

Using a simple method, SEAFDEC/AQD managed to produce premium unclustered oysters. Full story on page 4. [PHOTO BY MJH LEBATA-RAMOS]



aqd matters

May-June 2021

Newsletter of the SEAFDEC Aquaculture Department, Tigbauan, Iloilo, Philippines

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Aquafeed project shows promise to improve income of farmers

TO HELP lower the price of fish amidst volatile food prices across the country, SEAFDEC/AQD is coming up with a new fish feed formulation that is cost-efficient and eco-friendly.

Using byproducts of ethanol production, rendered animal protein, and processed copra meal, a scientist at SEAFDEC/AQD formulated fish feed that performed better

than commercially available feeds as proven in pond trials.

The SEAFDEC/AQD-formulated diet is cheaper as it only costs about P28 per kilogram to produce, while the average cost of a commercial feed is about P34 to 36 per kilogram.

“We came up with this feed formulation to lower the price of feeds which account

for more than 50 to 60 percent of the total production cost in aquaculture,” said Dr. Roger Edward Mamauag, a scientist at SEAFDEC/AQD and head of its Technology Verification and Extension Division.

Dr. Mamauag compared the new formulation with commercial feeds in high-density tilapia pond culture and found it will cost about



Tilapia feeds produced by SEAFDEC/AQD using alternative ingredients to lower production cost and improve the income of farmers. PHOTO BY RH LEDESMA



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P1.6 million in commercial feeds to provide for one hectare in a year of operation, while only P1.2 million using the new formula.

Accounting for the costs and returns of the trial runs, net income from one hectare of tilapia ponds is about P21,862 in a year using commercial feeds, and P543,925 using the new formula.

The field trials were done in 2020 at SEAFDEC/AQD's Dumangas Brackishwater Station (DBS) in Iloilo as part of a collaborative project between SEAFDEC/AQD, the National Fisheries Research and Development Institute (NFRDI), and the Bureau of Fisheries and Aquatic Resources (BFAR).

Cheaper ingredients

Dr. Mamauag used cheaper and locally available protein ingredients such as distiller's dried grain soluble, poultry by-product meal, and protein enhanced copra meal as a substitute to the usual fishmeal, which is an expensive, imported, and unsustainable fish-based ingredient.

"SEAFDEC/AQD's goal is to lessen our dependence on fishmeal as a protein ingredient in feeds since it is expensive and unsustainable to harvest fish from the oceans to feed the fish in the farms," said Dan Baliao, chief of SEAFDEC/AQD.

With the move to veer away from fishmeal dependence, the field trials showed that the new formulation was more efficient than the commercial diet. It had a lower feed conversion ratio, that is, less feeds were needed to produce a volume of tilapia.

"The tilapia that we fed with our diet gained about 730 percent of its own weight after 90 days, while the tilapia fed with a commercial diet only



Tilapia, weighing an average of 270 grams apiece, harvested from a project on the field testing of cost-effective aquaculture feeds at the Dumangas Brackishwater Station in Iloilo of SEAFDEC/AQD on 7 December 2020. PHOTO BY JF ALDON

gained about 680 percent," said Dr. Mamauag.

Good for farmers and consumers

Baliao also said that the success of this project would also benefit consumers since fish would be available at a lower price if the aquaculture production cost is reduced.

"We are happy with the outcome of this project, and we are looking forward to the mass production of these cost-effective feeds that would benefit our fish farmers and consumers," said Baliao.

Asked for comments, Dr. Jaime Gison, a medical doctor by profession who runs fishponds in Iloilo City and Banate in Iloilo, said that he is happy with the significant result attained in the 90-day culture of tilapia.

"A shorter culture period and cheaper costs of feeds imply more croppings in a year hence more profits for the farmer," added Dr. Gison, who is also a former trainee of SEAFDEC/AQD.

Costs can still go down

"The cost of the feeds that we developed will still go down



Brackishwater ponds at the Dumangas Brackishwater Station of SEAFDEC/AQD in Iloilo used in field testing cost-effective aquaculture feed for tilapia. PHOTO COURTESY OF RE MAMAUAG

if produced on a commercial scale. That is why we are doing these field trials to check the effectiveness of the feeds before giving the formulation to private feed manufacturers for adoption," added Dr. Mamauag.

The field testing began in 2019 when verification trials of the SEAFDEC/AQD-formulation were done in tilapia ponds at the BFAR National Freshwater Fisheries Technology Center, Muñoz, Nueva Ecija.

"The results of the field testing that we did in Muñoz and in Dumangas are almost

the same, and to further confirm these positive results, we will also be doing a field trial this year in Taal, Batangas, which will start in July 2021," shared Dr. Mamauag.

Field testing of the feed was also done at SEAFDEC/AQD's Igang Marine Station in Guimaras; Guiuan Marine Fisheries Development Center – BFAR 8, Guiuan, Eastern Samar; and BFAR 1 Regional Mariculture Technology Demonstration Center, Sto. Rosario, La Union for milkfish reared in sea cages. **a**

- RH LEDESMA

Shrimp birthing center ends unnecessary abortions



Tiger shrimp fry produced at the hatchery of SEAFDEC/AQD located at Tigbauan, Iloilo. These are ready to be packed and transported for stocking in shrimp ponds. PHOTO BY RD DIANALA



↑ Tiger shrimp spawners are being checked if they are ready to spawn at the shrimp quarantine facility of SEAFDEC/AQD. Spawners are mother shrimp that carry eggs that will hatch into larvae that will later develop into fry stocked in ponds. PHOTO BY SEAFDEC/AQD

BACK in 2018, eggs from infected shrimp spawners would be promptly chlorinated and disposed – all 200,000 to 1 million of them per brood – to quell notorious pathogens that continue to devastate shrimp farms worldwide to the tune of billions of dollars yearly.

This was the practice at the SEAFDEC/AQD Tiger Shrimp Spawner/Broodstock Facility in Iloilo, Philippines where incoming spawners are screened for pathogens, through polymerase chain reaction (PCR) tests, before allowing their eggs into a highly biosecure hatchery.

Upon releasing their eggs, the spawners, are tested for the white spot syndrome virus (WSSV), monodon baculovirus (MBV), infectious hypodermal and hematopoietic necrosis virus (IHHNV), yellow head virus (YHV), acute hepatopancreatic necrosis disease (AHPND), and the parasite *Enterocytozoon hepatopenaei* (EHP).

To end the wasteful abortion of shrimp eggs and boost the production of shrimp seeds, SEAFDEC/AQD

scientist Dr. Leobert de la Peña started disinfecting them and soon found that disease-free postlarvae can be successfully produced from infected spawners.

“Now we collect the eggs from each spawner and wash them with UV (ultraviolet) light-sterilized seawater, after which the washed eggs are then disinfected with iodine before being finally rinsed with sterilized seawater,” said Dr. de la Peña.

The Food and Agriculture Organization of the United Nations recommends that shrimp eggs and nauplii (newly-hatched shrimp) must be washed and disinfected appropriately to prevent the transmission of viral, bacterial, fungal, and other diseases from broodstock.

To date, disinfected eggs from several batches of infected spawners continue to be free from diseases, helping the experimental hatchery achieve a 19 percent survival rate (newly hatched shrimp to postlarvae) in 2020, more than double compared to only 9 percent in 2018 before egg

disinfection was done.

Disinfection of eggs helped the experimental hatchery cut losses from the disposal of infected spawners and their eggs. In the Philippines, each spawner costs P1,500 to P2,000 (US\$31 to US\$42), while eggs that successfully develop to postlarvae are P200 to P250 (US\$4 to US\$5) per thousand when sold.

The measure is made even more important in the face of an increasing number of wild-caught spawners purchased by the facility that are found to be infected with the notorious WSSV.

“In the mid-2000s, we found that between 0.3 to ten percent of shrimp in the wild are infected with WSSV. Recently, we found out that about 60 percent of the spent spawners that we have tested are infected,” Dr. de la Peña shared.

While spawning stress may help make pathogens more detectable in PCR, the tenfold increase gives a rough estimation of the alarming spread of WSSV that leads to

significant economic losses for hatcheries.

Oplan Balik Sugpo

The SEAFDEC/AQD tiger shrimp spawner and hatchery facilities are at the centerpiece of SEAFDEC/AQD's Oplan Balik Sugpo program launched in 2017 by Chief Dan Baliao, to boost the production of high-quality shrimp seeds and help revive the tiger shrimp industry in the Philippines.

The Philippines was once one of the top shrimp-producing countries in the world, harvesting 120,000 metric tons of tiger shrimp in 1992, worth US\$ 300 million that year (US\$ 571 million or Php 27.4 billion in 2020, accounting for inflation). Due to various shrimp diseases, the current national production is only roughly a third of the volume in 1992 at 42.45 thousand metric tons, worth Php 20.60 billion.

“Technologies in shrimp farming are constantly evolving, and we, as scientists, need to adapt depending on the current situation on the field,” said Dr. de la Peña. ■

- JR PAGADOR / RD DIANALA

Growing 'young, single, and meaty' oysters

WHILE oysters are naturally clingy, a scientist has found that they grow best with no attachments and when given healthy boundaries.

In the Philippines, seafood lovers are acquainted with prying their way through clumps of steamed oyster shells. The shells — large, petite, and everything in between — reveal random morsels of meat that go well with fish sauce and spiced vinegar.

These oysters sell for as little as a dollar per kilogram, roughly of a dozen to two dozen shells, in small seafood restaurants. However, diligent traders may opt to carefully separate, sort, and clean larger shells to enter the lucrative market of premium unclustered oysters, served in hotels and high-end restaurants, where a dozen pieces can fetch at least USD 10.

To help oyster producers capture the premium market,



Scientist Dr. Ma. Junemie Hazel Lebata-Ramos showing the pouch used to grow oysters for her study at Batan Bay in Aklan that aimed to grow single oysters that command up to five times the price of clustered oysters. PHOTO COURTESY OF MJH LEBATA-RAMOS

a mollusk scientist devised a simple method of growing oysters that are not only single, but also young and meaty.

“Oysters are traditionally grown on bamboo stakes, worn tires, or old shells

installed at river mouths,” said Dr. Ma. Junemie Hazel Lebata-Ramos, a scientist at SEAFDEC/AQD based in Iloilo. Wild oyster larvae naturally stick to these surfaces and form clusters of marketable oysters in nine to 12 months.

Dr. Lebata-Ramos, however, found that by giving oysters (*Crassostrea iredalei*) their own private space to grow, in pouches or trays, they can grow unclustered, yield up to 59 percent more meat, and in 50 percent less time.

Her team placed collected baby oyster “spat” and individually stocked them in prototype net pouches and plastic trays suspended from floating bamboo rafts at their study site in Batan Bay in Aklan.

Each hanging pouch contained 25 compartment pockets that each contained one oyster. Meanwhile the plastic trays are stacked on top of each other, with each tray also containing 25 oysters.

The spat were collected from submerged tires and old oyster shells where, in

the traditional method, they would otherwise have been left to grow to harvestable size.

Larger and meatier

After six months, the oysters grown in pouches and trays grew the most, to an average of 8.9 and 8.3 centimeters shell length, respectively. Those grown traditionally on old shells and tires were an average of 7.6 and 7.2 centimeters shell length.

The body weight followed the same trend with pouch-grown (87.7 grams average) and tray-grown oysters (87.1 grams) proving to be heavier than those grown clustered on old shells (67.4 grams) and tires (55.1 grams).

“Growing them individually in a space without overcrowding may have caused these oysters to grow larger and meatier compared with those reared using traditional methods,” Dr. Lebata-Ramos said. “More importantly, the oysters in pouches and trays grew individually and achieved

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Young, single, and meaty gourmet-type oysters grown in prototype net pouches, designed by Dr. Lebata-Ramos, may command a price up to five times that of ordinary clustered oysters. PHOTO BY IT TENDECIA

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almost uniform sizes which is what the premium market requires.”

Worth the additional investment

“While traditional methods require very minimal cost, the oysters are only sold per sack at low prices. Meanwhile, oysters produced using the new methods may require additional investment, but oysters can be sold by the piece,” she said.

Anecdotal information gathered from Metro Manila suggests that before the COVID-19 pandemic, single oysters are sold for up to USD 0.60 per piece.

Dr. Leбата-Ramos recommended the use of pouches since the pouches occupy less space when neatly suspended from the raft, and are less

cumbersome to handle, are made of low-cost net material and can be easily handmade by the families of fishermen.

“The use of hanging pouches from rafts also gives the oyster farmer the freedom to harvest his farmed products based on market demands without sacrificing those oysters that have not yet attained the desired harvest size which is the case in the traditional methods,” Dr. Leбата-Ramos concluded.

SEAFDEC/AQD Chief Dan Baliao said that oyster growers could easily adapt the technology because of its simplicity and the widespread availability of the pouch materials. “Oyster farmers should embrace innovation and build upon these findings to expand their market and improve their incomes,” he added.

Dr. Leбата-Ramos disclosed her findings in the article “Producing young, single and meaty



Newly-harvested young, single, and meaty gourmet-type oysters after six months of growing in innovative net pouches to grow single oysters that command up to five times the price of clustered oysters. PHOTO BY MJH LEBATA-RAMOS

oyster *Crassostrea iredalei* (Faustino, 1932) in grow-out culture using pouches suspended from rafts,” which was published in the journal *Aquaculture Research* on 11 June 2021.

The study was done in 2014 and 2015 with funding support from the

Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development of the Department of Science and Technology (DOST-PCAARRD). [a](#)

- RD DIANALA

Fish Health Section promotes diagnostic services



Mr. Christian Cordero, a SEAFDEC/AQD technical assistant, presents the diagnostic services being offered by the Department's Fish Health Section last 5 May 2021 via Zoom.

TO HELP farmers ensure the health of their aquaculture stocks, SEAFDEC/AQD Fish Health Section presented diagnostic services being offered by the Department via webinar last 5 May 2021.

Mr. Christian Cordero, a technical assistant of SEAFDEC/AQD, shared with over 100 online participants the different procedures of preparing and sending samples to the laboratory for testing.

SEAFDEC/AQD offers bacteriology, mycology, PCR-based diagnosis, direct microscopy, histopathology, and aflatoxin detection services. [a](#) - JM DE LA CRUZ

Did you miss the webinar?
CLICK HERE
to watch the full
presentation.



COMMUNITY

MOSRA in Molocaboc Island, still engaged



MOSRA members regularly maintain the protected abalone and sandfish release site in Molocaboc Island, Sagay. PHOTO BY J JARINA

THE MOLOCABOC Sea Ranchers Association (MOSRA) shared photos of their members conducting maintenance activities at the Community-Based Resource Enhancement demonstration site. The area, locally known as "semilyahan," is home to SEAFDEC/AQD-produced native abalone and sandfish released to replenish stocks in a coral-seagrass patch of Molocaboc Island in Sagay, Negros Occidental, in the Philippines.

This study site and community was originally supported by the Government of Japan-Trust Fund (GOJ-TF) from 2006 until 2019. Even now, aside from

maintenance activities of the study site, MOSRA also continuously conducts monthly meetings and sea ranch monitoring sessions. After almost two years since the project's turnover to the community, actions like these show a great promise of its sustainability.

The group is currently working with the SEAFDEC/AQD and the Australian Centre for International Agricultural Research (ACIAR), focusing on sandfish production and engaging in responsible practices to become even more effective partners of sustainability. **a**

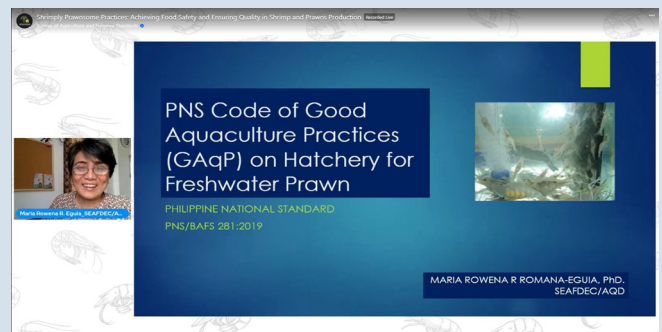
- JP ALTAMIRANO / JM DELA CRUZ

NEWS BRIEFS

FOOD safety and quality of cultured shrimps and prawns were discussed in a webinar organized by the Bureau of Agriculture and Fisheries Standards (BAFS) last 20 May 2021.

SEAFDEC/AQD, represented by Scientist Dr. Maria Rowena Eguia, joined BAFS in promoting awareness and understanding the good aquaculture practices embodied in the Philippine National Standards (PNS) for the production of economically relevant species.

Dr. Eguia virtually discussed the PNS Code of Good Aquaculture Practices on Hatchery for Freshwater Prawn to attendees. The presentation includes prevention and reduction of risks and hazards in the hatchery stage from feeding and health management of species to the welfare of hatchery workers. PNS aims to guide the aquaculture industry to achieve safe and quality products, protect consumers' health, and ensure global competitiveness. **a** - JM DE LA CRUZ



ONCE again, *Tanggol Kalikasan* invited SEAFDEC/AQD to share its programs, research, and technologies with over 60 local government officers from Ilocos Sur Province last 9 June 2021.

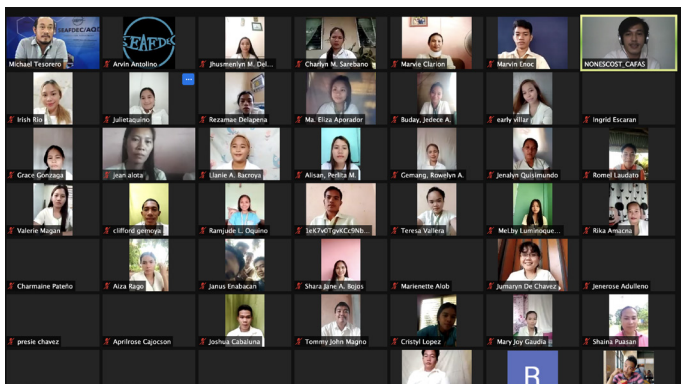
Dr. Jon Altamirano, a scientist from SEAFDEC/AQD, shared the Department's efforts in aquaculture and development, focusing on resource enhancement and management. SEAFDEC/AQD's demonstration, extension, training, and information dissemination activities were also covered in his presentation.

Tanggol Kalikasan organized this webinar session in partnership with the University of Northern Philippines as part of its Environmental Governance Webinar Series. It is the sixth session this year involving SEAFDEC/AQD and Dr. Altamirano. **a** - JM DE LA CRUZ



EXPERTS from SEAFDEC/AQD were invited as resource persons for the virtual on-the-job training program of the Northern Negros State College of Science and Technology (NONESCOST) from 23 to 29 June 2021. To further the knowledge of fisheries students joining the program, the Department presented 16 lectures on culture technologies, fish health management, and nutrition for shrimps, mangrove crab, and marine fish.

The virtual on-the-job training was conducted by NONESCOST in partnership with SEAFDEC/AQD as an alternative learning program to ensure that students can still enhance their knowledge and capabilities in aquaculture despite the pandemic. **📍 - JM DE LA CRUZ**



SEAFDEC/AQD and the Department of Agriculture-National Fisheries Research and Development Institute (DA-NFRDI) met to discuss their current and future research collaborations last 17 May 2021. Areas of collaboration mentioned were mostly on technology demonstrations, expert pairing programs, and the development of aquaculture business schemes, especially with the proposed establishment of agribusiness corridors in the country. The two research institutes agreed to harmonize their efforts and strengthen their partnerships on aquaculture research, development, and innovations. **📍**

- JM DE LA CRUZ

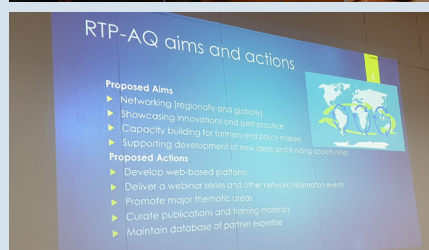


THE FOOD and Agriculture Organization (FAO) Regional Office for Asia and the Pacific tapped SEAFDEC/AQD as a collaborator of the initiative to develop a Regional Technical Platform on Aquaculture (RTP-AQ).

The RTP-AQ aims to increase knowledge sharing on aquaculture among stakeholders, take advantage of collaborations to increase innovations and improve best practices in all the regions, and bring together ideas from stakeholders to increase investment opportunities.

SEAFDEC/AQD Chief Dan Baliao, Research Head Dr. Leobert de la Peña, Training and Information Head Dr. Edgar Amar, Technology Verification and Extension Head Dr. Roger Edward Mamauag, and Breeding and Seed Production Head Dr. Shelah Mae Ursua participated in the webinar about this project on 25 May 2021. **📍**

- RH LEDESMA



LED by Chief Dan Baliao, a team from SEAFDEC/AQD presented feasibility study reports for two legislated hatchery sites in the Caraga Region (Hinatuan and Surigao City) last 10 May 2021. Officers from the Bureau of Fisheries and Aquatic Resources (BFAR) Central Office and the respective local government units were present to note the findings and recommendations of the Department.

This is part of an ongoing collaboration between SEAFDEC/AQD and BFAR in ensuring the Philippines' self-sufficiency for milkfish fry through the construction and operation of multi-species hatcheries in different parts of the country. **📍**

- JM DE LA CRUZ



Long-running marine fish training offered online for the first time



A screenshot of the participants and SEAFDEC/AQD resource persons during the closing program of the Marine Fish Online Training Course on 29 June 2021 held via Zoom.

TO SURMOUNT the limitations of the COVID-19 pandemic, SEAFDEC/AQD migrated its Marine Fish Hatchery (MarFish) training course online and conducted a first session last 14–29 June 2021.

The MarFish course, since its launching in 1985, was offered yearly by SEAFDEC/AQD as a hands-on training and is one of the best-attended training courses of the Department.

“This training course was offered as an online alternative to our usual hands-on face-to-face marine fish hatchery training course. This is the first time that Marfish is offered using the online learning management platform,” said Training and Information Division Head Dr. Edgar Amar.

In the first session, the course had 21 participants from nine countries. There

were six participants from SEAFDEC member countries, namely Brunei Darussalam, Japan, the Philippines, and Thailand which were funded by the Government of Japan Trust Fund. There were also participants from Kiribati, Papua New Guinea, Peru, Singapore, and the USA.

“I attended the training to learn the science-based approach and apply it to our aquaculture operations. Traditional knowledge has been the norm in rural areas, while various reference materials can be found on the [internet]. But I prefer to start learning from the experts and academe professionals who devoted their time for the practice and improvements of aquaculture techniques,” said Russel Abad, a professional mine geologist and MarFish trainee from the Philippines, when asked about his reason for joining the training course.

In addition, Sharon Maiseveni, a fisheries officer from Papua New Guinea, said that she attended the course to learn the different technologies used in culturing different marine species knowing that aquaculture is the way forward after the decline of the marine fish population.

“We find it really useful, especially when we first come across the online course, we thought we would have a lot of readings. But with the videos, it’s very useful, very practical information that really helps and reduce our time in reading. The content of the course is really good,” said Karibanang Tamuera, a trainee from Kiribati.

The 16-day online course used Canvas, a web-based learning management system (LMS), to provide the training experience and deliver learning materials

such as videos of lectures and practical activities. The LMS also provided a venue for the training participants to interact with SEAFDEC/AQD resource persons and fellow participants through the discussion board.

The course had six modules with topics on broodstock management, larval rearing, hatchery design, natural food culture, nutrition, health management, pond and cage culture, economic analysis, and biotechnology in aquaculture.

A recapitulation of the first three modules was done halfway through the online course via Zoom, where the participants can interact with the resource persons. Another recapitulation was done for the last three modules at the end of the training course.

“I like the fact that although it was an online

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course, in many ways, it did not feel so much online because you are right there, you were there to answer the questions in person,” said a participant from the USA who asked to remain anonymous.

During the closing program of the online course on 29 June 2021 held via Zoom, SEAFDEC/AQD Chief Dan Baliao expressed in his message, as read by Dr. Amar, his hopes that the online course attained its objectives in providing the trainees with technical knowledge and skills.

Chief Baliao also mentioned that he is convinced that distance

HATCHERY TANK DESIGN

Larval rearing tank

- Can be made of concrete or canvass
- 5-20 tonnes capacity, 1.5 meter depth
- Provide drainage hole at the bottom connected to the harvesting pit
- Provide aeration system
- Install black shading net as roofing






Ms. Nichole Yap, a technical assistant of SEAFDEC/AQD, gives a lecture on larval rearing during the online Marine Fish Hatchery Training Course.

learning mode can deliver what face-to-face training programs hoped to achieve under the present circumstances of restricted

travel and physical distancing. “For the real knowledge seekers, the medium by which knowledge is obtained becomes secondary. The real

challenge is how to apply this new knowledge and skills,” said Chief Baliao in his message. 📺

- RH LEDESMA

SEAFDEC/AQD's analytical lab up for accreditation

SEAFDEC/AQD's Centralized Analytical Laboratory (CAL) underwent a three-day virtual assessment for ISO/IEC 17025:2017 accreditation conducted by the Philippine Accreditation Bureau from 17 to 19 May 2021. This activity will determine if the laboratory meets the general requirements for competitive, impartial, and consistent operations. 📺 - JM DE LA CRUZ



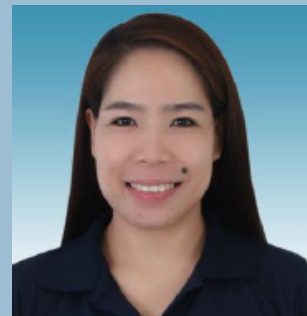
Ms. Angel Anne Juanillo, a chemist, demonstrates the water analysis procedure to assessors. This demonstration will be the basis of the CAL's competency in performing laboratory analysis.



CAL and supporting staff from the Training and Information Division during the assessment of the laboratory's microbiological testing procedures.

Welcome to SEAFDEC/AQD!

Here are the newest members of the AQD Family for the second quarter of 2021

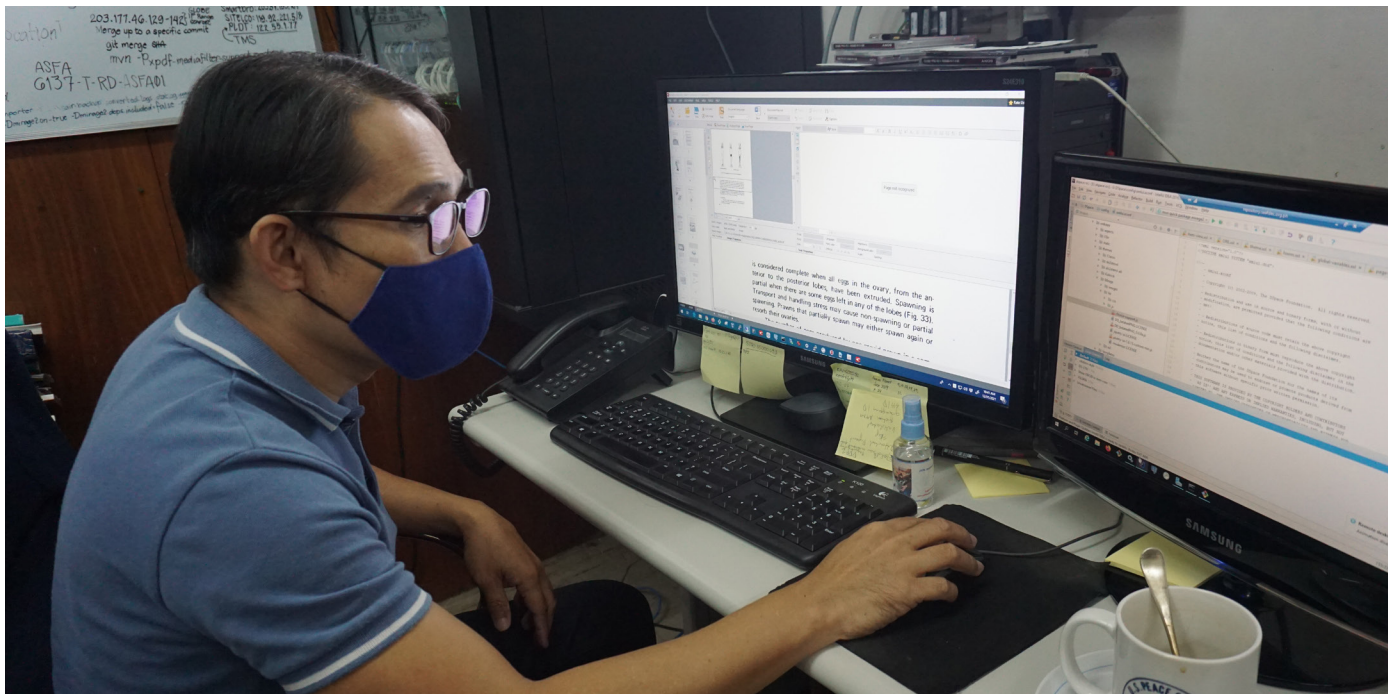


Marinelle S. Espino
Associate Researcher
Technology Verification Section
Technology Verification and Extension Division



Blan Jericho G. Caloylo
Senior Research Technician
Fish Health Section
Research Division

Virtual library boosts open access to aquaculture and fisheries publications



A library staff at the Southeast Asian Fisheries Development Center, Aquaculture Department (SEAFDEC/AQD) enhances scanned pages of various manuals and books using an OCR (Optical Character Recognition) software before uploading them to the virtual library of the research center. PHOTO BY JR PAGADOR

LIBRARIES might be closed physically due to the COVID-19 pandemic, but if you have access to the internet, you can still find your next read as one digital library made thousands of publications on aquaculture and fisheries technologies accessible to users all over the world.

Recently, the Department launched #FreeAccessFridays through the Facebook platform, where a curated collection of the organization's best open access titles is promoted including farmer-oriented manuals on the farming of tilapia, shrimp, seaweed, catfish, and bighead carp.

"We made even more of our aquaculture manuals readily available during this pandemic to help fisheries schools, and to empower

our fish farmers with the science-based procedures detailed by our scientists and researchers in these books," remarked Dan Baliao, chief of SEAFDEC/AQD.

Baliao says that because face-to-face training sessions and farm visits were very limited, making the publications available over the internet was "the least that SEAFDEC/AQD could do."

The titles are just among over 1,800 publications authored by the organization's scientists and researchers that may now be freely downloaded through the SEAFDEC/AQD Institutional Repository (SAIR).

Knowledge haven during the pandemic

The need for openly accessible digital publications

was highlighted by the shift to online learning and alternative working arrangements brought about by the onset of the COVID-19 pandemic in 2020.

Searches performed on SAIR in 2020 jumped over 147 percent to 224,524 compared to 91,057 in 2019, while unique visitors jumped 903 percent to 773,777 from just 77,147, with students and members of the academe making up a large part of SAIR's user base.

Savings for readers

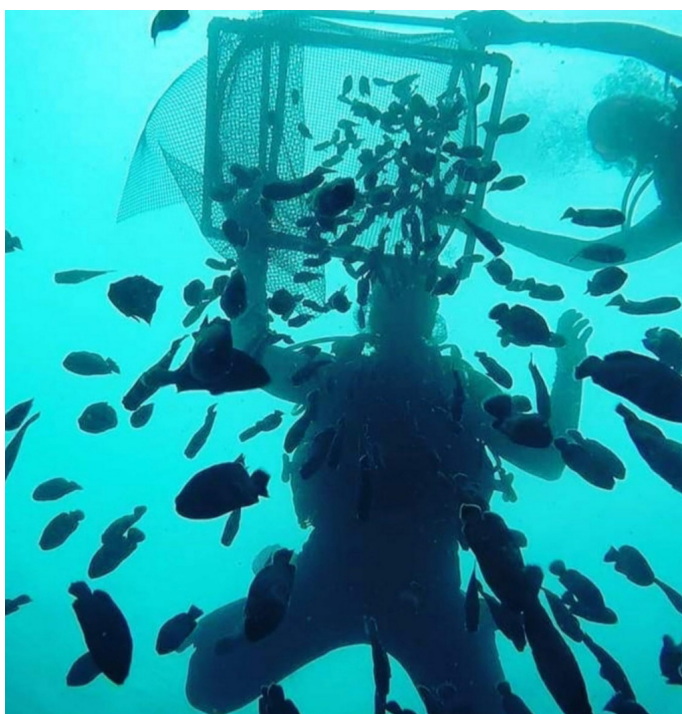
Some titles have been long out of print, including the much-requested "Handbook of Mangroves in the Philippines – Panay," authored by Dr. Jurgenne Primavera, a native tree advocate and scientist emerita of SEAFDEC/AQD.

"Among so many books I've written, this is probably my favorite – for the endless but happy days in the field, and sleepless nights my co-authors spent doing the metrics of countless leaves, flowers, fruits – and also the No. 1 bestseller. Except that it has long been out of print," Dr. Primavera shared on her Facebook.

She thanked SEAFDEC/AQD for making a digital copy available online which, she says, saves readers from the US\$100 cost currently being charged by foreign book resellers for original prints. [a](#)

- JR PAGADOR / RD DIANALA

Hope for the groupers



A diver releases dusky groupers in ocean waters as part of the ATEVI repopulation programs. PHOTO COURTESY OF CLAUDIA KERBER

IN BRAZIL, declining populations of grouper make it one of the country's endangered species. However, Claudia Kerber, a former SEAFDEC/AQD trainee, is at the forefront of its conservation and repopulation for more than a decade.

"The grouper is an endangered species according to IUCN [International Union for Conservation of Nature]. As we produced fingerlings, we thought that repopulation programs would be possible," Kerber shared in an interview.

As early as 2002, Kerber and her partner, Pedro Antônio dos Santos, launched Redemar Alevinos, a laboratory and hatchery, where they have been primarily producing Bijupirá, also known as cobia (*Rachycentron canadum*), and Garoupa, or dusky grouper (*Epinephelus marginatus*).

The laboratory first started out of concern for the local fishing communities in their area that heavily rely on artisanal fishing as a means of livelihood. Kerber stated that as fish catches have been declining, they thought that producing fish was the solution.

Kerber, who attended SEAFDEC/AQD's 37-day International Training Course on Marine Fish Hatchery in 2010, shared that they operated REDEMAR through a combination of European indoor and Asian outdoor production.

"Asian tradition in fish production is huge and the technology is more suitable to our reality," she said. Kerber further explained that since the production of fingerlings in Europe and the United States depend on technology and equipment that they could not afford in Brazil,

they decided to take a course on marine fish hatchery at SEAFDEC/AQD to gather knowledge on fish production without relying on too much equipment.

"Before visiting [SEAFDEC/AQD], we didn't evolve because we couldn't understand how to make the production without relying on so much technology. With [SEAFDEC/AQD], we learned creative solutions and developed our own protocols that are a mixture of European indoor and Asian outdoor production," she elaborated.

Redemar then continued to grow its operations and made a name for itself as the only hatchery rearing marine fish fingerlings in Brazil, supplying universities and other producers in the country.

"Developing production protocols for dusky grouper fingerlings is for sure one of Redemar's greatest achievements. It took us 10 years," Kerber explained.

Social work and ATEVI

In 2006, Kerber and her team then expanded their social work towards grouper conservation and established the Associação Ambientalista Terraviva (ATEVI), a Brazilian NGO dedicated to "ocean conservation and social development of traditional communities through the implementation of mariculture in small units and environmental education."

Under ATEVI, she executed several educational campaigns and repopulation programs for groupers.

From 2013 to 2015, ATEVI launched The Garoupa Project which aimed at raising community awareness of the

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aqd matters

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A member of ATEVI holds up a dusky grouper for a live demonstration during one of their face-to-face information campaigns. Dusky groupers (*Epinephelus marginatus*) are an endangered species under IUCN (A42d). PHOTO COURTESY OF CLAUDIA KERBER

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dangers brought about by the extinction of dusky grouper.

Kerber and her team also helped develop technology to produce larvae and consolidated larviculture research, obtaining significant advances in production protocols for grouper fingerlings.

The team also mapped habitats and assessed the degraded, preserved, and upwelling areas through scuba diving and placement of tracking chips. Juveniles were also released with telemetry monitoring to learn more about the feasibility of repopulation projects.

Environmental education through lectures, workshops, and hatchery visits was also launched by the organization in seven municipalities in Rio de Janeiro (Angra dos Reis, Itaguaí, Mangaratiba, Paraty, Cabo Frio, Arraial do Cabo and Búzios) and four in São Paulo (Ubatuba, Ilhabela, Caraguatatuba and São Sebastião).

Replenishing wild grouper in Brazil

ATEVI is also working on Projeto Garoupeta, an initiative aiming to replenish the population of

dusky grouper in the wild, a threatened species under Administrative Measure MMA 445/2014 in Brazil.

The project took its first steps through the genetic analysis of broodstock to choose the best couples. Fingerlings with the closest characteristics to the local population were selected and raised, suitable areas with burrows were located, and feeding was conducted through reconnaissance dives.

“We are still raising funds through public calls that involve environmental protection. Especially in the

Decade of the Oceans, there are many opportunities for coastal marine recovery. With these resources, we are now expanding the repopulation to other areas where the dusky grouper population is impacted, or even disappeared.” Kerber explained.

With the onset of the COVID-19 pandemic however, Kerber said that ATEVI had to undergo some changes to some of their projects. Information dissemination campaigns were conducted by participating in lives

and meetings as well as distribution of educational materials through social networks. Face-to-face visits of schools to their hatchery were also suspended.

ATEVI also has a seat at CONSEMA, the State Council for the Environment and the highest consultative, normative, appealing body in Sao Paulo. CONSEMA serves as a democratic forum to discuss environmental problems and acts as a catalyst for demands and proposing measures aimed at improving the State’s environmental management.

“Groupers are top-of-the-range species which means they are fundamental to keeping the ecosystem balanced. So, restoring the grouper population also means restoring the health of reef ecosystems,” Kerber stated. [a](#)

- JR PAGADOR

Learn more about ATEVI and Claudia Kerber’s social work through this website:



ATEVI.ORG.BR

Learn more about REDEMAR ALEVINOS through this link



REDEMARALEVINOS.COM.BR



Elementary students take a look at how dusky groupers are reared in Redemar Alevinos. As a partnership with ATEVI, the hatchery hosts face-to-face visits from schools as part of an environmental education campaign project on grouper conservation. PHOTO COURTESY OF CLAUDIA KERBER