

## Bio floc technology

Bio Floc Technology (BFT) is a relatively new biotechnology means to control water quality in fish and shrimp ponds, to minimize water exchange and environmental pollution, to recycle feed materials and reduce production costs. This is all in accordance with the requirement of developing sustainable and environmental friendly aquaculture.

Today, this technology has caught the attention of aquaculturists all over the world and many companies and farmers have started to use this technology. Presently it is being successfully applied in fishponds (mostly tilapia culture in the US and Israel) and in shrimp ponds (Belize, Indonesia etc).

A BFT working group, headed by Prof. Yoram Avnimelech was established 3 years ago by the Aquacultural Engineering Society. The group is operating a web page (<http://floc.aesweb.org>) and has organized specific sessions in different World Aquaculture and other conferences. In Busan, Korea during World Aquaculture 2008, the session on BFT covered the principles of BFT and some applications.

### What is it and how to use it?

**Yoram Avnimelech**, Dept of Civil and Environmental Engineering Technion, Israel Inst of Technology said that bio floc technology ponds can be visualized as built-in bio-filters. As fish and shrimp ponds are their own ecosystems with a rich microbial community, these can be used to control water quality as well as fish and shrimp nutrition and health. The inorganic nitrogen added into ponds through feed can be assimilated by these microorganisms and converted into microbial protein through an adjustment of C:N ratio. Shrimp, tilapia and other species can harvest the microbial flocs and utilize the microbial protein, doubling the feed protein efficiency. In these ponds, the effect of C/N ratio can be predicted and the amounts of carbohydrates demand can be computed. Present experimental and commercial results indicate that bio floc technology ponds achieve high yields in environmentally and economic sustainable systems. (Related article: Using the pond itself as a biofilter: A review of theory and practice Volume 4 (2) March/April 2008).

### Super intensive systems and organic certification

**Craig L. Browdy** and the team at Waddell Mariculture Center, South Carolina Department of Natural Resources have been focusing on how to grow SPF stocks of *Litopenaeus vannamei* in rich microbial biofloc greenhouse-based, zero-exchange raceways. The systems rely on fast growing high health animals from specific pathogen free stocks of shrimp, biosecure engineered systems to maintain water quality, dense high quality feeds developed holistically to maximize growth and contributions from microbial productivity while minimizing use of marine products for eventual consideration of certification under USDA Organic Agriculture standards. The technologies aim to reduce environmental impacts and allow commercial shrimp farms to be sited close to large population centres.

Recent research has focused on management of bioflocs within the systems. At densities exceeding 500 shrimp per metre, feed inputs are high necessitating the cropping of biofloc communities and external waste treatment to maximize mineralization and nitrogen utilization efficiencies. Toxic metabolites including ammonia and nitrite are initially controlled through the careful addition of supplemental carbon to sequester nitrogen in heterotrophic bacteria. Once the microbial community matures, the carbon additions are discontinued shifting control of ammonia and nitrite to chemoautotrophic nitrifiers. The cropping of microbial biomass allows greater light penetration, encouraging algal productivity. The challenge at present is to better define management strategies to encourage beneficial microbes while eliminating harmful elements. All of these strategies are designed to reduce the need for supplemental oxygen while assuring maximum growth and survivability. Competitiveness of these systems is enhanced by maximizing outputs per unit area while controlling variable costs.

### Stimulation of bacterial communities

According to **Angelito O. Abaoag**, Bionovar International Pte Ltd, Singapore, the most widely used pond management system relies on algae culture to provide water stability and nutrients to the cultures. Unfortunately, this system is very hard to maintain due to many interconnecting

## Aero-Tube™

## Discover the Aero-Tube™ Oxygen Advantage!

Aero-Tube™ aeration tubing is proven to be up to 4 times more effective in independent testing. That means up to 75% less energy consumption from your aeration system. Which means more money in your pocket.

It doesn't matter if you are raising shrimp or fish, in growout ponds or raceways, we have an Aero-Tube™ solution for you.

For more information go to  
[www.aero-tube.com](http://www.aero-tube.com) or email us at  
[info@clariferaerationtubing.com](mailto:info@clariferaerationtubing.com).

variables. In recent years, a new model in aquaculture is gaining ground and the emphasis of this is the stimulation of bacterial population in pond ecosystems to provide nutrient transformation, waste utilization through flocculation or 'bioflocs'. However, operational issues such as cost and functionality provide hindrances to its adaptation.

By using mixed bacterial cultures, he showed how these can stimulate, maintain and manages a 'beneficial' algal based flocculation during every stage of the culture of *Penaeus monodon* and *P. vannamei*. Different mixed cultures were used in the commercial trials, such as 'biosoil' for pond remediation and 'biogreen' in the water. Changes in floc density and size with time were monitored. Microbial and algal profile were also monitored through time. Performance data at two farms indicated a sustained production of large size shrimp; 70-100g for the black tiger shrimp and 35-40g for vannamei shrimp. Major interventions in terms of protocol, microbial application and floc development were required at day 72 for the black tiger shrimp ponds and at day 67 for the vannamei shrimp ponds. Successive intervention points were every 10-15 days.

### Launch of an Asian Chapter of the BFT group

Sessions participants agreed to establish an Asian chapter of the BFT group. Yoram said that due to the fact that these activities did not take place in Asia, involvement of Asian members have been minimal. The goals and planned activities of the group are:

- To serve as a contact point to individuals and institutions interested in the development of the field.
- To facilitate dissemination of relevant information a must toward the implementation of BFT systems.
- To keep a periodical coverage of BFT related information in Asian technical journals.

- To initiate specific sessions in aquaculture related conferences held in Asia.
- To organize training courses, seminars and specific workshop in order to provide the needed information to students, technical officials and farmers.
- To bring the existence of the BFT group to the attention of governments, universities and other related institutions and to seek cooperation.
- To place all relevant information in the BFT web page: (<http://floc.aaesweb.org>).
- To distribute the membership list and their e mail addresses to assist professional contacts.
- To work toward formal sponsorship of the WAS and AES.

The organising committee comprise

- Yoram Avnimelech, Technion Israel Inst of Technology; email: [agoram@tx.technion.ac.il](mailto:agoram@tx.technion.ac.il)
- Qiufen Li, Yellow Sea Fisheries Research Inst, China; email: [liqf@ysfri.ac.cn](mailto:liqf@ysfri.ac.cn)
- Angelito O. Aboag, Binovar International Ltd, Singapore; email: [lito.aboag@binovar.com](mailto:lito.aboag@binovar.com)
- Anil Ghanekar, Ecosecure systems, India; email: [anilghanekar@yahoo.com](mailto:anilghanekar@yahoo.com)
- Yuan-Nan Chu, National Taiwan University, Taiwan; email: [ynchu@ccms.ntu.edu.tw](mailto:ynchu@ccms.ntu.edu.tw)
- Nyan Taw, PT. Luxindo Internusa, Indonesia; email: [Nyan.taw@global2solve.com](mailto:Nyan.taw@global2solve.com); [nyantaw@hotmail.com](mailto:nyantaw@hotmail.com)
- David Smith, CSIRO Australia; email: [david.m.smith@csiro.au](mailto:david.m.smith@csiro.au)

The group welcomes individuals or institution interested to join this group. They can contact Yoram Avnimelech, email: [agoram@tx.technion.ac.il](mailto:agoram@tx.technion.ac.il) or Qiufen Li, email: [liqf@ysfri.ac.cn](mailto:liqf@ysfri.ac.cn)



**AQUAMAR**  
Internacional

## VII International Fair of Aquaculture and Fisheries

El Cid Hotel

November 12th-14th, 2008 - Mazatlan, Sinaloa, Mexico

- 🐟 Trade Show
- 🐟 International Symposium
- 🐟 XI National Forum About Tuna

Information: +52 (55) 5135 6128 & 5135 5697  
[zolla\\_lopez@aquamarinternacional.com](mailto:zolla_lopez@aquamarinternacional.com)  
[www.aquamarinternacional.com](http://www.aquamarinternacional.com)

**AQUAMAR**  
Our meeting point

