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Chasing the elusive ludong

The best tasting and most expensive fish in the Philippines

INSIDE...

R&D NOTES

A holistic approach to aquaculture R&D

The contribution of the fisheries sector to our Gross National Product (GNP) cannot be disputed. This is readily shown in the growth of our aquaculture industry. We are also among the top exporters of tuna. This is likewise true in the case of seaweeds. The potentials of this industry are rather unlimited. The role to be played by research and development (R&D) cannot be over emphasized. A more comprehensive approach to the industry cannot be compromised. A more holistic approach is needed.

At BAR, we strive to think of ways to create value for the development of the fisheries and aquaculture sector according to its Research and Development, Extension (RDE) needs. To serve as our guidepost, we remind our stakeholders to constantly refer to our RDE Agenda and Programs (2006-2010). We came up with this document in consultation with other DA agencies and partners who are considered experts in the various sub-sectors.

We are pleased with the collection of topics in this issue of the ***BAR R&D Digest*** since all of them are addressing the issues and concerns related to the aquaculture industry. Without any doubt, the economic contribution and viability of this sub-sector, requires continuing attention of research. The richness and potentials of this sub-sector will be fully harnessed through our investment in R&D.

Let this issue be a small beginning to a giant step that BAR will undertake not only to generate relevant and timely information for the development of the sub-sector but to its broad and far-reaching impact at the ground level.

In our commitment to make agriculture and more specifically, the aquaculture sector business, we will ensure that a more holistic approach to its R&D will be institutionalized. More than ever, we are much concerned with the nature socio-economic and political spin-off of this sector.

Let the content of this issue serves as the needed turn around to intensify our search for productive, profitable, and sustainable fishery sector.

Nicomedes P. Eleazar, *CESO IV*
Director, BAR

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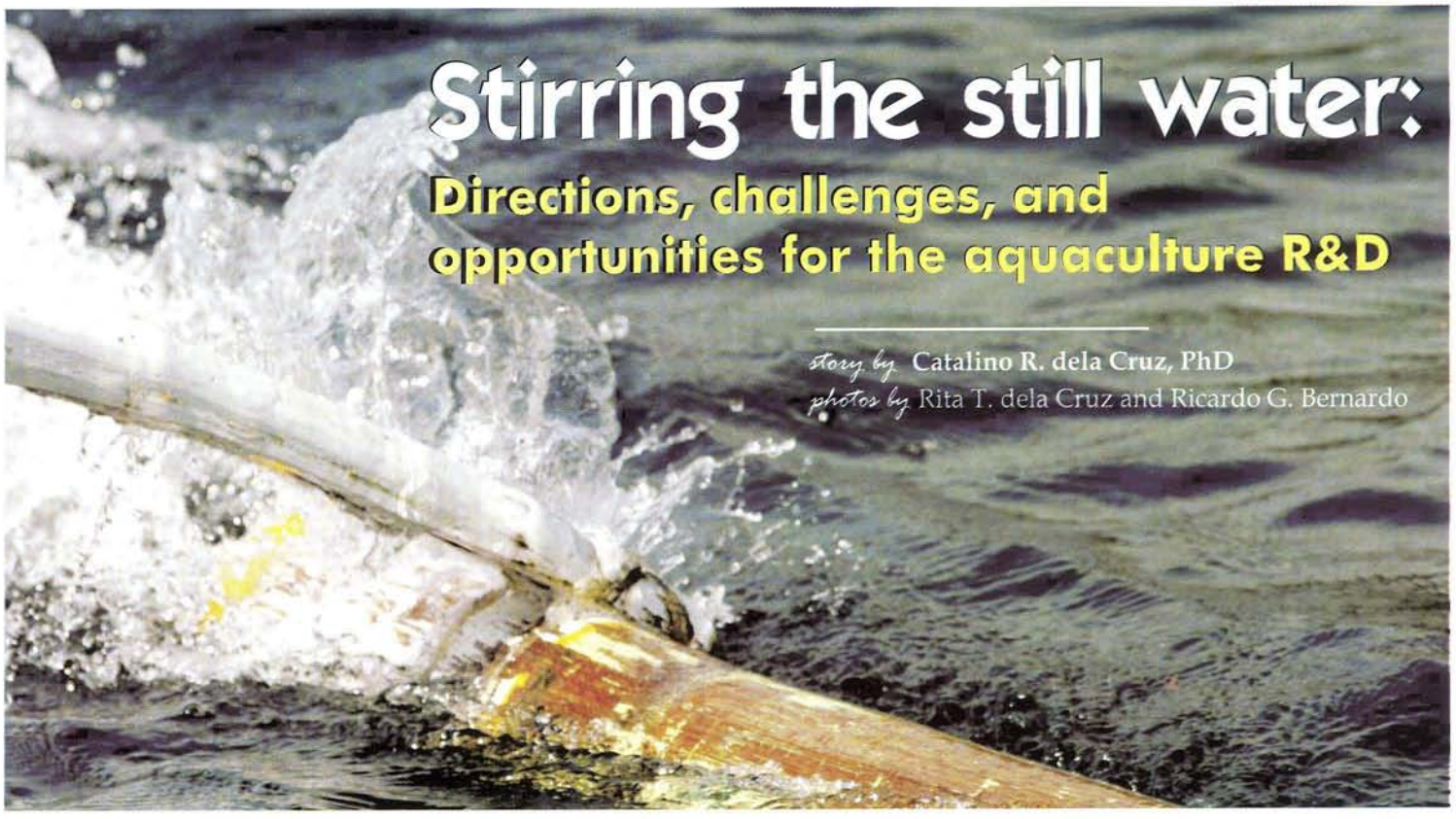


Stirring the still water:

Directions, challenges, and opportunities for the aquaculture R&D

story by Catalino R. dela Cruz, PhD
photos by Rita T. dela Cruz and Ricardo G. Bernardo

Being the national coordinator for fisheries Research and Development (R&D) in the country, the Bureau of Agricultural Research (BAR) focuses on three areas: aquaculture, fish capture, and postharvest fisheries. Of these concerns, this article focuses only on aquaculture R&D, observations, challenges, and related issues. Specifically, this covers BAR-supported projects and its participation in the national R&D agenda and programs and other funding government or private agencies from 2001 onward.

In 2003 BAR identified milkfish, tilapia, and seaweeds as the national priority commodities for aquaculture R&D in 16 regions of the country. Although research efforts have been going on for decades, particularly on milkfish, this provided the impetus to facilitate the development and enhancement of more technologies to boost production for local consumption and export.

Along with agriculture commodities, follow-up regional consultations were held to update the aquaculture R&D whereby specific problem areas and research activities were identified for each commodity in each region. In the process of updating, BAR included regional endemic high-value freshwater fish species such as loach (*Misgurnus anguillicaudatus*), locally known as *yu-yu* for the people in the Cordillera Administrative Region (CAR); lobed river mullet (*Cestreaus plicatilis*) or *ludong* for Region 2; tapiroid grunter *pigek* (*Mesopristes cancellatus*) for Region 10; and freshwater prawn (*Macrobrachium rosenbergii*) or *ulang* for Region 3.

High-value marine species were also supported to complement the efforts of other funding or research agencies such as the Philippine Council for Aquatic and Marine Research and Development (PCAMRD), National Fisheries Research and Development Institute/Bureau of Fisheries and Aquatic Resources (NFRDI/BFAR), and Southeast Asian Fisheries Development Center-Aquaculture Department (SEAFDEC-AQD). The marine species include sea urchin (*Tripneustes gratilla*), sea cucumber (*Holothuria scabra*), abalone (*Haliotis asinina*), angelwings (*Pholas orientalis*), shrimps (*Peneaus monodon*, and *Penaeus vannamei*), lapu-lapu (*Epinephelus* sp), and seabass (*Lates calcarifer*). Even before 2001, BAR had already begun funding research on sea urchin and angelwings.

To further facilitate the utilization of developed technologies, BAR-funded projects were categorized as applied, midstream, and downstream research. These are research station-generated technologies that are ready for field testing or verifications, or for adaptations/refinements and disseminations.

Challenges and opportunities

R&D projects implemented

After eight or so years, only few projects were completed or are ongoing; only two were categorized as CPAR and four under commercialization. Not all of the priority species have been covered in research activities. This indicates that not so many proposals had been received by BAR from the R&D researchers (RFRDC / BFAR, SUCs). For the priority species or areas that have no research activities, it could also mean that the technical needs in the problem areas are probably beyond the researchers' expertise.

Slow generation of hatchery technology

Most of the researchers' efforts are focused on the grow-out of priority

species. Technologies on grow-out of milkfish, *lapu-lapu*, and freshwater prawn are all available. But hatchery of *lapu-lapu* and mass seed production of the other two species needs more focus and attention. Researches are needed to support and sustain the grow-out or farming of these species. In terms of seed production, our country is lagging far behind Indonesia and Taiwan in milkfish fry/fingerling production; and Malaysia, Taiwan, and Thailand in lapu-lapu fry/fingerlings production; and Thailand on the hatchery of *ulang*.

In general, most of the priority species lack the hatchery techniques in producing the necessary seeds (larval rearing, fry nursing, mass production of PLs or fry) to service and sustain the production requirements of would-be investors/farmers. Take the case of lapu-lapu (*E. coioides* and *E. malabaricus*). Up to now, most of the local fry (a.k.a. tiny) supply comes from the wild. These fry are nursed to juvenile size to stock cages and ponds. Often the collected seed stock from the wild is not enough or unavailable when needed and this constrains the continuity of investors' production operation.

The source of livelihood of fry gatherers should continue; they should not be displaced. But a functional hatchery that produces fry at economical or acceptable level of survival rate to augment the seed stock produced by gatherers, to satisfy the requirements of pond and cage operators - is needed to go into large-scale commercialization of grouper. At present, however, the survival rate of *lapu-lapu* larvae reared in hatchery is still very low. Thus, concerted efforts in developing or enhancing hatchery technology (spawning and larval rearing) should be addressed.

On *ulang*, the technique in the production of post-larvae (PL) is available in BFAR hatcheries in Regions 1, 3, and 5. Two private hatcheries are also found in Region 2. But refinement of hatchery operation in PL production is still needed to minimize if not eliminate disease occurrence. And, although the demand for PLs of *ulang* is still low, the technique on mass production of PLs for satisfying increased demands in the future should now be addressed. The development of the *ulang* industry will not take off if supply of PL from government or private hatcheries is limited or intermittent. Hatcheries, particularly government-operated, should provide information on how many PLs can be supplied on a continuing basis to contemplating farmers or investors.

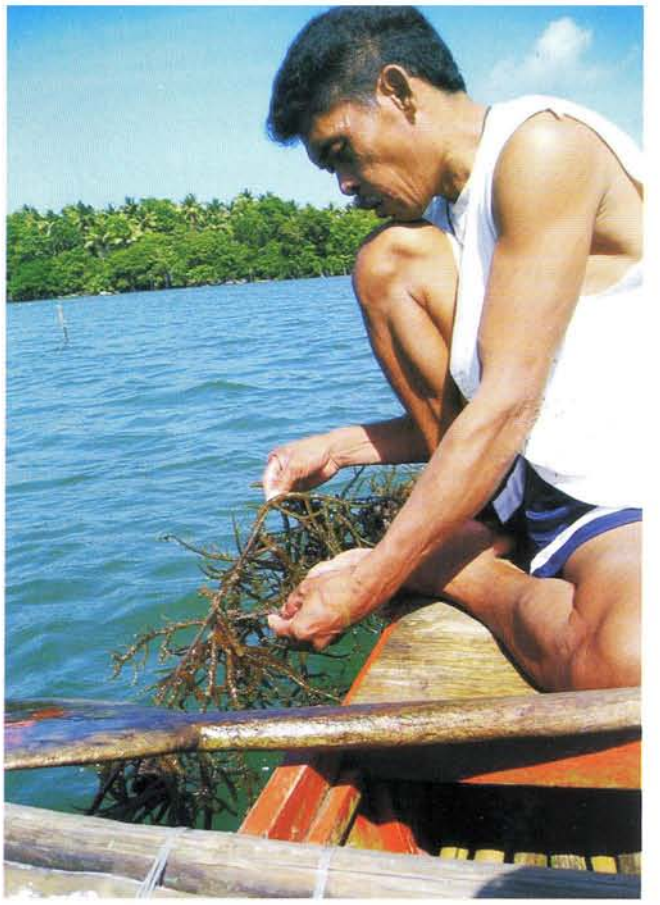
High feed cost for carnivores marine and freshwater species

Along with seed supply, high cost of feed, which is 55-65% of production cost, remains to be another major constraint in the aquaculture of carnivorous species. Feeds for *lapu-lapu* or sea bass consisting of trash fish and high protein (45%) formulated feeds are expensive. Aside from this, supply of trash fish is scarce and not sustainable. As such, the aquaculture of high-value carnivore species requiring good formulated feeds is for moneyed business investors. In this regard, the grow-out technology for these high-value species is not an equitable

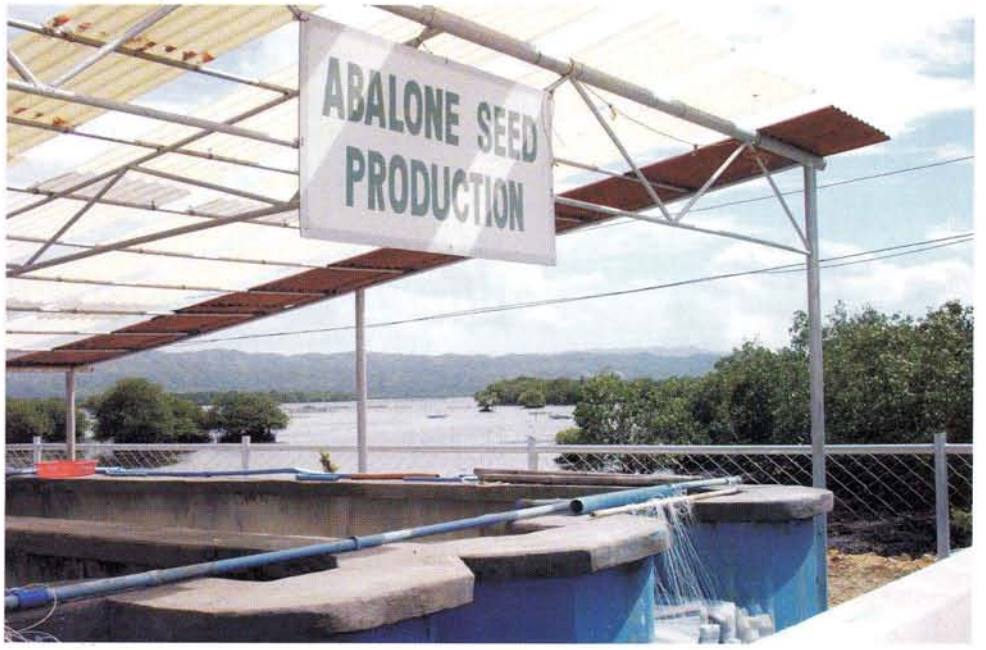
one. The opportunity for the low-income coastal community or fisherfolk to participate in this business venture is just through employment.

An option for the low-income group – fisherfolk or small business investors – to participate in or take advantage of aquaculture technology, is for them to engage in high-value species that require cheap feed cost. That is, to venture on high-value omnivore or herbivore species that feed low in the food chain or do not require high investment on feed. For marine species, the technologies developed or ongoing research of the University of the Philippines-Marine Science Institute (UP-MSI) and UP Visayas (and other institutions involved as well) on these high-value species - sea urchin, abalone, sea cucumber, angelwings—are appropriate. Sea urchin and abalone feed on seaweeds that grow naturally in the sea (*sargassum* and *gracilaria*, respectively), while sea cucumber and angelwings feed on sea bottom organisms or detritus. As regards hatcheries, except for angelwings, hatcheries for these species, although still smallscale, are now available. For angelwings, research on its hatchery is underway.

Thus, there is a need to continue screening for aquaculture high value species that feed low on the food chain and with good/wide market. This will benefit low-income groups or small farmers/investors. An example is sea cucumber which has several species. The breeding and production of *H. scabra* seem to be well researched already. UP-MSI, in collaboration with the WorldFish Center, is now expanding its research on this species to Region 11. With this, it is probably time to study the next ranking species of sea cucumber. Or in Region 11, a different species, *Stichopus hermanii*, although ranked to be in the middle category of sea cucumber, is claimed popular to the fisherfolk as source of livelihood. However, much of the basic information on the biology on this species (reproduction, growth, maturity, etc) is not known yet.



The effort to screen and develop new and cheap feed stuff, fertilizer, and feeding techniques to reduce feed cost should continue, particularly in freshwater aquaculture where various kinds of potential plant feed stuff or agricultural by-products for organic fertilizers may be developed. An example is the wild sunflower that grows abundantly in Mountain Province. Using composted wild sunflower as organic fertilizer in tilapia pond in conjunction with delayed feeding of formulated feed is a way of reducing feed cost.



Commercialization of sea urchin

As the activities to commercialize this commodity takes off, great supply of sea urchin can be anticipated. Therefore, quality product development needs to be addressed and foreign market has to be explored and developed. SUCs in the region with postharvest and processing capabilities should jointly get involved in the product development. Concerned government agencies and the private sector should focus their efforts on the search for market.

Inadequate research manpower

As compared to agriculture, the number of capable researchers in fisheries is less. As per mandate, the bulk of BFAR personnel workers do production activities

or extension work. Only few of the BFAR staff members are assigned at the RFRDC units to handle research for BAR. During regional visits on research matters, RFRDC workers are observed saddled with administrative work and hardly have the time to write proposals and more so, do research work. It often happens that they are unavailable or are also involved in extension activities of their mother unit. It would be great if BFAR would assign more research-capable full-time staff members to the RFRDCs. Training of more RFRDC researchers is also imperative, particularly on research areas that need immediate action.

Further, only a few of the SUC with fisheries units have projects with BAR. It is probably because BAR focuses its funding on applied research while SUCs researchers are more on the basic side. It would be good if more aquaculture researchers will get involved actively in midstream and downstream research and in the process interfacing with local government unit (LGU) extensionists in technology dissemination and adoption activities.

Insufficient funds or delayed release

This situation is unavoidable. This has contributed in the delay of technology development. A number of proposed projects (e.g., projects on small seaweeds, sea cucumber) were not previously funded or had been suspended for insufficient funds. Additional research funds and timely release would help in encouraging researchers to submit proposals.

Putting efforts rightly

Aquaculture should be "viable, environmentally-sound and socially equitable". This was in the Editorial of the DA-BFAR News (2nd quarter 2008). This is indeed very good if all three aspects are achieved. The first two (viable and environment-sound) can be achieved but the third (socially equitable) poses a real challenge – although it can be done. If technologies developed are expensive to adopt and only moneyed investors can venture in it, how can that be socially equitable? Thus, relentless efforts to identify more aquaculture species and develop more technologies where majority of those in the different socioeconomic classes can engage in.

We need to catch up with our Southeast Asian neighbors. We can do this if we put in our efforts rightly to where it is needed. Effort is important. But knowing where to make a properly timed effort makes all the difference. On this, there is a need for more research funds, more action from our fisheries researchers and administrators, and for SCUs – more involvement in downstream research and interfacing with the LGU extension workers in facilitating the delivery/adoption of developed technologies.

Aquaculture should be "viable, environmentally-sound and socially equitable".

U.P. VISAYAS

Addressing the need for sustainable dev't of Philippine fisheries resources

story by Christmas B. de Guzman
photos by UPV

With four campuses situated in Iloilo City, Miagao (Iloilo), Tacloban City, and Cebu City, the University of the Philippines Visayas (UPV) is acknowledged as the country's leader in marine science education and research, fisheries, and aquaculture.

A bit of history

Established on 1 July 1947, UPV started as UP Iloilo College (UPIC) with a Lower Division composed of third and fourth year high school levels and an Upper Division comprising first and second year college levels. The first ten years of the institution were manifested by hard work and great effort as it aspired to provide quality education for Ilonggos within the post-war rebuilding drive. The next decades saw its attempt to become a degree-granting unit. This was put into realization when it began to offer undergraduate and graduate courses in the various fields of the arts and sciences programs during the 1950s and 1960s. Earning the status of a full-pledged college, it was renamed as UP College Iloilo (UPCI).

In the early 1970s, the UP administration envisioned an autonomous unit that would become the country's foremost institution for fisheries and marine science education and research. The unit was to evolve from the UPCI and the College of Fisheries of UP Diliman. Later on, this was actualized when the UP Board of Regents (BOR) approved the establishment of an autonomous university at its 114th meeting on 31 May 1979 with Dr. Dionisia A. Rola as its first Chancellor. The construction of the buildings for the College of Fisheries started in 1981. When the then UP president, Edgardo J. Angara, now senator, reorganized the administration of UPCI and the College of Fisheries on 25 July 1983 through Executive Order No.9, UPV was born.

Defining moment

From its humble beginning, UPV has since then grown into a four-campus university (Miagao, Iloilo City, Cebu City and Tacloban City) with five colleges and one school (Colleges of Fisheries and Ocean Sciences, Arts and Sciences, Management, Cebu, Tacloban and the School of Technology) offering a wide range of undergraduate and graduate courses in fisheries education, arts and sciences, environment and technology, and management.

From the time of Chancellor Rola, UPV has had a series of administrators who, with their own management and leadership style, contributed to the growth and development of UPV. Dr. Francisco Nemenzo was Chancellor of UPV from 1989 to 1992; he subsequently became UP System president. It was during his term that the UPV campus in Miagao was fully operationalized having effected the transfer of the College of Arts and Sciences under the previous UPIC to Miagao.

Flagship college

The College of Fisheries and Ocean Sciences (CFOS) of UPV, formerly known as College of Fisheries, is recognized as the forefront in fisheries education in the country through its four institutes, namely: Aquaculture, Marine Fisheries and Oceanology, Food Processing Technology, and Fisheries Policy and Development Studies. The Commission on Higher Education (CHED) reaffirmed this status when it named the College as a Center of Excellence in Fisheries Education in 2007. CFOS recognizes its role as the leader in its field and continues to assess, revise, and institute programs to meet the many needs of the dynamic fisheries sector.

In 1999, CFOS started offering a graduate degree program called Master of Marine Affairs which is an interdisciplinary program that aims to provide a holistic approach in looking at the numerous problems that beset the country's coastal areas. It focuses not only on the management of resources but also on the people using these resources in the hope of ensuring sustainable use and development of the nation's coastal communities.

Understanding the apparent need to fill up the lack of human resource to man the ocean-based industries of the country, CFOS has responded by instituting the Master of Science in Ocean Sciences (MSOS) program. The MSOS integrates fields of specialization in the ocean sciences, ocean engineering, and ocean technology.

Major thrusts

The major research programs of UPV emphasize both the basic and applied sciences contributing to national development and the well-being of the people. In view of this thrust, the Office of the Vice Chancellor for Research and Extension was established.

Specifically, UPV has the following goals in terms of research and extension: 1) To generate new knowledge and develop technologies for the sustainable production, management, and utilization of fisheries, agriculture, and other available resources; 2) To formulate and develop frameworks or models of technologies appropriate for local area development; 3) To adopt and apply techniques and methods, particularly from the fields of information communication technology and biotechnology, for sustainable resource management; 4) To retrieve, preserve, and promote the rich cultural heritage of the region and stimulate creative work; and 5) To address socioeconomic and political issues of the region and country.

Synergy among disciplines is a distinctive mark of research undertakings handled by UPV. These research undertakings include the following top five vital areas of concern: 1) Aquaculture; 2) Capture Fisheries; 3) Postharvest and Food Sciences; 4) Environmental and Resources Management; and 5) Marine Biology, Reproductive Biology, and Biotechnology.

UPV Chancellor Glenn D. Aguilar working at his office.

> ***"The major research programs of UPV emphasize both the basic and applied sciences contributing to national dev't and the well-being of the people."***

Dr. Aguilar (right, sitting) and Dr. Crispino A. Saclauso (writing on his table), vice-chancellor for Planning and Development strike a laugh pose with their staff members during a photo opportunity.

The Institute of Aquaculture, under the CFOS, supervises and coordinates the activities being undertaken at different research stations such as the Brackishwater Aquaculture Center, Freshwater Aquaculture Station, Batan Mariculture Station, and the Taklong Island National Marine Reserve, parallel to upholding fisheries and aquaculture research and development.

Collaboration with DA

Out of the growing realization that while UPV's mission as a university is focused on life-long education and continuous self-learning, it also has the obligation of training students to contribute to national development by spurring economic and social growth.

CFOS, considered a premier avenue in fisheries education, is in extensive involvement when it comes to the national agenda on food security as it collaborates with the Department of Agriculture (DA) in leading the research, development, and extension (RDE) program under the Agriculture and Fisheries Modernization Act (AFMA), particularly in the Fisheries Sector Program. The operation and management of the Philippine National Programs for the improvement and development of capture fisheries, aquaculture, and postharvest and marketing rest on CFOS, which provides national team leadership of each of the three networks. Other concerns of AFMA-funded researches spearheaded by CFOS researchers address the challenges of poverty eradication and people empowerment, increased productivity and income, and global competitiveness.

A point of view from an outgoing leader

UPV's location in the Visayas gives it the opportunity to contribute to the development of the region. Its presence would spell progress for Miagao, a basically fishing-farming-weaving community. In exchange for this consideration, UP agreed in writing: 1) to keep the community adequately informed of the University's goals, policies, activities, and problems; 2) to make UPV aware of the aspirations, resources, and needs of the community; and 3) to collaborate with the community in promoting the community's well-being.

It is the University's fundamental nature to face the future with confidence as it continues to generate new knowledge through teaching, research, extension, and production of books and publications. Because it is an institution that puts premium in developing minds, being at UPV means having the ability to create new products and technologies and innovate and improve existing ones.

This year marks the 61st years of service of UPV. During the 61st Anniversary Celebration of UP Presence in Iloilo, Chancellor Glenn D. Aguilar (finishing his term at the end of October) expressed his hopeful aspiration for UP's next 100 years, to include: guidance to continue achieving the ideals formed in the first century of UP's existence, continue to serve with the best of one's ability whatever positions in the University he or she may have, for UP to proc uce good leaders for the next 100 years, conduct relevant research and assist communities in dealing with long-term and immediate disasters and continue to be a unique institution guided by the principles embodied by the Oblation: academic freedom and academic excellence.

"The University is founded on two important ideals, namely: 'service' and 'character' – service to the nation and character building. The University provides service to the nation by developing highly educated human resources with moral character to ensure a just and sustainable future," Chancellor Aguilar stressed.

Aquaculture in practice
Is there such a thing?

story and photos by **Marlowe U. Aquino, PhD**

One will be surprised by the question posed when looking at what aquaculture is all about and the practice it implores. This was the reaction of my former classmates at UPLB when they inquired on the things I was doing all these months. Well, I responded in a very casual manner and shared what BAR is doing in terms of its direction in information and communications management and the research and development trend in agriculture and fisheries.

Basically, my friends are environmental sociologists who are specializing in the fields of environmental health sociology, environmental geography, community fishery development and management, precision agricultural information and technology engineering, and business management and entrepreneurship. Each of us found our own way of sharing our insights because of the language of sociological perspective. Based on this, the question arises: Is there such thing as aquaculture of practice?

Knowing that I will have this intellectual exercise again, I prepared myself for more interactive information exchange. We ended up looking at what communities are in cyber development, particularly on urban and rural development focused on food security, sustainability, and development. I have orchestrated the course of discussion because I wanted to hear some views outside the agriculture mind-set. However, when we talked about issues and concerns facing communities, the issue on poverty and climate change vis-à-vis food security surfaced which went again and again until all views were piled up and eventually ended as synthesized information to determine our own judgments of what transpired.

Aquaculture defined

Fisheries have caught my fascination ever since I was in primary school when all I knew about it were the small fishes in our farm canal and the classroom aquarium of our Grade II science. Such fascination led me to ask several questions on how fishes are placed in a tank with the bubbling aerator and artificial plants to complement the aesthetic value of the aquarium. More specifically, how do these fishes survive in such a small container for a period of time? This simple handling and maintaining fishes in a small container may well be part of the aquaculture we know but serves as a fishing hobby or passion. So what is the real essence of aquaculture?

Aquaculture is basically the propagation, rearing, enhancement, and harvest of aquatic organisms in controlled or selected environments, conducted in freshwater, brackishwater, or marine water. Wherever the cultural management is implored, it requires the careful step-by-step production management of fishes, seaweeds, prawns, shellfish, and even cultured pearls.

Aquaculture is rapidly expanding and maturing domestically, it is still considered by some to be a small-scale activity when compared to the traditional fisheries. Now, aquaculture has become

the only sustainable method of producing high quality seafood. Historically, it has been the historic method or practice that has improved production of aquatic animals used to increase natural populations for capture and for sport fishing.

Most aquaculture commodities are destined for human consumption. Other products also include bait fishes, ornamental or aquarium fish, and perhaps even more important, it enhances natural stocks, however, it is now a large-scale commercial industry across the country providing direct and indirect economic benefits to many local and regional economies until it became increasingly important to address commercial interest. Furthermore, aquaculture is a unique industry based on new technologies and progressive thought, mixed with the global realization that demand for foods destined for nourishment of our world population.

In addition, it is a sustainable agri-food sector using aquatic resources, including the maintenance and management culture settings, either in tanks - raceways, earthen ponds, freshwater lakes and bays, or open oceans. The commodities are fed and cared for to ensure optimum health and product quality. Once the fish or shellfish reach an appropriate size, these are harvested, processed to meet consumer requirements, and are shipped to market.

Fishing communities defined

Communities are influenced by two factors, namely: spatial and temporal with respect to development. These factors determine the changes in the communities and their effects are observed based on the intertwined activities of the people with the use of available resources in terrestrial or coastal areas.

Given these, communities are defined based on the way people utilize the existing resources which protect, conserve, manage, and develop the environment. These are supported by social, economic, and technological factors towards development. Specifically, fishing communities are areas that are within a given boundary of operation that encourages the proper utilization and adoption of technologies. In order that this definition will address a collective fishing practice, it must consider the sociological dimension in the production, processing, and marketing activities in fisheries which incorporate the knowledge, attitudes, skills, and behaviors of fisherfolk, fishing households, and the community as a whole.

In addition, fishing communities must have a common goal to be socially stable and economically feasible, including ecologically balanced, in order that they can perform effectively and produce quality products that are globally competitive. With an end view of quality assured products and information sensitivity and oriented communities, the essence of aquaculture of practice is within the reach of further development.

Aquaculture of practice

It is very interesting to note that one concern confronting rural fishing communities is the maintenance and balance of interaction with their environment and establish a relationship that encourages technological breakthrough and usage including production and processing management systems and business venture. This could be attained through information sharing and exchange between key players and stakeholders on effective fishing activities.

Furthermore, this leads individuals to understand that the fishery sector is one unique way of looking at people's knowledge, attitudes, skills, and behaviors as events and environmental changes are gradually unfolding in people's eyes.

As viewed contextually, aquaculture of practice is focused on information that is shared and interpreted by individuals who are keen on making a difference using best practices with one goal - that is development-orientation. Specifically, aquaculture of practice is defined as a group of practitioners in the fishing sector who share a common interest or passion in an area of competence and are willing to share the experience of their practice.

In addition, aquaculture of practice may be groups of people who share a common concern or passion for something they do and learn how to do it better as they interact regularly. These two definitions exemplarily support the efforts of the practitioners when they were on the process of making their fishing practices applicable to the needs and interests of the people with appropriate management skills. But for us, we used it to support our efforts in analyzing the processes behind the best practices of the fisherfolk and their communities and take that information from the processes and practices to make the leap in agriculture and fisheries development.

At this point, the aquaculture of practice focuses on the development of the fishery sector using information and development trends while making its activities more effective and efficient to produce what is necessary to become globally competitive and sustainable.

Shrimps
making waves again

It's hard to explain how shrimp tastes like because really, it's sort of bland. Yet the assortment of dishes made from it and its fusion with numerous culinary concoctions make it a runaway hit in any seafood market. These days, however, if you could afford to enjoy shrimps regularly, it's either because it's harvested abundantly where you live or you don't have any problem spending more than P300 for a kilo of it.

The Philippines used to rank second to Thailand in shrimp production and export but the slump in the economy, and increasing prices of fuel and feeds further increased the production cost by 20 percent. Currently, the Philippines produces 24,000 metric tons of prawns and 30,000 metric tons of white shrimps annually, of which 60 percent goes to domestic market and 40 percent for export.

The case of Negros

Luzon and Mindanao are still the leading shrimp-producing areas in the country while in the Visayas, Negros is among the biggest producers accounting for 10 percent of the country's produce.

Philip Cruz, head, Cruz Aquaculture Corp., recounted how in the 1980s, pond owners in Negros enjoyed a profitable enterprise from shrimp growing before the economy plunged, forcing them to shift to milkfish (*bangus*) and *tilapia* production. However, he said that milkfish and mudfish culture, which make up most of the ponds in Negros, is not viable enough for world competition.

Currently, there are 650 hectares of active shrimp ponds in Negros which produce 80 percent "black tiger" (*Penaeus monodon*) and only 20 percent "Pacific white shrimp" (*Penaeus vannamei*), as shown by the figures from Negros Prawn Producers Cooperative (NPPC). Realizing that the world market is shifting its preference to *vannamei*, the shrimp industry in Negros is now considering shifting its production.

From *monodon* to *vannamei*

Cruz explained that the shrimp species vannamei, which came from Latin America, is disease-free as sources of its broodstocks (parent shrimp) are of reputable sellers, unlike those of the monodon, which is usually sourced from different breeders.

In terms of cost of production, Cruz compared the monodon feeds which contain 40 to 45 percent protein with vannamei which only has 25 to 30 percent. He explained that higher protein content produces more ammonia which is toxic to aquatic species. Hence, monodon growers need to change pond water weekly while for vannamei growers, they change pond water only every month.

According to Cruz, shrimp producers in Asia cover 81 percent of the world market for vannamei. Unfortunately, the Philippines has yet to take advantage of this big revenue stream as the country has not aggressively developed the shrimp industry the way Vietnam, Thailand, Indonesia, Taiwan, and others did.

Cruz pointed out how vannamei growers could save more than monodon growers given the advantages of the former. The lower cost of production would also lend the selling price of white shrimps to P150 to P200 per kilo, making it more affordable for more Filipinos. With these advantages, he said, it is expected that the industry would gradually increase its vannamei production until the country's shrimp industry regains its vibrancy as it were in the 1980s.

Philippine shrimp congress

With the newfound enthusiasm to revive the shrimp industry, the industry players are targeting to take over the Rank 2 spot next to China soon after the shrimp farms have been extensively reestablished in the country and the growers are already highly skilled in

the production of white shrimps.

In May 2008, the 6th Shrimp Congress was held in Bacolod City and was organized by PhilShrimp, Bureau of Fisheries and Aquatic Resources (BFAR), and other agencies. During the event, three important factors were identified to ensure a successful culture of vannamei.

These are the culture of specific pathogen-free (SPF) or specific pathogen-resistant (SPR) broodstock and "high health" fry; use of probiotics, biosecurity measures, and other best management practices (BMPs); and marketing of the right size of shrimps demanded by consumers plus compliance with food safety regulations.

Agriculture Undersecretary Jesus Paras, who represented Secretary Arthur Yap, said in his speech during the congress that the Department of Agriculture (DA) expects that the current shrimp production will double annually, especially since the ban on the importation of vannamei broodstocks and its culture has already been lifted by Secretary Yap in 2007. In 2001, the DA banned the entry of vannamei into the country to protect the local "sugpo" or black tiger prawn from Taura virus that had nearly wiped out shrimp farms in Japan, Taiwan, and Thailand at that time.

"Because vannamei matures faster, it requires less production inputs, and has strong resistance to diseases. It is projected that the country will be able to achieve an unprecedented shrimp production volume in excess of 100,000 metric tons (MT) in five years," said Paras.

According to BFAR Director Malcolm Sarmiento, after the government allowed the importation of vannamei broodstocks, they have already accredited seven maturation, breeding, and larval rearing hatcheries and certified 38 grow-out farms or 497 hectares production area in the country.

Hits and misses

What makes shrimp a highly demanded commodity is that it is expensive and exportable enough to warrant the value-adding machineries for the preparation of shrimp cuisines for party-plates, cocktails, and ready-to-eat microwavable packages. Just think of that global fast-food chain now offering shrimp-rice meal.

Can the Philippines compete in these market segments? According to Roberto Gatuslao, NPPC president, the Philippines is lagging behind its Southeast Asian counterparts in terms of marketability owing to the absence of processing plants. "We still export our produce fresh and in original state while Thailand, China, and Vietnam continue to corner the export market because they have invested much on value-adding facilities," Gatuslao said.

Meanwhile, Sarmiento said that the Philippines could highlight its competitive advantage which is the unique product quality of its shrimps. "The Philippines is recognized worldwide as the only country that shuns the use of antibiotics in the control and prevention of diseases," he said.

Dr. Jan Koesling of Bayer Animal Health, Vietnam, explained in the shrimp congress how Vietnam became a major player in the world market. Aside from its government creating a Ministry of Fishery separate from the Ministry of Agriculture and Rural Development, Koesling said Vietnam has an effective quality assurance control in importation done by its National Fishery Quality Assurance and Veterinary Directorate (NAFIQAVED), strengthened its R&D through government-academe-private partnerships, and organized 80 percent of its seafood exporters who organized into the Vietnamese Association of Seafood Exporters and Producers (VASEP) composed of different sectors.

Gatuslao said that in the Philippines, "our laxity in quality control devastated the shrimp industry back in 1997 and took us until now to slowly recover."

What would resuscitate our shrimp industry? Senator Edgardo J. Angara, keynote speaker during the congress, challenged all industry stakeholders to emulate Vietnam. His recommendation: heavy investments in research and development, a well-focused government bureaucracy, and a very influential private sector advocacy.

Small business on seaweed pickle turns big

story by **Ma. Eloisa E. Hernandez**
photo by DMMMSU

"A business no matter how small is big enough for a sustenance seaweed farmer and his family." This is what Ms. Enone V. Tepait of the Don Mariano Marcos Memorial State University (DMMMSU) believes as she comes up with a technology on seaweed pickles.

In the Philippine aquaculture setting, seaweeds and milkfish are considered the top commercially important species. Considered valuable, 800 species of seaweeds have been noted. The major commercial seaweeds in the Philippines are *Eucheuma, Kappaphycus, Gracilaria spp.*, and *Caulerpa lentillifera*. Others include *Codium, Gelidiela acerosa, Halymenia, Porphyra*, and *Sargassum spp.*

Production of seaweeds has continuously increased from 707,039 MT in 2000 to 1,204,808 MT in 2004. In 2008, good planting materials of seaweeds and better farm management, together with the newly opened areas in Palawan, resulted in a remarkable increase in output. In Zamboanga Sibugay and Tawi-tawi, there was seedling dispersal by Bureau of Fisheries and Aquatic Resources (BFAR). More seaweed areas were utilized where farmers were encouraged to culture owing to better demand.

Aside from seaweed culture being practiced by local fisherfolk, DMMMSU in Paraoir, Balaoan, La Union, developed a promising technology on producing pickles out of seaweed. Pickles are a potential livelihood project for the housewives of seaweed fishermen as an additional source of income.

Preparing pickles from seaweeds

The study was prepared to determine the standard recipes in processing seaweed pickles, its acceptability, food nutrients available, and the shelf life of processed seaweed pickles.

Easy and manageable. These best describe the seaweed pickles technology as the ingredients to be used are readily available in the local market. From the locally-known seaweeds, pickles can be made from *Kappaphycus* or *Eucheuma* and pickling ingredients such as sugar, vinegar, salt, crushed pineapple, carrots, onions, ginger, bell pepper, and chili.

The easy-to-do steps also coincide as a good source of food nutrients such as total fat, moisture, ash, carbohydrates, sodium, calcium, iron, sugars, dietary fiber, and vitamin. The shelf life of the product depends on the kinds of container used for packaging. For instance, glass bottles can prolong the product for five to six months while a Nylon stand-up pouch can be sustained for five months (30 °C) or nine months (20 °C).

Package development was designed by DMMMSU and the Package Development Center (PDC) of the Department of Science and Technology-Industry and Technology Development Institute (DOST-ITDI). This includes the label for the product. Bar Code is already obtained as a main requirement in marketing the products.

Gains from seaweed pickles

Ms. Tepait, project leader, led an R&D team in various technology transfer and commercialization activities to further promote and disseminate the technology. A technology dissemination and information campaign was launched through print media, radio broadcasting, seminar/training workshop, trade fairs, exhibits, and

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Small business... *from page 13*

provision of technical assistance. "These encouraged fisherfolk to adopt the technology to be one of their livelihood projects, thereby as a source of additional income, especially those farmers engaged in seaweed farming. Family members can help in the project since the process is easy and manageable," she said.

The technology does not involve machineries and is a potential livelihood for coastal areas. A family can just have a starting capital of P260 to P276. A one-shot process of a kilogram of seaweeds will give a return of investment (ROI) of 26.81 - 34.62 percent. Farmers producing the seaweed raw material will have additional products to invest on, and a guaranteed additional income.

However, Ms. Tepait suggested close collaboration of the concerned agencies, especially in the commercialization aspect must be in place. She explained that, 99-100 percent assured results of the study is to be attained only through continuing research in the project area as the project goes on.

The technology on seaweed pickles benefits not only the housewives of seaweed farmers but also the fishermen themselves. Possible entrepreneurs and stakeholders would also look into venturing into a business for a possible enterprise benefiting not only the seaweed industry but also the whole fisheries sector.

Indeed, "A business, no matter how small it is, is big enough for a sustenance seaweed farmer and his family".

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Program on *Pangasius* launched

The introduction of a new fish species in a new condition has always been a question to many environmentalists, bio-conservationists, and development specialists, especially if this stirs controversy on the natural habitat, including ecological balance and bioversity. However, the Cordillera inland fishery was all out during the launch of its newest program on Pangasius (*Pangasius hypophthalmus*) on 30 September 2008 at the Bureau of Fisheries and Aquatic Resources (BFAR) – Cordillera Regional Office in Guisad, Baguio City.

Pangasius is a freshwater fish inhabiting the Mekong River in Southeast Asia. It was introduced in the country from Thailand in 1978 but did not gain recognition and importance because of its physical characteristics not common to producers and consumers.

However, in 1982, it was reintroduced and was given support because it highlighted its nutritional relevance and as an alternative livelihood for emerging freshwater fish industry in north central Luzon.

Owing to the production potential in freshwater of Pangasius, the Cordillera believes it can sustain the needed impetus in the mainstream Cordillera Fisheries Program; the activity has drawn support from all sectors, particularly research and development, tourism, hotel and restaurant businesses, fish farmers, and educational institutions.

This was noted by Ms. Lois June Fermin, BFAR-CAR regional fisheries R&D center manager and overall coordinator of the Pangasius project, who shared brief discussions during the launch of the program.

The launch included display on the physical characteristics of Pangasius, discussions on the market potential and prospects for competitiveness, and technology on hatchery management and grow-out operation specifically for Cordillera waters. Its regional acceptance and operation will be supported in the provinces of Benguet, Kalinga, and Ifugao.

To highlight its potential in the domestic and global market, the activity was enhanced by food preparations and demonstrations on Pangasius-based dishes by Cordilleran Chef Pio de Guzman of the Baguio Country Club.

During the demonstration, Chef de Guzman prepared five original and delectable dishes such as breaded fillet with tartar sauce, streamed and poached fillet with dill and rice wine sauce, pan fried fillet with lemongrass teriyaki sauce, herb crusted fillet with basil tomato sauce, and fillet adobo.

Through this initiative, the fisheries development in the Cordilleras will take a major shift with the new commodity which will boost a lot of industries and create jobs for inland fishing families. With the right attitude, skills, and knowledge of fish farmers and their communities, including production and processing technologies provided by BFAR CAR, and strong support coming from provincial and municipal local government units and other sectors, the Pangasius is here to stay for a more secure and sustainable fishery development (*Marlowe U. Aquino, PhD*).

Chasing the elusive *ludong*

The best tasting and most expensive fish in the Philippines

story by Rita T. dela Cruz
photos by BFAR Region 2

The best tasting and most expensive fish can be found in the Philippines and it is locally known as *ludong* (*Cestraeus plicatilis*). *Ludong* is also called the "President's fish" alluding to its rarity and high-priced value befitting only very special people such as the President.

A closer look at *ludong*

Ludong is a freshwater mullet that is endemic to Cagayan River and tributaries extending through the watersheds of Cagayan Valley and in the Santa-Abra River systems of Ilocos Sur and Abra. According to the Bureau of Fisheries and Aquatic Resources (BFAR), this lobed river mullet is habituating in the deep pools of Addalem River in Aglipay, Quirino, and in the rapids of Didimpit in Lacab, Jones, Isabela.

This elusive fish is catadromous in nature, migrating to the ocean for mating. Two kilometers off the coasts of Aparri and Babuyan Channel, *ludong* migrates to salt water to spawn from October to December (flood and typhoon season). After spawning, these rare species of mullet return to upstream ponds.

Ludong undergoes upstream migration during December, January, and February which is coincident with the "ipon-run phenomenon". This phenomenon is an occurrence wherein different species of fish fry undergo an upstream migration. After the *ludong* has undergone downstream migration, it can be caught in Cagayan River and tributaries.

Is the taste worth the penny?

Ludong is herbivorous feeding only on the filamentous algae that live on rocks and boulders in and near river rapids.

A mature fish weighs from 0.25 kg to 2 kg and costs P4,000 a kilo, making it the most expensive fish in the country. It commands a very high price in the market because it is seasonal and difficult to catch.

This fish is known for its unique taste and peculiar aroma when cooked. In

fact, its unique taste makes it one of the most sought-after ingredients in making delicious dishes.

Saving the threatened *ludong*

Ludong is close to being an endangered species, considering its threatened state in the Northern Luzon waters. In fact, information gathered from fish vendors in Cagayan showed that the volume of *ludong* catch has been tremendously decreasing annually.

It was also observed that over the years, the sizes of *ludong* being caught are getting smaller. According to a BFAR report, the catch of *ludong* in 1998 weighed 2.4 kgs and has gone to 0.25 kg in 2001. Moreover, no *ludong* was reportedly caught in 2002 and 2003 proving its declining population.

Owing to its scarcity and high value in the market, the desire to catch *ludong* increases causing overfishing and endangerment. This concern resulted in the issuance of Fisheries Administrative Order (FAO) No. 31 aimed at conserving the *ludong* in Northern Luzon.

Specifically, FAO 31 prohibits the capture, purchase, sale, preparation, and serving of *ludong* for private or public consumption during its seasonal migration (October to January). It also prohibits the use of *tabukol* (a cast net of large meshes), *tabak* (small drag seine for river fishing) or *pateng* (cylindrical fish pot for catching mullet) in the Cagayan River and its tributaries and in the Santa-Abra River System during these months.

In 2006, BFAR launched *Oplan Sagip Ludong*, a wide fish-hunt in Aparri for 60 pieces of live *ludong*. The hunt was conducted during the first half of October because it provides the best opportunity to catch live *ludong*, which seasonally appears two to six times only in a year from October to November.

At the moment, the only live *ludong* in captivity is at BFAR research center in Bonuan Binloc in Dagupan City caught five years ago in the Cagayan River in Aparri town. It weighs 1.5 kilograms. This provides the researchers to study further this species and its breeding habits.

The fish hunt resulted in the identification of at least 30 more "probable species" of *ludong* which BFAR researchers are now studying.

BFAR Region 2 is studying the biology and conditions affecting the population dynamics of *Cestraeus plicatilis* (*ludong*) to sustain its production and develop strategies to conserve and protect this rare and expensive fish.

Evelyn C. Ame, head of the Research Division of BFAR Region 2 and project leader of the *ludong* study funded by DA-BAR.

Moreover, the live *ludong* in captivity was recently joined in by 40 fingerlings of fish which are being cultured at BFAR, undergoing further morphological identification. The live *ludong* was donated in 2001 and the fingerlings in January 2006 by Dr. Lino Edralim Lim for further studies on their physical traits and DNA fingerprinting. The results of these studies will form the basis for other captured fish which might be just *ludong* look-alikes.

R&D project on *ludong*

Given the economic importance of aquaculture both as income and as employment-generating activities, its performance as a key sector in the country's development takes on a great concern both for its development and sustainability. Research and development (R&D) is one area that could serve as an engine of progress for this sector.

The Bureau of Agricultural Research (BAR), being the national R&D coordinator for fisheries, is supporting projects on high-value freshwater species to boost their production both for local and export demands.

Among the high-value freshwater species identified by BAR in its R&D prioritization are *ulang* (giant freshwater prawn), *yu-yu* (loach), *pigek* (tapiroid grunter), and *ludong* (lobed river mullet).

Specific on *ludong*, BAR is supporting the project, "Research and development studies for the sustainable management and conservation of *Cestraeus plicatilis* (Ludong) in Cagayan Valley," which is being implemented by BFAR Region 2 based in Tuguegarao City.

Initiated in October 2007, Evelyn C. Ame, head of the Research Division of BFAR Region 2, is leading the project which will be completed in 2008. The project aims to study the reproductive biology and conditions affecting the population dynamics of *ludong* to sustain its production and develop strategies geared towards its conservation and protection.

In the initial study of Ame, *ludong* is considered a threatened species given the increasing desire to catch this elusive fish. "Benchmark information is needed specific on studying their monthly reproduction particularly during spawning season," Ame said.

"Information on its sexual maturity (i.e., fecundity and gonadosomatic index) is also vital in formulating management and conservation measures for *ludong*," she added.

Likewise, given the species' seasonality and high demand, Ame recommended breeding of *ludong* in captivity to exploit its market potential and sustain production and supply throughout the year.

Ludong is endemic to Cagayan River and its tributaries extending through the watersheds of Cagayan Valley and in the Santa-Abra River systems of Ilocos Sur and Abra.

The article was based on the study, "Research and development studies for the sustainable management and conservation of *Cestraeus plicatilis* (*ludong*) in Cagayan Valley" by Evelyn C. Ame, head of the Research Division, Bureau of Fisheries and Aquatic Resources Region 2 (BFAR Region 2), Department of Agriculture, Government Complex, Carig, Tuguegarao City 3500.

For more information about the study please contact Ms. Evelyn C. Ame at telephone numbers (078) 844-4252, (078) 844-4261 or email her at: *eame_ph@yahoo.com*

A viable alternative to *Ulang* pond culture

story by **Christmas B. de Guzman**
photos by MLA Cuvin-Aralar

Known as *udang* in Ilocos and Cagayan, *paje* in Palawan, *kalig* in Leyte, *kissing-kissing* in Pangasinan, and *ulang* in Tagalog, the giant freshwater prawn is a species of freshwater shrimp that is native to the Philippines. They inhabit freshwater and brackish water, where they spawn and afterwards return to freshwater to grow.

Scientifically known as *Macrobrachium rosenbergii,* the giant freshwater prawn is the most popular species with regard to freshwater shrimp aquaculture. This is due to its impressive growth performance and ability to survive and grow in turbid water conditions.

Out of more than a hundred *Macrobrachium spp* globally, three are reported to be utilized for aquaculture. In the country, approximately 15 species were reported to be present.

Present *ulang* industry

Basically, the common technologies used in giant freshwater prawn or *ulang* farming are the same as in marine shrimp farming. Hatcheries produce postlarvae, which then are grown and acclimated in nurseries before being transferred to grow-out ponds where the prawns are then fed and grown until they reach marketable size. Consecutively, they can be harvested either through draining the pond and collecting the prawns or by fishing the prawns out of the pond using nets (continuous operation).

Ulang, originally, was cultured in ponds and ricefields in Thailand, Myanmar, Vietnam, and the Philippines. Among the Southeast Asian countries mentioned, Thailand first began *ulang* culture in ponds, which can either be monoculture or polyculture (with other freshwater species such as tilapia).

Another system in culturing *ulang* is the integrated prawn-rice system. In Vietnam, specifically, it is called concurrent system (cultured prawn in the same growing area with deepwater rice). In the Philippines, it is prawn-rice system (prawn grown separately with rice but in a contiguous or connected area) wherein the prawn occupied area is located ahead of the rice area so that the water from the prawn pond will flow into the rice area thereby adding fertility into the ricefield.

Current problems encountered by the shrimp industry provided a boost for the culture of freshwater prawns. *Ulang* culture has traditionally been performed in ponds (New and Singholka 1985; D'Abramo, Daniels, Fondren and Brunson 1995; Correia, Pereira, Apolinario and Horowitz 2002; Weimin and Xianping 2002). What is largely disregarded is the potential use of natural inland water bodies such as lakes and reservoirs for its culture.

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Ulang is one of the most desirable candidates for freshwater aquaculture in the Indo-Pacific region and breakthroughs in its seed production and larval rearing have led to a new wave of enthusiasm among fish farmers for its monoculture and polyculture (Ranjeet & Kurup 2002). Although this species can be found in various regions in the country and the wild-caught prawns are marketed, its culture has not been widely modified, unlike in other Asian countries such as China, India, Thailand, and Malaysia. One possible approach that can put emphasis on the development of appropriate technologies for the integrated use of lakes is the cage culture.

Ulang cultured in cages

Ulang can be raised in fish cages. This is the technology developed and continues to be improved under a collaborative project on the development of genetically improved strain of *M. rosenbergii* being implemented in the Philippines, Indonesia, and Thailand. It was part of the Association of Southeast Asian Nations-Southeast Asian Fisheries Development Center (ASEAN-SEAFDEC) Special Five-Year Program on Sustainable Fisheries for Food Security in the Region from 2003 to 2005. In 2006, the project was placed under the ASEAN-SEAFDEC Fisheries Consultative Group Collaborative Mechanism.

The technology was the result of the study conducted by Dr. Maria Lourdes Cuvin-Aralar, Engr. Emiliano Aralar, and Mr. Manuel Laron of the Binangonan Freshwater Station, SEAFDEC Aquaculture Department (SEAFDEC/AQD), located in Rizal, Philippines. Also part of the team was Dr. Westley Rosario, chief of the National Integrated Fisheries Technology Development Center (NFRDI) in Dagupan City, Pangasinan.

According to Dr. Cuvin-Aralar, *M. rosenbergii* were cultured in experimental cages in Laguna de Bay, the largest lake in the country.

Its translocation and farming in Laguna de Bay do not create potential problem since brackish water is essential for the survival of its larvae.

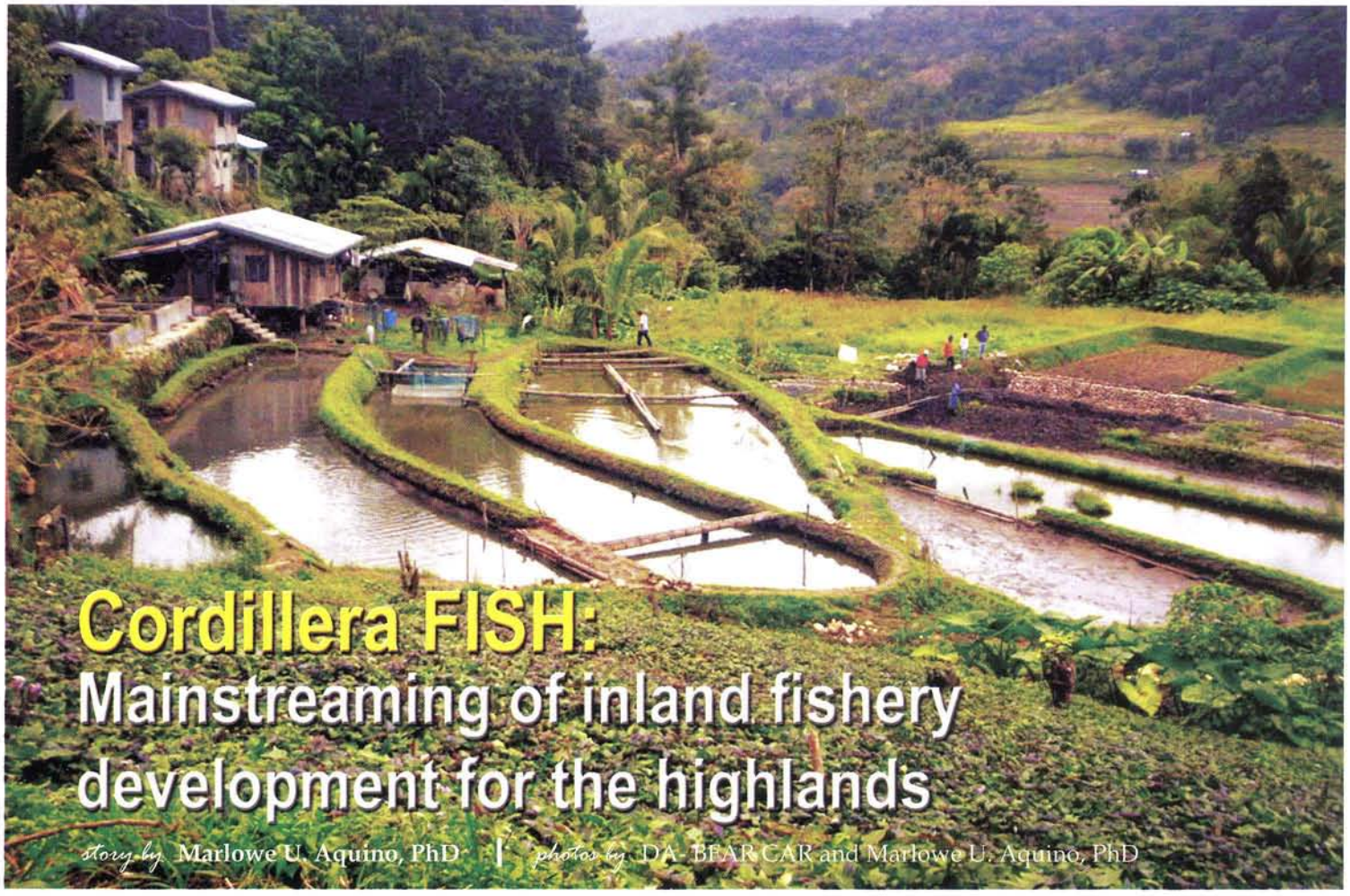
The study aimed to assess the viability of the farming of *M. rosenbergii* in a freshwater lake. Specifically, the study determined the growth and survival of this prawn as affected by different stocking densities.

The results show that the farming of the giant freshwater prawn *M. rosenbergii* in cages in a lake is a possible alternative to pond culture. Additionally, it has the potential of improving aquaculture production in lakeshore-fish farming communities. Nevertheless, further studies on the enhancement of cage culture techniques such as addition of shelters to reduce cannibalism in the cages, to improve growth and survival and the commercial viability of a lake-based culture system of the giant freshwater prawn are encouraged.

For more information about the study, please contact Dr. Maria Lourdes Cuvin-Aralar at telephone numbers (+63 2) 289-3787 or email at: *mlcaralar@aqd.seafdec.org.ph* or *mcaralar@yahoo.com*

ULANG CAGE CULTURE TECHNOLOGY

- **Broodstock**
  M. rosenbergii broodstock is stocked at a ratio of four females to one male. Blue- and orange-clawed males are preferred. Orange eggs of berried females will take about three weeks to hatch. Grayish or brownish eggs, on the other hand, will hatch in two to three days.
- **Larval Rearing**
  Larval rearing tanks may be made of fiberglass, polyethylene, or concrete. Brackishwater with a salinity of 12 ppt is used for larval rearing. Stocking density is 50 larvae per liter. Larvae are fed with brine shrimp naupliii and egg custard. The larvae undergo several stages of development before they etamorphose to post larvae (PL) in 28-35 days depending on temperature, nutrition and other factors.
- **Nursery**
  The larvae metamorphose to post-larvae (PL) and are acclimated to freshwater. The post larvae are reared in nursery tanks, ponds or lake-based hapa net cages. Fifteen- day old PL (PL15) or older juveniles are ready for grow-out.
- **Grow-out**
  Prawn juveniles are stocked in lake-based cages (B-net, 10 x 20 x 1m) at 10-15 pieces/m^2.
  Substrates made from old nets reduce cannibalism and allow for higher stocking densities.
  Submerged feeding trays are provided for prawns cultured in cages. Shrimp or fish feed may be used.
  Prawns reach marketable size in four to five months. Longer culture period maybe required at higher stocking densities. Recovery is 60 to 80%.



Cordillera FISH: Mainstreaming of inland fishery development for the highlands

story by Marlowe U. Aquino, PhD | photos by DA-BFAR CAR and Marlowe U. Aquino, PhD

Over the years, several development strategies have been formulated to effect change in communities. These are either supporting the growth of industries or transforming the lives of people and their communities. In the agriculture and fishery sectors, these strategies face the challenge of productivity, profitability, and sustainability. They enhance and improve production management systems or product processing and development, which eventually result in better living conditions and improved quality products and services.

One of the best documented agriculture strategies is found in the Cordillera Administrative Region (CAR). Historically, traditional practices of production management system are common in Cordillera farms, particularly in agriculture, inland fishery, and natural resources. The varied practices in the identified system are combination of tacit and explicit knowledge in business supporting local food production and processing.

Although most of these were traditionally practiced, only few were fine-tuned to adapt to the new trends of development and response to the unpredictable local condition. To fast track utility and adoption, local organizations work with agencies to share what was once a traditional practice and eventually became an innovative system to address the needs of the times. Local development practitioners call it – Cordillera FISH. What is this all about?

Cordillera FISH is actually a localized Fishery Innovative System for Households, which is commonly found in the rice terraces of the Cordillera region, particularly in the provinces of Ifugao, Benguet, and Mountain Province. Historical photo documentation shows that these are simply the rice paddies that are converted into fishponds to augment the fish protein requirements of farmers and their families who cannot avail themselves or obtain marine fishes and/or most often an improved rice production system with the integration of local freshwater fishes such as "yu-yu", tilapia, carp, and guppies.

The Cordillera FISH terraces

It is undeniable that the condition of the Cordilleras in Northern Philippines is the subject of development efforts. Through a sociological lens, the opportunity of this fishery innovative system became a research interest. It has cultivated questions, insights, and ideas which made development practitioners and agri-aquaculturists alike to combine the efforts of an indigenous knowledge to development.

FISH Terracing is a kind of rice production management system that integrates the aspects of aquaculture, agriculture, and lately tourism. This system allows a more intensive culture of fish with the inclusion of appropriate activities and management of resources to augment the required food supply of small farmers or communities and increase production owing to increasing population and

changing lifestyle of people.

To a local Cordilleran, FISH terrace is a kind of indigenous fish trapping of *yu-yu* (dojo) introduced by the Japanese during World War II, including freshwater crabs, frogs, and snails in terraces during the rice production. This is very ideal in highland areas with one cropping system, usually rice-fallow, with traditional rice planted in the first half season and the other half is for more intensive inland fish culture with the abundance of water coming from the streams, rivers, or creeks. Over time, it has become a common activity and new fish stocks such as ornamental fishes (e.g. Japanese Koi) were introduced, especially with continuous supply of water even during the dry months.

In such system, traditional rice is best suited because they do not require any additional inputs such as fertilizers and chemicals to increase production. Such inputs are believed to affect or destroy the growth and development of other forms of animals and fishes in their natural habitat. The system, when is properly practiced, will maintain an ecological balance between the rice crop, fishes, and the natural resources. These are properly managed by the farmers who take control of the operation of the innovative system.

Construction and description of the FISH terraces

Cordillera FISH has become an important aspect in inland fishery development. Based on the DA-BFAR Cordillera Regional Office, through the Regional Fishery Research and Development Center headed by Ms. Lois June B. Fermin, the fish terraces are prepared in a number of ways considering the natural and available resources in the area. Usually, the ingenuity of the farmers cum fishers develops and transforms their terraces according to use and scale of production.

The terraces are secured either with rock or earth walls. These walls also serve as dikes and walkways. In practice, the Cordillerans build their terraces depending on the availability of water. Elevation is not a major consideration in the construction of the terraces as long as there is a continuous supply or flow of clean water in the field. This plays an important factor because of the growth behavior of the fishes through the growing season.

According to Saret (1998) as cited by Fermin (2008), rice terraces engineering relies on the topographic patterns, materials, and types of construction. In areas where slope gradients are small, constructing walls along contours is unnecessary, thus, the straight and angular shapes and very wide pond fields could serve best for the fish terraces. At higher elevations where slopes are steeper, the terraces run parallel with the contours. In tributary valleys, on the other hand, rock embankments are perpendicular to the former stream. With the slope often not very steep, the walls are built straight and narrow.

In rock wall terraces, a small ditch is dug above the construction site. A meander-shaped ditch extension is dug in the soil, to be removed later, which is then connected with the irrigation canal. The underlying rock where the terrace wall is to be erected is then flattened carefully. Once an inclined rock wall is erected, the terrace area behind the wall is filled with a soil layer each time the wall is built one or two stone layers higher.

In earth wall terraces, the terrace base and wall are excavated in the disintegrated rock by water, spades, and crowbars. With the terrace and the wall completed, waste materials are removed through a slit of cut which is later filled with stones or clay. Soil is then placed in the terraced basin to form the soil.

A modification of the fishpond terrace from the rice terrace is that the dikes are higher to make the ponds deeper, allowing space for the fish. The dikes and walls are plastered with cement to prevent seepage and erosion, and sometimes the pond bottom is also concreted for ease during fish harvesting.

Cordillera FISH... *from page 21*

Potential for agri-aqua tourism and community research and development

Ever since the FISH terraces emerged from the mainstream of inland fishery development, research activities popped up to make it exciting and relevant. Researchers, extension workers, and development practitioners saw the need to continually improve the system and provide other areas for further research. Documentations were done but less emphasis on social dimension and people who could provide direction in the development of or changes in the communities. All data and information were mere photos and testimonies of practice and experiences. Creating a niche to inland fishery development became the trend to support the issue on food security and sustainability was on the rise.

Today, the Cordillera FISH became more popularly known with the so-called Fish Terraces because of its implication and relationship to community development, tourism, and industry. Based on the identified implications, the Department of Agriculture's Bureau of Fisheries and Aquatic Resources (DA-BFAR) Cordillera Administrative Region documented its features, experiences, and practices. These led them to make some innovations to boost its application as part of a community of inland fishery practice where they are located and used these pieces of documented information as part of an integrated approach to food sustainability and security in the highlands.

In addition, the DA-Bureau of Agricultural Research (DA-BAR) noted that there are areas for sociological inquiry on patterns, interactions, and relationships of people and communities with new trends in agriculture and tourism development. All aspects rolled into one became a subject of research because of the involvement of the farmers and inland fisherfolk with the resources used in maintaining and managing the fishery innovative system. This way, it made a difference when it used fishes within the confines of terraces in the highlands to boost the innovation in inland fishery system.

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Onion and ginger... *from page 26*

disease resistance and reduce disease incidence will be available reducing risks of incurring production losses owing to disease outbreaks," she mused. When the formulation is optimized, it will create a venue for feed companies in the country to mass-produce the feeds for commercial distribution.

As for utilizing onion and ginger, this would lead to increasing the demand for these crops because of its additional use not only as a food ingredient but also as an immunostimulant. Also, more farmers will be encouraged to plant these crops to sustain the demand. Again, this shall increase their productivity and income, hence, uplifting their economic status.

Onion and ginger can be a source of cheaper feed additives for grouper compared to other locally available immunostimulants. This shall lower the cost of production in aquaculture, as feeds constitute 60% of the cost.

The grouper industry ahead

With the development of a new technology for the grouper industry, Dr Apines-Amar foresees a promising future together with the many aspects of grouper aquaculture that are already in place, such as the hatchery and grow-out technology.

The use of new immunostimulants provides fish farmers with better option in formulating feeds for grouper. "Aside from being readily available, it could also be cheaper than commercially-available immunostimulants. Improved technology could result in increased efficiency," she added.

Dr. Apines-Amar considers fish health management critical, which makes use of a range of approaches from prevention to therapy. The better approaches such as using dietary immunostimulants to reduce disease occurrence are deemed important.

"The bottom line should be that growth and survival of the cultured fish should not be adversely affected for the venture to be economically viable," she concluded.

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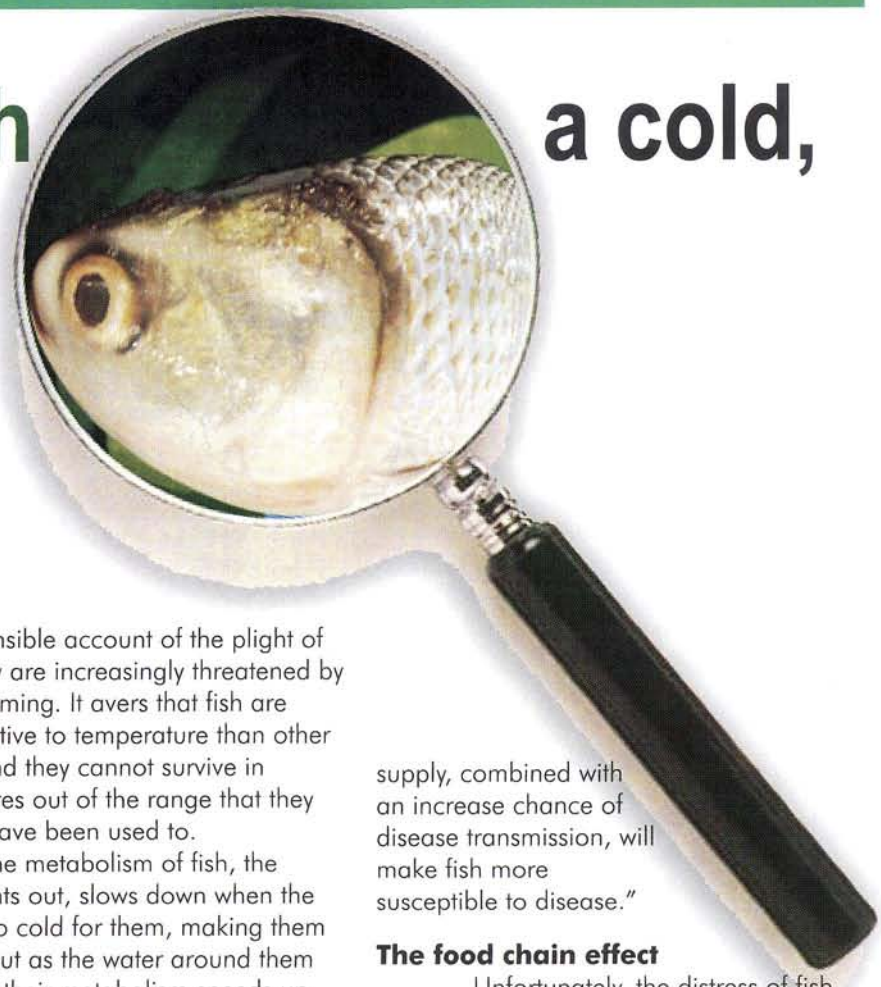
When fish catch a cold, the rest of the world sneezes



story by **Miko Jazmine J. Mojica**
photos by Rita T. dela Cruz

In less than four months this year, two tragedies swept through Pangasinan's *bangus* (milkfish) sanctuaries – the wrath of Typhoon *Cosme* in June which damaged 80 out of 300 fish cages in Sual town, and the mysterious slashing of six fish cages in the same town in September.

The impact of these two misfortunes was seen and felt immediately, causing the selling price of *bangus* to record lows and record loss for fish-cage operators. Come to think of it, we are talking about a popularly cultured fish where shelter and food are provided, and its reproduction well attended by humans. But have we seriously given a thought about mass extinction of fish species from our marine, estuarine (fresh and salt water mix), and freshwater reserves?

Reports from numerous international organizations showed that over the past 50 years, bodies of water all over the world have been heating up because of global warming. Most of these reports have similar findings: even the slightest rise in water temperature could have severe effects on fish and aquatic ecosystems, and ultimately on the global food supply and economic stability.

Looking through the fish eyes

In July 2005, the World Wildlife Fund (WWF) released the report, *Are we putting our fish in hot water?*, which explains the effects of climate change on fisheries worldwide. The report presents a comprehensible account of the plight of fish as they are increasingly threatened by global warming. It avers that fish are more sensitive to temperature than other animals and they cannot survive in temperatures out of the range that they prefer or have been used to.

The metabolism of fish, the report points out, slows down when the water is too cold for them, making them sluggish. But as the water around them warms up, their metabolism speeds up, making them digest their food more rapidly, hence, they grow more quickly and have more energy to reproduce.

"But fish need more food and more oxygen to support this higher metabolism. Warmer fish tend to mature more quickly, but the cost of this speedy lifestyle is often a smaller body size. Ninety percent of aquatic animals like fish raised in warm water end up smaller than their peers raised at cooler temperatures. Many fish will also have less offspring as temperatures rise, and some may not be able to reproduce at all," the WWF report stated.

"Water may all look the same to us, but for fish, the world is made up of very distinct layers – each with its own temperature and supply of food and oxygen," the report added. According to WWF, as the water near the surface continues to heat up, it becomes lighter and makes the mixing with the cooler, denser layers of water below harder. Eventually, "as fish crowd into bottom refuges, competition for prey will intensify, and the stresses of low oxygen, low food supply, combined with an increase chance of disease transmission, will make fish more susceptible to disease."

The food chain effect

Unfortunately, the distress of fish is felt by every living thing that is directly or indirectly affected by its troubles. In the Gulf of Alaska, where large glaciers are found, the fish are shifting to deeper waters. The WWF recounted that when fish in the Gulf moved deep in 1993, about 120,000 seabirds starved to death, most likely because they could not dive deep enough to catch their relocated prey.

"Billions of people throughout the world rely on fish as a primary source of protein, particularly in developing countries with rapidly expanding populations," the WWF said. In their report, the WWF lamented the fact that though the declining numbers of fish could have a devastating impact on humans both for their health and business, a bigger danger is in store for other wildlife. They cited an 18-year study in Ghana showed that during the years when fish supply was low, sales of meat from a variety of wild animals soared, poaching increased, and 41 species of wild, terrestrial mammals experienced sharp population declines.

Passing on the poison

The WWF report likewise stated that warm water increases the toxicity of pollutants. Thus, as fish pump more water through their gills to meet increased metabolic needs, they also collect more pollutants. The terrifying findings of WWF is that while warmer fish can flush out the extra load of some types of toxins, fish in warmer water accumulate mercury more rapidly even if only small amounts are present.

"Mercury poisoning is already a major economic problem for fisheries in Canada, Japan, and Scandinavia, and poses a significant public health risk. A recent study of 1,700 American women of childbearing age found that blood mercury concentrations were seven times higher in women who ate fish more than twice a week, and because mercury is transferred directly to the fetus during pregnancy, 300,000 babies born each year in the US alone may be exposed to levels of mercury high enough to harm their neurological development," said WWF.

Recently, tuna producers in the Philippines expressed their anxiety over the dwindling tuna catches over the past few years. According to Mike Lamberte, Fish Port Authority manager in General Santos City, tuna catch in the city has dropped by as much as 34 percent from January to June compared to the same period last year. The tuna industry is considered one of the few bright sectors in our economy and such incidence is bad news for our country. Reports of major dailies said that in 2007, industry players blamed rising global temperature as one of the primary causes of reduced catch. This year, they put the blame squarely on high fuel costs.

Yet it is interesting to note an observation echoed by Dr. Mina T. Gabor, president of the Small and Medium Business Development Foundation, Inc. (PHILSMED) and former Tourism Secretary when she served as one of the resource persons in the technology forum organized by the Bureau of Agricultural Research (BAR) in 2006, and she talked about the prospects of agribusiness in the country. According to her, the Japanese, who import most of Philippine fresh tuna, are becoming quite fastidious when it comes to buying our fish. Apparently, the Japanese are wary about the mercury content in our tuna. Having encountered that report from WWF, we could now relate to the troubles faced by the Americans about mercury poisoning from fish and any health risk we may incur from the exposure of fish to pollutants. Consequently, just by learning about the effects of climate change to the lowly fish, the interconnectivity of all living things on the planet we share and how even the seemingly mundane occurrence could affect everyone else is easier to understand now. But can we do anything about it?

Climate change overload

What is certain is that it's not only WWF that is raising the flag about climate change. One can easily access an abundance of reports and studies about the effects of climate change to fisheries. Some of these are reports from the United Nations Environment Programme (UNEP), the international marine watchdog group Reef Check, Inter-governmental Panel on Climate Change (IPCC), and the list goes on. In short, the world is now starting to take notice and take the cudgels for saving what we can still enjoy for now.

In the country, there is little literature available or accessible for everyone to peruse. Perhaps, we need to do some catching up on this since the forecast is that the Philippines is among the most vulnerable to the devastating effects of climate change. "The Philippines is not emitting a lot of carbon dioxide, but it's going to be the biggest victim of climate change," said Dr. Josefino Comiso, a Filipino senior scientist at the National Aeronautics and Space Administration (NASA). He is also a contributing author to the report on climate change of Nobel winner Inter-governmental Panel on Climate Change. He recently returned to Manila to share his knowledge with the academe under the DOST's "Balik-Scientist Program".

Comiso said that since the country is home to a high diversity of species, we are more vulnerable to the effects of temperature escalation. "In the Philippines, there's more diversity. If you lose 10 percent of them, we're talking of thousands of species," he said.

In a collaborative study by the University of California and WWF in 2005 on the *Effects of global climate change on marine and estuarine fishes and fisheries*, Roessig, et al. said that there is a need to research the physiology and ecology of marine and estuarine fishes, particularly in the tropics where comparatively little research has been conducted. They said that as a broader and deeper information base accumulates, researchers will be able to make more accurate predictions and forge relevant solutions. Now, that's a green light for our R&D.

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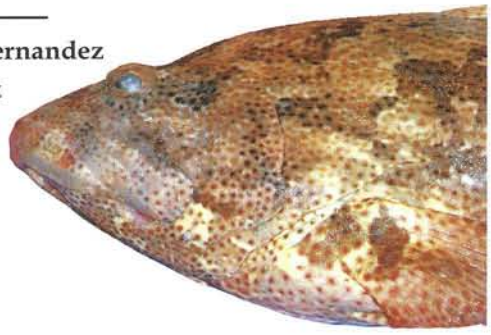
Onion and Ginger as immunostimulants in *Grouper*

story by **Ma. Eloisa E. Hernandez**
photo by Rita T. dela Cruz



The fishery subsector registered a growth of 6.81 percent in 2007, contributing 25.44 percent of the total agricultural production in the Philippines. In particular, higher demands on grouper (lapu-lapu) were noted in the fourth quarter of the year.

Grouper or *Epinephelus fuscoguttatus* is a fast-growing fish. This shows good culinary attributes resulting in high economic potential both locally and in some parts of Asia. However, grouper shows high susceptibility to stress and diseases that can result in low survival, hence, affecting its production.

In aquaculture, immunostimulants can enhance general disease resistance. Immunostimulant refers to an agent or a drug that increases or stimulates the ability of the body's immune system to fight infectious diseases. As immunostimulants, onion and ginger were used because of the reported health benefits in humans and other animals. Both onion and ginger contain anticancer, antibacterial, antiviral, and lipid-modulating properties and cholesterol-lowering activities.

In such cases, a study was conducted by the University of the Philippines Visayas (UPV), together with the Southeast Asian Fisheries Development Center-Aquaculture Department (SEAFDEC-AQD), to evaluate the effects of onion and ginger on the growth, immune response, and disease-resistance in grouper. The approach is projected to result in improved survival and production of cultured grouper.

Administering onion and ginger

Onion and ginger were administered through the feeding diet of grouper. Results showed that after 12 weeks of onion-supplemented diet, the fish exhibited higher weight gain. Utilizing ginger as immunostimulant, however, shows significantly higher lysozyme activity (showing high damage in the bacterial cell wall).

Addition of either onion or ginger in the fish diet particularly improved the total immunoglobulin and other immune defenses. Likewise, these supplements increased the survival rate of the fish infected with *Vibrio* sp.

Based on the results of the study, using the supplements could increase growth and survival by as much as 32 percent and 42 percent, respectively.

Benefitting from grouper

Dr. Mary Jane Apines-Amar, project leader said the study will create an impact benefitting the fisherfolk more so the aquaculture industry. "Both fish farmers and the industry can use the improved feed formulation to augment grouper production, generating additional employment opportunities in the process," she said.

In addition, she stressed that for the local fisherfolk engaged in supplementary livelihood activities such as cage culture of grouper, improved survival and production would result in increased profits and income for them. "These can create a multiplier effect as increased income means reduced poverty incidence among fisherfolk and the immediate community," she added.

"For new ventures, a new, improved diet intended to increase

continue to page 23

Based on the results of the study, using onion or garlic as supplements in the feed diets of Grouper could increase growth and survival by as much as 32% and 42%, respectively.

Harvesting the "Pinaka-Best" from the aquaculture industry

story and photos by **Rita T. dela Cruz**

Being archipelagic in nature, the Philippines is abundant in natural resources and its bodies of water well endowed with bountiful harvests from sea.

The aquaculture industry, being naturally diverse in species, and culture systems and ecosystems, plays a significant resource both for food and livelihood. Milkfish, carp, and shrimp that are raised in fish farming industry are mostly harvested for domestic consumption, sustaining about half of the protein requirement of the Filipinos' seafood diet.

In a paper authored by Dr. Nelson A. Lopez, chief of the Inland Fisheries and Aquaculture Division of the Bureau of Fisheries and Aquatic Resources (BFAR), in terms of commodities, seaweeds is a major contributor supplying 70% to aquaculture production in 2005. Following are commodities such as milkfish (16%), tilapia (9%) and tiger shrimp (2%).

The Food and Agriculture Organization (FAO) also ranked the Philippines as one of the top fish producing countries in the world as cited in Dr. Lopez' paper. In 2001, it ranked 11th with a total production of 3.17 million metric tons of fish, crustaceans, mollusks, and seaweeds.

Lopez added that, the fisheries industry provides employment to around one million people or 5% of country's labor force wherein 26% are into aquaculture.

Catching the "big fish"

Just as Philippine aquaculture industry is rich and diverse in species, the technologies available varies greatly

from one species to another. The industry is beset by many problems mostly production related problems including culture problems and inadequate quality species.

For consumers, the odds of knowing whether a technology on aquaculture is really working or not, is mainly based on the size of the commodity. As the famous saying goes: Size does matter! A consumer is likely to patronize harvests that are huge in size.

In the recently concluded "2008 Pinaka-Best Agricultural Harvest" organized by the Department of Agriculture (DA) through the Bureau of Agricultural Research (BAR), the biggest catch from the aquaculture industry was chosen out the 38 entries this year and was dubbed as the "Pinaka-Best" taking home P15,000 and a trophy.

The "Pinaka-Best Agricultural Harvest" is a nationwide contest that aims to recognize the farmers and fisherfolk who raise and produce commodities in their maximum capability and good quality. It is an annual activity of DA in cooperation with the Office of the Presidential Adviser for Job Creation (OPAJC) and the National Vegetable Industry Council (NVIC).

Initial screening was conducted in 16 regions of the country selecting one entry per commodity for every region. Facilitating the regional selection were the DA-Regional Field Units (RFU) and the Bureau of Fisheries and Aquatic Resources (BFAR).

The champion harvests for aquaculture were *bangus*, carp, *sugpo*, and *ulang*. They were judged based on weight, length, and physical appearance. They were also compared to the usual size of the commodity that was grown under usual crop production management practices or that was cultured under enclosed aquaculture facility.

Bighead carp *(Aristicthys nobilis)*

This year's "Pinaka-Best Carp" was awarded to Francisco Ceremonia of Binangonan, Rizal (Region IVA), who raised the heaviest bighead carp. Beating last year's record, the bighead carp tilted the scale at 8.02 kg and 62.12 cm in length.

Compared with the common carp (*Cyprinus carpio*), this species has laterally compressed body and is commonly referred to as "bighead carp" because the length of their head is larger than the body height. Other distinct features are their disproportionately large mouth and very small scales.

A two-month old carp develops body coloration which could go to dark gray and cream with black uneven blotches on the back and sides. Bighead carp is fast growing since it's basically zooplankton feeder. If cultured, it also accepts artificial feed including by-products from grain processing in addition to natural food. It can grow very heavy reaching to a maximum weight of 40 kilogram.

According to FAO (2008), culturing of bighead carp was initiated in the areas along Yangtze River and Pearl River in the southern part of China, much later than the culture of common carp .

The culture of bighead carp remained relatively small in scale, due to the dependence on the natural supply of seed. Success in induced breeding technology significantly promoted its culture. The fish has been introduced to more than 20 other countries including the Philippines.

The culture of carp started in the second half of the 1980s. Although the government has long tried to promote carp culture, they never became popular due to relatively low consumer acceptability. According to the study of W.G. Yap (2002), many Filipinos do not find carp palatable. Meanwhile, the bighead carp has recently become a dominant species in Laguna Lake fish pens.

Milkfish *(Chanos chanos)*

Another "Pinaka-Best" awardee is the milkfish entry of farmer, Marcelino Fernandez from Dagupan City (Region I). His milkfish weighed 6.70 kg and measured 98 cm in length.

Declared as the Philippine's national fish, milkfish or *bangus* is popular table dish among Filipinos and an important part in their protein diet.

Milkfish is naturally a sturdy fish that can adapt and thrive even in the

The culture of bighead carp remained relatively small in scale, due to the dependence on the natural supply of seed. Success in induced breeding technology significantly promoted its culture.

confined, unnatural environment of the fishpond. They can grow to a maximum of 1.7 m but more often about one meter in length. They have no teeth and generally feed on a wide variety of relatively soft and small food items like algae and invertebrates.

Being a predominant species that is being cultured in the country, milkfish was identified by DA-BAR, the national coordinating body for agriculture and fisheries research and development (R&D), as one of its national priority commodities for aquaculture R&D in 2003 as stated in the Research and Development Agenda and Programs (RDEAP) for 2006-2010.

According to Dr. Catalino dela Cruz, BAR's technical adviser for fisheries, "Although research efforts have already been going on for decades, particularly on milkfish, its continued support provided the impetus to facilitate the development and enhancement of more technologies to boost production of for local consumption and export."

Milkfish farming is a centuries-old industry in the Philippines and yet it has been slow to modernize facing challenges from competing aquaculture species and the present variability of the economy.

Black tiger shrimp *(Penaeus monodon)*

Locally known as *sugpo*, Chrisanto Cantong from Binmaley, Pangasinan (Region I) raised the largest black trigger shrimp and won the "Pinaka-Best Shrimp". His entry weighed 0.17 kg and measured 24 cm long.

They are referred to this variety as "black tiger shrimp" due to the dark stripes that encircle their shells. They are also known as giant tiger prawns, or simply tigers. When cooked, its flesh turns white and the black stripes on the shell turn bright red utilizing its color in gourmet dishes. This is one of the most popular varieties of shrimp in the world market.

The black tiger shrimp is the most widely cultured prawn species in the world, although whiteleg shrimp, *Litopenaeus vannamei* is coming into the race with its recent popularity.

Black tiger shrimps are commonly found in Southeast Asia and are widely available year-round, although the supply peaks in February and September. Generally, the rule of the trade is that, the larger the shrimp, the higher the price.

Giant freshwater prawn *(Macrobrachium rosenbergii)*

Called *ulang* among the Tagalogs and *udang* among the Ilocanos, the giant freshwater prawn is an indigenous species of high economic value. A delicacy among Filipinos, they are good substitute for lobster and tiger prawn due to their appearance and excellent taste.

In this year's bid for "Pinaka-Best Ulang" farmer, Leonardo Matienzo of Tanay, Rizal (Region IVA) took home the prize. He was able to harvest the biggest and heaviest *ulang* weighing 0.50 kg and measuring 29 cm. long.

According to BFAR, sizes of ulang are categorized into three, small (7-10 cm, 10-15 g), medium (11-14 cm, 40-80 g) and large (15-18 cm, 120-140 g). Marketable sizes of ulang are achieved after four to five months of culture.

Harvesting can be done through selective harvesting or total harvesting. Selective harvesting is done by seining the prawns using size 17 net keeping its bottom intact to avoid escape of prawns. Meanwhile, total harvesting is done by total draining of the pond using scoop net or with bare hands.

Grow-out culture of *ulang* in freshwater ponds is a very promising aquaculture venture. It can also be used in polyculture together with *tilapia* and carp since they are nibblers and slow feeders and consumed less feed.

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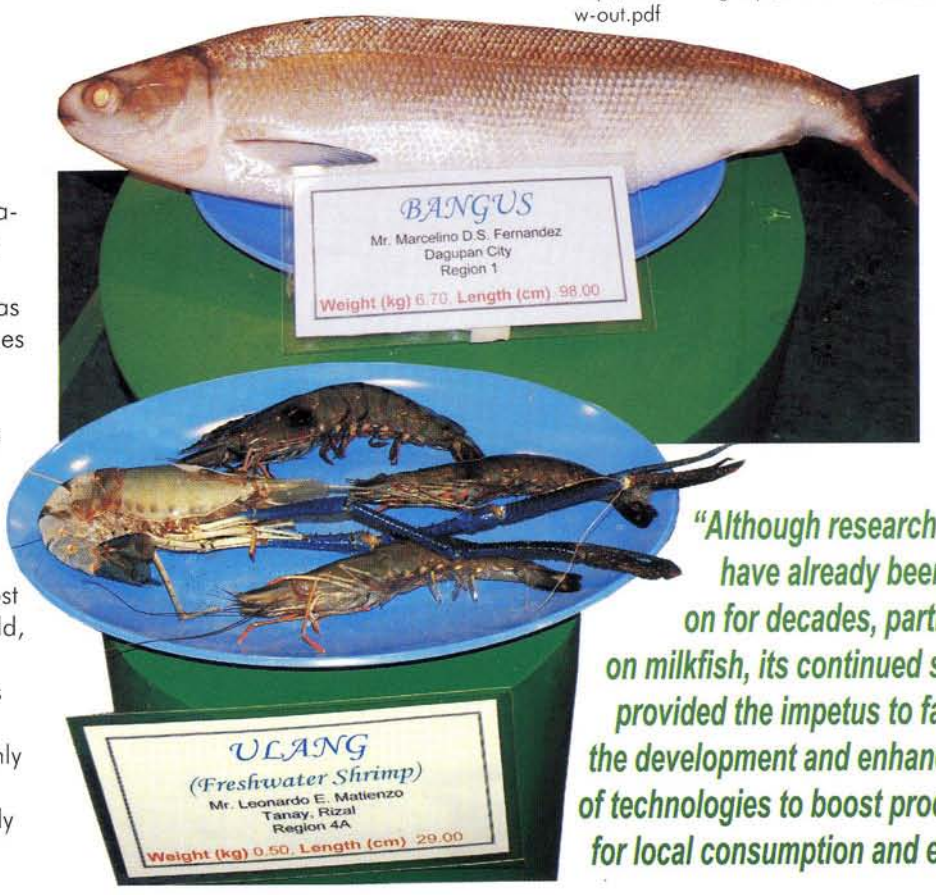

"Although research efforts have already been going on for decades, particularly on milkfish, its continued support provided the impetus to facilitate the development and enhancement of technologies to boost production for local consumption and export."

BRIDGING THE KNOWLEDGE GAP

Role of social sciences in fisheries development

story by **Manuel F. Bonifacio, PhD**
photo by Rita T. dela Cruz

As one goes through the current literature in fisheries development, one can readily notice the dearth of social science research in fisheries research and development. Among other things, this could be the result of the minimum attraction and support extended to it. It is unfortunate that even in major universities offering fishery education, the value of the social sciences to it appears not to be very clear.

This apparent neglect of the vital role of the social sciences can be taken as a weakness of the current knowledge building in fisheries development. This is perhaps best indicated in the weakness observable in the design and implementation of research and extension programs. The shock waves created by the passage of the Local Government Code wrought havoc in supporting and strengthening the role of social sciences, especially the role of research and extension in fisheries.

This was further aggravated by the passage of the Fisheries Code (RA 8550) which many took as the source of punitive measure to control and reverse the trends in the destruction of the coastal environment. In a number of instances, the code was used as the basis for identifying and isolating cases of the violations of the law.

Further neglect of the role of social sciences is reflected in the in-migration of poor families to the coastal areas. As noted by the Food and Agriculture Organization (FAO) of the United Nations, the population of many coastal communities will grow and the impact of this phenomenon to near shore fisheries is the further deterioration of the coastal environment. In fact, it has already been pointed out a number of times that there will be more fishers using destructive gears with negative effects on the environment.

The role of the social sciences in fisheries development, while not explicitly recognized, is reflected in fisheries policy pronouncements such as *reverse the trend in the destruction of coastal environment, implement the code of responsible fisheries, RA 8550, harness the assistance of the NGOs in mobilizing coastal communities for the appropriate management of coastal resources including providing them with opportunities for alternative livelihood development, models of conservation and protection of the environment, etc.*

It is clear from the above that the role of the social sciences in fisheries development is indispensable since to a large extent the issues, concerns, problems, and the directions to be charted are human in nature. In fact, the adoption of the concepts management, responsible fisheries, community management, participation, etc. are all social science-based.

The role of the social sciences becomes all the more crucial with the adoption of holistic approach focused on responsible management. It seems that there is an implicit bias in the approach since there is the presumption that an irresponsible management of coastal resources prevails in the coastal communities.

Even if one assumes that such a phenomenon exists, the help of the social scientists is necessary so that its social-psychological basis can be fully documented. There is no question about adopting the strategy of responsible management. However, it must be placed in the appropriate context since it involves social, economic, and political concerns. It could be said that the political dimension plays a substantial role in bringing about responsible management of fisheries resources.

In short, the issues facing fisheries development are multidimensional in nature but more than anything else; these are structural in nature and therefore would require careful structural analysis. Responsible action is human action and is created, instituted, and modified through human action. There is no other way!

Below is a list of research topics illustrative of the role of the social sciences in fisheries development.

- *Implementing RA 8550: Issues, Concerns and Problems – A Socio-Legal Analysis*
- *Impact of RA8550: The Persistence of Traditional Authority in Coastal Communities – Conflict or Complementation: A Socio-Legal Assessment*
- *Sustainable Community Development in CRM: Assessing the Impact of NGO Involvement*
- *An Ethnographic Analysis of Traditional Fishing Methods: Toward People-Sensitive CRM*
- *Transforming Small-Scale Business in Fisheries into Viable Enterprises: A Socio-Economic Analysis*
- *The Positive and Negative Consequences of Alternative Livelihood in CRM: An Impact Evaluation*
- *Small-scale Fishing and the Prospect of Direct Marketing, Instituting Innovative Enterprise Development in CRM*
- *Management From Below: Building Sustainable Coastal Resources for Poverty Alleviation*
- *Institution-Building: The Impact of Fisheries Management Councils*
- *Organizational Development: Transforming Fishing Practices into New Management System*
- *The Role of LGUs in CRM: A Performance Assessment*
- *Is Enforcement Antithetical to Empowerment? A Socio-Legal Analysis*
- *The Politicization of Coastal Communities: Assessing the Impact of Community-based Approach*
- *Politicizing Coastal Communities: Putting Participation and Empowerment in Context*
- *Cooperatives Development in CRM: New Challenges and Directions in Community Organizing*

"...the issues facing fisheries development are multidimensional in nature but more than anything else; these are structural in nature and therefore would require careful structural analysis."

Improving the way people live through R&D

FATTENING FISH FOR HIGHER PROFIT

A fish farmer feeds his cultured groupers in one of the DA-BFAR VII – Central Visayas Regional Fisheries Research and Development Center assisted technologies on the grouper grow-out production in floating net cages in Calape, Bohol. Grouper or locally known as "lapu-lapu" is considered as one of the priority commodities of Central Visayas for domestic and global markets.

BAR Research and Development DIGEST

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