

AQUA Culture

Asia Pacific

Understanding Responsible Aquaculture

Aquaculture in Vietnam

Second Generation Farmers in Indonesia

Cost Efficiency in Aquafeed Production

Revisiting

- Feed ingredients
- β - glucans
- Phytase

Feed Marketing

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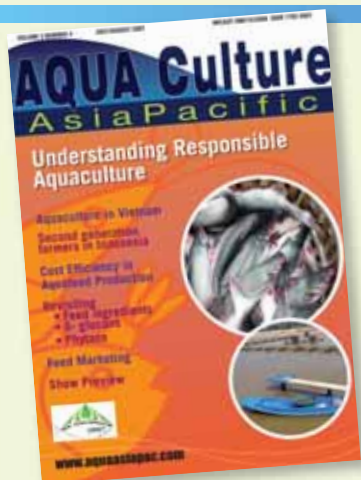
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From the editor

The role of the nutritionist – about to change?

We all know that feed comprises the largest portion of production costs of any culture species and to the farmers in Asia, rising feed cost is a nightmare. During my recent travel, discussions with several nutritionists at the Aquafeed Horizons conference in Utrecht, in France and in Vietnam showed that the demands on the nutritionist now stretches from feed performance, focused research, being a product champion to food safety. These come with the changing attitudes of the consumer and the industry. I have also realised that wherever we are, the problems of the nutritionist are global and that the world is flat.

WRITE TO THE EDITOR

We want to hear from you. Write your comments on the industry to the editor.

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Letters may be edited prior to publication

Getting the best from the formulated feed is the aim of most nutritionists. They continue to fine-tune the percentages of protein, fat, and carbohydrates for maximum weight gain in the shortest time. In the case of fish, should not the fillet composition and product quality characteristics be a criteria rather than the maximum weight gain? Relating to the work with poultry when modifications in diets have allowed them to produce a high yield of breast meat, Dr Alain Guyonvarch (p34-35), said that we have to learn to demystify aqua nutrition. Optimization of feed is the key factor.

At the recent technical conference, Catfish 2007, the requirements of the processor or consumers (for local and live fish markets) such as higher fillet yield and product quality were highlighted. Once again, we have to look at experiences in the salmon industry. The appeal of the salmon is the high fillet yield of 60%. In comparison, it is only 35% for the tra catfish and 30-35% for the tilapia.

Concurrently, the nutritionist has to work towards responsible and sustainable aquaculture.. The focus is on new and sustainable raw materials. Often raw materials account for more 85% of the net selling price. Although fish meal is a well managed resource, according to IFFO, it has become so expensive that in the past year, aqua feed producers use FAQ fish meal in vannamei shrimp feeds at 10-15%. LT fish meal is limited to feeds for the black tiger shrimp only. Despite this, feed prices were increased in Vietnam. At World Aquaculture 2007, Dr Allen Davies showed that fish meal is not required in feeds for the vannamei shrimp, but in Asia, it is still included.

What are the alternative sources of proteins in aqua feeds? Often mentioned is soybean meal (SBM). However, bio ethanol production in the US is threatening soybean planting acreage in favour of corn. To make matters worse, as China's population increases, meat production and its own bio ethanol production requires more corn. But on the positive side, we may have at our disposal high protein by-products from bio ethanol production, such as DDGS (from corn). However, little is known on its use in aqua feeds. Increasing high levels of plant meals will require more binders. An added problem is the sourcing of alternative binders as wheat gluten prices escalate. This shows that replacing fish meal may not be that simple after all.

Food safety and traceability of feeds are important too. With the recent case of melamine used in petfood, feed manufacturers now have to certify that their feeds are melamine free. The traceability of aqua feed must now include auditing of raw material production and not just at the level of aqua feed processing.

As the aquaculture industry continues to grow, the leverage is being able to predict trends which involve analyzing opportunities and threats. It also requires thinking out of the box and being innovative. The days of the conventional nutritionist are over. The new age nutritionist must adapt to be a product champion who needs to monitor all stages of the product value chain. His or her accountability certainly covers more than just feed formulation.

Zuridah Merican

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Hurdles in Russian market

In 2006, Russia and Poland were the main markets for Pangasius exports from Vietnam. Russia imported 15% of the total exports at 42,779 tonnes and Poland, 27,328 tonnes. Together this amounted to 24% of total exports. In the first two months of 2007, exports from Vietnam to Russia and Poland were 7,725 tonnes and 6,783 tonnes, respectively. This was an increase of 165% and 73%, respectively of volumes in January and February, 2006 (Vietfish International, 2007).

The explanation for this huge surge in demand is the revolution in retail in Russia. Ann Mari Haram, Eurofish in her presentation on aquaculture in Central and Eastern Russia at Aquafeed Horizons in May said that in Russia, as well as in other Central European markets, demand is for seafood products including fillets and sushi for consumption in fast food bars which are cropping up in large towns. After the EU, Russia is the largest market for seafood from Norway and China. Some 6.3% of Norwegian salmon exports went to Russia.

As Russia is willing to pay for exotic foods and product branding, it is also increasing demands on quality. In anticipation for this new market, the Ministry of Fisheries, Vietnam urged producers to follow the requirements of Russia's Federal Veterinary and Phytosanitary Surveillance Service (VPSS) for seafood consignments destined to the Eastern European nation, while following the strict procedures on packing and encoding required by the National Fisheries Quality and Veterinary Directorate (NAFIQAVED).

However, in May, 2007, Russia stopped the import from four Vietnamese companies and two Chinese companies, citing that these were

contaminated. Via earlier inspections, VPSS had specified that only processing plants that meet the strict requirements on food hygiene can export to the country. According to Globefish (2006), VPSS Head Sergei Dankvert said that only tra and basa catfish processing plants that passed norms and standards set by the Russian inspection team would have a chance to export to that market.

The next step for the Vietnamese authorities is to receive inspections from Russia to resolve the issue. In July, inspectors will examine 24 local catfish producers that have registered to export to Russia. At the sidelines of the Vietfish 2007, Nguyen Tu Cuong, director of Nafiqaved said in the Saigon Times that any local exporter that failed to meet the requirements would have their license revoked.

Dr Nguyen Huu Dzung, Secretary General of VASEP, Vietnam Association of Seafood Exporters and Producers, said, "All that is required are clear guidelines on what are the requirements similar to that for exports to the EU and the US. Then we will do our best to adhere to them".

(Related article: The Catfish Story, p41)

Temasek buys into seafood in Vietnam

Singapore's Temasek Holdings has acquired 10% of Minh Phu Seafood FSC of Vietnam. In the VietNam news, Wong Heng Tew, a Temasek representative, said, "We considered Minh Phu Seafood to be an emerging champion and is well positioned to capitalise on the tremendous growth potential of one of Vietnam's key export sectors, the thriving aquaculture industry".

Minh Phu is Vietnam's largest shrimp processor, both in terms of value and volumes. It is listed on the Hanoi Securities Exchange. Shares closed at VND56,000 on June 14. The company showed an estimated profit of VND 70 billion (USD 4.6 million) for the first five months of 2007. It was established in 1992 and has an annual turnover of VND 2.3 trillion (USD 153 million). It has six subsidiaries comprising 4 processing plants, a farm and one livestock farm.

In the Saigon Times, Le Van Quang, chairman of Minh Phu said that they chose Temasek as it is a long term investor committed to increasing value to the company. As an Asian investor, Temasek clearly knows the challenges faced by Asian firms and it has invested in many food processing companies. Temasek Holdings has a USD80 billion portfolio mainly in Singapore and will help to strengthen the prestige of Minh Phu. Proceeds from the sales will be used to invest in breeding and processing facilities. In 2007, the company plans to build a pangasius processing plant in Hua Giang Industrial Park. Products are mainly black tiger shrimp (frozen and IQF). The main markets are US (50%) and Japan (10) (Vietfish International, March, 2007)

New technical sales manager for aquaculture in Indonesia.



Alltech has announced the appointment of Fajar Sutriandhi as technical sales manager for aquaculture for Alltech Indonesia. Fajar graduated in 2001 with a Bachelor degree in Animal Science and Nutrition from the University of Agriculture Bogor, Indonesia. Previously he was sales manager in Dovia Indah, a local Indonesian

trading company, where he was responsible for the sales and marketing of feed additives to the livestock and aquaculture industry. In his new position he will be responsible for business development of Alltech's key accounts in the aqua industry in Indonesia. He will be based out of Alltech's office in Jakarta, Indonesia.

Uni President Vietnam

Ground breaking for new marine shrimp hatchery business

This is the start of the integrated business model of Uni President Vietnam (UPV), a leading shrimp feed producer in Vietnam. The hatchery complex of 3.5 ha in the central province of Ninh Thuan is expected to cost USD 2.0 million and produce almost 600 million postlarvae per year.

It will have bio secure facilities for broodstock culture, larval and nursery rearing of postlarvae of both the black tiger shrimp and vannamei shrimp. Additionally, there will be laboratory facilities, complete with PCR- polymerase chain reaction and other equipment for the monitoring of diseases.

"Vietnam's shrimp production increased to 320,000 tonnes in 2006. If we convert into larvae, each year the demand will be 35 billion postlarvae shrimp with a total value of USD100 million. It is not just this, but a demand for quality postlarvae. Currently, quality fluctuates and therefore farmers are at risks. Our idea is to provide quality and SPF postlarvae which can build up farmer's confidence in shrimp culture", said Jeff, Jie-Cheng Chuang, Assistant Vice President of foodstuff Group at UPV.

"There is also the issue of food safety which end consumers are taking seriously. Traceability from farm to fork is a requirement too. It is for these reasons, that we have decided that to keep pace with international markets trends, we needed an integrated business model with shrimp breeding, aqua feed and processing plants. Now we have started the hatchery. Next will be processing which we will do a thorough collaboration with a strategic partner".

Work on the hatchery production is expected to start in November. Brood stock for the production of black tiger postlarvae will be sourced from Africa and that for the specific pathogen free (SPF) vannamei shrimp from Hawaii. The company will collaborate with researchers at the National Taiwan University in several aspects of shrimp culture, such as the setting up of the laboratory and in programs in controlling post larvae quality. This is essential as it will give the company a larger involvement in the shrimp culture business in Vietnam.



Ground breaking ceremony by Ms. Tran Thi Kim Van, Vice President of Binh Duong Province and Mr. Hsieh Chih Peng, General Director of Foodstuff Group of Uni-President Corp.

Uni President started its shrimp feed business in 2001 with a feed mill in Song Than II Industrial Park in Binh Duong Province. In 2006, with increasing demand for its feeds, the company set up a second feed mill in the Mekong Delta at My Tho Industrial Park in Tien Giang Province. The production of shrimp and fish feeds at the two mills is expected to reach 200,000 tpy. Feeds comprise mainly for the black tiger shrimp at the feed mill in Song Than and catfish feeds at the feed mill in My Tho. Other feeds are for the grouper, cobia, tilapia, seabass, vannamei shrimp and freshwater prawn.

UPV as Gold Sponsor of the Asian Pacific Aquaculture 2007 conference and trade show to be held in Hanoi, 5-8 August will be at booth 22-24.

Indonesian Aquaculture 2007 in Bali



The theme of this year's gathering of industry in Indonesia is "Sustainable Aquaculture and Food Safety". This will be held from 30 July to 2 August 2007 at the Inna Grand Bali Beach Hotel Denpasar, Bali.

There are several objectives for the seminar and trade show. It will be to exchange information and encourage business interaction among researchers and other stakeholders in industry in Indonesia. It will be to encourage regions with aquaculture potential to accelerate commercial development and to attract both local and overseas investments into the aquaculture business in Indonesia. For the existing players, it is to get a commitment among government and other stakeholders in applying "Good Aquaculture Practices" in order to maintain the competitiveness of Indonesian aquaculture products.

In the tentative program, there will be sessions on the shrimp, catfish & tilapia, crustaceans, grouper & sea bass and ornamental fish. The shrimp session will have a full-day session with the theme

"Indonesian Shrimp Farmers Day," organised by the Shrimp Club Indonesia. At press time, the main organiser, Directorate General of Aquaculture, Ministry of Marine Affairs and Fisheries have confirmed the following invited speakers. The plenary speakers are Dr Made L. Nurdjana who will present 'Aquaculture Development in Indonesia: Problems, Strategies and Solutions' and Dr George Chamberlain, President, Global Aquaculture Alliance on the 'Global Shrimp Outlook 2007'. Some of the other speakers will include Dr. Chalor Limsuwan (Kasetsart University, Thailand), Dr. Ir. Antonius Suwanto (Bogor Agriculture Institute), Dr. David Drahos (Novozymes, USA), Dr Victor Suresh (Bentoli USA), Dr Bernard Devresse (Bernaqua, Belgium), Dr James Wyban (HHA, Hawaii). At the trade show, some 52 local and international companies have confirmed their participation.

News in brief

Vision 2010 in Bangladesh

This is a concept paper by the Bangladesh Seafood Exporters Association (BFFEA) to target USD 1.5 billion in exports of seafood products by 2010. It will be through increases in production, utilization of processing facilities and marketing globally. Shrimp production will increase to 250,000 tonnes from 230,000 ha. A massive development program is needed to develop infrastructure in and around the present shrimp farming areas. The setting of feed mills was highlighted in the plan. The number of hatcheries is sufficient with a production of 5 billion post larvae. It is also targeting the upgrading of lab facilities, training of technicians and the introduction of an international certification for product quality. (source: BFFEA).

Thailand urged to follow Ecuador on WTO complaint

Ecuador, one of the six countries in which the US imposed anti dumping tariffs on shrimp imports filed a complaint with the World Trade Organisation (WTO) over Washington's use of a practice known as "zeroing" to calculate whether the shrimp were being sold at below-cost price. It won the case in early February 2007.

Thailand also filed a complaint with the WTO over the US anti-dumping measures in March 2006, but it contained two allegations: one against the zeroing practice and the other against the requirement for a continuous bond (C-bond).

In the Bangkok Post, Poj Aramwattanon, the president of the Thai Frozen Foods Association wants the authorities in Bangkok to follow Ecuador and file complaints with the WTO separately for each allegation. He was quoted, "Single-allegation petitions would shorten the investigation process and could encourage the US to enter negotiations with Thailand." Aramwattanon also warned that Thai shrimp exports could be hit harder after the US penalty on Ecuador's shrimp was lifted, probably in August.

Thai shrimp prices have declined significantly since April. Market prices have fallen to below production costs at THB 50-60/kg (USD 1.47) for 100

pcs/kg of white shrimp as compared to THB 90/kg (USD 2.65) in 2006. Production costs average THB 70/kg (USD 2). For the first four months of 2007, Thailand exported 80,000 tonnes of shrimp, a rise of 12.5%, worth THB 20.6 billion (USD 605 mil), up 4.43 % over the same period last year.

US blocks imports of farmed fish and shrimp from China

On Thursday, June 28, the US Food and Drug Administration (FDA) announced a broad import control on farm-raised catfish and pangasius, shrimp, dace and eel from China. The agency will start to detain these products at the border until the shipments are proven to be free of residues from chemicals banned in the US for use in aquaculture. In a statement, China's top quality watchdog, the General Administration of Quality Supervision, Inspection and Quarantine, acknowledged that there were safety problems with Chinese seafood exports.

During targeted sampling from October 2006 to May 2007, FDA repeatedly found that cultured seafood imported from China were contaminated with banned (in the US) antimicrobials such as nitrofurans, malachite green, gentian violet, and fluoroquinolone. For aquaculture, Chinese authorities allow the use of fluoroquinolones but nitrofurans and malachite green are prohibited. FDA is not seeking the recall of products already in the US marketplace and is not advising consumers to destroy or return imported farm-raised seafood, as the levels of the drug residues found in seafood are very low, most often at or near the minimum level of detection.

International shrimp health workshop in Brunei

Dr Donald Lightner, the internationally recognized authority on shrimp diseases as well as several experts including Dr Leigh Owens, Rita Redman, Dr Terry Claydon, Wanidawati Tamat and Dr George Chamberlain will conduct this 3 day workshop on shrimp health. It will be held from August 13-15 at the Orchid Garden Hotel, Bandar Seri Begawan, Brunei. The organizers are the Department of Fisheries and Integrated Aquaculture International. The workshop is designed for producers, diagnostic technicians and policy makers to keep abreast of developments in shrimp health management.

CP Prima wins Dipasena

For USD76 million, PT Central Proteinprima (CP Prima) and its parent company, Thai agribusiness giant Charoen Pokphand, have won the bid to operate Southeast Asia's largest integrated shrimp farm, PT Dipasena Citra Darmaja. The bid was under the consortium Neptune. This was announced by the Indonesian State Asset Management Company (PPA) in May. The bid exceeded the minimum of USD53.5 million set by the government. Following this, the company is now required to invest IDR 1.7 trillion (USD 188 million) on developing Dipasena, according to the report in the Jakarta Post.

CP Prima had competed with other bidders including Thai Royal (Thailand), Laranda Consortium (Philippines) and PT Kemila International Holding (Indonesia). Laranda is also a global shrimp producer with operations in the Philippines and Middle East. In March 2007, PPA took back Dipasena when PT Recapital Advisors which took over its operations in September 2005, failed to settle loans to local farmers.

The two farms under the PT Dipasena Citra Darmaja, Dipasena and Wachyuni Mandiri have a total of 21,660 ponds. They were developed under the nucleus estate concept which means that the company develops all infrastructure, hatchery and feed mill and processing plants and 11,000 plasma farmers manage the ponds. The company provides the materials for culture and buys back the shrimp for processing. During its prime, Dipasena was one of the biggest shrimp

producers in the world; with an output of 19,854 tonnes of black tiger shrimp worth USD167 million in 1996. The government took over in 1998 after the Asian financial crisis.

CP Prima has obtained initial funding totaling IDR 880 billion (USD 97 million) as capital for the revitalization of the ponds and other infrastructural work on this nucleus project, according to a press release. This is for building up electrical lines, roads, water inlets and outlets and canals, all in dire need of repair, according to the engineering company in charge of the project. Each farmer will receive IDR 80 million (USD 8,800) in loans for the purchase of seed stock, feed, chemicals, etc to prepare ponds and resume operations.

With this takeover, CP Prima is poised to position itself as the largest vertically integrated shrimp producer in the world. It is already the largest integrated shrimp producer and processor in Indonesia with 3,700 ponds and 50,000 tonnes of annual production. It employs 20,000 people. Feed milling capacity is 108,000 tpy in Lampung, South Sumatra. It has 5 hatcheries located in Sumatra, Jawa and Bali. There are three processing plants with an annual capacity of 53,200 tpy. Annual sales total USD500 million. With Dipasena located in Kabupaten Tulangbawang, Lampung, the company has projected production of up 186,640 tonnes/year in 2009 when it will have a total of 6,331 ponds in operation under the plasma scheme.

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intervet

Understanding the path towards Responsible Aquaculture

by Aaron A. McNevin, Katherine Bostick, Flavio Corsin and Eric Bernard

For the past decade, WWF's work has focused on understanding the real and perceived impacts of aquaculture on the environment. To ensure responsible aquaculture, stakeholders must reach consensus on key impacts and ways to reduce these impacts to agreed upon acceptable levels.



In many respects, aquaculture is both a young industry and one that has been around for centuries. Aquatic organisms have been cultured in Asia for over 3,000 years and aquaculture products have long been an important source of protein. However, over the past few decades, industry has dramatically shifted and taken on a new form: in developing new technologies, expanding into new species and markets and consolidating production, processing and distribution.

The growth of this industry has been spurred by an ever-increasing demand for seafood and the limited supply of wild fish. For more than 30 years, per capita seafood consumption has increased and the world population has grown. The boom in aquaculture is a response to this increasing demand. Harvests from wild fisheries have remained relatively flat since the early 1990s. The Food and Agriculture Organization (FAO) estimates that about three-quarters of wild stocks are either fully exploited or over exploited. As a result, any future increases in seafood production are expected to come from aquaculture.

Asia's boom in aquaculture

Aquaculture has boomed globally and in particular in Asia. The growth rate of Asian aquaculture is extraordinary and, according to the FAO, between 2000 and 2005, the Asian aquaculture industry grew by 39 %, ten times higher than in Europe. Asia accounts for over 90 % of global aquaculture production. It produced almost 58 million tonnes in 2005. China is by far the largest Asian producer, supplying approximately 75 % of the total Asian production with an additional 7 countries that supply another 20 % of the continent's production. Among the most important aquaculture commodities, carps play a major role, accounting for one-third of the total Asian aquaculture production. Other important commodities in Asia are aquatic plants and molluscs, which each account for approximately one-quarter of production by weight.

The scale and growth of the aquaculture sector in Asia present unique challenges for sustainability. Asian aquaculture is characterized by a number of other traits of importance from a sustainability perspective.

Small-scale producers make up the majority of the farming population in the region. These operations rely on limited resources such as land, freshwater, and capital. The quality of inputs (e.g. seed and feed) is often low leading to unstable performance that can threaten farmers' livelihoods.

Because of their large numbers, geographic distribution, and poor organization, small scale producers tend to have poor direct access to markets and to services such as technical extension agents and aquatic animal health officers. This 'isolation' hampers their ability to benefit from technical knowledge and understand shifting market requirements and minimizes opportunities for them to express their needs or pool resources.

These industry characteristics, in combination with the limited resources of many Asian governments have often resulted in the uncontrolled development of the sector, with plans being poorly implemented or non-existent, which can lead to improper siting of farms resulting in a range of environmental, aquatic animal health and food safety concerns.

Real and perceived impacts

Whether it is tuna or seaweed, Asia or the United States, all aquaculture and all food production have impacts. Concerns about negative impacts will range from the real to the perceived, and it is only with bringing a generalized understanding around the main issues of concern that we can work together to address the true impacts of aquaculture.

Key areas of potential impact include the use of resources (e.g. water, land, feed, wild fish stocks, energy), nutrient loading, chemical use, disease, escapes and social impacts. The impacts of aquaculture are farm specific. There are some common issues that apply to a particular species or species group, but more often than not, the species produced, site selected and farming practices dictate the magnitude of impact.



Cage culture in China. "... more often than not, the species produced, site selected and farming practices dictate the magnitude of impact"



Land and water use

The utilization of resources, such as water, land, wild fish stocks and energy can play a major role in the responsible production of aquaculture products. Land and water should be, and typically are, used rather than consumed. The use of land and water must take into account the requirements of natural flora and fauna.

Inappropriate use of resources is often the case when marginal sites for aquaculture production are selected. By way of example, in more arid regions, freshwater from wells is used as a result of inadequate water supplies and deforestation of sensitive habitat can occur when less sensitive regions are not chosen (or are not available) for use.

In a responsible production system, the use of land and water resources should not cause the net destruction or loss of habitat.

Additionally, a producer's use of land and water should not marginalize the other users of this resource through depletion, restriction of access, or pollution of the resource. Impacts on water quality are inherent in the production of aquatic organisms. Irresponsible and inefficient use of feeds, chemicals and fertilizers will exacerbate this problem. The industry must focus on efficiency to address these issues, which simultaneously will reduce production costs.

Water Pollution

Methods exist to gauge the impact of a farm on the environment and to demonstrate changes in performance over time. For example, effluent concentration or load limits are a means to measure the impact a farm can have on the receiving waters. However, such criteria are difficult to implement in areas where ambient water quality is already sub-optimal and farm influent may never meet criteria that would allow for discharge into the natural environment.

The natural way.

BIOMIN Aqua Specials

The demand for solutions, which can offer producers safe and economical production of aquatic animals is rising. To cope with the demand, BIOMIN has launched a new range of aquaculture products including probiotics, nutra-ceuticals, premixes and pond treatments for shrimp hatcheries as well as pond grow out.

- **STARTgrow**
A Probiotic premix for Shrimp hatcheries
- **GROWout**
A Probiotic premix for Shrimp pond grow-out
- **PONDlife**
A Probiotic premix for Pond treatment in shrimp grow-out

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Drum for mixing additives in feed, Vietnam

Moreover, in other regions where ecosystems are delicate, fractions of what would be considered as “acceptable” effluent discharge could permanently harm the environment. Regardless of the particular site, quantification of the water pollution burden released by an aquaculture activity will be necessary, and continues to prove difficult in the Asian small-holder context.

Energy use

Siting also has implications for energy use efficiency as it is used to address deficiencies of suboptimal sites. Where land is scarce, high intensity production is often used and results in a higher demand for energy. High amounts of aeration or pumping of water is necessary in these systems. Innovations in recirculating aquaculture systems have provided opportunities to minimize water and land use, escapes, and disease transfer.

Energy use in these systems is high and the trade-offs of this type of production must be taken into account. Another important measure of energy use is the distance aquaculture products are shipped (food miles) and their mode of transport, which are determining factors in the amount of energy used to deliver product to end-consumers. In general, carbon emissions associated with aquaculture need to be examined to determine where to target efficiency improvements.

Chemicals and therapeutants

The use of chemicals and therapeutants in aquaculture has allowed the sector to push the limits of the species being cultured to allow farmed animals to cope with increased amount of stress and often increased risk of disease spread associated with increasing densities. Additionally, these chemicals can be used to reduce the risk of the spread of disease to other farms and species in the wild. It is often stated that chemicals and drugs are used as a last resort and that disease prevention is the rule, but in many instances small farmers may not be familiar with the chemicals they are using or the implications of their use. Sometimes this results in improper application of these substances.

Responsible use of therapeutants requires being aware of and recording their use, and using them only when necessary. The prophylactic or over-use of therapeutants is not only unnecessary and wasteful, but also can contribute to the development of disease resistant pathogens which has negative implications for producers, the environment, and human health.

Food safety laws

Chemicals that have been banned for use in aquaculture can have negative effects on the environment, the users of these chemicals and the end consumer. The use of these chemicals is not only irresponsible in terms of the environmental effects, but is ultimately financially irresponsible for the producer. Banned chemicals detected in exported product will result in batch rejections. This not only negatively affects the country as a whole but, in the absence of a traceability system this places an unfair burden and stigma on producers in the region that are abiding by the regulatory framework.

In international markets, the consumers are providing the capital for the livelihoods of the producers, and respect for and adherence to food safety laws in these countries is mandatory.



Feeding fresh fish to groupers in Indonesia. ‘Feeding carnivorous fish with wild fish stocks increases pressure on wild stocks to fuel aquaculture production’

Net loss of fish protein

One of the major criticisms of some forms of aquaculture such as the production of carnivorous species is that their activity results in the net loss of fish protein. Despite the good feed conversion efficiencies of these farmed species, their mass production will cause a heightened use of wild fish/organisms, thus increasing pressure on wild stocks to fuel aquaculture production.

There is an abundance of research being conducted on fish meal and fish oil replacements for aqua feeds. Some of this research is promising and will provide ways to reduce the amount of fish required per unit of aquaculture production, but the recent surge in the aquaculture production of top carnivores will unduly complicate the efforts to reduce the overall fishing pressure.

It is also important to note that wild fish resources are utilized by rural poor in Asia, and depleting these resources also directly affects those persons dependent on these resources as livelihoods.

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Another use of wild fish resources in aquaculture is the capture of seed or juveniles for grow-out on farms, which will increase pressure on wild stocks. Furthermore, it is often the case that the juveniles procured for capture-based aquaculture are carnivorous and require the further exploitation of the seas to feed these species. There is a growing awareness that the capture of seed and juveniles for grow-out is not sustainable and recent innovations in the artificial propagation of some of these species provide an opportunity to mitigate this impact.

Social responsibility

In aquaculture, social responsibility can have dramatic effects on the communities engaged in or surrounding the production facilities as well as on the natural environment. Unfair labour practices create a social environment where farm employees are less likely to respect appropriate procedures and regulations. In other cases, farm management may not encourage or provide adequate incentive for responsible production and operation in an attempt to minimize costs. In either case, worker behavior can decrease production efficiency, increase environmental impact, and even endanger employee health.

Communities surrounding aquaculture facilities play an important role in the success of a particular farm operation. Producers that understand the vital role of the surrounding communities are better equipped to anticipate, mitigate and/or resolve conflict before the issues reach critical thresholds. Larger production facilities that employ numerous workers must anticipate the effect of migration of workers to the surrounding area for employment and what the burden of this increased population is on the environment and social atmosphere.

Where small producers accumulate and carry out production activities, there must be awareness that their activities will greatly affect neighboring producers and their livelihoods.

WWF and Responsible Aquaculture

World Wildlife Fund (WWF) has been examining the impacts of aquaculture for over a decade and has focused efforts on collaboratively identifying key impacts and means to reduce them. This does not necessarily dictate expensive technologies, but rather an understanding of what the magnitude and scope of these impacts are, and how and to what level they should be reduced.

WWF recognizes that until those stakeholders concerned with aquaculture's environmental and social benefits and threats come to consensus on what acceptable levels of impacts are, the debates surrounding perceived and real impacts will continue indefinitely. While these debates occur there will continue to be those producers that do not know, choose not to know, or disregard the impacts that they have on the environment. There will also be those producers who lead the industry in environmental and social performance. WWF has concentrated its efforts in the aquaculture industry on building this consensus to reduce aquaculture's environmental footprint.

The work of the Consortium on Shrimp Farming and the Environment (FAO, NACA, UNEP, World Bank, WWF) allowed WWF to shape our thinking around consensus building. WWF initiated multistakeholder Aquaculture Dialogues on salmon, tilapia, channel catfish, Pangasius, seaweeds, clams, mussels, oysters, scallops, abalone, barramundi, trout, and sea bream to foster consensus on key impacts of culturing these species, ways to reduce them, and acceptable levels of impact.

Ultimately, the Aquaculture Dialogues aim to develop performance-based standards for culturing a wide variety of species. It is without question that standards developed unilaterally by specific interest groups are not transparent or credible, and will not be broadly adopted or supported. There must be a collaborative approach to solving these issues. The Aquaculture Dialogues present an opportunity to work together towards the conservation of nature and the sustainable existence of aquaculture as an industry and a livelihood.



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Eric Bernard
manages WWF's efforts towards the development of standards for responsible shrimp aquaculture.

The importance of setting KPIs in *P. vannamei* farming in South Thailand

By Zuridah Merican

In shrimp farming, feed management is a key success factor. At this eight-month-old demonstration farm in Phang-Nga province, the mission is to show this to feed clients of Inteqc Feed Co Ltd, Thailand. Along the same lines the farm itself is also a profit centre for the company, where the bottomline is to be able to harvest the target tonnage of the right size of *Penaeus vannamei*.



The current team at the farm. From left, Nantaporn, Saksahakorn, Nattaporn, Chutima, Bank and Thitikan. The company also uses the farm to train its sales personnel. Nattaporn, Chutima, Bank and Thitikan are graduates from Maejo University and part of their initiation into the Technical and Sales Services of the Company is attachment training at the farm.

The farm, named 'IT Farm 11', is one of seven farms belonging to the company, a top shrimp feed manufacturer in Thailand. For farm manager, Mr Saksahakorn Khongsamat, running this farm is a change from the previous one, also in Phang-Nga province culturing the black tiger shrimp *Penaeus monodon*. Since 2001, the shrimp industry in Thailand has made a paradigm shift from culturing black tiger to white shrimp. Today, it has been reported that more than 90% of production is white shrimp. With this came significant modifications in culture technology and feed management and in pond configurations. The only similarity is that in both farms, Saksahakorn had the task of redeveloping previously abandoned ponds.

There are 9 culture ponds of 3-4 rai (0.48-0.64ha) and 3 reservoir ponds totaling 10 rai (1.6 ha) at the farm covering 108 rai (17.28 ha, one rai=1,600 m²). Ponds are 1.8 to 2m deep. Water intake for the farm is from a canal 5 km from the open sea. Reservoir water is treated with potassium permanganate and manganese oxide and is filtered through 90-100 micron nets. Pond water is only exchanged during poor water conditions in the ponds or when brown algae proliferate.

At the farm, affluent water is passed through a treatment pond, following the Code of Conduct (CoC) guidelines of the Department of Fisheries Thailand. Based on some recent incidences with disease, the team at the farm is glad that these were in place. In the case of an outbreak of white spot at the farm during the last cycle, attributed to bad weather conditions, water from the infected ponds was channeled into treatment ponds, treated with chlorine and held there. This prevented a neighbouring farm from being affected. Equally, during a recent infection at another farm, they did not take in any water from the canal.

The site overlooking the Phuket Yacht club on the other side of the bay, has the disadvantage of a high variation in salinity. The average salinity is 20-25 ppt but it can sometimes increase to 38 ppt. The lowest average daily growth rate (ADG) at the farm (0.1g/day) was attributed to this high salinity. The farm is now planning for an underground freshwater source to better control pond water salinity. The variation in temperature is another problem and in the next series of ponds under construction, Saksahakorn said that this problem will be improved with 3m deep ponds.

At the time of the visit, all the ponds have been stocked at 200,000 PL12 (125 PL/m²) supplied by Kuna Labs in Phuket, a sister company. This was set up in 2005 to supply feed clients with quality post larvae as part of the upstream integration of Inteqc Feed Co Ltd. SPF and GSR-Taura™ broodstock (specific pathogen free and Taura syndrome resistant) are supplied by Kona Bay Marine Resources, Hawaii. Postlarvae costs between THB 0.08-0.10 THB.

Meeting KPIs

Saksahakorn cited that the ADG is the most important key performance index (KPI). At present, it does seem that he will be able to achieve his targets. After two months of culture, survival averaged 80% and the average daily growth rate (ADG) was within the target of 0.2 g/day. He has worked that the size achievable at the end of the culture period of 4 months will be less than 100 pcs/kg. However, shrimp can be sold at only 68 THB/kg at 2007 prices.

At the moment all is well to break even, and he has calculated that the shrimp should reach at least 15g in two months. Shrimp are fed with feeds for the vannamei shrimp containing 36-38% crude protein. Feeding starts at 20 days after stocking at 40% of body weight/day and is reduced to 7% after one month. Feeding is carried out five times/day.





He added that in Phuket, Phang-Nga and the areas surrounding them, stocking density of *P. vannamei* shrimp is high. Small farmers use partial harvesting to overcome the high cost of stocking large numbers of PL. Other factors influencing this practice are ADG, water quality and cash flow. Usually the first harvest is carried out at 2 months when shrimp reach 100-150 pcs/kg. The second harvest is a month later at 60-70 pcs/kg and the third follows at 50 pcs/kg on the fourth month. Some will continue with a harvest on the fifth month, collecting shrimp of 40pcs/kg.

As prices of small size shrimp (THB 100/kg in 2006 and THB 68/kg in 2007 for less than 100 pcs/kg) have been on the decline, a challenge for the farmers in Thailand is the cost of production. This is generally around THB 100-120/kg based on a survival rate of 80%. At the farm, the breakdown of costs of production was detailed as such. Some 40% is for feeds, 20% for energy, 10-15% for labour and some 5% for chemicals such as for water treatment. Costs of energy have been increasing. Ten long arm aerators are used for each 3 rai pond. No probiotics are used at the farm.

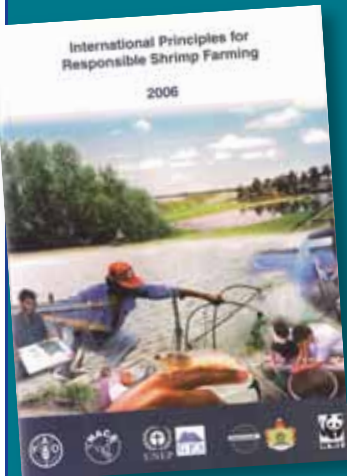
Bottomline

At the farm, the current goal for the total harvest is a minimum 3 tonnes/rai/crop (18.75 tonnes/ha). So far, they have managed to increase yields to 5 tonnes/rai /crop. All the ponds at the farm are functional. With decreasing prices, the farm is compelled to increase yields. As survival is already high, at the farm, Saksahakorn will do this by increasing stocking density to 300,000/rai (187 PL/m²) in the newer and deeper ponds.

Yield is not the only criteria. He is looking at increasing value by extending culture to 6 months to produce larger shrimp (50 pcs/kg) which will bring in higher prices, estimated at 130 THB/kg (April, 2007).



The International Principles of Responsible Shrimp Farming 2006



FAO/NACA/UNEP/ WB/ WWF,2006. *The International Principles of Responsible Shrimp Farming. Network of Aquaculture Centres in Asia Pacific (NACA). Bangkok, Thailand. 20pp*

This 20-page book provides the basis upon which stakeholders can collaborate for a more sustainable development of shrimp farming. This is the work of the Consortium on Shrimp Farming and the Environment (FAO, NACA, UNEP, World Bank, WWF). The aim is to provide guidance in implementation of the FAO code of conduct for responsible fisheries for use by private and public sectors for the development of local codes and best management practices in shrimp farming. The eight principles of responsible shrimp farming are explained as:

- | | | | |
|-------------|--|-------------|--|
| Principle 1 | Farm siting should make efficient use of land and water resources and recognizing other land users | Principle 5 | Feed management should minimize wastage and discharge |
| Principle 2 | Farm design should minimize environmental damage | Principle 6 | Health Management should aim at reducing stress and risks of disease transmission |
| Principle 3 | Water use means reducing discharge of nutrients and organic matter from farms and reduction of water exchange and pumping costs | Principle 7 | Food safety should not compromise on the safety of workers and production of foods are free from excess harmful |
| Principle 4 | Broodstock and postlarvae use of domesticated and selected wild stocks to enhance biosecurity | Principle 8 | Social Responsibility covers the development of farms that benefit the local community and country |

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Second generation of shrimp farmers in Indonesia

By Iffa Suraiya

After more than 20 years, the industry is beginning to see the emergence of a new breed of entrepreneurs ready to carry on the legacy of shrimp farming.

The history of intensive shrimp culture may be short in Indonesia but it is changing. In the 1980s, shrimp farming became a novel but favourite industry in Indonesia and farms sprouted like mushrooms in the rainy season. Many entrepreneurs saw shrimp farming as a challenging new business. For those who continued are considered the first generation of shrimp farmers.

The random exploitation and expansion have not been without challenges. Besides limited human resources, capital, infrastructure and technology, the industry faced major disease problems which limited the growth and development of the farms. These conditions have become second nature to the founding generation.

After more than 20 years, the industry is beginning to see the emergence of a second generation, all geared up to continue with the family business. This new breed share some typical characteristics. They are young, averaging early 20s, IT savvy, able to access to information quickly and well educated. Despite their limited experience in shrimp farming, they are becoming a significant force in the business. Who are they?



Samuel – shrimp farming as the bridge of hearts

Samuel Wangsa Winata, born in 1984 in Tuban, is happy with the change. Although his father, Mr. Winata is a prominent figure in the shrimp culture business in Tuban, East Java, Samuel confesses that he did not know anything about shrimp farming when he first started. He is an IT fan and spent one year in Beijing learning Mandarin.

The new change in Samuel is his noticeable tan. "This is evidence that I am a real shrimp farmer."

Samuel's knowledge of shrimp culture started when he joined the training program on Shrimp Health Management, organized by NACA and Alltech in Bangkok, Thailand in 2006. After

attending this school, he decided to become a shrimp farmer despite the negative perception of it being 'uncool'.

The first of four children then said 'Just one thing made me think – if my Dad has been doing this business seriously for more than 20 years, I should feel grateful, shouldn't I? Like it or not, I should know how to take this business into the future.'

Samuel has started this new stage in his life as a novice shrimp farmer. Shadowing his father around the ponds, he says 'I am learning from the expert, free of charge and the best teacher around. This is my best advantage'. He has confessed that his bonding with his father has become closer with the working relationship and a common language. It can be said that shrimp farming is the bridge of hearts.

At the moment, he refers to his father for more information when asked how the industry in Tuban is faring. Samuel's learning curve has been steep in this short period but he has enjoyed it. 'Shrimp are unpredictable creatures which we cannot fully control. There are always surprises that are very challenging! It is alike to riding a roller coaster. Learning the details of shrimp framing relaxes me. It is something I can be grateful for including being Mr Winata's son. However, I also have to live up to my father's name and legacy'.

What's next? Samuel plans to incorporate IT into shrimp farming by using simulation models. He is also under pressure to learn quickly as he is unsure if Mr. Winata wants to retire early. Samuel is determined to take this business seriously which he believes is profitable when done well.



Catur Widi

Tri and Catur: Learning from mistakes

Tri Widi Darmanto and Catur Widi Dariyono, 25 years, are twin sons of Mr Sutedjo, a prominent shrimp farmer in Banyuwangi. The elder Sutedjo has been in shrimp farming for more than 20 years. Tri and Catur, both, graduates of Indiana University, Bloomington have decided to follow their father's footsteps. They confess that they do not have any aquaculture background but they are not the least bit discouraged. Before starting in

2005, they went for a Mandarin language course in Beijing. They heard at that time that shrimp culture was beset with problems. The fuel hike in 2005 brought the industry's woes to a climax.

"These failures have forced us to learn quickly. It was difficult but surely, there must still be opportunities. All alternative solutions had to be considered. If they were not, the bankruptcy rate would have been higher". Catur added, "It is obvious that rational, sustainable and feasible action plans were required. We learnt a lot from our farm technicians and the farming community".

The farm is not strange to them as they often visited it during the harvesting period when they were younger but they confessed to not knowing anything about shrimp culture. "We only started learning the simple things such as the terminology – plankton, water quality, feeding time etc."

In 2006, they decided on a technology change by using plastic liners at the farm "By that time, the ponds were old, production levels were low, there was no bio security and the operational costs were high. We then decided to use HDPE lining." It proved to be the right choice. By using a ratio of 1 reservoir for every 10 ponds and a density of 150/m² in 1.5-2 m depth water, they harvested 6-7 tonnes/pond of 40-50 size. Total production was 65 tonnes.

"This success gave us confidence" Tri said but Catur added "The success also made us careless. Our next cycle failed. Failures pointed out the principles of farming to us. Adjust to nature and do not challenge it. Never be greedy. Always keep to the correct system and a rational density.

Tri continued "The question is which is the right system for our farm? Shrimp farming is more complicated than we expected. If we want to be successful, we have to be aware of all the processes. We have to be sensitive, careful and meticulous."

What's next? Both agreed that the business is interesting and exciting. However, they realize that managing it well will take time. They also realise that they will need a strong determination, and an open but responsible attitude and commitment to make this work.

Tilapia 2007 Kuala Lumpur

Shaping up as "The Global Tilapia Event"

Despite numerous industry events preceding it, interest in TILAPIA 2007 remains strong. This is undoubtedly a reflection of the growing importance of the fish as an aquaculture commodity.

In the opening session, speakers from FAO will discuss world supply and outlook for tilapia. Dr Sena de Silva, Director-General of NACA, will give a thought-provoking talk on "Tilapia aquaculture in Asia – has it impacted the biodiversity?" while Eric Roderick of Fishgen, UK will give a global update on tilapia farming.

The second session will look at the status of tilapia production in several countries. Rafael Guerrero of the Philippines will cover tilapia production in Southeast Asia, while Madan Dey of the WorldFish Center will cover the rest of Asia. Izzat Feidi, formerly of the FAO, will discuss tilapia culture and production in the Middle East. Erik Hempel, team leader of INFOSA, will discuss the situation in Africa, the original home of tilapia. Tilapia production in the Americas will also be discussed.

The third session will review some developments in various markets and marketing initiatives. Sherry Frey, Vice President of Perishables Group, USA will highlight the growing role of multinational retail chains and discount stores in retail marketing. Frank Chiang will talk on Taiwan's experience in branding its tilapia in the commodity market while Izzat Feidi will return to speak on demand and outlook for tilapia in the Middle East, a growing market for seafood. A speaker from CAPPMA (China Aquatic Products Processing and Marketing Association) will discuss developments in China.

Speakers from industry and regional organizations, including INFOFISH, will speak on the latest market situation in the USA, Europe, Japan and Asia as well as the growing niche market for organic tilapia. New developments in markets, such as the increasing popularity of

value added products, live marketing and the use of eco-labeling as a marketing tool will be discussed.

The session on technological developments, will feature Norbert Sporns, CEO of HQ Sustainable Maritime Industries on experiences in developing value-added tilapia products. Morten Hoyum CEO of GenoMar will look at genetic verification of seafood as a tool to address food safety. Raul Ponzone of the WorldFish Center, will relate the genetic improvements achieved with GIFT tilapia.

As sustainable aquaculture is the current buzzword Lorena Schwarz, of the Global Aquaculture Alliance (GAA) will discuss standards for sustainable tilapia culture. Aaron McNevin will explain the scope and mission of the ongoing Tilapia Aquaculture Dialogue between industry and environmental groups. Yong Kim Thai, PKPS Farm Mart, Malaysia will present experiences with intensive tilapia culture in concrete tanks. Markus Stern of the Swiss Import Promotion Program (SIPPO) will discuss organic tilapia farming. Cedric Komar of Intervet will review the key infectious diseases in tilapia while Patrick Blow of Lake Harvest Tilapia will describe industrial tilapia farming. Other interesting topics are also lined up. A special session is now being included within the conference to accommodate requests from researchers and industry representatives to make oral and poster presentations on their work.

Interest in the accompanying trade exhibition and sponsorship program is also building up. At press time, Cargill Animal Nutrition, Schering Plough, Aquatic Eco-Systems and Fick India are among the companies which have confirmed their participation. There will also be a post-conference tour of tilapia farms.

With the keen interest and support of international organizations, industry and the Malaysian government, TILAPIA 2007 KUALA LUMPUR looks set to rival its predecessor, TILAPIA 2001, as The Global Event of the Tilapia Industry.

FOR MORE INFORMATION, CONTACT INFOFISH-TILAPIA 2007 KUALA LUMPUR

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Significant developments have taken place in the global tilapia industry since 2001 when the first comprehensive, business-oriented international technical and trade conference on the species was held. Production of farmed tilapia increased by more than 40% from 1.27 million mt in 2000 to 1.82 million mt in 2004. Meanwhile, landings from capture fisheries rose modestly from 0.68 million mt to 0.72 million mt in the same period. The total production from both capture and culture thus rose from 1.95 million mt to 2.54 million mt, an increase of 30% within a period of just five years. Total farmed production in 2004 alone was estimated to be worth US\$ 2.2 billion, up 30% from five years earlier. Major developments have taken place in the form of growing domestic and international markets, introduction of a wide range of value added products, expansion of farming and advances in culture technology. All these, and more, will be discussed in depth at TILAPIA 2007 KUALA LUMPUR, the much awaited follow-up to the 2001 event. The conference will be accompanied by a trade exhibition featuring companies involved in growing, processing and marketing tilapia and providing various inputs and services to the industry.



For further details, please contact:

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Victam International 2007

Ingredients and raw material processing at Aquafeed Horizons

Aquafeed Horizons was a two-day technical conference, held in conjunction with the international feed equipment and ingredients show, Victam International 2007, Utrecht, the Netherlands. It was organised by the online portal aquafeed.com and Fiskeriforskning, the Norwegian Institute of Fisheries and Aquaculture Research based in Bergen, Norway on May 9-10.



Brian Plattner (right) and Galen Rokey at the Wenger booth

Both parties have developed a program to bring out current issues of interests to the global aqua feed industry; alternatives to fish, sustainable ingredients, organic aqua feeds, raw material processing and optimizing processing methods.

Small water soluble components in marine meals

The Department of Aquafeed Development and Marine Processing at Fiskeriforskning has been studying the essential components in fish meal in order find its alternatives in an optimal way. New at the conference was information on the beneficial effects of small water soluble components in marine meals. In his presentation on the 'upgrading of marine raw materials: the importance of finding substitutes', Dr Anders Aknes said that these are free amino acids, taurine and anserine, present in marine meals but absent or present at low levels in plant meals. These have significant effects on growth and feed efficiency but not on feed uptake. In studies, the removal of small compounds from the fish hydrolysates by filtration resulted in reduced feed utilization indicating that this marine fraction of small compounds is important for optimal growth of Atlantic cod and trout. This showed that it is not just the protein but its components that are essential in aqua feed for carnivorous fish. This may be important when we are considering replacing fish meal with plant meals.

Krill as a feed source

With 55 to 68% protein and a total of biomass estimated to range in between 125 to 725 tonnes, the Antarctic krill *Euphasia superba* is a future source of marine protein, said Dr Sissel Albrektsen from Fiskeriforskning. Krill meal contains a variable lipid content from 8-26%, ash from 10-16% and carotenoids typically from 100-130 mg/kg. The essential amino acids appear to be well balanced and cover the requirement in most farmed species.

The potential of replacing fish meal with krill meal is indicated by the high protein digestibility ranging from 96.3% in Atlantic cod, 88% in Atlantic salmon and 98% in Atlantic halibut. An attribute is the high utilization of astaxanthin which is present at 100-130mg/kg in krill meal and 1500 mg/kg in krill oil. When fed krill meal, the efficiency of astaxanthin utilization is equivalent to about 2/3 of astaxanthin found in salmon feed when present as 42mg/kg of the synthetic carotenoid, Carophyll pink.

A negative aspect is the high level of fluoride (F). Unfortunately, fluoride accumulates in calcifying tissues of krill and typically ranges in krill meal from 790 to 1700 mg/kg. Under the EU directive (2005/87/EC), the maximum allowable F level is 3,000mg/kg. In experimental trials, F accumulation is extensive in rainbow trout reared in freshwater in comparison with Atlantic salmon and Atlantic cod reared in seawater. As for heavy metals (cadmium, lead and mercury) levels are low. Krill meal also contains organic arsenic which is non toxic and inorganic arsenic below detectable levels. High Copper level in krill meal from 32 to 65 mg/kg could be a problem as it put restrictions to the maximum inclusion level of krill meal, although it does not accumulate in fish fillet. Nevertheless, when considering krill meal as a new marine feed ingredient, the main issues are the balance between quality, availability and market price, said Sissel Albrektsen.

Ingredients for organic feeds

Organic aqua feed production is an expanding market. In 2007, the production of organic salmon feeds is estimated at 12,000 tonnes producing 7-8,000 tonnes of fish. It was 4,000 tonnes of feeds in 2004. In outlining some of the main ingredients in organic feed production, Peter Bridson from Soil Association, UK said that the criteria must be in line with the principles of organic farming.

In the standards for aquaculture released in 2005, marine sources of proteins as feed ingredients must be certified as sustainable by the Marine Stewardship Council (MSC) or made from fish fit for human consumption, i.e. trimmings and fillet wastes of fish already caught for human consumption. The pigments allowed in fish feeds are shrimp head wastes from cold water fisheries. From July 2007, the use of synthetic oxidants such as BHT and BHA will be stopped and replaced with natural sources. The future will be ingredient diversification. What is sure, according to Peter is that meals from land animals will unlikely be used because of the earlier experiences with mad cow diseases. The goal will be a truly sustainable feed.

Sustainable ingredients

According to Ernest D. Papadoyianis, Neptune the current dependency on fish meal at staggering prices cannot be sustainable. Fish meal prices rose to USD 1,400/tonne in 2006 versus USD 750/tonne in 2005. Plant meals as alternatives have been proposed but they are now in demand for the production of ethanol and biodiesel. Other likely sources are poultry and blood meals, single cell bacteria, seaweed, polychaetes and insects.



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From Thailand, Dr Orasa, Adisseo, Thailand, Dr Orawan Sirirangkamonont and Aruntip Phansawat, Better Pharma, Thailand.

He introduced Ento-Protein™, a superior dietary protein source derived from selected insect species produced in controlled conditions. This was developed with the Mississippi State University. To date, feed trials showed good growth performance with catfish and tilapia. The meal contains 42-62% crude protein in comparison to 47% in soybean meal and 67% poultry meal. The omega 3 level is 0.15 to 0.30% as compared to 2.20% in fish meal but the insects can be fed diets to change the fatty acids profile to suit the nutritional requirements of the target fish. Methionine levels are higher than soybean meal at up to 1.20%. The goal is to provide our industry with a high quality, sustainable protein source for aquaculture diets.

The role of Centre for Environment, Fisheries and Aquaculture Science, UK (CEFAS) is to develop novel and innovative technology in aquaculture. Together with Kiotech International, it has developed Aquatice, a patented chemosensory stimulant. The product is used to increase feeding activity prior to the application of the feeds. (More details on page 43).

“On the environmental side, the use of novel attractants can lead to a reduction in the amount of waste from uneaten feed. In the longer term, it is anticipated that this technology will permit the use of more sustainable forms of proteins in aqua feeds, which are not based on proteins and oils derived from wild fish stocks said **Dr Andrew Moore**, Head of Salmon and Freshwater Fisheries.



Extrutech Booth

“This approach will further conserve and protect wild fish populations. One of the core-values of CEFAS is to provide a sustainable base for the large-scale expansion of the aquaculture sector”.

Ingredient processing

The nutritional and physical properties of diets are affected by extrusion processing and raw ingredient variation. **Dr Mette Sørensen**, AkvaForsk said that this was shown when fish meal diets were processed with a twin screw extruder at different temperatures (100,125 and 150°C). However, no major changes in apparent digestibility coefficients (ADC) in the rainbow trout was observed. At 140 °C, only the ADC of ash was reduced.

On the physical quality, she added that the reduction in hardness and durability was apparent when the extrusion temperature was 140° C. The better growth performance of fish fed this diet was supported by a higher feed intake. The results suggest that the feed produced at the higher temperature was more easily degraded in the gastrointestinal tract. The connection between physical quality and nutritional quality of diets are not well explored. Neglecting the information of physical quality of the feed may result in wrong conclusions when diets are evaluated. In studies to replace fish meal with soybean, research showed that extrusion process inactivates the trypsin inhibitor to safe levels when untoasted soy is included in the diet. Soybean meal in general improves the physical quality of the feed. Investigations have also shown an interaction between starch source and physical quality of the feed. The extrusion processing parameters thus need to be optimised according to the ingredient composition. She summarized that in future, there is a need to understand basic mechanization in binding properties.



Alan Tan, CPM, Singapore

Brian Plattner, Wenger, USA, looked at how raw materials impact the extrusion process. The fundamentals of processing are recipe and specifications. The guideline is that a smaller particle size results in a smoother pellet, improves product appearance, reduces incidences of plugging die orifices and reduces product breakages. A finer grind also hydrates faster and cooks more quickly on the extruder. The change in raw material from fish meal to plant meal requires a change in extrusion parameters. An increase of plant protein ingredients often requires more water. In the case of soybean meal, the oil content has to be considered. The addition of slurries is limited by the water content and this will depend on whether a single or twin screw is used.

As for raw materials, Brian said that inclusion rate will depend on specifications. With tapioca and potato starch, it should be 10% for sinking feeds and 20-22% for floating feeds. Then the heat required to cook the starch varies too. The minimum moisture level is 30%



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At the trade show, from left, Dr Warren Dominy, Oceanic Institute and Suzi Fraser Dominy, Aquafeed.com Hawaii, D. Ricque-Marie and Dr Elizabeth Cruz-Suárez, Universidad Autónoma de Nuevo León, México

for complete gelatinization. As a starch, rice will hydrate slowly and will also become sticky when gelatinised. Corn is sticky at high temperatures and wheat is sticky when overcooked but 40% should not pose a problem.

In the case of oils, levels below 7% show minor effects but within the 7-12% range, each increase in 1% will result in 16 g/l in bulk density. At more than 17%, the pellet is not durable. However, he cautioned that integral oil does not contribute to this effect. In the production of soft moist feeds, the moisture level is 16-28% at a pH of 4 to 4.5. Salmonella can be reduced but total plate count can only be reduced through sterilization. Toxins can be reduced with extrusion but not completely destroyed. However, insect populations can be reduced.

In his presentation starter feed technology, **Will Henry**, Extru-Tech, USA said that in the production of starter feeds, we have an option of pellet production and crumbling to obtain the desired sizes of 0.8 mm to 1.2mm.

This is a high capacity/low cost per unit of throughput. However yield of usable products could be as low as 40% after sifting. These are for sinking crumbles and usually have lower water stability relative to starter feeds produced by extrusion. As well, an increase in mortality can be seen due to the sharp edges of the crumbled pellet. Another option is direct extrusion using a single screw extruder. The rate of production is low and costs are higher than the pelleting and crumbling. Production rate is dependent on size of extruder and pellet. The advantages are pasteurization of the feed and flexibility of oil addition.

The appearance is also excellent and both floating and sinking pellets can be produced. In starter feed production, the aim is to have a homogenous feed particle, in terms of size and composition, with an option for low-loss heat sensitive supplement addition. The Sperezizer Agglomeration system has been designed for this. A pulveriser is recommended to give fine grind at low heat. In the production of 450 microns grind the post production sifting yield can be as high as 99.8%. The pulverized material is passed through a low shear and low temperature extrusion process and the strands are then shaped and sized through cyclonic motion to produce feed of a size range of 0.1 to 1.2mm. The disadvantages are lower production rates, requirement of a dedicated line and no pasteurization.

"The advantage is that the loss of vitamin is much less. In the direct extrusion process, losses of vitamin C of 10-15% have been recorded whereas it is 86% for vitamin E. When calculating costs, these losses must be taken into consideration. Consequently, there have been documented increases of 10-60% in growth rates, 10-13% in survival, and feed conversion ratio of 13 to 20%. These should be quantified when choosing the system", said Will.

Fish meal updates

Production is stable but usage should be at critical stages only.

This was the conclusion at the meeting of fifty representatives of aqua feed manufacturers attending the Bentoli workshop in March 2007, held in conjunction of Aquaculture 2007 in San Antonio, Texas. Dr Jonathan Sheppard, the Director General of the International Fishmeal and Fishoil organization, IFFO, said that production is stable at 5-7 million tonnes which means that it is well managed and sustainable. Growth in aquaculture has put demands on fishmeal. Prices will remain stable as fishmeal and fish oil move from being commodities to strategic ingredients used at critical stages only.

Dr Ronald Hardy, University of Idaho, US said that industry must now focus on the quality of fish meal that have the highest value in aqua feeds. They should limit its use to situations where its value is realized, such as in feeds for fry and fingerling. In the feeding of the white shrimp, Dr Allen Davies, Auburn urged feed manufacturers to use data showing that no fish meal is required in feed for the vannamei shrimp cultured in ponds. He added that cheaper and higher quality ingredients such as solvent extracted soybean meal, corn meal, distillers grain and corn gluten meal can be used successfully in shrimp feeds without compromising growth performance. Of course such modifications must take into account nutrient requirements in terms of essential fatty acids, fatty acids and minerals as well as shifts in palatability.

In reviewing previous work with shrimp feeds, Prof AL Lawrence, said that soybean can be included up to 50% with no detrimental effects but further increases in SBM levels results in pelleting problems and requires the use of oil and binders. Methionine, lysine and arginine, the three most limiting essential amino acids are not as limiting as protein levels in least cost formulation. The limitation is food grade plant meals with 60% crude protein with a digestibility value of more than 85%.

In the case of feeds containing 40% protein, alternatives to fish meal are difficult to find, according to Victor Suresh, Director of Research, Bentoli. He provided a case study of formulation of shrimp feeds.. Fish meal at USD1070/tonne are include at <2% or not at all in 35% or 30% crude protein diets. The addition of fish meal is justified only at prices below USD 500/tonne. Aspects such as attractability/palatability deserve as much attention as quantifiable nutrients. It is important to quantify such aspects and input values so that formulators can effectively manage ingredients and produce diets which are nutritionally adequate and meet the performance goals of the farmer. (www.bentoli.com)

Next conference

Aquafeeds Horizons Asia 2008 will be held on March 6 in conjunction with Victam Asia 2008 and Feed ingredients and Additives 2008 at the Queen Sirikit National Convention Center, Bangkok. It will cover the latest concepts in feed processing and new equipment. It will also include the status and overviews of world and Asian aquafeed markets, emerging species, farming technologies, market drivers. More information on paper submissions at www.aquafeed.info or contact: editor@aquafeed.com



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INVE Aquaculture Launches new identity



This business unit active in the aquaculture industry has an entirely new logo and style. The aim is to develop a more coherent and recognizable image in the numerous markets it serves world-wide. This

was announced by Frank Indigne, INVE Group's CEO and Philippe Léger, Business Unit Manager of INVE Aquaculture.

"Over the years, our product range has become quite diversified. There are the Artemia cysts, enrichment products, microencapsulated diets, dry larval feeds, premixes and concentrates for grower feeds and a new series of health products", said Philippe Léger. "We target different customer groups, from fish hatcheries, shrimp and shellfish hatcheries to farms and feed mills. On top of that, we offer both nutritional and health products, making our range even more extensive".

Up until now, the numerous products have been marketed with an equal amount of styles, shapes and logos.

"Sometimes this was confusing for our customers. Certain products were not recognized as being part of INVE Aquaculture's product portfolio. The time has come to evaluate and bring everything together under one umbrella to support and enhance our image in the market. More importantly, it will be clearer to our customers", added Philippe.

The new image illustrates the activities and the strong R&D support. Based on this logo, a whole communication style was developed. Each customer segment has its own colour variation. Of course, the well-known 'owl' symbol of the INVE group, is integrated in the style.

"The logo looks fresh, clean and dynamic, and that's exactly the image that we want to radiate," said Philippe.

INVE Aquaculture will launch its new style at the Asian-Pacific Aquaculture in Hanoi, 5-8 August 2007 at Booths 34 to 39.



The new and abstract logo, designed by a Belgian design agency, is a symbiosis of these 3 elements.

The blue parts of the oval structure represent the bodies of shrimp. They encircle the white body of a fish and the two curves underneath symbolize the protected environment in which these animals are cultured. The combination with the green colour is a reference to INVE Technologies, the corporate R&D unit, symbolising the strong science based approach for conducting INVE's business.

Experts in aqua feed milling



INVE Aquafeed Experts, a new focus within its aquaculture business, aims at assisting feed millers and integrated farmers to achieve better profitability and product quality by offering tailored feedmill products and customer services. At Victam International 2007, Peter Coutteau, Manager Inve Aquafeed Experts said, "The challenges in our relatively young industry are its extremely fast growth, traceability and food safety issues, wide

diversity of species and convince the farmer to change from "low cost" to "cost efficient" feed. Aquafeed milling demands more expertise and we offer the best of our R&D capabilities, innovative products and specialized customer services to assist the industry. We have over a decade of experience with a wide diversity of fish and shrimp species, working with customers in many countries, including South Korea, India, Iran, Vietnam, Thailand, Indonesia, Brazil, Ecuador, Panama, Greece, Italy, Madagascar, and Turkey."

The unit has a multidisciplinary group of engineers, veterinarians and feed technologists with global experience in customer-oriented research and in-house development of feed mill specialties. It has the use of a pilot feed plant in Belgium and test center facilities in Spain and Indonesia to screen and test out products for the most important species. Customer support services consist of formulation and analytical services, technical assistance in the feed mill, optimization of cost efficiency and profitability at the farm as well as scientific and marketing support.

Inve Aquaculture's scientific competences have been at the basis of important innovations in aquaculture nutrition and health. Novel concepts have been verified under field conditions at selected customers' farms and are currently applied either as specialty product or tailored to a customer-specific solution. Key product lines include Aquasterol (specialty premix to boost lipid nutrition in shrimp), Sanoguard® Aquastim (species-specific premix of immunostimulants and nutrients to enhance disease/stress resistance), Aquaflavour (species-specific premix containing enhancers of palatability, feed uptake and protein digestion), Fish Essence/Shrimp Essence (range of premixes to supply the essentials of nutrition for different life stages for a wide diversity of fish and shrimp species), Sanolife® FMC (selected probiotic premix for application in the feedmill).

New products to be launched at the Asian Pacific Aquaculture 2007 in Hanoi and the EAS conference in Istanbul include species-specific concentrates to enhance palatability and digestibility in fish to address the key issues induced by replacing fishmeal in fish feed.

(More information: email: INVE_AquaFeed_Experts@inve.be)

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Phytase in aqua feeds:

Focus on different enzymatic sources and their properties

By Tobias Steiner and Pedro Encarnaç o

Phosphorus (P) is an essential nutrient for aquatic animals. It is an important constituent of nucleic acids and cell membranes, a major constituent of the structural components of skeletal tissues and is directly involved in all energy-producing cellular reactions. In the water environment only minimal quantities of P compounds are available to aquatic species as their concentration in the water is lower than 0.1 ppm. As a result, it must be supplied in sufficient amounts in the feed to maintain health, body functions and performance.

Levels of total P present in most commercial diets are inherently high enough to meet the requirement of the animal. However, the major portion (50–80%) of total P in plant ingredients is present as phytate (myo-inositol 1,2,3,4,5,6-hexakis dihydrogen phosphate), the primary storage form of P in plants (Pointillart et al., 1984). Phytate contains 28.2% P, which is tightly bound in six phosphate groups. In this form, P is unavailable for absorption. Moreover, phytate binds positively charged minerals and trace elements (e.g. calcium, zinc, iron) and also protein, amino acids and starch, thereby reducing their bioavailability, as well (Maga, 1982; Erdmann, 1979).

The digestibility and availability of phytate P for fish is very low (Ketola, 1975; Ogino et al., 1979; Sajjadi and Carter, 2004). Consequently, the available P in diets containing large amounts of plant protein may not meet the requirements of fish. Therefore, other forms of P such as mono and dicalcium phosphate may be supplemented in the feeds. Such supplementation increases the feed cost and can lead to water pollution as the un-utilizable P is excreted in feces which in turn accumulates in the water environment and result in an unbalanced proliferation of zooplankton and phytoplankton communities. In extreme situations, excreted P leads to eutrophication of the aquatic environment.

Phytase: current use and future

A powerful measure to counteract the poor P utilisation in non-ruminants is to include exogenous phytase into the feed. Phytase breaks down the phytic acid molecule within the digestive tract and provides inorganic P and other bound nutrients for absorption. Addition of microbial phytase has been reported to improve the utilisation of plant P not only in poultry (Nernberg 1998) and pigs (Han et al. 1997) but also in fish diets. Addition of microbial phytase in aqua feed increases the bio-availability of P. Hence, there is less discharge into the aquatic environment, thereby reducing the level of pollution.

Rodehutsord and Pfeffer (1992) fed trout diets that were mainly soybean meal based and contained only vegetable sources of protein. Diets were fed with or without 1,000 U/kg phytase. At water temperature of 15°C, digestibility increased from 25 % in the control to 57% in the phytase group and P utilization increased from 17 to 49% in control vs phytase group.

Microbial phytase supplementation in the diet of catfish *Pangasius pangasius* also increased the apparent net protein utilization (Debnath 2003). An increase in weight gain has been reported in channel catfish *Ictalurus icталurus* fed phytase supplemented diets containing only plant protein or a combination of plant and animal protein sources (Jackson et al., 1996). Weight gain and feed consumption increased by 23.5 % and 11.6 %, respectively, compared to a control group. A

similar improvement in performance was observed for *P. pangasius* (Debnath 2003) and African catfish *Clarias gariepenus* (Van Weerd et al. 1999). Results in tilapia also indicated an improvement in apparent digestibility coefficient of P in fish given phytase supplemented feed (Phromkunthong & Gabaudan, 2006).

Trials with the carp (Schafer et al., 1994) also showed improved phytate P utilisation as well as a reduction in P excretion compared with mono-calcium phosphate addition. The diets used were soybean meal, fish meal and wheat starch based with a total P content of 0.72%. Both the addition of mono-calcium phosphate and phytase significantly increased weight gain and total body ash. Some 500 U/kg of phytase increased P utilisation by 20% and reduced P excretion by 28% in comparison with the unsupplemented (negative control) group.

When phytase is included into feed, supplementation with inorganic P can be reduced because of better utilisation of phytate-bound P. Taking into account that P is the third most expensive feed ingredient after energy and protein, this means a considerable economic benefit for producers through lowering of feed costs. Kies et al. (2001) reported that, depending on actual market prices, overall feed costs could be reduced by up to USD 4.16 per tonne through addition of phytase. Considering the increase in availability of calcium (Ca), protein/ amino acids and energy may further reduce feed costs under practical conditions.

Commercial phytase

There are various phytase preparations commercially available to the feed industry. However, there are distinct differences in efficacy between these enzymes. The first phytase preparations were industrially produced from fungi, with the earliest product originating from *Aspergillus niger*. Later on, phytase originating from other fungal sources (e.g. *Peniophora lycii*) entered the market.

However, deficiencies in enzymatic properties, including efficiency in phytate hydrolysis rate, thermal stability and pH optimum have driven strong efforts to discover other sources of phytase with improved efficacy. The development of bacterial phytase originating from *E. coli* has recently attracted considerable attention of scientists and nutritionists all over the world. Enzyme engineering using state-of-the-art molecular methods and modern fermentation techniques have now resulted in a big step forward to improve phytase efficacy.

Bacterial vs fungal phytase

Generally, the effects of phytase on digestibility and performance are determined by the concurrence of intrinsic enzyme activity, action time and inactivation (e.g. by proteases in the small intestine). Thus, an efficient commercial phytase enzyme should reveal high intrinsic

activity over a broad range of pH and temperature. The residence time in the stomach should be long enough to hydrolyse a large portion of dietary phytate. On the other hand, feed enzymes are usually susceptible to heat, harsh pH conditions and proteolytic enzymes which altogether result in gradual deactivation of the enzyme. Furthermore, concentrations of P, Ca trace elements and vitamin D affect the *in vivo* efficacy of phytase.

Numerous scientific studies have investigated various phytases with respect to their potential benefits in animal nutrition (e.g. Augspurger et al., 2003; Simon and Igbasan, 2002; Igbasan et al., 2000). These studies have shown that phytases can differ in activity at different pH conditions, resistance against proteolytic degradation and thermal stability. These factors are highlighted below.

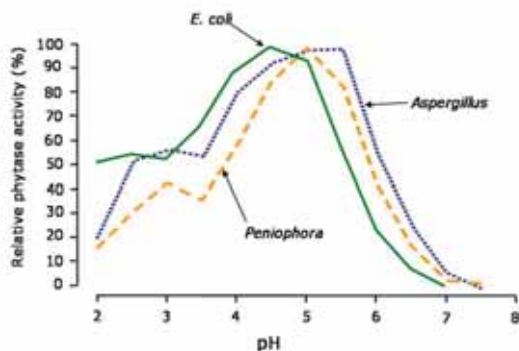


Figure 3 Activity profile of *E. coli* and fungal phytase at different pH values (adapted from Simon and Igbasan, 2002)

Activity at different pH conditions

The main site of phytase action is in the upper gastrointestinal tract. One reason for the superior efficacy of *E. coli* phytase over fungal phytase is a broader pH optimum, which is closer to the actual conditions in the stomach. The highest activity of *E. coli* phytase is around pH 4.5. This is in agreement with the experiments by Augspurger et al. (2003) indicating the highest coefficients of P availability in chicks fed *E. coli* phytase (Figure 2). In contrast, as can be derived from Figure 3 that, for example, *Peniophora* phytase has comparatively less intrinsic activity between pH 2 and 4.

Resistance against proteolytic degradation

As with other enzymes, phytase are complex proteins and are thus inactivated by proteolysis during their passage through the gut. *In vitro* studies have shown distinct differences between commercial phytases regarding their stability against proteolytic degradation. As shown in Figure 4, *E. coli* phytase has exerted highest stability among different phytases, when incubated with pepsin or pancreatin. In

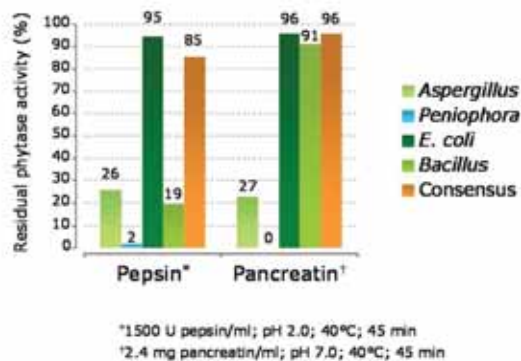


Figure 4 Residual phytase activity after incubation with proteolytic enzymes (adapted from Simon and Igbasan, 2002)

contrast, *Aspergillus* and *Peniophora* phytase retained no more than 27 or 2%, respectively, in the presence of proteolytic enzymes.

Thermal stability

Most feed enzymes are applied in powder or granular form prior to feed conditioning. Feed conditioning (e.g. pelleting, expansion, extrusion) may adversely affect the efficacy of phytase since these enzymes are rapidly inactivated at temperatures above 50–60 °C (Cavalcanti and Behnke, 2004).

Post-pellet spray application represents an alternative to the incorporation of solid enzymes prior to conditioning. However, such systems require additional efforts in terms of labor and investments. It has, therefore, been a major target of research to improve the thermal tolerance of phytases.

As can be derived from Figure 5, thermal stability of *E. coli* phytase is higher in comparison to fungal phytase. In this experiment *E. coli* phytase (Biomin® Phytase 5000) and *Aspergillus* phytase were incubated at 95 °C and elevated humidity (60%). After 50 min of incubation, the residual activity of *E. coli* phytase was 74%, whereas the activity of *Aspergillus* phytase was 53% only.

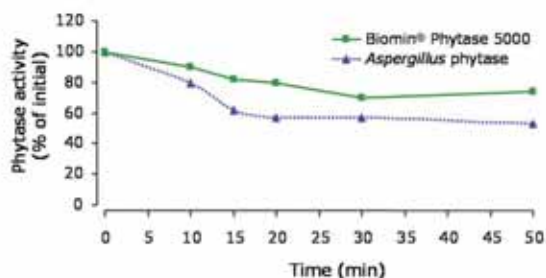


Figure 5 Thermal stability of *E. coli* and fungal phytase at elevated humidity and 95 °C

Conclusion

Phytate-rich plant ingredients restrict the bioavailability of P along with other minerals and protein to fish. Recent studies have demonstrated that phytase supplementation improves the bioavailability of the P and nitrogen (protein), which are the main culprits of aquaculture pollution. The use of phytase in feeds reduces or sometimes eliminates the necessity of mineral supplementation, which also decreases the cost of feeds.

The *in vivo* efficacy of phytase enzymes is largely determined by their intrinsic properties, such as activity at different pH conditions, resistance against proteolytic degradation and thermal stability. Recent studies have shown that a new generation of bacterial phytase originating from *E. coli* has improved efficacy as compared to fungal phytase. Thus *E. coli* phytase contributes substantially to optimal P management and efficient utilization of P sources.

References are available on request from the authors



Dr. Tobias Steiner is technical manager for feed enzymes at BIOMIN. Based in Austria, he has conducted various scientific studies in the field of phytases and NSP-hydrolyzing enzymes. He is a graduate from the University of Hohenheim (Stuttgart, Germany), where he also obtained his PhD in animal nutrition.



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Nutrition and Health

Activated β -glucans to the Rescue...

By Paul Perucchiatti and Arjen Roem

β -glucans may improve zoo technical performance, play a role in fish and shrimp health management and reduce the dependency on antibiotics. Like an insurance policy β -glucans can be used to produce seafood that is safe, healthy and sustainable.

Healthy animals with an outstanding predictable technical performance are desirable under all circumstances in aquaculture. Today, antibiotics use and vaccination are the two main practices to support animal health. Support animal health through a dietary immunostimulant could be a new opportunity to promote sustainable and profitable aquaculture farming practices.

β -glucans are a type of polysaccharides that can be extracted from yeast cell walls. When properly exposed these β -glucans are 'activated' and can boost the natural self defense of fish and shrimp.

When included in fish and shrimp diet, activated β -glucans can stimulate macrophages and dendritic cells located in the gut layer tissues. Those cells, part of the non-specific immune system are specialised in targeting potentially dangerous bacteria, virus-particles and parasites. Furthermore, macrophages have the ability to activate other cells of the immune response.

What are activated β -glucans?

β -glucans have the ability to improve the immune system resulting in better health and performance of animals. To exert optimal immunostimulatory properties, two major conditions have to be met:

- Firstly, the β -glucans must have the correct helical structure. Not all glucans have similar immunostimulatory properties. Glucans are structural components of cell walls of bacteria, fungi, yeast and grains. β -1,3/1,6 glucans from yeast cell walls have been shown to successfully stimulate the immune system.
- Secondly, the β -glucans have to be exposed to be activated. Yeast cell walls are naturally composed of different biochemical compounds such as mannoproteins, phospholipids and β -glucans (Figure 1). In the cell wall, β -glucans are tightly connected with the outer mannoprotein layer. This connection must be broken up to make the β -glucans bio-available and effective (Figure 2). As fish and shrimp do not have enzymes to break up this connection, β -glucans must be activated to be part of the production process.

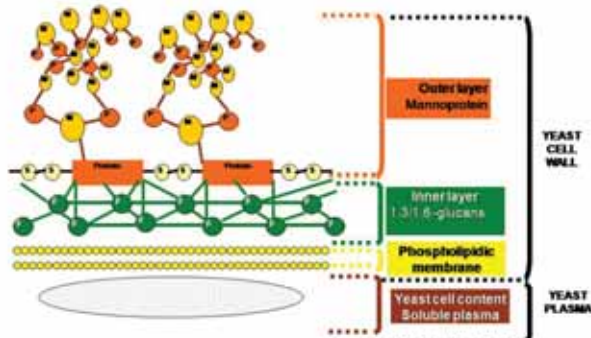


Figure 1: Live yeast cell structure

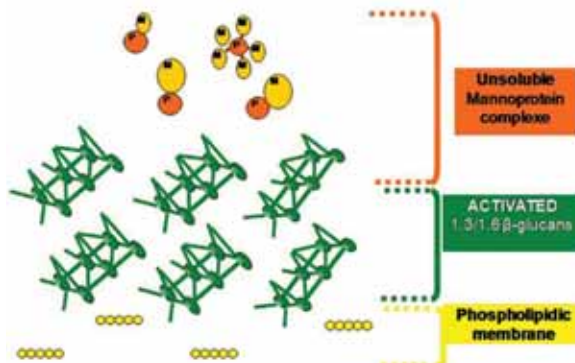


Figure 2: Activated yeast β -glucans extracted out of the yeast cell wall during the production process

What is different about the immune systems of aquatic species?

Even though the immune system of fish and higher animals share the same fundamentals, there are still important differences. The immune system of fish is relatively primitive. The innate (non-specific) immunity contributes more than the acquired (specific) immunity. Macrophages and dendritic cells, both part of the non-specific immune system play an important role in disease prevention. These phagocytic cells are specialised in finding, 'eating' and killing bacteria, viruses, parasites and injured body cells. Furthermore, macrophages have the ability to activate other cells of the immune response.

Shrimp lack the conventional immune system found in higher animals and fish. However, they do possess a non-specific immune response consisting of agglutinins, killing factors, lysins, precipitins and clotting agents. These have all been associated with the removal of invading organisms by phagocytosis or haemocyte encapsulation.

How can dietary activated β -glucans stimulate gut immune cells?

Nutrition can play a role in activation of the first line of animal self defense. Macrophages are located in high concentrations in the gut tissues and dendritic cells are present in the cell lining of the mucosa and in contact with the gut lumen. Both, macrophages and dendritic cells continuously monitor the gut lumen content for pathogenic organisms and take action in case of a threat for infection.

Macrophages as well as dendritic cells have specific surface receptors that can recognize β -glucans. The fact that macrophages found in the gut of fish can be 'stimulated' is also well documented. β -glucans are known to increase the phagocytic activity (increased respiratory burst activity) of these cells when administered *in vivo* and *in vitro*.

Our researchers investigated the effect of β -glucans on the bacterial killing activity of macrophages in salmon. Prior to their exposure to a virulent bacterial flora (*Aeromonas salmonicida*), salmon macrophages were sampled *in vivo* and equally divided into two groups before incubation with or without activated yeast β -glucans.

Both macrophages groups were then put in contact with different concentrations of the pathogenic flora for 5 hours. Survival rate of pathogenic bacteria populations was finally measured. For all the concentration tested, bacteria populations showed a lower survival rate when presented to macrophage incubated with β -glucans (green bars, Figure 3).

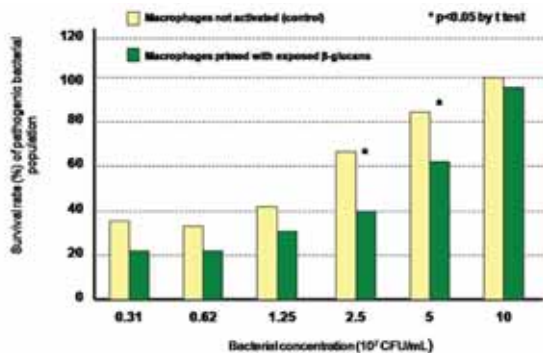


Figure 3: Bacterial killing activity of Atlantic salmon macrophages incubated with activated yeast β -glucans for 3 days (green bars) vs. control without β -glucans (yellow bars) for several concentration of bacterial flora

Effect of inclusion level of β -glucans in fish diet

The effect of β -glucans on macrophage stimulation may depend on inclusion level in the feed. This was the hypothesis of a R&D program in the last decade on different fish species carried out by our research group.

- A dose response trial was conducted to investigate the effects of dietary β -glucans in sea bream (*Sparus aurata*) against Pasteurellosis infection (*Photobacterium damslae sub. piscicida*). The experiment showed that fish fed the diet with a low dose of β -glucans had significantly lower cumulative mortality compared to the control and higher dose groups (Figure 4)
- A recent study led to the same conclusion on dose response to dietary glucans on the innate immune response and protection against *Vibrio harveyi* infection in large yellow croaker *Pseudosciaena crocea*. The group of fish fed with a low dose of dietary β -glucans showed better survival than the groups fed with control or high dose of β -glucans.

Both studies illustrated that inclusion level of dietary β -glucans in fish diet must be considered in order to get optimal and repeatable results.

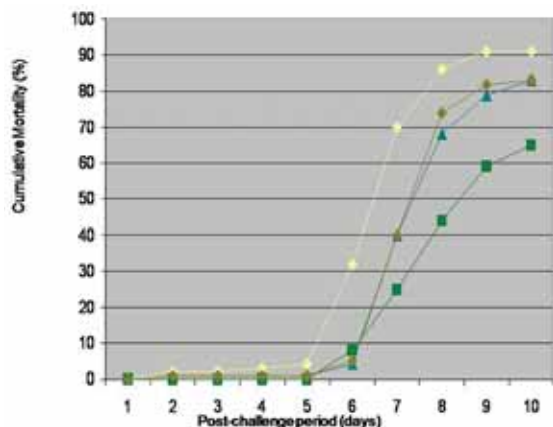


Figure 4: Cumulative mortality in sea bream (*Sparus aurata*) fed with 4 dietary levels of activated yeast β -glucans (0, low, medium, high) during a Pasteurellosis outbreak (*Photobacterium damslae sub. piscicida*)

β -glucans in shrimp diets

β -glucans can be beneficial to shrimp farmers. Experiments with black tiger shrimp (*Penaeus monodon*) and white shrimp (*Litopenaeus vannamei*) demonstrated that β -glucans used as immunostimulant in shrimp diets can improve their natural self defense by increasing non specific immune cells activity (haemocytes). These *in vitro* observations were confirmed later during *in vivo* challenge trials.

Disease resistance induced by yeast β -glucans was significantly improved in the black tiger shrimp. Shrimps challenged with white spot syndrome virus (WSSV) showed a lower mortality rate when fed dietary β -glucans.

A challenge trial was carried out to investigate the level of disease protection in kuruma shrimp *P. japonicus* against injection of the virulent *Vibrio* strain. Shrimp in two treatment groups were fed orally at 50 mg/kg body weight /day for 7 days with or without (control group) activated yeast β -glucans (Fibosel®). Then shrimp were then challenged by the injection of virulent *Vibrio penaeicida*. Mortality of both groups was checked daily. The β -glucans fed shrimp group showed a better protection against *Vibrio* infection with a lower mortality relative to the control group (Figure 5).

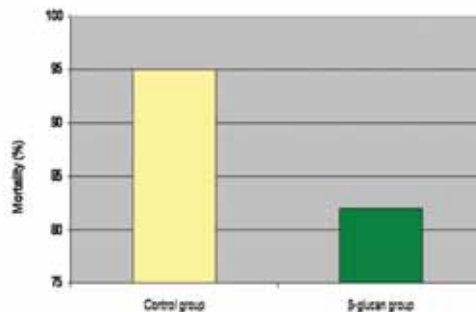


Figure 5: Effect of dietary activated yeast β -glucans (Fibosel®) on mortality rate in *P. japonicus* shrimps challenged with *Vibrio penaeicida* infection

When to apply β -glucans?

Starter phase

Juvenile fish less than 10g rely heavily on the non-specific immunity. Macrophages are the main line of defence. The acquired immunity only develops later when fish are 10-50g. It is then beneficial to vaccinate when fish are >10g. Feeding β -glucans before and after vaccination was shown to enhance fish recovery and vaccine efficiency.

Temperature stress

Fish are poikilotherms (cold blooded) and this means that they adapt to the environmental temperature. However, they have a narrow optimal temperature range for maximum immune-response. Typically, many disease outbreaks occur when the water temperature is temporarily a bit too low or too high for that species. Thus, supporting the immune system at times of major temperature changes (winter/summer) is necessary.

Transfer

This is probably one of the most stressful events in the lifecycle of the fish. Change of water temperature, salinity and dissolved oxygen all impact the fish immune system. Poor water quality can increase bacterial concentrations many fold.. All those small changes add up to a high risk for disease outbreak.

There are also many useful stages in the lifecycle of fish and shrimp to consider feeding β -glucans.

Life stage	Recommendation
juvenile fish < 10g	Continuous use of activated β -glucans to boost the immune system which is still under development
fish 10-50g	Continuous use is still recommended
fish > 50g	Use at regular intervals, for example 2 weeks every 8 weeks or alternatively use for 3-4 weeks before an anticipated stressful event such as: sorting & grading, transfer & transport, vaccination, temperature changes, algal blooms, maturation etc
Brood stock	Continuous use for optimal fish health and influence on egg & larvae
Shrimp	Administered to post-larvae by immersion or nursery diet before culturing (pre-transfer) and orally administered during the culturing period (growing diet)

Conclusion

Immersion and spray vaccination techniques are effective tools in controlling some diseases in fish but vaccination in shrimp is still under development. Furthermore, efficacy of vaccination remains uncertain and difficult to evaluate in invertebrates lacking a real specific immune system memory.

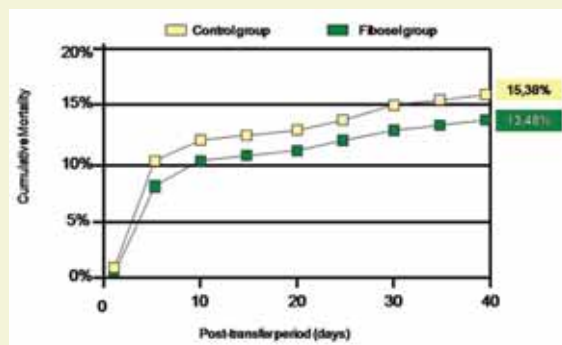
On the other hand oral administration of β -glucans can be one of the easiest and most efficient ways to support health status and improving technical performance, especially survival rate, at any life stage. Synergic effects have been reported when β -glucans were fed to fish during the vaccination period, boosting antibody production. Safe and easy to use in formulation, β -glucans are heat-stable. Therefore their activity remains preserved when included in both extruded and pelleted feeds.

In order to alleviate the antibiotic issue and improve benefits of vaccination program the use of natural dietary immunostimulants as activated β -glucans can reduce the prevalence of antibiotics in fish and shrimp.

Effect on fish



A major tilapia farming group in Indonesia tested the effect of activated β -glucans (Fibosel®) in a large scale commercial trial. In all, more than 60 batches, each consisting of 8,000 fingerlings, were used in the experiment equally divided over the treatments: feed with or without β -glucans. Fingerlings were fed with the test feeds for a period of 3 weeks prior to their transfer to the grow-out cages. Feeding was 1 to 3 % per day. Fingerlings grew from 12g to 20g. The transfer of fingerlings to net cages involved the handling, a 4 hour journey by truck and introduction to a new environment with lower salinity and lower temperature. Mortality after transfer was significantly reduced by 2% points in the β -glucans fed batches. This demonstrated that β -glucans also work in practice and give a positive return on investment.



Cumulative mortality during post-transfer period (40 days) in tilapia fed with / without activated yeast β -glucans (Fibosel®)

References are available upon request from the authors



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Victam International 2007

Modern feed technology to bring significant savings

More exacting customer requirement, intensified competition, official directives and changing market condition are increasing demands on compound feed producers. Huge price increase in the last 2-3 years and the general fuel shortage, suggest that high costs of energy will continue and affect the bottom line.

At Victam International 2007, it was clear that modern technology with emphasis on energy savings is currently a requisite for feed producers to be competitive and improve profits. A positive aspect of these is that the lowering of energy consumption which also lessens the environmental impact. Correspondingly, feed equipment manufacturers are matching these requirements to their equipment. Some of the dryer, extrusion and other technology presented at this trade show and at the Aquafeed Horizons conference are featured below.

Dryer technology *Optimal drying conditions*

In any plant, most energy is consumed during the extrusion and drying process. Usually fuel oil is used to run boilers for steam generation. As dryers are very energy intensive, both in terms of thermal and electrical energy, Aeroglide, USA is constantly working on technology to reduce energy consumption such as by using preheated making up air, among others.

In his presentation during the Aquafeed Horizons conference, **Andy Sharpe**, said, "We at Aeroglide think in terms of water removed, producer's thinks of the product output only".

He added that in drying, water is removed on the surface of pellets, the vapour is carried away and water diffuses from inside the pellet depending on pellet composition and size. If the pellet contains temperature sensitive materials such as pigments, the best way is to do a step by step drying, from 120°C to 70°C in stages. But this can require a double the retention time which will of course mean a much larger dryer. This will result in a much more gentle drying profile which can ensure that pigments or vitamins are not degraded during the drying process.

The overall result is that Aeroglide can provide a dryer that achieves optimum drying conditions in terms of moisture uniformity, energy consumption and throughputs. All of this is backed up with service and process support available globally.



Aeroglide feed dryer

Least energy consuming

Modern technology is an investment. According to **Sander Geelen**, Geelen Counterflow, an energy efficient dryer is the fastest way to reduce energy consumption.

"An efficient dryer for 6 tph of extruded petfood or aquafeed will consume Euro 150,000 – 200,000 worth of gas per year, depending on running hours and exact cost of gas. Most existing dryers over 10 years old will use 50-100% more, so the payback time for the replacement of existing driers is short. On top of that, modern dryers achieve a better uniformity of moisture in the final product, which usually leads to additional savings of at least the same magnitude".



Geelen Counterflow drier at the show

The company said that dryers based on the counterflow technology are least energy consuming. The reason is that this technology is inherently superior to cross flow. The exchange of energy between any two mediums is more efficient when these two flow in opposite direction, which is why this principle has been in use for many years in the chemicals industry.

Horizontal dryers of similar quality and material specification will cost about the same, but their energy consumption is at least 15-25% higher for the same evaporation capacity (50-100% higher for low cost dryers without recirculation system). For horizontal dryers, the recirculation of drying air cannot completely compensate this problem and heat recovery systems can only do it at a much higher cost. So it is for the same reason that counterflow coolers have almost completely replaced their horizontal predecessors over the last 25 years.

Prototype dryer

Stolz, France has developed a prototype dryer for fish feeds which is currently being tested at two aqua feed mills in Vietnam. To date, it is promising in terms of energy usage. It has a steam consumption of less than 2,500kg per hour which translates to 1,500kg per hour steam savings compare to standard existing materials. This is based on a 9 tph Stolz fish feed dryer. This has a capacity of 4 to 12 tph. The dryer was designed in France, assembled in Vietnam using key components, imported from France.



Stolz's 9 tph dryer in Vietnam

Innovation Gold Award

The winner of the Victam Innovation Gold Award was in the drying technology. The award, organized by Feed Tech magazine, went to the innovation "Energy Efficiency Indicator (EEI)" developed by Geelen Counterflow which gives the operators a visual and numerical indication of the efficiency of the current drying process. On the control display the operator can check how many kJ of energy are currently being consumed by the dryer, for every kg of water that is evaporated. This unit of measure (kJ/kg evaporation) is the critical indicator of efficiency for every dryer. The EEI measures all the drying variables in real time, which gives the operator the possibility to immediately adjust the drying process to the quality standards needed. Even in an already efficient counterflow dryer, a 10% extra energy efficiency can be obtained.

Cost efficiency with twin screw extrusion

Twin screw extrusion technology is increasingly utilized in the aqua feed production because of its overall cost efficiency. Clextral, France which has 25 years of involvement in fish feed processing has extrusion production lines which have been particularly adapted for the micro aquatic feed, down to 0,5 mm diameter. These are starter feeds for various fish species.

The production involves the Clextral standard twin screw extrusion technology fitted with a specifically designed die assembly together with die face cutting and the utilization of a small mesh raw material mix. The company said that the feeding and positive conveying patterns in the twin screw system can allow virtually any raw materials to be processed. This is a major advantage when to optimize the cost of the formulations, feed formulators need to look at more available and cheaper sources of proteins and carbohydrates. Furthermore, it has wider possibilities to improve nutritional efficiency of feeds and thus better feed conversion ratios.

Another feature is the accurate control of the various process parameters. These are the mechanical shear/energy from the screw



Clextral's twin screw extruder model Evolum 145 (screw diameter = 145 mm), in a version producing 12 tons/hour of fish feed.

pattern, the variable screw speed and the thermal energy with steam injection in a pre-conditioning device and in the extruder itself. The temperature profile all along the extruder independently controlled sections, combined with the greater mixing ability of the intermeshing co-rotating twin screw design result in a fully and homogeneously cooked and consistent pellet. Another effect is the possibility to achieve floating pellets with reduced starch content in the recipe.

These two major attributes also mean that the processed mix can contain a higher fat content which may minimize or even sometimes delete the need for further fat coating of the pellets, depending on fish species. In hot regions this decreases oil leakages.

Another major interest lies with the control on density and thus the floating/sinking properties of pellets. It gives 100% of the required target. Depending on recipes, the extruder configuration and the process parameters, densities can vary from 350 g/l to 750 g/l.

Besides the cost advantages, the pellet properties, better FCR, better cook and better digestion by the fish, less feed wastage and 100% floating-sinking target all have an immediate effect on reducing pollution. This is very critical when currently the emphasis is on environmentally friendly technologies.

Some of Clextral recent projects in aqua-feed include a 2 tph unit for small pellets in the Philippines, 8 tph and 10 tph units in Vietnam, and over 15 tph units in Scandinavia and Latin America.

Compromise with a hammermill

In fine grinding, the pulveriser will always give a better grind as compared to a hammermill, but at a higher cost, according to Olivier Rousseaux, Stolz, Asia. In his presentation at the Aquafeed Horizons conference, he said that power usage is 17% higher with a pulveriser. It is difficult to quantify the costs of parts replacement which are usually higher for a pulveriser. Another factor which cannot be quantified is moisture loss. Overall, the costs are USD 1.75/tonne to grind using a hammermill and USD 2.70/tonne with a pulveriser.

To obtain a fine grind closer to that with a pulveriser, the suggestion is a hammermill coupled with pneumatic system and turbo shifter. The factors affecting grinding cost are the physical qualities, biological aspects of raw material and the number of steps in grinding. The initial size influence output capacity. Higher moisture and fat will reduce capacity whereas hardness will increase capacity.

Other ways of saving costs are by changing the machinery parameters. Some of the features in the design of the Stolz feeder allows for the removal of heavy particles and adjustments of airflow. In the hammermill, the design with crushing plates and rotor of eight axes and counters beaters allows higher fineness and capacity. A quick screen replacement in 3 minutes reduces down time. The turbosifter is fitted with an unplugging device of the sieves by means of compressed air and cross contamination is avoided.

"In any aquafeed mill, thanks to his advanced design, the Stolz grinding line offers unmatched advantages and efficiency", said Olivier.



Olivier Rousseaux (left) and Louis Mourey at the Stolz booth

Relationship, partnerships and innovation in aquaculture marketing

Through a close relationship with farmers and feed manufacturers, Ocialis will grow in Asia

Ocialis is the aquaculture business of the French international animal nutrition and health specialist group, Eivalis. The mission of the group is to improve the quality of end products for human consumption through biological and technical viability of livestock farming. Expertise has been built since its foundation in 1954 as Guyomarc'h, a family business in animal feed production. Since then, the company has expanded with organic growth and through mergers and acquisitions of core businesses in feed production. Guyomarc'h was renamed Eivalis in 2001.



Since its inception, the group has opted to focus all its research and resources on animal nutrition and health for all species; productive livestock, aquaculture and pets. There are no downstream activities from this core business. It is active in three business areas, the production of complete feeds for all species (Eivalis Nutrition), health, dietary foods & hygiene products, (Eivalis Health) and sales of premixes & nutritional specialties and expert advice to industries and on farm feed manufacturers (Eivalis Premixes and Specialties).

Global sales activities under these main business areas are in 50 countries. There are 52 plants for complete feed and premix production in 12 countries. The turnover in 2006 was 675 million Euros.

Proximity to markets

Ocialis, formed in 2003, came about from the recent transformation of Eivalis into business lines. The aquaculture business, though small in comparison to livestock, presents a challenge for the company to leverage its expertise and innovative capability. The aquaculture activity of the company started 30 years ago in France with sales of seabass, trout and carp feeds. Eivalis became a significant player in aqua feed production in 1996 with the construction in Brazil of a new extruded fish feed plant, followed by a shrimp feed plant in 1998. Later in 2003, it started shrimp and fish feed production in Vietnam and fish feed production in Indonesia in 1995. In 2005, aquafeed production in Asia grew 64% and in 2006, it tripled production capacity of the Vietnamese aqua feed mill.

Stéphane Ralite, responsible for the strategic planning, technical and marketing of the aquaculture business said, "In line with the strategy of customer satisfaction, we will position ourselves to be close to our clients. The approach is that Ocialis is a local brand in each country where we have a presence (a Vietnamese, Indonesian or Brazilian

brand). As we see it, the aqua farmer does not need international solutions but those that can be used in his own ponds or culture system".

Innovation to lead

At the heart of the company is the largest private R&D facility in France and auxiliary R&D aqualabs in Indonesia, Vietnam, France and Brazil. Supporting R&D is the international accredited laboratory, Lareal and laboratories in Brazil, India, China and Vietnam. Eivalis innovation and R&D are driven by fulfilling the needs of industry. This means that researchers are close to the farmers and are able to answer the specific needs of the farmer and translate these needs into products and solutions.

Similar to the livestock industry, complete feed production corresponds with the global demand of the different aqua species. The expertise and skills of formulators are used to develop feeds which take into account the physiological and nutritional needs of the animal at each stage of development (see box). The fish and shrimp feed lines in the plants in Ho Chi Minh City, Vietnam currently produce feeds for the black tiger and vannamei shrimp, freshwater prawn (*Macrobrachium rosenbergii*) as well as extruded feeds for the cobia, grouper, barramundi, catfish and tilapia. In Jakarta and Surabaya Indonesia, the focus is on pelleted feeds for the carp, rohu and other freshwater fish. Compliance to norms on quality control and traceability are assured by Lareal (see box).

The aqua premix plants in France, Brazil, South Africa, India, Myanmar and China provide premixes and nutritional specialties for use by feed formulators as additives and premixes. A special team provides customized products and services for both industrial and on farm feed manufacturers. The type of services range from specific research and services such as feed formulations for specific species, quality assessments, operational marketing and sales support. In Europe, the focus has been on 'antibiotic free health' products and the development of phyto products.

"This is also the recent thrust in Asia and the company is willing to answer these needs", said Stéphane.

Value marketing

"We are here to help our partners grow in their markets. To do this, we must be able to measure the results. Our clients should be able to say to us that the results and improvements are obvious. If they come back to us and say that the products do not make a difference, then we have failed," said Stéphane.

The focus is also on robust development for the industry where Ocialis is present. One way is to secure economic and environmental sustainability of farming. The macro picture is the preservation of a harmonious global environment for aquaculture.

"Similar to what we have done in Europe, we will help to ensure that all the stages from 'farm to table' benefit the farmer. Customers must be satisfied with final product quality and the production process must be sustainable, and economically and environmentally friendly. Through R&D, we develop the sustainable applications".

Core to the company is the dedication to continuously improve meat quality standards. Most plants have improvements that meet both the ISO and HACCP certifications. It is also in a position to help clients to share this knowledge and adhere to such programs.

A promising future

In the next few years, Ocialis will be expanding its aquaculture business internationally. A website will be launched in August.

"We see ourselves more like a service company rather than a product supplier. Our actions are based on a very simple idea: if we help our clients to grow their markets, we can expect to grow with them. If our clients succeed for a long time, we can expect to succeed with them. The consequences of this simple idea are that we must help our clients to be profitable, help them to produce good and healthy food and help them to maintain and to produce in a sustainable environment. Our R&D centres in Asia, Europe and South America and our field presence near our clients allows us to bring to them the adequate support", said Stéphane.



Stéphane Ralite (centre) with Marc Campet, Ocialis, Vietnam (right) with the French Consul in Vietnam during Vietfish 2007 in June.

R&D to demystify aquaculture



"Our focus in nutrition is on the optimization rather than maximization of feed formulation by taking into consideration the economics of production"

Alain Guyonvarch

The key asset of the group is the 6,000m² experimental station with 20 research units. Their direction is research based on food safety & quality of animal food and technical & economical considerations for environmental protection. Formulators have expertise in market knowledge; availability of raw materials, nutritional requirements and technical quality and safety. Through this, the right products are developed for the industry.

In formulating feeds, ingredients, premixes and health & hygienic products for the aquaculture

industry, Ocialis has, at its disposal, the data on quality control of more than 300 raw materials. This has been accumulated by working with clients on feed formulation and on specific research. The formulation of optimal feeds for the industry is the strength of the company.

Dr Alain Guyonvarch, R&D Director, said, "In aquaculture, we have to move away from the belief that maximum growth is important. Our focus in nutrition is on the optimization rather than the maximization of feed formulation by taking into consideration the economics of production. The goal is to return maximum fillet weight from a cost effective feed. This is similar to our work with livestock farmers where economics is an important key factor in formulating feeds. In poultry we have already reached the stage where we can easily formulate optimal feeds for maximum breast meat".

"In R&D it is important not to accept that we have reached saturation point in aquaculture nutrition. We also want to demystify aquaculture nutrition by using basic models of animal nutrition as the foundation to develop optimal feeds for each species, taking into account, of course, that in aquaculture, there are major differences in requirements based on culture environments, species and feeding habits".

"We have developed models based on extensive research on availability and digestibilities of nutrients. It will be possible to transfer, with some adjustments, some of the models developed for terrestrial animal nutrition for various species of fish and crustaceans," according to Alain.

Lareal- A vital link

Important for the R&D activity, is the support in nutritional and analytical work provided by Lareal, the 1,600m² research laboratory, founded in 1954. It is also the heart of quality control assessments for the company and all its subsidiaries which guarantee the quality and food safety of raw materials and finished products. The mission of Lareal is to control ingredient quality, validation of production units, control of contaminants and evaluation of new products.

As a private contract laboratory, it does not only work exclusively for Evialis. More than 50% are external clients. In 2006, a total of one million analyses was carried out. The important role played by the 60 scientists in Lareal is the spread of analytical capabilities; from simple proximate analysis, *in vitro* digestibility trials, to capillary electrophoresis of Vitamin C, mycotoxins contaminations and aromatic profiles of materials. Some crucial work for the industry is the identification of GMO ingredients (genetically modified organisms) using Real Time PCR (polymerase chain reaction) in raw materials and finished products and in antibiotic research by microbiology for the detection of meat and bone meal in feeds.

In general, the assessment of quality and authenticity of raw materials and finished products are the main activities at Lareal. Lareal is also active internationally. It participates in the work in the field through several associated laboratories, such as those of Ocialis in Vietnam, India and China.



"Our lead is the short turnaround time for analysis. Within 24, our clients can see online the first results of the samples. We are the reference lab for gas chromatography of fats to label human food as containing omega 3. Another important work is the analysis of ORAC value, indicative of anti ageing agents in food supplements. We do R&D on the latest analyses as well as develop and adapt protocols for local materials. Internal and external audits are held every 15 months".

Dr Renaud le Bouquin of Lareal

Vietnam's catfish and marine shrimp production: an example of growth and sustainability issues

By Võ Hoàng Nguyễn

The spectacular growth in production, especially for the catfish, is raising concerns on its social and environmental impacts. Industry is seeking more collaboration among Vietnamese stake holders for sustainable development and for the production of quality products equal to standards of export markets.

In the global aquaculture industry, the *pangasiid* catfish is synonymous with Vietnam. *Pangasius* catfish production is one example of the fast development of Vietnam's commercial aquaculture. Together with the black tiger shrimp, it has brought Vietnam to the position of top producer in the Asia Pacific region. It now ranks fifth in the top ten aquaculture producers in the world in 2006, after China, India, Indonesia and the Philippines.

The total production of all marine, brackish and fresh water aquaculture in Vietnam increased from 480,000 tonnes in 1997 to 1,694,000 tonnes in 2006 (MOFI, 2006). Most of Vietnam's aquaculture production is exported to 65 countries. In the case of the catfish, the major markets include the European Union (EU), which represents 46.9% of export volume, followed by Russia, 15% and the US, 9.8%. Marine shrimp is exported mainly to the US, 22.6%, Japan, 33.3% and EU, 12.5%.

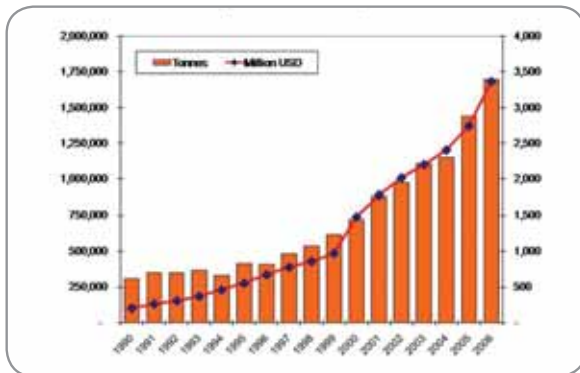


Figure 1 Aquaculture production in Vietnam from 1990 to 2006 (Source: MOFI – Fistenet)

Black tiger shrimp

Penaeus monodon is the key marine shrimp farmed in Vietnam. It was started in the central part of Vietnam (Khanh Hoa, Binh Thuan, Phu Yen) in the early 1980's. Culture spread to the Mekong Delta provinces which has become the main region for its farming in Vietnam (Ca Mau, Bac Lieu, Soc Trang).

The majority of shrimp production came from this region, utilising 476,582 ha (87%) followed by 41,372 ha (8%) in the northern provinces and 28,803 ha (5%) in the central part of Vietnam. The most common culture methods are semi-intensive farming (10-15 PL/m²) and intensive farming (20-30 PL/m²). In some parts of the Mekong Delta, such as in Bac Lieu, the stocking density in intensive farming has reached 50-60 PL/m².

In 2004, the implementation of the US antidumping action against shrimp products from Vietnam as well as five other countries created uncertainties in the industry as the US was the major importer.

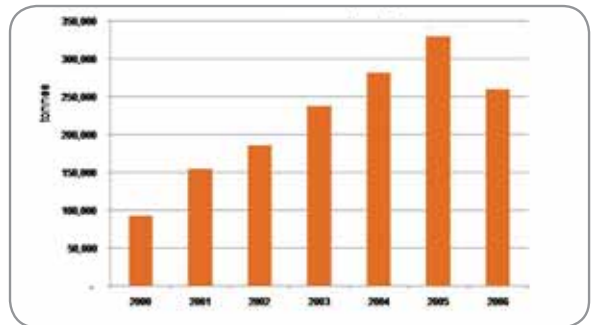


Figure 2 Annual production of marine shrimp in Vietnam according to the Ministry of Fisheries (MOFI)

Currently, tariffs are 4.57% (country wide rate) to as high as 25.76% for some companies. Although the industry has adjusted to the tariffs, the high cost of exporting to the US with custom bonds, imposed in 2006, continues to be an issue for the sector. However, Vietnamese seafood processing companies have also successfully expanded to other export markets in order to reduce the dependence on the US market.

Vietnam is a pioneer in Asia for organic aquaculture, the shrimp culture project in Ca Mau, implemented by the Forestry Fishery Enterprise 184 (FFE 184) was initiated in 2002 based on Naturland standard. At present, around 4,000 ha and 800 farms have been certified by IMO Switzerland and they produce 250-300 tonnes/year (Serene 2007). According to Naturland, shrimp culture has to be carried out as naturally as possible.

Commercial feed and chemicals are not allowed. Only fertilizers certified organic can be used. Organic shrimp consume only detritus from the mangrove environment. Cost of production is low and there is a 20%



Organic shrimp

Picture courtesy of Philippe Serene, Aqua Service, Vietnam

price premium for the harvest. This is an important source of income for these farmers. The very modest performance (300 kg/ha/year) is sold to mostly to the Swiss COOP. None of the farms have reported any *en mass* shrimp mortality such as those reported in the neighbouring provinces such as Bac Lieu and Soc Trang.

With regards to *P. vannamei*, Vietnam has considered carefully the culture of this exotic species. There is an official ban since June 2002 due to the possibility of diseases spreading, in particular the Taura Syndrome Virus (TSV). Since 2006, vannamei culture is allowed in the central and north provinces, according to feed producers.

Despite official restrictions, it is estimated that approximately 10% of the 479,000ha of shrimp ponds was used to culture *P. vannamei* in 2003 with a total production of 30,000 tonnes in 2003. The farms did not receive any government support or national marketing efforts and thus production decreased to 6,000 tonnes in 2005. This was aggravated recently as it was reported that consumers in Japan, the key shrimp export market preferred to buy white shrimp. In 2006, white shrimp imports increased by 10% while black tiger shrimp imports decreased by 10%.

Shrimp feed industry activities began in 1998 with an annual production of 10,000 tpy. Currently there are 20 feed mills producing shrimp feed with a manufacturing capacity of 500,000 tpy. According to current farming trends, demand for commercial shrimp feeds in Vietnam is about 150,000-250,000tpy. Imported shrimp feed is around 3-5% of the total demand (Hung 2006).

	Area (ha)	Production (tonnes)
Black Tiger Shrimp	604,479	324.700
White shrimp		6,000
Local shrimp		3,000
Giant prawn	9,847	6,000
Catfish	4,913	376,000
Tilapia	2,148	24,000
Clam	1,400	115,000
Total	622,787	854,700

Table 1: Area and production of main species of aquaculture 2005 (MOFI-2005)

Catfish

The catfish, tra *Pangasius hypophthalmus* and basa *P. bocourti* have been farmed in the Mekong River Delta for decades. An Giang, Dong Thap and Can Tho, the provinces along the border to Cambodia, are the centres of production. Some 70 to 80% of Vietnamese pangasius come from this region. Due to the high export market demand for the tra which has a higher fillet ratio as compared with basa, production is now focused on the tra.

Production has been increasing rapidly during the few years, from over 100,000 tonnes in 2002 to 825,000 tonnes in 2006. By mid 2007, estimated production has escalated to one million tonnes according to Dzung (2007). This is attributed to the intensification of production systems. Most farmers have shifted to the more controlled and less expensive pond culture system as compared to cage culture in the Mekong river and its tributaries.



Stocking density has increased to 60-80 pcs/m² producing 250-300 tonnes/ha in pond culture and 80-120 pcs/m², producing 300-350 tonnes/ha in net enclosure culture (Dzung 2007). Average yields have improved to over 300 tonnes/ha/cycle. Grow out period has been shorten from 9 months in 1990 to only 6 months in 2000 for rearing the fish to market size of 1-1.2 kg. Training on farm management is provided by government officers as well as by feed and aquaculture supply companies.

Hatchery produced fingerlings are used. In 1979, tra broodstock domesticated in ponds were successfully used in induced spawning. During 1980 to 1990, Vietnamese scientists established the production system of broodstock and fingerlings (MRC 2002). The system was then standardized in the years of 1991 to 1996. Today there are 145 hatcheries producing a total of 4-5 billion fry per year. Although the quality is large, often there are shortages of fingerlings. The quality of fingerlings as well as of the broodstock is not well controlled. (Hao 2007).

The country has about 33 feed mills with an installed capacity of more than one million tpy of fish feeds for the catfish and other species. Commercial feed production was estimated at 400-500,000 tpy in 2006 (Hung 2006).

It was estimated that currently 30-50% of feeds used for pangasius production are farm made mainly because of the lower price. About 80% these farms used trash fish as the main source of ingredient (besides rice bran). The FCR of farm made feed is estimated at 3-3.5.

However, more and more, pangasius farms are beginning to use commercial feeds for better performance. The FCR of commercial feeds range from 1.5 to 1.7. Small scale farming is being replaced by industrialized farming.

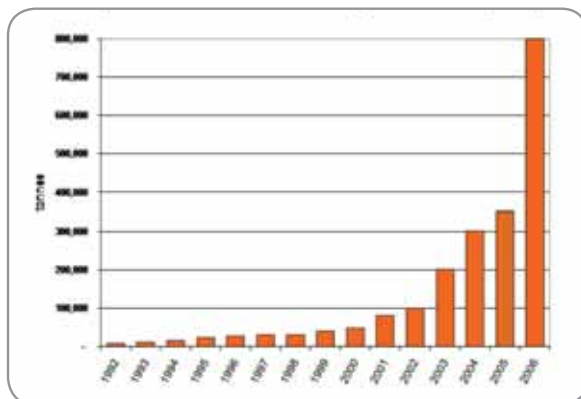


Figure 3 Annual production Pangasius catfish in Vietnam (source: Vietnam Association of Seafood Exporters and Producers, VASEP).



Harvesting catfish

Challenges for a sustainable development

From 1998 to 2000, while pangasius production was still less than 100,000 tonnes/year, black tiger shrimp farming was already facing several viral and bacterial diseases such as vibriosis and white spot syndrome virus (WSSV). Some farmers in the Mekong Delta then shifted to pangasius farming, mainly to move away from problems of diseases management and antibiotic use.

However, from 2003, with intensive production methods, the same situation is noticeable within the pangasius culture industry. The high stocking density has brought in a large variety of diseases. The simple solution was to use antibiotics to eradicate diseases. Most of the losses was attributed to ESC (Enteric Septicemia for catfish) caused by *Edwardsiella ictaluri*. Rather than complete eradication, the passive use of antibiotics has led to resistance to several antibiotics.

Since 2005, monogenean parasites (gill fluke) began to cause high mortalities and reduction of growth rate. Usually, farmers paid more attention on direct economical loss from ESC than the indirect impact from gill fluke infection. In fact, gill fluke infections could have contributed significantly to the loss due to ESC via secondary bacterial infections.

Importing countries are emphasizing on tests for chemicals/antibiotics residues. In some parts of the North Vietnam, fish farmers are applying herbal treatments for diseases. Several local available herbs are being used to cure protozoal/bacterial infections. More institutional research is in this direction.

In the case of both the catfish and marine shrimp, there are concerns on the long term sustainability. This can be expressed in several ways such as: Fluctuation on market price and yield performance; non-uniformity of quality; anti dumping law suit; diseases, antibiotics residues; non stable cost of feed and fingerlings/post larvae; poor quality of broodstock; environmental issues and most relevant is the conflict of interest between farmers and processing companies.

Improving competitiveness

The Ministry of Fisheries (MOFI) has a plan on "The Development of Market Strategies and Branding for Tra, Basa to the EU/USA markets 2006-2015" to increase the competitiveness of Vietnam's seafood in world markets. This will unify all the local available resource and know-how to aim for a sustainable catfish culture and stable development of the export business.

The government will also implement different international farming standards such as GAP, SQF, EurepGAP and soon BAP, Vietnam GAP. The private sector is also carrying out their own programs. To ensure the export market and to harmonize the benefit between farmers and processing/exporter companies, An Giang producers and Agifish have established AFFU (Agifish Pure Pangasius Union), Faquimex processing company in Ben Tre has also created an union of shrimp farmers to cooperate with Faquimex for better development.

These are good signs and solid platforms for sustainable development. This substantial future demand for safe and high quality fish products can only be met if efficient standardized system arrangements are in place.

However, if the "Farm to Table" concept is key to safe food production, fish feed manufacturers must be deeply involved, since over 70% of fish production costs is from feed. A specified GAP standard for feed processing should be established.

Bottomline

Achieving a target of one million tonnes in mid June is ahead of the target set by the MOFI. The higher production volume has been achieved using the same method of farming. Overall, the production has been increasing quantitatively but not qualitatively. The industry should not only target a growth in production, but also should be able to regulate it to be sustainable in the long term.



Võ Hoàng Nguyễn is the Managing Director of Thủ Nhân Consulting. Prior to this, he was chief of Public health Lab in Dalat, Marketing Manager of Roussel Vietnam Animal Health and Technical Consultant to Intervet Vietnam. Currently, he conducts training in management and marketing skills. Email: vonguyen@hcm.vnn.vn

Prospering from dynamic growth

This promises to be an exciting event for Asian aquaculture. Organised by the Asia Pacific Chapter and hosted by the Vietnamese Ministry of Fisheries, there are already 350 submitted abstracts for the 13 main sessions at the conference. As of June 6, some seven booths are still available for the trade show.



The plenary speakers are Dr. Nguyen Cong Dan, currently Vice Director, Aquaculture Department, Ministry of Fisheries and Dr Sena De Silva, Director of Network of Aquaculture Centres in Asia Pacific, Bangkok, Thailand. Dr Dan will present recent developments in aquaculture development in Vietnam and its future trends whilst Dr De Silva will cover the international aquaculture scene. The date for the Vietnamese producer session has been fixed for Wednesday August 8.

What to expect at the trade show

In Issue May/June 2007, we carried a preview of some exhibitors. This is continued below.

SPF marine shrimp

At this show, there will be active participation from three US based SPF broodstock suppliers. In the last issue, we featured Moana Technologies. Below are details on the participation by two companies from Hawaii.

High Health Aquaculture (HHA) is the world's leading shrimp breeder and supplier of SPF GxTVR shrimp broodstock. It breeds four species of SPF shrimp including *P. vannamei*, *P. stylirostris*, *P. japonicus* and *P. monodon*. It is a partner in High Health Thailand (HHT), a new industrial scale shrimp hatchery in Thailand which uses HHA broodstock and technology to produce the top quality *P. vannamei* postlarvae in Thailand.

"HHA is interested in meeting qualified partners to develop large JV shrimp hatchery in Vietnam similar to High Health Thailand" said Dr James Wyban. Jim will be presenting two papers at the technical sessions on 'Thailand's shrimp revolution: key factors in Thailand's switch to farming *P. vannamei*' and 'Domestication and breeding of SPF *P. monodon*'.

At their booth, Jim and his team plan to develop brand recognition for the HHA brand. It will also be to network with industry, sell broodstock and HHA technology. They will be promoting HHT SPF postlarvae sales in Vietnam and Southeast Asia.

Booth No 5

High Health Aquaculture, Kona Hawaii USA
Web: www.SPFGenetics.com
Contact: Jim Wyban, (jim.wyban@gmail.com),
Jason Ueki (jason617@msn.com)

Kona Bay is the world's leading supplier of SPF vannamei broodstock. The largest shipper of broodstock in Hawaii and recipient of the Hawaii Governor's Exporter of the Year award, Kona Bay has developed the most advanced fast growing and Taura resistant line of shrimp, GSR-Taura™. At the Vietnam Producers session, Kona Bay's breeding program manager, Oscar Hennig, will talk on the shrimp breeding program at Kona Bay.

Booth 16

Kona Bay Marine Resources,
3465 Waiialae Ave, Suite 240, Honolulu, Hawaii 96816
Tel: +1808 732 1500; Fax: +1808 732 7665 Fax
Email: konabaymarine.com

Fish and shrimp feeds



Uni-President (Vietnam) is a Taiwanese-based aqua feed company and a leading shrimp feed producer in Vietnam. Apart from feeds for marine shrimp and catfish, it has feeds for fresh water prawn, tilapia,

grouper and seabass. In 2006, a new feed mill was set up in the Mekong Delta to focus on tilapia and catfish feeds. To keep pace with the global market trends, it now has an integrated business model with a hatchery and laboratory facilities (see page 5).

"Recognizing the recent and visible changes in shrimp culture from black tiger shrimp to the vannamei shrimp, in many Asian countries and in Vietnam, in particular, we are taking this as another way to further develop the shrimp culture industry in Vietnam. As the gold sponsor of the Vietnam Producer Session, we would like to take this opportunity to bring to industry, information on the global vannamei shrimp culture. This is to provide the necessary knowledge and experiences on all facets of its farming for successful culture. We hope that all participants will find this informative", said Chuang Jie Cheng.

Booth 22, 23 & 24

Uni-President (Vietnam) Co Ltd
Web: www.uni-president.com.tw; www.aquafeed.com.tw;
aquafeed@upvn.net
Contact person: Mr. Chuang Jie Cheng
Email: jeff@upvn.net

Catvis which was featured in the last issue, has indicated that aside from aquaculture supplies, it will be introducing a range of broodstock and larval feeds manufactured by LuckyStar. Broodstock C/M feeds are complete feeds to condition prolific spawners for maturation and selective breeding programs and broodstock-C is a balanced diet promoting fast growth of healthy shrimp for selective breeding programs. Also on display will be the larval feed range which has been specially formulated for all penaeid species. Feeds are produced by a micro particulate technology which ensures uniform particle size for each culture stage.

Booth 1&2

Catvis BV
Web: www.catvis.com
Email: catvis@catvis.com
Contact: Gerry McGuire, email: mcguire@catvis.com /
gerrygm111@aol.com
Tel: +1856 786 0064; Mobile: +1 856 986 6451

Aquaculture Solutions

Novus International Inc. active with animal feed ingredients and with innovations for the livestock industry, now brings its tradition of proven customer solutions to the aquaculture industry. These have been developed through laboratory research, practical field studies and customer interaction. At the show, the Novus Aqua business team will present products in the following categories: nutritional and health, water treatments, hatchery products, and probiotics.

Dr Farshad Shishehchian, Aquaculture Specialist for Novus Aquaculture will present 'MERA Met Plus new product for fed mill: an efficient solution to overcome shrimp and fish performance and colouration problems in intensive culture and to enhance immune systems.

Booth 13 & 14

Novus International Inc.
Website: www.novusint.com
Email: aqusnovus@novusint.com
Contact: Dr.Farshad Shishehchian

Aqua Techna supplies professionals in the aquatic sector with a range of services including studies and technical assistance to production facilities and development projects. It also helps aquaculture aquafeed manufacturers with services including assistance in formulation, aquafeed manufacturing and premix and additive supplies. The company manufactures and distributes products to improve water quality, performances and health in aquaculture facilities.

Booth 114

Aqua Techna
 BP 10 - Les Landes de Bauche
 F-44220 Couëron, France
 Tel: +33 1 30 41 42 89 Fax: +33 1 30 41 26 30
 Web: www.aquatechna.com
 Contact: Hervé Lucien-Brun
 Email: h1b@aquatechna.com Cel: +33 6 70 70 86 03

ABN is a biotechnology company with research in aquaculture related fields and developing aquaculture products for sustainable aquaculture. Its mission is to become the leader in providing aquaculture customers with science-based solutions to improve animal health and nutrition, increase safety and ensure environmental sustainability.

"ABN's purpose at the show is to launch our AquaGrow Shrimp Premix, DHA Gold, and AG ARA products in the Asian market, following the USA launch at WAS in San Antonio. We will be holding a small reception during the trade exhibition to introduce the products, said Lawrence Giessinger, based in Bangkok.

Booth 46

Advanced BioNutrition Corp
 Suite H, 7155 Columbia Gateway Drive, Columbia, MD 21046
 Contact: Lawrence Giessinger
 Email: lgeissinger@advancebionutrition.com



"Biomini has gone fishing and is expanding its operations to the aquaculture industry, said Pedro Encarnação.

Biomini's continuous research work in association with research institutes around the world as well as in its in-house facilities has resulted in a number of very specific feed additives. These feed additives are based on natural ingredients, which are able to unlock the performance potential of the different animal species.

A recent development is a new line of products, the Biomini Aqua Specials. These include a probiotic product line for shrimp culture - STARTgrow, probiotic mix for shrimp hatcheries, GROWout, probiotic mix for shrimp grow-out, PONDlife, probiotic mix for pond water treatment, PONDlife Plus, bioremediation solution integrating probiotics and enzyme blend for effective pond water treatment. It also has a range of Natural Growth Promoters (NGP™) that make use of a modular system combining different substances to improve gut health and performance and boost the immune-system of the targeted species; AQUAstar, Biotronic, HEPAProtect Aqua, AQUAboost. The Mycofix® range of products is a modular system of patented mycotoxin deactivation.

Booth 113

Biomini
 3791 Jalan Bukit Merah #08-08, E-Centre@Redhill
 Singapore 159471
 Tel: +65 6275 0903; Fax: +65 6275 4743
 Web: www.biomini.net

Behn Meyer services the Southeast Asian region since its foundation in Singapore in 1840. At the show, the Animal Nutrition Group will present research done in cooperation with Can Tho University and commercially launch a range of new products for Vietnam's shrimp and catfish industry.

"Our main business is liquid enzymes and their application in feed mills but in Hanoi we will feature the complete aquaculture product range", explains Dirk Lorenz-Meyer, head of the animal nutrition business in Vietnam. "The industry has been growing rapidly here, and solutions towards more sustainable culture practices are needed to secure export opportunities. Thus, it fits that Behn Meyer introduces a more organic approach to aquaculture and promotes nutritional supplements that are certified for organic production".

Hemicell® is the key enzyme for catfish feed, Azomite® is a natural trace element mix, and Fermacto® a probiotic made from dried Aspergillus sp. meal. Both products have been shown to improve growth rate, FCR and health status of fish and shrimp. Additionally, the potential of Aquatize®, a novel in-feed disinfectant, to ameliorate the impact of bacillary necrosis in catfish will be presented at the conference.

"All of our products are widely used in aquaculture worldwide, adds Dirk Lorenz-Meyer, but some have been custom-tailored to meet the demand of the Vietnamese farmers, like our probiotic Penegetic T®. The specially adapted catfish formula is now used in the Mekong Delta to treat and prevent bacterial diseases in pangasiid catfish."

Booth 57

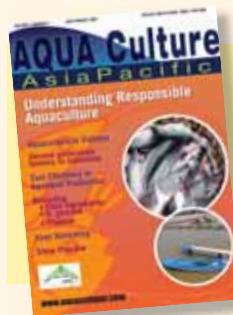
Behn Meyer Vietnam Rep. Office,
 HanNam Officetel, 3rd floor, 65 Nuyen Du Street,
 District 1, HCMC, Vietnam
 Contact: Dr. Dirk Lorenz-Meyer, email: dirk@behn-meyer-vietnam.com
 Tel: +84 9199 75643

Kiotech International, founded ten years ago and quoted on AIM on the London Stock Exchange, has the worldwide rights to Aquatice, a patented nature identical chemosensory stimulant used to stimulate feeding of farm fish and crustacea. It has the licence to commercialise the technology from Cefas, UK (Centre for Environment, Fisheries and Food) which specialises in the sustainable management of the aquatic environment (see page 43).

The company sees this show as an opportunity for to increase awareness in the aquaculture industry and community of the ongoing program developing feeding stimuli that can improve feeding efficiency, reduce waste and make sustainable forms of fish feed more acceptable. At the show, the company representatives will be discussing the potential of the novel Aquatice feed attractant.

Booth 15

Kiotech International
 Tel: + 44 208 336 6180
 Web: www.kiotech.com
 Contact: Mark Nicholls
 Email: mark.nicholls@kiotech.com



Aquaculture Asia Pacific Magazine will be featured at Booth 17.

A free copy of this issue will be available. See you at our booth.

TRADE SHOW SCHEDULE

SUNDAY August 5	MONDAY August 6	TUESDAY August 7	WEDNESDAY August 8
Move-in noon -18:00	Move-in 8:00 - 10:00 Exhibits open 10:00-18:30	Exhibits open 10:00-17:30	Exhibits open 10:00-16:00
Welcome reception 18:00- 20:00pm	Happy hour 17:20-18:30	Reception 18:30-20:30	Move-out 16:00-20:00

For more information, go to www.was.org
 Participation in conference and trade show, contact, Conference Manager PO Box 2302, Valley Center CA 92082 USA , Tel: +1 760 751 5005 Fax: +1 760 751 5003, email: worldaqua@aol.com
 Conference schedule: <https://www.was.org/meetings/ConferenceInfo.asp?MeetingCode=AP2007>

The Catfish Story

When Dr S. Subasinghe, Director of Infotech, posed the idea of a conference on the catfish in Asia, the initial perception of many was- who will be interested in catfish production, presumably unique to Vietnam. However, from June 13 to 15, 300 international and local participants at this international technical and trade conference demonstrated that the catfish is of interest to many producers in the region and to major importers in Europe and the US. It was held in conjunction with the annual Vietfish 2007 exhibition. Organisers were Infotech, VASEP and NACA. It was hosted by the Ministry of Fisheries, Vietnam.



Three aspects of the production of *Pangasius catfish* dominated the meeting. The extremely fast pace of production in Vietnam which is raising questions on its long term sustainability; food safety and product quality which is affecting the market structure and lastly the issue of false labeling of products.

Catfish in Vietnam

Growth in catfish production has been phenomenal in recent years. In 2004, production was 300,000 tonnes and this rose to 825,000 tonnes in 2006. In presenting the current scenario and future challenges in the sector, Dr Nguyen Huu Dzung, Secretary General of VASEP, Vietnam Association of Seafood Exporters and Producers likened its development as 'a Cinderella' ie previously an overlooked step child. Today, nearly 100% of production is of tra *Pangasius hypophthalmus* which has a yield of 35% for fillet. The catfish contributed USD 737 million out of the total value of seafood exports of USD 4 billion in 2006. Exports of fillet reached 286,000 tonnes in 2006 from 7,000 tonnes in 1997. An all year demand for the fish, mainly for export, has pushed production to one million tonnes in June 2007.

An important criteria in the production of the fish for international markets is flesh quality, according to Nguyen Van Hao, Director of Research Institute No 2 (RIA2). The institute is working on breeding programs to select for growth and fillet composition. Culture technology is well developed. Supply of fry is sufficient from 145 hatcheries with an annual capacity of 4-5 billion fry. The problem remains in inconsistent quality of broodstock and fingerlings. The success in production comes from intensive culture practices as farming area has only increased 7 times as compared to 36 times for fish volumes.

Small scale producers need quick solutions to disease and pond management problems usually aggravated by the high stocking density (average 50 fish/m²) in ponds. To help farmers resolve problems, feed manufacturer Ocialis has set up a 'fish house' in Long Xuyen in the Mekong Delta, complete with lab facilities for water analysis services and diagnosis of diseases, said Marc Campet in his presentation on farming and fish health practices. The most common parasites are

gill flukes according to a survey conducted by Vo Hoang Nguyen, Thi Nhan Consulting, in An Giang and Cantho regions, the main producing areas. Of more concern is the secondary bacterial infection which some farmers try to eradicate immediately with antibiotics.

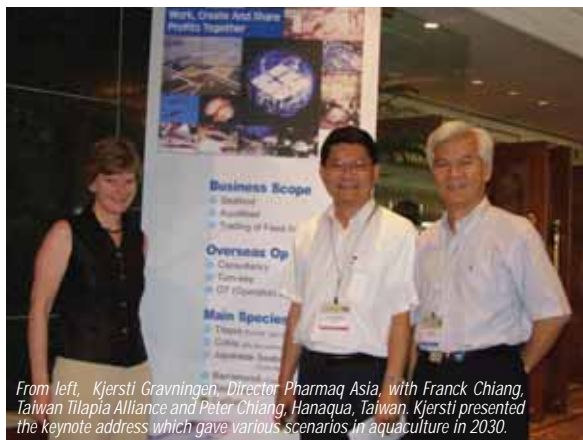
Standards and RSA

Generally, planning has fallen behind the developments and there is considerable impact of this fast development on land use, water resources and communities, said Nguyen Van Hao. The strategy for all stakeholders is towards a responsible and sustainable aquaculture. However, as concerns are on its rapid growth particularly on the food safety and quality of products, Dr Dzung said that the immediate action is the imposition of mandatory national standards for farms to treat waste water affluent prior to discharge. The authorities will follow up with the implementation of standards such as Vietnam GAP. This will be equivalent to EureGap and BAP-ACC standards.

William More, Aquaculture Certification Council, GAA said that standards are required for each industry and each species. The BAP-ACC standards cover environmental, social and food safety and traceability aspects along the production chain. As it is now the third most important freshwater fish, standards for its responsible production will benefit Vietnam and other countries which are increasing their production of catfish. Through the *Pangasius* dialogue, World Wild Life fund (WWF) engages all stakeholders to a consensus based standards where cost/benefits are balanced, said Flavio Corsin, WWF Vietnam. Currently, there are already several standards being implemented by the private sector, many of these without multi stake participation and small scale producers are unable to meet the criteria.

Organic catfish

A pilot project on production of organic catfish is carried out in several locations. Philippe Serene, AquaService, Vietnam, said that these follow the guidelines set by Naturland. At the three farms, samples of fry are analysed for antibiotic residues. The density of culture is 10 fry/m². Fish are cultured for 6-8 months and harvested at 1kg/fish.





Participants from Indonesia

Transport time must be limited to 10 hours according to standards. Feed are farm made and comprise of rice bran, soybean and fish meal. As far as possible, organic ingredients are used. Demand will increase but the small premium of 30% on selling prices may not encourage new entrants.

In Europe, the market for organic fish is increasing, fuelled by questions on the sustainability of production, said **Thomas Sporrer**, Sippo. In large markets such as Switzerland, the reasons consumers buy organic products range from health, environmental concerns to better taste. Generally, organic fish must have the same or better taste than conventional products. However, this niche market is controlled by international supermarket chains and products must match their requirements. It can also be a closed market as exemplified by the AB brand in France. It is also a sensitive market as any contravention means the product will be banned and considerable effort will be required to reenter.



Sri Wahyani and Lenny Tooy, Aquaculture Directorate, Indonesia

The US market

In the US, demographics are changing the pattern of seafood consumption. It is increasing to 17lbs/capita (7.72kg) but still well below EU levels (26 kg/capita), said **Peter Redmayne**, President, Seafare Group in his presentation on the 'Catfish war- Round Two'. The consumption of catfish alone increased 54% in 2005. The future supply of 1.5 million tonnes of seafood will be from imports. The production of catfish is expected to decrease to 220,000 tonnes in 2007.

The US is now importing large volumes of catfish from China comprising of the American catfish (*Ictalurus ictalurus*), which can be marketed as 'catfish' in the US and Pangasius. Imports of catfish from China were 4,500 tonnes of Ictalurus and 1,500 tonnes of Pangasius catfish in the first two months of 2007. This and the fact that China's production is from cage culture, deemed cleaner than from pond culture poses a challenge for Vietnam's production. On the other hand, China as a low cost producer may pose a greater threat to American catfish producers who are fighting hard to retain their markets. The price for catfish from China and Vietnam is USD 2.10/lb in comparison to USD 3.10/lb for American catfish.

EU markets

In his review of the white fish markets in the EU, **Guus Pastoor**, President, EU Fish Traders and Processors Association, said that the addition of 10 new members makes the EU a large market. Freshwater fish represent 9% of the total imports of white fish into the EU. From 1995 to 2005, growth of imports of freshwater fish fillet was 560%. Despite the increase, he said that consumers ask questions such as are the products safe, where do they come from and are all rules respected. In turn, the processor in the EU wants to provide guarantees to consumers and promote the image of the products. **Torjorn Trondsen**, Norwegian College of Fishery Science, said that in the EU the pangasius is a low price fish at USD 4.00/kg, below that of tilapia at USD 8.00/kg but higher than the Alaskan Pollack. Nevertheless, under the whitefish category, fish from Asia is filling the supply gap. In 2006, volumes were 80,000 tonnes, a large portion is presumably from Vietnam. Differences between prices for fresh and frozen fillets are widening in favour of fresh fillet.



Team from Vietnam

Traceability

Concurrent to the implementation of standards during the farming cycle, members of VASEP have committed to a complete traceability at the processing level with the GNet setup by Tracetracker. **Ole Frerderikson** said that the key drivers for this are economic with higher prices, lower shrinkages and increased sales volumes. This has the added advantage of food safety management and compliance with international markets. The last driver is a strategy where it will increase competitiveness and market access.

Trade Issues

This is the third year of the US imposed antidumping tariffs on catfish fillets. Next will be the sunset review. In 2001, 80% of exports went to the US and this decreased to 20% in 2004. In 2006, 43% of exports went to the EU and 15% to Russia. Dr Dzung said that although exports continue to increase, processors and farmers have to produce quality fish according to the standards of importing countries and to prevent incidences of false labeling of the fish. Reports that producers have illegally labeled tra as other species (such as grouper) in order to enter the US market has tarnished the image of producers in Vietnam. In Asian markets, the catfish is labeled as dory, which apparently is acceptable.

Over glazing has a negative impact along the supply chain. **Fatimah Ferdouse**, Infish who presented an overview of Asian markets for the catfish, said that this can be as high as 40%. The addition of polyphosphate is also beyond the allowable limits. Similar to other markets, quality assurance is as important for Asian consumers. Peter Redmayne also said that in the US, products from Asia have a bad image exemplified by the 90% net weight and US importers selling false net weights. Imported catfish can be better than US products. More needs to be done to improve its image through generic marketing. (More information: www.infish.org).

Aqua Bounty

Updates on activities and Shrimp IMS

Aqua Bounty Technologies, Inc. (ABTX), a biotechnology company focused on enhancing productivity in the aquaculture market has announced an update on its operations and lead products.

Since May 2006, the company has expanded with six sales managers and technical services representatives. The senior management team was strengthened with the appointment of Dr Ron Stotish, to lead the Company's regulatory activities. These additions have increased its ability to conduct trials in target countries as well as ensure that they are carried out effectively and aggressively pursue registration approvals for its products.

It has reported progress with Shrimp IMS, a stimulant for shrimp immune system and the company's leading product. In Latin America, it has established partner distributors in Mexico and Ecuador. Local feed manufacturers such as Vimifos (the largest shrimp feed producer in Mexico), Expalsa (the largest in Ecuador), and Malta Cleyton in Mexico, are all anticipating significant demand for IMS this shrimp season (April to December).

Aqua Bounty is now providing feed technology support to its partners so that they can upgrade their feed milling equipment to include IMS in their primary shrimp feed production lines. Feed partners in Ecuador, Mexico, Panama and Indonesia have already re-fitted their plants in order to apply IMS to their pelleted shrimp feed lines.

The company is currently overseeing 15 field trials with IMS in Mexico, Ecuador, Panama, Peru, and Indonesia. Trials are expected to begin shortly in China, as well as a laboratory and hatchery trials in Thailand with the black tiger shrimp *Penaeus monodon*. If successful, this will enable the company to expand its market in Asia.

The majority of completed trials over the past year showed positive results well in excess of the minimum level required to economically justify use of the product by the producer. A minority have showed neutral results. The incidence of neutral results in a field environment is expected due to variation in application, disease pressure and local environmental factors.

A second generation product form of Shrimp IMS is in development. Shrimp IMS Emulsion delivers IMS in a blend of oils, attractants and stabilizers which is a practical and efficient vehicle for applying IMS in hatcheries. This product is currently being tested in hatcheries in Panama, Mexico and Indonesia and initial reports have been favourable and encouraging.

With the product, AquAdvantage™ Viral Blocker ("VPX"), a potent blocker of WSSV in shrimp, the company is completing a process for drying the active protein in a form that is shelf stable and easy to ship. Incorporation of VPX in a small scale batch of commercially produced feed has allowed it to begin tests to determine the optimal methods for feed incorporation. Optimization of expression is still required to minimize cost to the shrimp producer. Other technical studies, including long term dose response and analytical methods to accurately ascertain concentration of active VPX in feed, are required before proceeding to field trials with customers. (More information: www.aquabounty.com)

Kiotech

Can this novel range of attractants stimulate feeding?

Aquatice is a patented chemosensory stimulant developed at the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) in the UK, in partnership with Kiotech International. It took 7 years to develop. It is sprayed directly into the water to increase feeding activity prior to the application of the feeds.

The first commercial trials in the use of the novel attractants for fish and marine shrimp, conducted in collaboration with local research institutes in Europe, Asia and China have shown very encouraging results. This could result in both significant commercial benefits for participating farmers and equally important environmental benefits as well, according to Dr Andrew Moore, CEFAS at the recent Aquafeed Horizons conference held in conjunction with Victam International 2007 in Utrecht, Netherlands.

"These results give much encouragement and demonstrate the effectiveness of the new technology," said Dr Moore. "This gives us the impetus to press on with the development of products tailored to other commercially important species and to start work on commercialising them."

Tilapia

The trials with 2-2.5g tilapia *Oreochromis niloticus*, were conducted in Zhouhai, Guangdong, China, over a six month period. After 109 days of culture, the application of pheromones product resulted in a 17% increase in the average weight of the tilapia in comparison to fish in the control pond. Fish also reached marketable size (700g) faster at 3 weeks earlier than fish in the control pond. In addition, based on anecdotal evidence, fish in the treated ponds appeared healthier and pond water quality was better. The secondary crop of white shrimp was significantly higher with less incidence of disease. Overall, the farmer received a 50% higher income from the Aquatice treated pond than the control.

White shrimp

Trials in Tradt Province, south east Thailand, conducted with Shrimp Biotechnology Business Unit (SBBU) Bangkok looked at the effects of these novel attractants in white shrimp *Litopenaeus vannamei* culture. The stocking density was 100 postlarvae/m² in 0.64 ha ponds. The trial lasted 92-111 days. Shrimp in pond treated with the attractant had a higher growth rate of 0.11g/day as compared to the control group at 0.08g/day. The average weight of the shrimp was 10g which was 30% larger than shrimp in the control group (7.8g). It was concluded that the attractants promoted significantly faster growth in shrimp and that less feed was required.

Another objective is to be able to use this product to develop more sustainable feeding methods, according to Dr Moore. "In Japan, we have worked closely with Tokyo University in studying how to increase consumption of feed containing low levels of fish meal in the red seabream *Pagrus major*. Another area will be to target life-history bottlenecks in intensive aquaculture production".

Currently, suitable delivery mechanisms are being addressed for various aquaculture applications. The novel attractants work well when added directly into water. However, the challenge is to incorporate the attractants into feeds where they will directly target individual fish and produce the increased feeding activity. (More information: www.kiotech.com)

July 29-August 2

Indonesia Aquaculture 2007
Bali, Indonesia
Email: indoaqua-07@hotmail.com;
indoaqua_2007@yahoo.com

August 5-8

Asian Pacific Aquaculture 2007
Hanoi, Vietnam
Tel: +1 760 432 4275
Email: worldaqua@aol.com
Web: www.was.org (IBC)

August 13-15

International Shrimp Health Workshop
Bandar Seri Begawan, Brunei
Email: wandawati.tamat@fisheries.gov.bn/george@integratedaquaculture.com

August 23-25

Tilapia 2007
Kuala Lumpur, Malaysia
Email: infish@po.jaring.my
Web: www.infish.org (p17)

August 24-27

Guangdong(Zhanjiang) International Prawn
Exhibition China
Tel: +86 20 38390114, 38390115
Fax: +86 20 38390116
Email: market@southfish.com.cn
Web: www.southfish.com.cn

September 23-28

14th Annual Practical Short Course on
Aquaculture Feed Extrusion, Nutrition
and Feed Management
Email: mnriaz@tamu.edu
Web: www.tamu.edu/extrusion

September 25-28

IAFI World Seafood Congress
Dublin, Ireland
Web: www.worldseafoodcongress07.com

October 23-25

Livestock Asia 2007.
Kuala Lumpur, Malaysia
Web: www.livestockasia.com
Email: mha@ambexpo.com

October 24-26

Fish Africa & Aquaculture
Africa Capetown, South Africa
Web: www.fishafrica.net/

October 24-27

Aquaculture Europe
Istanbul, Turkey
Tel: +32 923 34 912
Email: ae2007@aquaculture.cc
Web: <http://www.easonline.org> (p31)

November 6- 9

Caribbean and Latin
American Aquaculture
San Juan, Puerto Rico
Tel: +1 760 432 4275
Email: worldaqua@aol.com
Web: www.was.org

November 6-8

China Fisheries & Seafood
and China Aquaculture
Dalian, China
Web: www.seafare.com

November 20-23

8th Asian Fisheries Forum
Email: 8aff2007@gmail.com
Tel: +91 484 2394798
Web: www.8aff2007.org/

November 27-30

Iran 5th International Fisheries
and Aquaculture Exhibition
Kish Island, Iran
Email: iranseafoodexpo@ccorg.com
Web: www.iranseafoodexpo.ir/

Aquaculture Feed Extrusion, Nutrition and Feed Management

Sept. 23-28, 2007, Texas A&M University

This is the 14th Annual Practical Short Course on Aquaculture Feed Extrusion, Nutrition and Feed Management. It is a one-week short course conducted by staff, industry representative and consultants. This program will cover information on:

- designing new feed mills
- selecting conveying, drying, grinding, conditioning and feed mixing equipment.
- preparing full-fat soy meal processing
- recycling fisheries by-products, raw animal products, and secondary resources
- raw material and extrusion of floating, sinking
- high fat feeds; spraying and coating fats

It will have practical demonstration of sinking, floating, and high fat aquafeed on four major types of extruders – dry, interrupted flights, single and twin screw, using various shaping dies.

More information: Dr. Mian N. Riaz
Tel: +001 979 845 2774 Fax: +001 979 458 0019
Email: mnriaz@tamu.edu Web: www.tamu.edu/extrusion

AE2007 Aquaculture Europe 07

October 24-27, 2007, Istanbul, Turkey

Together, the European Aquaculture Society and Eurasia Trade Fairs will launch this event, bringing together the scientific conference with the highly successful Future Fish Eurasia Exhibition. The potential of Turkish aquaculture will be on display at event hosted by the Turkish Federation of Aquaculture and Fisheries (SUFED).

Aquaculture Europe 2007 will operate on two sites – the recently inaugurated World of Wonders hotel and the Istanbul Expo Center – both near to Istanbul Ataturk Airport. A series of special events is being organised during Aquaculture Europe 2007.

- A special Turkish Farmers Day on October 26th organised by SUFED
- The 6th Practical Short course Aquafeed EurAsia 2007 – October 23-24,
- AquaMax – EU-funded Integrated Project on aquaculture feeds – October 24
- Controlled reproduction and larval rearing of the European Eel – October 24
- EUROFISH workshop on Marketing and Quality Insurance – October 25
- a special farm tour to visit sea bass and sea bream facilities near to Bodrum.

More information: Conference: ae2007@aquaculture.cc
Registration: worldaqua@aol.com
International booth sales: mario.stael@scarlet.be



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