The Dean Domiciano K. Villaluz Memorial Lecture Series is held every SEAFDEC/AQD anniversary, and is dedicated to the late Dean Villaluz, the first AQD Chief, in acknowledgment of his able leadership during AQD's organizational and formative years and for his contribution to the development of the aquaculture industry in the Philippines and the rest of Southeast Asia. Dean Villaluz was AQD Chief from 1973 until his retirement from active government service in 1979.

This year's lecturer is Dr. Felix Ayson on biotechnology (inset on right).

# Facing the challenges in aquaculture through biotechnology

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Biotechnology, the science of manipulating genetic traits and substances, has been with us for centuries. The Chinese have created gold fish of different shapes, sizes and colors from a single species through centuries of breeding. New techniques in molecular biology, particularly genetic engineering, have made the field more exciting. Microorganisms act as the new drug factories. Harnessing them has made many medicines cheaper and more readily available. For example, insulin for diabetics is mostly produced by genetically altered bacteria through recombinant DNA technology.

Biotechnological tools fueled the Green Revolution through the development of higher yielding varieties of rice, wheat and maize. Biotech is being held as the engine of the second Green Revolution - one that would be less dependent on pesticides and fertilizers. The same tools have the potential to fuel another revolution, in another front - a Blue Revolution.

The rapid increase in population and the ensuing increase in the consumption of fishery products, as well as uncontrolled fishing, poor management, and the accumulation of chemical pollutants in the environments, have strained global fisheries production. Many countries have turned to aquaculture to increase fisheries production. At present, aquaculture is the world's growing food production sector.

The success of aquaculture depends on the control of reproduction and life cycle. The genetic background of the parent fish stock, efficient detection and effective prevention of diseases, thorough understanding of the optimal conditions for growth and development, sufficient supply of good quality water, and innovative management techniques. By improving some of these factors, the aquaculture industry has already made impressive progress over the last several years. Application of biotechnology can further speed up the expansion of the industry.

The cDNAs and the genomic sequences of growth hormone (GH) and other growth factors have been isolated and characterized for several fish species in recent years. Biologically active recombinant GH preparations have become available and exogenous application of recombinant GH results in significant growth enhancement in fish. If new strains of fish produce elevated but optimal levels of GH, it would bypass many of the problems associated with exogenous GH treatment. Transgenic carp, salmon and rainbow trout have been produced to contain either GH gene promoter sequences or additional copies of the GH gene itself. Such fish has been shown to grow at increased rates compared to unmanipulated fish, resulting in increased production per unit time and a markedly shortened production cycle.

Occurrence or outbreaks of diseases during aquaculture operations substantially reduce profitability. Antibiotics are often used to prevent and control disease outbreaks. However, long-term use brings the risk of bacteria developing resistance and of residues in the cultured product. Apparently, the most effective method can only be the development of natural disease resistance in fish. Selections for specific pathogen resistant (SPR) strains are complimentary approaches that are being addressed in current selective breeding programs in shrimps.

Rapid disease diagnosis and screening for pathogens is one area where molecular biology tools can be applied. In shrimp culture, kits have been developed and several more are being established for PCR-based detection of viral, fungal and bacterial pathogens before clinical symptoms of infection become evident.

Harnessing the hosts' specific and non-specific defense mechanisms for controlling diseases has considerable potential for health management in aquaculture. There are a large number of commercial immuno-stimulants and non-specific immune enhancers available in the market at present and these are incorporated to the diet to provide added protection to the animals. The use of probiotics and microbial food additives is also becoming widespread. Probiotics are living bacterial preparations that improve the balance of the intestinal microflora, such that digestive functions are enhanced or pathogenic microbes are inhibited or both. However, the effectiveness of many of these products still needs to be established.

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In their speeches during the opening program, local legislator Emilio Esmeralda and the governor's executive assistant Diosdado Gonzaga said that the mariculture livelihood project could reduce the pressure on existing Guimaras fishing grounds, which are now overexploited and depleted. Both expressed appreciation and full support to the collaborative undertaking among AQD, BFAR and the local government units of Guimaras.

At the end of the SDS, the participants and the LGU officials are expected to implement sustainable mariculture livelihood enterprises in their respective coastal areas. *- J Genzola*

*The Guimaras governor's executive assistant, Diosdado Gonzaga, addresses the trainees at the opening of the skills development session*

*The trainees are oriented on the Igang Mariculture Park facilities during their first day*

## AQD welcomes DA Secretary Montemayor

Department of Agriculture (DA) Secretary Leonardo Montemayor visited AQD on August 4. He arrived with BFAR Director Malcolm Sarmiento Jr. and National Agriculture and Fisheries Council Executive Director Ricardo Villo Jr. Also present was BFAR Region VI Director Sonia Seville.

AQD staff members headed by AQD Chief Dr. Rolando Platon warmly greeted the guests at FishWorld, and toured them around the Biotech Wet Laboratory construction site and the renovated Biotech laboratory complex on the second floor of the Nutrition Building. They were briefed on the purpose of the laboratory, daily construction-related activities, and extent of work finished in the wet laboratory area and the Nutrition building. Dr. Platon briefly explained that the Governments of Japan and the Philippines provided the budget for the construction.

The guests were also briefed on the technologies developed by AQD. Some of the species presented were the seahorses, mudcrabs, molluscs (abalone, top shell), and finfishes (siganid, snapper). Their hatchery technologies were discussed.

Dr. Platon then accompanied the visitors to Tigbauan town proper for a turnover ceremony of materials for salt making and "payaw" project. In his speech, Secretary Montemayor expressed his confidence that AQD technologies will benefit the local fishers. "The culture technologies developed by AQD for seahorse and blue tang can benefit ordinary fisherfolk like you because these species are expensive (and potentially profitable)," he said. ###

FACING THE AQUACULTURE CHALLENGE . . . FROM PAGE 17

Bioremediation, which involves the degradation of hazardous waste to environmentally safe levels by the use of selected microorganisms, bivalves, algae, etc., has been used to reduce organic loading and excess nutrients in shrimp ponds. Selection for and engineering of organisms to be more efficient in the removal of nitrogenous and other organic waste from the water and bottom sludge is another front that has to be explored.

Genetic modification may alter attributes of the organism or create new attributes that affect its interaction with the environment and other organisms. One of the major concerns about releasing, accidentally or deliberately, GMOs into the wild is their effect to the ecosystem of the released site in particular, and on the genetic biodiversity in general. One of the more common measures taken to "reduce" these risks is sterilization. Aside from potential risks that GMOs pose to the environment, there are perceived risks to human health and safety.

A significant issue facing developed and developing countries alike pertains the ownership and patents of products and processes resulting from biotechnology research. Intellectual property rights (IPR) protect and ensure the exclusive rights of scientists to their inventions. Although IPR and patenting may encourage private sector investment in biotechnology research, there are fears that patenting may lead to monopolization of knowledge, restricted access to germplasm, controls over the research process, selectivity in research focus, and increasing marginalization of majority of the world's poor population.

Clearly, biotechnology has the potential to enhance aquaculture productivity. However, in order to fast track the use of biotechnology in aquaculture operations in developing countries, there is a need for a critical mass of trained manpower. The national governments will have to provide support for this undertaking. ###