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AQUA Culture AsiaPacific

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Letters may be edited prior to publication

From the editor

Reaching for the win-win situation

I had just started on the first few chapters of Thomas Friedman's highly acclaimed book – The World is Flat, when I started thinking if his hypothesis holds true for the aquaculture industry. While visiting Nandan Nilekani, CEO of Infosys Technologies Ltd in Bangalore, Nilekani told Friedman that 'the playing field had been levelled'. He meant that countries like India are now able to compete for global knowledge work as never before – and America had better get ready for this. The world is becoming borderless with countries like China and India emerging as the factory and back office to the world, respectively.

This discussion is timely as it was in 2004 when the US Department of Commerce (DOC) imposed antidumping tariffs on shrimp imports from six countries and en suite other barriers (customs bonds for seafood exporters). The country-wide duties were 5.9% for shrimp from Thailand, 10.17% from India, 25.76% from Vietnam and 112.81% from China. Since 2003, the US imposed antidumping duties on Vietnam's catfish fillets and after a review in 2006, the nation wide rate was 63.88%. For Asian producers, this was stark punishment for producing at low costs. In the case of shrimp, the lower cost of shrimp aquaculture in Thailand cannot be compared to the high cost of harvesting depleting resources in the Gulf of Mexico. In the case of catfish, it is competing with American catfish producers with higher costs of production vying the same white fish markets in the US.

Some affected countries have since sought help from the WTO to 'level the playing field'. Ecuador and Thailand have already registered complaints to the WTO. There is bound to be a domino effect as it will only be a matter of time before the other penalized Asian countries follow suit (see brief news, p6).

Before we get emotional and parochial about this subject, let us take a step back and look at the bigger picture. Liberalising trade and allowing shrimp and fish to move across the borderless world would benefit the hundreds of millions of consumers in the US. The effect would be lowering the retail prices and making seafood affordable to all. This will increase consumption and create an even larger market for all aquaculture producers.

This has brought some resilience in the industry too. With the imposition of antidumping duties on its catfish fillets, Vietnam looked for other markets and today counts the EU as its major market. With the increased attention on hygiene and the method of production, they have developed procedures to produce better quality fish and shrimp, amenable to consumers in Europe and parts of Asia.

The complaints to the WTO will help to level the playing field and figuratively speaking, flatten the world. So Friedman's hypothesis does apply to the aquaculture industry. In another article in the IHT, William Pesek Jr said that another reason to support the free movement of goods, capital and people is that it will raise living standards. If you have recently visited Vietnam's Cantho City and the smaller towns in the Mekong Delta, you will be convinced and happy to know that aquaculture is contributing to the country's economy.

Levelling the playing field creates winners in the consuming public and low cost producers. Whichever way one looks at this, it has to be considered a win-win situation – and high cost producing countries (Asia included) had better get ready for this.

Zuridah Merican

What it should have been

In the July/August issue, Trade show at Aqua 2006 (page 39, col 2), we stated that Sino Aqua of Taiwan was established in 1997. We stand corrected and it should be '1987'. We apologise for this error.

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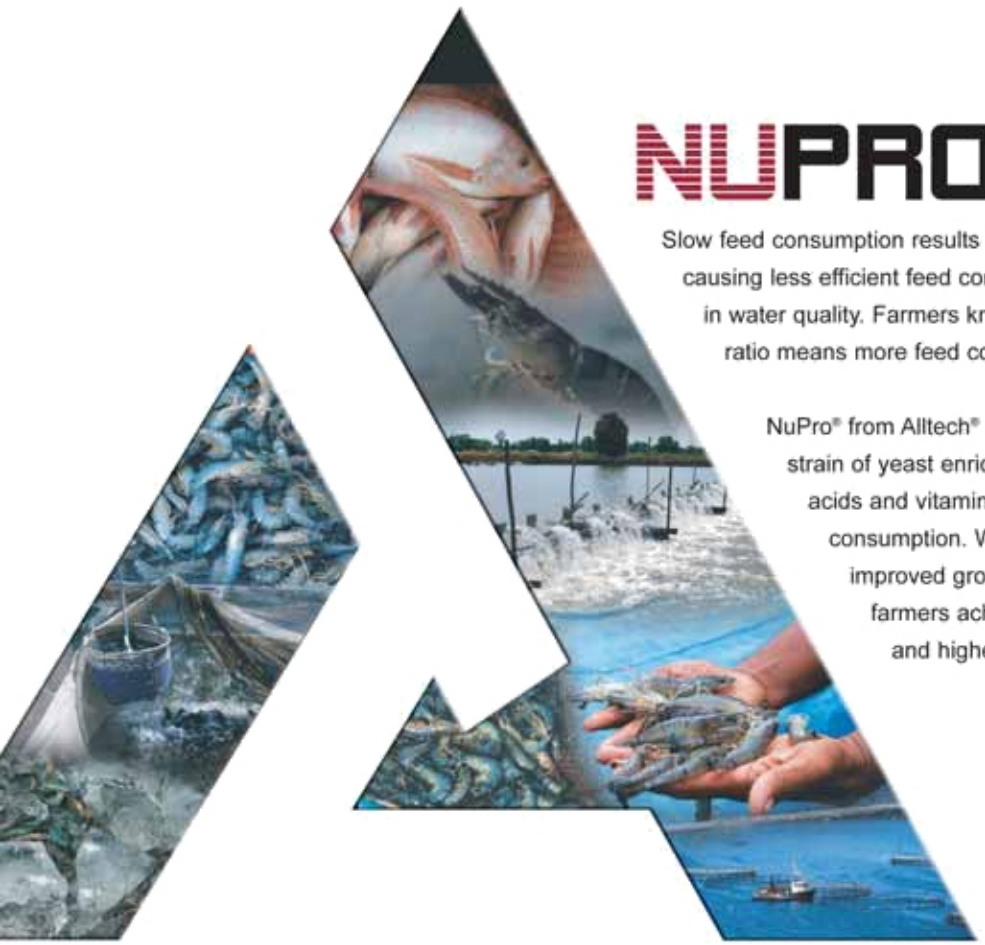

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ASEAN Shrimp Alliance (ASA)

In June, the Department of Fisheries, Thailand held discussions with representatives of the shrimp industry from member countries of the Association of Southeast Asian Nations (ASEAN) on the establishment of an 'ASEAN Shrimp Alliance'. This was agreed by seven members of the ASEAN nations (Brunei, Cambodia, Indonesia, Malaysia, the Philippines, Thailand and Viet Nam). Its purpose was to win recognition among consumers and buyers and to strengthen the price of the product of ASEAN on the world market. Both ASEAN-region governmental and commercial sectors will take part in the ASEAN Shrimp Alliance activities.

At the Thai Fish Expo held from June 24-27June, Dr Jaranthada Karnasuta, Director General, DOF, Thailand (second left) with Dr Niwat Suteemeechaikul, DDG (right), Dr Jivawan Yampragoon, Senior Expert in Fisheries Products and Inspection (left) and Dr Poonsap Virulhakul, Senior Expert in Fisheries Management.

The Director-General of the Department of Fisheries, Thailand, Dr Jaranthada Karnasuta said that the alliance was aimed at setting up common standards for shrimp exports from ASEAN countries and tackle problems of trade barriers. ASA will also promote the sustainable trade of seafood products and serve as a forum for the harmonisation of intra-ASEAN quality standards and certification systems.

In a first step toward establishing the new group, the first meeting of the Alliance asked Thailand's Fisheries Department and the Southeast Asian Fisheries Development Centre to study the scope, role, mandate, possible technical cooperation, trade and industry agreements within the framework of the Alliance.

A website (www.aseanshrimpalliance.net) has been created to serve as an information portal on academic, trade and regulatory information for members.

Dipasena restarts

Since July 2006, normal operations have started at Wahyuni Mandira in Lampung, Sumatra. The farm is part of the world's largest shrimp farming company PT Dipasena Citra Darmaja. Works began with the reconstruction of quarantine and reservoir ponds.

At the side lines of the seminar 'Indonesian Aquaculture 2006', held in Jakarta in August, company President Rudyan Kopot said that operations have recommenced module by module and the target is to complete all by the end of 2006.

The next phase will be farms at Dipasena Citra Darmaja (DCD). Initially production will be mainly with *P. vannamei* shrimp. They will move to *P. monodon* shrimp culture when disease free broodstock becomes available. All other facilities such as the processing plant, feed mill and hatchery are all operational. The aim is to produce up to 75,000 tonnes of shrimp/year.

Dipasena, which previously had an annual production capacity of 16,000 tonnes of *P. monodon*, has been virtually idle following the financial crisis in 1998, leading to its take over by the Indonesian Bank Restructuring Agency (IBRA). In 2005, the debt of the company was restructured and a new investor the consortium of Renaissance Capital Asia injected IDR 2.6 trillion (USD 281.1 million) to prop up the company.

Although top management of the company are new, the employees and farmers have remained the same. The project will still involve 11,000 farmers. The two farms under the umbrella of the PT Dipasena Citra Darmaja have a total of 21,660 individual plastic-lined culture ponds. Most ponds measure 2,000 m^2 in DCD, 2,500 m^2 in Wachyuni Mandira with a few 0.5ha ponds. These have been developed under the nucleus-estate concept, which means that the company develops all infrastructure, hatchery, feedmill and processing plants. Plasma farmers then manage the grow-out ponds. The company provides the materials for culture including postlarvae and buys the shrimp for processing and export.

The new team at PT Dipasena Citra Darmaja
From right; Dr Ngan Taw, SVP Aquaculture R&D, Rudyan Kopot, President Director and Wayan Agus Edhy, Operation and Marketing Director.

Joint venture in aquafeed business in India

In July, the Gold Coin Group and Godrej Agrovet Limited (GAVL) announced that they have signed an agreement to form a joint venture in India to consolidate their aqua feed business. The new company will be called Godrej Gold Coin Aquafeed Limited (GGCAL), with 51% shareholding by Gold Coin Group and 49% by GAVL.

The joint venture will combine the market-leading animal feed experiences of Gold Coin Group, a subsidiary of the Zuellig Group and the strength of Godrej Group in Indian markets.

CK Vaidya, Managing Director, Godrej Agrovet Limited said, "GAVL has been a leading player in the animal feed business in India, as well as with a strong presence in the shrimp feed business. We are pleased to enter into this alliance with the Gold Coin Group as their vast expertise and technical knowledge in feed will help us to consolidate our position in the Indian aquafeed business".

JC Filippi, CEO, Gold Coin Group stated, "We are delighted with our association with Godrej Group, the market strength of which, combined with our recognised knowledge and experience in the feed and aquafeed business, will undoubtedly help us to gain market share. Recognizing both Groups' excellent track records, I am confident that together, we will be able to deliver better products and services to the growing aquafeed market in India".

The Gold Coin Group, a subsidiary of the Zuellig Group, is one of Asia's best-known and most successful multinational feed manufacturing groups, with over 50 years presence in many Asian countries. Its area of expertise is in the research and development of scientifically formulated animal feeds. Today, the group operates 20 feed mills throughout Asia, each with its own state-of-the-art laboratory, qualified chemists and team of nutritionists and veterinarians.

Godrej Agrovet Ltd. is part of the USD 1.3 billlion Godrej Group of India. It is a leader in the Indian agricultural sector with a large presence in cattle, poultry and aquafeeds, as well as innovative agricultural inputs. With a turnover close to USD 200 milllion, the company employs more than 1,600 staff and has over 40 manufacturing and processing facilities across India. Godrej Agrovet is a market leader in animal feeds, innovative agri-products and oil palm development in India. Nature's Basket is the urban retailing venture and Godrej Aadhaar is the rural retailing venture of Godrej Agrovet.

GOLD COIN 金錢 SPECIALITIES

Godrej Agrovet Ltd.

Profiting from fish wastes with aquaponics

The dual revenue from recirculation aquaculture and intensive horticulture on the same infrastructure was demonstrated by several speakers at a special session on aquaponics at the recent Skretting Australasian Aquaculture Conference and Exhibition in Adelaide Australia. Aquaponics combines intensive aquaculture with intensive growing of food plants from their waste.

Five presentations reported on recent advances in aquaponics technology. With the use of fish wastes to grow vegetables, fruit and flowers, revenues are increased and efficiencies introduced in waste management and water conservation. Waste management cost is transformed into a profit-generating activity. It can also be included with agri-tourism.

At the session, Dr James Rakocy, of the University of Virgin Islands, US discussed the economic potential of aquaponics systems. He has been researching aquaponics for 26 years and has a team running an aquaponics farm for instruction and research. It produces five tonnes of tilapia fish a year, with water harvested from a plastic-sheeted rainwater catchments and from nearby rooftops. Tilapia fish wastes grow vegetables in channels on polystyrene floats. Dr Nick Savidov, a Canadian hydroponics research scientist who has been studying aquaponics in greenhouses in a cold climate, showed that aquaponics can be a superior method for plant production than inorganic hydroponics. His team in Alberta, Canada, is now studying aquaponics economics in greenhouses and the "unknown growth factor" involved in aquaponics. Dr Wilson Lennard, Australia's first PhD graduate in aquaponics, has a farm close to Melbourne, Victoria and runs both a commercial operation and as well as a demonstration farm of aquaponics using Australia's native fish, Murray cod, and basil.

An Aquaponics Network Australia has been set by Geoff Wilson, session chairman. The network welcomes anyone interested in learning more about the aquaponics technology or individuals supplying equipment and consumables. More information on this network can be found at www.urbanag.info

Skretting Australasian Aquaculture Conference and Exhibition in Adelaide Australia was held from August 28-30, 2006. More reports on the show and conference will be available in future issues of AAP.

Venture capital for aquaponics

MahaCapital Ltd, one of Sri Lanka's leading venture capital companies has entered into preliminary negotiations with Tailor Fish Farms of Australia, joint partner of U.S public company Tailor Aquaponics Worldwide, (TQWW). The Sri Lanka company has determined a need for the Tailor Company's technical expertise in aquaculture/hydroponics in developing this much needed industry for the country, capitalizing on Tailor's leading technology in its field. (Source: MahaCapital Ltd)

Brief news

IPO for CP Prima

PT Central Proteinaprima (CP Prima), Indonesia will offer shares to the public soon to part finance a planned USD 80 million expansion of shrimp production with additional 2,000 shrimp ponds. Currently there are 3,732 ponds. In the Jakarta Post, the company said it expects to earn a net profit of USD 40 million in 2007. It reported a net profit of USD22.3 million in 2005, 62.5% higher than in 2004. No profit target was given for 2006. CP Prima is part of the Indonesian unit of Thailand's Charoen Pokphand Group. It operates shrimp feed mills, hatcheries, f arms and processing plants across Indonesia. It is the largest exporter of frozen shrimps to the US, EU and Japan It voluntarily delisted its shares from the Jakarta Stock Exchange in December 2004.

La Niña dilutes shrimp ponds

Shrimp farmers in the south of Thailand, said the salt water in Songkhla Lake was being diluted by the increasing rainfall generated by La Niña which is characterised by unusually cold temperatures in the Pacific Ocean. It brings humidity from the sea to the land, leading to a sharp rise in rainfall. Normally, shrimp hatchery operators pump some brackish water from the lake and mix it with fresh water. Today it is the reverse and as breeders must bring in sea water from the Gulf of Thailand. The price of salt water has increased from around THB1,200 to THB 3,000 for a 15,000-litre load brought in by a truck. These added costs are pushing some out of business according to the Bangkok Post. Consequently, farmers predict that shrimp output could drop by up to 50%.

Related article; White hope in South Thailand. Vol 1(2);pp8-9. Archive picture of Songkhla farmer during better times.

US shrimpers upset with high diesel costs

The US NOAA (National Oceanic and Atmospheric Administration) has estimated a below average catch for shrimpers of 23.8 million pounds of shrimp (10,818 tonnes) in the 2006-07 season. Shrimpers are also upset over the low prices of shrimp which is blamed on foreign imports. The average selling price is USD3 a pound (USD 6.6/kg), while the price for a gallon of commercial diesel is going at USD 2.00 (USD 0.44/litre). They said that three years ago, a gallon costs about 80 cents (0.17 cents/litre) and shrimp price was USD 4/lb (USD 8.8/kg). They need bigger shrimp production to overcome high fuel costs and other expenses. (Source: Valley Morning Star)

US shrimp antidumping duties

India to presents its case to WTO

India has planned to take up with the World Trade Organisation (WTO), the issue of trade barriers of customs bond over that of the antidumping duties on its shrimp exports. Indian officials said in the Financial Express that the customs bonds of 10.17% on the annual turnover have made business with the US near impossible. It has forced medium and marginal exporters out of the US market. The numbers of exporters have been reduced from 230 in 2004 to 125 in 2006. In Kerala, the duty reduced numbers of exporting companies by 50% to 23. They added that nearly 55,250 tonnes were exported after the imposition of the bond and the custom bonds payment totalled USD 48 million.

US offers Thailand a shrimp deal

In Bangkok, the Nation has reported that the US said it will revise down or waive the continuous bond (C-bond) on Thai frozen shrimp if the Thai government agrees to withdraw its complaint of unfair trade practice with WTO. However, Thailand's DG of the Trade Negotiations Department, Apiradi Tantraporn said that Thailand was still insisting the WTO consider the complaint. In the latest negotiations, the US insisted on carrying on with its C-bond, but it has offered to revise the measure by allowing importers to submit financial documents to the US Commerce Department.

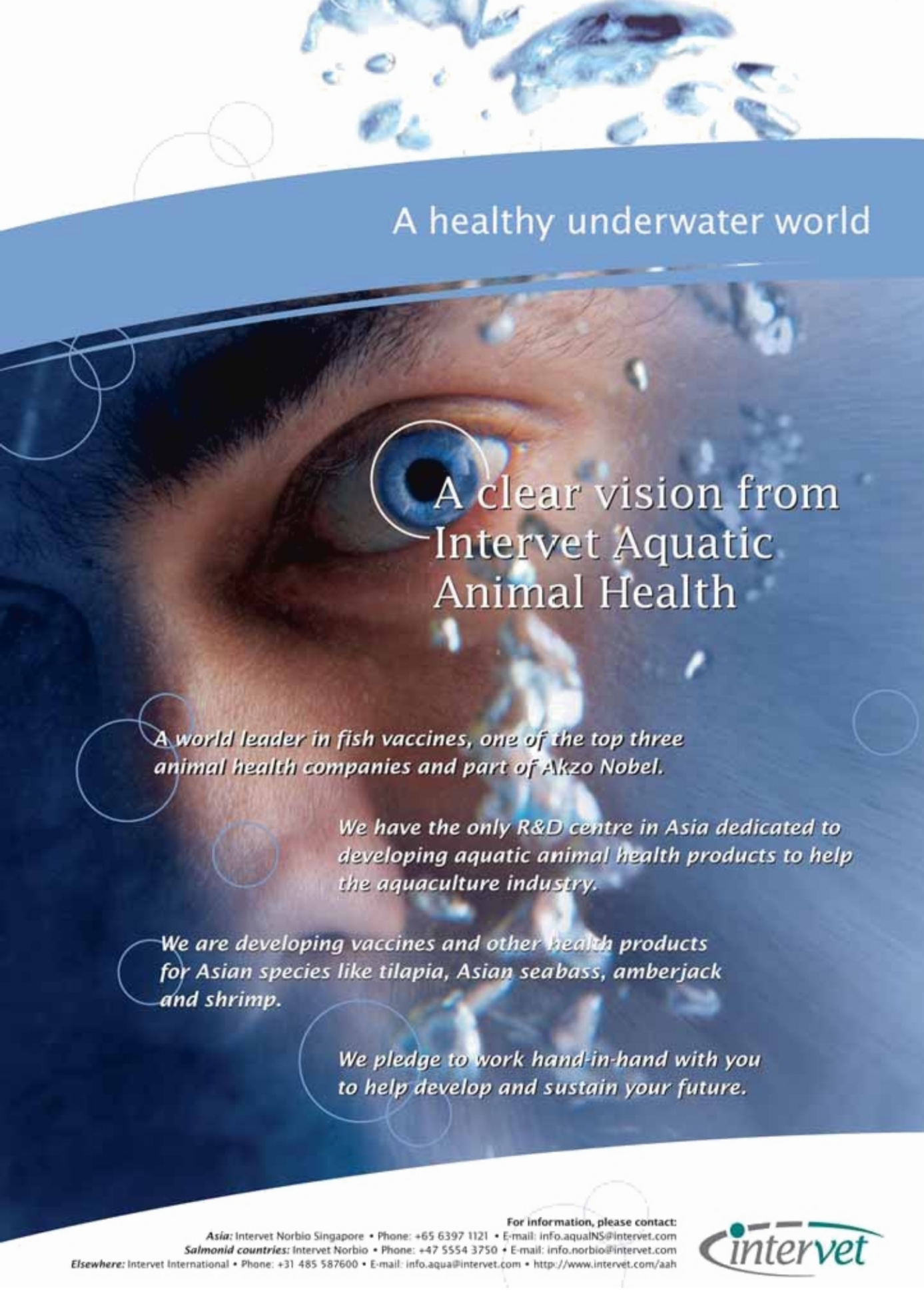
Briefs on catfish from Vietnam

Organic fish farming expands

Following a pilot project in 2004 to raise organic tra catfish in net enclosures and floating rafts in Long Xuyen town in An Giang province, organic tra catfish production increased to 700 tonnes in 2005, up from just 100 tonnes in 2004. In 2006, customers' demand for organic tra catfish is estimated to be 1,200 tonnes. The An Giang Fisheries Association (AFA) coordinated with the Binca Seafood Company (BSC) of Germany to carry out the pilot project. This clean fish farming model meets international organic standards, certified by Naturland of Germany and the Swiss Import Promotion Programme (SIPPO).

Russia and EU are largest importers of tra and basa

Russia is the biggest single country importer of Vietnam's tra and basa catfish with imports of 16,000 tonnes in the first six months of 2006, compared to 500 tonnes in the same period in 2005. During the same period, the EU imported 37,000 tonnes, triple the volume in the same period in 2005. Poland, Spain and the Netherlands are the leading importers of the fish with increasing volume of fillets selling at retail shops. In 2005, Vietnam exported 141,000 tonnes valued at USD328 million (VNeconomy.news)



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Thai Fish Expo 2006 a success

Thai Fish Expo 2006, an exhibition and seminar on fisheries and aquaculture, held from 24 to 27 June 2006 in Bangkok attracted over 30,000 participants from Thailand and throughout Southeast Asia.

The most significant event at the show, according to participants, was an international seminar that addressed important issues for both aquaculturists and seafood processors. These included the epidemic of aquatic animal disease in Southeast Asia, biosecurity and marine shrimp broodstock selection and feeds and feeding to mitigate environmental impacts. In the session on emerging opportunities to increase competitiveness of Thai fishery products, major seafood processors discussed perceptions in markets in the US, Japan and EU and the positioning of Thai fishery products and future opportunities in these markets.

Major Thai feed millers and seafood processors formed the largest group of exhibitors at the show, which was organised by Thailand's Department of Fisheries (DOF). As in Thailand, the focus in on the production of safe and quality seafood, there was a significant presence of exhibitors providing laboratory services for exporters. LCFA, the laboratory centre for food and agricultural products provides a one-stop centre for testing and certification of imports and exports of agricultural products. SGS provides on farm quality assurance farm programmes for shrimp producers. Several bloodstock suppliers such as Kona Bay and Hi Health, from Hawaii and SyAqua Siam were also there.

Daniel Loo (left) and Ethan Tan, Arda Tek, Malaysia introduced their new aeration equipment.

Major aquaculture feed millers such as Thai Union Feedmill Co took part in the Thai Fish Expo.

Tai Chia-Hung of Tung Hsin Biotech Corporation. The company introduced plant extracts for use with shrimp feeds.

At SyAqua Siam booth, from left, Supot Chungyampin, Department of Fisheries, Thomas Wilson, Thai Luxe Enterprises and Napat Chunhasant, SyAqua Siam

Certification for shrimp farm clusters

Small shrimp farms, often family owned with limited resources face problems in meeting standards of Best Aquaculture Practices (BAP) developed for large farms. However, as large buyers such as Wal-Mart Stores, Darden Restaurants and Lyons Seafoods recently adopted the BAP program for their shrimp suppliers, many of these small operators must now be certified. A farm cluster approach using shrimp-farming cooperatives which can be found in several countries, can be considered as a way for small farms to readily participate in BAP certification, according to a report by Claude Boyd, Chalor Limsuwan and Dan Fegan in the GAA news.

In June, a 25-member working group meeting in Thailand looked at the harmonization of standards for BAP facility certification of cluster farms. However, the unique aspects of small farms and cluster operation require modifications of the (BAP) standards and their administration.

In the definition of cluster farms, which could vary from country to country, the group said that a typical farm cluster could range 50-500 ha in size. The size and productivity of component farms could however vary widely. For example, in Thailand, a small farm within a cluster might contain 3-4 ha of production ponds and produce 25-75 tonnes of shrimp/year. A small farm in Bangladesh might have one or two ponds totalling 0.5 ha and produce only 200-300 kg of shrimp/year.

In a review of the current BAP standards for certified shrimp farms, it was agreed that some criteria might not be fully applicable to the small farms within clusters. Other issues are in the use of child labour, prohibited in a BAP farm. However, children doing routine chores at the family farm will not be considered a violation. In monitoring nutrient loads of effluents, some exemptions were proposed as appropriate for farm clusters. On drug and chemical management, the participants suggested that the requirements for monitoring shrimp for PCBs and pesticides are shifted from small farmers to processing plants.

The group also agreed on the education of small farmers on the benefits of clusters, assist them in the cluster formation process, and guide them in meeting the certification standards. Thailand's Code of Conduct and Good Aquaculture Practices (GAP) programs developed by the Department of Fisheries (DOF) are excellent models for assisting in the formation and certification of farm clusters. Several cooperatives in Thailand are arranged in clusters and use production practices recommended by the DOF. The DOF programs could serve as models for cluster farms in other Asian nations.

The BAP Shrimp Farm Standards Committee will look at the harmonization of the standards of the Thai programs with the new BAP cluster farm standards. The recommendations of the working group are being reviewed by GAA's Shrimp Farm Standards Committee for possible addition to the BAP shrimp farm standards. More information: www.gaa.org

More land to increase shrimp production

Malaysia has set a target production of marine shrimp of 180,000 tonnes by 2010. However, many in the industry are doubtful that this can be achieved, mainly because of several bottlenecks such as reallocation of coastal land for shrimp farming, the high cost of production and support services. In 2005, production of the marine shrimp increased 30% to 35,000 tonnes. This increase was attributed to the production of the white shrimp *Penaeus vannamei*, with the lifting of the ban on its culture in March 2005.

To meet this target, an expansion of culture by 23,000 ha at a productivity level of 10 tonnes/ha/yr will be required. In July, a seminar was organized to deal with issues affecting in the industry. It also included a dialogue session with the Minister of Agriculture where main stakeholders voiced concerns on the high tariffs for electricity and high diesel prices. Producers requested for subsidised fuel (MYR1/litre) similar to that provided for the fishing industry. Other issues raised were with the inadequate laboratory facilities for disease diagnosis, R&D support, certification of products for exports and the import of shrimp from Thailand at competitive prices.

DOF briefed participants on efforts to designate land for aquaculture. Currently, state governments have already allocated a total of 14,884 ha for aquaculture purposes. This will add to the existing 7,554 ha of shrimp farms, though far from the 23,000 ha required to 2010. The government will provide the basic infrastructure for the private sector to develop shrimp farming in these new areas.

Tuan Syed Omar, President of MSIA said, "The association would like to maintain a 10% annual growth. We will need to catch with developments in neighboring countries. Shrimp from Malaysia has a promising export potential. Malaysian is not among the countries in the US antidumping list and we have 4% rate for imports into the EU. However, we need to adhere to the quality requirements of our customers and farms should comply with good aquaculture and codes of practices. There must be an upgrade and improvement of services for the testing and certification of products for exports".

Tuan Syed Omar of the Malaysia Shrimp Industry Association

Jeffrey KC Lee, Kembang Subur (left) and Ting Kwong Chung, JW Properties

Tan Kim Tee and Tan Siew Ngo, EMT farms (centre) with T. Segar, (left), and Shafie Ali, (right) of Grobest/Black Tiger Farm and Hatchery.

The focus of DOF will also be in quality assurance programs at the farm level, development of traceability programs and R&D in domestication and selective breeding programs for the black tiger shrimp. To date, three large farms (JW Properties, Grobest and Agrobest) have embarked on the domestication of the species using local stocks as well as those from Tanzania, Mozambique and Australia. In the case of the white shrimp, six hatcheries are allowed to import SPF broodstock from Hawaii and Florida. Currently, the yearly demand for post larvae was estimated at 1.16 billion per year.

Guest speaker, Dr Pinij Kungvanji, from Charoen Pokphand Foods' Foreign Investment Section said that high production costs usually come from crop failures. In the case of Thailand, this is considered high as 3 crops in 10 fail mainly due to diseases. It is important to look at the mode of entry and the trigger mechanisms. WSSV enters through bad pond bottom and is triggered by low temperatures, low oxygen and abrupt changes of salinity. TSV enters with carriers and is triggered at temperatures below 25°C, salinity below 10ppt and higher than 35 ppt. Luminous bacteria are triggered by high salinity. Thus the keys to success are in understanding biosecurity and preventive measures. Both IHHNV and TSV are known to stay in infected soil for more than 20 days. Reservoirs that are never dried will reinfect ponds. Pond bottom must be dried for more than 21 days to prevent infection with IHHNV and TSV.

Dr Pinij Kungvanji

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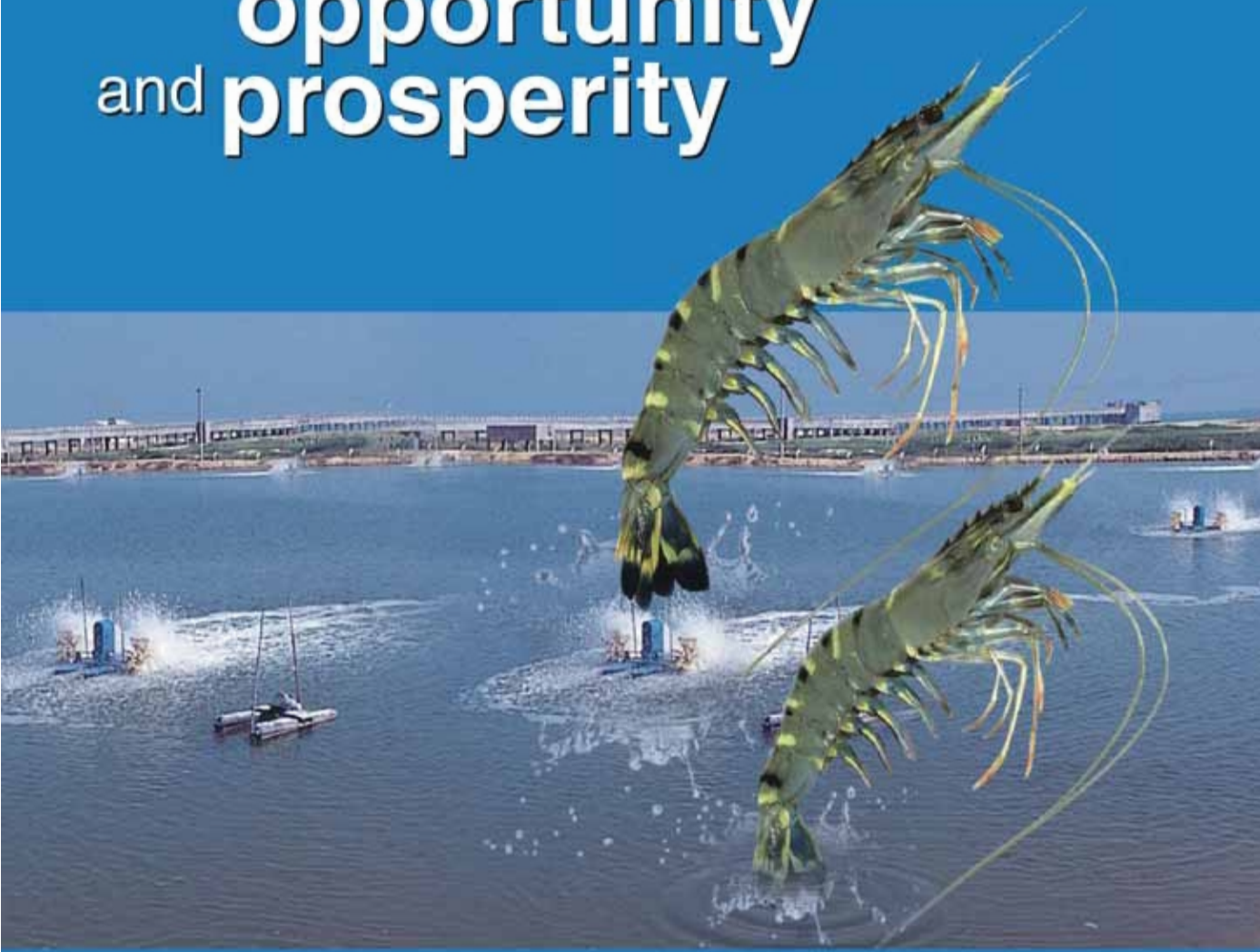

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The second international symposium on cage culture in Asia (CAA2)

Offshore cage. Picture courtesy of Michael Cremer

The main focus of this second symposium, which followed an earlier one held in 1999 in Taiwan, was on the commercialization of marine fish culture, in particular that in offshore areas. In coastal and inland freshwater systems, concerns were on disease and health management and ways to improve the standard of existing culture systems.

Prof Yngvar Olsen, Sintef, Norway (right) and Dr Awind Kumar, SKM University, India

Duan Tong (left) and Dr Li Zhiwei, Beijing Sunpu Biochem and Tech, Co. Ltd

Lessons for a technically efficient and sustainable industry

In Asia, an expansion of cage culture, both in inland and marine environments is anticipated as land based aquaculture face competition from other industries. Growth of marine cage culture will be accelerated in the next few years as fish resources from capture fisheries become fully exploited and countries legislate close fishing seasons to sustain resources. To develop commercial farming in cages, the organisers have arranged presentations to bridge the information gap existing among stakeholders understand the environmental impacts of current practices and provide opportunities to learn from the experiences and lessons elsewhere.

The CAA2 symposium was held in Zhejiang University, Hangzhou, China and was attended by over 300 participants. It was organised by the Asian Fisheries Society in partnership with Zhejiang University, China Society of Fisheries, Bureau of Ocean and Fisheries and the Department of Science and Technology, Zhejiang Province. Sessions dealt with marine cage culture, freshwater cage culture, policy, management, economic and markets, disease prevention and health management, environmental impact and management and general aquaculture. A small trade show was also held.

Fish supply chain

In her keynote presentation on "Who will supply world demand for fish?", **Dr Meryl Williams**, looked at the trends and outlook in fish supply chains. The most visible changes have been the extraordinary rise in fish production in Asian countries, the prominence of Asia and Europe as major fish producers and importers and exporters in world markets. Aquaculture has shown a strong upward trend in all regions

and production growth has exceeded past projections. She said, "With its strong trade, fish is increasingly subject to international trade policies and disputes".

Recently, the trend in fish supply chain enterprises is towards greater corporatisation with a more global reach, although small producers are still the heart of production in many developing countries. Services in fish production and fish processing are becoming more vibrant. The growth in aquaculture is also being driven by quality and changes such as seen in Thailand where there is a decline in the numbers of small traditional processing facilities and a rise in the larger more modern ones. Large supermarkets, now a feature of cities and towns in most countries, are starting to have an impact in fisheries, with their higher purchasing power. There is pressure on corporate behaviour as consumers seek assurances on product quality and activists are confronting industry. Domestic fish consumption in Asia will rise with increases in incomes and affordability will be the key.

According to Dr Williams, the heart of future aquaculture development is also on the choice of species and domestication. It was the balanced evolution of domestication with farming practices and feed efficiency that has driven the Norwegian salmon industry to its present level. Some 16% of China's aquaculture is now based on improved domesticated stocks.

She concluded, "Those who will supply world demands for fish in the long term, are those countries/companies that can create and sustain value added chains of fish supply".

Threats, conflicts and opportunities

Dr Zilong Tan, Intervet said over the years since cage culture started, it was the high prices of several species of marine fish that have initiated a 'gold rush' to increase production. The traditional culture methods using as few as 20-30 cages per family and fed on trash fish, prevalent in many parts of Asia and concentrated in coastal areas, has resulted in waste sedimentation levels of 2-3 m high in some areas. This has increased prevalence and transmissions of infectious diseases, namely viral, bacterial, fungal and parasitic infections.. In Asia, acceptable levels of mortality are low as compared to the salmon-50% vs. more than 95% for the latter. These are negative issues which threaten production, profitability and sustainability. It is also the myriad of species being cultured to meet market demands that does not allow us to focus on one species and develop a truly efficient industry with domesticated species, controlled production methods, low mortality rates and production costs. On a positive note, Dr. Tan conclude his talk by mentioning that sustainability is a shared responsibility. Collaborative efforts from governments, non-governmental agencies, academia and the private sector are on-going in order to standardize aquaculture practices and to promote good health management for disease control.

At this symposium, **Prof Yngvar Olsen**, University of Science and Technology, Trondheim, Norway discussed the environmental impact of cage culture on the surrounding ecosystem. He said that there is a strong feeling in industry on the impacts on the pelagic communities. This has not been studied well whereas, we are very much aware on the impact of waste sedimentation on the benthic communities. However, from his research on intensive cage culture in NE Atlantic, he concluded that the nutrient emission do not affect pelagic communities and that in fact, nutrients are sources for production and can be exploited for extractive aquaculture. The open ocean aquaculture apparently has unlimited potential.

Cage culture technology

An overview of the developments in Norway from the wooden cages to the current large circular cages with circumferences up to 160m was provided by **Arne Fredheim**, SINTEF, in his presentation on technological trends in global ocean fish farming. He said that the developments in cage structure and technology in Norway were hand in hand with changes in feed type and method. As the industry shifted to PE cages, it also started to use pellets instead of waste fish. As it moved to hinged steel cages, dry feed with feed blowers were used. Production strategies also changed as prices of salmon fell from Euro 6/kg in 1990 to Euro 3/kg in 2005 and from Euro14/kg (1990) to Euro 4-6/kg (2000) for the seabass. The open ocean culture also lead to better fish welfare, productivity, fish quality and less public concerns and reduced visual pollution.

Based on his work in China, **Dr Michael Cremer**, said that the average productivity level was 3.3kg/m^3 and 16,245 tonnes of production was from 4,909,815m^3 of offshore cages. Cages are not submersible and could not withstand the strong typhoon winds and large cages were difficult to operate. After four years on a suitable open ocean cage design, the ASA-OCAT program developed cages for low volume, high density cage culture and high quality formulated diets with optimal soybean product inclusion). The latter was to move away from using trash fish as feed. These low cost 100m^3 were used to culture 3g pompano *Trachinotus sp* to 35g in 42 days with a feed FCR of 1.13. (See page 37).

Data management is the key to success

Based on his experiences in the salmonid industry in Norway, **Dr Clive Talbot**, Marine Harvest said that in modern aquaculture, a professional approach is key to optimising production. Producers should seek the

Clive Talbot

Y.C. Thampi Samraj, RGCA (MPEDA), India (left) and participant from India.

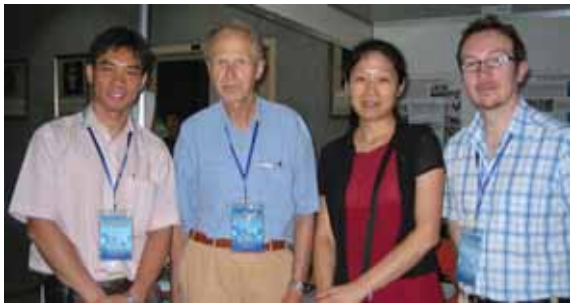
The Asian Fisheries Society Council

Traditional cages. Picture courtesy of Haisheng Xu

highest values for growth rate, stocking density, fish quality and value/kg. The lowest will be feed conversion ratio, environmental impact, operating costs and mortality. Intensity, efficiency and control are the essence of responsible profitability. The procurement of accurate and basic data, such as average weight in each cage, fish counts, feed usage per cage, specific growth rates and feed conversion ratio, is critical. It is also important to collect relevant information on the environment. In feeding and FCR control, the growth and ration curve is the tool to visualize performance at any time.

Dr Yu Yu, National Renderers Association, Hong Kong

Kana Washizu (left), AQ1 systems and Takuya Fujiwara, Fukushin, Japan. AQ1 markets Akvamarine CCS Central feed systems for cage culture. Kana said that trials on the use of two feeders are being carried out in Indonesia. In China, the company will link with feed companies to test out the systems.



The Intervet team, from left, Dr Zilong Tan, Zhao Shuang, Dr Brian Sheehan with Bjorn Myseth of Marine Farms, Norway (second from left).

Cage culture in China

Among the countries in Asia with cage culture activities, China stands out with its exponential developments in the last ten years. According to keynote speaker, **Dr Xu Jun Zhuo**, Zhejiang Marine Fisheries Institute, the cultivable land area in China is only a quarter of the world average on a per capita basis. Moving to coastal waters and the open ocean is the alternative to increase fish production. The per capita consumption of fish has increased from 4.8kg in 1978 to 35.5 kg in 2004. Cage culture, inland and marine contributed 50% to China's fish production. With 'zero gain' implemented for marine capture fisheries from 1999 and reductions in fishing fleets, cage culture will remain an important source of marine fish.

At present, there are one million cages in coastal areas, mainly in Shandong, Zhejiang, Fujian, Guangdong and Hainan Provinces, These traditional cages measure 3x3m to 5x5m with depths ranging from 4-6m and are made of bamboo, hard wood or steel pipes. Larger cages of 6mx6m have been developed but restrained by the relatively high costs, these have not been popular. Dr Xu said that the recent development of offshore cages total 3,800 of which 68% are found in the Zhejiang Province. There are spin offs from this development which began in 1998. There are now 100 national patents on cage technology and 10 enterprises producing cages.

According to Dr Su Young Quan, College of Oceanography, Xiamen University, since the 1980s, production has been increasing from 50-100 kg/cage to 200kg/cage in the 1990s and 300kg/cage in the 2000s.This was attributed to the use of improved culture technologies and larger cages. Production of marine fish from cage culture reached 287,301 tonnes in 2005 and that of freshwater fish was 473,138 tonnes.

However, the proliferation of cages in coastal areas situated close to each other, overstocking, the use of trash fish, comprising 90% of feed usage, have raised ecological and health issues. The deteriorating water quality has given rise to increase incidences of bacterial and parasitic diseases. Survival rates were less than 70% in traditional cage culture in comparison to more than 90% in offshore cages. Trash fish at USD1.5/kg is preferred to match wholesale prices for the large yellow croaker (USD 2.0-2.5/kg), red sea bream (USD 3.0-3.5/kg), red drum (USD 1.6-4/kg), Japanese perch (USD 3.0-4/kg) and grouper (USD 30-40/kg). Loss of 30% of production to fish mortality was valued at RMB 6 billion (USD 0.75 billion).

Traditional cage farming in China (Courtesy of Dr Zilong Tan)

At CAA2

Session on disease prevention and health management

This session covered a range of topics, from basic research required for the development of health solutions to field observations on the epidemiology of diseases. Several of the presentations were on diseases affecting marine fish cultured in China and Southeast Asia, such as grouper (*Epinephelus* spp.), snapper (*Lutjanus* spp.), pompano (*Trachinotus ovatus*), yellow croaker (*Larimichthys crocea*) and cobia (*Rachycentron canadum*).

Dr Leong Tak Seng

Dr Haisheng Xu, College of Animal Science, Zhejiang University

Dr. Leong Tak Seng from Malaysia present a paper entitled "Impact of infection with capsalid monogeneans in marine fish cultured in Asia". He pointed out that many capsalid monogeneans, mainly *Benedenia epinepheli*, *B. lutjani* and *Neobenedenia girellae* (*N. melleni*), infected marine fish all year round. Among them, *N. girellae* appeared to cause the greatest economic losses, at least in the S.E. Asia region. The high density of the monogenean population in the cage culture ecosystem is the direct cause of the parasitic disease outbreaks. Improved farming practices, and prevention and control measures must be used to tackle the problem. Reduction in stocking density, frequent cleaning of cage nets, application of antifouling paint and use of pelleted feed can decrease the incidence of parasitic infection. More research needs to be done on developing products for prevention and/or treatment.

In another paper, the species composition of myxosporidia in several marine fish cultured in cages during 2003-2005 was studied by Dr. Haisheng Xu of the College of Animal Science, Zhejiang University. His team isolated 25 species of myxosporidia from 20 fish species. Among these were two new species found in the gall bladder of the host. The characteristics were described.

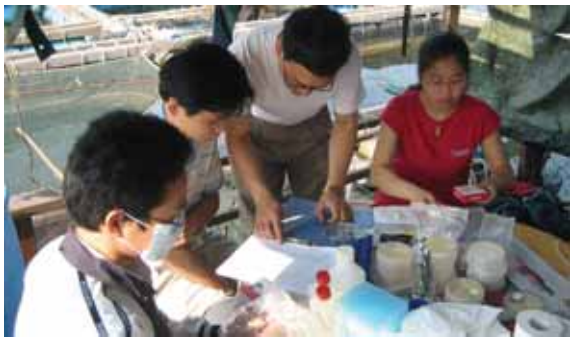
A study that monitored the health status of marine fish in Asia was conducted by Dr. An-xing Li and colleagues from Sun Yat-sen University in Guangzhou and Intervet Singapore. This epidemiological survey on a variety of farmed fish studied the prevalence of viral, bacterial and parasitic diseases during the July 2003 to April 2006 period, and they found that 84% of fish (mostly clinically-abnormal) were infected with one or more pathogens. Several species were co-infected with multiple pathogens. Bacterial pathogens identified included *Streptococcus iniae*, *S. dysgalactiae*, *Pasteurella damsela* subsp. *piscicida*, *Nocardia seriolae* and *Tenacibaculum maritimum*. Parasites were monogenean trematodes and *Cryptocaryon irritans*. In 2005, an outbreak of cryptocaryonosis caused over 65% mortality in pompano, grouper and yellow croaker within two weeks. Farms were typical, with traditional wooden cages stocked with multiple species and fed with trash fish. They were also located in heavily congested fish farming areas. The authors called for improvements in the farming environment and health management practices.

Phan Thi Van and colleagues from the Research Institute for Aquaculture No. 1 of Vietnam showed that viral nervous necrosis (VNN) virus can be transmitted both horizontally and vertically from eggs to broodstock in cobia and grouper (*E. coioides*). Washing grouper eggs with a 15 ppm iodine solution for 20 minutes may reduce the impact of VNN infection but there was no effect with cobia eggs. Also in farmed cobia, Wang Ruxian and co-authors from the South China Sea Fisheries Research Institute, Guangzhou compared the bacteria profile in the water with that in the intestine of the fish. *Pseudomonas* and *Bacillus* sp. were the most prevalent in the intestine.

During the discussion at this session, the panel members and

audience concurred that diseases pose a major economic threat to the aquaculture industry. We must emulate health management from the well managed salmonid industry in Norway and Chile. Dr Zilong Tan (Intervet Norbio Singapore), Chairman of this session, said that there was a need to undergo disease epidemiology studies and to develop sound health solutions for the industry. Also, regulations regarding zoning and carrying capacity are needed. In Norway, production is regulated through quotas and licensing of farm sites. It was also mentioned that the industry must learn not to carry out intra-species transfer of pathogens through the irresponsible movement of live fish and by feeding trash fish. Ultimately, as the industry expands to large commercial entities, it will need to accept that preventive health management (e.g., biosecurity and vaccination) must be part and parcel of any operation. Current methods where fish are treated with freshwater baths are too labour intensive.

Earlier, Alistair Brown (co-authored with Dr. William Enright, both from Intervet International) in his presentation on the global success of the salmon industry in Norway, said that, with the use of vaccination programmes, 5.6 million tonnes of salmon were produced during the period from 1986 to 2005. This figure would be only about 3.6 million tonnes without vaccines. Translated into value, the extra 2 million tonnes equaled USD 8 billion at present salmon prices. He also emphasized the reductions in the use of antibiotics as a result of vaccination and the overall improvement of health management practices. Although it was emphasized that vaccination had a major role in the salmon success story, concurrent developments with feeds, culture operations, marketing, etc. also contributed. In Asia, until vaccines are developed, members of the panel agreed that the industry should emphasize other preventive measures like pathogen exclusion and biosecurity rather than treatment.



Dr. An-xing Li (second from right) and students conducting a disease investigation.

A diseased fish with skin lesion (All pictures courtesy of Dr Zilong Tan)

Developing vaccines against WSSV

Is there a possibility with this preliminary work?

By Rajeev Kumar Jha, Zi Rong Xu, Maddur Lingappa Umashankara

The white spot syndrome virus (WSSV) is considered as the major disease agent in shrimp culture and has developed into an epizootic disease among all the known viral pathogens. WSSV virions belong to a new family of *Nimaviridae* and genus *Whispovirus* with single species. It is enveloped, ovoid to bacilliform in shape and has a tail-like appendage at one end. It consists of at least 39 structural proteins and out of nine envelope proteins; six envelope proteins are involved in white spot syndrome infection. VP19 and VP28 envelope proteins have been identified as the most important.

Immunity in shrimp

Adaptive immunity is assumed to be absent in crustaceans, since they lack lymphocytes and specific antibodies. The defense system of crustaceans depends on innate immunity, which is carried out mainly through the phagocytic, encapsulating and agglutinating activities of the circulating haemocytes as well as by anterior orbital factor of haemolymph.

Haemocytes are responsible for most of the cellular responses, including encapsulation, phagocytosis, melanization, cytotoxicity, cell to cell communication, clotting and the proPO system. The presence of antimicrobial peptides and lectins as humeral response factors has also been reported. An up regulation of the lipopolysaccharide and ,-1, 3-glucan binding protein was observed upon infection with WSSV.

Peroxinectin, an adhesion molecule, which is important for the development of immune memory in vertebrates, is also present in crayfish *Pacifastacus leniusculus*. Quasi immune system is a new concept reported in *Penaeus japonicus*. However, a recent study has suggested that the crustacean defense system may be capable of specific memory. It has also been reported that upon viral infection, apoptosis may be another trait of a non-specific defense mechanism. Several reports showed the occurrence of signs of apoptosis in WSSV-infected shrimp, i.e. nuclear disassembly and increased caspase-3 activity in various infected tissues, e.g. lymphoid organs, subcuticular epithelium and hematopoitic tissue and gills.

Although antibiotics and chemotherapeutants are extensively used to control disease outbreaks, there is increasing concern on the use of

these substances in aquaculture because of health hazards from drug residues in food. Increased attention is now being given to disease prevention as a means of controlling disease outbreaks based on improved husbandry and biological control methods such as vaccination and immunostimulation.

Vaccination

Vaccination is now a part of routine husbandry management in aquaculture systems in Europe and is used as a means of controlling bacterial disease outbreaks. With the use of vaccine in aquaculture, the levels of antibiotics applied to control bacterial diseases in fish farms have been reduced. For example, in Norway, antibiotics application has decreased from 47 tonnes to around one tonne in salmonid culture.

Development of recombinant Vaccines against WSSV

For the development of any successful vaccine for aquaculture, the important criteria are inexpensive, adaptable to mass vaccination and confer a strong and long lasting immunity with no or minimal side effects in the vaccinated animals. To accomplish this, a vaccine must provide long term protection against the disease under the intensive rearing conditions found in commercial shrimp farms.

Many of the successful vaccines against viral diseases in humans (e.g. rubella, measles, and poliomyelitis) and in domestic animals (e.g. rabies and distemper) are live attenuated organisms. It is difficult to license such vaccines in aquaculture.

Thus, the preparation of subunit vaccine is an alternative method where specific components of the disease causing agent are isolated and then used as vaccines. In order to increase the amount of available antigens, the recent trend has been to clone up the genes encoding for specific antigens and to incorporate them into bacterial DNA, yeast or any other expression system where they are expressed and called as recombinant vaccine.

These are well defined, non-infectious and simple, as well as inexpensive to produce in large quantities. In addition, further engineering of the vaccine is relatively easy to do and can also be used to enhance particular immune responses. The recombinant vaccines are convenient for crustacean viruses because they cannot be cultured due to lack of susceptible cell lines.

Trials

Recently some trials have been carried out to develop recombinant vaccines with significant effects against WSSV. WSSV envelope proteins (VP19 and VP28) have been expressed in bacterial expression systems and used as injection, oral and immersion vaccines in *P. monodon*.

The purified large dsRNA as well as siRNA molecules were used as a vaccine agent and it was found that they induce a sequence independent anti-viral immunity when injected in shrimp. The anti-TrVP28:19 egg yolk antibodies were used and found that they were able to neutralize shrimp disease (white spot syndrome) in *P. chinensis* experimentally challenged with WSSV.

There is a possibility of specific immunization of shrimps against WSSV by using bacterin of Vibrio harveyi. The efficacy of vaccines which were made of inactivated WSSV with or without immunostimulants (1, 3-glucan or killed *Vibrio penaeicida*) and recombinant proteins of WSSV (VP26, VP28) were tested by intramuscular vaccination in kuruma

shrimp *P. japonicus*. WSSV envelope proteins VP28 and VP19 were expressed in silkworm using a baculovirus (HyNPV) expression system and fed to crayfish orally as vaccine agents with significant effects.

Some work has also been reported on the development of vaccine against WSSV by using peptidoglycon or lipopolysaccharide or glucan. The three structural proteins of WSSV (VP36A, VP36B and VP31) have been isolated and used as vaccine components with significant results. The VP19-antiserum and anti r-VP28 have been used to neutralize WSSV. The envelope proteins (VP19 and VP28) have been used as oral, immersion and injection vaccines against WSSV in crayfish *Procambus clarkii* in our laboratory.

Vaccine coated food pellets were fed for 25 days to the crayfish and then challenged with muscle of WSSV-infected crayfish at a rate of 2g per individual for 2 days. The cumulative mortality was monitored for 25 days. On this basis, the relative percent survival of 86% was calculated for the group given VP28 protein as oral vaccine. The groups given immersion vaccination showed a relative survival of 63% and injection vaccination showed 91% relative survival. In other trials, the methanolic extracts of five different herbal medicinal plants fed orally as immunostimulants against WSSV in *P. monodon* gave significant results where the relative survival was 60%.

All these trials demonstrated that show that research on virus-host interaction is required to formulate an efficient vaccination program and selection of an appropriate expression system.

Rajeev Kumar Jha

Prof Zi Rong Xu

Rajeev Kumar Jha, PhD is with the Animal Science College, Zhejiang University, Hangzhou, China under the Indo-China cultural exchange program. He obtained his PhD in June 2006. Previously he worked for 3 years on a World Bank funded Project titled integrated management through fish, duck and pig culture in rice farming system. Email: jha_fish@yahoo.co.in, jha.fish@gmail.com

Prof Zi Rong Xu is the Director of Feed Science Institute, Zhejiang University, China and Maddur Lingappa Umashankara is Asst. Professor at Mysore University,India.

Shrimp Health Management Workshop 2006

A second generation of shrimp farmers learns the workings of shrimp culture at the Alltech –NACA workshop

Field experience in shrimp culture is important but understanding the science and interactions between the shrimp and the pond ecosystem is critical for proper shrimp health management. Better knowledge of the key factors and their impact on production can ensure consistent success for shrimp producers in Asia. However, it is also important that producers understand the management of their faming business and the effect of production practices on profitability, especially in these days of low prices and increasing costs.

A second generation of shrimp producers
From left, Robert Sim, Philippines and Robin Soegondo, Catur Widi Darwiyono, Samuel Winata, Yulius Soegondo and Petrus Stevens from Indonesia

Widyatmoko, PT Suri Tani Pemuka, R&D Manager, Indonesia and Margawan Kelana, Technical Manager, Gold Coin Specialities, Malaysia (left)

This was the strategy adopted for the second Alltech-NACA shrimp health management workshop held from 24-29 July, 2006 in Bangkok, Thailand. At the workshop, conducted by well known experts in the region, 35 participants from across the Asia Pacific learnt how to use best practices in shrimp and pond management in the culture of the two species of shrimp, *Penaeus monodon* and *P. vannamei* for their business.

Dr Pornlerd Chanratchakool, Technical Manager, Novozymes, USA, an organizer of the original AAHRI/ODA/NACA course which ran from 1994 to 2004, said, "We would like to think that, other than contributing to the shrimp industry, the course focus on better management of the environment will help industry to reduce damage to the ecosystem. The pressure on prices will continue as supply increases and we will also need to be more scientific as the market looks at how the shrimp is being produced".

In his introduction to the course, Dan Fegan, Regional Technical Manager, Aquaculture, Alltech, said, "A thorough understanding of farm management requires us to start from the beginning and go through the various stages of culture, step by step. This is especially important if we are to understand diseases and their management. This year's course covers all aspects of culture from shrimp biology, post larvae selection to the business management of shrimp farming. Participants will profit from the lecture component and from two days

of farm visits to see shrimp production and a novel approach to farm management to support shrimp sales direct to retail supermarkets at Thammachart Farm in Trad Province".

Good start for a second generation

This year, participants came from well-known feed companies in Asia, such as Gold Coin and Cargill in Malaysia, PT Matahari Sakti and PT Suri Pemuka from Indonesia. Interestingly, there were several new entrants into the industry, including a "second generation" of shrimp producers from Indonesia and the Philippines where the younger generation are taking over the shrimp farming business from their parents, some of whom started shrimp farming as far back as in the early 1980s. The father and son team of Albert and Robert Sim operates a hatchery business in Luzon, Philippines and their aim was to gather information on the culture of *P. vannamei* and learn from the industry in Thailand. All these are in preparation for the impending introduction of the culture of this shrimp into the Philippines (see AAP, issue July/August 2006). Leong Wing Hong, another participant, started his shrimp farm two years ago in Brunei, where the government has recently allocated 500 ha of land for the industry. Although working with *Penaeus stylirostris*, there was much for him to take back given the similarities between this species, also from Latin America, and *P. vannamei*.

Basics and beyond

In the introduction to shrimp biology, Dan Fegan described some of the morphological and physiological attributes of *P. monodon* and *P. vannamei*. For those more familiar with the former species, this provided a better understanding of *P. vannamei*. For example, there are differences in the reproductive morphology of the two species which help to explain the more rapid development of domestication and selective breeding of the latter species.

As artificial insemination is more complicated in closed thelycum species such as *P.monodon* compared to open thelycum species such as *P. vannamei*, selective breeding work has progressed faster in the latter. In closed thelycum species, mating takes place during the moult and the spermatophore is inserted when the shell is soft. If mating is successful, the ovaries then develop and spawning takes place later. This contrasts with open thelycum species such as *P. vannamei*, in which the spermatophore can be inserted when the shell is hard and mating takes place following ovarian development on the night of spawning.

In the fight against disease, Dan said that the lymphoid organs plays a central role in the immune system by aiding in the clearing of pathogens.

"In general, there is no immune memory in shrimp and neither are there antibodies so the concept of vaccination is invalid. Responses to viral or bacterial attack are through the non-specific immune system and, although we may have a "vaccine" for Vibrio, the response will be much the same as that when we use alternative immune stimulants such as glucans, lipopolysaccharides and peptidoglycans." He also mentioned that clotting of the hemolymph is fast in healthy shrimp and, if a shrimp is suspected to be infected, one simple way of checking is to cut the tail and drip the hemolymph onto a glass slide. If it takes more than 20 seconds to clot, this indicates that there is a systemic infection".

In discussing the pond environment, Dan said that it is important to understand the chemistry of the pond water and soil, and how these change over time. Some 90% of ammonia in the pond ultimately comes from the feed protein as 75% of the protein in the feed does not end up as shrimp tissue. Nitrogen from the protein is lost through leaching, excretion of ammonia, faeces and bacterial breakdown of uneaten feed. In the case of a one ha pond given 100 kg/day of a 35% protein feed, this can result in ammonia being added at a rate of 4.2kg /ha/day or 0.42 ppm. To reduce ammonia and nitrite, the effectiveness of bacterial populations, probiotics and chemical means such as zeolites can vary greatly depending on the environmental conditions, making it preferable to adopt less variable approaches, for example, through the use of Yucca-based products such as Alltech's De-Odorase.

Vijaya (left) and KR Ramesh (middle) from the Marine Products Export Development Authority, India (MPEDA) with Dhanunjaya, Alltech, India

From left, Timbul Hariyanto, Heri Utomo and Anda Soemaryono, Indonesia

World shrimp season and high value products

In discussing shrimp culture systems, Dr. Pornlerd said that each farmer should be able to adapt tested culture principles to his own farm situation.

"The aim of this adaptation is to reduce risks and increase profits. However, before you decide on what system to use, you have to look at the market challenges. You may wish to produce for niche markets or stock all year round and market every two days for local wholesale markets, through partial harvesting".

Some of the market challenges are price pressures caused by increasing supply, the shift from black tiger to vannamei shrimp and more integrated production.

The shrimp season is clear (Figure 1), and Pornlerd explained that most farmers tend to produce during the second half of the year whereas during the first half of the year, the price of the small shrimp was more attractive. In 2005, the price for both shrimp species (20 g) was around USD 4.50/kg in early 2005 but only USD 3.50/kg for white shrimp in September. If the plan is to market only white shrimp (20 g), the low prices in the second half of the year will make it very difficult to make a profit. When comparing the two species at this time, monodon at the same size (20 g) had a 20% higher price. Therefore, to make profit from white shrimp during the second crop, we should look to produce bigger shrimp (>20 g).

Pornlerd said that with closed pond systems, the challenge is

Figure 1. WORLD SHRIMP SEASON.

	Non			low		high					
country	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
BTS												
Vietnam												
India												
Phillppines												
Bangladesh												
WS												
Thailand												
Brasil												
Ecuador												
Panama												
Mexico												
Honduras												
China												
Indonesia												
U.S.A.												

maintaining water quality during the 120-150 days of culture. Diseases including White Spot Syndrome Virus (WSSV),Yellow head virus (YHV) and loose shell syndrome are often triggered because of low water quality. In a system allowing partial exchange of pond water, we require at least 3 culture ponds to one reservoir pond. At the Thammachart farm, which participants visited, the ratio of culture to reservoir ponds is 1:1.

"The need is to make more profit which does not necesarily come with higher productivity, especially when prices are low. Thus, the farmer may wish to change the system to produce larger shrimp. However, most producers may have the same idea and thus it is important to think a step ahead. The aim is to be able to produce repeated crops and a successful farm is one which is well managed for at least 3-4 years. My message to you is to work at producing high value products and/or aim for low cost", said Pornlerd.

Other topics covered by Dan and Pornlerd were aspects from post larvae quality assessment to water and feed management. Julian Davies, the MD of SNR farms, talked on basic shrimp farm business management whilst Dr Tim Flegel discussed principles of fish disease management and updates on the disease occurrences and diagnosis. Dr Chalor Limsuwan discussed current problems in the Thai shrimp culture industry.

Workshop participants during the field trip

Q&A with Dan Fegan on the shrimp physiology and pond environment

Q: If stocking density is increased and feeding is controlled, will increasing aeration work? ~ *Anda Soemaryono, PT Matahari Sakti, Indonesia*

DF: Stocking density is not as crucial as the total biomass of shrimp in the pond. When biomass increases, more feed is used which means that bacterial consumption of faeces, uneaten feed etc will increase. Contrary to popular belief, shrimp oxygen demand is much less than that for bacteria and plankton. As you increase feed (or after a bloom crash) there will also be increased consumption of oxygen by bacteria. In one study, it was shown that some 55% of oxygen demand comes from bacteria, another 45% by the plankton and that shrimp only consume 5-10%.

The main source of oxygen, even in heavily aerated ponds, is usually phytoplankton. It is important to realise that aerators usually reduce the rate of oxygen loss but are inefficient at raising oxygen levels as air contains only 20% oxygen. If the oxygen concentration in the water is below 100% saturation (usually around 6.2 ppm), oxygen from the air enters the water. However, if the oxygen saturation is above 100%, oxygen will leave the water into the air from the water spray. In super-intensive systems, where there is a high bacterial load, pure oxygen can be injected into the water to increase oxygen levels. Most aeration systems used in Asia are a compromise between aeration and circulation. A rough guide for pond aeration is around one hp for every 4-500kg of shrimp to be harvested or around one hp for each 16kg of feed/day.

Q: We worry about water quality. What is the recommended frequency of tests? ~ Leong Wing Hong, Greenville Farm and Food Industries, Brunei

DF: Ammonia is often tested weekly. However, after over-feeding, ammonia 'spikes' will occur within around 6 hours and may not be detected by a weekly sampling so it is advisable to check for ammonia more often. The pH is usually measured twice a day (am and pm) and similarly for dissolved oxygen. pH should be maintained at 7.5-8.5. Salinity and alkalinity are usually checked weekly but temperatures should be monitored daily if possible, usually early morning to get the minimum.

There is a lot of talk about hydrogen sulphide in ponds and most times, I believe this is not important. With the right conditions, the effects of hydrogen sulphide on the shrimp will be very low as it is quickly broken down in the presence of oxygen to harmless forms. We can smell H_2S at levels far below those that are harmful to shrimp and so we tend to overestimate its importance. Hydrogen sulphide, like ammonia, exists in a toxic (un-ionised) form and a non-toxic form with the toxic form being more prominent at low pH (the opposite of ammonia). At the recommended pH of 7.5 to 8.5ppm, very little of the H_2S will be present in the toxic form.

The cheapest way to reduce ammonia in ponds is to change water. However, if you practice zero exchange and worry that water exchange will introduce diseases, you can use products such as De-Odorase, especially for emergencies when bacterial preparations need more time.

Pondside probiotic production - what are you really growing?

Q: What is the effect of water colour on shrimp in the pond? Can we add artificial colour to the pond and is it true that when the colour is right, the crop will be good? ~ Albert Sim, Aquafield Research Center, Philippines

DF: Many years ago, we used special dyes that absorbed light at the same wavelength as algae to try to prevent lab-lab from growing but this proved to be expensive and difficult unless the treatment was timely. The colour of the water itself is not so important since water colour that is light green, green yellow or brown have all been used successfully to grow shrimp. The important factors are maintaining a stable water colour and preventing lab-lab or undesirable algae from growing.

Q. What are the best practices to make probiotics? Is there any way to measure the probiotics bacteria in the pond? ~ Catur Widi Darwiyono, PT Goldern Stars, Banyuwangi, Indonesia

DF: This is not recommended unless you can control the conditions carefully and can ensure that you will end with what you start with. It is very difficult to do this and the longer you leave it the more contamination you may get. Of course you can test on agar plates if you know which bacteria you are looking for. For example, TCBS agar is specific for Vibrio bacteria. Now, researchers are studying what are known as 'unculturable' bacteria which are dominant in the environment but which we cannot grow in the laboratory. Their role in pond environments is likely to be far more important than we currently understand.

There are so many commercial probiotics on the market that it is difficult to decide which will be effective for the range of conditions (temperature, pH, salinity, organic load) in any one pond. Ideally, you should understand the principles of probiotics and buy something that has solid research behind it rather than culturing it yourself beside the pond. These kind of farm fermentation systems (see picture) are prone to contamination so the bacteria that grow may not be the same as those you started with, and may even contain human and shrimp pathogens. Companies that produce microbial cultures such as Alltech and Novozymes take great care to maintain sterilized equipment and controlled conditions for fermentation to prevent the entry of undesirable or pathogenic bacteria.

Often, farmers buy products, make them up to a large volume at the pond side and add them to the pond without knowing or monitoring the bacteria strains being used. Many products also contain a long list of bacteria, some of which are unlikely to be present in the product or viable in pond conditions. I believe in the scientific use of probiotics as an approach but I am concerned that many commercial products are simply ineffective and their abuse may result in further consumer concerns over food safety and damage our efforts to produce and market shrimp internationally.

Male scampi

The current status of giant freshwater prawn production in India

By S.Chandrasekar, Julius Edward and Victor Suresh

A few years ago, it was considered a species of great potential for Indian's aquaculture industry. Progress continues to be constrained by water availability, diseases, and lack of domesticated broodstock.

Farming of the giant freshwater prawn, *Macrobrachium rosenbergii*, (known as scampi in India), has undergone several changes in recent years. The species that was once cultured along with fish in traditional polyculture, began to be cultured as a single species in the late nineties.

Large-scale commercial farming gained momentum in the early part of this decade. Technological improvements made in seed production and monosex culture provided much hope for the continued expansion of *Macrobrachium* farming in India. In 2005, estimated farm production was 15,743 tonnes which was a further fall from the quantity in 2004 of about 18,000 tonnes.

The reversal in progress is due to the widespread occurrence of diseases and other culture related problems.

Water shortage

The year 2005 witnessed a reduction in the fresh water farming areas in Nellore district, the area in the state of Andhra Pradesh that contributes about 75% to prawn production. The reduction in pond area was from 9,000 ha in 2004 to 7,900 ha in 2005 (see figure 1). The major reasons for this reduction included shortage of water supply, viral and bacterial diseases and the scarcity of quality brood stock.

Consecutive failures in monsoon rains and the depletion of ground water due to its use for both agriculture and aquaculture, had resulted in the lack of adequate water supply to the ponds. As a result, prawn farmers moved to less water-demanding forms of agriculture. Most farmers switched to sugarcane because it demands less water and the government provides a price guarantee and subsidies for this crop.

Disease

White Muscle Disease (WMD) was the major problem in freshwater prawn nurseries causing heavy mortalities. Unlike in previous years, WMD did not affect the prawns in grow-out ponds seriously in 2005. Absence of well-defined procedures for screening the larvae and the parent stock rendered the farmers and hatchery operators helpless in containing WMD problems. Slow growth and runt syndrome also caused severe economic problem to the farmers.

Breeding problems

Early maturation, presumably due to in-breeding, emerged as a serious production problem in 2005. Females were found to mature at 8-10 grams while males were mature at 15 grams. As those hatcheries that had their own broodstock ponds produced good quality seeds that performed well in the grow-out, many hatcheries were seeking for ponds to own.

Amidst all the problems, monosex culture of freshwater prawn is becoming the practice of preference in Andhra Pradesh. About 40% of the farmers in the state of Andhra Pradesh are doing monosex culture of the prawns. Good prices for the prawns prevailed in 2005 consistently which kept alive the interest in farming of the species.

Early matured female scampi

SWOT Analysis of Farming Freshwater Prawns in India

STRENGTHS

- Proven technology
- Year-round availability of seeds, quality feeds and other inputs
- Good demand for exports
- Good farm price

WEAKNESSES

- Lack of sufficient water and high dependence on monsoon rains in major culture areas
- Unknown etiology of viral diseases
- Heterogeneity in growth
- Partial harvesting and extended culture period
- Lack of quality broodstock
- Mixed culture resulting in high size variation

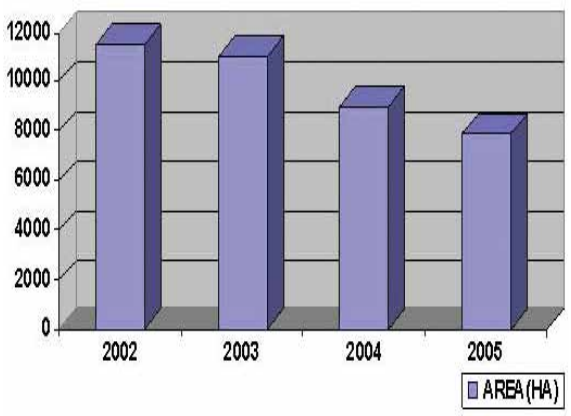
OPPORTUNITIES

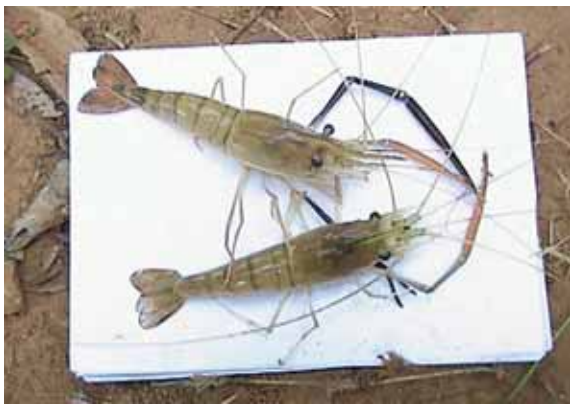
- Potential farming areas for expansion
- Increased production with new development/farming technology (quality feeds, probiotics, immunostimulants)
- Potential species for crop rotation in less saline areas
- Genetic diversity to develop new hybrids between strains

THREATS

- Oversupply and possible reduction in price
- Failure of monsoon season
- New diseases

Figure 1. Reduction in the *Macrobrachium* farming area in Nellore, Andhra Pradesh, India.





Early matured female scampi

Outlook in 2006

The year 2006 looked bright in the initial stages with good monsoon rains at the end of the year 2005. The first three months of stocking in 2006 showed an increase in stocking of seeds by around 25%. However, the stocking declined in the following months up to June. On the positive side, freshwater prawn farming is slowly expanding in other parts of Andhra Pradesh and other states of India such as West Bengal and Gujarat.

What next

Solving hatchery-related problems and producing quality seed is important to the future of freshwater prawn farming in India. Reliable, rapid and cost-effective methods to screen broodstock and post-larvae are urgently needed. Both hatcheries and farms need to adopt better disease-prevention measures and improved management practices. There is a serious need for a genetic management program for the prawn broodstock. The fact that the prawns have already been domesticated and that wild stocks are available in various parts of India make it possible to establish a genetic improvement program. Since all farmers and hatchery owners are small operators, government or large companies involved in feed and input supplies need to take an initiative in such a program.

*The information was first presented at the Aqua India 2006 Conference, organized by the Society of Aquaculture Professionals, March 3-4, 2006, Chennai, India

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Research update

Infectious hypodermal and haematopoietic necrosis virus (IHHNV) infections in giant freshwater prawn, *Macrobrachium rosenbergii*

by Chia Y. Hsieh, Po C. Chuang, Li C. Chen, Chien Tu, Maw S. Chien Kwo C. Huang, Hui F. Kao, Ming C. Tung and Shinn S. Tsai

Abstract

Between July 2004 and January 2005, high mortalities (up to 80–100%) were frequently encountered in postlarvae of *Macrobrachium rosenbergii* in southern Taiwan. Pathologically, eosinophilic intranuclear inclusion bodies (INIs) were found only in the hepatopancreatic tubular epithelial cells of the infected postlarvae from hatchery farms. No lesions could be detected in tissue of ectodermal or mesodermal origin. Interestingly, different lesions were found in sub-adults collected from a grow-out farm. Atrophic changes in abdominal muscles from the fourth to sixth segment and tail fan, associated with a reddish discoloration, were prominent features in these shrimp, but there was no unusual mortality or INI formation. In PCR assays for the detection of infectious hypodermal and haematopoietic necrosis virus (IHHNV), hepatopancreatic parvovirus (HPV), white spot syndrome virus (WSSV), Taura syndrome virus (TSV), yellowhead virus (YHV), *M. rosenbergii* nodavirus (MrNV) and extra small virus (XSV), only an expected 389-bp product, specific for the IHHNV nonstructural protein gene, was obtained from all postlarvae and sub-adults examined. Positive reactions to in situ hybridization, using a DIG-labelled DNA probe, further confirmed IHHNV as the causative agent. In a comparison of our strains with Taiwanese (GenBank accession no. AY 355306 and AY 355308) and American strains (GenBank accession no. AF218266 and AF273215), nucleotide sequence identities were up to 99.7%. This is the first report concerning natural infection of IHHNV in postlarvae and sub-adults of *M. rosenbergii*.

In Aquaculture, Volume 258, Issues 1-4, Pages 73-79

Organic Aquafeeds:

Application of functional nutrition through a certifiable organic protein source

By Daniel F. Fegan

In recent years, there has been increasing interest in aquaculture species that are reared 'organically' to supply the growing market for organic products in Europe and the USA. Although complicated by a lack of a single recognised standard, several groups have developed their own standards for organic aquaculture, based on the principles of the International Federation of Organic Agriculture Movement (IFOAM, http://www.ifoam.org) and such products usually sell at a premium price over uncertified products.

Organic Aquaculture

Organic standards apply not only to the methods of production of a species but have also been applied to the feeds used. For example, restrictions on feed ingredients of animal origin, in particularly fish meal and fish oil, are often included as well as the requirement that they are replaced by plant or other sustainable protein sources. There may also be restrictions on the use of specific synthetic feed additives such as crystalline amino acids and pigments. This places considerable constraints on feed manufacturers when formulating for organic feeds.

'Organic' protein sources

Current commercial aquafeeds are developed to meet the basic nutritional requirements of a few farmed species. Raw material selection, formulation and manufacturing processes should provide a feed that meets basic nutritional demands and support adequate, economic growth under standard farming conditions. For organic feeds, there remains the same pressure on feed companies to deliver a high performance feed while maintaining greater traceability and meeting the demands of the consumer and the organic certification agency.

Most of the research on alternative protein sources have focused on increasing the proportion of plant proteins, such as soybean. However, many sources of plant protein have disadvantages such as low nutrient density, anti-nutritional factors, high carbohydrate content, imbalanced amino acid and fatty acid profiles, low palatability, seasonal variability and potential mycotoxin contamination.

An important area of concern with regard to organic standards is genetically modified organisms (GMO) including soybean and corn meals from GMO plants. Worldwide, protein sources from GMO are strictly forbidden in all drafts of organic standards. This limits the available sources of high protein, highly digestible, cost-effective feedstuffs that can be utilised in organic aqua feeds.

Another challenge is the ability to track and certify feedstuffs for use in organic feeds. Traceability is equally important in the organic certification process as in food safety and biosecurity. This and the documentation of raw material supply will become increasingly important as organic standards are developed, revised and become more stringent. Therefore, research should be directed towards protein and oil sources that are completely traceable and certifiable in terms of organic standards.

Apart from plant materials, research into alternative protein sources has shown that single cell proteins, including microalgae, bacteria, yeasts and yeast-derived products, have several advantages, not least the ability to produce them in large quantities in production systems that are sustainable and allow them to be fully traceable and certifiable. Yeasts, for example, are a rich source of protein, B-complex vitamins, pigments, complex carbohydrates (including glucans) and nucleotides and have potential immunostimulating properties. However, many single cell proteins also have some drawbacks such as low digestibility, low protein content and poor amino acid profile and their use has met with varying degrees of success.

Cobia – can marine species like these be raised within organic certification guidelines?

Recent research into replacement of fish meal in production of organic aqua feeds has shown that commercial production of freshwater and marine fish and marine shrimp is possible using feeds in which fish meal has been completely replaced by a yeast-derived product, NuPro® (Alltech Inc.). This products is derived from a specific strain of *Saccharomyces cerevisiae*, grown under consistent and carefully controlled conditions and further processed in state-of-the-art production facilities capable of producing 100,000 tonnes/yr. It provides a consistent and excellent source of protein, amino acids, nucleotides and important vitamins (Fegan, 2006).

Commercial organic aquaculture trials have shown that this a yeast-derived product, is a highly promising candidate to replace fish meal in aqua feeds due to its relatively high protein content (>50% crude protein, dry weight basis), an amino acid profile that closely mimics the requirements of major production species, and its potential to be fully certified as an organic protein source. Moreover, when combined with nutrients such as protein and vitamins with more functional components such as nucleotides and free amino acids, it offers significant benefits beyond simply providing an organic protein source and helps in developing a new generation of "functional feeds" that support better and healthier

White shrimp raised under organic farming principles in the southern USA.

production. Moreover, it is fully sustainable in terms of production, aids in producing high quality pellets and when added at high inclusion levels, acts as a binder in aquafeeds.

The nutritional properties

Fish and shrimp, like other animals, do not have a requirement for protein but for a well-balanced mixture of essential and non-essential amino acids required for tissue development. Therefore crude protein levels are less important than the protein digestibility and the balance of essential amino acids in the diet. A comparison between the amino acid profile of NuPro® and the typical essential amino requirements for fish and shrimp shows that the former provides a close match (Craig and McLean, 2006). In addition, the amino acids are highly digestible. The positive effects of using this as a protein source replacing fish meal has been demonstrated for several fish and shrimp species, including tilapia, cobia, black tiger prawn and pacific white shrimp. In a series of trials to develop organically certifiable feeds for fish and shrimp, it has been shown that complete replacement of fish and soybean meal with the yeast derived product is possible (Craig and McLean, 2005 and 2006).

The functional properties

Functional feeds have been defined as feeds or feed ingredients that can offer benefits beyond simply meeting nutritional needs. The concept was introduced from human and animal nutrition where functional foods include DHA-enriched eggs and milk, nucleotide enrichment of baby foods, selenium-enriched pork and eggs, prebiotics and probiotics.

In aquaculture, feeds need to be both attractive and palatable. However, as more plant proteins and oils are being used, attractability and palatability can become an issue. As this yeast product has a rich source of nucleotides and a combination of free amino acids, known to be potent feeding stimulants, improved growth and FCR have been noted in laboratory and field trials with fish and shrimp. As a protein source, it will contribute to improved growth, the improvement in FCR may be partly due to improved attractability and palatability of the feed. This may be especially for slow feeding species such as shrimp.

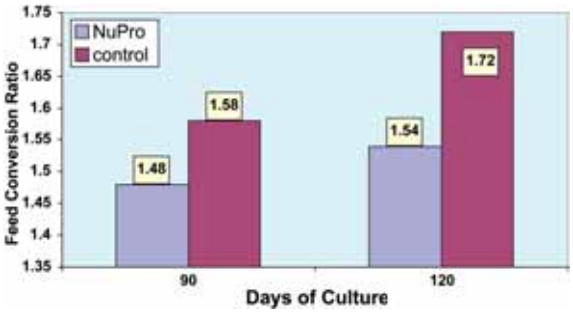
As basic building blocks of life, nucleotides may be especially important during periods of rapid growth or cell replication such as reproduction and early development of eggs and larvae. Additions of nucleotide have been shown to significantly increase relative fecundity, hatching rate of eggs and larval quality and survival at the end of the yolk sac stage. Experiments on first feeding with different species also showed that larvae from broodstock fed nucleotide-enriched feeds had better intestinal development, first feeding success and larval performance.

Nucleotides also play an important role in times of stress or disease when blood cell (especially those involved in the immune response) production increases rapidly. Aquaculture practices often place a great deal of physiological stress on the animals, which can result in immune suppression, reduced growth rate and increased susceptibility to disease. Under such conditions, a nucleotide-supplemented diet may also provide benefits. Research has shown that dietary nucleotide supplementation has been associated with improved humoral and cellular immunity in animals and improved immune responses and disease resistance has been found in NuPro®-fed fish and shrimp (Fegan, 2006). This is because it represents a rich source of nucleotides (around 5% of the dry weight), most of which are soluble, making them much easier to assimilate than nucleotides bound in insoluble forms such as nucleoproteins.

Performance and immunity enhancement

Commercial production trials conducted at Virginia Tech and the Organic Aquaculture Institute in the USA with tilapia and Pacific white shrimp also showed that it can significantly improve growth performance when was used as a protein source (Craig and McLean, 2005). In a tank trial carried out with *Litopenaeus vannamei*, with 2% inclusion in a diet, the average feed conversion ratio was significantly lower than the control diet after 90 and 120 days of culture (Figure 1). This has also been noted in commercial farm conditions for both *L. vannamei* and *Penaeus monodon* where FCR has been reduced by as much as 24% compared to the standard feed (W. Kramer pers. comm.)

Figure 1. Comparison of feed conversion ratio of Litopenaeus vannamei fed on a standard shrimp diet and a similar diet containing NuPro® (2%).



This ability to increase the level of immune response has been demonstrated in shrimp. Shrimp fed diet with 2% and 4% of the product for 4 weeks resulted in an increase in total haemocyte count as well as significantly increasing the number of granular haemocytes, from 2.8 x 10^5 ml^{-1} to over 7.0 x 10^5 ml^{-1} (Sritunyalucksana *et al.*, 2005). This increase was also reflected in an increased rate of bacterial clearance from the haemolymph following an injection challenge using an elevated dose (109 $cfu.ml^{-1}$) of the shrimp pathogen *Vibrio harveyi*. Interestingly, no difference was found between the granular haemocyte count nor bacterial clearance between the 2% and 4% treatments although the initial bacterial clearance rate may have been faster at the higher concentration (Figure 2).

Commercial trial data (Mendoza *et al.*, 2001, unpublished report) from a farm in Ecuador also suggested that NuPro® may play a role in reducing the severity of shrimp virus diseases such as White Spot

Figure 2. Comparison of bacterial clearance rate from the haemolymph in shrimp fed NuPro® at 0, 2 and 4% of the diet (from Sritunyalucksana et al., 2005).

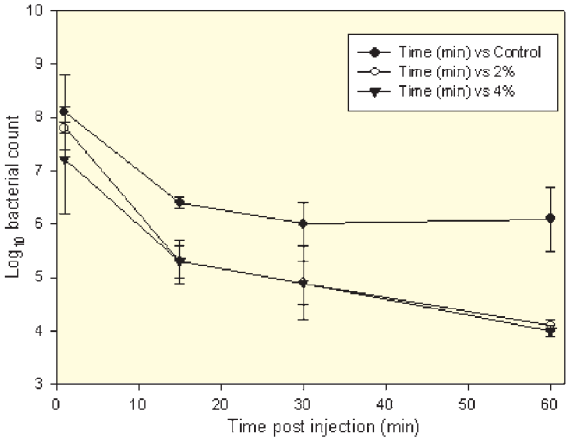


Table 1. Comparison of production parameters in WSSV-exposed shrimp in paired ponds given control and treatment* (NuPro™ at 1%) diets

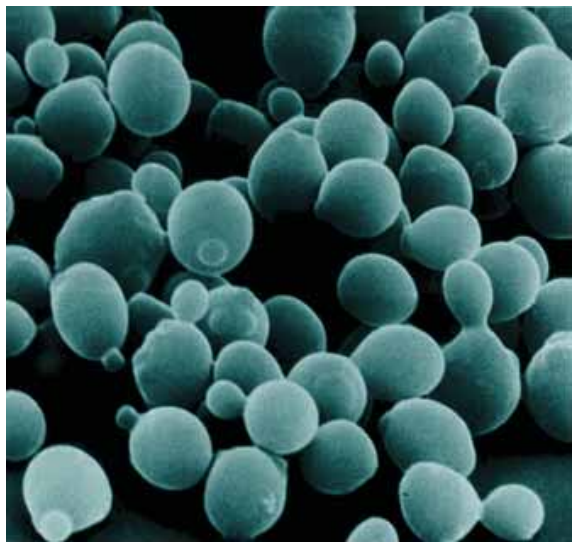
		Ave. Wt (g)	Surv (%)	Yield (Kg/Ha)	FCR
Trial 1 (35 days)	Treatment	2.66	25	131	2.3
	Control	1.9	18	87	3.1
Trial 2 (52 days)	Treatment	2.19	21	90	3.64
	Control	1.27	11	28	11.4
Trial 3 (65 days)	Treatment	5.9	11	132	2.45
	Control	4.9	10.5	100	5.6

Syndrome Virus (WSSV). In a series of three pairs of ponds, all of which had been exposed to WSSV, shrimp fed diets with 1% of the product, showed consistently higher average body weight, survival and yield as well as reduced feed conversion (Table 1). Although economic performance remained poor, it suggests that further study could yield further improvements.

Its potential was also investigated for cobia, a high level marine carnivore. Fish meal was replaced at different dietary protein levels in the feed and it was shown that cobia can accept up to 40% replacement of fish meal with NuPro® without any negative impact on production characteristics. From an organic standpoint, this was exciting as it is widely assumed that marine carnivores need high levels of fishmeal and animal protein in the diet. Although inclusions at levels higher than 40% detrimentally affected production characteristics of juvenile cobia, this could be overcome by specific amino acid supplementation. Addition of taurine, for example, allowed inclusion at up to 75% replacement of fish meal in cobia feed without affecting production.

This research into organically certifiable alternative protein sources could provide the basis for organic production of marine carnivores, a truly novel and potentially lucrative product. Investigations to determine whether 100% replacement of fish meal is achievable with cobia are currently underway (Craig and McLean, 2006).

Although still clearly in its infancy, organic aquaculture production may have a promising future. Organic aquaculture products are likely to remain a niche market and the price premium obtainable for organic aquaculture products makes this a worthwhile business. Challenges remain in the production of high quality, good performing aquafeeds that meet the needs of the various organic certification agencies. The use of single cell proteins such as NuPro® demonstrates that replacement of unsustainable animal proteins is possible without adversely affecting commercial production.



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Daniel D. Fegan has been involved in commercial aquaculture for almost 25 years. After spending some years providing technical support for shrimp hatcheries in Ecuador he moved to Asia in 1986. He has a vast experience in commercial production of shrimp at hatchery and farm level. In 1998, Dan started as an advisor to the Thai National Center for Genetic Engineering and Biotechnology where he worked until January 2004, when he joined the US-based biotechnology company, Alltech Inc.

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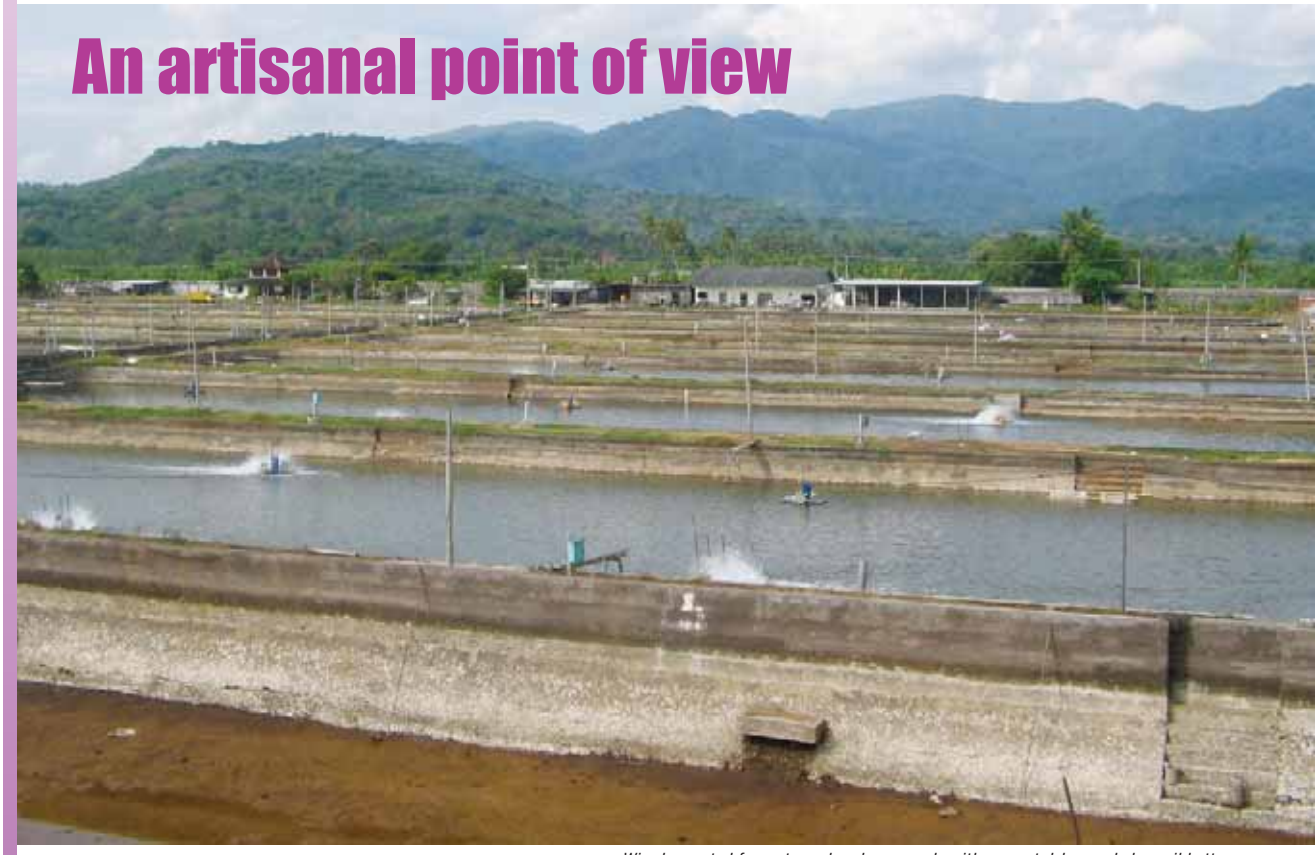
An artisanal point of view



Wira has opted for rectangular shape ponds with cement dykes and clay soil bottom

In Bali, Wira Chayadi Wangsa has achieved consistently high yields for the last four years. Here he tells Iffa Suraiya the innovations that he has used at his farm to arrive at this level of success.

Wira (right) is pictured here with Haris Murtadi, Alltech Indonesia

Iffa Suraiya is based in Surabaya.

Four years ago, Wira switched from the culture of the black tiger shrimp *Penaeus monodon* to the white shrimp *P. vannamei*. In Bahasa Indonesia, these are *udang windu* and *vaname*, respectively. Farm productivity has been consistent and stable. On average, the stocking density ranges from 150 – 200 PL/m^2. Harvests have been around 22-28 tonnes /ha/crop. He has managed well despite some disease occurrences. Once when he had a large problem, he used the services of a farm technician.

For Wira, shrimp culture is not only a business but also a hobby. He does it gladly with dedication and with passion. He is very proud of his success in shrimp farming. For the last 23 years, this has been his life.

"Shrimp farming cannot be considered as moonlighting. It must be done seriously." he said smiling.

"Actually, the farming of shrimp can be more complicated than we expect. If we want to be successful, we have to be fully aware of all the processes. By doing so, we will be monitoring for every indication on the lives of our shrimps. If something is wrong, we will be the first to know and able to take a quick and right action. As an example, for me, in the case of TSV (Taura Syndrome Virus), clinical symptoms such as the redness at the tail or black spots at the abdomen, means that it is too late. There are actually earlier symptoms that occur before these. We have to be aware, be really careful and meticulous. I have learnt a lot throughout the years".

Minimizing death point

To reach his targets, Wira considers that it is most important to be on the look out to improve farm efficiency. "This means being open to new technologies", he said.

Pumping water from one and another reservoir ponds

These are the cement platforms jutting into the ponds for regular sampling work. Note that there is no foundation pole in the pond

He has made several innovative moves. Some 19 years ago, he decided to move the farm from Denpasar Bali to another one at Kalang Anyar, Singaraja Bali. It takes 1.5 hours to reach his farm, by land from Gilimanuk port.

He is pleased with this location. He said that this place is perfect for farming shrimp. "The seas off Kalang Anyar have tidal fluctuations of 2-3m. The soil is clay. Water leakage can be reduced. Fresh water supply is sufficient. Last but not least, it is also close to the Gondol Research Center *", he added.

There are 22 ponds for shrimp grow out ponds at the farm. However, Wira said that he has never stocked all the ponds at the same time. "It's difficult to watch over all of them. Well, it is good training not to be greedy." he said smiling. Each pond can be harvested twice a year.

Rectangular ponds

What is interesting is that his pond configuration differs from the norm. Wira's ponds are rectangle, with average sizes of 30 m X 100 m. In his opinion, this is far more efficient. "Shrimp live around the pond edge and it is 12m towards the middle. The rest of the middle part is for waste deposition. This pond shape is to minimize this which I call the 'death point'."

The dyke construction of his farm is made of concrete, whereas the bottom is soil. Although many farmers have started to use cement or plastic liners to cover pond bottom, Wira prefers a natural soil base. In his opinion,it is easier to manage water quality and will be faster to develop a plankton population with many species. It is also easier to induce a good bacteria decomposition and more natural food for the shrimp. To keep the pond bottom in good condition and able to have a high carrying capacity, he regularly replaces the soil base with the new one. Besides, he carries out good pond preparation, perfect drying and liming with the proper dosage.

One of the dykes of the ponds is used for vehicle access during the harvesting process. The depth of the pond is about 2 meters and the height of the water is about 160-180 cm.

A concrete sampling platform

Another interesting feature is the concrete platform for lifting the sampling tray. Usually the construction of it is made of bamboo or wood. But, at Mr.Wira's farm, this is of concrete and is 4 meters away from the dyke of the ponds without any supporting poles. For this innovation, according to Wira, the investment cost was high but it has lower running costs. For every pond, he has built four of these.

"Just think about it, if we use wood or bamboo, we will need something to support it. At the harvesting or cleaning up stages, the platform support must be always resettled. It takes a longer time. Using the concrete construction, we do not have to do so. It is safer. It is true that it costs us more for the first construction. But it does not take much from the profit."

Aeration

Wira uses 8 paddle wheels (4 regular ones and 4 venturi models) for each pond in the morning. Later at mid day, only 4 paddle wheels are used. The stocking density is about 250 PL/m^2, and can produce 11 tonnes. During the last cycle, some of his ponds were affected by white spot syndrome virus. By the correct handling, he still harvested about 7–8 tonne. Though he lost about 2.5 tonnes, the feed conversion was still good around 1:1.7. Normally, feed conversion average at Wira's farm is about 1.4 - 1.5.

'Feed character'

At the farm, Wira prefers to use monodon feed for his vannamei shrimp. This decision is based on the high density nature of his culture. According to Wira, a higher energy is needed by the shrimps and monodon feed contains higher levels of protein. He has an interesting point of view about shrimp feed.

Wira has also assigned a parameter which he termed as 'feed character' to the feed.

What he means by feed character is the relationship between feed stability and feed quality. During the last 15 years, he has faithfully used Gold Coin feed. "I have also used other feeds. But, because I don't know their character well, the results were not satisfactory. That's why, I'm reluctant to change to another one which makes me have to learn from the beginning again and again."

In his opinion, this is most important. He said, "A high quality feed does not guarantee the life quality of the shrimp. Choosing the high feed quality that costs more is not necessarily the right decision. The

more important thing for the farmers is to know exactly the feed character." The suitability between the feed character and the environment should be consistent and stable.

Nevertheless, as a person interested and open to new ideas, he is always challenged to try new inventions and apply them. "Of course, as long as they are reasonable, profitable, legal, safe -not antibiotics and for instance improves the farm performance."

His lastest innovation, was using Aqua-Mos and the yucca extract De-Odorase (Alltech Inc., USA). Aqua-Mos was used to improve gut health because antibiotics should not be used in its culture. Buyers have been concerned with the antibiotic residue of shrimp products. Meanwhile, De-Odorase is used to control the ammonia content in the water during culture period. Since 2005, he has already used these products for three harvests. In July/August, he began to use the nucleotide NuPro to increase the appetite of shrimps and improve their growth rate especially during the colder months when the temperature declines to 25°C.

Sensitive to water quality

Among the many parameters, Wira is most concerned with water quality. "My thinking is simple. Shrimp are creatures of the water. So, it is their environment. Like other creatures which really depend on their environment quality, the living quality of shrimps depends on the water quality.

"I believe, shrimps need a good environment --good water--, to live well.

To fulfill this need, Wira provides 6 reservoirs, each of 4,000 m^2. Water goes through a sedimentation process for 2 days and is then channeled to another pond which contains milkfish and tilapia as a bioremediation species. The main reservoir is also used to keep milkfish broodstock. The water from this reservoir is the source water for all the grow out ponds and for the grouper and milk fish hatchery. The reservoir with this biological treatment is also economically profitable. In one cycle, the milkfish broodstock can produce up to a million eggs/day. There are as many as 1,000 fish which are already 6 years old and weigh 8-10 kg.

One of the problems he often faces is high levels of ammonia. To overcome this, Wira usually change water. However, he emphasized that one must be careful not to stress the shrimp. He also uses probiotic bacteria which he produces himself and materials like zeolite. Farmers are more familiar with the yucca extract. He uses this routinely at 0.3 ppm every week. With this, Wira said that he has seen significant improvements in water quality. He added, "Before, the colour of the water tends to be brown and at night, slight foam appears on the surface of the water. Besides that, the pH value tends to decrease."

Old pond bottom soil is replaced by new soil before each cycle.

Detecting problems

During the visit, he was seen hanging out in his farm. This worries his employees as it is indicative that a problem is on the way. "Actually, it is not going to be a problem, but it is already happening. They just do not know it yet," he said with a wide smile.

For him, to be successful, it is not only determination and hard work needed, but also the love for the work itself. This makes him so sensitive to the signals, even though small.

"Never underestimate the trivial things because failure usually comes from our negligence of them. Such as, avoid walking on the pond paths when our own shadow falls on the water of the pond. The vannamei is easily startled. Just watch it. At the time the shadow is moving on the water of the pond, the shrimp will jump up. The ones that do, surely will die," he explained, again with a big smile. *-IS*

(*) GRIM is a major institution for aquaculture research in Bali. The main focus is on the breeding and seed production of various marine fish. However, it also provides industry with technical services such as PCR disease diagnosis, pure culture of phytoplankton and zooplankton and assist farmers in general techniques on culture of shrimp and fish and seed production for marine fish.

Wira has nursery ponds alongside with shrimp ponds

Broodstock of milkfish in reservoir ponds

Part 1: A description of rehabilitation works and planning operations

Using science to drive black tiger shrimp culture

How a team in the Philippines develops the right protocols to restore operations and achieve consistent harvests of black tiger shrimp

by Zuridah Merican

In 1998, one of the pioneers in feed shrimp manufacturing in the Philippines, Hoc Po Feeds Corp (HPFC) positioned itself 'as a strategic partner in innovative feed technology and sustainable aquaculture'. The aim was to bring new life to the industry. Since 1995, black tiger shrimp production was on the decline as farms continuously suffered from luminous *vibrio* infections. In 2003, William Kramer helped to establish the Business Development Group (HPFC- BDG). The strategies of the group are to re-establish shrimp culture in six idle to partially operating shrimp farms, introduce the current concept of semi close system of culture and develop sound culture protocols.

Today, through the precise control of soil and water conditions throughout the culture cycle, it has managed to produce 36- 42g black tiger shrimp at average survival rates of more than 80%.

William Kramer, Assistant Vice President of the group said, "What we have developed are tried and tested protocols which are applicable to all six farms as well as at clientele farms. These have been confirmed by Roselyn C. Usero, Manager and Chief Lab Chemist/Analyst at the Negros Prawn Producers Marketing Cooperative Incorporated (NPPMCI), who systematically monitors and conducts the various technical audits. Data from all members such as those from HPFC_BDG are open to production and operations audit". Most of the active growers in Negros as well as from other areas are members of NPPMCI which was established 23 years ago".

The farms

After a complete assessment of each farm, the initial task for the team was to restructure and upgrade grow out and reservoir ponds for a semi-closed or closed water exchange culture system. These involved the conversion of some ponds into a series of reservoir ponds with different levels of filtration prior to use. However, the main prerequisite was an implementation of farm iosecurity.

The HPF-BDG team at the Mina farm. From left, William, Noël, Romeo, Jumar, Jerry and Dennis. Jumar and Dennis are farm administrators.

The team

William Kramer with his HPFC- BDG team sees shrimp culture as a long term commitment. Today the group handles a total 6 farms in Negros Occidental, Western Visayas. Three farms are in San Carlos, one in Talisay City, 1.5kms. from Bacolod and two other farms are in Bais City and Amlan.

William said, "Success is also the team work and dedication of each personnel in the group. We need to be open to new ideas and abreast with international developments".

"Shrimp farming is capital intensive and competitive, but profitable. Our challenge is to be sustainable and profitable especially during these times where production costs are increasing but global shrimp prices are on the downward trend. Ultimately, our aim is to be the main key player to make Negros as the shrimp capital of the country once again and expand in other parts of the country and eventually within the region through strategic partnerships".

Management of all these farms requires concerted efforts from top and middle management, joint venture partners, supervisors, support personnel to transient workers, according to William. Noel Valdez, one of the production and operations superintendents is responsible for five of the six farms in Negros. At the Mina farm, Romeo Marfil, the senior farm technician has 26 laborers and transient workers. Each pond tender is responsible for three 0.6ha ponds or two 1 ha ponds. The larger farms have a laboratory manned by a technician. Support staff at the larger farms include junior production technician, accounting clerk, water quality monitoring personnel, pump and generating set operators, electricians and utility personnel.

Baffle nets at the reservoir ponds in Mina. Reservoir and grow out ponds all have overhead lines.

In the case of the 32ha Mina Farm in Calatrava, close to San Carlos City, the group recognised its potential because of the good basic farm structure and source of clean seawater deeper offshore. Some modifications to improve pond bottom conditions and design of reservoir system were also required for sustainable production.

Originally, the farm was established in 1988 by owners who were involved in sugarcane production. In 1994, they stopped operations when they could not overcome infections caused by luminous *vibrio*, although some 2 or 3 ponds out of the total of 22 ponds were still operated on an "on and off" basis. HPFC entered into a 5 year contract with the owners with 15% of the returns to the latter.

Today, the water area for reservoir ponds occupies 10.5ha and supports grow-out ponds with a total water area of 27ha. The reservoir comprises a 9ha pond split into five sections and a channel of 1.5ha. Freshwater from a shallow river is collected into a one ha reservoir pond. Pond sizes average 0.6ha with some one ha ponds. Both culture and reservoir ponds are protected by net fencing to prevent the entry of predators and disease carriers such as crabs, goats and dogs. All ponds have bird scarring devices made up of nylon lines at distances of 30cm.

William said, "Bird migration is a problem from November to February. Ideally we would like to follow the example of a farm in Thailand which uses the nylon lines at distances of 15cm but then it will be too costly for us at these early stages. The current lines already cost us USD 450/ha which we depreciate over two cycles".

In 2003, the group took over the older Viveros San Jose Inc. farm also through a profit sharing scheme. The farm is located in San Carlos City and has 56 ponds. Highly productive sugarcane fields were converted into this shrimp farm in 1987. During 1998-2002, when ponds were affected by luminous *vibrio*, the owners shifted to milkfish and tilapia production. Only one to three ponds were used for black tiger shrimp culture. The seawater source is the deep blue Tañon Strait but the water intake for the farm shoreline is situated along a tidal flat with muddy bottom. As such intake water is turbid.

On taking over the farm, the group began the reconstruction of the farm's three phases. Of the total of 54 ponds, 17 ponds (12ha) have been converted into series of reservoir ponds. Presently, only 31 out of total 35 grow-out ponds with a water area of 22ha are operational. Four ponds remained unutilized due to seepage problems. In phase one, three sets of ponds are reservoirs for 25 grow out ponds. In phase two, there are two sets of three reservoir ponds which serve eight culture ponds. The average size is 0.8ha. Phase three is served by four one ha reservoir ponds serving nine culture ponds. The total area is 7 ha.

In Talisay City, the HPFC_BDTG_ ALP Farm has a total land area of 9 ha. The group went into a joint venture (JV) agreement with the farm in 2004. The original farm was started in 1988. From 1995, it suffered losses due to luminous vibriosis and shrimp culture was stopped in 1998. It shifted to milkfish culture. By 2003, all operations were stopped.

Today, the team has restructured the farm with 7 culture ponds with a total water area of 3.72 ha and 5 reservoir ponds totaling 3.1 ha. The high ratio of reservoirs to grow-out ponds is because the source of water is from a river which is 2 km from Bacolod City. Conditions of extreme salinity occur during the dry season with highly turbid water during the wet season coupled with effluent coming from agricultural, residential and industrial areas.

The planning

William conducts meetings with key personnel and together they develop strategies and protocols to be followed at each farm. An internal workshop is also organised to discuss problems based on the performances during the previous year. Before stocking, farms follow a standard check list which includes several critical points. In each farm, implementation of these is crucial in meeting targets. All of these critical points are studied and established together with the R&D section of the Group.

The ROI

Prior to each culture cycle, William and the Production & Operations Superintendents together with the administration and finance staff with top management's approval set the budget and production targets for each farm and the entire operation. A return on investment (ROI) is then set. For example, it is 35% for black tiger shrimp at the Mina farm with a given set of production criteria, such as feed conversion ratios (FCR), survival rate, average body weight, days of culture (DOC). This also becomes the basis for the incentive bonus scheme for the farm production personnel.

Farm rehabilitation costs are depreciated over two years instead of the usual five years which comprises 15% of total production costs. The largest component of total production cost is feeds at 35%, power, fuel and oil at 16% and probiotics at 6%. Other costs are chemicals and vitamins at 4% and labour at 7%. Direct costs contribute 79% to the production cost. It was calculated that for every one gram reduction in harvest size, costs increases by almost PHP5 Philippine Pesos or USD 0.10/kg.

For this year's crop (2006), the target size is 42g with a DOC of five months and a lower stocking density of 12 PL/m^2. In 2005, the stocking density was 15-18 PL/m^2 and the actual production of 339 tonnes was

below target (370 tonnes) by 8%. This was because 26 out of the 108 ponds were affected by WSSV at sizes of 3 to 22g. The average harvest was 4.8 tonnes/ha which was below the target of 5.3 tonnes/ha. The average final mean body weight was at 32grams below the target of 36grams. Actual average FCR was at 1.88 over the budget of 1.8.

In comparison, 2003 and 2004 were 'good' years as the mean body weight achieved was 36g. Shrimp were sold at an average farm gate price of USD7.4 - 8 /kg. Cost of production has increased too. The cost per kg in 2005 was USD3.9 as compared to predicted costs of USD5.00/kg in 2006.

It is probable that the ban on the culture of *P. vannamei* in the Philippines will be lifted. "However, *P. monodon* will still remain to be the major species for 2006 and most likely next year. *P. vannamei* will be cultured in the succeeding cycle right in time for the cold season. A lower ROI with vannamei shrimp is anticipated because of lower price, smaller size shrimp and will require more aeration due to higher biomass. In the beginning prices of postlarvae will be on the high side", said William.

Tilapia in nets are used for bioremediation in growout and reservoir ponds

Moving away from traditional ways

In 2003, the team started to implement several measures to restore operations in these farms. First and foremost, they installed biosecurity measures to prevent diseases. Visitors entering each farm and to the various section of a particular farm are required to go through a vehicle tire bath. This is followed with a foot bath and hand wash. Then there were further improvements in culture technology, focusing on water and shrimp health management. Water quality is monitored according to set standards, shrimp pond probiotics are used at specific intervals and biological control of water quality when required. Top dressing of feeds with immunostimulants also improved feed conversion ratios.

At present, with these sound protocols in place, most aspects of culture are within their control and what remains to be a major concern are WSSV and the anxiety with declining prices for shrimp on the global market.

Their first encounter with WSSV infections started with four out of the 22 ponds at Viveros in 2004. In 2005, 13 out of the 31 ponds were infected with WSSV. The contamination in this farm came from an adjacent farm which initially thought that their ponds were infected heavily by luminous *vibrio*. At the nearby Mina farm, they managed to harvest 13 out of the 22 ponds hit by WSSV. The loss was 0.5 tonnes of dead shrimp. However, in the smaller ALP Farm in Talisay City, they were fortunate to prevent contamination from a neighboring farm practising extensive culture system, by an effective disinfection of the latter's effluent water prior to draining into the river system. They stopped pumping water into the reservoir system for ten days.

Reservoirs

In general, the ratio of reservoir ponds to culture ponds has been increased. This is to allow for sufficient volumes of filtered and treated water. This gives the farm control of water quality and salinity. It also allows the farms to exchange water, irrespective of the environmental conditions. On average, water exchange takes place only after 115-120 days. In all reservoirs, net baffles are installed in strategic locations to reduce the flow of water and increase the surface area for filtration. Tilapia is stocked at 1.2 tonnes/ha for bioremediation.

At the Viveros farm, nets with a mesh size of 1mm prevent the entry of crustaceans into the reservoirs. An organophosphate is used for 7 days to eliminate crustaceans. Water flowing into the next section is filtered through a 300 micron net. In the secondary reservoir, water is disinfected using the disinfectant. In all, there are 6 baffle nets in a series of pond reservoir. Finally, after mixing with freshwater, water with a salinity ranging from 14-22ppt is channeled to the ponds.

At the Mina farm, seawater of 28-30ppt is pumped into the main reservoir during low tide levels with a 40,000 gpm horizontal flow pump. During high tides, water enters the reservoir ponds by gravity. The initial filter nets are 14mm mesh because of the high flow rate and volume of the pump. Subsequent reservoir ponds are installed with net baffles with a series of 1mm fine screens and finally with 300 micron nets. The standard used at this farm and the rest of the JV farms, is that water flow to the various sections of the 9 ha reservoir ponds and freshwater is then mixed.

With the implementation of sound protocols (described in detailed in part two) and emphasizing on biosecurity and stress management, they have over the years, managed to control to a large extent the pond culture environment in the farms. Overall for 2005, they have achieved a survival rate of shrimp (in ponds not affected by WSSV) of 99.83%.

In the next issue: In part two, William will describe the R&D and pond trials to derive the best practices suitable for all six newly rehabilitated farms of the group.

Ponds after cleaning to rid of benthic algae at the Viveros farm

Ponds prior to stocking

Overview of the Mina farm

14th Annual ASA Southeast Asian Feed technology and Nutrition Workshop

Aquafeed technologists look at fish meal replacement to feed probiotics

This annual series of Feed Technology and Nutrition workshops is a way for the American Soybean Association (ASA) to work with the region's feed producers and to provide information and ideas for the industry's development. It is usually focused on the livestock industry which forms a large market for soy. For the first time, ASA in South East Asia, based in Singapore changed its focus to the aquafeed industry in Asia. The workshop was held in Siem Reap, Cambodia from 25-28 July, 2006.

In developing the program for this meeting, Robert Swick, ASA Singapore wanted to bring industry together to discuss issues affecting the aqua feed industry in Asia, similar to their earlier workshops for the livestock industry. In the sessions on industry, the situation and trends as well as the opportunities for aqua products for the US markets were discussed. The emerging aquaculture industry in Cambodia was presented by Dr Hav Viseth from the Ministry of Agriculture. New developments in spiny lobster and tuna nutrition were presented by Dr Robert Barneveld, Barneveld Nutrition, Australia.

In this workshop, attended by some of the top feed formulators in the industry in Asia, the main subject of interest was the replacement of fish meal with plant and animal protein sources. With the escalating price of fish meal, an urgent need is how to use soybean meal and other alternatives without comprising growth performance. Increasing knowledge in feed technology is also important. There are also other issues such as the use of feed probiotics where an understanding of its effects is well documented in livestock but is lacking in aquaculture nutrition.

John A Lindblom, Regional Director (centre) and Dalilah Ghazalay (second from right), ASA Singapore and Hav Viseth, Cambodia (right) with participants

From right, Vo Hoang Nguyen, Thu Nhan Consulting Co Ltd, Vietnam and Sawat Tangtanapon, Thailand

From left, Ir Candra Yanuartin, PT Sinta Prima Feedmill, Indonesia and Vo Thi Kim Hang, Viet Long Feed Co,Vietnam

Letter to editor

Puspita Dewi Prijadi (right) with daughter at the workshop

On reading the "Fish Meal and Fish Oil Situation Report: How Narrow is The Bottleneck for Marine Fish?" by Peter Coutteau, on my way back home, I still believe that the aquaculture business is still showing good prospects in the future just like we had talked about.

However, as a feed manufacturer, I face the challenge of the scarcity of the main raw materials FM/FO. The demand for FM/FO far exceeds the supply, and this creates the high price that we face today. Now feed manufacturers have to be smart enough to formulate the feed using the high cost ingredients to produce good quality feed for the aquaculture industry. Although the price has already gone up now, but I still believe that the industry is still progressing as I can see that the demand for aquaculture products is still there. The FM shortage will definitely provide a challenge to feed millers and it is up to us to accept the challenge, go around it and eventually overcome it.

For instance, we know the main ingredient for shrimp feed is the FM, and the demand for the FM keeps increasing while the supply is limited. Therefore, to support what I had just said, that the feed millers should innovate, be creative in producing good quality shrimp feed.

~ Puspita Dewi Prijadi, President Director, Pt Matahari Sakti, Indonesia

Nutrition and feed for the marine shrimp

~Tim O Keefe, Aqua Food Technologies, USA

Ideally, similar to formulating feed for land animals, information on digestible and metabolisable energy should be used when developing shrimp feeds. However, often this information is lacking. Conversely, as excretion is into an aquatic medium, there are losses due to leaching of faecal material and any quantification of digestible energy will be an overestimate. In the absence of any information on ME values and the difficulties in their assessment, DE values will be sufficient when formulating feed. The unique characteristics of the marine shrimp are that energy consumption is low and zero amount is used to maintain body temperature. There is no detoxification of nitrogen which is excreted as ammonia into the aquatic environment. Shrimp also has a natural buoyancy. Therefore it uses protein energy efficiently. DP/ME (mg/kcal) ratios in practical diets for various intensity of culture give ranges from 70 to 95 to 110 as the shrimp is cultured in extensive to semi intensive to intensive systems.

Data on essential amino acid requirements for the marine shrimp are also limited. Usually, feed formulators use published information on requirements. However, calculated averages on requirements may be lower than that currently used. In the case of methionine-cysteine, levels in feeds are 3.6 whereas the average value is 3.45%. As for lipids, they have functions beyond energy supply. The HUFAs DHA and EPA are required in osmoregulation. Cholesterol, as precursor for vitamin D and mobilizes calcium during moulting, has different requirements depending on the size of shrimp.

Improving gut health with additives ~ Pedro Encarnação, Biomin, Singapore

The fish gut microflora is extremely variable and dependent on the rearing water and feed. In young fish, once feeding begins, microbiology is derived from live feed ingested rather than the water. The intestinal microflora plays an important role in neutralization of toxins, bacteriacidal activity and provides some antigens to stimulate immune responses. As such, management of fish gut microflora is important towards achieving a good FCR, animal growth and health. Previously, this was done through antibiotics but currently there are more sustainable methods to regulate the gut environment which include probiotics, prebiotics, immunostimulants and acidifiers. Probiotics provide protection against pathogenic bacteria by competitive exclusion of one species over another in the gut. Prebiotics favour beneficial gut bacteria and improve the host intestinal balance. However, one constraint in adding these to feeds is how the probiotics can survive the processing and extrusion process.

Impact of feed quality and environment in product quality

~ Chawalit Orachunwong, Charoen Pokphand Foods Limited. Thailand

The relationship between feed quality and the environment is now well understood in many countries in Asia and this has resulted in more successful aquaculture practices. In the catfish industry in Vietnam, many have moved to earthern ponds where there is more control on the environment. In the shrimp industry in Thailand, close systems with probiotics are highly successful. In Indonesia, the crisis in the cage culture industry in reservoirs persists and the solution will be to regulate water use and limit the number of cages. A positive change has been the use floating feeds with an FCR of 1.3:1 compared to sinking feeds with FCRs of 1.6-2.0:1. It was concluded that the failure to manage feed quality and environment will affect production systems, fish quality and sustainability.

HACCP and certification in aquaculture facilities

~ Philippe Serene, Aquaservice, Viet Nam

To ensure safety and acceptance of aquaculture products, there is now a proliferation of certification initiatives and to the outside observer; this can be a bit confusing. HACCP, being merely a food safety control tool is insufficient as consumers also demand consideration for the environment and ethical issues. Feed mills usually opt for ISO standards. A number of private certification programs are being introduced to provide standards for commitments to the community, environment, food safety, transparency, reporting and monitoring. In the feed mill, good manufacturing practices have been introduced. Soon, there will be the Euregap integrated farm assurance feed module. However, it was emphasized that the final decision on the type of certification will come from buyers such as Darden Restaurants in the US which have asked that their suppliers have Aquaculture Council Certification (ACC).

Some issues and solutions for feed companies in Asia

A global demand for feed based aquaculture by Dr Michael Cremer

As the global population will increase by more than 3 billion in 2050, the global demand for aquaculture products will reach 100 million tonnes. Some 60% of this demand will be from Asian countries. In 2003, global aquaculture production totalled 54.3 million tonnes. A large portion came from feed based aquaculture, mainly the carps and which 88% is carried out in Asia.

Global shrimp production is also on the rise. China has staged a comeback with an estimated production of 600,000 tonnes in 2006 with the introduction of the vannamei shrimp. The production of tilapia is rapidly expanding with one million tonnes. Although most of fish is consumed domestically, producers will need to look at the production technology. The fastest growing sector in Asia will be culture of the marine fish.

How can aquaculture meet this demand will depend on its progress. In China and elsewhere, there are already increasing competition for limited water use and declining water quality. This requires measures to reuse water once it is in the pond. Land once available for aquaculture, especially in sub urban areas, is being allocated for vital purposes such as tourism and housing. All these will require changes in production strategies. The impact will be in both marine and freshwater sectors.

The commercial viability and sustainability of aquaculture will need to be based on efficient feeds. Freshwater fish production will be entirely feed based. In China, even the filter feeders such as the silver carps will be produced in feed based systems. Offshore culture of marine fish will have the greatest potential to meet the growing demand for marine fish products. Increasing values for coastal land will force hatcheries to relocate inland. Hatcheries must modernize with recirculating and water purification systems for more intensive larval and juvenile production.

All these will require new technologies. In offshore cage technology, ASA has developed 100 m^3 offshore self submerging ocean cages. Handling and fish stress during harvesting is reduced through a detachable underwater fish transfer tunnel. The main advantages are low cost, construction with local materials, and operation by two persons.

Gains in fish and shrimp must also come from improvements in genetics. Although there have been some developments in this area for freshwater fish and the shrimp, very few marine stocks are domesticated or selected for growth performance and disease traits. For example in the salmon industry, with improved breeding programs, the feed conversion ratios have improved from 2:1 to 1:1. Another issue with the culture of

Even filter species like silver carp will be produced in feed-based systems as service species

the marine fish is the use of trash fish, some containing high levels of heavy metals. A case is when Korea rejected red drum from China leading to a collapse of the industry. It is probable that in the future, markets will demand zero tolerance for chemical residues.

Sustainability of the industry also requires better adoption of plant based feeds. The situation is now critical with the current high prices of fish meal (USD1,500/tonne for 65/9 fish meal in June, 2006). Fish meal will continue to escalate in price and will be reserved for the highest quality specialty feeds such as post hatch marine feeds, emerging species, juvenile fish and difficult species. China itself may absorb 80% of this supply and Chile may become a net importer within the next decade. Another aspect with the use of fish meal is the contaminants such as dioxins and PCBs in fish meal. In the future, we may even need to look at replacements in juvenile feed for the marine fish and one possibility is the use of soy protein concentrates. Concurrently, industry must work on the supplementation of crystalline forms of amino acids, particularly the sulfur amino acids that are

Speakers, from left Victor Suresh, Yong J Cai and Pedro Encarnação

From left, Bob Swick, ASA with Edmund Tan and Tey Jyb Ming, KL Supreme Feedmill and Chai Yeng Fatt, Weissen Co Ltd, Malaysia

lacking in soy products.

The industry has no options but to seek suitable raw materials to substitute for fish meal. "During this transition period, we may need to live with lower growth performances and lower production levels".

Fish meal – how narrow is the bottleneck for marine fish Dr Peter Coutteau, INVE

According to IFFO (2001), the yearly production of fish meal averaged to 6.6 tonnes of fish meal and 1.25 tonnes of fish oil for the period 1990 to 2000. Although these are good estimates for the FM/FO supply in most years, the aquafeed industry has to forsee the occurrences of crisis years such as in 1998 when production fell 25 to 30% because of the El Ninõ. Recent price increases have once more highlighted the total dependence of the aquafeed industry on the market fluctuations of FM/FO.

In a sensitive test case provided (figure), a theoretical model based on least cost formulation of a marine fish feed formulation with common ingredients showed the evolution of the cost of the formulation containing high levels of FM/FO (44% FM/11% FO) supplying $^{2}/_{3}$ of dietary protein and $^{3}/_{4}$ of dietary lipid in a 48/20 CP/CF diet. It showed that when FM prices escalate to higher than 600 Euro/tonne, the increase in cost can be attenuated by increasing the degree of FM/FO replacement using plant meal/oil. FM inclusion is reduced to a level of 25% at FM/FO prices of Euro 800-900/tonne. FM/FO levels below 5% (similar to in chicken feed) are achieved when prices increase to Euro 900/tonne. The ultimate nutrient restriction that keeps FM and/or FO in the formula is the requirement for n- 3 highly unsaturated fatty acids (HUFAs). However, these extreme replacements of fishmeal/fishoil without compensation of palatability and nutritional imbalances resulted in poor performance of marine carnivorous fish species such as Gilthead seabream (*Sparus aurata*) and European seabass (*Dicentrarchus labrax*).

Also, the range of alternative ingredients available for fish meal replacement is limited. Animal by products offer interesting nutritional benefits but their use is currently prohibited by European Union legislation and large supermarket chains. A current solution is the partial replacement with a balanced mixture of soybean meal (defatted, full fat and soybean concentrates) and gluten products. A blend of plant products provides a more balanced supply of amino acids as gluten is rich in methionine and soybean is rich in arginine and lysine). This dilutes the negative aspects of introducing a single plant raw material.

Nutritional imbalances and low palatability with low FM/FO diets can be compensated by appropriate supplementation of nutrients and attractants. A supplementation package containing attractants, amino acids, phospholipids and essential fatty acids added to a FM/FO (25%CP/40% FO from marine origin) feed gave comparable growth in European seabass as the control with 67% CP from marine origin). Such solutions may then reduce the pressure on fish meal and fish oil.

Stabilization of formula cost through FM/FO replacement

Assumptions for simplified simulation

- CP/CF 48/20
- High FM/FO control (44%FM+11%FO)
  = 2/3 CP + ¾ CF from FM/FO
- Basal requirements for seabass
- Standard raw materials

Raw material (CP/CF)	Price (€/mt)
Fish meal (71/10)	variable
Fish oil	= FM price (FM < 500)
	= FM price -120 €/mt (FM >= 500)
Alternatives	**constant price**
defatted SBM (44/2, 50/2)	300; 370
fullfat SBM (35/20)	300
SB concentrate (67/1)	640
SB oil	500
corngluten (64/7)	450
wheatgluten (79/7)	1000

The solutions

Three presentations gave possible solutions for nutritionist to substitute fish meal in aquafeeds. Dr Cai Yong Jiu, ADM, China said that soyprotein concentrate (SPC) is most effective in aquafeeds. SPC is produced after soluble carbohydrates have been removed with ethanol from soybean meal. The product has 65% crude protein and in the production process, some anti-nutritional factors (ANF) are eliminated. In comparison to other plant proteins, SPC is highly digestible and can generally provide most of the essential amino acids required by shrimp (*P. vannamei*) and several species of freshwater fish.

With the demand for replacements of fish meal with soybean meal, there are opportunities for synthetic methionine, especially for MHA which is a calcium salt of hydroxyl analogue of methionine. Dr Farshad Shishehchian, Novus, USA said that this is a three in one product with 84% methionine activity, salt and organic acid. It provides the nutritionist flexibility in formulation and balance the essential amino acid profile in feeds for the different species. In some studies with the marine shrimp L.vannamei, he showed that feed conversion is optimized at 20%FM:25% SBM diets with addition of 0.2% MHA.

As the industry moves away from the use of fish meal, a relook at feeding effectors is highly relevant. Feeding effectors is a broad term for chemoattractants, feeding incitants and stimulants. Dr Victor Suresh, Bentoli AgriNutrition, emphasized the importance of feeding effectors as fishmeal gets replaced with terrestrial animal and plant proteins that lack chemoattractants that are key to feed identification and incitants and feeding stimulants that are key to feed intake. He said that we lose 15% of protein in shrimp feeds within two hours of immersion in water and such loss is not only expensive, but also pollutes the rearing system. Trials in Andhra Pradesh, India, have shown that that up to 33% increase in consumption is possible with application of a feeding effector.

As feeding effectors are generally expensive, Victor emphasized some important points to consider prior to their use. Aside from determining the need and economic cost of an effector, he also suggested that consideration is given to the application method and its effects on the environment. Most importantly, there is a need to develop reliable laboratory methods to quantify the value of ingredients as a feeding effector and integrate the values in the least-cost formulation system so that cost optimization is possible.

Soy based feeds for the freshwater and marine fish*

By Michael Cremer*

Current progress with soy based feeds in China may provide opportunities for further advances in the replacement of fish meal in other countries

In China, the culture of freshwater fish in ponds is the largest aquaculture activity. China alone produces almost 20 million tonnes of fish. The sector is dominated by omnivorous species and this has provided us with the opportunity to research the use of renewable soy based protein products in feeds for all stages of culture.

In field trials, we have shown that we could effectively replace the majority of fishmeal in fry and fingerling rations for several species of the carp, tilapia, catfish and other freshwater fish species. Soybean can also serve as the primary source in all plant protein grow-out rations for the same species. No fishmeal is needed in rations for fish larger than 50g.

Feed for fry and fingerling

A typical fry feed, for fish of size 0.1 g to 2-3 g, contains 41% crude protein and 11% crude lipid. The majority of protein in the fry feed is derived from dehulled soybean meal, which comprises 46.3% of the ration. Fish meal is typically about 14% of the diet, but we are working on replacing fishmeal with soy protein concentrates (SPC) to make an all-plant protein fry feed. The feed for fingerling fish of 2-3g to 50g contains 36% crude protein and 7% crude lipid, with the protein component supplied primarily by dehulled soybean meal (46.3%) and fishmeal (8%). Fishmeal in the fingerling diet will also be replaced by SPC if it is cost effective.

All plant feeds for tilapia and carps

Trials using the ASA soy based fingerling and growout feeds with 36% and 32% crude protein, respectively, were conducted in ponds. In a trial with hybrid tilapia, the tilapia grew from 28 g to 525 g in 131 days and the production was 7.6 tonnes/ha. In addition, a production of 1.1 tonnes of silver carp was produced in this 80:20 technology system.

In low volume high density cages (LVHD), red tilapia were fed the 32/6 soy feed. Results in table 1 show that production exceeded the target of 180 kg/m^3 in cages in fresh water. The feed conversion ratio averaged 1.34:1 in the freshwater cages. In coastal cages in Quangxi, red tilapia were fed the extruded floating pellets to satiation twice daily. There were three replicate cages of 6.4 m^3. The FCR was 1.41 because of the variation in the salinity of the water (7.5 to 19ppt). The formulation for the feed is given in table 2.

Table 1. Tilapia in LVHD cages in inland freshwater* and coastal brackishwater**

Species	Feed	Growth (g)	Number of days	Gross production kg/m^3	Survival %	FCR
Red tilapia*	32/6	52 to 577	150	225.8	98.5	1.34
Red tilapia**	32/6	64 to 493	124	113	91.7	1.41

The numerical component of the feed refers to the % protein and lipid, i.e. 32/6 indicates 32% protein and 6% lipid

For the grass carp, a 32% crude protein with 3% low fat feed with high fibre was developed. The market demand is for long and slim fish whereas with the 32/6 feed, fish tend to be deeper bodied. Ingredients were 16% soybean hulls and 50% soybean meal to more closely mimic the natural feeding habit of the grass carp.

ASA-IM pompano offshore cage trial in China is testing a marine fish feed with 50% soy products

Table 2. Formulation for the ASA 32/6 feed

Ingredient	%
Soybean meal 47.5	52.8
Wheat, SWW	23.6
Wheat middlings	10
Corn gluten meal	6.0
Fish oil	3.53
Soy Lecithin	1.00
Calcium monophosphate	2.70
Vit PMXRoche 2118	0.10
Min PMXF-1	0.25
Ethoxyquin	0.02
Total	100.00

Source: http://www.soyaqua.org/pdf2/02NiTTBrackishCRLongmen.pdf

Marine fish

In the marine fish sector which is dominated by carnivorous species there are significant opportunities for the use of renewable soy products in aquafeeds. As a first step, the sector needs to shift from trash fish to manufactured feeds. The soy based feed developed by ASA-IM contains 43% crude protein and 12% crude lipid (Table 3). A portion of the protein is supplied by dehulled soybean meal, which comprises 35% of the ration. For these diets, we ran up to 40% dehulled soybean meal but obtained difficulties with pelleting the feeds.

Table 3. Formulation for the ASA 47/15 marine feed

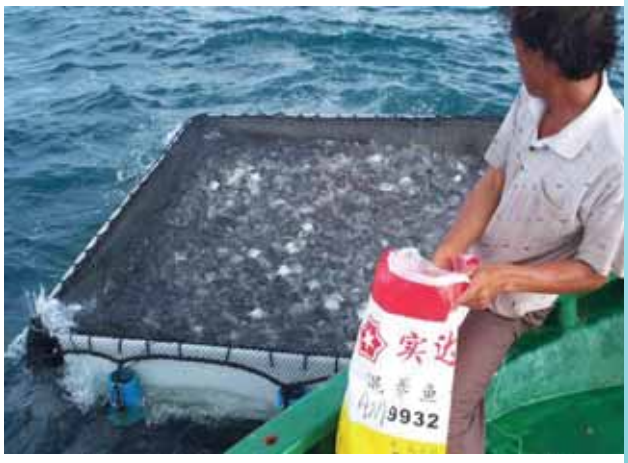
Ingredient	%
Fish meal, anchovy 67/7-8	48.70
Wheat flour 10	20.00
Soybean meal	10.00
Wheat middlings 68	10
Fish oil, unspecified PV=10<20	10.50
Vit PMXF2	0.50
Min PMX T&S 1	0.25
Stable Vit C35	0.03
Ethoxyquin 66	0.02
Total	100.00

Source: http://www.soyaqua.org/pdf2/03pompanodensc9ultshainan.pdf

In trials, juvenile goldenfin pompano were fed extruded floating pellets to satiation daily. The pompano stocked at 250/m^3 grew from 5 g to 389 g in 157days. Pompano stocked at a higher density of 375/m^3 also grew to 385g in the same period. The fish were fed a 47/15 diet to 25 g, after which they were fed the 43/12 diet. The average FCR with the lower stocking density was 2.11 and 2.26 for the higher stocking density. In other trials with several other species, the feed performed well as indicated in Table 4.

Table 4. Marine fish fed ASA diets

Species	Feed	Growth	FCR
Japanese seabass	47/15	2g to 25g	1
Japanese seabass	43/12	25g to 500g	1.54
Red drum	47/15	0.5g to 25g	1.04
Red drum	43/12	25g to 500g	1.31



The trials also dealt with proper feeding techniques

Summary

As a result of one of these trials in China, the Chinese cooperator is replicating the LVHD production system with red tilapia on a new farm in Vietnam. In the Philippines, the feed based pond culture of tilapia demonstration has created excitement among hatcheries and farmers alike. Here the return on investment was 64% in ASA-IM ponds as opposed to 4% in controls. Farmers see value in the soy-based feeds and desire commercial production.

**Extracted from the presentation "Use of Soy Products in Feeds for Freshwater and Marine Fish Species" at the 14th Annual ASA Southeast Asian Feed technology and Nutrition Workshop, July 25-28, 2006, Siem Reap, Cambodia. Additional information from http://www.soyaqua.org*

Dr Michael Cremer is an aquaculture consultant with 37 years in the fisheries and aquaculture research. He is currently Technical Director for the US Soybean export Council.

China's growing seafood market

by Peter Redmayne*

China with a population of 1.3 billion and a growing GNP of 9% in 2003, continues to increase its demand for seafood. This demand is fuelled by the fast growing Chinese middle class, at least 100 million strong and with increasing disposable incomes. The seafood trade is benefiting from the trend by Deng Xiaoping – "To get rich is glorious"

With the entry of China into the World Trade Organisation (WTO), markets are now more attractive. These came from lower tariffs on imports, financial reforms (currency, banking), foreign-owned enterprises, the opening up new sectors to foreign investors to encourage foreign investment (retail, distribution) and a reform of licensing which has allowed for more players into the industry. The WTO has also required the domestic fish and seafood firms to work towards higher quality products and more skill workers.

A global seafood powerhouse

The value of the global seafood trade is estimated at USD10.2 billion in 2004 and rising to USD12 billion in 2005. China is a major player in this trade. Its production of aquatic products rose to 51 million tonnes in 2005, an increase of 4% over that of in 2004. In 2006, further expansion is expected, largely from aquaculture.

The value of seafood imports was USD 3.66 billion in 2005 as compared to USD 2.96 billion in 2004. Exports were 2.57 million tonnes in 2005 valued at USD 7.9 billion. This gives China a strong trade surplus in seafood products amounting of USD 4.5 billion. This was attributed to the rapid expansion of the reprocessing industry which accounted to 37% of the total value of exports. In addition, there was a surge of exports of cultured products.

This is likely to continue in 2006 as China favours developing its processing trade and production of certain species such as tilapia, shrimp, yellow croaker and eel. The number of processing plants reached 8,745 in 2004, up by 458 since 2003. Domestic processing capacity reached 14.2 million tonnes, up by 9.3% in 2005. (US Gain Report, 2005).

China also has the world's largest reprocessing industry. The industry is centered in northeastern China (Qingdao and Dalian). The Government views this as an 'advantageous' industry as it benefits from jobs created and leftovers are used in the feed industry. With this policy, imports under the processing trade will still enjoy free tariff and value added tax with the condition that processed products are exported. From January 2006, trade is also expected to increase with the ASEAN countries as a zero tariff can be applied to agriculture products. (US Gain Report, 2005). It is a major supplier of value-added products to Japan, U.S and the EU. It is the very aggressive companies ie the first movers have big advantage to seek new sources of raw material.

Imports are also on the rise as domestic fisheries have been over fished. Reduction in production from capture fisheries has been recorded. The Government has also announced seasonal closures to renew fisheries resources. As there are now safety concerns of domestic product (pollution, sanitation etc.), imported seafood products are seen as of higher quality and safer to eat. The trend for imports has been facilitated by lower tariffs, making imported seafood more affordable. There is also the changing lifestyle and culinary habits towards preparations such as sashimi and convenience meals. High quality import products such as geoduck, salmon and crab continue to be attractive. There is also a preference of live fish over fresh products and frozen products.

For the Chinese, seafood represents meals. There is never a dinner without seafood. The consumption of marine protein has been on the rise too. Per capita consumption among the urban population was 9.3 kg in 1996 and this rose to 12.3 kg in 2001 and to 12.5 kg in 2004. Consumption is also higher in coastal provinces where the disposable income is much higher. However, the challenge to seafood is still meat.

A changing retail market

The retail market for seafood products is expanding as the country's middle income expands. Many see alternatives to typical wet markets and this is helped by the fact that large supermarket chains can now import directly. Good opportunities are available for fresh and frozen fish.

Ultimately, it is the large chains that are benefiting from these changes in preferences. Some are poised to grow such as the Lianhua group with 2000 stores, followed by the Hualian group. Besides these two large chains, there 3,300 Chinese owned supermarkets in China. Gradually, these will replace the traditional wet markets, especially in coastal cities.

The foreign chains will also benefit. These are Carrefour, Wal Mart, Metro and Lotus (CP). Carrefour is the largest foreign chain in China with more than 75 stores in major cities and has its own distribution center, imports directly and also sources product for export. Wall mart has more than 45 concepts stores, (Super Center/Sam's/ Neighborhood Market) and is concentrated in coastal China. The Metro chain has wholesale/retail 'cash n' carry format. It has 30 stores in the larger cities and plans for 40 more in 3 to 5 years. It is open to promotions with overseas suppliers.

The future

FAO predicts China seafood consumption will increase 80% over the next 5 years. If this is realised, it means that China will need an additional 6 to 8 million tonnes of seafood to satisfy projected demand.

* **Peter Redmayne** is CEO of Seafare expositions. Email: peter@seafare.com

Reference

China, Fishery Products, 2005. USDA Agricultural Service. Gain Report Number, CH5098.

All these will be presented at the coming China Fisheries & Seafood Expo 2006 and Aquaculture China 2006 to be held from November 1-3, 2006 at the Qingdao International Convention Center, Qingdao, China. This show is organized by the Ministry of Agriculture, CCPIT-SSA. The overseas co-organizer is Sea Fare Expositions, based in Seattle, US and with 20 years experience organizing seafood shows. This will be the 11th Annual Show and 700 exhibitors are expected. The show will attract 15,000 buyers from 50 countries. At press time, in September, the show has already sold out.

Tips on developing markets in China

- Invest in market research and testing
- Find a local Chinese partner and/or distributor/or Chinese employee
- Find your market segment or niche and focus on it
- Adapt your product to the Chinese market
- Invest in market promotion (export agencies can help)
- Be prepared for a long-term process that requires serious commitment

Show schedule

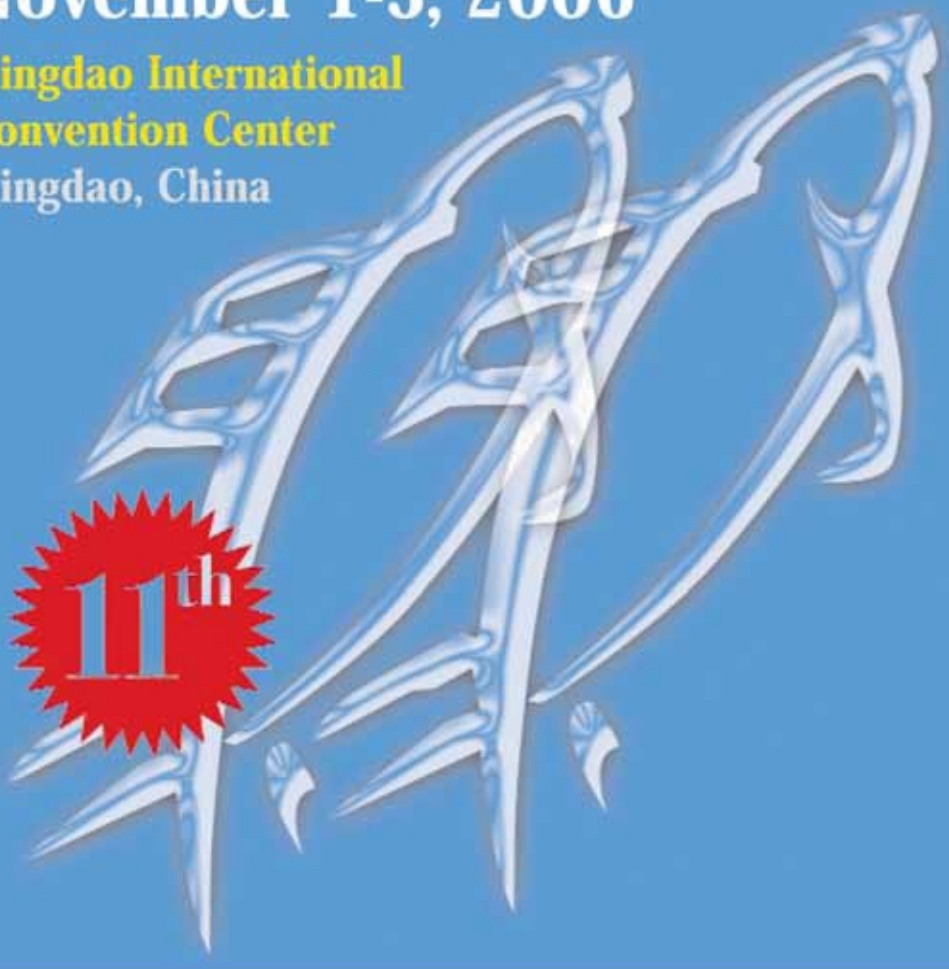
Wednesday, November 1
Opening Ceremony 1000-1030
Exhibits Open 1030-1630
Thursday, November 2
Qingdao Industry Half Day Tour 0800-1300
Exhibits Open 0930-1630
Friday, November 3
Exhibits Open 0930-1500
Saturday, November 4
Qingdao Industry Full Day Tour 0800-1730

China's aquaculture industry is making substantial invesments in better equipment technology and services to increase its production of high-value aquatic products. Aquaculture China has been organized by China's Ministry of Agriculture to make it easier for China's aquaculture industry to purchase the latest products and services from Overseas Companies. If you want to increase your sales to the largest aquaculture industry in the world, make plans now to exhibit at Aquaculture China, China's largest international aquaculture exhibition.

Aquaculture China 2006

November 1-3, 2006

Qingdao International Convention Center
Qingdao, China



Asia's Largest Seafood Show

2006 China Fisheries & Seafood Expo

2006 Seafood Technology China

2006 Aquaculture China

Organized By:
China Council for the Promotion of International Trade (Specialized Sub-Council of Agriculture)
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Global distribution unit in Singapore for polychaetes

Seabait Ltd is proud to announce an exciting new global distribution agreement with the company Zagro Singapore Pte Ltd (Zagro). Seabait Ltd is known globally for the production of the highest quality and biosecure (SPF) cultured marine polychaete worms, which are known to provide vital components to maturing brood shrimp and fish. Zagro is manufacturer and global distributor of a wide range of nutrition and protection products for livestock, crops and aquatic animals.

The distribution agreement will mean that Seabait Ltd polychaetes will now be readily available not only to the USA, Central and South America, Africa, Middle East markets but also to industry in Asia via a distribution unit in Singapore. This will mean that all the shrimp and fish producing countries in South East Asia, the epicentre of world aquaculture will now be able to access and benefit from this highest quality premium feed. Supplies will be available quickly and directly. This global distribution agreement will also allow all countries to benefit from direct access to the full range of Zagro products including product support.

Seabait Ltd cultures polychaetes under bio secure conditions from known brood stocks. All polychaete offspring are then grown to harvestable size on terrestrial plant based feeds (no crustacean or terrestrial animal component) under carefully controlled conditions. With the shift to the culture of white shrimp in Asia, the most significant development is that of shrimp hatchery systems that are able to produce sufficient post larvae to meet industry needs.

It is the vision of Seabait Zagro to produce and distribute polychaetes to create a more sustainable global aquaculture industry. For this reason both Seabait Ltd and Zagro participated in, and were co-sponsors with the British High Commission for Singapore and the UKTI, of the inaugural UK/Singapore workshop "The gateway to sustainable aquaculture in SE ASIA" held in Singapore from 22 - 25 August 2006.

Feeding the 'Gene for Performance & Profitability'

Alltech has announced details for its Asia-Pacific Lecture Tour (APLT) for 2006. The theme 'Feeding the Gene for Performance and Profitability' relates to that of the 22nd International Feed Industry Symposium on 'Delivering on the Nutrigenomics Promise'. The tour will begin in Japan on 30 October 2006 and will conclude in India on 17 November 2006. This year also marks the 20th anniversary of the tour in Asia.

Presentations during the tour will be given by Dr. Pearse Lyons, President of Alltech and by leading Alltech researchers including: Dr. Richard Murphy, Research Laboratory Coordinator, Alltech Ireland; Dr. Colm Moran, Coordinator of Microbial Research, Alltech USA, and Dr. Keith Filer, Research Manager of Alltech's Asia-Pacific Biosciences Centre in Bangkok, Thailand. For more information, contact your Alltech local office.

Industry meetings in Asia and Australia

Biomin met with the feed and animal husbandry industry at its Biomin Forums, conducted in 6 different cities in Bangladesh, India, Australia and the Philippinesm from July 3 to 14. These focused on trends and new solutions for the industry and attracted about 300 technicians and decision makers.

"The aim of a Biomin forum is to start discussion on new trends and solutions for the industry" says Kurt Wegleitner, Biomin, Singapore. "It is crucial for Biomin to work with the industry on new solution in order to master the challenging times ahead, together".

As industry trends vary from market to market, the program was especially adopted for regional and local needs. The speakers, a mix of consultants, representatives of the authorities, field technicians and Biomin's key people focused their presentations on topics ranging from avian influenza, new trends in breeding, fertility management by means of feed additives, natural growth promotion, effects of mycotoxins to preservation and acidification of feed and feed ingredients.

The investment in these forums has paid off for Biomin. According to Erich Erber, the company's founder "The growth of the company in Asia Pacific will continue at a level of about 50% in sales annuallyî. He added, ìMore staff has been hired and will be hired also in the years to come. At the moment Biomin is setting up more research facilities in the region – very soon a new research farm will open in Asia Pacific."

Downloads of the some of the presentations on its websites are available at its web site for those unable to attend the forums. More information; Kurt.wegleitner@biomin.net

Probiotic *P. acidilactici* in shrimp production

The first results of a joint research project between Lallemand and IFREMER (French Research Institute for the Exploitation of the Sea) were presented at the WAS Aqua 2006 Conference by PhD student Mathieu Castex. The work was conducted in New Caledonia, at the IFREMER research station.

This project showed the positive impact of the administration of the probiotic bacteria *Pediococcus acidilactici* MA 18/5M (Bactocell®) on zootechnical performances of shrimp and survival to opportunistic infections. Backed by previous production trials in shrimps and scientific evidences of the modes of action of the probiotic in monogastrics, this study confirms its potential in shrimp culture. Previous field trials conducted in Viet Nam (Vung Tau Center for Shrimp Research and Production) and in China (Aquaculture Science Institute Shengzhen Dapeng Trial Center) showed the benefits of the probiotic on the growth rate, survival rate, and microbiological status of juvenile *Penaeus monodon*.

These results presented at the conference were proof of concept, validation and the reproducibility of these results, both in tanks and in ponds. The growth of *Litopenaeus stylirostris* increased by about 30% in ponds, while resistance to vibrio infections also improved. The winter syndrome (syndrome 93), caused by *Vibrio penaeicida* when the water temperature decreases below 22°C, has had significant impact on the industry in New Caledonia during the past years. The syndrome is responsible for mortality rates of about 60%. After 30 days supplementation with the probiotics and with the variation in tank temperatures between 25°C and 20°C, shrimp survival rate increased by more than 75% compared to the control. Shrimp gut microbiological studies illustrated these findings, showing a significant reduction of vibrio population in the gut of shrimp fed the probiotics.

In a second part of the project, IFREMER scientists are investigating the modes of action of the probiotic in the animal gut by further looking at its effects on gut microbiology, nutrition physiology and enzymology, immune response and oxidative stress. Previous results indicate that Bactocell could improve immune response and digestive functions. The next step is then the scaling-up of these findings in commercial farm trials, in order to confirm the efficacy and profitability of its supplementation at the production level.

More information: Sylvie Roquefeuil-Dedieu, Email: sroquefeuil-dedieu@lallemand.com

Update on sulphites in cooked crustaceans

In the Directive 2006/52/EC of the European Parliament and of the Council of 5 July 2006, published in the Official Journal of the Europe Union the 26 July 2006, the new norms for metabisulphites are as follows. Related article: Quality issues in marketing white shrimp to European markets, Part 2: Influence of harvesting methods on the final quality of shrimp by Hervé Lucien-Brun and Frédéric Vidal, pp30-32 issue 4, July/August, 2006)

Information courtesy of Hervé Lucien-Brun, Aqua Techna, Email: Hlb@aquatechna.com

Foodstuff per type and size	Maximum level mg/kg or mg/l as appropriate, expressed as SO_2
Fresh, frozen and deep-frozen	
Up to 80 units per kilo	150 (1)
Between 80 and 120 units per kilo	200 (1)
Over 120 units per kilo	300 (1)
Cooked	
Up to 80 units per kilo	135 (1)
Between 80 and 120 units per kilo	180 (1)
Over 120 units per kilo	270 (1)

(1): in edible parts

Pet Food Technology Seminar

Wenger Manufacturing, Inc, has scheduled a three-day Pet Food Processing Technology course for November 7 - 9, 2006. The seminar will be held at the Wenger Technical Center in Sabetha, Kansas, and is open to any plant management and operations personnel from the pet food industry. Seating is limited to 35 attendees and reservations are due by October 1.

The seminar provides a blend of classroom and hands-on training for review of extrusion system procedures and theory, while introducing new technologies for product quality and process improvement. Featured topics are:

- Raw material properties and preparation
- Preconditioning technology
- Extrusion processing technology
- Extrusion die and knife technology
- Application of extrusion technology
- Recent advances in extrusion and drying technology
- Maintenance procedures

The cost for the three-day program is USD1,200 per person, which includes the course notes, morning and afternoon breaks, daily lunch and two evening meals. Attendees are required to make their own hotel reservations and travel arrangements. For more information, contact Nancy Campbell at +001 785 284 1420 or email: ncampbell@wenger.com

31 Oct -3 November

Iran's 4th International aquaculture and seafood exhibition
Kish Island, Iran
Tel: +98 2 6648 2281
Fax: +98 2 6697 0742
Email: iranseafoodexpo@ccorg.com
Web: www.iranseafoodexpo.ir

1-3 November

Aquaculture China 2006
Qingdao,China
Web: www.aquaculturechina.com
(see p40-41)

16-19 November

Malaysia AquaFair 2006
Kuala Lumpur
Web: www.aquafairmalaysia.com.my
(see p27)

11-13 January

INDAQUA 2007
Chennai, India
Web: wwwmpeda.com
(see p11)

28 Jan-2 Feb

Practical Short Course on Feeds & Pet Food Extrusion
Texas A&M, USA
Web: www.tamu.edu/extrusion

28 Feb – 2 March

Aquaculture 2007
San Antonio, USA
Tel: +1 760 432 4275
Web: www.was.org
(see IBC)

7-9 March

VIV Asia 2007
Bangkok, Thailand
Tel: +31 30 295 2788
E-mail: viv.asia@vnuexhibitions.com
Website: www.viv.net

May 8-10

Victam International 2007
Utrecht, Netherlands
Tel: +31 33 246 4404
Fax: +31 33 246 4706
Email: expo@victam.com
Web: www. victam.com

May 9-10

Aquafeed Horizons
Utrecht, Netherlands
Email: editor@aquafeed.com
Web: www.aquafeed.info

May 24-27

Aquarama 2007
Singapore
Tel: +65 6735 3366
Fax: +65 6738 9644
Email:aquarama@cmpasia.com
Web: www.aquarama.com.sg

1-5 August

Aquaculture Asia 2007
Hanoi, Vietnam
Tel: +1 760 432 4275
Email: worldaqua@aol.com
Web: www.was.org

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Fax details to: +603 2096 2276 or email to the Editor at zuridah@aquaasiapac.com

Practical Short Course on Feeds & Pet Food Extrusion Jan. 28 - Feb. 2, 2007

The 17th annual one week practical short course on Feeds & Pet food extrusion will be presented Jan. 28-Feb. 2, 2007 at Texas A&M University by staff, industry representatives, and consultants. The program will cover information on designing new feed mills and selecting conveying, drying, grinding, conditioning and feed mixing equipment. Current practices for production of pet foods, preparing full-fat soy meal; recycling fisheries by-products, raw animal products, and secondary resources; extrusion of floating, sinking, and high fat feeds; spraying and coating fats, digests and preservatives; use of encapsulated ingredients and preparation of premixes, and least cost formulation are reviewed. Practical demonstration of pet food, vacuum coating, and several others are demonstrated on four major types of extruders – (dry, interrupted flights, single and twin screw), using various shaping dies.

Reservations are accepted on a first-come basis. For more information, programs and application forms, contact: Dr. Mian N. Riaz, Food Protein R&D Center, 2476 TAMU, Texas A&M University, College Station, Texas 77843-2476; Phone: 979/845-2774; Fax: 979/458-0019; Email: mnriaz@tamu.edu; Web: www.tamu.edu/extrusion

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FOR MORE INFORMATION:

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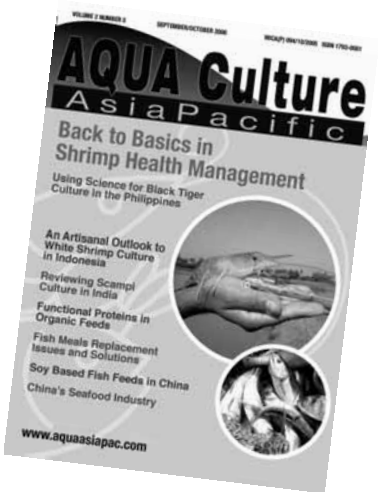

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