Intelligence

We can grow better shrimp, and in better ways

5 September 2016
By Darryl Jory, Ph.D.

Advocate Editor Emeritus Darryl Jory addresses the XI Central American Aquaculture Symposium

Shrimp was by far the central topic of the recent symposium in Choluteca, Honduras. Photo by Darryl Jory.

I participated in the recent XI Central American Aquaculture Symposium, 24-26 August 2016 in Choluteca, Honduras, where some 24 speakers presented talks and the more than 600 participants – representing mostly producers, industry suppliers and researchers from the region as well as from Mexico, the United States, Colombia, Ecuador, Peru, Brazil, Venezuela, Italy, France, Germany and other countries – also enjoyed a well-organized and diverse trade show.

The event is held every two years, and this year the program heavily reflected the importance of farmed shrimp to the region, as the central topic of most talks involved revolved around this activity. The topics of presentations ranged from the global status of the shrimp industry to diseases, nutrition, production systems, aeration and engineering, equipment, health management and others.

In my invited keynote presentation "The Global Shrimp Farming Industry: Status, Issues and Perspectives," I discussed some current production data and trends in the main shrimp producing regions and countries, and some of the major issues affecting industry development – like diseases and aquafeeds – as well as technical perspectives to support further industry expansion.

Regarding global production of farmed shrimp, I believe production in 2016 could be similar to 2015. We will know more after the upcoming **GOAL 2016** (https://www.aquaculturealliance.org/goal/?__hstc=189156916.b4297cf27e51e25ac3b71e49cdaa98a2.1676369044686.1676369044686.1676369044686.1&__hssc=189156916.1.1676369044687&__hsf meeting in Guangzhou, China, later this month, when annual forecasts are released. The countries of India, Indonesia and Ecuador continue pushing the market as producers, and in the case of India, the development of new production areas (Bengal, Orissa, Gujarat) has been important for their output.

We have accomplished the quadrupling of global production of farmed shrimp in only about 20 years despite a number of diseases.

China is obviously the major world player, both pushing and pulling the market as a producer and importer, and the country needs massive imports from Ecuador and other suppliers to satisfy its huge internal demand. Thailand continues its strong recovery from EMS/AHPND, through the increased use of improved genetic lines, enhanced production techniques and to some extent the expansion of its domestic market. Ecuador appears on track to meet or exceed its impressive 2015 production.

Aquaculture in general – and certainly the shrimp farming industry – faces several challenges including diseases, feeds, environmental and social responsibility, the marketplace, investment, leadership, consumer awareness and education.

I believe diseases and feeds are probably the most important ones for the shrimp industry right now. In its relatively short history of around 30 years, it has been periodically affected by various diseases, mostly of viral origin and including the Taura and White Spot viruses.

In the last few years we have seen the emergence of two new, serious ones, the EMS/AHPND disease (Early Mortality Syndrome/Acute Hepatopancreatic Necrosis Disease) caused by a bacterium, *Vibrio parahaemolyticus*; and a new disease called Hepatopancreatic Microsporidiosis (HPM) caused by a small (1 micron), intracellular, spore-forming microsporidian parasite (Enterocytozoon hepatopenaei, or EHP).

We are definitively learning to manage both, and the case of Thailand coming back strongly from the significant impact of EMS/AHPND is a good example. Diseases have been an important part of the industry since its early years, and will certainly continue to have an impact, but we have accomplished the quadrupling of global production of farmed shrimp in only about 20 years despite a number of diseases, and I believe the industry will continue to live with and learn to manage diseases as it continues expanding.

The other challenge I think is very important is that of aquafeed ingredients. Aquaculture – including shrimp farming – has expanded very significantly in the last 30 years or so, and needs to continue growing in order to contribute the very large volumes of seafood needed by our growing human population. Several major aquacultured species that must continue playing an important role in feeding people are fed with manufactured aquafeeds, which means the aquafeed industry also needs to grow significantly, and this will increase the need for more ingredients. Although cultured algae may have a role, I believe the large majority of additional ingredients will come from various land-based activities like agriculture, through increased production of major current ingredients like soybeans and other crops, from processed animal by-products, and from new ingredients like diverse bacterial products, insect meals and others. Land-based production of feed ingredients under largely controlled conditions is expandable, sustainable, responsible and certifiable.

Regarding industry perspectives, I see three basic questions we should ask and answer. The first one is **"Can we 'make' a better shrimp?" My view is, most definitively yes.**

The most widely cultured species, the Pacific white shrimp (*Litopenaeus vannamei*), and also the still very relevant black tiger shrimp (*Penaeus monodon*) have amply shown their potential to grow significantly, and domesticated lines have demonstrated substantial genetic gains in growth rates, resistance and other desirable selection traits. The relatively short generation time (versus other aquacultured species) is a plus in their selective breeding efforts. Of special importance will be their further domestication, the development of improved lines of specific pathogen-free (SPF), specific pathogen-resistant (SPR and specific pathogen-tolerant (SPT) animals, and breeding for improved performance in specific culture environments. Also very important, in my opinion, will be the increased use and application of the -omics technologies like genomics, nutrigenomics, proteomics and others in our young industry.

The second question to consider is "Can we grow shrimp better?" Again, yes.

We have the tools and they keep getting better, as well as new ones being developed. In the growout technologies we can increase water reuse and biofloc technology, and increased use of multi-phased production with nursery systems. We can grow the industry going inland, near major consumption centers. Nutritional research is further expanding our understanding of shrimp's nutritional requirements, the relevance of their gut health, with innovative ingredients and improved feed manufacturing processes, with novel, functional feeds (seasonal, stress, immunomodulation, others), with improved delivery/management of feeds including precision feeding.

In the health-management area, we can improve effective biosecurity including looking at the larger picture with zone management; research is continuously improving pathogen detection and providing a better understanding of their mode of action; the effective use of immunostimulants and probiotics can be even more very significant, and ongoing research has shown that even the development of "vaccines" now appears not so far-fetched.

And my third question is "Can we grow the shrimp market?" Definitively. But we need to offer consistent availability and quality, as well as more, novel value-added, "convenient" products.

We must work harder to reach the fast-food sector and increase our presence in the domestic markets of many countries. New technologies like those that can extend the shelf-life of fresh products (e.g. modified atmosphere packaging) could revolutionize how we market our products. We know we have a great story to tell, and we must tell it better and to a wider audience.

I believe we can expect the trend of global production of farmed shrimp to continue. The main trends include more efficiency at every level of production and marketing, and increased industry consolidation. Important R&D issues are faster-growing, more disease-resistant animals developed for specific growing conditions. Additional product characteristics (e.g. higher w-3 content) would be a plus for marketing and increasing consumer demand.

The main hatchery issues are Artemia availability and prices, increased replacement of live feeds, and biosecurity. Important growout issues include shortening the period of days of culture through selective breeding, production efficiency and management; and improving biosecurity, health management and survival.

The market issues include expanding consumption (new markets, internal/external); development of new value-added products; and meeting increasing consumer expectations regarding wholesomeness, sustainability and responsibility. The industry has significant potential to expand global production, both through the development of new locations and by responsible intensification of production technology and procedures.

There were several other relevant presentations at the symposium, and following is a summary of some of these.

Linking stress to disease

On the topic of shrimp diseases, Dr. María Soledad Morales-Covarrubias of Centro de Investigación en Alimentación y Desarrollo, A.C. (CIAD, Mexico) discussed the current situation of various diseases of farmed shrimp – including those caused by bacteria, protozoans and viruses, as well as others – in Central America. She presented results of the incidence of these diseases from sampling programs throughout the region, and concluded that "…the risk of these diseases requires the creation and implementation of efficient management schemes that interrelate the organism with the water, soil and food, resulting in a minimum of stress."

Dr. Sonia Soto, also from CIAD Mexico, presented a detailed overview of infectious diseases in farmed shrimp in Mexico. She reviewed the history of shrimp diseases in the country, and diagnostic methods and technology for the major bacterial and viral pathogens. She also discussed the phenotypic characterization of the bacterium strain (*Vibrio parahaemolyticus* AHPND+) involved in early mortality disease or acute hepatopancreatic necrosis disease (AHPND) in Mexico, and among her conclusions she stated that there are "Vp primary pathogen strains with different virulence, that toxins in the plasmid have the ability to infect local strains, that there are slight differences between Mexican and Asian strains, and that pathogenic strains can tolerate a wide range of environmental conditions."

As alternatives to control AHPND, she recommended "maintaining the density of Vp below de infectious level of 10^4 CFU/mL; the use of closed nursery systems with low water exchange and the use of probiotics and biofloc technology; the application of stringent sanitation measures in laboratories producing shrimp postlarvae; to avoid the use of antibiotics and generic probiotics; and the use of shrimp genetic lines."

View of participants in the technical, interactive sessions of the event. Photo courtesy of ANDAH.

Industrial strength

Another talk related to shrimp health was presented by Ing. Fernando García, Aquaculture Business Development Director for Epicore Network, U.S.A., with a detailed discussion on important emerging diseases of shrimp – including EMS/AHPND, EHP, ATM and Running Mortality Syndrome. He concluded that "we need to move away from managing shrimp farming at an artisanal level and convert the activity into an industrial one."

He also emphasized that biosecurity levels must be improved at shrimp nurseries and farms, and management of vibrios in general modified and enhanced; increasing stocking densities while maintaining the current production systems is not the best solution and may increase prevalence of pathogens; and that we must insist in developing technologies and change management practices that will allow us to have more control, minimizing risks and improving cost structures. According to García, "This is the path to a sustainable future in the shrimp industry."

Building a better raceway

Nancy Murillo, Raceway Coordinator for Grupo Granjas Marinas (Honduras), discussed the company's production of shrimp juveniles in open raceways (RWs). She stated that "Instead of closed, super intensive RWs that are continuously aerated and fed, we have developed open RWs that are cheaper to build and easier to operate."

These RWs are open and operated at low density, and are based on algae production, and the goal is to manage a shrimp biomass in the RWs similar to those of growout ponds. These RWs use solar energy to produce its own source of carbon through photosynthesis; diatoms produce more oxygen than they consume and are very nutritious for the postlarva."

RWs have improved water quality without relying on high loads of formulated feeds, are highly productive and environmentally friendly, and can produce 1,000 lbs./ha in 7 days. Murillo said: "The company now has two systems of RWS: One is closed and biofloc-based to recycle ammonia, and the other is open and uses algae for the same purpose." In comparing the two systems (open and closed), under local conditions "the open RWs are much cheaper to operate and produce better results; after seven days of culture, open RW shrimp show better survival, growth and general condition than animals from the closed RWs, with higher survival (62 percent vs. 39 percent), larger size (0.042g vs. 0.039g), and almost twice the biomass. Open RW are 110 percent more productive and their animals appear fuller and are more active."

Pros and cons of recirculation systems

Ing Fernando Huerta, an international consultant and shrimp farmer from Ecuador, presented a talk on water recirculation systems and its benefits for shrimp culture. He discussed the technology, its several advantages – including increased biosecurity, better water quality and stability, and improved production efficiency – and some disadvantages, like a significant initial setup cost and the need for a higher level of technical expertise in the management of the system.

Through case studies he offered detailed insight into various projects he has been involved with in the Americas. Huerta stated: "I believe this technology potentially has wide application throughout the region, and could help revitalize production in areas with poor water quality and disease problems."

Peter Van Wyk, R&D Technical Manager of Zeigler Bros, Inc. (USA) discussed in detail feed management in intensive nursery systems. Photo courtesy of ANDAH.

Feed management crucial at nurseries

Peter Van Wyk, R&D Technical Manager of Zeigler Bros, Inc. (USA) discussed in detail feed management in intensive nursery systems. The key to the success of shrimp nursery systems is feed management.

According to Van Wyk: "The advantages of these systems include greater control of diet, feed management, and water quality; faster animal growth; production of bigger and stronger juveniles with better survival and high potential for compensatory growth; indoor rearing systems allow early stocking of PLs during cold seasons to provide an initial advantage in growth; a management Strategy for WSSV by maintaining nursery temperatures above 30 degrees-C during seasons when temperatures in ponds are low; a more developed immune system; as an AHPNS management strategy, these systems allow stocking of large juveniles, with better resistance to AHPNS; and more efficient use of growout ponds by shortening the growout cycle, resulting in more crops per year."

Van Wyk discussed several related topics, including nursery feed characteristics, formulation, overfeeding and others. He stated: "The concept of precision feeding is key, and involves providing each animal with the exact amount of feed that it can consume, when it wants to consume it, containing the exact nutrition and the exact sized food particles having the exact texture, at the exact location of each animal, to optimize water quality and maximize profitability."

Marketplace outlook for shrimp is bright

Mr. Bill Hoenig, VP of Delta Blue, discussed global population trends and their impact on the aquaculture industry. "Seafood is a growing business and demand for top-grade aquatic products can be expected to continue to increase over the next 20 years or so," he said.

"This growth will be driven by the 3 billion middle-income consumers in Asia-Pacific and by rapid urbanization," he added. "However, in refining projections for future demand, it is critical to take into account the growth of the middle class (not only population growth), the geography and culture, and the fact that consumption is not infinitely elastic to income."

Econ. Angel Rubio from Urner Barry (U.S.) provided an in-depth review of the U.S. shrimp market and its trajectory during the last two years. He concluded "Currently there is a lack of product from Central and South America, but Asian suppliers are meeting demand for now… there are imports of large sizes in larger volumes, in HSLO relative to smaller sizes…value-added shrimp (peeled) is seeing increased consumption."

Rubio noticed a significant increase in late November and December; and revisions show mixed signals, with strong purchases for year-end festivities, increased food sales outside homes, a recovery of long-term demand; and a "growing demand and consumption in the U.S. given the low prices in 2015."

Many major commercial suppliers – including various aquafeed companies and suppliers of several products and services to the industry – sponsored the event and participated in the tradeshow, which was very well attended. Photo courtesy of ANDAH.

Perspectives

The National Association of Honduran Aquaculturists (Asociación Nacional de Acuicultores de Honduras, ANDAH; www.andah.hn (http://www.andah.hn)) again successfully organized and hosted the event, and several well-known commercial suppliers – including various aquafeed companies and suppliers of several products and services to the industry – sponsored the event and participated in the tradeshow. Most of the events' presentations will be made available at ANDAH's website.

Author

DARRYL JORY, PH.D.

Editor Emeritus
Global Aquaculture Alliance

darryl.jory@gaalliance.org (mailto:darryl.jory@gaalliance.org)