JULY/AUGUST2009
Volume 5 Number 4

AQUA CULTURE
Asia Pacific

Biosecurity for white spot disease prevention

Food safety and traceability in products from Asia

Assessment of feed ingredients

Disease management tools for tilapia and shrimp

MICA(P) 074/10/2008 PPS 1699/08/2009(028061)

www.aquaasiapac.com

Grow with Gold Coin

GOLD COIN 金錢 SPECIALITIES

Since 1984, GOLD COIN is committed to research, sustainability and good customer service.

visit our website
www.goldcoin.com.hk

At **GOLD COIN**, we are committed to provide superior shrimp feeds to ensure your business success. Using only the highest quality raw materials and manufactured under strict quality controls, we offer a range of feeds* to consistently meet the various levels of production systems. Our strict policy of opposing the use of antibiotics in our feed is congruent with the growing demand by consumers for traceability.

- **GOLD SUPREME** for superior growth and feed efficiency. Health enhancement with proprietary ENCAP® Immune enhancer
- **GOLD FORTE/GOLD VERTEX** are specially formulated for the intensive culture of white shrimp Penaeus vannamei in Asian conditions
- **GOLD CLASSIC/GOLD ELITE** are our flagship products that meet all nutrient requirements of Penaeus monodon shrimp under normal conditions
- **GOLD ROYALE** is used in highly intensive conditions by the most discerning farmer
- **ENCAP®** Hatchery Feeds have prime quality ingredients micro-encapsulated within a digestible yet water stable membrane

Some products may not be available in your country. For details on Gold Coin range of shrimp feed and other Gold Coin Aquaculture products, please contact our regional offices.

HONG KONG *(HEADQUARTERS)* - Gold Coin Group Limited, Room 1204-1207 Shui On Centre, 6-8 Harbour Road, Wanchai, Hong Kong. Tel: +852-2585-1200 Fax: +852-2598-711, email:general@goldcoin.com.hk

MALAYSIA *(JOHOR)*- Gold Coin Specialities Sdn Bhd/Gold Coin Biotechnologies Sdn Bhd, Tel: +607 237 0695 Fax: +607 236 1143 email: sp.koh@goldcoin-my.com

INDONESIA *(NORTH SUMATRA)* - P.T. Gold Coin Specialities Medan, Tel: +62 61 415 5115 Fax: +62 61 451 2748, email: p.zulkarnain@goldcoin-id.com

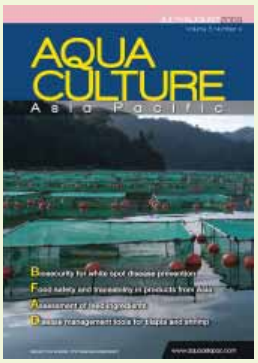
INDONESIA *(WEST JAVA)* - P.T. Gold Coin Indonesia, Specialities Division, Tel: +62 21 885 3668 Fax: 62 21 884 1947 email: p.zulkarnain@goldcoin-id.com

THAILAND *(SONGKHLA)* - Gold Coin Specialities (Thailand) Co Ltd, Tel: +66 74 483 600/5 Fax: +66 74 483 493 email: w.pradipat@goldcoin-th.com

INDIA JV *(CHENNAI)* - 1-B, Industrial Estate, Ambattur, Chennai 600098, India, Tel: +91 44 2625 8031 Fax: +91 44 2625 8034 email: viney.vatal@godrejagrovet.com

Contents

Volume 5, Number 4 July/August 2009 MICA (P) 074/10/2008 ISBN 1793-0561



2 From the editor
Is biosecurity the weakest link in sustainability?

4 News
New shrimp breed in Indonesia, first SBT fingerlings in Australia, first organic BT shrimp from India and GlobalGap partners WWF.

6 News in brief

Shrimp Culture

8 Pushing for continuous shrimp culture in Hué
This is the ultimate triumph for Truong Son JS in Vietnam. By Zuridah Merican.

12 Biosecurity for white spot disease prevention: a practical challenge
An opinion piece by Pornlerd Chanratchakool on what can be done to reduce risks of outbreaks.

Health Management

16 Vaccination of tilapia against *Streptococcus agalactiae*
This may become a tool in disease management and control in intensive tilapia farming, says John S. Clark, Warren A. Turner, Angus MacNiven and Nantarika Chansue.

22 Study on common diseases in farmed pangasius in the Mekong Delta
With rapid development in its farming, diseases have now become a major concern. By Nguyen Hoang Vu and Marc Campet.

25 Microbial dynamics in shrimp ponds
Understanding the microbial ecological process in ponds and in the shrimp intestinal tract is vital. By Marcos H. S. Santos, Tadeu da Silva, Jose Torres, Roseli Pimentel Silva, David Moriarty and Olivier Decamp.

Feed Technology

27 A feed is only as good as its ingredients
In Part II, Brett Glencross looks at some of the more traditional parameters of ingredient assessment studies.

30 Hydrolyzed animal proteins and gelatin
Eric De Muylder, Carine van Vuure, Romain de Vargas, Daan Delbare and Geert van der Velden investigate the effects of utilisation in low fishmeal diets for juvenile white shrimp.

Marketing

32 Q&A with Mr. David Byrne
On food safety and traceability in aquaculture products from Asia.

34 Focus on creating value
Changes in marketing aqua feed in Vietnam for Uni President Vietnam.

Industry Review-Freshwater fish

38 A future for the tilapia in Bangladesh
Dr M. G. Hussain says that a tremendous progress in its farming is being achieved with improved strains and expansion of culture areas.

41 Working with nature
Producing clean and healthy tilapia in an eco-friendly environment by Zuridah Merican.

43 Malaysia's first aquatic biopark
This is a new concept in the aqua business.

Company news

44 DSM's Quality for Life concept

46 Behn Meyer in Vietnam's role in aquaculture

47 RAS from Fujian/Appointments

48 Alltech/IAI/Addcon

Show preview

50 Updates on Asian Pacific Aquaculture 2009 & World Aquaculture 2009.

Forthcoming events

52 Events in 2009/2010

Editor/Publisher
Zuridah Merican, PhD
Tel: +603 2096 2275 Fax: +603 2096 2276
Email: zuridah@aquaasiapac.com

Editorial Coordination
Corporate Media Services P L
Tel: +65 6327 8825/6327 8824
Fax: +65 6223 7314
Email: irene@corpmediapl.com
Web: www.corpmediapl.com

Design and Layout
Words Worth Media Management Pte Ltd
Email: sales@wordsworth.com.sg
Web: www.wworthmedia.com

AQUA Culture AsiaPacific is published bimonthly by **Aqua Research Pte Ltd**
3 Pickering Street, #02-36 Nankin Row,
China Square Central, Singapore 048660
Web: www.aquaasiapac.com
Tel: +65 9151 2420 Fax: +65 6223 7314

Editorial and advertising enquiries
Request for reprints and articles
Email: zuridah@aquaasiapac.com
Tel: +603 2096 2275 Fax: +603 2096 2276

Subscriptions
Online: www.aquaasiapac.com
Email: subscribe@aquaasiapac.com

Annual Subscription by airmail (6 issues a year)
Asia: SGD70
Other zones: SGD100

WRITE TO THE EDITOR
We want to hear from you. Write your comments on the industry to the editor.

Send by fax to Zuridah Merican at +603 2096 2276 or email: zuridah@aquaasiapac.com

Letters may be edited prior to publication

From the editor

Is biosecurity the weakest link in sustainability?

The aquaculture industry today seems to be jumping through hoops and hurdles to reach the consumer. International buyers are pushing the sustainability issue that is gaining importance with hypermarkets and brand leaders who use it as a selling point and differentiation tool.

Environmental management is a crucial component of sustainable aquaculture. As a measure of sustainability, feed companies have been asked to show the fishmeal component in their feeds. The conversion rates of capture fisheries turned into fishmeal for aquaculture is only one part of the sustainability issue. How should the industry address this concern and meet these demands?

To see how this escalates upstream and affect the production side of the industry, we need to look at the economic aspect of sustainable production. This is profitability through efficient conversion of inputs, reducing FCR and increasing survival rates. A quick- win for sustainability in production is for the industry to overcome the major obstacle of disease. High cost production is not sustainable in the long term. In the case of shrimp, be it monodon or vannamei, disease remains a major risk factor in production. The all too-often occurrences of mainly WSSV in Southeast Asian farms are leading to the harvest of smaller size shrimp as farms rush to salvage their stock. This only contributes to the lack of predictability and inefficiency in current farming technology.

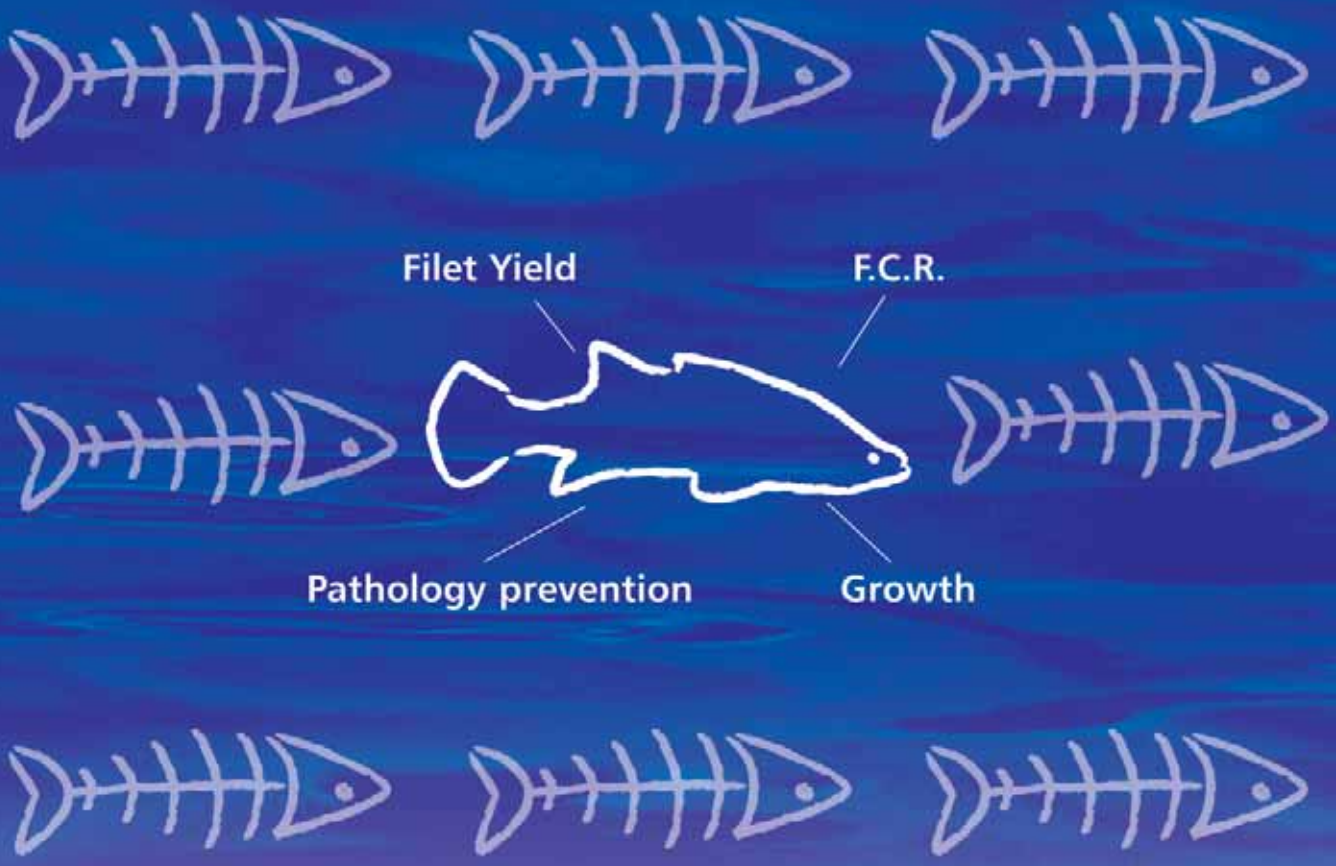
Lower survival rates automatically mean higher cost of production with higher FCRs that is not sustainable. Indirectly, it also means an inefficient use of fishmeal in the feed that goes back to the environmental issue. Focusing on the poor use of fishmeal is only tackling the symptoms. If the industry were to overcome the disease problems and increase survival, we can immediately reduce FCRs and improve the efficient use of fishmeal. This goes a long way in promoting a sustainable industry.

Health management comprises three intersecting components of: SPF seed, preventive biosecurity and therapy. Today's focus is on SPF seed and therapy but it lacks in preventive biosecurity. Specific Pathogen Free (SPF) seed is a good starting point but it is not the silver bullet to all our disease problems in the farm. Often producers have been reminded that SPF status is temporary and to conserve this, we need to always remain vigilant. The prevention of disease lies in the implementation of biosecurity measures. We cannot be laissez faire with disease just because SPF seed is used.

Should disease prevention to increase survival be an integral part of farm management together with growth and increase in average body weight (ABW) ?

For shrimp aquaculture to be sustainable, we need a long term vision and we must avoid another decimation of the industry such as that faced in 2002 with the monodon shrimp. The way forward is genetic improvement but at the moment, solutions on an ad-hoc basis such as Dr. Chalor Limsuwan's recommendation of keeping vannamei shrimp postlarvae at 32ºC in the hatchery before stocking them in ponds to prevent WSSV, could help. A great deal of hope is also placed on SPR stocks. However, it is believed that general education on prevention and biosecurity is a good way to go, at least for now.

Zuridah Merican



RESEARCH MAKES THE DIFFERENCE

OCIALIS : Our best publicity is your improved results !

OCIALIS has developed its own Aqua Feed Research Centres in Vietnam, Brazil, Mexico and Indonesia.

WHY ? Because we believe that our innovation must be developed as close as possible to our partners to best respond to their needs.

OCIALIS commercial and research teams are working day-to-day with farmers to optimise their results.

Our 12 world wide Aqua feed plants manufacture feeds for Pangasius, Cobia, Barramundi, Grouper, Tilapia, Monodon, Vanamei, etc ...

Do you have specific requirements ?

Contact us !

www.ocialis.com - ocialis@ocialis.evls.net

Feeding a sustainable future

World aquaculture

Ocialis

A brand of the EVIALIS group

Indu Vannamei Nusantara I in Indonesia

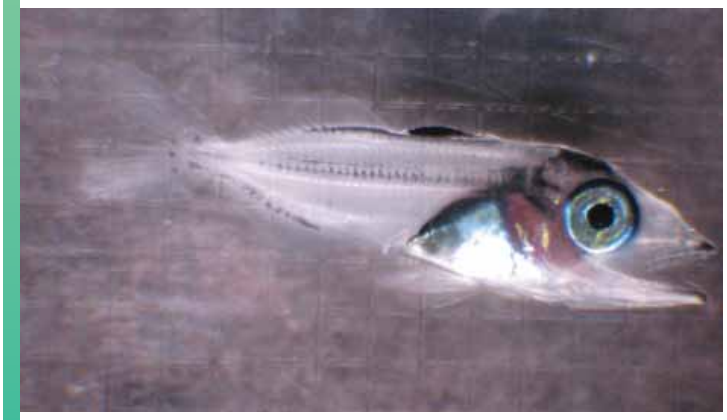
By cross breeding varieties of *Penaeus vannamei* shrimp, government researchers in Indonesia have pioneered a fast-growing shrimp breeding stock called Indu Vannamei Nusantara I.

The Ministry of Maritime Affairs and Fisheries research office in Situbondo, East Java have developed a hardier variety of the *P. vannamei* species by breeding vannamei shrimp brood stock from Florida, USA with local stocks. The first commercial IVN-I shrimp production is under way in two centres in Situbondo and Karangasem, Bali. These will be distributed to domestic farmers. This stock is also highly resistant to shrimp disease, grows faster and will be available at lower costs. Shrimp farmers will be able to buy a pair of IVN-I brood stock for only IDR 50,000 to IDR 75,000 (USD4.85-7.37). The cost savings to the country is significant as the farmed shrimp industry requires about 900,000 to 965,000 of vannamei brood stock per year. Indonesia imports about 320,000 vannamei brood stock mostly from the US.

Dr Made L. Nurdjamah, Director General Aquaculture, Department of Fisheries and Marine Affairs said in thejakartaglobe.com, "The more affordable the brood stock, the less farmers would have to pay for post larvae. By using the new varieties, for example, farmers will only have to pay IDR15 per shrimp fry. This can reduce production costs. The price of a pair of Florida shrimp brood stock is IDR 300,000 to IDR 400,000 (USD 29-38), forcing farmers to pay IDR 35 for each fry. The new variety is also better suited to Indonesia's weather and is considerably more resistant to disease".

First SBT fingerlings

In South Australia's Eyre Peninsula, the research team led by Port Lincoln-based aquaculture company Clean Seas Tuna Ltd showed the first pictures of the month-old Southern Bluefin tuna (SBT) *Thunnus maccoyii* fingerlings on youtube.com.



They had worked for the past decade to reproduce the breeding patterns of this tuna. The team members include scientists from the University of the Sunshine Coast, Fisheries Research and Development Corporation (FRDC), the South Australian Research and Development Institute (SARDI) and the Australian Seafood Cooperative Research Centre. This is a world-first breakthrough which will revolutionise the tuna industry in Australia .

Chairman of Clean Seas Tuna Ltd, Hagen Stehr said, "This achievement is a world first, and a major stepping stone to presenting the world with a sustainable food resource for the future. It is with confidence that Clean Seas Tuna will now accelerate the commercialisation of its achievements to grow and produce SBT. These photographs and videos symbolise the depth of work our team has put into closing the lifecycle of this magnificent fish".

Earlier, the company had announced the continuous spawning by its captive SBT brood stock over 35 days and production of more than 50 million fertilised SBT eggs and 30 million larvae. Some 90% of eggs have been fertilised and fingerlings grew to about 2.5 cm in about 28 days.

First organic black tiger shrimp from India

The Marine Products Export Development Authority based in Cochin, India (MPEDA) has selected three ponds, totalling to 7 ha in the Kottuvally Village of Ernakulam District in Kerala to culture organic black tiger shrimp *Penaeus monodon*.

These ponds were stocked with Naturland approved post larvae produced by Queen's Hatchery, Kodungallore in Trichur Dist, Kerala. Naturland is a private certifying body in Germany. Post larvae were screened with a PCR–polymerase chain reaction prior to stocking. Shrimp were fed organic feed produced by The Water Base Ltd., Nellore. The feed mill was also certified by Naturland. Proper monitoring of the farm was carried out periodically by MPEDA. After a total culture period of 115 days, the farmer harvested the organic black tiger shrimp at 25-30 counts. The average weight of shrimp was 40gms at the time harvest. The first harvested organic black tiger shrimp from India was sold at a high premium price to the exporter, Baby Marine International, Cochin, certified as an organic processor for organic black tiger shrimp and scampi by Naturland.

WWF and GLOBALGAP to streamline certification process for producers

At the European Seafood Exposition in Brussels in April 2009, GLOBALGAP launched sustainability standards for tilapia and pangasius aquaculture. In June, it announced that the program will be expanded so that aquaculture producers can be certified in one step.

It will do so by supplementing its existing food safety, environmental and social requirements with the metrics-based environmental and social standards under development by the Aquaculture Dialogues. The Dialogue standards are being created by approximately 2,000 producers, NGOs, scientists and other stakeholders from around the world. World Wildlife Fund (WWF) coordinates the Dialogue process.

"We are thrilled that GLOBALGAP will offer a voluntary add-on module to its existing standards," said WWF-US Aquaculture Program Managing Director Jose Villalon. "The Dialogue standards will add value to the GLOBALGAP program because they are metrics-based, which is the best way to accurately measure if aquaculture's impacts on the environment are minimized."

The Dialogue standards are being created by consensus through an open and transparent process that involves a broad and diverse group of stakeholders. The first set of standards for tilapia is expected to be completed in September 2009. Standards for 11 additional species will be finalized over the next year.

"This move is a win for producers because it will help streamline the certification process for them, by offering a one-stop shop audit using the high integrity of the GLOBALGAP system to provide an efficient and cost effective certification process," said Chairman Nigel Garbutt. "It also is a win for retailers who would like to see a harmonization of the various certification programs on the market. This partnership is significantly different from other partnerships, because robust but separate standards are being offered in combination with each other."

The WWF/GLOBALGAP partnership, formalized in a memorandum of understanding, is a means to certify producers prior to the creation of the Aquaculture Stewardship Council (ASC) in 2011. The ASC, a new independent organization, will be responsible for working with third party entities to certify farms that are in compliance with the dialogue standards. WWF and several other entities, including the Dutch Sustainable Trade Initiative, are taking the lead in creating the ASC. The WWF/GLOBALGAP partnership is non-exclusive, which means other entities could certify producers who adopt the standards prior to the start-up of the ASC, as long as those entities meet the criteria for standards-holding entities established by WWF. All certification prior to the creation of the ASC will be business-to-business. The ASC certification will be business-to-consumer by providing a consumer label.

As part of this partnership, WWF will work with GLOBALGAP to create checklists, guidance documents and training materials for auditors who will certify aquaculture producers. This work will be completed for tilapia by the end of 2009, when GLOBALGAP is expected to begin offering the add-on to its certification to tilapia producers. For more details: web: www.globalgap.org

Standards for tilapia: http://www.globalgap.org/cms/front_content.php?idart=832

Standards for pamgasius: http://www.globalgap.org/cms/front_content.php?idart=833

Comments on the editorial "End of Road for BT?"

I read your editorial on "End of Road for BT?" *P. monodon* is an excellent species for aquaculture and I would still call it a billion dollar species for India. Therefore, there is no end of road for BT in the near future despite the intrusion of *P. vannamei* and replacement of BT in a few countries. Probably India is the latecomer in introducing *P. vannamei* after a prolonged debate. As an endemic species *P. monodon* with its widespread distribution will win over *P. vannamei* by domestication and selective breeding which had boosted up its production. Farmers will no doubt prefer any species for farming as long as economic returns are assured and are high enough. Super intensive farming of *P. vannamei* in indoor culture may give good economic returns. How long is the big question? Despite its success, new viral/bacterial diseases in intensive farming have not been ruled out. The new disease can be more dangerous than white spot syndrome virus. US Scientists were right to select *P. vannamei* to increase its production in their waters. Copying the same technology for BT for culture in India and South East Asia could be the right approach rather than introducing an American species in Asian seas. The "Gold rush" greediness and opportunistic tendency for temporary gain are dangerous in any aquaculture. A balanced approach in species selection is the need of the hour.

Dr. M. Sakthivel, President, Aquaculture Foundation of India,
(Former Chairman & Director, MPEDA), Consultant to TATA Sons,
4/40, Kapaleeshwarar Nagar, Neelankarai, Chennai – 600 041. Tamilnadu, India. E.mail : sakthi.afi@gmail.com

News in Brief

Malaysian seafood firms resume exports to EU

Compliance with the European food safety standards has enabled six Malaysian exporters to resume exports to the EU. This follows a Food and Veterinary Office (FVO) inspection in March. In June 2008, Malaysia voluntarily suspended exports of seafood and aquaculture products to the EU after a FVO team found shortcomings along the supply chain and that enterprises did not meet the EU's hygiene standards. Prior to the suspension, 46 companies exported to the EU. The trade was valued at Euro 102 million in 2007 (USD 143 million). EU is the largest importer of the country's seafood. The ban led seafood exporters to focus on Asian markets such as China, Japan and South Korea albeit at 5% lower prices.

Supply deal with China

Zhanjiang Guolian Aquatic Products has announced a USD 50 million value-added shrimp supply deal with Darden, Florida, USA. This is the largest overseas order for the company which will produce high end shrimp products to Darden Restaurants with four shrimp products specifically customised for Darden. Zhanjiang Guolian Aquatic Products is certified as a three star facility with hatcheries, farming, feed mill, processing and R&D. It has a zero duty rate for exports to the US and is certified by the Aquaculture Certification Council (ACC).

More grouper production in Taiwan

The government will provide TWD 100 million (USD 3 million) in subsidies to expand grouper farming in Yongan and Mituo, Khaosiung County. It will also invest TWD 24.2 billion (USD 730 million) over the next four years to boost promising businesses and this includes grouper culture. The grouper farms in Yongan will be expanded to 300 ha from the current 250 ha by 2012. In Mituo, 100 ha are used for grouper culture. Kaohsiung and Pingtung are the main grouper culture areas. Taiwanese producers have the advantage of proximity to China and production of quality fish compared to producers in Hainan, China, according to the Central News Agency. As of July, boats from Taiwan can directly transport locally grown groupers to China.

Credit in aquaculture in Indonesia

In March, Indonesia's Ministry of Maritime Affairs and Fisheries launched an IDR 161 billion (USD15.6 million) development program to provide credit to small- and medium-sized aquaculture enterprises. The strategy is for aquaculture to supply future fish demand, said www.thejakartaglobe.com. Investments are required in grouper, silver catfish, shrimp, pearls and seaweed farming. Only 0.5 to 0.6 million of the 1.25 million ha of the potential area for aquaculture have been used. In shrimp farming, investment in infrastructure is required where there is a lack of industrial power supplies and farms have to invest in expensive generators.

Higher shrimp prices and quality BT post larvae

The Vietnam Association of Seafood Exporters and Producers (VASEP) reported that Chinese brokers are buying shrimp direct from farms in the Mekong Delta and the central region. Their offer prices in June were much higher that what processors in Vietnam say they can pay. It was VND 195,000 for 20 pcs/kg (USD10.95) instead of VND140,000/kg (USD 7.86) for black tiger (BT) shrimp in the Mekong and VND 45,000/kg (USD 2.5) for 100pcs/kg of white shrimp in the central region. The report in Saigon-gpdaily also said that BT shrimp production had declined by 30-40% compared 2007 figures while production for smaller white shrimp increased. The reduced farming of BT shrimp is attributed to the high prices of imported post larvae at VND35-40 each whereas local post larvae cost VND10. In response, the Research Institute of Aquaculture No 2 (RIA2) reported that it had developed high quality BT shrimp breeding stock and farmers in Soc Trang have successfully tried two crops.

Cyclone damage shrimp farms

In May, cyclone Aila devastated some 50-70% of the shrimp farming area in the south western Khulna region in Bangladesh. The damage, estimated by the Bangladesh Frozen Food Exporters' Association (BFFEA) to the frozen shrimp industry was USD 142.9 million. The area produces nearly 80% of the country's export-oriented marine and freshwater shrimp in 170,000 ha and 50,000 ha land, respectively. The cyclone also occurred at the peak season and shrimp were ready for harvesting. The freshwater prawn industry is already reeling from contamination with antibiotic residues in 50 consignments of fresh water prawn exported to the EU. Bangladesh had decided to suspend its exports of fresh water prawn to the EU for six months from June. Shrimp is the country's second largest export commodity, valued at USD 537 million in 2008.

Improving nutritional value of fishmeal

In some aqua feeds, fishmeal is an essential marine ingredient but producers are seeking ways to reduce its use because of price and sustainability issues. Increasingly, fish meal is being replaced by plant meal. In Norway, Nofima Ingrediens is trying a different approach: by increasing the nutritional value of the fishmeal, less fishmeal is needed in the feed than before. They are adding stickwater which contains free amino acids, peptides, small proteins, minerals, soluble vitamins and small components such as taurine, creatinine and carnosine back into the fishmeal. In a trial with juvenile salmon in saltwater, eight different feeds were tested. One of the feeds was commercial and contained 30% fishmeal. The remaining seven feeds contained just 10% fishmeal, but contained stickwater equivalent to that in the commercial feed and up to 200% over and above that found in commercial feed. Part of the fishmeal was replaced with a plant meal. After 10 weeks, there was no difference in growth between fish fed 10% fishmeal with an extra supply of stickwater and those that had received 30% fishmeal. (www.nofima.no)

Korea begins checks on China's seafood

South Korea signed a liberal arrangement with China on fisheries hygiene in 2001. The Korean Herald reported that a team of government inspectors will visit 21 fish farms and seafood factories in the eastern and northern regions of China end June to inspect their hygiene standards. There has been concern on products from China since 2005 when eels imported from China contained malachite green. South Korea imports 35.5 % of its requirements from China.. Some 53 fish farms have been banned from exporting to South Korea, representing 3% of the exporters from China.

Regional certification body for shrimp

The Asean Shrimp Alliance (ASA) plans to establish a regional certification body to verify the production standards of farmed shrimp of member countries for export. The aim is to reduce pressure from buyers with different and restrictive standards. In the Bangkok Post, Dr Somying, Director-General of the Fisheries Department of Thailand said current production standards are in line with international benchmarks but some countries have imposed restrictive import standards not only to protect local consumers but also for commercial purposes. Despite low rejection rates, importers continue to impose more purchasing conditions in terms of standards such as on diseases and some non-tariff barriers. ASA was formed in 2007 by Asean members, mainly Thailand, Vietnam and Indonesia, the major shrimp producing and exporting countries.

Sanolife®

PROBIOTICS

DEVELOPED SPECIFICALLY FOR AQUACULTURE

INVE
Advanced Solutions for animal rearing

www.inve.com
sales@invethailand.com

INVE AQUACULTURE

Pushing for continuous shrimp culture in Hué

By Zuridah Merican

Today, the farms of Truong Son Joint Stock are dedicated to only vannamei shrimp but the ultimate triumph will be a sustainable culture by overcoming the annual disease outbreak during the winter months.

In Vietnam, *Penaeus vannamei* was introduced into the country in 2004 but culture was initially restricted to the north and central provinces of Vietnam. This worked well for Truong Son Joint Stock Limited in Hué which had started farming the black tiger shrimp in 2002 but had perpetual disease outbreaks. In Thua Thien Hué province, it had invested VND 12 billion (then USD 0.80 million) to develop 12 ha of the 50 ha in Dien Loc sub district, allocated by the government. Culture area expanded to 23 ponds totaling 11.5 ha in Dien Huong sub district with an additional VND 10 billion in 2004 (USD 0.67 million). In Dien Hoa sub district, development continued in 2008 with the construction of 12 nursery ponds each of 1,800m^2 with 18 grow out ponds, each of 3,600m^2, costing another VND 8 billion (USD 0.47).

Strategy to sustain success

Two years ago, the company changed completely to farming vannamei shrimp. This strategy was critical for the pioneering company. It has continued to receive land allocations from the government which depended on it to sustain successful culture in the region and to be the catalyst for smaller farms. In 2009, it was also given 70 ha in the sub districts of Dien Mon-Dien Huong of which 40ha will be developed and the balance of 30 ha will be completed in 2010. The total area of 300ha allocated to Truong Son is significant as the region around Hué has only 1,500ha of shrimp culture area.

Since 2007, farms of the company increased vannamei shrimp production from 512 tonnes to 617 tonnes in 2008 and up to June 2009, it was 850 tonnes. In all, the three production areas in Dien Loc and Dien Hoa with 22 ponds and Dien Huong with 12 ponds with a water area of 34ha can produce 11tonnes/ha. With an average of 2.5crops/year, the estimated production in 2009 will be 1,500 tonnes of shrimp with a turnover of VND 50 billion (USD 2.8 million). Turnover in 2007 reached VND 24 billion (USD 1.4 million) and this rose to VND 35 billion in 2008 (USD 2.1 million).

Anh Bao, Vice President and wife Huyen Ton Nu Bao Thi, both manage the aquaculture business of Truong Son Joint Stock

Mr Anh Bao, Vice President and 28 year old son of the founder of Truong Son JS, manages the aquaculture business of the company.

"Shrimp farming started in Hué with my father who saw the success achieved by farms in the southern part of the country. He was curious as to whether it will work in the central region. He was given 3 ha to start shrimp farming. However, it was difficult in the early days and he nearly lost his investments. From this initial 3 ha, we are now very successful with the white shrimp. With harvests of 11-12 tonnes/ha of 100 pcs/kg after 80 days, it is most likely we will not return to farming black tiger shrimp".

Visitors and farm team at the Dien Loc farm
Standing, from second left: Ho Khac Thuan, (UPV sales supervisor), Duong The Anh (Dien Loc farm supervisor), Le Thi Thuy Trang (Dien Loc farm manpower manager), Huyen Ton Nu Bao Thi (Truong Son JS), Thai Binh Duong (Truong Son JS) and Ming Hsun Wu (UPV). Front row from left Nguyen Van Cuong (Truong Son JS), Tran Van Hung and Lam My Phong (both UPV).

The Truong Son JS farm at Dien Loc

In 2006-2007, before committing 100% to vannamei shrimp farming, half of the grow-out ponds in this pond site were used to stock *P. vannamei* and the other half *P. monodon*. Today all ponds culture the white shrimp. A total harvest of ponds starts after 70-80 days. Products are sent to the traditional markets in Hué, Haiphong and Hanoi. The demand for the latter is 10 tonnes/day. Prices for live shrimp are currently VND 52,000/kg (USD 2.9/kg) whereas chilled shrimp fetch VND 44,000/kg (USD 2.5/kg) for 80-100 pcs/kg.

All the 3,300m^2-5,000m^2 ponds at the farm have cement sides and are lined with HDPE liners. Pond preparation includes the use of microorganisms for 3-5 days. Shrimp are stocked with post larvae (PL10) at 100 PL/m^2. Stocking starts in March and again in July. This year, it plans to stock in November for the winter season and harvest in January. The market preference during the New Year festivals is larger shrimp. The target annual production is 700-800 tonnes of shrimp.

The farm gets some of its post larvae from several hatcheries including that from the Uni President Vietnam (UPV) hatchery, all of which are in Ninh Thuan Province. During the first three months, farm supervisor, Duong The Anh monitors growth monthly. Upon reaching 2-3g, weekly sampling is done to monitor growth until harvest. The target growth is at least 1g/week. Survival is 80-90%. Feed conversion ratio has been good too at 1.2 to 1.3. It has at one time achieved a FCR of 0.9.

The main challenge is diseases which have been identified as yellow head (YHV), white spot syndrome (WSSV) and hepatopancreatic parvovirus (HPV). Some 30-40% of ponds with 20-30 day old shrimp have been infected. It has been difficult to prevent these diseases from occurring although there has been no exchange of water. Any stock infected one month after stocking is discarded whereas shrimp infected at a later stage are quickly harvested. Dead shrimp are killed using chlorine and whereas the pond water is disinfected using chemicals.

"The highest that we have achieved is 17-18 tonnes/ha. However, we need to increase production to recover our investments. Almost every year we have disease outbreaks during the winter months from November to January. Now culture is limited to March to October. Almost all farms are affected. What we need is a way to continue culture during these months".

He added, "We can say that we are unique. We were the first to cement line the ponds. At the farm in Dien Huong, we have developed a nursery and grow out pond system costing VND 800 million (USD 53,000). Here the post larvae (PL10) is reared to larger sizes of 2-3g in 1 to 1.5 months in one nursery pond and then transferred directly to two grow-out ponds. Now I am looking at covering the ponds during the winter months to increase the water temperature to 23–24ºC from 17ºC. I expect the cost of production to increase from VND 35,000 to VND 45,000/kg for 100 pcs/kg shrimp (USD1.9/kg and USD 2.5/kg, respectively), but I can take advantage of the extremely high prices during the early part of the year with demand for festivals. It can reach VND 80,000 to 90,000/kg (USD 4.7 to 5.3/kg)".

On the future, Anh Bao said that in the short term, the goal is to work towards a continuous culture cycle. It may start practising partial harvesting and harvest monthly which will help with cash flow and the flexible prices of shrimp. In the long term, the company will continue to expand. Currently, the farm produce is sent to a plant in Hué but when production increases, the next step is to set up its own processing plant. It will also look at expanding culture to another species.

Disinfectant at entry to the Dien Loc farm

Phong Diem

At another farm in the district, Mr Le Mai has just completed the construction of 20 new 2,500 m^2 ponds. The land was leased by the government in recognition of his role as a feed distributor, deemed as encouraging culture activities in the region. Soon he will expand culture with another 10 ha of ponds.

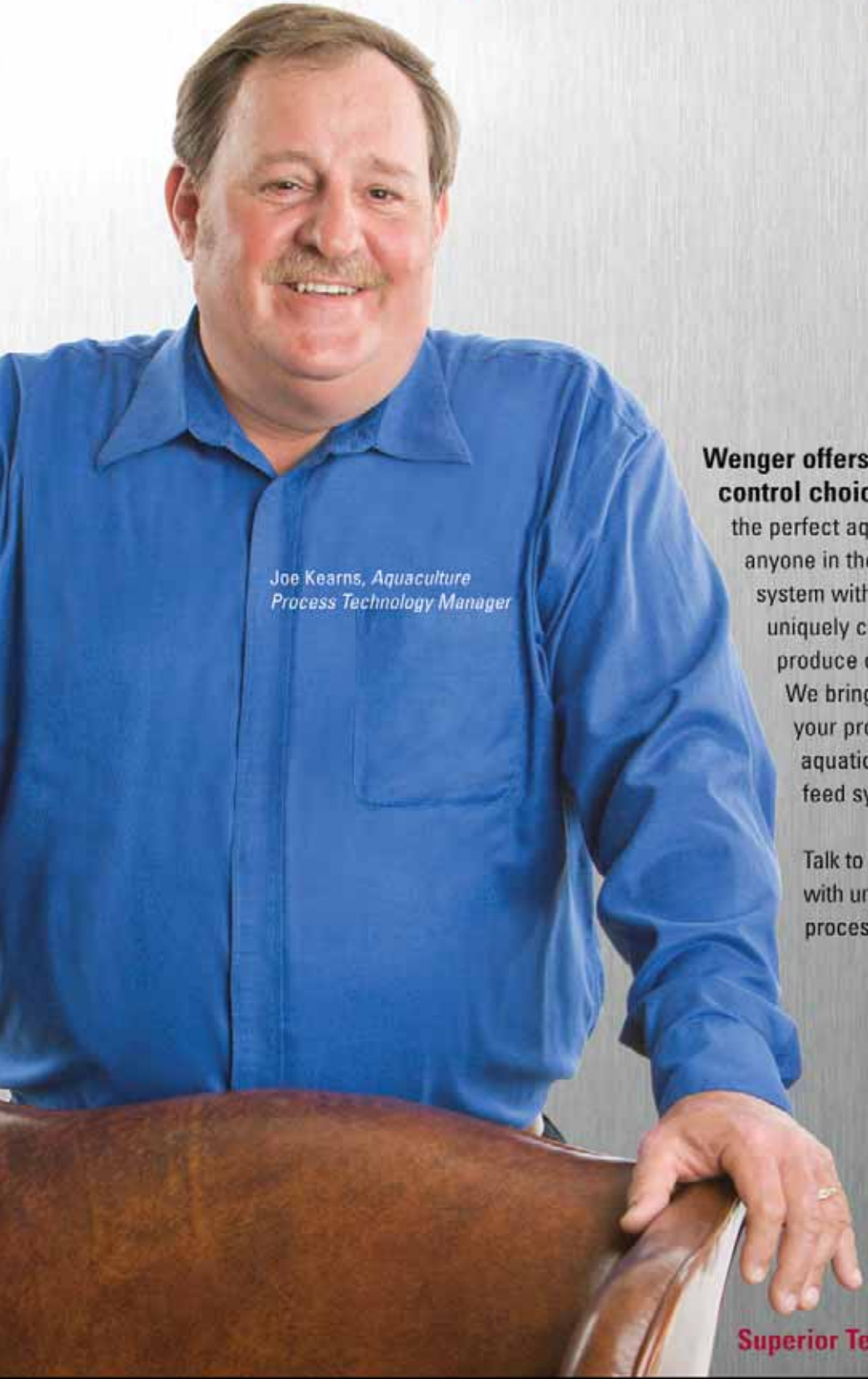
At this farm, the 1.7m deep ponds are lined with HDPE liners which he said will last 5 years. In January, he has stocked all ponds with vannamei shrimp. Seawater pumped directly from the sea is mixed with freshwater to obtain 17ppt culture water. However before harvest the salinity is increased. Le Mai expects a harvest of 100 pcs/kg every three months, with the exception of the colder months. Shrimp will be sold live to markets in Hanoi.

Five years ago in another location, Le Mai started shrimp farming with *Penaeus monodon*. Similar to the other farmers in the region, he faced disease problems and moved to vannamei shrimp. In this new area, he has incorporated several features such as net fencing and overhead lines to reduce the risk of contamination.

Le Mai with an aerator fabricated onsite using plastic piping. These aerators will disperse water upwards and long arm paddle wheels (left) will move water around the ponds.

We could talk all day about our aquatic feed systems.

But we'd rather talk about yours.



Wenger offers you more extruder, dryer, and control choices, and more ways to put together the perfect aquatic feed production system, than anyone in the industry. We'll custom design *your* system with a wide range of features and options uniquely configured and expertly engineered to produce optimally for *your* specific application. We bring unmatched technical expertise to your process requirements, making a Wenger aquatic feed system *your* Wenger aquatic feed system.

Talk to Wenger today, and surround yourself with unrivaled resources for exceeding your processing goals.

WENGER®

Superior Technology. Unparalleled Service.

SABETHA, KANSAS USA 785-284-2133 INFO@WENGER.COM WWW.WENGER.COM

USA BELGIUM TAIWAN BRASIL CHINA TURKEY

Biosecurity for white spot disease prevention: a practical challenge

By Pornlerd Chanratchakool

Temperature could be a trigger factor and what can be done to reduce risks of outbreaks of WSSV.

Biosecurity measures include net enclosures and overhead lines to prevent carriers and reduce the risk of cross contamination within the farm.

Among the viral diseases affecting the marine shrimp, the white spot syndrome virus (WSSV) is still the most dangerous for most shrimp farmers. An outbreak usually leads to an emergency harvest. Many management options have been used to prevent viral contaminations. In the last ten years, the focus has been on implementing biosecure facilities in ponds and production systems and stocking ponds with only WSSV free post larvae. However, despite these measures, outbreaks of WSSV are being reported from many areas.

When do outbreaks occur?

If we try to look at the pattern of an outbreak, we can clearly see that temperature is a key trigger factor. In Asia, it is common to see outbreaks in winter or during a period with fluctuations in temperatures. There are usually very few outbreaks with the summer crop. It is also common that an outbreak usually occurs during 25-45 days after stocking.

In many cases, with a winter crop, the outbreak occur as early as 14 days after stocking, even in ponds within a full biosecure facility and no water is exchanged or even added. On the other hand, many small scale farmers have experienced no disease outbreaks even if they did not have any biosecure facility setup and stocked with non-tested post larvae.

Consequently, farmers have a lot of questions in their minds, such as

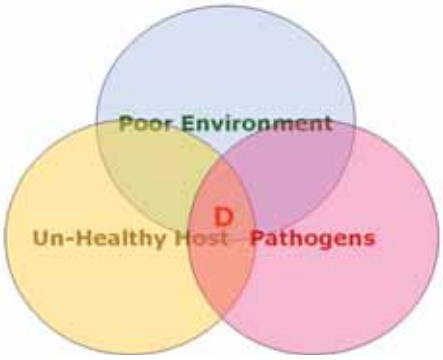
"Where is the virus coming from?"
"Is biosecurity working?"
"Did they stock with 'real' specific pathogen free (SPF) post larvae?"
"Was the disease monitoring program in the hatchery effective enough?"
"Was there anything wrong during water treatment and are the viral carriers still in the pond?"
"We did the same thing in the summer crop, why do we have a problem in a winter crop only?"
"Why do we have WSSV in a newly stocked pond and not with the previous crop/earlier stocks"… etc.

What would be the most critical factor contributing to an outbreak?

Among these are:

- Viral carriers?
- Pond condition or environment?
- Weather conditions?
- Contaminated post larva?

Which one should we pay attention to? My personal view is that all factors are interrelated and equally important. This can be explained by a classic three circles relationship described by Snieszko since 1974, as below;



Disease outbreaks can occur once the host becomes weak and susceptible to the pathogen while the pathogen becomes more virulent. The poor pond environment as well as poor weather condition plays important roles affecting the health of the host which makes them weak and vulnerable to pathogens.

In the case of the white spot virus, temperature is the key factor affecting the pathogen growth.

Where does the virus come from?

In a general shrimp disease management practice, the first two circles, host and pathogen are common factors that we have been focusing in the past. We are trying to get healthy, disease free post larvae from a domestication-SPF hatchery. We also try to exclude viral and carriers by using only disinfected water as well as establishing biosecure systems.

However, the disease monitoring program in a SPF facility is done by routine sampling of the stock using different PCR (polymerase chain reaction) test systems available. Therefore, it is not an absolute guarantee that the post larvae from the hatchery is 100% clean from the test pathogen.

Below are some points to be considered, even if the hatchery operator has already implemented the best practice available;

- Post larvae may lose SPF status once it came out from the brood stock facility if there is no proper disease monitoring system implemented in the nursery
- Post larvae may be contaminated during the hatchery/nursery process, transportation etc.
- Disease testing/detection system has failed to detect a low viral load in a low prevalence population
- Contaminated in the farm etc

What is the detection limit in any testing system?

One possible reason for the failure to detect white spot virus during any hatchery/nursery stage could be the effect of temperature. A recent study in 2009 from Dr. Chalor Limsuwan's laboratory in Kasetsart University showed the effect of water temperature on the mortality of post larvae and juvenile white shrimp after a challenge with the white spot virus. The result demonstrated that 100% mortality of both, post larvae and juvenile were observed in groups kept in tanks at 24°C and 28°C. This was confirmed with a positive test with the PCR. However, no mortality was reported and PCR results were negative in the group kept at 32°C.

Quality post larvae is most critical

The other test was done by challenging the shrimp and then dividing them into different groups. The groups were maintained in water temperatures of 32°C for 1, 3, 5 and 7 days before dropping the temperature to 28°C. The accumulated mortality was recorded. A 100% mortality was observed in all groups where the temperature was maintained at 32°C for 1, 3 and 5 days before dropping to 28 °C. All these groups showed PCR positive results. However, there was no mortality with the PCR negative shrimp in the group maintained at 32°C up to 7 days.


Stressful conditions are in ponds with unstable blooms and ponds with accumulated uneaten feed and dead shrimp.

The result here may confirm that white spot virus can be replicated well below 28°C but could not show or lose infectivity at the temperature beyond 32°C. Therefore it may be difficult to get PCR positive result from the low contamination brood stock or post larvae when the temperature was maintained around 30-32°C in the hatchery/nursery facility. However, there may be others factor effecting the PCR test results such as sampling size, frequency etc,

Effect of environment, weather and pond conditions?

Once the less contaminated post larvae have been stocked in ponds during a summer crop, when the water temperature was also above 30°C, an outbreak may not occur unless the shrimp was being faced with fluctuations in temperature such as during the constant rains or cloudy periods.

In a winter crop, it may also be difficult to maintain the temperature in a hatchery facility above 32°C at all times. Therefore, the viral load may be higher but still too low to be detected. After stocking in a pond and post larvae are then exposed to the low temperatures in the pond, an outbreak can easily occur.

This is the last circle; the pond environment is an important factor triggering an outbreak.

Why are infections more common during the 25-45 days period?

If we look into a record sheet detail of a pond with a white spot outbreak, most of them were in ponds suffering from toxic conditions during the early stages of the production cycle such as ponds with poor preparation, ponds with unstable blooms, ponds with dead benthic algae and ponds with accumulated uneaten feed and dead phytoplankton. This causes a buildup of ammonia, nitrite or hydrogen sulphide, creating stress to the shrimp at around 25-45 days post stocking.

When the temperature fluctuates to less than 28°C during this period, there will be a higher chance of an outbreak. Thus pond water/soil quality monitoring and management during the first 45 days is very critical.

What can we do?

As we have seen, a temperature fluctuation to below 28°C can be a serious trigger of white spot disease. Thus the stocking schedule is very important. If we cannot avoid stocking the pond, in a period when the crop will move into winter, then using clean post larvae becomes another key factor. Based on the study from Dr. Chalor above, one recommendation is; to raise the temperature in hatchery tank to above 32°C for 7 days before stocking. This could reduce the chance of an outbreak. However, it may be very difficult to do this in practice, especially during the winter period.

I would think the best possible way for the grower to handle the situation is to take a bias sample for PCR testing before stocking. This bias sample can be obtained by taking a few thousand of post larvae at the 4-5 stage from the hatchery tank. The sample is kept in aquarium in an air conditioned room in which the temperature is around 23-25°C for 5 days. After that, some 150 weak post larvae are tested with a PCR. This could give a better result than taking the post larvae from the hatchery tank directly. The temperature shock should at least, stress the post larvae and possibly also let the virus replicate themselves to the detectable level, if present.

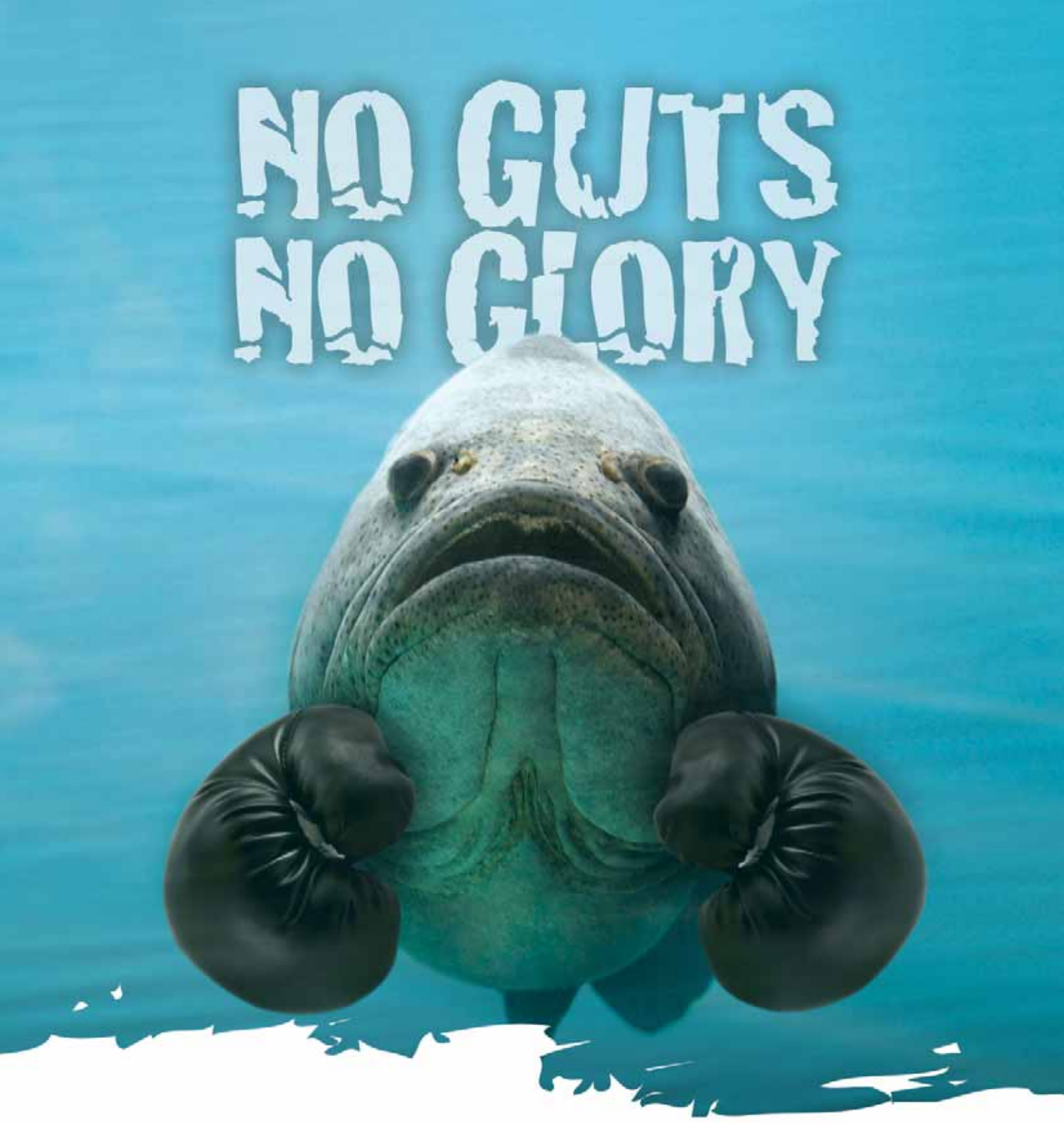
As for the other factors, we may need to select the ponds which are easy to manage for stocking. This can help to prevent/minimize the stress condition during the crop. Once the pond condition is stable, the shrimp should be healthier and stronger. Try to maintain the pond condition as best as we can since we cannot control weather. If the farms need to stock many ponds, the ponds should be stocked in 2-3 phases, at 3 week intervals and using different sources of post larvae. This could help to spread the risk over time and the risk on the source of post larvae At each phase, shrimp will be exposed to a poor weather condition period at a different age.

Finally, a biosecure facility should be implemented, to reduce the risk of cross contamination within the farm.

Once we minimize the risk of virus contamination from pond, and post larvae and try to maintain the best pond environment, a risk of outbreak could be minimal.

Authors note: This article contains my personal views on handling risks from diseases and is based on information obtained in Asia. It may not be applicable to other conditions/areas. Nevertheless, I hope it will be useful, at least for some farms. My special thanks for Dr. Chalor Limsuwan and his team for the work they have done.

Dr Pornlerd Chanratchakool is Technical Manager of Aquaculture Business Unit for Novozymes Biologicals. He is based in Bangkok, Thailand. Email: pchn@novozymes.com or pornlerd@gmail.com



BIGGER, STRONGER, HEALTHIER

grouper | catfish | shrimp | tilapia | carp | salmon | trout | seabream | yellow perch

natural micro feed ingredient
host-targeted immunoglobulin
improved FCR
supports gut health in challenged environments
big performance, big return on investment

Big Fish

aova technologies
powering animal agriculture®

www.usebigfish.com

Advances in fish health management:

Vaccination of tilapia against *Streptococcus agalactiae*

By John S. Clark, Warren A. Turner, Angus MacNiven and Nantarika Chansue

This tool in fish disease management and control in intensive tilapia farming will become a cornerstone for further development of the industry.

World tilapia production has risen from 830,000 tonnes in 1990 to 1.6 million tonnes in 1999 and again to 2.5 million tonnes in 2005 (Josupeit, 2007). China is the world's largest producer of the tilapia, producing over one million tonnes in 2005, followed by Egypt (300,000 tonnes), Indonesia, Philippines (200,000 tonnes each) and Thailand (100,000 tonnes). By 2010, world tilapia production is expected to reach 3.5 million tonnes (Josupeit, 2007).

Risks from diseases

With increases in production come increases in risk of loss, particularly from diseases. The most significant disease causing losses in tilapia culture is Streptococcosis. Streptococcal diseases of fish are becoming more common and when they do occur, significant losses can result. Some aquatic Streptococcal species may cause disease in humans in unusual circumstances. They do not usually affect healthy people.

In addition to bacteria in the genus *Streptococcus*, there are several other closely related groups of bacteria that can cause similar diseases, including *Lactococcus, Enterococcus*, and *Vagococcus*. Streptococcal infections in fish can cause high mortality rates up to 75% over a period of 3 to 7 days. Some outbreaks, however, are more chronic in nature and mortalities may extend over a period of several weeks, with only a few fish dying each day.

Issues with *Streptococcus*

A typical history suggesting that Streptococcus may be the cause of disease in a group of fish might include reports of abnormal swimming behaviour, often described as spiraling or spinning. Any time fish are observed behaving in an unusual manner, Streptococci should be considered as one of the possible causes; however, not all infected fish show abnormal behaviour.

Affected fish may exhibit one or more of the following clinical signs, depending upon the species: erratic swimming (such as spiraling or spinning); loss of buoyancy control; lethargy; darkening; uni- or bilateral exophthalmia ('pop-eye' in one or both eyes); corneal opacity (whitish eyes); haemorrhages in or around the eye, the gill plate, base of the fins, vent/anus, over the heart or elsewhere on the body; ascites (dropsy/bloating) and ulcerations. In some cases, the fish may show no obvious signs before death. Of the signs listed above, haemorrhage, pop-eye, spinning, and rapidly progressing mortalities are among the most frequent observations.

Most recently, *Streptococcus agalactiae* has become an important pathogen of tilapia in Asia and the Americas (Klesius et al., 2005). It is this pathogen that is responsible for much of the mortality in Thai tilapia culture in recent years (Tan et al., 2007). According to Maisak et al., (2008), of 60 isolates from infected tilapia from different areas of Thailand, 53 were *S. agalactiae* (88%) and only 7 (12%) were *S. iniae*. Some symptoms appear different from those in S. iniae infections, in particular the presence of blisters/abcesses on the jaw and on the caudal area, whilst others are extremely similar eg, melanisation of the skin and lesions of the skin.

Tilapia with lesions from Streptococcus

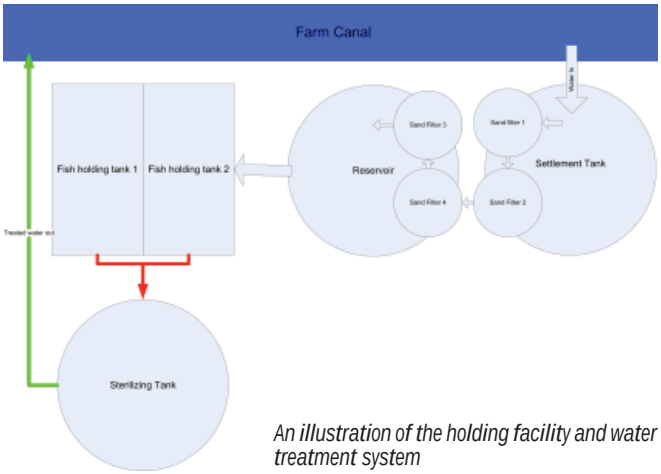
The taxonomy of the genus *Streptococcus* is complex and one of the results of this complexity is that a vaccine for *S. iniae* may not prove efficacious in the prevention of *S. agalactiae* infection. This has been clearly demonstrated by Evans et al., (2005); there appears to be very little or even no cross-protection between these species.

Protection with injection vaccine

In the present series of studies, an injectable vaccine was developed for the protection of tilapia against *S. agalactiae* infection in Thailand. Its safety and efficacy were established during this study and the commercial implications of having such a vaccine available for use are discussed.

In a series of laboratory scale trials, the holding facility used is described in the diagram. Water from a supply canal is first pumped into a settlement tank. After settlement, the water is passed through a series of four sand filters to remove particulate material into a reservoir tank. Water is treated with chlorine to eradicate any potential pathogens

Diagram 1. Vaccine system setup



An illustration of the holding facility and water treatment system

from the culture water. Residual chlorine is removed using strong aeration. Water can then be used to supply the fish holding tanks.

Water is also supplied to the challenge facility which contains 12 net cages each. These net cages hold the replicates for each treatment. During the safety component of the experiment, water is allowed to flow through the system, but during the challenge phase, the water exchange was terminated and challenge water was passed to the sterilising tank. Prior to discharge of the water, a chlorine treatment was applied. This ensured there was no discharge of potential pathogens into the environment.

Trial groups

Three trial groups were used. These were control (untreated, positive control (injected with saline) and test (injected with vaccine). There were three replicates for each group holding 20 fish each.

In the first phase of the trials, fish used in the experiment were of 2 strains; Thai Red and GIFT. The average body weight of the test fish was 20g. At termination of the experiment, red fish weighed 30g. Fish were fed daily at 1% of body weight and any moribunds or mortalities were removed for examination.

In the second phase of the trials, fish used in the experiment were of the following strains; Genomar, Chitralada, Nam Sai, Thai Red and GIFT. The average body weight of the test fish was 20g. At termination of the experiment, fish weighed 30g. Fish were fed daily at 1% of body weight and any moribunds or mortalities were removed for examination.

Vaccine

The vaccine was a sterile, formalin killed adjuvanted vaccine containing two strains of *S. agalactiae*. Cell density of each strain within the vaccine was 5x 10^{11}cells/ml. The two strains used were isolated from moribund tilapia sourced from 2 locations in Thailand; Nakhon Pathom and Prachinburi. The vaccine was stored at 2ºC under refrigeration until required.

The injection route is the most effective route although some may question the high labour costs.

Safety

Safety studies were conducted over 56 days. Controls were not injected, but a positive control was present which was injected with 0.1ml of saline solution. The vaccine group was injected with 0.1ml of vaccine applied intra-peritoneally (see photo) by a Kaycee multi-jector after

anaesthetization of the fish. At the start of the experiment fish were first sedated using 0.1g/l phenoxyethanol. Fish are then returned to their respective tanks.

At the start of the challenge period, all surviving fish were injected with 0.2ml of pathogen in Tryptic Soy Broth.

Efficacy

After the 56 day safety study, surviving fish in all treatments were anaesthetised with phenoxyethanol, then fish were challenged by intra-peritoneal injection of live pathogen (0.2ml of $1.3x10^9$ CFU/ml); this dose was considered optimal for this size of fish in previous research by Janenuj (pers.comm.) The pathogen was isolated from moribund tilapia from a farm in Prachinburi by the Aquatic Animal Health Research Institute in Kasetsart University, Bangkok, Thailand. Pathogen identification was carried out using API Strep from the same institute.

The pathogen challenge solution was prepared in Tryptic Soy Broth and contained 1.3 x 10^9 Colony Forming Units/ml broth (prepared by IQA LAB, Bangkok, Thailand. Mortalities were monitored daily and recorded, and the appearance of symptoms was similarly recorded. The experiment was terminated 14 days after challenge. Actual survivals were calculated along with RPS values. The pathogen was re-isolated from moribund fish and compared with the challenge organism using API Strep at AAHRI, Kasetsart University, Thailand.

Figure 1. Mean % survival of Thai red tilapia to day-56 during a vaccine safety test (2007)

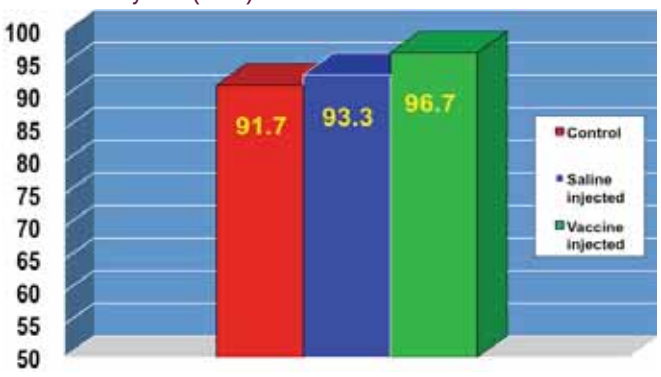
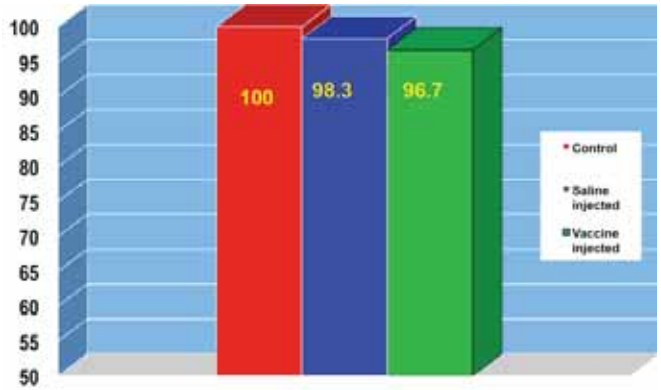


Figure 2. Mean % survival of Gift 7 tilapia to day-56 during a vaccine safety test; (2007)



Results

In 6 separate trials this tri-valent *S. iniae* vaccine proved to be extremely safe 56 days post-injection, with survival values ranging from 97% to 100% (Figures 1 and 2). Safety by intra-peritoneal injection route could therefore be considered safe (Clark et al., 2009a, 2009b and 2009c, in press).

Figure 3. Mean % survival of Thai red tilapia to day-14 during a pathogen challenge (2007).

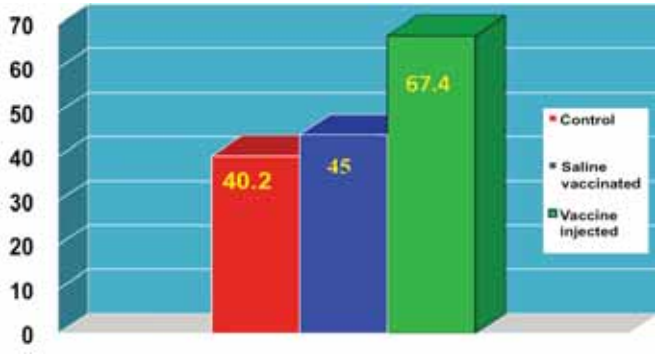
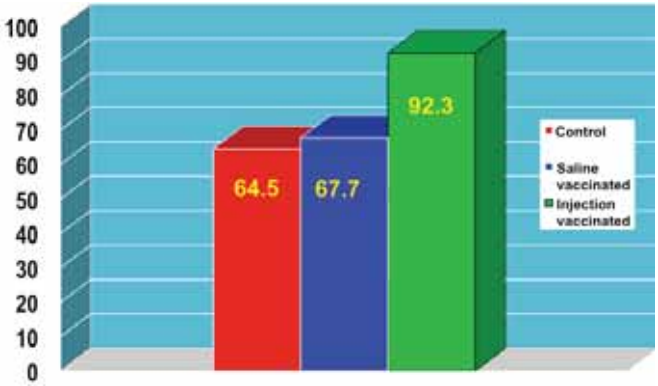


Figure 4. Mean % survival of Gift 7 tilapia to day-14 during a pathogen challenge (2007).



Again, in 6 separate challenge trials using a high dose of live pathogen isolated from infected tilapia *Oreochromis niloticus* ($1x10^9$ CFU/ml), survival rates of vaccinated fish, both single and double treated doses, were high. Typical safety data is shown in Figures 3 and 4. RPS values were high in both experiments (Figures 5 and 6)

Figure 5. Mean RPS of Thai red tilapia to day-14 during a pathogen challenge (2007).

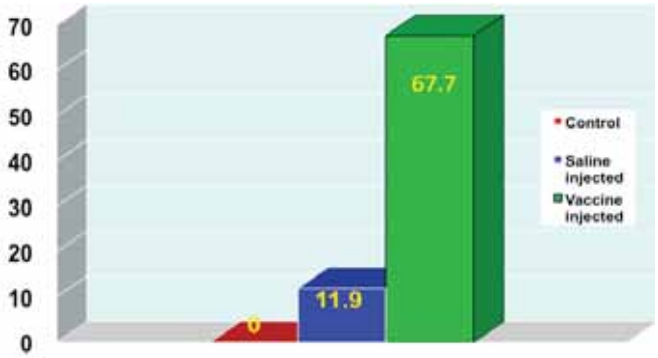


Figure 6. Mean RPS of Gift 7 tilapia to day-14 during a pathogen challenge; 2007.

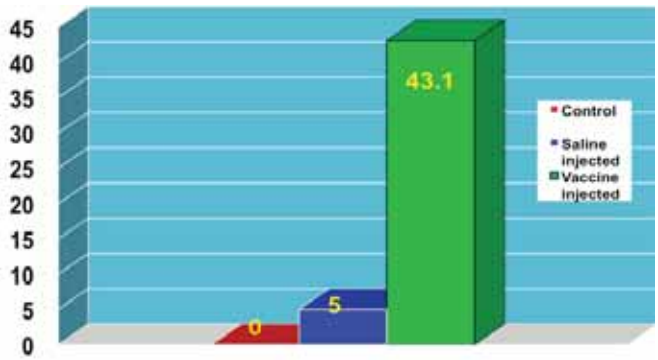
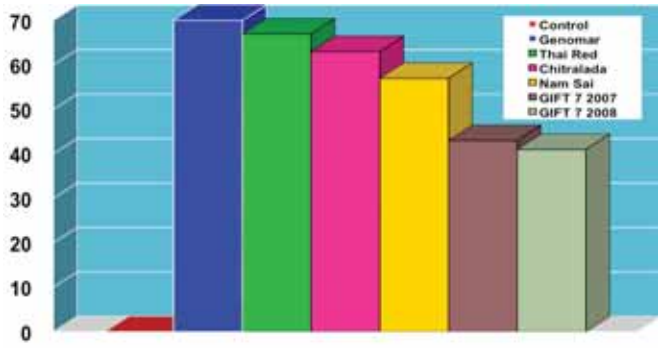


Figure 7. A summary of RPS values in tilapia corrected to control zero (2007/2008).



but from Figure 7 it is noteworthy that in fish of the same size injected with the same dose of the same pathogen, RPS values are variable. It was obvious from this data that different strains of tilapia displayed different susceptibility characteristics towards *S. agalactiae* infections. RPS Values for the vaccine ranged from a low of 41 to a high of 71 depending on the severity of the infection and the strain of tilapia.

Vaccination of fish species in Asia will become the industry norm in the not too distant future. In many ways it will mirror events in the salmonid industry some 20 years ago. Whilst high value marine species such as grouper merit attention in terms of vaccine development (Clark and Chansue, 2009), so too do more commonly cultured lower value species such as tilapia and catfish.

Vaccination options

In these preliminary studies carried out over a 2 year period, it can be seen that Streptococcosis in tilapia can be controlled via injection vaccination. RPS values can be high although they are masked to some degree by genetic variability. Re-infection studies using a re-isolate produced the same symptoms in infected fish (see photo), and in a more recent trial in brood stock cages, the injection vaccinated fish exhibited

Melanisation of the skin

Holding tank for red tilapia

Red tilapia in uncovered facility used for challenge tests

Vaccination by immersion

survivals of 65% six months post-vaccination compared to 49% in the control. Analysis of brain tissue of affected individuals showed that over 99% of the isolates were in fact *Streptococcus agalactiae*. Analysis was conducted at VMAARC, Faculty of Veterinary Medicine, Chulalongkorn University. This vaccine is still being improved but has already demonstrated significant cost-effectiveness to the farmer.

While some may question labour costs, fish stress etc. as barriers to injection vaccine use, other forms of this vaccine are being tested. An immersion form is under test, although thus far it is not as successful as the injectable route. Immersion RPS values tend to produce RPS values 2x lower than injectable forms (Evans et al., 2004), and this in part could be due to low antibody response values in fish serum compared to those in mucous in injection vaccinated fish (Delamare-Debouteville et al., 2006).

Oral vaccination is considered the optimal vaccine delivery system but this too is problematic, particularly in terms of an optimal vaccine delivery system. As seen in one commercial trial with the tilapia, however, an oral vaccine form has produced a similar survival result after 6 months of cage culture to an injectable form, around 69% being achieved. This experiment is in need of repetition to ensure consistency, but there are strong grounds for optimism in this case.

However, whilst vaccination may well be a prime tool in prevention of disease, it should not be viewed as a panacea for all illnesses. Numerous other tools are available to help prevent disease and disease vectors.

Finally one should consider why pathogens such as *Streptococcus agalactiae* have become problematic wherever tilapia is cultured. There are large movements of fish between countries and it should not be surprising that pathogens move with the fish. If a large ecto-parasite such as the skin fluke *Benedenia* can be moved from country to country via marine fish fry, something as small as *Streptococcus* can be moved too. This is particularly true in the case of *Streptococcus* as it can "hide" within white blood cells of the fish (Zimmermann et al., 1975).

In conclusion, vaccination has a good future as a tool in fish disease management and control in tilapia, and in either immersion, injectable or oral forms (or combinations thereof), will become a cornerstone for further development of the industry.

Blister on fish challenged with re isolate.

John S. Clark obtained his Ph.D. in micro-encapsulation at Heriot-Watt University in Edinburgh, Scotland in 1983. He currently works on formulation of anti-parasitics, vaccines, nutritional/health products for a variety of clients. Email: aquavax2003@yahoo.co.uk

Warren Turner, MSc in Aquaculture from Stirling University in Scotland in 1991, was Research Associate at AIT in Bangkok, Thailand. Since 1994, he is Managing Director of Nam Sai Farms, Prachinburi, Thailand. Email: warren@tilapiathai.com

Angus MacNiven PhD, is the managing director of FarmAqua Systems Ltd. The company supplies farm equipment, training and consultancy services for sustainable aquaculture. Email: angus@farmaqua.com.

Dr. Nantarika Chansue is the Associate Professor and Director of the Veterinary Medicine Aquatic Animal Research Centre (VMAARC) at Chulalongkorn University in Bangkok. She specialises in disease identification and control methods for shrimp, marine and freshwater fish, turtles and aquatic mammals. Aquatic immunotoxicology has been her major research interest for some 20 years.

Do you know where your trace minerals come from?

...Well, we do.

In a time where product quality and traceability have never been more important to the feed industry, Alltech® is proud to introduce Q+ (Quality Plus™).

Q+ is Alltech's mineral quality program unique to the Bioplex® range of organic trace minerals and forms an integral part of the Alltech Quality System (AQS).

This positive release program guarantees that all incoming batches of inorganic trace mineral sources and final Bioplex batches are tested for dioxin, PCBs and heavy metals prior to sale.

Q+ also integrates the Bioplex quality measures which has been developed over the last 18 years, guaranteeing total chelation and mineral content.

Alltech has a commitment to manufacturing reliable and traceable ingredients and with the Q+ program, we have absolute confidence in the quality, safety and performance of every batch of Bioplex minerals that leaves our facilities.

Alltech®
...naturally

To find out more about Alltech's natural nutritional solution programs and traceability, please contact your local Alltech representative
or email: info@alltech.com
www.alltech.com

Proud sponsor of the
Alltech FEI World Equestrian Games 2010™

Study on common diseases in farmed pangasius in the Mekong Delta

By Nguyen Hoang Vu and Marc Campet

The catfish *Pangasius hypophthalmus* is the most common farmed freshwater fish species in Mekong Delta as well as in Vietnam. Production rose from 40,000 tonnes in 1997 to 1,200,000 tonnes in 2008. Following this rapid development in its farming, diseases have now become a major concern.

In 2006, feed company and specialist in aquaculture nutrition, Ocialis, set up a technical laboratory called the 'Fish House' in An Giang province. This province is the centre for pangasius farming in the Mekong Delta. From this 'Fish House', Ocialis offers free technical services to its fish farmers. Monitoring fish diseases is one area of importance for this centre. This article reviews some common diseases affecting pangasius in the Mekong Delta in 2008 based on observations at the centre. This covered 460 fish samples sent by farmers from all over the Mekong Delta to the laboratory for disease diagnostics (Figure 1).

In 2008, diseases in pangasius fish occurred all year round with two peaks: June to August and November to January. This showed an effect of season on fish disease occurrences. The period from June to August is the flooding season in the Mekong Delta with changes in water quality in the Mekong river, the main water source for pangasius farming. The period from November to January is considered as the 'cold' season with low temperatures as compared to the rest of the year (Figure 2)

Bacterial diseases

Bacterium was the major the causative agent of the disease. Some 74 % of fish samples had bacterial infections common in pangasius fish. These were white spot, swollen head and white tail (Figure 3).

White spot

This was the most serious disease in pangasius farming, caused by the gram negative bacterium *Edwardsiella ictaluri*. Typical clinical signs were countless white spots on the liver, kidney and spleen. A high mortality rate ranging from 30 - 90 %, long- term occurrence and frequent recurrences were some of the signs of this disease. Some 55% of the received samples were found infected with WS, regardless of fish sizes. It seemed that the disease occurred all year round but with an increasing frequency from June to August.

Swollen head

Gram negative bacterium *Aeromonas hydrophila* was the causative pathogen. Infected fish usually showed swollen head, exophthalmia, hemorrhage in the anus and visceral tissues. This disease caused scattered to massive mortality (5 to 30 %) and could be considered as the second most damaging bacterial disease in the pangasius after white spot. It made up 12 % of total fish samples. Swollen head occurred at all times of the year, especially after fish stocking. Injury, shock or stress after harvest and transportation, water pollution, were the main reasons for the outbreak of this disease.

White tail

The gram negative bacterium *Pseudomonas dermoalba* was a causative agent of this disease. Infected fish was observed with typical symptoms: a white spot spreading out from the tail to the head and as far as the dorsal and anal fins. This resulted in a whitish posterior part of fish body, rot and loss of tail. Heavily infected fish showed a "tail-up and head-down posture" (handstand disease). This disease caused quick and massive mortality and affected mainly young fish. Bad handling during harvest or transportation, polluted water environment, high temperatures were favourable conditions for this bacterium. White tail occurred in 7% of total fish samples.

Figure 1. Number of fish samples received during 2008.

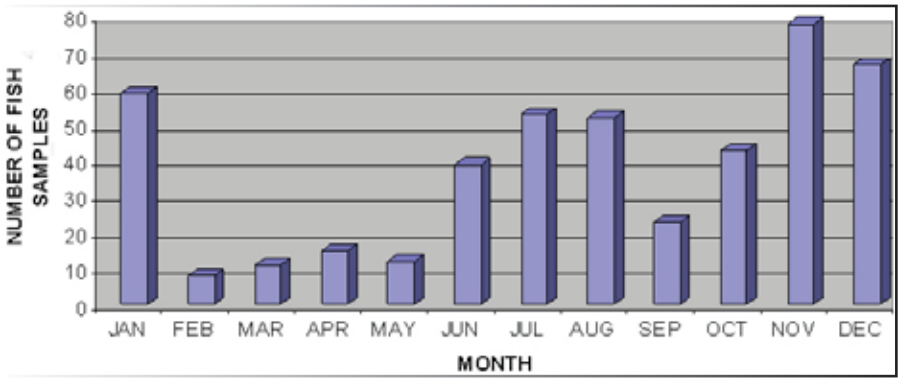
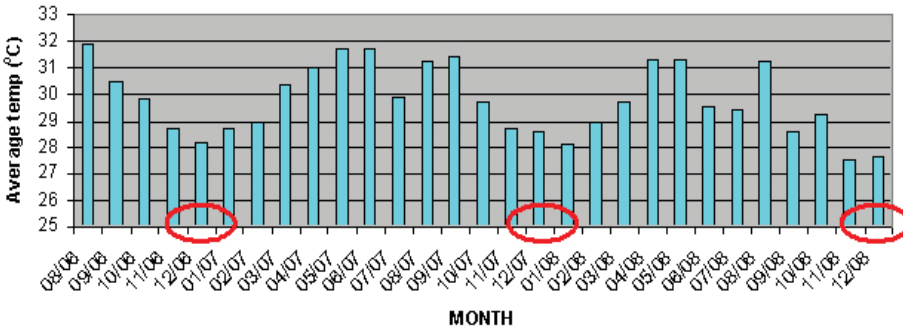


Figure 2. Average water temperatures in pangasius ponds in the Mekong Delta by month.



Parasitic diseases

The gill fluke (*Dactylogyrus*), ciliates (*Trichodina, Epistylis*), myxozoa (*Myxobolus, Henneguya*), round worm (*Nematoda*) were common parasites. Some 90 % fish samples were found infected with one or some of the these parasites.

a DSM Product

PROTECT YOUR ASSETS
WITH NEW ROVIMIX® AQUA PREMIX

Quality for Life™

Find out more about our Quality for Life™ program, visit **www.qualityforlife.com**

Because we at DSM manufacture our own vitamins and have arguably the most stringently controlled and modern premix factories in the world, your feed is guaranteed quality, reliability and traceability.

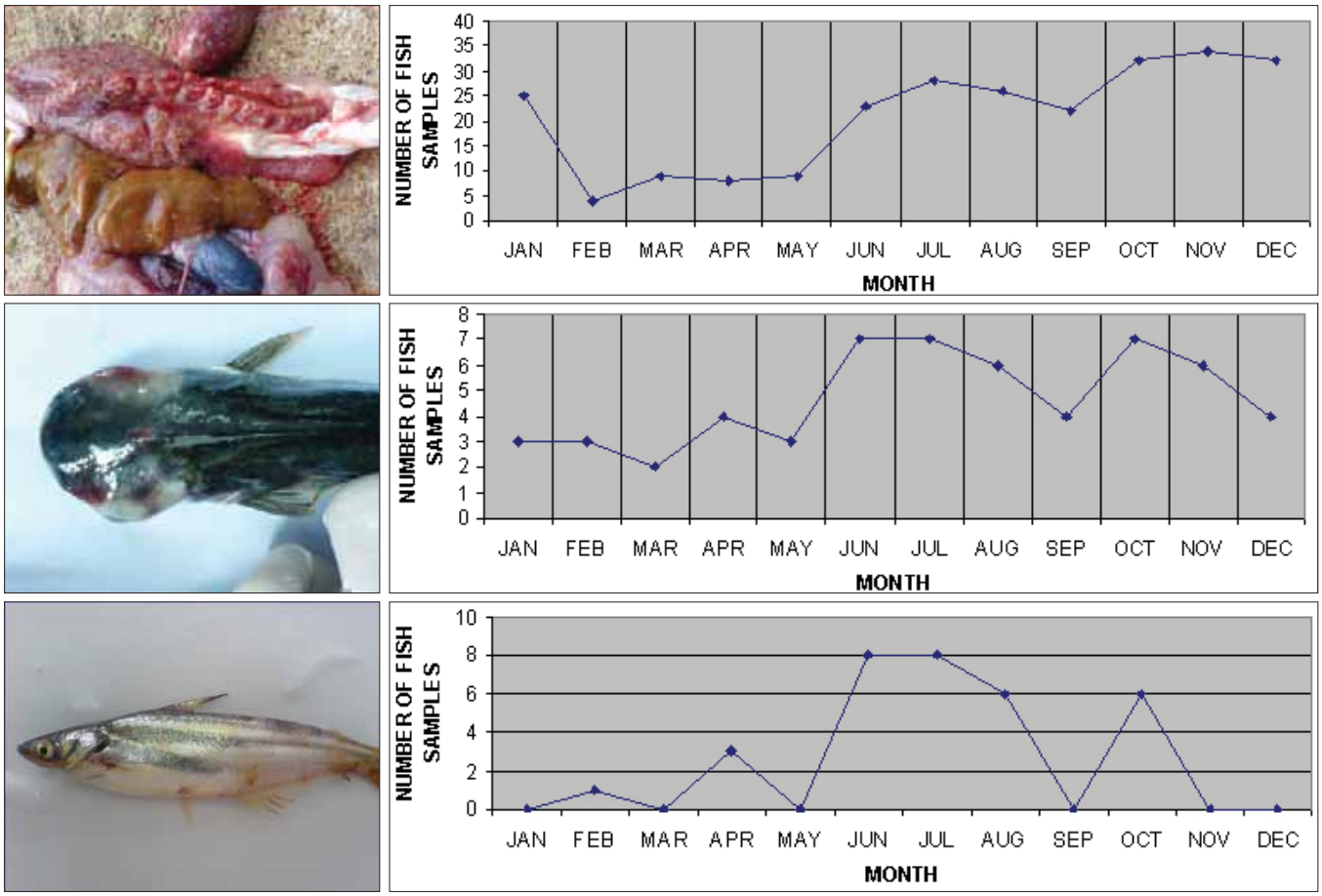
New Aqua Premix formulation is scientifically designed to meet individual farming needs and keep your business and your assets in great shape.

DSM Nutritional Products
Asia Pacific Pte Ltd
78 Shenton Way, #21-01, Singapore 079120
Tel: +65 6325 6200, Fax: + 65 6220 1976
www.dsmnutritionalproducts.com

Rovithai Limited
Aquaculture Centre Asia Pacific
17/1 Fl., Maleenont Tower, 3199 Rama IV Road
Klongton, Klongtoey, Bangkok 10110, Thailand
Tel:+66 (0) 2264 9800, Fax:+66 (0) 2264 9899

Unlimited. DSM

Figure 3.



Gill fluke

Gill flukes are monogenetic trematodes settling in fish gills. Some 70% of fish samples were infected with this gill fluke. It was noticeable that *Dactylogyrus* infection frequently occurred together with white spot disease as over 75% of white spot samples were infected with *Dactylogyrus*. It seemed to be the main causative agent initiating white spot infection.

Ciliates

These parasites are ciliate protozoans that are very popular in freshwater fish in general and in pangasius in particular. Some 21% of fish samples were found infected with these parasites. Skin and gills of fish were the main infection targets. Heavily infected fish frequently move up their head over the water surface, with head shaking movements. Thus, the disease is also called "head shaking" disease. Fish at any stage of development could be infected by these parasites. They cause massive mortality in young fish (larval rearing stage) and also secondary bacterial problems in larger size fish.

Myxozoans

These myxozoans are internal and external parasites. Gills, skin, fins, muscle, cartilage, brain, spinal cord, intestine, liver, gallbladder, kidney and many other internal organs are targets for infection. White or yellowish nodules (cysts) of 2-3 mm could be found in infected fish. These parasites caused direct harm to fish health as it affected growth and reduced fish market value. Some 14 % of total fish samples were infected with these parasites.

Worms

This kind of round worms of 5 to 8 mm in length, was usually found in the intestinal tract, gall, swim bladder and body cavity with regular attack on the gall bladder . It seemed to occur all year round but higher occurrences were reported during the flooding season (June – August). Larger fish (> 500g) were more susceptible to this disease. Some 3% of total fish samples were found infected with this worm but 100% of the larger fish were infected. Deep internal lesions were found on internal organs with, in some cases, obstruction of gall bladder causing skin and meat yellow colouration.

Nguyen Hoang Vu is Technical Manager at Ocialis Vietnam since 2006. Previously, he worked on tilapia seed and grow-out production at Vinh Hung Ltd and as pangasius seed production manager at Agifish. He has worked on pangasius species propagation under a cooperation program with Cirad institute - France.
Email: vufishhouse@evialisvietnam.com

Marc Campet is Regional Technical Manager of Ocialis Vietnam, based in Ho Chi Minh City.
Email: mcampet@evialisvietnam.com

Microbial dynamics in shrimp ponds

By Marcos H. S. Santos, Tadeu de Silva, Jose Torres, Roseli Pimentel Silva, David Moriarty and Olivier Decamp

Understanding the microbial ecological process in ponds and in the shrimp intestinal tract is vital to maintain and optimize productivity without prophylactic use of hazardous substances. The maintenance of good water quality and the control of disease are closely linked to managing the communities of microbes and phytoplankton.

Healthy shrimp in a pond will be responding to variables that include interactions, with each other, interactions of shrimp and the pond physico-chemical environment (especially oxygen concentration) and interactions of the microbial community, in particular the phytoplankton and the bacteria. As ponds are shallow, water chemistry is influenced primarily by the chemistry of the soil and sediment (material settled on to the pond bottom, including dead algae, waste feed and faeces.) These are governed by bacteria activities.

Most organic matter is decomposed by aerobic heterotrophic bacteria in the water column and sediment surface. The remaining organic matter is broken down in the anoxic zone of the sediment mostly by fermentative bacteria, of which clostridia are important constituents, but it also includes vibrios. Short chain fatty acids are the final products of fermentation by these bacteria and they are then used as nutrients by the sulphate-reducing bacteria and respired to CO_2. Thus organic matter in the sediment that is not oxidised in aerobic and other respiratory processes will finally be converted to carbon dioxide by these bacteria. The toxic hydrogen sulphate is the other main product of this process, and thus it is important that fermentation be minimised in a shrimp pond. The strategy that can used to achieve this is discussed below.

Probotics, which are live, natural, beneficial bacteria, are now accepted and widely used in shrimp aquaculture. They are designed to modify the microbial communities in the alimentary tract of animals and in their aquatic environment and thus also compete with and displace pathogens.

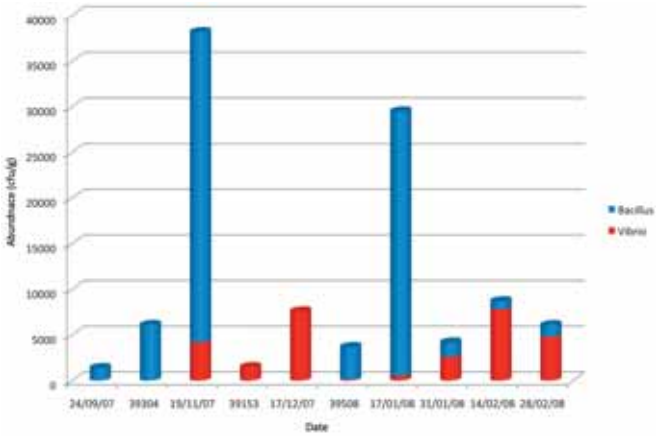
In this article, we report on field data from Potiporã (Queiroz Galvão Group), a major aquaculture company located in RN, Brazil. Their operations at the company include a hatchery unit with an overall production capacity of 150-200 million post larvae per month, an outgrowing farm with 900 ha total pond area, capable of producing up to 6,000 tonnes of shrimp per year from ponds stocked at 18-30/m^2, and a processing/packaging plant with a daily capacity of 45 tonnes of shrimp. The company has access to modern techniques (molecular biology, pathology, microbiology) that are used as part of the disease prevention and shrimp genetic programs.

Optimise yields

In 2007, Potiporã started using a range of probotics in their larviculture and ongrowing operations. These were a combination of Sanolife PRO-FMC (mixture of Bacillus strains, supplied as dry spores, coated on feed by the feed-mill) and Sanolife PRO-W (mixture of Bacillus strains, supplied as dry spores, which was applied directly to the pond water. As part of their quality control analyses, Potipora confirmed the abundance of viable spores and the composition of the commercial products. For example, their Real Time PCR analyses confirmed the absence of *Bacillus cereus* contaminants from these products.

The combination of Bacillus strains products in feed and water improved the farm productivity, i.e. biomass, survival and profits. As part of their investigation, Potiporã also analyzed numerous water and soil samples in order to understand the microbial dynamics better. These data indicate that the Bacillus strains were abundant in the sediment of the pond (Figure 1).

Figure 1. Abundance of Bacillus and Vibrio (cfu/g soil wet weight) in the sediment of ponds.



Difference in colour in the outlet of Sanolife-treated ponds (light-colour, in the middle of the picture) and control ponds (black water, right side of the picture). Source: Indonesia.

The reasons for higher numbers of the Bacillus in the sediment than in the water column were:

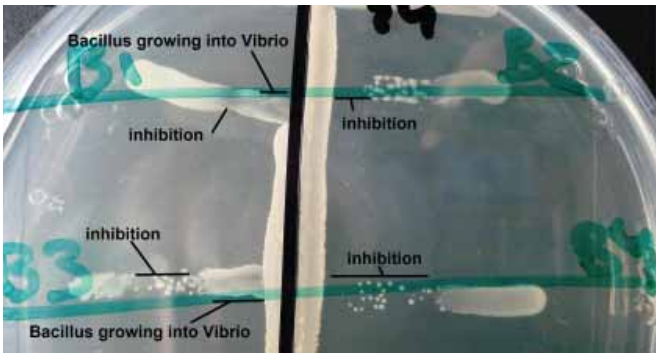
- Bacillus strains would stay in the water suspension during a short time before sinking to the bottom, maybe via the production of flocs. Bacillus are known to produce exopolymer flocculants and laboratory tests confirmed the ability of the Bacillus strains in improving floc production under the right conditions. More interestingly, the Bacillus strains have been shown to improve the nutritional quality of bioflocs (with significantly higher protein and lipid content) and the growth performance of shrimp reared in the presence of probiotic (Ballester and Wasielesky, pers. comm.).
- The Bacillus coated on feed would remain in the uneaten feed pellet and in the faeces that sink to the bottom of the pond. These Bacillus would inhibit pathogens and degrade waste products when the faeces are released into the pond environment. The ability of the Bacillus strains to survive the passage through the shrimp gastrointestinal tract, and germinate, was also evaluated at the IATEC trial facilities (INVE, Thailand). Shrimp were fed for 3 days with either control diet (coated with salmon oil) or Sanolife PRO diet (coated with salmon oil + Sanolife PRO (final concentration $1.5x10^8$ cfu/g). Shrimp faeces were collected and sent immediately to the laboratory for analysis. The analyses confirmed concentration of Bacillus in the shrimp faeces in the order of $1.5x10^7$ cfu/g faeces. With a dry matter of 10.6%, this represents $1.4x10^8$ cfu/g dry faeces.

Inhibit pathogens

As documented in previous publications, these Bacillus species were selected for their ability to inhibit pathogens directly (Figure 2). Furthermore, they inhibit pathogens indirectly by competitive exclusion (ie competition for nutrients and attachment sites in the gut or an algal particles and waste material in ponds.)

These data also confirm the scientific publications suggesting that (1) Gram-positive bacteria comprise a relatively large proportion of the bacterial communities in habiting marine sediments (Gontang et al. 2007, Moriarty and Hayward, 1982);) (2) the dominant species of Bacillus reported from Brazilian marine sediments include *B. subtilis*, *B. licheniformis* and *B. pumilus* (Miranda et al, 2008). The range of probotic includes strains of *B. subtilis*, *B. licheniformis* and *B. pumilis*.

Figure 2. Inhibition of Vibrio strains (Brazilian isolates, horizontal streaks) by a strain of Bacillus (vertical streak)



Conclusion

These data confirm the benfit of using specifically selected strains of Bacillus for their ability to degrade waste organic matter, improve water quality (Figure 4) and out compete Vibrio on the upper sediment layer, the area of the pond where shrimp spend most of their time:

- The continuously produce a wide range of digesive exo-enzymens, which makes them expecially suitable for improving water and sediment quailty and for assisting digestion in the shrimp mid gut.
- Bacillus grow aerobically and certain selected strains also live in the absence of oxygen or at low oxygen tension, allowing them to live in the mid gut of shrimp as well as in anoxic sediment particles.

Marcos H. S. Santos, Tadeu da Silva are with INVE do Brasil, Brazil, Jose Torres and Roseli Pimentel Silva are with Potiporã, Brazil and David Moriarty is with the Centre for Marine Studies, The University of Queensland, Australia as well as with INVE Aquaculture Health, Thailand. Olivier Decamp is with INVE Aquaculture Health, Thailand. Email: Olivier Decaomp (olivier@inveasia.co.th)

A feed is only as good as its ingredients – Optimising ingredient evaluation technology for aquaculture diets – Part II

By Brett Glencross

This second part in the ingredient evaluation series discusses the assessment of some of the more traditional parameters of ingredient assessment studies. In particular those parameters that affect feed intake, growth, survival and feed utilisation.

To improve the sustainability of diets for aquaculture species there is a need to be able to use a wide range of alternative ingredients. These satisfy formulation constraints for the specific nutrient, energy and processing requirements of each intended diet. However, prior to the use of any particular ingredient, it is critical for that ingredient to undergo evaluation to be able to consider its potential nutritional limitations. This nutritional evaluation process has several key facets that need to be considered to be able to provide a clear indication of the potential that any ingredient may have for use in an aquaculture feed.

This ingredient evaluation process has been reviewed in detail in: *Glencross, B.D., Booth, M. and Allan, G.L. 2007. A feed is only as good as its ingredients – A review of ingredient evaluation for aquaculture feeds. Aquaculture Nutrition 13, 1 34*. This is the second part of a series of three articles, which are largely abridged versions of that review. For further details and references readers should refer to the original article. In this second part of the series the assessment of ingredient palatability, growth and utilisation are considered and their importance in the ingredient evaluation process considered.

Autofeeding systems are routine pieces of equipment on most industrial fish farms in the developed world.

Ingredient palatability

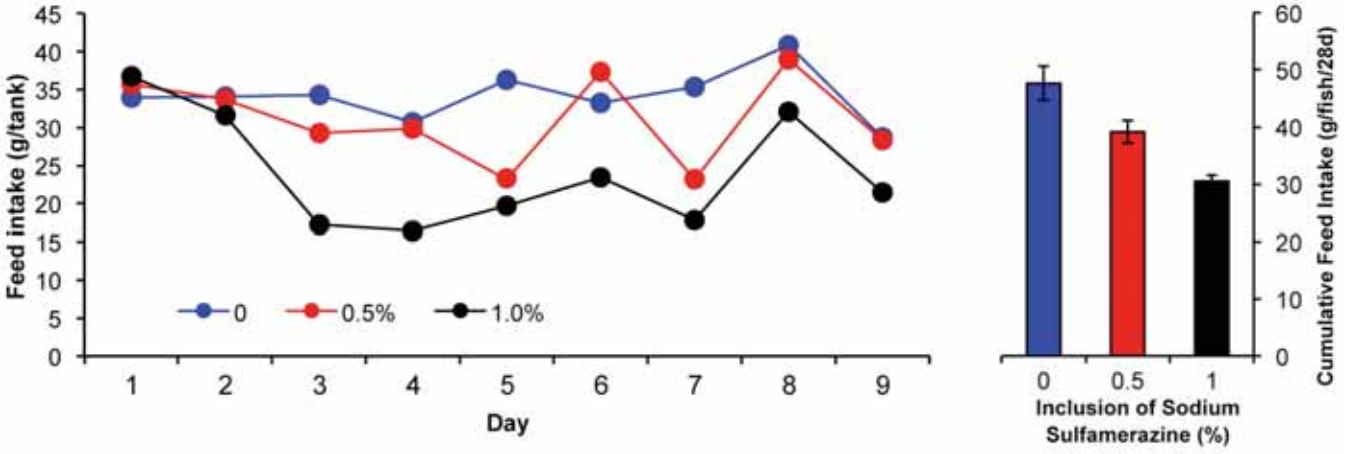
For nutritional research to carry any credibility it has to be based on the actual ingestion of nutrients by an organism, therefore one of the key assessment criteria of that research should be some demonstration or assessment of food intake by the animal. From such an assessment it then becomes valid to base the measurement of a response by the animal relative to that feed intake. However, assessing feed intake, particularly for aquatic animals, is not necessarily straightforward or simple parameter to measure (Jobling et al., 1995).

If the ingredient has a negative effect on feed intake then, irrespective of how digestible the nutrients and energy from a particular ingredient might be it is of limited use in a feed formulation. Although there may be strategies to avert or resolve palatability problems of certain feed ingredients using ingredient processing or feeding stimulants, clearly it is better if these problems can be avoided outright.

Variability in feed intake

For an animal to be able to demonstrate variability in feed intake, it must be given the chance to refuse feed. Therefore ensuring that the ration fed is above apparent satiety is important. Feed preference studies are one way of assessing affects on intake. A simple method published by Helland et al, (1996) provides an easy way of determining feed intakes in tanks of fish. By feeding to excess and simply collecting the uneaten feed and using compensation factors to account for solubilisation losses, a reasonable estimate of feed intake can be achieved. This method has strengths over fixed ration feeding regimes in that it allows for an element of self-discrimination of the feeds by the fish.

Figure 1. Daily feed intake (a) by tanks (n=3) of rainbow trout (n=20/tank) fed diets with either 0%, 0.5% or 1.0% sodium sulfamerizine in the diet and the same dietary treatments represented as cumulative feed intake (b) per fish over a 28 day period. From Glencross et al (2006).



The use of self feeding systems, such as those managed through computer controlled feedback response mechanisms are a further advancement. This option allows the discrimination of feeds by fish and certainly assists in removing human error from the feed intake assessment process. In examining the feed intake response of fish to a novel diet, the use of appropriate control treatments, provide an extra degree of confidence in the ability to discern feed intake variability.

One of the many problems observed of some experiments designed to examine the effects of ingredients on palatability and growth is that they end up with no significant effects on either parameter. While this is often used to argue that the ingredient is palatable to the test animal up to the inclusion level studied, it can be difficult to determine the degree of confidence in such results when the experiments are run without controls designed to demonstrate a specific effect, such as a planned decrease in feed palatability.

Intake over time

Feed intake as intake variability over time can also be an important issue to consider (Figure 1). It has been noticed that adaptation to some diets occurs slower than others and it is suggested that this was primarily a sensory discrimination by the animal against certain feeds until it becomes accustomed to them. To enable such an examination in feed intake variability an assessment of the daily feed intake of individual replicate tanks is required.

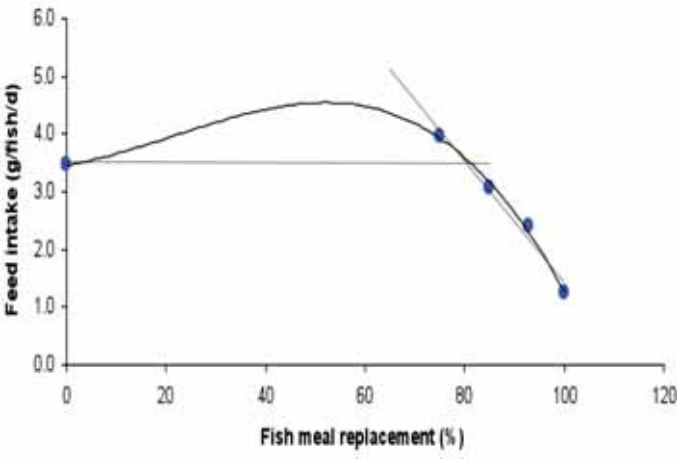
Ingredient inclusion studies are the simplest way to examine effects of ingredients on feed intake. In this strategy, an ingredient is included into a series of test diets at increasing inclusion levels while the nutrient content of the diet is kept constant. The reference and test diets are then fed to apparent satiety to replicate groups of fish for a period of time, usually several weeks. Differences in feed intake between the reference and test diet can then be argued as reflective of the apparent palatability due to the test ingredient. Ideally a range of inclusion levels that cover what would be the practical inclusion levels should be used, as this also allows examination of critical palatability levels or break-points in a practical context (Figure 2).

Defining effects on growth and utilisation

An additional issue to resolve for ingredient evaluation is in determining the capacity of the animal to use the digested nutrients for growth. However, there are many elements to be considered in defining growth. In the simplest essence this constitutes the gain in weight by an animal; this can also be extrapolated to other features such as protein and energy retention, feed use efficiency and even molecular factors such as gene and/or specific protein expression which will be discussed in part three of this series.

Measuring growth

Figure 2. Effect of replacement of fishmeal by lupin protein concentrate in a diet fed to juvenile Asian seabass (Glencross, unpublished).



In nutritional experiments, growth is generally defined as the difference between initial and final live-weights. More specifically this should be defined as live-weight gain. For a measure of growth to be considered a "growth rate" it has to be time specific. The three most routinely used growth rate assessments are daily gain (DG), daily growth coefficient (DGC) and specific growth rate (SGR). Daily gain is the simplest of the three rates and is a measure of the live-weight gain over time. Daily growth coefficient in contrast is calculated based on a percentage of the one third root transformation of the final and initial live-weights over time (Kaushik,1998).

Thermal growth coefficient (TGC) is another growth rate parameter which is derived from the DGC, but the time component is expanded to be considered on a temperature basis. In this regard the time component of the TGC is multiplied by the average temperature (°C) over the period of the study (Cho and Bureau, 1998). Specific growth rate is an alternative weight transformation often used to describe growth and is calculated based on a percentage of the natural logarithm transformation of the final and initial live-weights over time (Kaushik,1998). However, the point of using a growth rate descriptor is to attempt to standardise the assessment and allow for some comparability of performance across experiments. Therefore the growth rate assessment needs to provide some independence from fish size. Kaushik (1998) compared both DGC and SGR for a range of fish sizes and noted that DGC provided a much better transformation of growth rates than SGR. It was summarised that if such a growth rate descriptor is required, then DGC is more appropriate than SGR. However if the initial weights of the animals are provided, then actual weight accrual as gain per day (DG) is arguable the most practical option.

Survival

Animal losses that occur during an experiment are usually expressed as percentage survival. This survival is determined based on the number of individuals surviving at the end of a study relative to the number included in the study at the beginning. Unless the percentage is divided by the time of the experiment, it is incorrect to report survival as a rate.

Feed conversion efficiency

For an assessment to be made on the utilisation of a diet, and by inference, to a possible ingredient choice, there needs to be an accurate measure of feed intake. Feed intake by fish is often reported as both an amount (g/fish) and rate (g/fish/d). However, truly accurate assessment of feed intake by fish is one of the more difficult aspects of aquaculture research to achieve. The efficiency of food use by fish is usually reported as either feed conversion efficiency (FCE) or food conversion ratio (FCR). FCE is the gain per unit feed intake, while FCR is the feed intake per unit gain. Clearly these two parameters are the inverse of each other. These assessments are usually made on a dry weight of food and live-weight of fish basis. Because these variables rely on both live-weight gain and feed intake assessment they assume the errors of both measurements.

Nutrient retention

To determine the efficiency of nutrient and energy retention from feeds, the nutrient and energy composition of both the feed and fish need to be assessed on an as fed and live-weight basis, respectively. However, efficiency data can be strongly influenced by animal size, so some consideration of this needs to be included (Glencross, 2008).

The apparent biological value (ABV) is another parameter derived from nutrient and energy retention values, but rather those based on digestible nutrient and energy intake. Typically ABV provides some assessment of the proportion of the nutrients or energy absorbed from the diet that is actually used for tissue growth. The determination of the partial efficiencies of protein and/or energy utilisation is a variant on this theme. This option examines the relationship between varying levels of digestible nutrient/energy intake and the somatic

accretion of that nutrient/energy. The coefficient of that relationship being the partial utilisation efficiency. Typically this parameter has been determined to underpin bioenergetic models of fish growth and feed utilisation (Glencross, 2008). For ingredient evaluation studies though, variants on this design have been used to examine the effect of ingredients on diet partial utilisation efficiencies.

Factors likely to affect nutrient and energy utilisation of ingredients

There are a range of factors that have the potential to affect nutrient and energy utilisation of ingredients. Among these are anti-nutritional factors (ANFs) and amino acid limitations. ANFs have the potential to cause significant problems to nutrient and energy utilisation by fish by interfering with digestion, palatability or even cellular function. In defining the effects of ANF on fish there have been a variety of experimental strategies examined and they vary primarily based on the mode of action of the ANF being studied. A detailed review on the variety and effects of ANF is given in Francis et al. (2001).

Amino acid limitations can also limit the potential protein and energy utilisation by affecting the capacity of the animal to sustain growth potential. Specific ratios are required between the essential (indispensible) amino acids in the diet to allow protein synthesis to occur to its maximum potential (Kaushik, 1998). Typically, these ratios are referenced against the amount of dietary lysine. If an ingredient is included in a diet such that any one of the ten essential amino acids falls below the specific ratio required, then the supply of this amino acid becomes a limitation in protein synthesis and therefore growth. Concise experimental effects of such limitations due to an ingredient inclusion are rare, but have been demonstrated.

Endnote

Clearly the assessment of palatability, growth and utilisation effects of ingredients is a highly complex process. While this article briefly covers some of the elements for consideration in those areas of ingredient assessment, the next article will consider the other accessory data that can help in the assessment process and also future technologies that may provide some application to ingredient evaluation science.

References available upon request.

Brett Glencross inspecting tilapia in Hai Duong, Northern Vietnam.

Dr Brett Glencross has a PhD in Aquaculture Nutrition and is the Principal Research Scientist for Aquaculture Nutrition at the CSIRO Division of Marine and Atmospheric Research in Australia. He has 15 years of experience in a broad range of aspects of aquaculture nutrition R&D in Australia, Asia and Europe. Email: Brett.Glencross@csiro.au.

Utilisation of hydrolyzed animal proteins and gelatin as supplement in low fishmeal diets for juvenile white shrimp

by Eric De Muylder, Carine van Vuure, Romain de Vargas , Daan Delbare and Geert van der Velden

Fishmeal replacement by vegetable proteins is limited not only due to amino acid balance but also by the digestibility of proteins. This is more obvious in aquaculture species with a rudimentary digestive system.

MucoPro is a hydrolyzed porcine mucosal protein. Using hydrolyzed animal proteins such as MucoPro as digestible protein can stimulate the overall digestibility of the feed. The addition of such a protein can also increase the attractability and palatability of the feeds, which is an important factor in optimal feed use for shrimp.

Recent research at FiskeriForskning in Norway indicated that hydroxyproline is a limiting factor when replacing fishmeal. Hydroxyproline is formed by the hydroxylation of proline and is one of the basic amino acids of collagen. Most vegetable products are low in hydroxyproline, except canola meal.

Fishmeal is relatively rich in hydroxyproline, especially in the bone fraction. Animal bone meal is rich in hydroxyproline (about 5.5%) and logically, the level in gelatin is much higher (about 11.5%). FiskeriForskning indicated a recommended amount of 1-2% hydroxyproline in salmon feed. If fishmeal contains about 1% hydroxyproline, then 1% gelatin in the feed can replace 11% fishmeal. If we can determine the requirements of hydroxyproline for different fish and shrimp species, this would enable nutritionists to formulate cheaper feeds and be less dependent on fishmeal as sole protein source.

Experimental tanks for feeding trials

Effects on growth performance

Diets

Five diets were formulated to contain limited amounts of hydrolyzed animal proteins: 2% fish hydrolysates (CPSP, Sopropeche), 2% and 5% MucoPro (Sonac) and 2% gelatin (Pro-Bind Plus, Sonac). Diets were low in fish meal and without other marine proteins such as squid or shrimp meal (Table 1)

Table 1.Inclusion rates (%) of hydrolysed animal proteins and composition of experimental diets

	Reference	CPSP	MucoPro2	ProBindPlus	MucoPro5
Ingredients					
Danish fish meal LT	12.00	10.00	10.00	10.00	8.00
CPSP G		2.00			
Wheat flour	34.50	34.50	34.50	34.50	33.50
MucoPro			2.00		5.00
ProBindPlus				2.00	
*Others	53.50	53.50	53.50	53.50	53.50
Total	100.00	100.00	100.00	100.00	100.00
Composition of diets					
Protein	35.00	35.00	34.7	35.4	35.0
Lipids	8.40	8.67	8.26	8.30	8.11
HUFA	0.71	0.71	0.71	0.71	0.68
Fibers	3.05	3.03	3.03	3.03	2.99
Ash	6.39	6.15	6.77	6.13	7.48

**Other ingredients were corn gluten, canola, soybean meal, wheat gluten, soybean lecithin, fish oil, vitamin and mineral premix.*

Shrimp

Juvenile shrimp *Litopenaeus vannamei* (0.6g) were obtained from the Happy Shrimp Farm in Rotterdam. Shrimp were acclimated in a tank and two days later, shrimp were weighed. Each tank had 45 shrimp and the density used was low (150 shrimp/m^2). We used a flow-through recirculation system. Temperatures were kept between 27-29ºC and salinity around 25 ppt. Aeration was provided using air stones. We used 17 tanks in total. Each diet had 3 replicates but there were 4 replicates for the reference diet and MucoPro (2%) diets. The experiment lasted 9 weeks.

Monitoring

Water quality was monitored once a day. Water parameters were stable throughout the experiment. Ammonia was checked at least once a week and remained stable (less than 0.5 ppm) during the duration of the experiment.

All tanks were monitored once a week. Growth, SGR (Specific Growth Rate), survival (individual counting) and FCR (Feed Conversion Ratio) were determined. The total population was sampled each week. Shrimp were dried before they were weighed. The feeding ratio was adapted for each tank. For the final week, we carried out individual sampling and weighing of each shrimp.

Feeding was done with automatic pulse feeders once the daily feeding quantity allowed it. We started with less than 2g/day. Until we could use the feeders, feeding was done by hand at least 3 times per day. We started to use the feeders after one month. Feeders were set in order to feed every 3 hours over 24 hours. The feeding ratio was determined by an adjusted standard feeding table.

Results

Overall, growth was very good and FCR excellent. Shrimp fed diets with ProBind Plus showed the best growth, although differences were minimal. The graph shows the average weight throughout the trial.

Graph 1. Growth of *L vannamei* fed experimental diets.

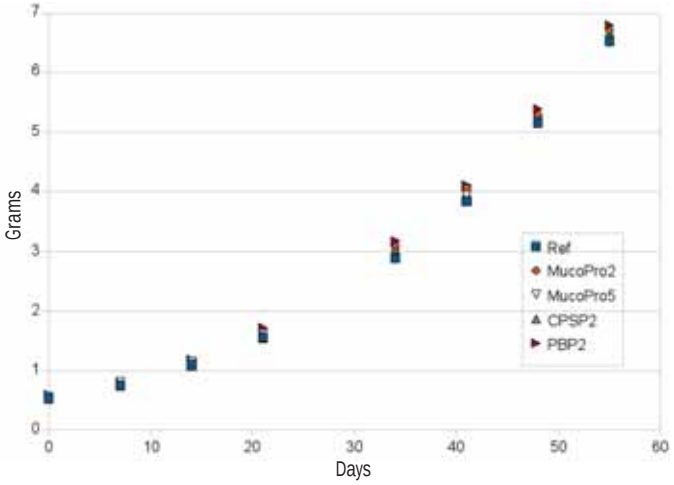


Figure 2. Growth parameters are summarized in table 2.

Diet	Ref	MucoPro2	MucoPro5	CPSP2	PBP2
Average initial weight (g)	0.53	0.55	0.56	0.56	0.59
Average final weight (g)	6.52	6.71	6.51	6.68	6.8
Weight increase (g)	5.99	6.16	5.95	6.12	6.21
Average growth (g/week)	0.67	0.68	0.66	0.68	0.69
Initial weight total (g)	95.31	98.73	75.78	74.93	79.47
Final weight total (g)	1,114.46	1,174.4	821	821.46	823.25
FCR	1.14	1.19	1.19	1.17	1.2

Palatability and attractability of diets

In order to determine the palatability and attractability of the different diets several experiments were carried out. Each one of the five diets was compared with the other four diets. Three extra diets were made for that experiment and have been compared to the growth experiment diets.

Attractability of diets was measured in 2 by 2 experiments. The preference of the diets and consumption was measured. We took 10 starved shrimp from the experimental tank and we placed them into an independent aquarium where two Petri dishes with 2 grams of different feeds had been previously placed. Each feed was placed on one side of the aquarium and the shrimp released in the middle. After 5 minutes shrimp on each plate were counted. After 30 minutes the same count was made again.

The food remaining in the plate was taken out, the extra water removed and the food oven dried. In addition to the 5 experimental diets described before, 3 more diets were tested:

- Referent Diet + 2% MucoPro added via vacuum coating
- Referent Diet + 2% heated ProBindPlus added via vacuum coating
- Referent Diet + 2% MucoPro + 2% heated ProBindPlus added via vacuum coating

The experiment was carried out in salt water. Nutrients leaching and salt retention have been determined and corrected.

.

Results

Feeds were tested 1 to 1 and Table 3 represents the average of all observations. MucoPro 5 % attracted the shrimp for a short period, but this attractability did not last. The feeds with the best palatability were the Reference diet, Mucopro 2% coated and ProBindPlus 2% coated. Even though feeds with ProBindPlus are less attractive, this did not show in the palatability study.

Table 3. Observations on palatability and attractability of diets

Feed Type	Number of shrimp per feed location		% of feed ingested
	After 5 min	After 30 min	
Reference diet	1.43	1.29	16.12%
MucoPro 2%	1.71	1.43	14.52%
MucoPro 5%	2.71	1.14	8.87%
CSCP 2%	1.00	1.00	13.36%
ProBindPlus 2%	0.86	1.43	14.76%
MucoPro +ProBind coating	0.60	1.00	10.25%
MucoPro 2% Coating	0.80	0.40	19.69%
ProBind 2% coating	1.00	0.60	19.08%

Conclusion

The addition of 2% Pro-Bind Plus and 5% MucoPro in low fish meal diets of juvenile *L. vannamei* had a positive effect on attractability and growth. MucoPro had a similar effect as hydrolyzed fish proteins (CPSP). It is possible to obtain good growth rates with low fishmeal diets if some essential or limiting nutrients are added in the formulation.

Eric De Muylder (pic) and Romain de Vargas are with CreveTec, Belgium. Email: eric@crevetec.be

Carine van Vuure and Geert van der Velden are with Sonac. Email: geertvandervelden@sonac.biz
Daan Delbare is with ILVO. Email: daan.delbare@ilvo.vlaanderen.be

Q&A with Mr. David Byrne

Food safety and traceability in aquaculture products from Asia

As European Commissioner for Health and Consumer Protection from 1999 to 2004, Mr. David Byrne oversaw the implementation of highly significant laws and regulations governing food and feed safety. These are now largely perceived as setting the global standard for excellence. Byrne also established the European Food Safety Authority (EFSA) that led to the adoption of the first European Food Law and framework on GMOs and was instrumental in implementing a comprehensive risk analysis and risk management strategy.

Currently serving as a non-executive director with Alltech, Byrne is instrumental in leading its food safety, quality and traceability programme. In this article, he answered our questions on how the necessary regulations came about in the EU market and the attention producers in Asia should show if they wish to export to the European Union.

AAP: Briefly explain what are the EU's objectives in its food safety and traceability? How did it arrive at the current guidelines.

DB: European consumers became deeply concerned about food safety issues in the 1990s when they realised they were exposed to serious health risks from contaminated food. The main health risk which caught public attention was the brain wasting disease said to be associated with the consumption of beef derived from animals suffering from mad cow disease. In 1999 cancer causing dioxin was found in milk and dairy products which resulted in the removal of all dairy products from the supermarket shelves of Europe.

Much of this coincided with the establishment of the European Commission under the presidency of Romo Prodi. My task as the Health Commissioner was to put in place the appropriate legal measures to make food production safer and other safeguard measures directed to the removal of any contaminated foods and thus to the protection of consumers.

During the period 1999 to 2004, over eighty pieces of legislation were put in place with these objectives in mind. The white paper of 2000 chartered the way forward and led to the passing of the General Food Law 2002. A new independent European food safety authority was established whose function was to give independent advice directed to the safety of food. These new laws established a requirement for the safety in the production of food from "farm to fork".

A fundamental part of that was the requirement for full traceability throughout the food chain. With traceability in place it was possible to establish an effective mandatory recall system allowing for the removal of unsafe food from the market, with immediate effect, once a food safety risk had been detected.

The new laws also required a measure directed to putting in place official food and feed controls. Each member state of the EU was required to enforce these controls thereby giving an EU wide impact to the new food safety laws.

The effectiveness of these measures soon became clear. The incidence of mad cow disease dropped immediately and has continually reduced to the point where it has now been nearly completed wiped out. Surveillance measures continue to be effective and the recall system not only protects consumers but the very existence of such measures generates a valuable sense of confidence among consumers that the food produced within the EU or imported into the EU are safe for consumption.

AAP: Can you talk on the EU's efforts in cascading this message to the supply chain internationally?

DB: As the world's largest trader, in terms of both exports and imports, the EU is centrally placed to get its message across. Simply put, if you want to access EU markets – and everyone does – you have to be able to meet very high safety standards. You also need to have very good traceability systems in place. In addition, the EU is active in the major international standard setting bodies like the Codex and the World Organisation for Animal Health, in getting its message across. This includes in terms of the standards adopted by these bodies which are often heavily influenced by the EU. Last but not least, European companies trade worldwide and are comfortable with the high standards that apply in the EU. They like to apply similar standards in all their products, including in their non-EU subsidiaries.

The situation in the EU is also constantly evolving. For example, there are major new initiatives expected in the near future, including a forthcoming communication on the European aquaculture industry. It will outline the likely policy agenda in this field for medium to long term.

AAP: Specific to aquaculture in Asia, what is your current assessment of the food safety situation? What are the strengths and weaknesses?

DB: The strengths are clear. Exports of aquaculture have grown strongly from the region and it is clearly one of the most dynamic export sectors. Close linkages have been established with the major retail chains in

Europe, who are actively looking for high quality aquaculture products. Consumer demand remains strong in Europe and cannot be met from domestic production within the EC. The likelihood is therefore that Europe will continue to be a major market for Asia for aquaculture products.

However, it is important to avoid complacency. The European Community's rapid alert system continues to find problems in imports and similarly the inspections of the European Commission services also find problems. These are sometimes so serious as to require restrictions on imports, usually in the form of additional testing. This concerns in particular the use of banned veterinary medicines such as chloramphenicol and nitrofurans.

AAP: How do feed and other inputs come into this picture?

DB: Feed is clearly a huge issue for the aquaculture industry. The exponential growth in the aquaculture industry has required corresponding growth in feed supplies. These continue to be sourced overwhelmingly from wild fishery catches. In turn, this is leading to further pressures on already stretched fishery resources. In Europe this is becoming a very significant issue due to the implications for the sustainability of world fishery stocks in general.

More effort will need to be made in finding more efficient uses of feed and in feed conversion ratios. Similarly, more needs to be done in finding feeds of vegetable origin to replace exclusively fish-based feeds. There are of course important challenges in moving in this direction but there are real problems ahead if there is a failure to find more efficient and diverse uses of feed. The safety of feed will also likely come under increasing focus at the international level. Europe imports almost 50 million tonnes of feed a year, including half a million tonnes of fishmeal. It is clear that the safety of food is conditional on a high level of safety in feed. Already, at the Codex level, the EU is pressing for new work on food safety.

AAP: What are the opportunities and threats and how can you and Alltech play a bigger role in food safety and traceability for producers in Asia?

DB: Threats to the safety of food and feed are always present thereby requiring constant surveillance and vigilance. Where high standards have been put in place, measures must be taken to ensure those standards are achieved and maintained. The producers of food and feed who understand the all important dynamic of consumer confidence in food safety clearly see that the production of food and feed to the high standards that exist in the EU provides a valuable marketing opportunity for their products wherever they are sold in the world. Production to EU standards has become a hallmark of the safety and quality of food.

Alltech's products are all naturally produced. They are directed to the health of animals by concentrating on the enhancement of good nutrition in animal feed. All of Alltech processes and procedures comply to the high standards laid down by the European Union. Particular attention is given to the high quality of the products themselves and also to the overall importance of maintaining a system of traceability which helps to ensure safety and quality.

Food and feed producers in Asia who maintain EU standards and who themselves buy product from companies who maintain these high standards increase the assurance of the production of safe food. Many food producers have discovered in the past that not only is it important to maintain high standards in the production of their own materials but they must also be certain that their suppliers also maintain high standards. Traceability is the key to this assurance.

Having been responsible for putting in place the food safety legislation in the EU, I maintain an interest in promoting the value of compliance with these laws. Through my work with Alltech I have the opportunity of continuing to maintain this interest through Alltech's symposiums and seminars and through my writing and interviews.

In very many parts of the world consumers are now determined to have access to safe food. They believe their own and their children's health depends upon it. To survive food producers must respond to these consumer demands. Any food or feed producer achieving the standards put in place by good food safety laws will satisfy this demand, will build the future of the company and protect its reputation.

Mr David Byrne, Former European Commissioner for Health and Consumer Protection, was awarded Alltech's Medal of Excellence 2009 for his commitment to food safety including his revolutionary reform of the European Union's safety systems during his tenure Commissioner.

"Mr. Byrne pioneered the structures of traceability, rapid response and recall within the European Union. These structures are now used worldwide and are recognised as the global blueprint for feed and food safety systems. He revolutionised feed and food safety and restored consumer confidence in the industry," said Dr. Pearse Lyons, President and founder of Alltech.

Prior to his role as European Commissioner, Byrne served as Attorney General of Ireland from 1997 to 1999. In September 1999 to 2004, he was appointed as Ireland's European Commissioner for Health and Consumer Protection. He is a graduate of University College Dublin, Ireland with a Bachelor of Arts Degree in Economics, Ethics and Politics, and studied law at King's Inns Dublin, Ireland. He currently holds the position of Chancellor of Dublin City University. Byrne is a member of Alltech's Reputation Overview Committee (ROC) where he works to ensure that the company has effective and efficient risk management structures in place.

Focus on creating value

New pilot at the helm at Uni-President Vietnam aims at changes in marketing aqua feed in Vietnam

In June, Franky Lee Ching Tyan takes over as General Director of Uni-President Vietnam (UPV) and he will be responsible for the noodle, beverage, wheat flour, livestock, shrimp hatchery and aqua feed business of the company. A graduate in International Management from the prestigious Thunderbird School of Global Management, Arizona, USA, Franky brings with him the vast experience in managing UP's business in the Philippines, Taiwan and Indonesia. He joined UP's marketing team in Taiwan 16 years ago.

In Vietnam, the main business is aqua feed production. However, from a marketing standpoint, Franky said that currently, for any product, be it for humans or animals, the focus is on creating value and quality. Consumers pay a premium for quality and services. This is what UPV will look at in developing its marketing strategy to meet future challenges.

"I will bring with me my noodle and beverage experiences and marketing concepts to this aqua feed business. In each country, we look at the conditions and culture practices and merge these into our marketing strategy. In Vietnam, UPV has been very successful in the shrimp feed business. In the next few years, we will be expanding production capacity and similarly, in the hatchery production of shrimp post larvae. Vietnam is a long country and transportation costs are high but we will need to project how the business develops before we can decide on the right strategy. As we expand, we will also need to improve the professionalism of our sales and technical services by creating branch offices and service centres".

Positioning the aqua feed business

Currently, UPV has the largest market share ranging from 30-35% in the shrimp feed business. However, in the central region where vannamei shrimp farming dominates, it has almost 70% of the feed market. Here farmers use both the premium monodon and cheaper vannamei feeds for vannamei shrimp culture, depending on the stages in shrimp development. This practice will continue as long as profit margins are good.

In contrast, in the Mekong Delta, where UPV had a strong presence during the early years of monodon culture, there is now strong pressure to maintain feed sales. It expects sales to decline in this region as it faces competition from new producers as well as some established aqua feed companies. In the production of feeds for the catfish, it ranks fourth in terms of market share. The marine fish feeds business is also expanding with line with growth of the industry in Vietnam. UPV produces feeds for the sea bass and grouper. Vietnam is also the base for UP's expansion into the region. Currently the company exports shrimp and grouper feeds to Malaysia and Singapore.

UPV together with the major aqua feed producers are faced with the recurring problem of fluctuating and low selling prices for catfish in contrast to high feed conversion ratios. The Government has attempted to fix prices based on a formula taking into account cost of production and FCR. Despite recent rises in commodities such as soybean meal, feed companies must maintain low prices for catfish diets. To improve on the efficacy of its feeds, the company is currently conducting feed trials such as on the lipid oxidation of some new raw materials and tolerance of fibre by the catfish. It is also looking at fillet quality with substitution of common raw materials as well as using enzyme technology to improve feed efficacy and reduce the environmental impact of intensive farming methods.

The research work in Vietnam is supported by the R&D team in Taiwan which supplies basic information on raw material quality and composition. Worldwide exchange of information on ingredients is communicated through the internet and feed traceability is assured.

The company has the advantage that it can draw upon quickly information from four feed mills in China. This had enabled the UP feed mills to be aware of the melamine issue much earlier than other companies. In Vietnam, the feed mill uses commercial ponds to carry out field trials and to collect data.

Expanding PL Production

UPV entered into the vannamei shrimp post larvae production business in 2008 with a hatchery in Ninh Thuan. Currently, this hatchery produces 150 million post larvae (PL10) per month using US imported specific pathogen free (SPF) brood stock. These are sold to the free market throughout Vietnam and farmers have the option of feed purchase. However, demand is much higher during some months of the year. This resulted in cheap imports of doubtful quality post larvae from China and elsewhere. These cost less than half of locally produced post larvae. The worry is the introduction of diseased stock. The need for UPV and other local producers to increase output is critical.

UPV's Ming Hsun Wu, Director of R&D Division, said that vannamei shrimp farming is gradually catching up with monodon shrimp. Consequently, the country wide demand for post larvae is expected to increase. This and the expansion of culture areas will increase production of vannamei shrimp to 35% of total volumes from the

current 30%. Shrimp production in 2009 is expected to reach 350,000 tonnes.

The official opening ceremony for the hatchery complex in Ninh Thuan was held on 26 June 2009. Central and provincial officials from Vietnam, the President of Uni President Taiwan, government officers, researchers, VASEP, dealers, distributors, media from the region attended the event.

UPV's role in development is not limited to supply of post larvae. There is a concern on the rampant occurrences of diseases, lack of reporting by farmers and on the capacity of farmers in handling such situations. There are PCR machines available for the monitoring of diseases and the strategy is to encourage farmers to participate in disease monitoring programs and make use of these facilities. In this way, farms will be better prepared in case of a country wide infection.

The hatchery at Ninh Thuan

Promotions

Since 2007, Uni President Vietnam began to increase its profile as a leading feed company in Asia and in the development of aquaculture in Asia. This began with the Gold Sponsorship of the Asian Pacific Aquaculture 2007 in Hanoi, where it conducted a Vietnamese producer session. This was followed by a similar sponsorship during the World Aquaculture 2008 meeting in Busan, Korea where a similar industry session was conducted. In 2008, it sponsored the 7th symposium of the World's Chinese Scientists on Nutrition and Feeding of Finfish (SWCSNFFS) in Beijing and the 7th symposium of Disease in Asian Aquaculture (DAA-7) in Taipei, Taiwan. This will continue in 2009 with UPV as the Gold Sponsor of the Asian Pacific Aquaculture 2009 Conference and Trade show in Kuala Lumpur, Malaysia from 3-6 November 2009 (see page 50).

Gold Quality of Vietnam Aquaculture

UPV is the only excellent aquaculture enterprise invited by the Ministry of Agriculture and Rural Development (MARD) to present a speech in the opening ceremony on 29 May in Hanoi. It will be the Diamond sponsor for the Gold Cup 2009, Gold Quality of Vietnam Aquaculture. In celebration of 50 years of Vietnam's fisheries and aquaculture, the award is given for outstanding results in a particular sector. The selection criteria include national and international standards achieved, safety and hygiene of products, market and export turnover. The benefits include recognition of the success of the company and promotion of the brand in the publication of the Gold Quality of Vietnam Aquaculture by the Vietnam Fishery Association and MARD. The award honours creative enterprises and for excellent leadership in management and business. It encourages companies to increase product and product quality. On August 25, MARD will officially announce the excellent aquaculture enterprises awards at a ceremony in Hanoi.

New GM to expand business in China

Since June 2009, Jeff Jie-Cheng Chuang has assumed a new position as General Manager in China and is responsible for Zhongshan President Enterprises Co., Ltd in Guangdong and Songjiang President Enterprises Co.Ltd in Shanghai. In 2000, Jeff was Director of Aquatic R&D Division of Uni President Vietnam (UPV) and in 2002, he became Director of Aquatic Business Division. In 2007, he was the Vice President of UPV responsible for the aqua feed, animal feed, wheat flour and instant noodles business.

Jeff has a MSc. in Aquaculture Nutrition from the National Taiwan Ocean University and began his career with UPV in 1995. Jeff and the team in Vietnam have been credited with the establishment of the UPV brand in Vietnam as well as developing it as a leading aqua feed company in the South East Asian region. UPV now has two aqua feed plants in Binh Duong and Tien Giang with the total capacity of 300,000 tpy and a hatchery with a capacity of 1.5 billion/year white shrimp post larvae in Ninh Thuan.

The Uni-President Group with its headquarters in Taiwan invested USD 48.5 million to set up Zhongshan President Enterprises Co., Ltd in 1995 which has an annual production of 150,000 tpy. The company produces feeds for the eel, marine fish, trout, tilapia, koi and other ornamental fish, mainly for the Pearl River Delta Region, Hainan and Fujian Province as well as for export to Malaysia. Feeds for ornamental fish are also sold nationwide in China.

China is the fastest growing market for aqua feeds. Production in 2007 was 13.26 million tonnes which was 17.7 times that in 1991 (750,000 tonnes). However, the current aqua feed production is 41% of total demand. In his new position, Jeff's role will include market development for UP's premium quality feeds and strengthen technical services.

On the making of fish silage

Joachim W. Hertrampf

Some 70 years organic acids and their salts are used in agriculture for the preservation of feedstuffs. Silage is important for feeding cattle during the winter periods. As a replacement of antibiotics as growth promoter, organic acids are used successfully in pig production as feed additive. In this context the article on "Storage control for fish offal or by-catch" in this magazine (Vol. 5, No. 2, p 40) is very interesting. However, some supplementary remarks are required for a better understanding of the subject.

It is right that there is a growing interest in fish preservation. Unfortunately, the availability of trash fish is limited. In addition, the supply is very seasonal and varies in a wide range and this affects the market price for trash fish enormously. The high variation in demand and supply makes trash fish an unreliable and costly feed component. Since the dry matter content of trash fish is around 25% only, the cost of the individual nutrients are higher than e.g. in fishmeal. Trash fish, therefore, is not a suitable protein feedstuff for aquaculture feed. It has to be considered, too, that the high moisture content of trash fish limits the formulation's inclusion rate to 5–7%.

It is, therefore, quite common to use fresh trash fish as a chemo-attractant in shrimp and fish feeds, only. This makes the search for food by cultured aquatic animals more efficient. Fresh trash fish is preferred; fish silage is made only, if there is an over-supply of material. The use of an organic acid makes the feed ingredient more costly. Furthermore, in shrimp it was found that the chemo-attractant effect of fresh trash fish is better than of fish silage. In order to reduce the cost for making silage, experiments have shown that salt (NaCl) liquefies and preserves trash fish just as good as e.g. formic acid.

Finally, some questions may be of interest for readers.The recommended inclusion rate of the blend of potassium diformate, antioxidant and corrosion inhibitor is 1.0%. How much is the return of investment for the product? It could have been an advantage, if the function of the antioxidant and the corrosion inhibitor in this blended product was explained!

Christian Lückstädt, Technical Director, Addcon, Asia

Author's response

The storage control for trash fish, offal or by-catch has a very high relevance in Asia. It is estimated that around 6 million tonnes of trash fish are available each year. China alone "produces" up to 3 million tonnes of trash fish every year - based on a report given during a Trash Fish Workshop in Vietnam in 2005. Due to the high moisture and high temperatures in South- and South-East-Asia fish not fit for human consumption and/or offal will degrade rather quickly, since the availability of ice is limited and in most cases only used when fish is caught for human consumption. The approach of using blends containing potassium diformate aims towards that problem. By preserving such fish or offal, the protein quality of this high value feed raw material will be kept at a high level, since bacterial degradation would reduce the protein quality (the major reason for the use of such materials) tremendously. The fish/offal is than transferred without nutritional losses to the relevant fishmeal factories. Thus, the described method allows the use of trash fish and offal to be used for further fishmeal production - aiming towards sustainability. The comment on high moisture content is therefore irrelevant, since the fish is transferred into fishmeal. The return on investment is given, since in most countries fish for fishmeal production is paid upon a basic principle - the better the quality, the higher the price! The quality assurance after using the mentioned preservative (see the article about low TVN-levels) is therefore a possibility to use existing resources sustainable and economical.

ASIAN PACIFIC AQUACULTURE 2009

and

Malaysian International Seafood Exposition 2009

"Sustainable Aquaculture and Quality Seafood for All"

November 3 - 6, 2009 • Kuala Lumpur, Malaysia

Hosted by: Department of Fisheries, Ministry of Agriculture & Agro-Based Industries, Malaysia

moa INCORPORATED
MINISTRY OF AGRICULTURE AND AGRO-BASED INDUSTRY MALAYSIA

Jabatan Perikanan Malaysia

UPM
UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI

MIBE

Gold Sponsor
Uni-President

WORLD AQUACULTURE Society

Health Session Sponsor
Intervet
Schering-Plough Animal Health

For More Information Contact:

Conference Manager
P.O. Box 2302 • Valley Center, CA 92082 USA
Tel: +1.760.751.5005 • Fax: +1.760.751.5003
Email: worldaqua@aol.com • www.was.org

A future for the tilapia in Bangladesh

By M. G. Hussain

A tremendous progress in its farming is being achieved with improved strains and expansion of culture areas.

In Bangladesh, freshwater aquaculture systems mainly revolve around the polyculture of various species of carps (both Indian and Chinese carps) and in varying combinations and densities depending on the availability of seed. The monoculture of the pangasiid catfish is a recent practice using improved management methods. However, costly feed and low market price has slowed progress in farming of this fish. In the case of the giant freshwater prawn (*Macrobrachium spp*) and tiger shrimp (*Penaeus monodon*) which are primarily cultured in coastal areas, farming is near to collapse because of disease outbreaks (white spot syndrome and yellow head virus). A mass involvement of rural communities in carp and shrimp culture is also difficult due to limited water and financial resources.

Under such conditions, progressive farmers and entrepreneurs have been looking for alternative species which can maximize production and profit. Among them, the tilapia is the best candidate, due to several desirable characteristics. A new avenue for extensive tilapia farming in Bangladesh was also possible with the introduction of a synthetic strain of *Oreochromis niloticus* ie.GIFT strain in 1994 through WorldFish Center (formerly ICLARM) under the DEGITA project and development of further genetically improved strains by Bangladesh Fisheries Research Institute (BFRI). This was followed by the dissemination of these strains and low cost and appropriate aquaculture technologies to producers.

According to the Fishery Statistical Yearbook of Bangladesh (DoF 2009), tilapia production in Bangladesh was about 66,767 tonnes in 2007. During 1999 to 2007, there was a tremendous progress in tilapia farming in this country. Production increased from 2,140 tonnes in 1999 to 66,767 tonnes in 2007 (Figure 1). Due to the rapid expansion of hatcheries producing monosex all male seed, and farms within a span of 2 years (2005-2007), tilapia production increased more than three folds in Bangladesh.

BFRI Super GIFT Strain of tilapia

GIFT and red tilapia strains in Bangladesh

Stock improvement

The GIFT strain was developed by WorldFish Center through several generations of selection from a base population involving eight different strains of Nile tilapia (Eknath et al. 1993). BFRI received the first batch of the GIFT strain tilapia in 1994 and later 116 families of the same strain in 1996. The on-station and on-farm trials conducted by BFRI, the GIFT strain was reported to show 35-57% superior growth performance in comparison to the existing local strain of the country (Hussain et al. 2000).

Further stock improvement of GIFT using mass selection technique was initiated in 1998 and continued until 2004. Meanwhile, 6 generations were developed and the F6 generation progeny showed 32.66% higher growth than that of average group of GIFT strain. Initially, the rate of genetic gain in weight of fish was greater up to the third generation and afterwards it gradually decreased. The reason behind such a declining trend in genetic gain in particularly for body weight might be the accumulation of inbreeding. Therefore, the genetic improvement strategy for enhancing the growth of GIFT strain was re-designed and presently being implemented through family selection protocol by introducing an upgraded new stock of GIFT from Malaysia in March 2005.

Due to excellent performances for growth and relevant traits (survival, fecundity and disease resistance etc.) the newly improved strain has been renamed as BFRI Super GIFT strain. Presently BFRI, as a center of excellence for genetic upgrade of tilapia strains, is distributing on an average 0.3 – 0.5 million improved tilapia germplasm every year to interested farmers and entrepreneurs all over the country.

Production all male monosex tilapia

Optimization of hormone dose for the production of monosex all male GIFT seed production was performed for mass seed production. Subsequently the sex reversal technique has been disseminated to the public and private hatchery operators and presently about 70 monosex tilapia seed production hatcheries have been established under the technical supervision of BFRI in several regions of the country. These hatcheries are presently producing about 135-150 million monosex fry every year.

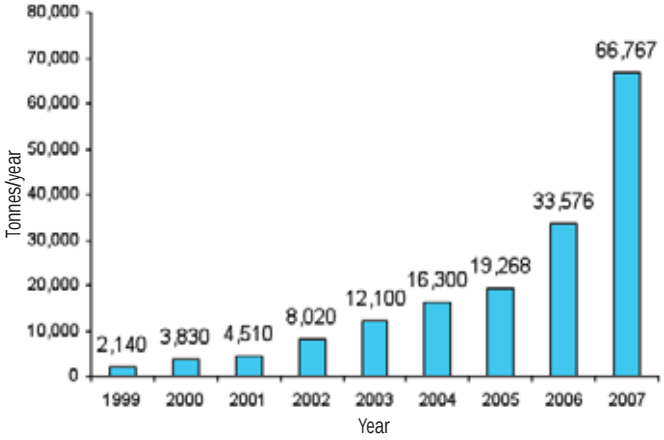
Development of true breeding red tilapia

It was experimentally proven that the existing stocks introduced in 1988 (i.e. Thai red strain) were not true breeding (Hussain 1994). So, a new batch of red tilapia strain was brought to Bangladesh in 2005

Egg hatching jars

through the World Fish Center and progeny tested at BFRI through Mendelian Test Cross techniques. Malaysian red strain was found as true breeding, which can produce 100% all red progeny in breeding programmes. Currently, BFRI has further improved this strain by using a rotational selective breeding technique and initiated mass seed production for distribution and dissemination of breeding and culture techniques to interested farmers and entrepreneurs. Meanwhile, more than 0.1 million newly improved red tilapia germplasm have been distributed during the last breeding season (2008).

Figure 1: Production of farmed tilapia in Bangladesh from 1999 to 2007



Grow-out of tilapia

Land based farms

Currently, there are about 446 medium and large scale commercial farms involved in the grow-out of table size tilapia (Table 1). These farms have been established very rapidly within a span of 7 years (2000 – 2007). The average farm size is 10ha with an average of 20 ponds/farm. More than 90% of grow-out farmers stock their farming ponds with monosex BFRI Super GIFT strain at a density of 62,250 fish/ha. Moreover in about 500 farms, monosex and mixed sex tilapias are cultured with riverine catfish (*Pangasius sp.*) species. Presently, commercial farms are producing about 67,000 tonnes of marketable size tilapia (150-300 g). In most of the local markets the fish are marketed fresh but in chain super markets, chilled fish are sold. Tilapia contributes about 6.64% of total aquaculture production in Bangladesh (DoF 2007).

Table 1. Distribution of commercial tilapia farms in major districts Bangladesh.

Districts (Administrative Units)	No. of Farms
Comilla	60
Chittagong	25
Cox's Bazar	15
Kishoregonj	22
Rajshahi	25
Pabna	13
Mymensingh	50
Jamalpur	15
Khulna	55
Shatkhira	60
Bagerhat	30
Jenaidha	10
Dinajpur	16
Sylhet	22
Netrokona	10
Norshigndi	18
Total	446

Trays for egg hatching and larval development

Cage culture

In Bangladesh, the Bangladesh Fisheries Development Corporation (BFDC) was the pioneer in experimental cage culture of Nile tilapia in Kaptai Lake, Rangamati in the 1980s. However, no production data is available. Subsequently CARE, Bangladesh conducted grow-out trials of BFRI Super GIFT strain in cages in the Meghna river lagoon area near Munshiganj in the 1990s (Hussain et al. 2000). CARE also implemented a CAGES project for more than 5 years with limited success as potential livelihood options in different sites in Bangladesh.

Recently, a number of private entrepreneurs have initiated tilapia cage culture in Dhakatia river near Chandpur and Munshiganj region. Table 2 shows data on culture period, stocking density and production of cage culture. In their operation, the stocking density varied from 200-350 fish/m^3. After 8-9 months of culture, production ranged from 120 to 190 kg/m^3, whereas the feed conversion ratio was around 2.00. Table 3 shows the cage culture data of some of the selected farmers.

Tilapia cage culture is gaining popularity day by day. Recently under

Table 2. Cage culture data of some selected commercial farmers.

Name of Farmers	Species used	Cage size (m^3)	Stocking density (no/m^3)	Duration (month)	Production (kg/m^3)
Md. Zakir Khan	Monosex GIFT	2.75	350	9	125-140
Md. Billala Khan	Monosex GIFT	2.75	350	9	120-130
Md. Alamgir	Monosex GIFT	2.75	350	9	130-150
Md. Sowakat Hossain	BFRI GIFT (mixed sex)	4.0	200	8	170-190

Table 3. Production of BFRI Super GIFT tilapia in tea estate aquaculture farms.

Name of Tea garden	Area of water body (ha)	Species stocked	Culture period	Production (tonnes/year)
Monipur tea estate	6.52	Monosex tilapia	5	120.00
Marina tea estate	2.0	Monosex tilapia	5	25.0

Culture in cages in Dhakatia river near Chandpur and Munshiganj region.

A new culture system in irrigation canals in tea gardens. There are 163 tea gardens covering about 140,000 ha available for tilapia culture.

the Ministry of Fisheries and Livestock, Government of Bangladesh in collaboration with BRAC- an international nongovernmental organization have come forward to operate experimental cage farming in various parts of Bangladesh. Here tilapia will be the main species for culture.

Tilapia in irrigation ponds in tea gardens

Water bodies of tea estates are a new avenue of tilapia farming in Bangladesh. In Bangladesh there are about 163 tea gardens covering about 140,000 hectares of land. In each tea estate there are more than 30 ha of water bodies, which are mainly used for irrigation purposes during summer season. These water bodies could be used for fish culture especially, monosex GIFT tilapia farming. During, 2006 and 2007, Marina and Monipur tea gardens have initiated farming of monosex tilapia on an experimental basis (Table 3). These currently produce an average of 125 tonnes of monosex tilapia per year, which is very encouraging in the context of Bangladesh.

Technology dissemination and training

In order to disseminate the appropriate technologies of BFRI Super GIFT strain seed production, hatchery management as well as farming practices, a total of 50 government hatchery managers, and more than 300 private hatchery managers/entrepreneurs were trained in eight batches. They were taught monosex hatchery management systems, brood stock replacement protocols, implementation of simple breeding plans etc. Moreover, a total of 2000 progressive fish farmers were trained on improved BFRI Super GIFT strain all male monosex culture and management in ponds in twenty batches (Table 4).

The future for tilapia

Bangladesh has hundreds and thousands of seasonal water bodies in the form of ditches, shallow ponds, road side canals, barrow pits and it is without doubt, that these water bodies have tremendous potential for aquaculture. These are especially suitable for the culture of fish species with short life cycle, fast growth rate and require low input support (Hussain et al. 2000). In such cases, tilapia can be a promising candidate for aquaculture in suitable seasonal water bodies.

Recently, the low market price had severely damaged the farming of the exotic riverine catfish (*Pangasius hutchie*) in the country. Therefore a large number of commercial catfish producers have found tilapia as an alternative species to culture in their farms to maximize the production. In brackish water zones and coastal farms (200,000 ha) where improved extensive shrimp culture has collapsed due to disease outbreaks, commercial farming of tilapia will be an alternative.

In Kaptai reservoir (70,000 ha), lower Meghan and other southern river tributaries, lagoons, irrigation canals and other similar water bodies (1.03 million ha), intensive cage culture of monosex all male tilapia could boost up fish production. Suitable water areas in all the tea estates (140,000 ha) can be used for tilapia farming

Conclusion

Farming of the tilapia has a great potential in Bangladesh and it will be a prime culture species in the near future for freshwater and brackish water ecosystems. The way tilapia aquaculture is expanding at small, medium to commercial scale; it will not be long before the tilapia contributes to the bulk of aquaculture production. It will also be a major source of employment. It can be confidently said that in the near future Bangladesh will be one of the leading countries in Asian in tilapia production.

References are available upon request.

Table 4. Number of trainees on BFRI Super GIFT strain seed production and culture.

Criteria of Trainees	Batches	Number of Trainees	Name of the training course
Govt. Hatchery Manager	2	50	GIFT monosex seed production technology
Public/private hatchery operator/Entrepreneurs	12	300	GIFT monosex seed production technology
Progressive farmer	60	2000	GIFT monosex culture management

Dr. M. G. Hussain is the Director General of the Bangladesh Fisheries Research Institute (BFRI) and team leader for genetic stock improvement research group and promotion of tilapia aquaculture in Bangladesh. Email: hussain.bfri@gmail.com

Working with nature

By Zuridah Merican

This is to produce clean and healthy tilapia in an eco-friendly manner in a lake system

Fish production in enclosed water bodies have always been frowned upon vis-a-vis environmental protection groups due to poor waste management leading to eutrophication. Malaysia has potential areas for freshwater aquaculture but it has to be done in a systematic and sustainable manner. This is how aquaculture can work together with the environment in Malaysia, according to a group of Malaysian aquaculturists and Australian scientists. In 2008, Eco Tilapia Sdn Bhd was formed to show how tilapia can be produced whilst keeping the ecological equilibrium of the water body. The responsibility of the group is not only sustainable aquaculture but one with a small footprint and eco friendly production. This should be the strength of tilapia products from Malaysia as it cannot compete with low cost high volume producers.

Errol Perera, Technical Manager, said, "Prior to all these, we approached buyers in Europe to determine their criteria for tilapia products that they wish to market. Of course, it has to be chemical free and produced with respect to the environment. Only then, could we get investors to participate. To be in line with this concept, we had to use eco-friendly materials and also had some constraints in design of cages to take into account the numerous predators (otters, snakehead *Channa micropeltes* and sebarau *Hampala macrolepidota* and waves of more than a meter during a storm. We had to think out of the box on waste management".

The Temenggor Lake in north Perak has an area of 15,500 ha. The lake is used for hydro electric generation and is a well known eco touristic destination. Eco Tilapia has set up 600 square cages near to Banding Island. These floating cages use galvanised iron frames and are 3mx3m square cages. These are arranged in a line, perpendicular to the flow of the current. Anchor lines go to the bottom of the lake, sometimes 100m deep. Small cages are preferred for ease of management and feeding. Each cage has a feeding collar to prevent floating pellets from leaving the cage perimeter. Currently feed from a local company is used but gradually, the team intends to develop their own feed using sustainable feed ingredients.

Since 1985, Errol Perera (left), Malcolm Philips (right) and Mohd Yussof Kassim, Managing Director, old fishing buddies have been combining their passion to work with nature and have invested about USD4 million into the production of this eco-friendly tilapia.

In January, the cages were stocked with 300 two-three inch (5-7.6cm) fingerlings of selectively bred tilapia, *Oreochromis niloticus* and *O. mossambicus*. The fingerlings are the results of several selective breeding programs, available in Malaysia. The market size will be 700g-1.3kg fish and the first harvest of 50 tonnes is expected in November. These will be for fillet production at a processing plant in Malaysia.

Clean and eco friendly tilapia

In any aquatic production system, the main concern is that the waste output from uneaten feed and faeces should not upset the ecological dynamics of the water body. What is required is a way to prevent any imbalance. An integrated approach of keeping an equilibrium with the environment by using bio film substrates was developed in Australia, said Malcolm Phillips, Operations Manager. These support the growth of bacteria and algae. The bacteria colony is a biological filter, reducing nitrite to the nitrate. Algae is also feed for the omnivorous tilapia and commercial feeds can be reduced gradually to that of a supplemental level rather than as complete feeds.

Errol said, "Our strength is the monitoring of the parameters in the water body which we have been carrying out for the past ten years. In presenting our concept to the authorities, we showed that the biological load within the cages was lower than that in the surrounding water area. Furthermore, as algae growth on the substrates can contribute to the feed requirement, we expect to increase the contribution of natural food and slowly reduce the amount of commercial feeds. Subsequently, this will reduce the effects of feed on the environment. In this way, we will improve on the feed conversion ratio to less than one from the current FCR of 1.5. We will also reduce our costs of production further."

Limits to growth

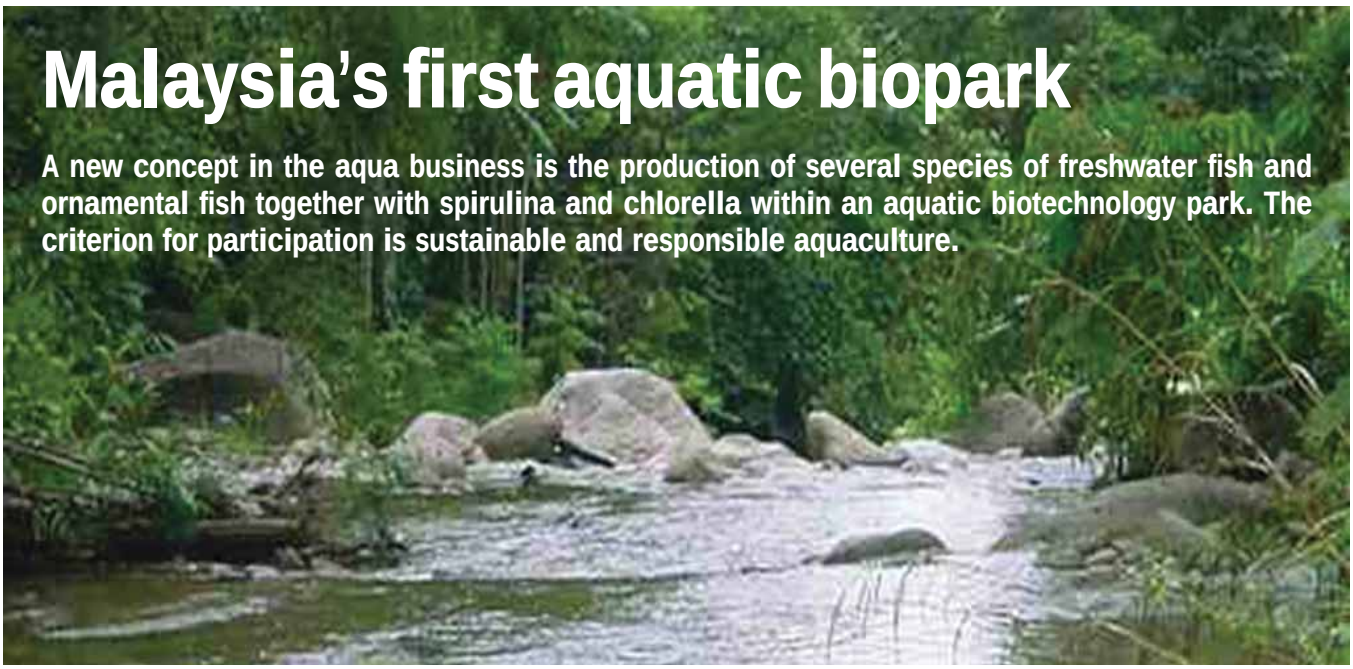
"This is what makes Eco Tilapia different. As far as buyers are concerned, we meet their requirements. We can also ensure that the product is within the norms of sustainable and responsible aquaculture. As we fine tune our bio-film substrate concept and use other materials, we can

increase density in the cages. With probiotics, we may be able to push the equation further. However, in any sustainable production methods, there are other issues such as fish welfare during transportation, use of non genetically modified organisms in feeds, chemicals and in the case of sex reversal of tilapia, non hormonal methods. These are also our targets", said Errol.

Currently the company gets its supply of fingerlings from a private hatchery. The next step will be to set up a hatchery where it can fully control selection, breeding techniques and production protocols. This and a processing plant will be the final steps in producing controlling the supply chain. Going ecological also demands that the team use solar energy to operate aerators etc within the farm. More information: Email: errolperera7@yahoo.com

Malaysia's first aquatic biopark

A new concept in the aqua business is the production of several species of freshwater fish and ornamental fish together with spirulina and chlorella within an aquatic biotechnology park. The criterion for participation is sustainable and responsible aquaculture.



The idea of a biopark for aquaculture is modelled on that of agro biotechnology parks, where basic infrastructure and support is provided to participating companies. The Bentong Aquatic Biopark, is the first such biopark in Malaysia and is a major project for Aquatic Biopark Malaysia Sdn Bhd, a subsidiary of Gema Padu, a diversified group of companies involved in livestock, agriculture and housing. Major (Retired) Ng Bon Chong, CEO has been using his background as a civil engineer to develop aquaculture projects on an ad hoc basis for several years. With various partners, he currently operates a marine shrimp hatchery in Kuantan and 16 freshwater prawn ponds in Telemong, both in the state of Pahang.

"We have this piece of land of 360ha which straddles an undulating area in Chamang, Bentong, Pahang. The site is drained by a number of rivers with a 21km^2 catchment. The site is in a pristine state, with the catchment area located over 90 meters above sea level. As the Malaysian government is focusing on agriculture and aquaculture as the third engine of growth, we decided to focus on aquaculture. We see this as a modified agro technology park. Our output is targeted at RM258 million per year when fully operational. The biopark will support national goals to develop the aquaculture sector as a major facet of the agriculture sector."

"Our mission is to build, develop, manage and operate a world class biotechnology and aquaculture facility in total consonance with the environment in which it is located, providing for the very best in product quality while maintaining deep and abiding sensitivity to the environment," added Major Ng.

Major (R) Ng (left) at the site

Project consultant, Gopinath Nagaraj was responsible for developing the biopark concept. The biopark is divided into zones. The pristine upper reaches of the area have been designated for production of ornamentals such as koi and semi-temperate food fish such as silver perch *Bidyanus bidyanus* and murray cod *Maccullochella peelii peelii* which will benefit from the cooler water temperatures. Further downstream, has been identified for local high value species such as the riverine carps, mahseer *Tor tambroides* and temoleh *Probarbus jullieni*. The production will be of premium quality fish targeted for local restaurants. Downstream zones have been identified for the production of algae such as spirulina and chlorella, ornamentals such as arowana or dragon fish *Scleropages formosus* and food fish such as tilapia *Oreochromis spp*.

"We need to demonstrate an environmentally friendly farming establishment adhering to international standards on production of healthy fish. The design is modular in that each zone will be independent. Effluent water from the ponds will be treated before being released back into the stream. Culture will be in cages in the adjacent Repas dam or in ponds. Part of the concept will be to introduce recreational fishing activities which we have decided to defer to 2015. Aside from aquaculture, the biopark will have facilities for the culture of spirulina and chorella. These will be for the nutraceutical and feed additive industry."

"In this biopark, investors will be required to take part or all of a module. They will be required to adhere to the environmental regulations and meet supply chain certification such as the best aquaculture certification organized by the Department of Fisheries, Malaysia. In the future, we aim for branding the products from this biopark. As volumes of production increase, we will expand the area to 900 ha and processing of the products will be the next step", said Gopinath.

The company has started to develop infrastructure for the first phase since early 2009. It is now seeking participating partners. A local Japanese koi carp breeder has been selected as a partner in the ornamental fish module. The group in Aquatic Biopark Malaysia Sdn Bhd is enthusiastic with the project which has attracted interests from local and foreign investors.

Aside from the investment incentives with aquaculture projects in Malaysia, participation in the biopark will also gain further incentives under the East Coast Economic Region (ECER), within which it is located. More information: Lee Kuan Yong. Email: leekuanyong@gmail.com

Quality, Reliability, Traceability and Sustainability in Quality for Life™ concept

DSM has launched the Quality for Life™ concept in response to the growing demand for reliable and traceable products in the food and feed industry. This is a commitment to global quality, assuring customers the same ingredient quality and safety standards, wherever they are in the world. The program encompasses quality, reliability, traceability and sustainability.

DSM Nutritional Products is the leading global supplier of feed ingredients and premixes. The main ingredients for the feed industry are vitamins, carotenoids, enzymes and eubiotics. These ingredients are sold as such or in tailor-made blends to answer exactly the needs of customers.

The Quality for Life concept

DSM believes that its reputation for quality has to be earned continuously, each time there is interaction with customers. This world's leading nutritional product manufacturer has its own definition of quality. This originates from a deep understanding of the needs of the customer. This runs all the way from product conception and specification, through product development and manufacture via quality control, quality assurance and product distribution, to after-sales service. For DSM, quality is a way of life.

There is a constant need to maintain and advance its own high standards. The aim is to give customers and consumers the peace of mind that only comes with high quality, reliability and traceability products that are

- High in purity, with no cross-contamination
- Homogeneous, with all ingredients evenly distributed
- Stable in time, with all performance characteristics guaranteed
- Safely packaged, with all labels correct to ensure safe handling
- Safe for consumers, workers and the environment.

Reliability: an essential ingredient

This is the ability to guarantee not only the quality and safety of products but also the reliability of their supply. It is also to provide customers with the assurance that they can plan their own activities without the fear of damaging interruptions. Through its global reach, customers can trust the company to deliver the same products that have been manufactured to the same standards anywhere in the world.

Global purchasing

DSM practices global purchasing lowering risks in material management. It uses a unique level of backward integration. The company uses its own plants for the production of bulk ingredients to ensure products are manufactured to the same standard at any of the worldwide facilities. This global network of close to 40 feed premix plants offers proximity to customers ensuring products can be delivered on time and wherever needed.

Supply chain management

It uses an integrated supply-chain approach to manage every phase of production of nutritional ingredients and delivery to guarantee consistent and timely supply. An advanced distribution system and a highly sophisticated distribution network complement a just-in-time delivery scheduling.

Full traceability

Tracking essential

The way to earn consumer trust is full traceability throughout the supply chain. At every stage of the manufacturing process, from arrival of raw materials to sales, tracking is essential to ensure that product characteristics can be controlled and verified. With its advanced automated process and material management systems, DSM can precisely and rapidly trace all its products within the supply chain. It maintains the required information and documentation such that in the case of an urgent ingredient investigation, global systems are implemented to immediately inquire and inform the customer. All necessary actions are then undertaken to minimize business interruptions.

Auditing key suppliers

It also regularly audits and evaluate key suppliers in line with its high standards concerning the safety and quality of the raw materials and other ingredients. Suppliers have to demonstrate their compliance with regulations and manufacture their products in accordance with GMP (Good Manufacturing Practices). Materials from non-certified suppliers are subject to strict entry controls, batch by batch for each delivery.

R&D support

The strong R&D support assist in looking for the best commercial micro-ingredient forms for a premix which fits perfectly with the customer's needs and applications. Laboratories for vitamin monitoring, either in each premix plant or through regional co-operation among DSM sites, ensure that the premix production process is strictly controlled.

Care for the environment

Companies with a focus on sustainability are long-term winners in their markets. DSM's business and sustainability strategy is fuelled by four trends: Climate and Energy, Health and Wellness, Functionality and Performance and Emerging Economies. During 2008, the company continued to implement its sustainability strategy within the framework of these four global trends.

Climate and energy

A strategy to minimize the use of raw materials and energy requires that all sites operate waste water treatment facilities, compliant with local regulations. The manufacturing sites are ISO14001:2004 accredited or have implemented the environmental requirements into their quality management systems.

Paying significant attention to climate change, it has energy saving programs to raise energy efficiency and reduce greenhouse gases and NOx emissions. Since 1 January 2008, DSM has been implementing an expanded energy savings program to raise the energy efficiency target from 1% to 2% a year. This includes switching to less energy-intensive processes where possible.

White biotechnology

Industrial (White) Biotechnology is a key part of its continuous drive to have cleaner, more efficient and sustainable processes. The introduction in 2002 of Vitamin B2 production by fermentation instead of traditional chemical synthesis is one example of how it has embraced this technology. Fermentation uses a fully closed system, which makes it more environmentally friendly than traditional chemical production. Another example is in the manufacture of Vitamin C, where it has partially replaced some chemical steps of the process with more efficient and sustainable production methods.

More information: www.qualityforlife.com

Introduction of Shanghai International Fisheries & Seafood Expo (Sifse2009)

SIFSE2009 will take place on Dec 9–12 .2009

Shanghai Everbright Convention&Exhibtion Center,China

SIFSE Expo sustained three years continuously development under the great support and concern in fishery and Seafood industry at home and abroad.SIFSE Expo achieved qualitative progress in terms of scale,professionalism,international popularity,thus make SIFSE to be the most influential event in marine products industry in East China even whole China and best gateway to access to China's fishery and seafood market.

European Brussel and American Boston fishry expo is prone to being the exchange center of global fisheries and seafood companies,China's fishery and seafood market just like China's economy need to be gradually Incorperated into world market to facilitate the accession to China's market for the fishery and seafood giant and China's companies also are calling for a high-grade local expo to expand world market. Shanghai,lie on the midpoint of China's coastline geographically,the most highly internationalized city around Yangtze River Delta,influence the Yangtze River Delta even China with it's powerful economic strength and potentially huge fishery and seafood market,besides the advanced exhibition industry conceive and shape the SIFSE expo

Shanghai Fisheries Trade Association, associated with Shanghai Fisheries Office, China Aquatic Products Processing & Marketing Association and Taiwan Aquaculture Marketing Cooperative together with China Tongyuan Corperation are going to hold SIFSE2009 together

We will survive and grow hand in hand in presence of global economic recession under the support of China's huge market demand and purchasing power for fishery and seafood. You will catch a big "fish" in Sifse2009.book your stand now for your business opportunity from organizer

Shanghai Gehua Exhibition Service Co.,Ltd

Web of Sifse.www.sifse.com

E-mail:daniel@sifse.com

Mr Daniel

M.P:+86-13817672984

Tel:+86-21-34140855

Fax:+86-21-64516467

Building strength in aquaculture

In Vietnam, Behn Meyer Vietnam Representative Office is now Behn Meyer Vietnam Co Ltd which will allow its animal nutrition unit to be more than a marketing and distribution company.

Behn Meyer Animal Nutrition has moved to larger premises with warehousing facilities of 4,200 m^2 in the Vietnam Singapore Industrial Park, Binh Duong Province, near Ho Chi Minh City. The next step will be to obtain distribution rights as well as producing more its own products for the aquaculture and livestock industry. The company said that it is also building a 400m^2 R&D complex, complete with enzyme and water treatment laboratories. In addition, Behn Meyer Aquaculture will have a wet laboratory and pond facilities as to conduct its own feed trials. It has existing enzyme laboratories across South East Asia such as in Bangkok and Jakarta. The wet laboratory with several recirculation systems will be the nucleus of the R&D work with freshwater fish. In Indonesia it uses commercial ponds to carry out experiments in shrimp.

Dr. Dirk Lorenz-Meyer, Technical Advisor of Behn Meyer Aquaculture said, "The decision to build this in Vietnam demonstrates our commitment to the local pangasius and tilapia industries. We are working closely with our customers to do our part for a more sustainable aquaculture in South East Asia." After its tremendous growth over the last years, pangasius production will be stagnant this year as the industry has to deal with rampant disease as well as overcapacity in feed mills and processing. "There is fierce price competition with the final product in the export markets, which means insufficient funds returning into the farming system," analyses Dirk. "So we either have to make the feeds more economical or try to drastically improve feed efficiency".

Currently, the company pursues both directions in collaboration with renown universities and research institutes. In Vietnam, Behn Meyer Aquaculture cooperates with Nong Lam University (NLU) to do basic research on the fibre tolerance of fish. There are also opportunities in using additives such as Hemicell, shown to improve feed conversion ratio in fish by 5 to 8%. "Working with feed companies, we would like to see more flexibility in formulation of diets with the aim of bringing down the cost of production for the farmers".

Research to improve feed performance is mainly done in Europe. "We are working on several prebiotics, such as the ones being tested at Stirling University in Scotland. Initial feeding trials with pangasius have shown excellent feed conversion responses and we now need to do challenge work to determine their efficacy against bacteria, such as *Edwardsiella* and *Aeromonas*."

The team in Vietnam

It is of special interest that all products that Behn Meyer Aquaculture promotes are organic. While they are mostly used in conventional feeds today, its OMRI certified products will allow the company to participate closely in developing organic aqua feeds in the region. The company is even set to offer market access of organically farmed produce through its seafood import division in Germany.

"The new R&D facilities in Vietnam will enable us to be a key player in terms of local adaptation as well as true innovation of nutritional and health concepts for fish. We see ourselves as a service provider to the aquaculture industry in Southeast Asia. Enzyme analyses and maintenance of our PPLA systems were the first step but our focus on local R&D opens a new chapter now."

Dirk added that as the student population is increasing yearly at NLU, it will require additional experimental facilities. The company will assist with facilities for students to conduct their research and at the same time benefit from the expertise in nutritional research of Dr Le Thanh Hung at NLU.

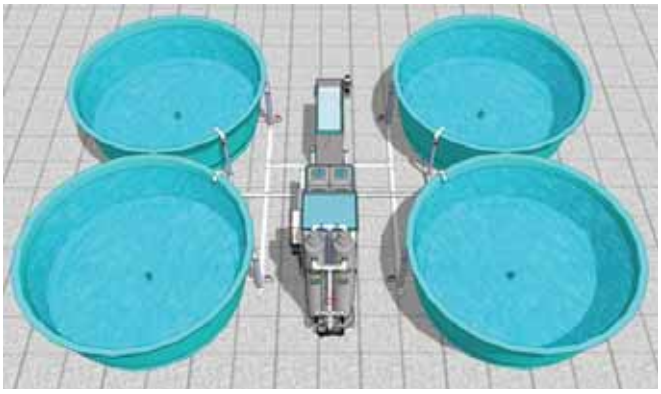
The new address is Behn Meyer Vietnam Co., Ltd, 36, Street 6, Vietnam Singapore Industrial Park (VSIP), Thuan An District, Binh Duong Province , Tel: +84 650 3766030 Fax: +84 650 3766040. Email: dirk@behnmeyer-vietnam.com (Dirk Lorenz-Meyer).

An innovative RAS for aqua-farming

In China, supplies of groupers for consumption are mostly from South East Asian marine floating cages and wild catches. Demand for farmed grouper continues to increase in the coastal areas of China. Ponds and marine floating cages are the traditional farming methods in China and these are concentrated in the provinces of Fujian, Guangdong and Hainan. However, climatic changes, cold weather, typhoons and red tide occurrences are hindering growth of grouper culture activities.

In Fujian Province, the second largest province for grouper production in China, Goldbill RAS has developed a recirculation aquaculture system (RAS). Michael Yan, CEO said that the innovation recirculation aquaculture system is now widely used in coastal provinces such as Zhejiang, Guangdong and Fujian. The yearly production of grouper using RAS is 8,000 tonnes in Fujian. He added that more and more producers are using RAS for the production of high valued marine fish such as groupers and the red snapper.

The RAS has been brought to Malaysia by the STAC R&D Center of Sepang, Selangor. In Malaysia, a constraint to expanding culture in marine



floating cages or in ponds is getting young graduates interested in this business, said Khoo Eng Wah of STAC . He sees the RAS as the alternative way to encourage young graduates to be involved in aqua farming.

"With this system, we are providing better working conditions for the younger generation who do not want to work under the hot sun or rain during the monsoon in floating cages or ponds. With this RAS, culture facilities are land based and are similar to working in a factory. The indoor production facility can be close to the coastal regions where electricity and pipe-water supply are available and there is accessibility to land transport. With IT technology, CCTV cameras and internet connectivity, the system can be monitored in situ or remotely", said Khoo.

Goldbill RAS has combined all the critical treatment processes into one compact machine . These include the mechanical filter (solid separation), protein separation, CO_2 degassing, biological filtration, nitrification and denitrification, ultraviolet UV disinfection, oxygenator and odour disinfection.

More information: Email: engwah.khoo@stac.com.my (Khoo Eng Wah).

Skretting

New Managing Director

Skretting has announced that Viggo Halseth has succeeded Knut Nesse as Managing Director of Business Unit Skretting Northern Europe from 1 June 2009. As a result of an organisational change, Skretting Australia will also continue reporting to Halseth. Prior to this, Halseth was Managing Director of BG Skretting Trout & Marine. He has worked in Skretting for 25 years and has held several senior positions including that of Managing Director of Skretting ARC from 1999 to 2007, Executive Vice President and Marketing Director for Skretting Norway (1993-1999) combined with Marketing Director Skretting worldwide (1995-2000) and Product Manager and Technical Salesman for Skretting Norway (1984-1993). This long experience and broad expertise within feed and industrial fish farming gives Halseth a unique position globally. He has a Cand. Agric. degree from the Norwegian University of Life Sciences.

GAA

New VP for Development, Administration and Communications

The Global Aquaculture Alliance (GAA) has appointed Peter Redmond as Vice President of Development, Administration and Communications. Redmond, who has worked with GAA in a consulting role for the past year, will be tasked with 'helping the organisation continue its advocacy for responsible, sustainable aquaculture to expand the supplies of fish and seafood for global consumers'.

"His personal commitment to sustainable, responsible aquaculture has helped reshape the entire retail sector", said GAA co-founder and President George Chamberlain. "Redmond's expanded role in GAA will surely drive the BAP program to new heights".

Redmond will continue his efforts to develop marketplace acceptance of GAA's Best Aquaculture Practices certification (BAP) standards. Chamberlain will continue as GAA president, with a major focus on the work of the BAP Standards Oversight Committee. Wally Stevens, Executive Director and Chamberlain will focus on supporting responsible aquaculture development, working with governments, regulatory agencies, trade associations and involved stakeholders around the world. The organization will continue to operate from its St. Louis, Missouri, USA, office with support from its existing staff.

Alltech's Symposium

Leading agricultural experts offer opposing views

At the 2009 'Great Debate', held during Alltech's 25th International Animal Health and Nutrition Symposium in Lexington, Kentucky, USA in May, three global agricultural leaders presented differing views on sustainability. Offering insightful opinions to more than 1,000 delegates representing top global agribusinesses, the panellists commented on a variety of issues with topics ranging from environmental concerns to raw material traceability.

"We will only have a sustainable system if farmers are protecting their assets," said Dr. Lutz Goedde, deputy director Agriculture Development, Bill & Melinda Gates Foundation.

"Sustainability is more than just sustaining your own business. It is the next generation and the next generation. The United States' response is disappointing. We need to broaden our horizons," said Prof. Michael Boehlje, Department of Agricultural Economics and the Centre for Food and Agricultural Business (CAB), Purdue University. "Children do not believe that intensive agriculture and sustainability are compatible…We need to shape the definition…"

"The main limitation on agricultural sustainability in the future is people and the understanding of what sustainability is. Calorie demand doubled in the past 30 years and will continue to grow. Population will increase, the climate is changing and water is an issue for all," according to Philip Wilkinson, OBE, managing director, 2 Sisters Group. "We need to take a leaf out of Dr. Lyons' talk and be proud of what we do….We need to be passionate about what we do. Then, and only then can we win the hearts and minds of our consumers," he said.

More information: www.alltech.com/symposium

Young scientist award winners for 2009

The Alltech Young Scientist Award competition is part of the company's commitment to furthering scientific education, global animal health and nutrition. The award went to Tung M. Che, a Ph D student at the University of Illinois at Urbana-Champaign, Illinois, USA who submitted a paper examining the effects of mannan oligosaccharide on immune function and disease resistance in pigs. Fan Liu of Nanjing Agricultural University, Nanjing, China who submitted a paper on HSP70 as a new biomarker in the development and evaluation of anti-stress feed additives won in the undergraduate category. Tung M. Che and Fan Liu will be awarded prizes of USD10,000 and USD5,000 respectively.

Tung M. Che holds a degree in animal science from Nong Lam University, Ho Chi Minh City, Vietnam and a Masters degree in animal nutrition from Universiti Putra Malaysia in Malaysia. Tung M. Che has published extensively and in 2004 co-authored a book entitled "Husbandry Techniques for Aquatic Birds". Fan Liu from Shijiazhuang City, Hebei Province, China is currently studying for a degree in animal science at Nanjing Agricultural University. Scientifically, his interests include reproductive and molecular nutrition. When he graduates, Fan Liu intends to pursue a Ph.D. in animal nutrition.

Each student was required to submit a scientific paper of 3,000-5,000 words on a topic involving the company's natural solutions to animal health challenges. More information: www.alltechyoungscientist.com

From left to right: Paulo Rezende, corporate events manager, Alltech, Dr. Inge Russell, Alltech Young Scientist competition chair and professor at Herriot Watt University, Fan Liu, Nanjing Agricultural University, China, undergraduate winner of the Alltech Young Scientist Award 2009, Tung M. Che, University of Illinois, USA, graduate winner of the Alltech Young Scientist Award 2009, Dr. Mark Lyons international projects director, Alltech.

Online modeling and scenario analysis tools

Aquanate.com and AquaFarm Software have announced they are joining forces to offer online aquaculture modeling and scenario analysis software for facility design and management planning. This unites Aquanate.com's strength in online aquaculture data management and AquaFarm's strength in computer modeling and decision-support analysis.

AquaFarm uses modeling and simulation to test and analyse all types of aquaculture systems, including finfish, crustacean, mollusc, microalgae and macroalgae and employing a wide range of production technologies, including static and recirculating green-water pond systems, intensive water reuse and recirculation systems, and flow-through and cage (net pen) systems. AquaFarm can be used for aquaculture design and management planning, enterprise development, research, and education. It gives users complete control over facility system configurations, physical components, culture species, and management strategies and methods. The modeling process provides a powerful analytical tool for decision making, ranging from scenario testing and 'what-if' analyses to fine-tuning of system specifications and management planning.

Aquanate.com offers a complete suite of tools designed to meet the data gathering and analysis needs of fish farms and hatcheries. The secure web based service includes population tracking and analysis, feed consumption tracking, cost of goods analysis, and tagged fish tracking.

More information: www.aquanate.com; www.aquafarm.com

IAI

Acquires Kona Bay Marine Resources

A subsidiary of Integrated Aquaculture International, LLC (IAI) has purchased a majority interest in Sunrise Capital, Inc., a Hawaiian holding company doing business as Kona Bay Marine Resources.

Kona Bay exports genetically-selected specific-pathogen-free (SPF) Pacific white shrimp (*Litopenaeus vannamei*) from its breeding operations on the island of Kauai, Hawaii. Nearby, is an aquaculture farm, with 48 plastic-lined round ponds and a processing plant, the largest in Hawaii. IAI is an aquaculture technology company which offers products and services in aquatic animal health, genetic selection, hatchery and pond management, nutrition, processing, and marketing. IAI has developed an SPF line of black tiger shrimp (*Penaeus monodon*) through a contract with the government of Brunei Darussalam.

George Chamberlain, one of the principals of IAI and president of Sunrise Capital, Inc., said, "The two companies will mutually benefit through enhanced ability to provide high quality products and services to meet the significant challenges presently facing the shrimp farming industry".

According to James Sweeney, manager of Kona Bay, "The talented team at IAI will not only help Kona Bay improve its breeding and production operations in Hawaii, but also provide a critical link to clients in Asia and Latin America." Sweeney began his career at Japan's renowned Fujinaga Institute in 1979 and continued at Hawaii's Oceanic Institute, where he assisted in the development of SPF white shrimp and intensive culture technologies. He has worked at the Kauai-based shrimp facilities since their inception in 1997.

Chamberlain said that IAI had been using Kona Bay brood stock for two years through its clients in Asia. He added that Kona Bay also has unusually rich collection of breeding lines for fast growth and disease resistance. Another advantage is the unparalleled water quality from deep seawater wells and their intensive ponds, which allows the company to evaluate its lines in on-site commercial trials. It also has 200 hectares of adjoining land suitable for aquaculture development.

"Access to pristine seawater and year-round growing conditions provide unique capabilities for developing breeding, hatchery, and grow-out technologies for a variety of high-value marine species. We welcome collaboration with groups interested in exploring these exciting opportunities."

More information: Kona Bay Marine Resources, Jim Sweeney (email: james4shrimp@aol.com) and IAI George Chamberlain (email: georgec@integratedaquaculture.com).

Addcon

Teaming up of managers in the Philippines

In April and May, Dr. Karsten Schroeder and Dr. Kai – J. Kühlmann, both Application Marketing Managers of Addcon Asia, explored the Philippine agricultural markets to promote the company's product range. The Philippine aquaculture market is the fourth largest in South East Asian led by Indonesia, Vietnam and Thailand. In 2007, it produced about 0.8 million tonnes of milkfish, tilapia and several species of shrimps.

Both experts visited the Manila area, Negros and Cebu and introduced the growth promoter Aquaform and the fish-preservative Fishform Plus to technical personnel from production and sales and CEOs of various feed mills and trading companies. Products from Addcon are new to the SE Asian market, thus information about these innovative 'Green Chemicals' were met with great interest.

"Introducing the fish-preservative Fishform Plus to the Philippines would be of advantage to the tuna industry in Mindanao as tuna landings can be preserved in its freshness on the one hand and, would save handling costs on the other", summarized Malcolm Sarmiento, National Director of the Bureau of Fisheries and Aquatic Resources (BFAR) in Manila. By applying the product to the offal obtained from tuna catches, massive costs on ice storage and electricity – traditionally used up to present – could be saved. As protein quality of by-products is maintained for several days, the quality of the fishmeal produced from 'preserved' raw materials can improve significantly.

Although customers were impressed by the potential of the various products with regard to improved health condition and growth performance, verification trials under local climate conditions are still in demand. Thus, grow-out trials for tilapia and milkfish are in preparation to test different concentrations of Aquaform added to the respective compound feeds. To demonstrate the freshness effects of the preservative under tropical conditions, a local trial with freshly caught fish is being conducted in Cebu, while product focus seminars are planned for the tuna industry in Mindanao (Southern Philippines) and the trash fish processors and fishing operators in Negros.

Asian Pacific Aquaculture 2009

Sustainable Aquaculture and Quality Seafood for All

Asian Pacific Aquaculture 2009 conference and trade show will be held in Kuala Lumpur, Malaysia from 3 to 6 November 2009. It is hosted by the Department of Fisheries, Ministry of Agriculture and Agro Based Industries. Some updates on what to expect at this conference and trade show organized by the Asian Pacific Chapter of the World Aquaculture Society, Malaysia Fisheries Society and University Putra Malaysia is given below. Simultaneously, the Department of Fisheries will organize the Malaysia International Seafood Exhibition which will showcase the seafood trade of Malaysia.

Special industry session

This will be a local gathering of 150-200 farmers (sponsored by the Department of Fisheries) as well other regional participants. Translation services will be available. Presentations will be in marine fish, shrimp and freshwater fish production. It will convey practical information and solutions for current challenges facing industry in the region. At press time, the following presentations have been confirmed. During the morning session, Professor Grace Lo, National Taiwan University will deliver practical information on shrimp disease management in the region. Two other confirmed presentations will be on biosecurity challenges in farming and hatchery for monodon shrimp farming by Dr. Marc Le Groumellec, Director of Aqualma, Madagascar and modern marine fish farming by Mr. Misai Tsai, director of P.T.Lucky, Indonesia. Other suggested topics will include marketing shrimp to meet standards and certification requirements of markets and hatchery technology.

At the trade show

Some 60% of the 70 booth trade show have been booked. The list of exhibitors registered for the trade show as at press time is given below.

Exhibitors	No of booths	Country	Services/Products
Wiley-Blackwell	1	Australia	Major publisher of peer-reviewed journals and an extensive collection of books.
Inve Aquaculture	1	Belgium	Provides nutritional and health specialties for fish and shellfish hatcheries and farms.
Zymonutrients	1	India	Manufactures and exports natural healthcare feed additives for aquaculture with specialty products for aquaculture in the region.
Department of Fisheries Malaysia -DOF	3	Malaysia	Role is to manage and develop the fisheries and aquaculture sectors of the country in a sustainable, dynamic and competitive manner. Host for the event
Infofish	1	Malaysia	An intergovernmental organization providing market information and technical advisory services to the fishery industry of the Asia-Pacific region. Publishes Infofish International
Kembang Subur Sdn Bhd	1	Malaysia	A leading marine shrimp hatchery based in the East Coast of Peninsula Malaysia
Lab-Ind Resource Sdn Bhd (LIR Biotech)	1	Malaysia	A dynamic biotechnology company providing products and service to laboratories, universities and industries. In aquaculture, it provides technical training and services on disease diagnostics and health management.
Recirculating Aquaculture Systems Sdn Bhd	1	Malaysia	Manufacturer of complete systems and components for recirculation aquaculture systems.
QL Foods	2	Malaysia	Producer of a wide range of value-added seafood products
Panorama Acuicola	1	Mexico	Magazine in Spanish and online information for the Industry in Latin America and the World.
Aquaculture Asia-Pacific	1	Singapore	Publishes bimonthly magazine in english for regional aquaculture industry.
Fish Breeding Association Taiwan (FBA)	10	Taiwan	Includes companies involved in fish breeding and aquaculture under the umbrella of FBA which integrates international marketing efforts of members.
Team Aqua	1	Taiwan	A leading manufacturer of aquaculture equipment and supplier of shrimp and fish feed as well as closed water treatment systems.
Uni-President	3	Taiwan	Headquarters in Taiwan, plants in Taiwan, China and Vietnam produces feeds for shrimp, ornamental fish, freshwater fish and marine fish. Developed integrated services in Vietnam. Gold Sponsor for event.
Erisler Gida San ve Tic.	1	Turkey	Feed ingredients manufacturer
Intervet Schering Plough	2	UK	Renowned pioneer in aquatic health management. Intervet Norbio Singapore Pte. Ltd is the R&D centre to products and application strategies for the Asia-Pacific region. Headquarters in the UK, sponsor for health sessions at conference.
Cargill	2	USA	US based Cargill supplies branded feed and ingredients for feed manufacturers and retailers. In Malaysia, it manufactures a full range of feeds for most key aqua species.
Moana	3	USA	Development and supply of genetically improved and disease free seed of black tiger shrimp *Penaeus monodon* in Hawaii. Has multiplication centres in Vietnam, India and Thailand.
Novus	2	USA	US based Novus Aqua is dedicated to developing products with performance and innovation for the global aquaculture market.
Tekni-plex	1	USA	The leading manufacturer of garden hose and aeration tubing with a plant in Suzhou, China. For aquaculture, the company has aeration tubing for various culture systems.

For more information on how to participate in this conference and trade show, contact:
Asian-Pacific Aquaculture 2009, Conference Manager, P.O. Box 2302
Valley Center, CA 92082 USA, Tel: +1-760-751-5005; Fax: +1-760-751-5003

Stay in touch with the program developments for ASIAN-PACIFIC AQUACULTURE 2009 through Web Page at: http://www.was.org

World Aquaculture 2009, Veracruz, Mexico

Micro-algae in the aquaculture industry at SBAE workshop

The launch of the GreenStim product range at the World Aquaculture 09 exhibition in Veracruz, Mexico will be highlighted during the SBAE workshop "Micro-Algae in the Aquaculture Industry" on Sunday September 27th at 17.30h in the Olmeca 7 room.

GreenStim products from SBAE Industries, Belgium provide aquaculture producers with the key to optimal results in the hatchery. GreenStim Marine is the green water solution for marine larvae. GreenStim Roti is an innovative rotifer diet. GreenStim Marine is a natural mix of micro-algae creating an optimal green water environment in marine larval tanks. Due to higher survival, better and faster growth towards weaning stages and savings on expensive live feeds, the GreenStim green water environment results in more turnover and reduces the dependency on the own algae culture. The GreenStim Marine is user friendly and fits into the existing set-up and procedures of the hatchery. More information: Free invitation at Booth 180. Email: sales@sbae-industries.com; web: www.sbae-industries.com

Second Seriola and Cobia Aquaculture Dialogue September 24-25

A Seriola and Cobia Aquaculture Dialogue (SCAD) is underway to create measurable, performance-based standards that will help minimize the impacts *Seriola rivoliana*, *Seriola lalandi* and cobia farming has on the environment. Industry leaders, conservationists, academics and others are participating in the dialogue, which is being conducted under the auspices of the World Wildlife Fund (WWF) Aquaculture Dialogues. The SCAD is being coordinated by Paul Holthus, Executive Director, World Ocean Council.

The first Seriola and Cobia Aquaculture Dialogue session was held at Aquaculture America in Seattle in February 2009. Participants identified the impacts that will be addressed through the standards and the goals and objectives of the SCAD. For the first meeting summary, see http://www.worldwildlife.org/what/globalmarkets/aquaculture/WWFBinaryitem11779.pdf

The second SCAD workshop will be September 24-25, 2009 in Veracruz, just before WAS. The participants will begin drafting criteria, principles and indicators to consider for use in the standards for sustainable seriola and cobia production. To indicate your interest in the SCAD, and register to participate at the SCAD 2 in Veracruz, contact: paul.holthus@oceancouncil.org

What to expect in AQUA CULTURE Asia Pacific Magazine in 2010

As we continue to move the aquaculture industry to the next phase of growth, new opportunities and challenges arise. The only constant we see is change. During this 6th year of our publication, we will continue to look at current issues, trends and the latest developments and technology to keep readers updated.

Editorial calendar 2010

Volume 6 2010						
Number	1	2	3	4	5	6
	January/February	March/April	May/June	July/August	September/October	November/December
Issue focus *Current trends and challenges*	Aqua feed Production	Hatchery	Sustainable & Responsible Aquaculture	Health & Biosecurity	Cage Culture	Food Safety & Traceability
Industry review *with profiles and outlook*	Marine Shrimp	Marine Fish	Catfish	Freshwater Fish	Tilapia	Marine Fish
Feed Technology	Processing Technology Animal & plant meals	Larval feeds & processing Feed additives	Feed standards Feed enzymes	Pre and Probiotics Immunostimulants	Processing Technology Feed additives	Nutrition Novel meals & oils
Production Technology	Aeration & Disinfection Technology	Brood stock & genetic Improvement	BMP, Standards and Certification	Recirculation aquaculture technology	Feed management	Health management
Shrimp/Fish culture developments	Coverage on experiences from industry, including role models, benchmarking and opinion articles.					
Markets	Contributed reports on market trends, product development, issues and challenges.					
Show Preview/Issue	Victam 2010, Bangkok, Thailand 3- 5 March World Aquaculture 2010, San Diego, USA March 1-5	Australasian Aquaculture 2010 Hobart, Tasmania 23-26 May	Vietfish 2010, Ho Chi Minh City, Vietnam 12-14 June		Aquaculture Europe 2010, Porto, Portugal 6-8 October 9th Asian Fisheries and Aquaculture Forum & ISTA 2010, Shanghai, China, 15-19 October	

September 20–25, 2009

16th Annual Practical Short Course on Aquaculture Feed Extrusion, Nutrition and Feed Management

This one-week Practical Short Course on Aquaculture Feed Extrusion, Nutrition and Feed Management at the Texas A&M University will be conducted by staff, industry representative and consultants.

This program will cover information on designing new feed mills and selecting conveying, drying, grinding, conditioning and feed mixing equipment. Current practices for preparing full-fat soy meal processing; recycling fisheries by-products, raw animal products, and secondary resources; raw material, extrusion of floating, sinking, and high fat feeds; spraying and coating fats, digests and preservatives; use of encapsulated ingredients and preparation of premixes, nutritional requirements of warn water fish and shrimp, feed managements and least cost formulation are reviewed.

Practical demonstration of sinking, floating, and high fat aquafeed, are demonstrated on four major types of extruders - (dry, interrupted flights, single and twin screw), using various shaping dies. Other demonstrations include: vacuum coating and lab analysis of the raw material for extrusion. Reservations are accepted on a first-come basis. For more information, programs and application forms, contact:

More information: Dr. Mian N. Riaz, 2476 TAMU, Food Protein R&D Center, Texas A&M University, College Station, TX 77843-2476, USA. Tel: +1 979 845 2774; Fax: 979 8452744; Email: mnriaz@tamu.edu; Web: www.tamu.edu/extrusion

2009

August 14-17
Aquaculture Europe 2009
Trondheim, Norway
Web: www.easonline.org

August 17-19
International Aquaculture Biosecurity Conference (IABC)
Trondheim, Norway
Web: www.iabconference.org

September 7 - 10
Larvi 2009-5th Fish & Shellfish Larviculture Symposium
Belgium
Email: larvi@ugent.be
Web: www.aquaculture.ugent.be

September 16 - 19
World Fishing Exhibition
Vigo, Spain
Email: IRoberts@mercatormedia.com
Web: www.worldfishingexhibition.com

September 20–25
16th Annual Practical Short Course on Aquaculture Feed Extrusion, Nutrition and Feed Management
Texas A&M, USA
Email: mnriaz@tamu.edu
Web: www.tamu.edu/extrusion

NEW DATES

September 25-29
World Aquaculture 2009
Veracruz, Mexico
Email: worldaqua@aol.com
Web: www.was.org

October 13-15
Integrated Technologies for Advanced Shrimp Production
Hawaii, USA
Email: shrimp2009@oceanicinstitute.org
Web: www.oceanicinstitute.org

October 11-31
Training on grouper hatchery production
Lampung, Indonesia
Email:yuan@enaca.org (Yuan Derun)
Web: www.enaca.org

November 3-6
Asian-Pacific Aquaculture 2009
Kuala Lumpur, Malaysia
Email: worldaqua@aol.com
Web: www.was.org (see page 50)

November 3-5
14th China Fisheries & Seafood Expo'2009
Qingdao, China
Email: seafoodchina@seafare.com
Web: www.chinaseafoodexpo.com

November 8-11
International Symposium on Aquaculture, Biology and Management of Commercially Important Crabs – 2009 (ISABMC-2009)
Shanghai, China
Email: shanghai09crabconference@gmail.com
Web: www.crablab.org

November 27 - 30
1st International Symposium on Aquaculture and Fisheries Education (ISAFE)
Pathumthani, Thailand
Email: aarm@ait.ac.th

December 9-12
4th Shanghai International Fisheries & Seafood Exposition
Shanghai, China PRC
Email: daniel@sifse.com
Web: www.sifse.com

March 3 2010
Aquafeed Horizons Asia 2010
Bangkok Thailand
Web: www.feedconferences.com

2010

March 3 – 5 2010
Victam Asia 2010
Bangkok, Thailand
E-mail: expo@victam.com
Web: www.victam.com

After we've fitted the final piece, we find a new puzzle

How can we find new alternatives to fishmeal and fish oil, and how can we increase the omega-3 content in fish raised on such feeds? How can we boost fish health and performance through functional ingredients? The researchers at Skretting Aquaculture Research Centre are committed to finding answers in a world that changes rapidly. Their priorities are consumer safety, fish health and productivity, improved feed management and sustainability both in feed production and in fish farming. Their discoveries benefit fish farmers directly, by ensuring that consumers can eat healthy, sustainable and delicious fish. **www.skretting.com**

Feeding your passion for fish

SKRETTING

Uni-President

CREATES THE VALUE OF PRAWN

Uni-President implements traceability through all sectors along with supply chain. Biosecurity hatchery produces SPF (Special Pathogen Free) and SPR (Special Pathogen Resistant) larvae. Quality program of prawn feed plants was certified by ISO 22000 & HACCP.

• 16-18, DT 743, Song Than II Industrial Zone, Binh Duong, Vietnam.
• Tel: +84-650-3737626 - Fax: +84-650-3790819
• Email: aquafeed@upvn.com.vn

CTY TNHH UNI-PRESIDENT VIỆTNAM
UNI-PRESIDENT VIETNAM CO., LTD.

Establishing a Healthy and Happy Tomorrow