lampung, Sumatra. Buffer zones are now 500m in Aceh Province after the tsunami of 2004. In worker compensation, it was noted that Indonesian companies do not compensate workers for loss of income.

Iwan Sutanto, President, and Pitoyo, Shrimp Club Indonesia

Shrimp Club Indonesia (SCI) represented by Pitoyo and Iwan Sutanto, said, "Overall, we see this as good for the industry, although many will find it difficult to comply. Nevertheless, it will keep the industry sustainable and responsible. There are some aspects of the standards that the SCI is agreeable but aspects such as interactions with the local communities may pose some problems. The issue of reinstatement of the land after farm closure is important as it helps with the image of shrimp farming. The deciding factor is land ownership. It may be easy to reinstate the land when the lease expires but with land owned by the farmers, perhaps we may need government assistance."

Environment and social and impacts

Principle 2 deals with conserving biodiversity and important natural habitats. In general, agreement was on actions to ensure that shrimp aquaculture results in minimum damage to the surrounding ecosystem, endangered species and on critical habitats. The uncertainty was on the correct implementation of replanting of mangroves as standards for corridors and coastal buffers suggested a 100m wide buffer with 30 trees/m^2 in mangrove areas. The divergence in requirements and guidelines in Basic Environmental Impact Assessment (BEIA) and EIA within individual countries may pose problems in determining standards, said Pinyo Kiatpinyo, a producer in Thailand. In Indonesia, an EIA is required for farms of more than 50ha but this is only for more than 100ha farms in Thailand. Another concern raised was the erosion of banks in the Mekong Delta, not attributed to shrimp farming but to other riverine activities.

Farm operations

The draft standards are contained in principle 4 dealing with farm operations with consideration of surrounding communities and responsible labour practices. The wide diversity in social issues in Asia was again emphasized. There was a general consensus on the standards on the use of child labour and discrimination in employment. The use of migrant labour should reflect the prevailing labour conditions in each country. Indonesia has its own transmigration programs in aquaculture. In discussing the implementation of standards on the reinstatement to original state after farm closure, suggestions ranged from adding this into insurance coverage to government funding.

Biosecurity in a Malaysian pond complex

Stakeholders agreed on the need for measurable indicators in disease prevention in principle 5, although groups debated on managing shrimp health in a responsible manner. Without hesitation, agreement was on the standards prohibiting the use antibiotics. The disconnect in the current availability of SPF black tiger shrimp stocks requires a relook at standards for managing broodstock in principle 6. Lastly, the debate on principle 7 which covers the use of resources in an environmentally efficient responsible manner focused on whether GMO

Principle 2 deals with conserving biodiversity and important natural habitats.

(genetically modified organisms) in feeds should be allowed, taking into consideration the limited availability and price of non GMO feed ingredients. To ascertain the sustainability issue of fish meal produced in Asia, stakeholders proposed some assistance from Sustainable Fisheries Partnership.

The meeting saw stakeholders expressing their concerns on standards for specific indicators. The main concern was the applicability of certain indicators for existing farms and small scale producers which form the bulk of industry in Asia. Nevertheless, recognition was given to this methodology of deriving indicators through consultations and later via dialogues. This is to ensure that standards developed are the result of consensus and is not just another innocuous exercise to have another set of standards for industry.

Core value is sustainability says two leading producers

Mathias Ismail is the Managing Director of OSO (Organic Sustainable Only), the largest producer of organic *Penaeus monodon* at 1,600 tonnes annually. Based in Madagascar, it is the first to be certified with AB "Agriculture Biologique" Label which has now become the EU standards. The farm has 425 ha, comprising 10 ha ponds, a 120 million post larvae hatchery and a processing plant. During the certification process, the farm developed nursery plantations and grew local species of trees, including mangroves, which are used to provide a resource for the local community, stabilise pond banks and protect the site from wind erosion. In order to guarantee the best of its organic 'gambas', the farm's capacity is limited to approximately 2,000 tonnes a year with stocking density limited to 8 post larvae/m^2. Shrimp are fed marine and vegetarian feeds, certified organic and GMO-free.

For three decades, OSO's focus has been the sustainable management of Madagascar's marine resources and to protect Madagascar from the social and environmental damage commonly seen in Asian or South American regions with intensive shrimp farming. Madagascar's achievements in sustainability were officially recognized at the UNESCO Conference on Biodiversity in Paris, France in January 2005.

In the GSC are Mathias Ismail (left) and Marc Le Groumellec (right), producers making a mark in sustainable shrimp aquaculture. Eric Bernard (centre) is the WWF coordinator of the shrimp dialogue.

"We first started in the African regional dialogue and our experience in the organic shrimp farming, hatchery and distribution was certainly very valuable for the WWF and GSC, we are not only a producer but active on the distribution side. For us, it is all about sustainability".

OSO, part of OSO-Atlantys, is a leading wholesale distributor of chilled quality seafood mainly to traditional markets and food service sectors. It distributes 42,000 tonnes of seafood annually, mainly chilled. The annual turnover is EUR 260 million.

Dr Marc Le Groumellec, aquaculture specialist is currently in charge of hatcheries and the *P. monodon* domestication centre at the Unima group of farms in Madagascar. His experiences include the development of the Label Rouge and Organic AB standards. Unima is at the origin of the aquaculture model of Madagascar developed according to a pilot project of responsible shrimp culture with FAO. For the past 18 years, Unima's farm has been achieving consistent results. Unima is the pioneer and only fully integrated farm in the African zone. The company is highly involved in a sustainable development including a carbon policy. It is reducing its environmental footprint and the first shrimp company to offset its carbon.

"I think this a sign of sustainability and achieved by developing an environmentally and friendly and social responsible approach. We were first certified by ACC and Label Rouge. The latter was the most complete standards as it deals with quality and consistent production. We developed an original partnership with WWF on sustainable development practices in production. Thus, we are very much aware what certification entails and the value it can bring to the final consumer and also the constraints associated with certification".

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An industry and NGO partnership to create standards acceptable to all

The future of aquaculture with Aquaculture Dialogue standards

The standards initiated through WWF's Aquaculture Dialogue process stand alongside several market driven standards in the global aquaculture industry. However, here the emphasis is on measurable and focused indicators. With multiple stakeholder participation, during all stages of standard development and addressing more the concerns of NGOs on environmental and social impacts, does it make these standards more rigorous than others?

Jose Villalon, a 27-year veteran of the aquaculture industry oversees the Aquaculture Dialogues, a set of multi stakeholder groups developing standards for more sustainable aquaculture production. Prior to joining WWF in 2007, he had a consulting business in Mexico, operated a 280 ha shrimp farm, also in Mexico, worked for five years in AquaNova which operates a shrimp feed mill and processing plant and was technical director of shrimp production at Marine Harvest International.

As Director of World Wildlife Fund-US (WWF) aquaculture program, Jose Villalon oversees 8 aquaculture dialogues for 12 species, around the globe. In this telephone interview, he explains why the global aquaculture industry needs these standards.

AAP: There are several market driven standards for the aquaculture supply chain. Do we need another set of standards?

JV: For many years, WWF has engaged with other bodies in making comments and trying to improve aquaculture standards during the comment period. We focussed on the relevance of the standards and applicability. In general, there was not much progress. It was then decided that WWF would initiate a multi stakeholder and client based program of our own. Frankly, when the decision was made to go ahead with the aquaculture dialogue process, which strives to comply with the ISEAL code, it was because WWF perceived that aquaculture standards as they existed then, did not address the key issues. This led to the birth of the aquaculture dialogue process.

It is important to emphasise that WWF is the initiator and not the owner of the standards. It coordinates the effort and strives to reach the ISEAL level of compliance. The ISEAL is an international social and environmental alliance for the creation of solid and credible standards. It promotes a rigorous standards development process which requires multi stakeholder participation and is transparent based on consensus and science.

During our various dialogues, we have 2,000 people involved in the process and there is a lot of effort made to reach producers, both small and large, with each one of the species. We have our meetings, often in places close to the producers.

An emphasis on social and environmental impact

Aquaculture, in particular shrimp aquaculture, has been receiving a lot of negative publicity from environmental groups with respect to its impact on the environment and sustainability. How will this process help the industry?

Yes, these are environmental and social standards which address the key major impacts of shrimp farming-seven of them. With NGO participation, as stakeholders, the design of the dialogue process seeks to make an impact from an environmental and social perspective and then addresses those impacts in a measurable way. I emphasise 'measurable way' as often, we find aquaculture standards using vague language, are often not measurable. If the indicator for dissolved oxygen is 3 mg/l, if you are 4 mg/l, you are compliant and if you are 2.9 mg/l then you are not compliant. Compliance with the standards means that you have significantly reduced or eliminated the environmental and social impact that the industry is causing.

Getting all involved

How do you get stakeholders, especially those from Asia, to participate?

The dialogues are open to all involved in a particular species. We send out press releases and we advertise as much as possible in trade press. Besides these, we send out invitations to key stakeholders, other NGOs, seafood buyers, academia, producers, manufacturers and government entities. Early in the process, there is a call for those who would like to be more involved and to be part of the decision making body, which is the global steering committee (GSC). These are all volunteer positions, be they producers or NGOs and they need to dedicate time and resources to the process.

The crucial issue is the multi stake holder approach. If you are a group who share the same perspective, they generally ask the same questions but from a different view point. People with different perspectives will give a robust discussion of relevant issues. An example is when the group discusses feed consumption. The group might decide to put a cap on the amount of feed used but the stakeholder process would extend this to include kilograms of wild fish used to produce fishmeal for feed to produce one kilogram of farmed fish. The real environmental impact is not the amount of feed but the amount of fish used for fish meal. That is the beauty of the multi stakeholder process; it allows the question to be asked and investigated thoroughly. In a majority of standards development, a group develops standards and then ask for public comment but this cannot be termed as multi stakeholder.

NGOs are very important as they add another perspective and their voice is crucial. Having this community involved in the process ensures that environmental and social aspects are being dealt with.

Visual identity at ESE 2010 and label for farmed fish by mid 2011

ASC is the acronym for Aquaculture Stewardship Council, an independent not for profit organisation. The ASC was founded in 2009 by WWF and IDH (Dutch Sustainable Trade Initiative) to manage the global standards for responsible aquaculture, which are under development by the Aquaculture Dialogues, a program of roundtables initiated and coordinated by WWF. The dialogue standards are expected to be completed and handed over to the ASC by end 2010.

At the European Seafood Exposition in Brussels, ASC presented its visual identity. This was produced pro bono by Ogilvy Amsterdam and represents what ASC stands for: transparency, responsibility, credibility, independence, linking demand with supply and effectiveness.

The presentation at the ESE where all the major players in the seafood industry are in attendance is an important stepping stone towards the introduction of a credible consumer label for responsible aquaculture for 12 seafood species. These have been chosen based on their potential impact on the environment and society, their market value and the potential in the international seafood trade. The ASC will create market demand for responsible farmed seafood by introducing a consumer label by mid 2011.

Currently the ASC is in its business development phase. From September 2009, Dr. Philip Smith, CEO is leading the development of the ASC. In preparation, are projects for the implementation of the Aquaculture Dialogues for the tilapia and pangasius. Major seafood buyers, seafood processors, retailers and NGOs have already publicly supported the ASC. It is engaging partners in capacity building. In a pilot program in Vietnam, Anova, IDH and GTZ will help small scale pangasius farmers comply on the Pangasius Aquaculture Dialogues standards (PAD).

In an interview during ESE 2010, Dr Philip Smith detailed the work ahead for the ASC. This will be published in our next issue, July/August 2010.

No exclusivity on standards

Will the aquaculture dialogue standards become the umbrella standards adopted by governments? What role will the other existing certification organisations play?

The aquaculture dialogue standards will be handed over to the Aquaculture Stewardship Council (ASC) as the standard holder. These are voluntary standards and we think that these will be market driven standards. They are not meant to be regulatory or law in the countries. We believe that the major seafood buyers and the retailers will ask or demand that their supply chain becomes compliant with the standards. The farmer will seek to be compliant to have the ASC label on his product.

If government decides to use these as a means of licensing the way aquaculture should be carried out within their borders, it will be good. We would encourage this but this is not the aim of the dialogue standards.

I think there is still room for multiple standards in the industry and some retailers will ask that their supply chain comply with standards addressing environmental and social issues from a superficial level. Then we may also have some seafood buyers and retailers who may want to address the relevant issues on a deeper level and say that they want a more robust certification. This is where the ASC standards come in. Overall, there should not be any exclusivity on standards.

Some governments in the region have insisted that only their own standards be used by local producers. What is your opinion on this?

It is the sovereign right of each country to want to have their own producers compliant to their own standards. On the other hand, we have to look at what the market, buyers and consumers want. Often we find that these stakeholders do not want to rely on any government certification scheme to certify or verify compliance. An independent third party certification and those developed through a transparent and multi stakeholder process brings in the credibility. Often when we talk with governments, we ask them to take advantage of the output from this dialogue process.

However, there are also very good standards developed and we commend them. We ask them to have this base line and look at the aquaculture dialogue standards and incorporate into their regulatory policy and avoid reinventing the wheel.

Disparity within WWF on aquaculture

Whilst your section is going through this process and helping industry achieve sustainability, aquaculture continues to receive negative press from WWF country offices. Why is this?

The reason for this is because today, although there are a lot of standards for the industry, they fall short on sustainability. WWF has several country officers doubtful on the sustainability of aquaculture. This will remain until we have our aquaculture dialogue standards and the ASC is completed. There is a lot of disparity in the way aquaculture is carried out. With ASC certification, we will find that WWF offices will welcome ASC certified industries, similar to how they welcome those certified under MSC.

Codes of Practice and Better Management Practices in Aquaculture

Call for contributions to FAO overview of COPs/BMPs in aquaculture

The FAO Aquaculture Service calls for contributions to the development of a worldwide overview and databank of Codes of Practice, Codes of Conduct, Best (Better) Management Practices, Technical Guidelines, etc. in aquaculture.

We would like to invite all those interested in the promotion of sustainable aquaculture development to advise FAO of the existence of COP/BMP documents in their countries or regions. In particular, all aquaculture producer associations and farmer organizations are encouraged to send to FAO their Codes of Practice, Codes of Conduct, Best (Better) Management Practices, Technical Guidelines, etc. COPs/BMPs in aquaculture, as available with national and international organizations, would also be important and should also be contributed. These documents could be sent to FAO in hard copy format or electronic format, or, if available online, by informing FAO of the relevant website, internet link or URL. For further information on the scope of this initiative, please visit FAO's aquaculture gateway page: ftp://ftp.fao.org/FI/DOCUMENT/aquaculture/COPBMP/call.pdf

Your collaboration and contributions to this initiative will be most appreciated, and your participation will be duly recognized and acknowledged.

Jiansan Jia
Chief
Aquaculture Service
Fisheries and Aquaculture Department
Food and Agriculture Organization of the United Nations (FAO)

Direct contact: For all correspondence & information on this activity, please communicate directly with Mr Uwe Barg, Fishery Resources Officer (Aquaculture) via email: uwe.barg@fao.org, or by phone: ++39-06-57053454. His mailing address is:

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Preventing 'blackspot' in shrimp and prawns

By John Davis

Shrimp and prawn farmers in the Asia Pacific region should consider a safer and more effective alternative to sodium metabisulphite.

Europe represents an important market for farmers in the Asia Pacific region and many will have noticed that there is a growing trend by European food buyers to move away from any product containing sulphite additives. For Asian Pacific shrimp and prawn farmers, this represents an important issue because sodium metabisulphite is commonly used as a treatment to prevent the onset of melanotic blackening, or 'blackspot' in shrimp and prawns.

Melanosis is a natural process caused by hormonal changes in the recently harvested shrimp and prawns that leads to unsightly dark markings on the shell. Although melanosis is harmless, it does affect the appearance of the prawns, which in turn can make selling the product difficult and increases the rate of rejections.

Masking the development of blackspots

Sodium metabisulphite

After harvesting, shrimp and prawns are still commonly dipped in a sodium metabisulphite solution. However, sodium metabisulphite is corrosive and can cause serious and expensive damage to equipment in processing factories. However, even more serious than this, is the well documented evidence that sulphite based treatments are hazardous to the health of processing workers because sulphur dioxide fumes released during treatment can harm the airways and lungs of operators.

Research has shown that metabisulphite can cause asthma attacks and trigger allergic reactions. A scientific study by Steiner et al (2008) found that three patients; a trawler man and two prawn processors, developed work related airways disease due to exposure to sodium metabisulphite.

Independent testing by the United Kingdom Sea Fish Industry Authority supports the fact that there are other more effective alternatives to sodium metabisulphite. A study in 2005 (see http://www.seafish.org/whatsnew/detail.asp?id=1239&p=ca for more details) found that prawns (*Nephrops norvegicus*) treated with 5% metabisulphite lose some visual qualities through bleaching and attain high sulphite residues, often above the permitted 150ppm. Furthermore, prawns treated with a high concentration of sodium metabisulphite were found to have poor flavour.

A safe and effective alternative

However, there are more effective treatments that are gaining popularity. One of these is Prawnfresh (XyRex Ltd, UK) where the active ingredient is E586, which is safe to use, leaves no chemical residues or taints. It is approved for use by the European Union and in the Nordic Economic zone. It works by inhibiting the enzyme polyphenal oxidase which causes melanotic blackening. The application of the treatment is very straightforward and involves dipping the shrimp or prawns into a tank containing saltwater with the product added at a ratio of 1:1000. European processors and fishermen who are already using this liquid solution treatment on a variety of prawn and shrimp species have found immediate and tangible benefits.

This alternative liquid solution treatment, results in shrimp and prawns that have a much longer shelf life before melanosis sets in. This is crucial for shellfish farmers in the Asia Pacific region looking to export fresh shrimp and prawns into the European and other export markets. This increase in shelf life and better overall appearance should in turn result in buyers paying higher prices. In the Asia Pacific region, Prawnfresh has also gained the approval of a number of food regulatory authorities, including those in Australia, New Zealand, Thailand and China.

A number of other alternative treatments were tested (Table 1) to compare their performance with sodium metabisulphite.

The study found that this alternative delivered the best results in terms of shelf life, with a maximum of nine days from harvest and treatment before the onset of melanosis. Treated prawns also rated best with regards to appearance and eating qualities.

Prawns Nephrops norvegicus seven days post harvest after treatment with Prawnfresh. Source, University of Glasgow Langoustine Laboratory (Ms Chonchanok Theethakaew, Dr Amaya Albalat and Professor Douglas Neil).

Untreated prawns after seven days, show melanotic blackening. Source, University of Glasgow Langoustine Laboratory (Ms Chonchanok Theethakaew, Dr Amaya Albalat and Professor Douglas Neil).

Results of studies by Sea Fish Industry Authority comparing effectiveness of different alternative treatments to sodium metabisulphite.

Treatment	Days on ice								
	5	6	7	8	9	10	11	12	13	14
Ascorbic acid										
Citric acid										
Soft acid										
Control										
Meta 2.5%										
Aquabon										
Meta 5%										
Melacide										
Everfresh										
Hasenosa										
Pluscolour										
Xyrex Prawnfresh										

Blackening on all prawns. Unacceptable quality
Occasional / slight darkening of head
Good, bright appearance

Research in 2008 by the Langoustine Laboratory at the University of Glasgow in Scotland found that the anti-melanotic properties were retained in coldwater prawns *Nephrops norvegicus* that were frozen and then thawed. Following these results and the successful use of this alternative treatment in the catching and processing sectors of northern Europe for several years, there are now trials ongoing in many other parts of the world, including the Asia Pacific region.

In Australia, Seafarm in Queensland has been using the treatment on banana prawns *Fenneropenaeus merguiensis* at its Crystal Bay Prawns brand operation. Dr Trevor Anderson, general manager of Seafarm, says,

"This alternative treatment allows the sweet natural flavour of Crystal Bay Prawns to come through. The environmental approach of Xyrex and the natural ingredients in Prawnfresh is a natural fit with our chemical free natural Crystal Bay prawns grown in the pristine waters of Australia.

"It also ensures that we avoid sulphur allergy issues in our customers and processing staff. It means we can offer our customers a product, which is safer, healthier and more natural. It also overcomes the problem we find with metabisulphite, which results in erosion of the shell."

In northern Europe, Donald Kristensen, managing director of seafood processor Royal Fish Denmark A/S, says he has noticed a big improvement in the welfare of his processing employees after switching from sodium metabisulphite.

"All our employees used to have general breathing problems including irritated eyes and nose. This is no longer an issue."

The quality improvements are important too. "Tests have shown that prawns treated with Prawnfresh stay nicer in colour, texture and odour, longer than raw material treated with sodium metabisulphite. We also feel it is a healthier additive for the consumer."

Another photo of prawns seven days post harvest after treatment with Prawnfresh.

Conclusion

The company has more trials lined up in the Asia Pacific region over the coming months in shrimp and prawn farms. Inevitably, different species will require different levels of treatment and these trials will form an important component in ensuring the best results are delivered. It is also encouraging more farms to participate in these trials.

"As well as the marketing benefits of using alternative treatments to sodium metabisulphite, I think it is again important to remind all crustacean farmers that the well-being of their processing operatives must always be a priority. They should utilise best practice techniques to prevent any potential health risks posed by sulphite based treatments".

John Davis is the managing director of UK company, Xyrex. As well as Prawnfresh, it manufactures the Xyrex U500 and Ice-Active treatments, which prevents spoilage in finfish species. Email: john@xyrex.com; More information: www.xyrex.com

Local production - local sales

The first plant of SPF-Aquativ for the Asia Pacific market will manufacture functional hydrolysates for aqua feed and pet food using a proprietary enzymatic process.

The mission of Aquativ and SPF, both owned by the French group Diana Ingredients is to develop naturally processed functional hydrolysates, liquid or spray dried, for the aqua feed and pet food industries.

Aquativ Director George Marco said, "Since its creation in 2004, Aquativ has been focusing on the aquaculture market to offer products that improve aquaculture productivity by accelerating fish and shrimp growth and optimizing production cost."

With production and sales forces in every major market, the strategy of the group is to manufacture and sell products locally and to support customers with next-door services and technical teams.

"In this way, we can supply quickly, avoiding long distance logistics which in the long term is not sustainable. It allows us to deliver competitive products to markets close to the plant. Moreover, our local production strategy is an excellent way to secure raw material sourcing through partnership with local raw material suppliers."

For Aquativ, Thailand is an ideal place to set up an industrial and commercial Asian platform for its functional hydrolysates. The country is the leading farmed shrimp producer as well as a major supplier of quality raw material from a very strong local processing industry. The company chose the Thai company TC Union as a partner for the supply of quality raw material from tuna processing.

This SPF-Aquativ brand new plant in Samutsakorn, 30 km from Bangkok, will produce liquid and spray dried powder hydolysates. During the grand opening of the plant in March, Gwenael Betin, product and process engineer explained the history behind the set-up of the plant to a group of Thai and Vietnamese feed manufacturers and regional press representatives.

"Aquativ has benefited from SPF's 30 years of experience and know how in the field of enzymatic bioprocess. The factory design and construction was done by a team of engineering specialists from SPF led by Martin Darbois who is responsible for deploying plants worldwide. Due to some specific designs, critical equipments such as reactors were imported but the final set up was done with local suppliers. The new factory has been designed so that the capacity can follow the rapid market growth."

George Marco at the Aquativ/SPF booth during Victam Asia 2010.

Enzymatic hydrolysis process

Raw material freshness is a key point in the enzymatic hydrolysis process. To be approved, the raw material supplied must match Aquativ's specifications on moisture content, temperature and time between processing and arrival in factory.

"We are very selective in the choice of our raw material and very species specific. We know that wherever we go, the raw material is never the same and it is the role of the R&D team to come up with the right enzyme selection and best process to produce functional hydrolysates with right combinations of low molecular weight compounds according to the need of the target species. Thus being able to tweak the recipe is important for us. This is where the core expertise of both Aquativ and SPF lies."

Once validated, incoming raw material is first ground and pumped to reactors. The product undergoes a bioprocess according to a specific recipe monitored by a computer. The process duration can vary between 3 to 10 hours depending of the final molecular weight targeted. The processed material is passed along the supply pipes for pasteurisation at 90°C for 30 minutes. After cooling with a heat exchanger, the material undergoes in line filtration or a vibrating sifter, depending on the final product specifications. Preservatives are then added, followed by acidification to set the pH at 2.9-3.5.

Both pasteurisation and pH are critical control points in the HACCP certified factory. The acidic pH prevents development of bacteria. The final filtration is done to guarantee the absence of any particles in the liquid and allow the customer to apply it easily. Packaging of the products ranged from 200 litres, 1 tonne or 20 tonnes bulk containers.

"Product development directions are instructed by our research group in France but pilot trials and industrial scale up is then done locally. Based on the local raw material composition, R&D selects the cocktail of enzymes to be used to obtain a hydrolysate with targeted

profile of low molecular weight compounds. Parameters such as temperature, mixing time and process duration are also defined and controlled to guarantee product consistency between batches," said Betin.

Functional hydrolysates

"Functional hydrolysates best describes Aquativ products. They are rich in low molecular weight compounds such as peptides, amino acids and nucleotides responsible for the fish and shrimp physiological activities therefore the growth performance," said Marco.

"The product dosage in aqua feed varies from 1% to 6% depending on product form (liquid/powder). In addition, we have to assess the customers' goals, product range and production systems to help them determine the optimal dosage."

Thomas Levallois, Director of Sales said "We are working with Texas A & M University (USA), University of Songkhla (Thailand) and University of Nong Lam (Vietnam) to assess our products in fish and shrimp trials. Our R&D led by Dr Vincent Fournier looks at the overall equilibrium of these low molecular weight compounds and the impact on performance for each species."

On what is responsible for the performance, Marco said, "We have identified the family of peptides and amino acids which brings performance to the feed leading to superior productivity and growth. The next step will be to find out which specific peptide or amino acid is responsible for which function. We have already made progress on this matter."

The Aquativ team in the plant in Samutsakorn.

"Our strategy to reinforce our local presence in the Asian Pacific markets is clearly supported by the establishment of this new plant in Thailand in addition to the existing one in Australia" said Marco.

For more information: Thikhamporn Charoenwai – Technical Sales Manager, SPF-Aquativ Thailand Co., Ltd. Email: thikhamporn@aquativ-thailand.com, Web: www.aquativ-diana.com

A sixth extrusion fish feed mill in India

The total extruded fish feed capacity that ASA-IM has helped build in India rises to 43 tph.

In April Growel Feeds Pvt. Ltd launched its soy-based floating fish feed brand in Krishna District, Andhra Pradesh, India. The event was attended by more than 2,000 people comprising fish farmers, feed millers, consultants, various stake holders, representing some 70% of the aquaculture industry in Andhra Pradesh. Also in attendance were several representatives from the American Soybean Association – International Marketing (ASA-IM).

Dr. P.E. Vijay Anand, Technical Director, Poultry, Livestock and Aquaculture, ASA-IM/ASC gave a presentation on 'Modern Fish Feed Technology' where he emphasized the advantages of using extrusion technology for the manufacture of soy-based fish feeds and subsequent usage to achieve profitable and sustainable aquaculture products. The management of the feed mill has been associated with the Soy-in-Aquaculture Program as well as ASA-IM marketing programs, which assisted the company with training and sharing of local and regional experiences.

Dr.P.E.Vijay Anand, delivering the inaugural speech on "Modern Fish Feed Technology"

The current capacity of the mill is 10 tph and it can produce 48,000 tonnes of feed per annum, at 80% efficiency and three work shifts. It has already sold about 3,500 tonnes of feed under the 'GROWFIN' brand, produced during the trial production in mid February 2010. With pending orders, production will utilise up to 93% of the installed capacity and as such the company will add a second line. Anand said that for the association, this is good news as the plant will consume 16,800 tonnes of soy meal (SBM) at a 35% average inclusion level. When the production capacity is doubled, SBM usage will reach 34,000 tonnes. With this sixth mill, the total extrusion capacity that ASA-IM helped build in India is 43 tph, equivalent to an annual volume of 258,000 tonnes of fish feed and a potential utilisation of 90,300 tonnes of SBM.

More information: P.E. Vijay Anand, Email: vanand@asaimasc.org

A better deal with krill meal in shrimp feeds

An Indonesian feed producer is adapting the marine meal in shrimp feeds for its feed conversion and growth benefits.

"We now use krill meal to fully replace the fishmeal and squid meal we used previously. Krill meal in our shrimp feeds is a fantastic attractant and our customers say that shrimp fed these diets grow faster."

This is the assessment of Erwin Tjia, General Manager of PT. Luxindo Internusa in Indonesia. His company produces around 1,000 tonnes/month of vannamei shrimp feed and another 1,000 tonnes of feed for various fin fish. It is part of Global Aquaculture Group, which has an integrated vannamei shrimp operation comprising breeding, hatchery, farming, processing, cold storage, feed mills as well as a R&D program.

Erwin Tjia

Research in Brazil

"We introduced QRILL™ Antarctic krill meal into our shrimp feeds in 2007 with the help and support of Aker BioMarine. Since then we have not looked back because the alternatives are less effective and more expensive," added Erwin Tjia. His observations on the value of krill meal in shrimp feed are supported by research in Brazil on cost savings and in Australia on growth rates.

The Brazilian research was conducted by Alberto Nunes of the Laboratory of Shrimp Nutrition at the Instituto de Ciências do Mar (Labomar), in the Federal University of Ceará, Brazil. These feeding trials were conducted on behalf of Akvaforsk, the Institute of Aquaculture Research in Norway. The results were reported as part of the Shrimp Program at the World Aquaculture 2009 in Mexico.

In the trials *Litopenaeus vannamei* juveniles were fed diets with krill meal and krill oil replacing fishmeal, fish oil, soya lecithin and cholesterol. The diets were formulated to provide significant cost reductions in comparison with a standard diet. They were conducted in indoor and outdoor rearing tanks over a period of 72 days.

Four experimental diets with QRILL™ Antarctic krill meal or QRILL™ oil, both from Aker BioMarine, were prepared. Three diets contained krill meal at 1%, 5% and 11% respectively and the fourth diet contained krill oil at 2.5%. Care was taken to ensure that during the 72 days, water quality; pH, temperature and salinity were kept within the optimal range for the culture of *L. vannamei* for all treatments.

Shrimp in all tanks grew continuously throughout the culture period as indicated by the weight of the samples. Although, there were no statistically significant differences in the weight of shrimp among treatments, there were significant cost savings when using krill ingredients in comparison with the base diet. In the outdoor tanks, two out of three krill meal diets delivered the best economic performance.


Chris McReynolds

Aker BioMarine Senior Vice President Chris McReynolds explains that for commercial purposes, the addition of the QRILL™ Antarctic krill meal alone will provide krill oil as well as the nutrient input from krill meal. This krill meal contains 25% krill oil, thus a feed with 10% krill meal will have 2.5% oil.

He added, "The results in Brazil reinforce earlier findings in Australia with the black tiger shrimp *Penaeus monodon*. Trials at CSIRO in Australia led by David Smith and reported in Aquaculture Nutrition have shown improvements in the growth rate and feed conversion ratio with the addition of krill meal to diets using relatively high levels of vegetable proteins to supplement fishmeal. Growth rates were improved by around 20% and the FCR by 17%. This reduced the time required for shrimp to reach a 30g harvest weight from 163 to 117 days. This is a significant economic benefit."

Growth in high salinity conditions

Under more challenging culture conditions, nutrients to overcome stress can be more important than those used for growth. At the Mexico conference Nunes, described trials to investigate the influence of krill oil on the growth of *L. vannamei* when reared under hypersaline water conditions.

High salinity can occur in commercial grow-out ponds, where salinity fluctuates between rainy and dry periods. Other factors such as pond depth and water exchange rates also influence salinity. In high salinity environments, shrimp are forced to use their osmoregulatory mechanisms to restore physiological balance. In turn, these mechanisms can lead to stress that affects, for example, the digestive and antioxidant enzyme activity. Krill products have high levels of ingredients thought to benefit shrimp growth in high saline conditions, including n-3 highly polyunsaturated fatty acids, cholesterol, phospholipids and astaxanthin (provitamin E).

Trials were conducted over 48 days with diets in which the lipid sources were krill oil, fish oil or soya oil in various combinations. The shrimp were in tanks in optimal and high salinity conditions (21–26‰ and 40–47‰). Nunes reported that when salinity was high, n-3 highly unsaturated fatty acids, specifically DHA and EPA, found in krill products were important in enabling the shrimp to counterbalance osmoregulatory stress. He added that a regular daily intake of krill oil in the diet was more important than increasing the inclusion level. Optimum growth was achieved when the DHA reached 10.8% of the total lipid content.

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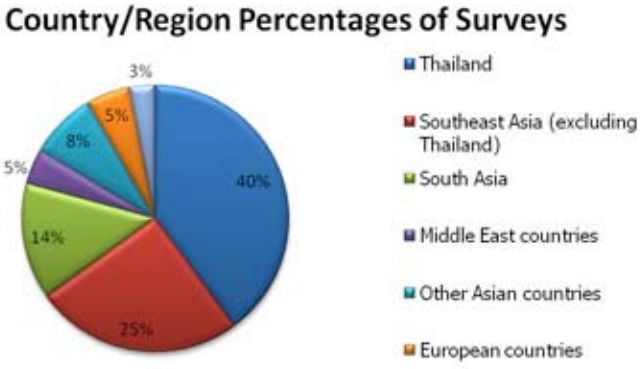
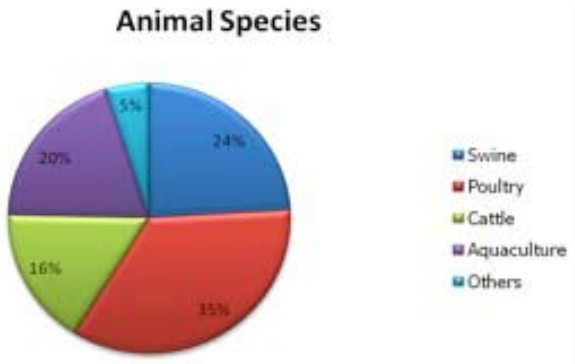
An all time high in brand recognition survey

A recent brand recognition survey revealed an all time high for ADDCON and its major product lines in Asia as obtained during the FIAAP/VICTAM held in Bangkok, Thailand from March 3-5, 2010.

In cooperation with the Asian Institute of Technology, Bangkok, its students Wiparat Taweewattana and Arissara Sopawon interviewed more than 800 visitors from 30 countries at the entrance area of the FIAAP/VICTAM to collect data on the their type of business as well as brand recognition of Addcon and its main products. Most of the visitors came from Thailand (40%), followed by South East Asian (25%) and South Asian countries (14%).

Surprisingly, 20% of the trade experts represented the aquaculture industry followed by swine (24%) and poultry (35%). Out of all visitors interviewed, more than 40% expressed their interest in using non-antibiotic growth promoters in their operation and hence, were set to consult exhibitors specialized in those product lines.





Since the first brand recognition of Addcon survey in Thailand (2009), the company's brand recognition has more than doubled. This goes in line with the brand recognition of Addcon´s major feed additive product lines. FORMI and AQUAFORM had the highest recognition rates, followed by FORMI NDF.

"We are very pleased with those findings" said Addcon Marketing & Sales Director Kurt Wegleitner, "as the findings of the survey is consistent with our experiences in other markets. Further, the results are in line with Addcon's sales figures in the region. Addcon has launched its product line based on diformates at the same show two years ago. Since then, our brand reputation steadily rises in the market."

More information: Email: kurt.wegleitner@addcon.net; Web: www.addcon.net

Aquatic Asia 2011

In their ongoing drive to invest in effective marketing platforms, VNU Exhibitions and NEO have launched another big step: Aquatic Asia 2011.

This is the brand-new dedicated event for the Asia-Pacific aquaculture business. Not only does the concept cover the production of fish, molluscs and crustaceans, the event also strongly focuses on the production of algae. Aquatic Asia 2011 will be organised at BITEC Bangkok, March 9-11 and will be co-located with VIV Asia 2011.

Asia is the world's market leader in aquaculture. China, India, Vietnam, Indonesia and Thailand rank high on the list of the largest producers. Following special editions of Aquaculture at VIV Asia in 2007 and 2009, VNU Exhibitions and NEO have decided on a dedicated trade show for the Asia-Pacific Aquaculture business.

With this move, the organisers offer buyers and suppliers in aquaculture in Asia-Pacific a unique opportunity to meet key contacts active solely in aquaculture or with a joint-interest in both aquaculture, poultry and/or pigs. Aquatic Asia 2011 focuses on the research & development, production and marketing of 4 main categories for aquaculture: Fish, Molluscs, Crustaceans and Algae.

The aquaculture business regularly focuses on the production of fish, molluscs and crustaceans. "The organisers of Aquatic Asia 2011 have also opted for the production of algae to be included due to its significant growth potential and extensive range of applications," said Ruwan Berculo, Project Manager.

With 4 years of experience in aquaculture events, the organisation has established an Asian-wide network of key suppliers, buyers, media partners and associations. As a result, 25% of the total number of visits to VIV Asia 2009 had a specific interest in aquaculture. In close co-operation with exhibitors and media partners the event is targeting suppliers all along the supply chain. However, it is expected that the production and feeding will be a significant part of the event.

More information: Email: aquatic.asia@vnuexhibitions.com; Web: www.aquatic-asia.net.

Aqua specialist in a new technical support role

Meriden Animal Health Limited has appointed Matt Pearce as International Technical Support Specialist. Matt will head the Aqua division at Meriden Animal Health and give support to the growing demand from the Orego-Stim® Aquatract product range. Matt has 10 years international experience working in commercial fisheries and aquaculture and has a MSc in Aquatic Pathobiology from the Institute of Aquaculture, University of Stirling, Scotland.

Matt said he is looking forward to building his career within the animal feeds sector at Meriden Animal Health which offers practical and economic solutions to modern agricultural practices.

More information, Email sales@meriden-ah.com

Wins Sustainable Biofuels award

SBAE Industries has received the award in the Green Shoots competition during the past World Biofuels Conference in Amsterdam. The Green Shoots award is given to the most exciting innovation in next generation development.

The Belgium company, founded in 2006, has biological and engineering expertise in the area of algae and algae based products. It applies processes that are sustainable, natural and clean. The indoor AlgaForce platform is suited for mass production of high value algae monocultures. The outdoor DiaForce™ patented system enables bulk production of diatom algae polycultures.

The award was handed out to Dr Koen Vanhoutte, founder and Science Director of the company. The selection by an independent judging panel is based on the criterion of greatest sustainability benefits as measured by GHG savings, environmental impact and further societal benefits of the operations or technology.

SBAE has added the DiaForce™ technology as a third pillar of algae production technologies. To date, those production technologies were limited to the open ponds versus closed photo bioreactors options. The patented approach imitates rivers. This third pillar enables various new engineering solutions to the processing of algal biomass. It operates on running seawater and marginal land. It tackles the food-feedstock conflict and alleviates freshwater needs for salinity reduction in traditional open pond systems. Moreover, part of the diatom biomass can be used as a fishmeal replacer, which reduces the price pressure on the aquaculture/human food sector.

For more information: Web: www.sbae-industries.com

Revolutionary freshwater system under construction in Singapore

This is the world's first self contained re-circulating system for rearing saltwater species, in freshwater and in inland areas. This OUROBORUS™ Freshwater System was developed by UK based Diobas Limited.

In its final stages of construction in Singapore, the 2.8 million gallon (600 tonnes) facility in Singapore will be operational in three months. The company said that the Agri-Food & Veterinary Authority of Singapore (AVA) was quick to recognise the potential and have set up meetings in Singapore with its directors in April to explore the installation of a series of production units for local production of both marine and freshwater species.

Since going public in September 2009 with the results of the revolutionary new technology that can be applied to both marine and freshwater species, Diobas said that events have progressed at such an incredibly rapid rate and that they are struggling to cope with demand. Continuing research is dramatically increasing the number of species that can be successfully reared in this system, which now includes the marble goby, arowana, turbot, bluefin tuna and giant grouper. Their research also indicated that the shellfish can be cultured and that growth rates of the lobster and crayfish are promising. Coupled with their patent applied for Ciren® EMF technology and vegetable based feed, the company said they are not surprised that the Far East have been the first to install their system to produce quality fish.

Steve Marriot, Managing Director of Diobas said "It is a fantastic achievement for all of us at Diobas to see the results of our 16 year investment into this research finally establishing itself throughout the world. Over the next 18 months, in excess of 100 full scale production units are planned to be constructed, under license with the smallest unit yielding in excess of 75 tonnes of fish per annum at an attractive and sustainable market price. Our system will enable the production of fish as a valuable comparatively cheap source of protein in areas where food production is often impossible. At long last, we are one step nearer to our vision where all fish are produced in a humane and carefully managed environment alongside processing plants situated where they are needed."

The demand to implement this technology has been overwhelming with licensing agreements under negotiation with Germany, Denmark, USA, Canada, Malta, Cyprus and others, with Singapore, Malaysia and Ireland already secured.

More information: Web: www.diobas.com, Email: commercial.director@diobas.com

Sustainable fishmeal can support expanding aquaculture

Growth in production from aquaculture will not be limited by ensuring the supply of fishmeal and fish oil is sustainable. This is a central message Dr Andrew Jackson, Technical Director of the International Fishmeal and Fish Oil Organisation (IFFO) will deliver at AquaVision 2010, 7–9 June in Stavanger Norway and he will support it with evidence from the past and present.

"In 1960 virtually all fishmeal, 98.5%, was used in pig and poultry feeds," says Jackson. "At the time, pig and poultry producers were concerned they would not be able to increase production without new sources of fishmeal. As we all know, in the past 50 years the production of both species has increased enormously yet today they use less fishmeal than in 1960. We will see a similar transformation in aquaculture, though marine raw materials will continue to make an important contribution. That is why we are working to ensure the supply is sustainable through the application of effective regulation and strict sourcing criteria."

Responsible fishmeal

IFFO in October 2009 introduced its Global Standard for Responsible Supply which covers two critical areas: responsible sourcing of fish for fishmeal and oil production and the purity and safety of these products. IFFO cooperated with fish meal producers, feed companies, fish farmers, fish traders, the Global Aquaculture Alliance, the Marine Conservation Society and WWF Scotland in drawing up the standard. The fishmeal producers are audited by a third party certification body and the outcome is confirmed by a standing committee that includes a retailer, processor and environmental NGO. The first fishmeal producer to meet the standard was certified in February 2010, with several more in the following months.

Preparing for the future

If fish catches for reduction are controlled at sustainable levels and with a growing proportion being processed for the more lucrative human consumption market, aquaculture faces the challenge of a limited or declining sustainable supply. "The aquaculture industry anticipated the challenge and has answers in place," says Jackson.

"Research is reducing the levels of fishmeal and fish oil needed in fish feed and the increasing volume of fishmeal coming from by-products of fish processing is an important development. Trimmings now constitute around 25% of the raw material for fishmeal production, which is a good way of using the wild catch and farmed fish to maximum effect. However we need precautions. Clearly, fishmeal should not be fed back to the same species, so identity preservation is necessary. Second, care is needed to avoid by-products from endangered species and to avoid contamination, for example with land animal proteins. We are developing a definition of what constitutes an acceptable by-product and will add it to our standard."

Organised since 1996, the biennial aquaculture business conference AquaVision has developed into a leading meeting place for decision makers at strategic level in modern aquaculture worldwide. AquaVision is organised by Skretting and parent company Nutreco with day-to-day coordination by Blue Planet.

More information: Email: lillian.hoeivik@skretting.com Web: www.aquavision.org

Cognis Australia

Opens facility for production of carotenoid-enriched Artemia

Cognis Australia has unveiled its state-of-the-art facility for production of carotenoid-enriched artemia (brine shrimp). This high quality supply of artemia will address the gap in the quality and quantity of this aquaculture feedstock, leading to reliable and sustainable improvements in fish farming practices. The artemia project is jointly funded by Fisheries Research and Development Corporation (FRDC), Department of Fisheries Western Australia (DoFWA), and Cognis Australia Pty Ltd.

"We are delighted to contribute our production expertise, and facilities, to the partnership, and the support we have received from the Australian and West Australian Governments has been outstanding," commented Roger Taylor, General Manager of Cognis Australia.

"The sustainability of this project is due to an elegant integration between Cognis' high-salinity natural algal cultivation lagoons producing mixed carotenoids, and the brine shrimp that thrive on the algae," comments Boyd King, Nutremia Project Manager at Cognis Australia. "The symbiotic existence of the two cultivation processes makes it uniquely positioned to provide a much-needed natural resource to the aquaculture market. We are currently targeting the Australian market and actively seeking international distribution partners for our products."

Cognis' supply of artemia is nutritionally superior, as well as reliable and renewable. The carotenoid-rich artemia will be sold under the trade name Nutremia™, or through licensed distributors to the aquarium market.

Nutritious and safe

One of the biggest concerns for the aquaculture industry is bio-security as pathogens can quickly devastate the industry. Using closed systems and naturally hyper-saline conditions, Cognis is able to produce artemia in a way that greatly reduces bio-security risk. Another advantage of this new source is the nutritional profile of the artemia, which are fed a lush diet of carotenoid-rich algae. The bright orange colour of this artemia indicates good health, specifically the presence of carotenoids, which contribute to the colour, fertility, and immunity of prawns and fish.

"Nutremia has become an important component of our balanced hatchery diets, and the prawns feed on it aggressively," reports Tony Charles, Australian Prawn Farms' Hatchery Manager. "The addition of Nutremia with other fresh and pellet feeds helps me achieve an effective nutritional balance. Before I started using Nutremia I had been looking for a source of quality artemia biomass for a long time. Nutremia is clean, bright orange which indicates high carotenoid content, and is of the highest quality."

A sustainable future for the fish industry

The next step for Cognis' artemia project is to commercially produce artemia eggs, or cysts, to supply the aquaculture industry. The cysts are shipped in dry form to fish farms where they are hatched on-site specifically for fish species which thrive on live feed. The global demand for cysts is currently served by harvesting wild blooms of artemia from salt lakes. The annual harvest volumes from salt lakes can vary dramatically in quality and quantity, causing turmoil in the aquaculture industry as it struggles to find alternatives.

More information: Web: www.cognis.com

Aquaculture insurance is critical to risk management

Aquaculture insurance is one of the tools used in aquaculture risk management, but in Asia there is a general lack of awareness on including this as part of a business plan.

Singapore Aquaculture Group (SAG) was established with the purpose of becoming the valued partner of choice for organisations, communities and individuals in the aquaculture industry. Matthew Tan, an insurance veteran of over 20 years said that the role of SAG is to provide well-managed and responsible aquaculture services, especially in the area of insurance products, technical consultation, investments and project management.

Stock Insurance

"It is common for farms to have insurance for the physical structure but stock insurance remains in its infancy. Insurance for stock is a rarity in Asia, possibly because of perceived costs, lack of information on the benefits and tedious documentation process. In contrast, fish stock insurance is available in Europe, North America, South America, Japan and Australia and many farms have aquaculture insurance, said Matthew.

" In early 2009, using my experience in general insurance of more than 20 years, I started to introduce a regional platform for aquaculture insurance in Vietnam, the Philippines, Indonesia, Malaysia, Taiwan and Singapore. SAG is now working with local governments in the region to conduct seminars and introduce the aquaculture insurance concept, as part of the total planning for new farms and projects".

"It is also unfortunate that some Asian producers have been too late in procuring insurance. For example, in the typhoon in 2009 that hit southern Taiwan and also the Philippines, many ponds and cage culture farms were destroyed."

In Asia, the regulations on general insurance differ among countries. In many Asian countries, an aquaculture program has to be underwritten and procured in UK. This adds to costs, albeit unavoidable, in the insurance supply chain. Matthew is also an Aquarius Consultant, focusing mainly on the Asian market. Aquarius Insurance Services Ltd, is a UK based aquaculture insurance specialist company for the global aquaculture industry. The company has 40 years of combined experience in aquaculture insurance.

Matthew Tan with Tim Sangster, MD Aquarius Insurance Services (right).

Matthew Tan, right, with Oto Lee, CEO & owner of Crossback Arowana Farm (middle) during one of his visit and insurance survey. In Malaysia, many arowana owners and farmers are keen on insurance for their high value fish.

Documentation and risk management

"Farms can benefit from stock insurance through the risk management process survey. We will be able to know what the farm operation is lacking or what it needs to put in place. Farms will be required to show their standard operational procedures such as monitoring of stock and proper records on water quality, disease outbreaks and treatment protocols. In the long term, the industry will learn to document activities which will help in managing risks", said Mathew.

Safety net for farmers

"Aquaculture insurance comes at a price but we have to look at several concepts unique to Asian farmers and on how the insurance will be beneficial for the farmer. This includes working with associations and perhaps, governments to underwrite a stock insurance program for small scale farmers. With the unpredictability of weather conditions and possibility of natural disasters and disease, aquaculture insurance plays a vital role by providing a good safety net for aqua farmers in Asia. Insurance can give that security, peace of mind and the farmers' welfare and business are protected," said Matthew.

Spreading wings

Establishing an insurance platform in the Asian region is a challenging and demanding process for Matthew. "As aquaculture insurance is in its infancy, relatively unknown and inaccessible to farmers in Asia, it has been an educational process for me too. Considerable time is spent educating farmers and companies on the importance of insurance and its benefits," said Matthew, as he travels every week to Vietnam, Malaysia, the Philippines and Indonesia. Next on his agenda will be Taiwan and China.

VICTAM Asia 2010 | FIAAP Asia 2010 Feed Ingredients · Additives · Formulation | grapas asia 2010 flour milling · grain · rice · pasta processing

Praises for this combination of three trade shows and conferences

These three events co-located under one roof brought together animal feed processing technology, animal feed ingredients, additives and formulation as well as rice milling, grain processing and preservation. The venue was the Queen Sirikit Convention Centre, Bangkok from 2 to 5 March 2010. Organisers said that conference participants and the 173 companies exhibiting came from all over Asia, Europe, Canada, North America, Australia, and New Zealand and even from as far away as Mexico and Argentina to see, examine and discuss the range of products on display. About a third of exhibitors were from China.

Organisers were happy with the outcome of the show and quoted comments that capture the feelings of the 'entire' show.

"As a visitor I can now come to this one event and find what I need for my mill and all under one roof!" *~ A visitor*

"I enjoyed the meeting, which was a good program and well run. The trade display associated with all the days was one of the best I have seen." *~ A conference delegate*

"We were able to sit down and talk to our customers, this show brings the right people to our booths, the decision makers." *~ An exhibitor*

Aqua feed in Thailand

Since 1992, the Department of Fisheries is responsible for the implementation of the Aquafeed Quality Control of the Animal Feed Quality Control Act of 1982 and the subsequent rules of 1999. As the first speaker at Aquafeed Horizons Asia 2010, Dr Juadee Pongmaneerat, Department of Fisheries presented information on the status of aqua feed production in Thailand. Since her last update two years ago, Thailand's production of tilapia and freshwater prawn continued on its upward trend. So did fish meal production which was 535,000 tonnes in 2008 with an increased value of THB 29.22/kg. Concurrently, feed production for various finfish increased to 581,800 tonnes in 2009 whilst that for the marine shrimp decreased to 672,000 tonnes. In 2009, more feed manufacturing facilities were certified under the Good Manufacturing Practices (GMP).

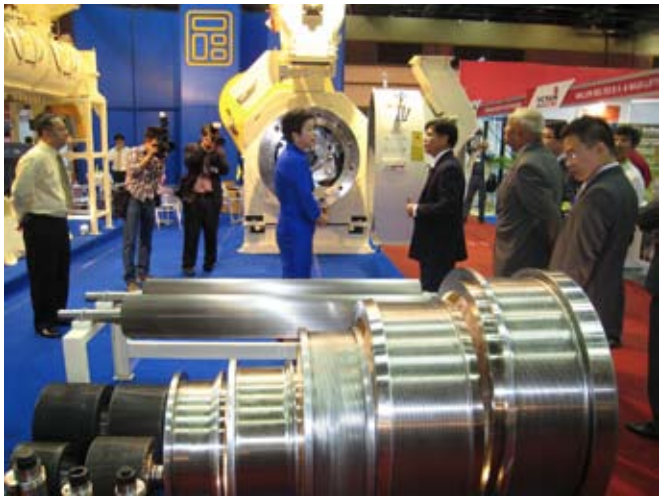
Larger machines at Victam Asia 2010

Following the trend in previous years, the big names in feed processing showed up with large displays of the latest machines and equipment. In general, these reflected the good times for the feed production industry in Asia, both for livestock and aquaculture, according to an industry source at the show. The main markets are Vietnam and Bangladesh.

At its booth, Triumph Engineering, Thailand displayed a 30 tph pellet mill for poultry feeds and 6 tph extruder for fish feed. Andy Lee, Managing Director, Megaline Far East, the Malaysia agent for Triumph said, "Big is the name of the game at this year's show. Almost all the major machine makers were exhibiting huge machines especially the extruder for fish feed and pellet mills. I think 'increase production to save cost' is the trend."

"Although we know most of the people coming from Malaysia, we managed to also see manufacturers of other products like rollers for flour milling and grain handling. I think the exhibition is quite successful. Almost all the big names were at the show. The people coming to our booth were real end-users".

As they have done two years ago, the booth of Wenger/Extru-Tech, USA was of the same size and in the same spot. On display was an Extru-Tech E-800 HC, a high capacity 10-11 tph single screw extruder for aquatic feed, which has been sold to a company in Bangladesh.



Welcoming VIPs from Thailand at the Triumph Engineering booth

The Extru-tech/Wenger USA booth featured a 10-11tph single screw extruder.

Visitors to Aqua Culture Asia Pacific booth at Victam & FIAAP, from the Gold Coin Group, Sam Soh, Regional Director (right) and Jonathan Wilson, COO with Antonio C. Choa, Camden Industries, Philippines (left).

At the Addcon booth, from left; Kunjie Li, Christian Luckstadt, Kurt Wegleitner, Kai Kuhlmann and Karsten Schroeder.

Joseph P. Kearns, Aquaculture Process Engineering Manager explained to visitors some new developments achieved in both the twin screw and single screw extruder designs, which allow an increase capacity for feeds less then 3mm in diameter.

"Extruders both single and twin have always been limited in capacity for smaller diameter feeds until now. Developments in both the areas of the final screws and the dies now allow for capacity increases in the area of three to five times up to the normal capacity rating of the extruder in question. Five tph extruders now can make 5 tonnes of small diameter feeds either floating or sinking. The same applies for larger extruders as well at their nominal capacities. It is believed that the advantages of extruders for shrimp feeds in terms of formulation and pellet size produced will result in extrusion becoming an increasingly popular production method now that the capacity can be elevated to real production levels".

"Victam Asia 2010 was a big success with visitors from all over the world. We met many friends and made new ones too. We noted that visitor interests centred on aquatic feeds for all style of feeds from floating, sinking, shrimp, sea bass, sea bream and other specialty species such as abalone and sea urchin. There were other areas of importance including chicken, pig and dairy cattle feeds made from a specialized Universal Pellet/Cooker® which has been proven to work in these fields. We had visitors from Northern Europe, South America, Asia, Africa, Australia and the Middle East. It was truly a worldwide event. There was quite an interest in feeds for marine fish in Asia, which would indicate more expansion into open waters. Salmon feed discussions and abalone feeds from the colder water areas of the world were a surprise but welcome discussions", said Kearns.

Liu Guang Dao at Muyang, China's booth said that growth for the company has been in international markets rather than in China. He expects further expansion in the fish feed production sector in India. The machines on display were a high capacity pellet mill, twin-screw extruder and a new model of a hammer mill. At the E.S.E booth, the new machine was the Vibra Roto, a state of the art compact, fast and efficient screening system for size separation.

In a press release on the show, Buhler announced that it is continuously developing the Asian market where it operates its own production plants in China and India. The company offers a wide range of solutions for complete plants, processes and stand-alone machines. Several solutions for the production of high quality feed and aqua feeds were proposed. There is a modular design pelleting system with a capacity up to 30 tph and adapted to specific needs and a high speed

On display at the Department of Fisheries, Thailand booth were details of the specifications of feeds at various culture stages for eight species ; catfish, freshwater fish (omnivorous), freshwater fish (carnivorous), marine shrimp, freshwater prawn, marine fish, soft shell turtle and frog.

The ICC team, Luciana Porciuncula (right), Fabio Lima Freire and Daniel Morais with visitor, Abdul Ahad Wahla, Vet Vision Enterprise, Pakistan (left)

At the UniPoint AG booth, Tan Meng Kiang, Dr Klaus Hoffmann, Chemoforma Ltd and Dr. Nah Keng Cheng, Technical Consultant, Unipoint Ag for Asia.

mixer with 20 mixing cycles per hour. There is also the innovative AHZC Hammer Mill, which saves energy and enables a constant product throughput and a compact twin extruder with a small footprint, which is powerful, fast and flexible.

Additives for aqua at FIAAP

Brazilian company, ICC is a regular exhibitor at these shows in Asia. ICC was established to develop innovative products from yeast with the support of research in universities and research centres. The other aim is to improve the scientific understanding of yeast properties and components. Such a product is Immunowall®, a prebiotic derived from the *Saccharomyces cerevisiae* yeast cell wall and rich in mannanoligosaccharides (MOS) and β-glucans. The immune stimulating action of the latter, leads to better growth performance. The product also has proteins, lipids and phosphate. At the ICC booth, Luciana Porciuncula, Sales Manager, Asia Pacific, said that the perfect choice for chlorophyll A and B as well as source of high quality protein is a concentrated alfafa extract (CAE). This is an extract from lucerne juice, heated by hot air at 150°C to develop a product with 52% crude protein. The ingredient has a balance synergy of carotenoids, xanthophylls and tocopherols. It also contains linoleic (Omega 6) and linolenic (Omega 3) fatty acids. The inclusion of CAE in shrimp diets at 4 to 8% increased astaxanthin pigmentation which results in a strong red colour. Its inclusion increased weight gain significantly. In fish, it improves growth by 5 to 6% and brings up the natural yellow colour on the operculum and frontal area.

E.S. E Inc's Ing Josef Barbi (middle) and wife, Mercedes with a visitor from Kenya

The new product for aquatic feed at GePro Gefluegel-Protein's booth is derived from LT drying of hydrolysed feathermeal. Marketed under the Gold Mehl® range, it showed enhanced growth in the Asian seabass. This was attributed to the highly digestible proteins, which the company says can replace fish meal. In diets for the vannamei shrimp it can partially substitute for fish meal. New to the show is India based Advanced Enzyme Technologies Limited. It has three products for the aquaculture industry: SEBLip AQ an effective solution for white spot disease syndrome in prawns and shrimp, Aquatrenz, a blend of probiotics and enzymes fortified with vitamin C and AquaSEB SWP, a water quality management system for ensuring proper phyto and zooplankton populations and for improving dissolved oxygen levels.

Henk van de Bunt, the General Manager of Victam International BV, the organisers of the event, announced that FIAAP Asia, Victam Asia & GRAPAS Asia will return to Bangkok in the spring 2012.

Proconco is the 2010 Asian Feed Miller of the Year

Vietnamese feed miller Proconco is the 2010 Asian Feed Miller of Year, the award organised by Asian Feed Magazine and sponsored by Addcon. Proconco was one of four finalists from Pakistan, Sri Lanka and Vietnam judged on five criteria: industry leadership, use of technology, quality control and safety, logistics and marketing.

Kurt Wegleitner of Addcon presented the award to Philippe Serene, Director General of Proconco. Proconco won the majority of the votes of four judges: Dr Robert Swick from Linden Nutrition, Singapore, Dr Seksom Attamangkune, Department of Animal Science, Kasetsart University Kamphaeng Saen Campus, Thailand, Rex Holyoake, Publisher of Asian Feed Magazine and Kurt Wegleitner, Addcon.

"Achieving sales of more than one million tonnes/year in Vietnam requires great products, ongoing innovation, the right strategy and right pricing. Proconco has shown for 18 years that it is able to fulfill those requirements. Proconco has shown that it is constantly at the forefront, even under difficult macro environments," said Wegleitner.

The Asian Feed Miller of the Year Award is an annual award for the most innovative feed miller in Southeast Asia or South Asia. Participation for the 2011 award will open in September 2010.

World Aquaculture 2010

Working for "Sustainable = Profitable"

By Eric Roderick

A general consensus from the broad spread of delegates from industry, academia and government institutions is that aquaculture is weathering the global financial situation better than most and there is overall optimism amongst the stakeholders.

World Aquaculture 2010 in San Diego, USA from March 1-5 was a combined conference and trade show for World Aquaculture Society (WAS), the National Aquaculture Association (NAA), the US Aquaculture Suppliers Association (USASA), American Tilapia Association (ATA), Striped Bass Growers Association (SBGA) and US Trout Farmers Association. More than 3,000 participants from 80 countries registered. The number of companies exhibiting was 150 in the 173 booth trade show. Oral presentations were split over 16 concurrent sessions. There were also over 200 poster presentations. Every significant cultured species was featured, but the main ones were shrimp, trout (and other salmonids), catfish, tilapia, flatfish, shellfish, striped bass, sturgeon and algae. Highlights of the conference and trade show are reported below.

Certification and ecolabelling

With the conference theme in mind, the keynote speaker was Peter Redmond representing Global Aquaculture Alliance (GAA) who spoke on "The importance of certification" followed by a session on ecolabelling in Aquaculture. There are currently 3 main certification organisations, World Wildlife Fund (WWF), Global Gap and the Global Aquaculture Alliance (GAA) competing directly for clients on a global basis with their eco-standards. The ideal scenario would be a single standard, so there may be some consolidation to enable producers and consumers to have a more transparent view of the sector. All three organisations have completed their tilapia certification schemes and the result of an independent study comparing all three will be published soon.

There were also sessions on Sustainable Aquaculture, Best Management Practices (BMPS), and Environmental Impacts of US Aquaculture. The latter had several presentations on effluents, and discharge which is of major importance in any new planning application and 'zero discharge' is what people are looking for to satisfy the environmental lobby. Traceability was another word that cropped up in several presentations, highlighting the importance of being able to track the fish from the farm to the plate.

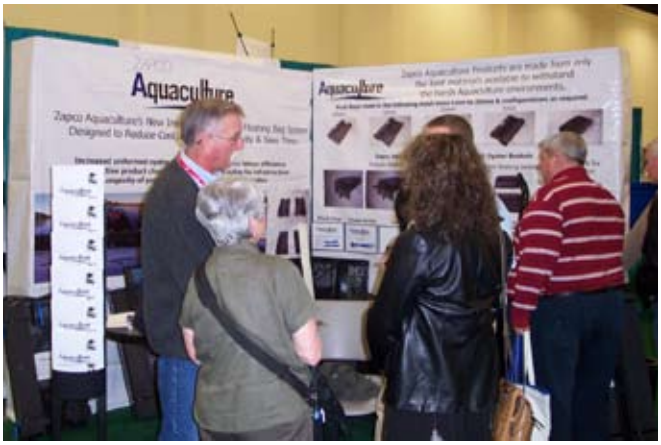
Replacements for fishmeal

Nutrition featured prominently, with replacements for fishmeal discussed, along with many alternatives to live feeds such as artemia for larval rearing. Biofloc featured heavily too. Algae seem to be the new buzzword in aquaculture nutrition and recent research indicates that algal extracts can replace fish oils in many fish diets. Nutrition and larval rearing are seen as the major obstacles to the farming of many new species, and as such attract much industry research funding. Professor Simon Davies from the University of Plymouth, UK, gave a talk on "Dietary mannan oligosaccharide supplementation modulates intestinal microbial ecology and improves gut morphology of rainbow trout" which reported on Alltech's Bio-Mos feed supplements. Alltech also had a prominent booth at the trade show, which was always busy and Alltech's President and owner Dr Pearse Lyons even managed to call in for a visit.

FDA

There were several sessions on drug testing and regulations and the US Food and Drug Administration (FDA) gave presentations on the development of safe and effective drugs for treating fish diseases at their Center for Veterinary Medicine Office of Research. The FDA also had a booth at the trade show to respond to any enquiries. Priorities include studying the biodistribution, residue persistence, metabolism, efficacy and environmental effects of drugs and other chemicals used in aquaculture. Other studies are designed to investigate the effect

SBAE Industries, Belgian is a company bringing together biological and engineering expertise, enabling them to produce micro algae for green water technology and other applications in industrial quantities. The GreenStim Concept is monocultured micro algae for the aquaculture industry. In the Photo Koen Vanhoutte, the CEO, in discussion with senior managers at Alicorp who produce Nicovita feeds in Peru.



Zapco an Australian company supplying shellfish products as well as general aquaculture products, and they were launching a new product, which was the world's first injection moulded floating oyster basket.

Aquaneering Inc. an international leader in the manufacturing and design of aquatics research systems. These are currently being used for Zebra Fish research facilities.

Current WAS president Jeff Hinshaw (middle), with WAS Latin American Chapter President Juan Pablo Lazo (left) discussing the YY male tilapia technology at Fishgen's booth with Vicente Porragas a commercial tilapia farmer from Mexico already using Fishgen's YY technology.

of drugs on the environment, non-target species and the pathogens associated with aquatic species. Of increasing importance are studies designed to understand the development and transmission of antimicrobial resistance in both pathogens and environmental microbes. Health management also featured prominently in the conference.

Shellfish were certainly very well represented with several sessions and a great many papers devoted to research, culture health benefits, and genetics highlighting the commercial importance of shellfish in global aquaculture production figures. Several papers looked at funding opportunities for the aquaculture industry, as there is certainly going to be further expansion to meet market demands. With aquaculture currently providing over 50% of the fish consumed globally and with more pressure on wild stocks, many new species are being successfully cultured, due to the excellent research work being undertaken and it seems that the outlook for aquaculture as a global industry is very positive. There were 18 presentations from Iran, enabling a full session devoted to Iranian Aquaculture, in particular on the sturgeon. There were two sessions devoted entirely to Zebra fish culture, showing the importance of this ornamental species as a "model species" for high tech aquaculture research and several exhibiting companies offered specialised equipment required for Zebra fish culture.

Trade show

The trade show covered every product you would ever wish to buy and many you did not know you needed until you saw them. Most companies reported making some business at the show, but some booths were much more popular than others. SBAE, the new Algae company run by Koen Vanhoutte reported great interest especially in the "GreenStim" concept enabling you to efficiently run a green water system in your hatchery (see page 43).

NorthWest Marine Technology from Seattle reported good business and Lee Blankenship, the Biology Director commented on a big increase in Chinese visitors to the trade show over previous years, with a lot of interest in NMT's Visual Implant tags. Many visitors were very impressed with their AutoFish system, which automatically fin clips, and coded wire tags fish at the rate of 50,000 every 8 hours without being anesthetised or touched by human hands. One of the most impressive items offered for sale by NMT is a large tagging truck, which is basically a travelling fish tagging laboratory, fully kitted out with everything you would need to run a large tagging programme in remote areas.

As with most aquaculture meetings these days, the "farm tours" proved extremely popular, effectively covering the aquaculture spectrum in California. One visit was to the Hubbs Sea World Research Institute's Leon Raymond Jr. Marine Fish Hatchery at Carlsbad. This facility set up in 1983, but completely revamped in 1995 is primarily involved in stock enhancement of the local marine species, white sea bass (*Atractoscion nobilis*), Californian halibut (*Paralichthys californicus*) and spotfin croaker (*Roncador stearnsi*) and is funded mainly by the California Department of Fish and Game's Ocean Resources Enhancement and Hatchery program. The facility is on a 2.4ha site, with 0.8ha leased from a local generating station for USD1 a year. There is a large flow through system, with 3 huge sand filters on the intake, to ensure good water quality through the raceway rearing tanks which are also fitted with large biofilters, ensuring that the discharge water is cleaner than the intake.

White sea bass is the priority species at the moment and the broodstock are held in several large indoor tanks on a recirculation system, enabling the researchers to manipulate temperature and photoperiod, to ensure spawning year round. The fry are then reared initially indoors for maximum growth in the warmer conditions using a range of live feeds, also produced on site. The fingerlings are then acclimated and transferred to the outdoor raceways, before being transported to near shore based net pens operated by non-profit groups, where they are reared to a size of 20 to 30cm before being released into the ocean. All fish are marked with coded wire tags and larger sizes ensure a good start in their new home. Upwards of 20% of tagged fish regularly appear in a wild fish catch and 100,000 fish were released last year.

Another visit was to the Carlsbad Aquafarm, located just north of Encina power station. Here they culture a diverse range of sustainable seafood and ornamental products. Aquaculture has been practised at this site for over 50 years and the cultured species include Carlsbad mussels, Luna and Blonde Oysters, Rainbow Abalone, Red Ogo, Ulva (sea lettuce) Chaetomorpha sp, copepods, artemia phytoplankton and seahorses. The tour to the California's Imperial Valley covered 4 facilities, focusing on algae for biofuel, along with catfish and grass carp farms.

The next World Aquaculture 2011 will be held in Natal, Brazil from June 6-10, 2011.

ASIAN PACIFIC AQUACULTURE 2011

January 17-20, 2011, Kochi, Kerala, India

Kochi, located on the west coast of India is the place for the next biennial conference and trade show of the Asian Chapter of the World Aquaculture society. The venue will be Le Méridien Resort and Convention Center.

Organisers said, "Kochi is the place to network and learn about the latest in aquaculture, current and new research and all other aspects of aquaculture. It will be the venue to network with suppliers of technology, feeds, etc. in the trade show and enjoy everything that is the new India, an awakening giant".

The event will be jointly hosted by the College of Fisheries, Kerala Agricultural University, Panangad, Kochi, and the Kerala State Fisheries Department. At a press conference for the meeting on 5 February 2010, the Minister of Fisheries said, "APA 2011, which is the first of its kind in India, will be a milestone in the development of aquaculture in the country. It will also give a new direction for its future developments. It will facilitate the creation of a strong support system by promoting technical and infrastructure developments in Indian aquaculture".

There will be a conference involving technical and producer programs with 2,000 international participants. A 3-day technical session on the culture of the freshwater prawn, Giant Prawn 2011 will be held concurrently (see box). An international trade show will showcase fisheries and aquaculture developments in India. There will be post-conference tours for the delegates to see the aquaculture developments in Kerala

CALL FOR PAPERS - DEADLINE: July 1, 2010

Asian-Pacific Aquaculture 2011 and Giant Prawn 2011 encourage the submission of high quality oral and poster presentations. All abstracts must be in English, the official language of the conference and should be submitted online at www.was.org. More information: Email: worldaqua@aol.com Web: www.was.org

Tentative Sessions

Sessions and workshops at Asian-Pacific Aquaculture 2011 will cover all aspects of aquaculture in India as well as Southeast Asia.

- Marine Shrimp – Production, Nutrition, Diseases & Genetics
- Giant Prawn – invited & contributed
- Tilapia and Carps – Production, Nutrition &, Health
- Genetics in Aquaculture – Population Genetics, Selective Breeding & Genetically Modified Organisms
- Shellfish Culture – Crabs & Lobsters, Molluscs & Production Systems
- Aquafeeds / Nutrition – Nutrient Requirements , Alternative Feed Ingredients & Feeding Strategies
- Animal Health – Pathogenomics, Nutritional Diseases & Emerging Diseases
- Marine Finfish – Cobia, Grouper, Production & Nutrition
- Pangasius – Production, Nutrition & Health
- Freshwater Aquaculture – Integrated Cultured Systems, Production & Nutrition
- Seaweeds and Algae – Integrated Cultured Systems, Bioremediation, New & Alternative Uses
- Production Systems – Aquaponics, Organic Aquaculture & Recirculating Systems
- Economics, Marketing (IAAEM) – General Economics, Consumer Behaviour & Supply Chain
- Aquaculture Biotechnology – Bioremediation, Vaccine Production & Diagnostics

Giant Prawn 2011 (GP2011), a landmark technical meeting on the culture of freshwater prawns, will be held as a component session of APA 2011. The session will provide a unique opportunity for all those involved in freshwater prawn farming and research to share knowledge and meet new contacts. In addition, field trips to freshwater prawn farming sites are being planned for 21 and 22 January 2011.

The scientific program for GP2011 consists of a 3-day invited paper session (18-20 January 2011), plus a one-day parallel session for contributed papers on freshwater prawn farming (date to be announced later). Invited speakers will present up to date information on biology, genetics, hatchery and grow-out technology, health management, processing and marketing. Some invited speakers include Nesar Ahmed (Bangladesh), Janet Brown (UK), Michael Frinsko (USA), Ilan Karplus (Israel), Spencer Malecha (Hawaii), Peter Mather (Australia), C. Mohanakumuran Nair (India), M.C. Nandeesha (India), Uthairat Na-Nacorn (Thailand), Michael New (UK), Nguyen Thanh Phuong (Vietnam), K.R. Salin (India), Amir Sagi (Israel), James Tidwell (USA), Wagner Valenti (Brazil), Patricia Moraes-Valenti (Brazil), Md. Abdul Wahab (Bangladesh) and Miao Weimin (China). Discussions on the contributions of several further invited speakers are on-going, said organisers Michael New and Dr. C. Mohanakumaran Nair.

The abstracts of all papers for GP2011, whether invited or unsolicited, will need to be sent to WAS by the abstract deadline, clearly marked "for Giant Prawn 2011". Authors are also reminded that selected GP2011 papers will be considered for a special issue of the journal Aquaculture Research after the conference.

What to expect in AQUA CULTURE Asia Pacific Magazine in 2010

Volume 6 2010			
Number	4	5	6
	July/August	September/October	November/December
Issue focus *Current trends and challenges*	Health & Biosecurity	Cage Culture	Food Safety & Traceability
Industry review *with profiles and outlook*	Freshwater fish/prawn	Tilapia	Marine Fish
Feed Technology	Pre and Probiotics Immunostimulants	Processing Technology Feed additives	Nutrition Novel meals & oils
Production Technology	Recirculation aquaculture technology	Feed management	Health management
Shrimp/Fish culture developments	Coverage on experiences from industry, including role models, benchmarking and opinion articles.		
Markets	Contributed reports on market trends, product development, issues and challenges.		
Show Preview/Issue		Aquaculture Europe 2010, Porto, Portugal 6-8 October Aquaculture China 2010/China Fisheries and Seafood Expo, 2010, November 2-4 Dalian, China PRC	Asian Pacific Aquaculture 2011 January 17-20 Kochi, India

Executive Program for Extrusion Processing: Technology and Strategic Management

June 10-12, 2010, Ooty, Tamil Nadu, India

This 3-day executive program on technology and strategic management in the extrusion business is organised by Kansas State University in partnership with Wenger Manufacturing, USA and Assocom, India.

This is a 3-day workshop, focused on technology of extruded products for the Indian market and strategic management of extrusion-based businesses. It is tailored for high-level executives from the processed food, pet food and aquatic feed companies in India. Technology topics are designed to familiarise executives with the latest issues and new developments in processing equipment, specialty processed foods such as quick cooking lentil and rice analogue products and aquatic feed and pet food products.

Strategic management topics will focus on developing solutions to help executives develop their skills for increased competitiveness. Areas will include risk management, strategy formulation and execution, human resource development, marketing and financial management and other commercial aspects of extrusion-based businesses. Several case studies will be reviewed.

Participants can register for the Ooty program (India module) only or in combination with a US module conducted at Kansas State University on August 1-6. The US module comprises a 6-day program: 2 days of field trips to survey the US retail sector and a hands-on session with pilot-scale extruders for processing of products such as lentil analogues, aquatic feed and novel pet food and 4 days attending the annual KSU 'Extrusion Processing-Technology and Commercialization' short course which includes more hands-on sessions on pilot-scale extrusion.

More information and registration:Raj Kapoor, Assocom-India Pvt. Ltd, Email: email@assocom-india.com Web:www.ksu.edu/igp

2010

May 22-23
Recirculating Aquaculture Technology Workshop
Hobart, Australia
Email: sarah-jane.day@aquaculture.org.au
Web: www.australian-aquaculturereportal.com

May 23-26
Australasian Aquaculture 2010
Hobart, Australia
Email: sarah-jane.day@aquaculture.org.au
Web: www.australian-aquaculturereportal.com

May 31-June 4
14 International symposium on fish nutrition & feeding
Qingdao, China
Web: www.isfnf2010.com

June 10-12
Executive Program for Extrusion Processing
Tamil Nadu, India
Email@assocom-india.com
Web: www.ksu.edu/igp

June 12-14
Vietfish 2010 – Vietnam Fisheries International Exhibition
Ho Chi Minh City
Email: quocthanh@vasep.com.vn
Web: www.vietfish.com.vn

June 16-18
Offshore Mariculture 2010
Dubronik, Croatia
Email: iroberts@mercatormedia.com
Web:www.offshoremariculture.com

August 20-22
8th International Conference on Recirculating Aquaculture
Roanoke, VA, USA
Email: Terry Rakestraw (aquaconf@gmail.com)
Web: www.recircaqua.com

September 22-25
Global Conference on Aquaculture 2010
Phuket, Thailand
Email: aqua-conference2010@fao.org
Web: www.aqua-conference2010.org

September 26-October 1
17th Annual Practical Short Course on Aquaculture Feed Extrusion, Nutrition, & Feed Management
Email: mnriaz@tamu.edu (Mian Riaz)
Web: www.tamu.edu/extrusion

October 5-8
Aquaculture Europe 2010
Porto, Portugal
Web: www.easonline.org
Web for exhibition: www.marevent.com

October 21-23
Tilapia 2010
Kuala Lumpur, Malaysia
Email: infish@po.jaring.my/ infish@tm.net.my
Web: www.infofish.org

November 2-4
Aquaculture China 2010
15th China Seafood and Fisheries Expo 2010
Dalian, China PRC
Web: www.Seafare.com

November 8-10
X International Symposium on Aquaculture Nutrition
Monterrey, Mexico
Web: www.fcb.uanl.mx/xsina/index.html
Email: sina2010@uanl.mx

2011

January 17-20
Asian-Pacific Aquaculture 2011 and Giant Prawn 2011
Kochi, India
Email: worldaqua@aol.com
Web: www.was.org

April 21-25
9th Asian Fisheries and Aquaculture Forum & 9ISTA-International Symposium of Tilapia Aquaculture
Shanghai, China
Web:www.9afaf.org
Web: http://ag.arizona.edu/azaqua/ista/ISTA9/ISTA9.htm

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