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Better management practices for catfish aquaculture in the Mekong Delta, Vietnam

A grant of AUD$455,590 has been procured for the development of better management practices (BMPs) for tra catfish (*Pangasianodon hypopthalmus*) aquaculture in the Mekong Delta of Vietnam. The grant has been provided by AusAID's Collaboration for Agriculture and Rural Development Programme.

The project will be jointly implemented over a two year period commencing in 2008, by NACA in conjunction with Fisheries Victoria on the Australian side and the Research Institute for Aquaculture No. 2 and Faculty of Fisheries, Cantho University in Vietnam. This project will further strengthen the initiatives of NACA on the development of BMPs for other important cultured commodities, such as shrimp and marine finfish carried out with other collaborators.

Weighing the harvest, Mekong Delta, Vietnam.

Catfish farming in the Mekong Delta, the bulk of which is still undertaken by relatively small-scale producers, is one of the largest and most rapidly growing freshwater aquaculture industries in the world. The sector has already reached the forecast for 2010 of a production of 1 million tonnes with export value of 1 billion US$.

Current farming practices need to be improved on many fronts and issues of environmental integrity addressed to ensure that the industry continues to develop in a sustainable manner. Issues impacting the viability and development of catfish farming in the delta include poor husbandry practices, low quality seed, excessive dependence on trash fish as a feed resource, inadequate planning in site selection, food safety and market access, and environmental degradation. These issues can be addressed through the development and adoption of Better Management Practices (BMPs), implemented through collaborative groups of small-scale farmers in conjunction with those from large-scale farmers. The project aims to develop and facilitate adoption of BMPs for the catfish farming practices that will increase the efficacy and profitability of small-scale farmers while simultaneously reducing their risk profile and environmental impact, and ensure the wider sustainability of the sector as a whole. This could also provide a model for addressing sustainability in other aquaculture commodities.

Developing better management practices for marine finfish aquaculture

A workshop on the 'Development of Better Management Practices for Marine Finfish Aquaculture in the Asia-Pacific region' was held in Lampung, Indonesia, 7–10 November 2007. The workshop was held to begin the process of developing Better Management Practices (BMPs) for the marine finfish aquaculture sector, which is growing rapidly in Asia. The rapid expansion of marine finfish aquaculture, and concerns regarding its environmental sustainability, has led to the development of several accreditation / certification schemes, and the proposed development of others. NACA

and ACIAR are concerned to ensure the participation of small-scales farmers, who provide the bulk of production in Asia, in certification and market access schemes. The development of a BMPs-based approach is intended to allow small-scale farmers to adopt practices that will better support their participation in more formal accreditation / certification schemes in the future, and facilitate market access by small-scale farmers in the face of increasing consumer demands for environmental and social responsibility in aquaculture.

The four-day workshop was undertaken as part of the ACIAR-funded project 'Improved hatchery and grow-out technology for marine finfish aquaculture in the Asia-Pacific region' (FIS/2002/077). The workshop was attended by 60 participants from Australia, Cambodia, China, France, India, Indonesia, Myanmar, Norway, Philippines, Thailand and Vietnam, involving people from government, research, NGO and the private sector. There was a strong participation in the workshop by the private sector, with about half the participants coming from private industry, including representatives of farmer organizations and feed companies. Industry participants were supportive of the need to develop BMPs for marine finfish aquaculture as a way to enhance the sustainability of their industry. The workshop was also attended by representatives of environmental and other NGOs. The full report from the workshop will be available in early 2008.

The workshop was organized by NACA and the Directorate General of Aquaculture (DGA) of Indonesia in conjunction with the Australia Centre for International Agricultural Research (ACIAR).

Workshop on modeling carrying capacity for tropical finfish cage culture: Towards a consensus view

NACA and the Directorate General of Aquaculture (DGA) of Indonesia in conjunction with the Australia Centre for International Agricultural Research (ACIAR) organized the workshop on "Modeling carrying capacity for tropical finfish cage culture: Towards a consensus view" in Lampung, Indonesia from 5-6 November 2007. The objective of the workshop was to demonstrate and compare models developed for estimating carrying capacity of finfish cage culture in the Asia-Pacific region, and to develop a consensus view and recommendations to support implementation of better management practices in this important sector. Participants also considered issues with fish cage culture in inland waters in the Asia-Pacific and made recommendations with regard to use of cage culture as livelihood activity in inland lentic and lotic waters. The workshop brought stakeholder groups together to compare results, discuss issues and add value to the work that has already been done. The workshop adopted the following definition of carrying capacity:

Participants in the carrying capacity workshop.

"Carrying capacity for cage culture operations can be considered as the level of sustainable production that can be achieved in a given water body without overly perturbing environmental integrity, i.e. causing eutrophication, algal blooms, or inducing negative environmental impacts on sensitive ecosystems such as coral reefs".

The workshop participants recognized that models need to be designed to match particular environments and aquaculture problems, and these need to be at an appropriate scale (farmer-level, bay-level, provincial level). Models of carrying capacity need to be widely accessible, simple to use and affordable. It is important that models be adequately tested, ideally by the use of pilot projects, so that the results are realistic. Issues of site selection, zoning, legislative framework, farm management and socio-economics need to be considered. Dissemination activities need to incorporate all stakeholders, including farmers, decision makers and scientists.

Two modelling products are of particular relevance to the Asia Pacific region. TROPOMOD, developed under PHILMINAQ, has been developed to apply specifically to milkfish farming in the Philippines, but has application to other tropical species. CADS_TOOL (Cage Aquaculture Decision Support Tool) developed under an ACIAR project, currently includes 5 modules each representing a different modelling tool. The workshop recommended that CADS_TOOL be adopted as a prototype for the region, but recognised that it needed expansion and improvement, ideally incorporating TROPOMOD as an additional module.

The workshop was an activity under the ACIAR funded project on 'Planning tools for environmentally sustainable tropical finfish cage culture in Indonesia and northern Australia'. The workshop was attended by 25 participants from Australia, China, France, India, Indonesia, Norway, Philippines, Thailand and Vietnam. The report of the workshop will be available in early 2008.

First comprehensive genetic management plan for Asian fish species: Mahseer

The mahseer species, *Tor tambroides* and *T. douronensis*, are often referred to as empurau and semah, respectively in Sarawak, Malaysia. The two species are indigenous to the State with an aquaculture potential and of conservational value. Empurau and semah are well sought after due to high market value as well as being attractive sport fish. Many anthropogenic activities, including the recent developments in watersheds within the natural distribution of empurau and semah, as well as increased fishing pressure have led to depletion of their natural stocks. As such there is an urgent need to replenish such depleted stock as well as reducing pressure that affects the well being of natural populations of empurau and semah.

The Government of Sarawak, recognizing the importance of these two species, made an attempt to evaluate their aquaculture potential, including captive breeding using long-term pond-reared broodstock, commencing in the 1990s. However, limited success was achieved until the period 2002-2004 through an international collaboration, where researchers from Australia and Sarawak were able to breed both species using hormone induction techniques, popularly referred to as hypophysation, on long-term, pond-reared broodstock. Success in artificial propagation of empurau and semah would bring about significant developments in term of aquaculture and conservation. On the one hand, fish produced from aquaculture can be used to replenish the wild stocks – the practice often known as stock enhancement, and on the other hand, fishing for food fish will also be reduced due to the availability of cultured fish.

However, it is important to note that aquaculture and stock enhancement could be counter-productive if genetic aspects of broodstock management are not taken into account or broodstock are not properly managed. Detrimental genetic impacts of poorly or inappropriately managed fish breeding programs for both aquaculture and stock enhancement have well documented over the last two decades (Waples, 1991). When fish are removed from the natural environment and placed in a cultured environment and domesticated, random genetic drift and domestication effects (new and greatly different selective forces act upon fish in the domestic environment compared to the natural environment) alter the gene frequencies and reduce genetic variation. Domestication reduces genetic variability in fish through both selective processes and random genetic drift. Such fish once released in to the natural waters could have potential impacts on altering or diluting natural gene pools, and such events have been documented for many species. Hybridization between closely related species can have a detrimental affect on natural gene pools. Interspecific hybridization among other mahseer elsewhere has been reported. Because of the high level of morphological similarity between empurau and semah there is risk that inadvertent mixing of the two species, especially during breeding, may lead to hybridization. Therefore hybridization is an important threat to the genetic integrity of both species. In order to avoid the above mentioned potential problems, it is crucial that a genetic management plan be developed with the aim to warrant the long-term maintenance of genetic diversity of cultured stocks, as well as to minimize potential adverse effects on the genetic integrity of the wild populations through proper stock enhancement practices.

Surveys on current status of genetic variability of empurau and semah are reported herein, and the results from which are used as baseline data for development of a genetic management plan. Further, this document represents the first example in Asia of a comprehensive genetic management plan that was developed at the inception of industry development and commercialization, and that takes into account both commercial aquaculture of fish species as well as the conservation and management of wild populations.

The Guidelines for genetic management and conservation of mahseer can be downloaded from the link below. This document presents the current status on genetic diversity of empurau and semah in Sarawak, Malaysia, including taxonomic status; and a management guideline based on genetic data:

http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=63&lid=893

NACA and World Fisheries Trust sign agreement on collaboration

NACA signed a letter of agreement with the World Fisheries Trust (WFT), a NGO based in Victoria Island, Vancouver, Canada, underlining the desire to collaborate in activities that facilitate sustainable, socially and environmentally responsible aquatic resource conservation, development and management, particularly those that benefit poor and disadvantaged communities and contribute to poverty alleviation. WFT has been working on issues on aquatic resources management in the Americas and now is expected to extend into Asia and Africa.

NACA has in the past year collaborated with the WFT on activities in relation to biodiversity of aquatic resources and the agreement will now further collaboration into other areas of mutual interest. It is expected that this collaboration will also facilitate south-south dialogue on issues pertaining to aquatic resources development and management, when experiences from one region could be effectively utilized elsewhere. The collaboration initiated by the WFT will include providing financial support to NACA to document “success stories” in aquaculture pertaining to small scale farming communities, which is a also a priority and the mandate of NACA.

Fish Health Master Class

A two week master class in fish pathology, supported by the Crawford fund of the Australian Government, was formally opened by Prof Sena DeSilva, DG of NACA in Bangkok on 12th November 2007. The master class focused on training candidates in reading and interpreting slides to understand normal histology, pathological process, tissue pathology, disease case studies and artifacts. Eighteen participants from 14 countries in the region attended. The course was taught by some of the well known and respected fish pathologists from the region with resource experts including Dr Brian Jones, Dr Barbara Nowak and Ms Susan Kueh from Australia; Dr Supranee Chinabut from DOF, Thailand; Prof Miyazaki from Japan; and Dr CV Mohan from NACA. The master class was a collaborative activity between Murdoch University in Australia, AAHRI in Thailand and NACA.

Second Workshop on Application of Molecular Genetic Techniques in Inland Fisheries and Aquaculture Management

NACA and its lead centre in India, the Central Institute of Freshwater Aquaculture (CIFA), Bhubaneshwar, in conjunction with the Food and Agriculture Organisation (FAO) organised the second Training Workshop on Application of Molecular Genetic Techniques in Inland Fisheries and Aquaculture Management. The workshop was held at CIFA, India from 27 November to 05 December, 2007.

The workshop was organised particularly for scientists from south Asian member countries of NACA (Bangladesh, India, Nepal, Pakistan and Sri Lanka). The ten-day workshop covered the theory of population genetics and fish selective breeding, as well as hands-on training in common genotyping techniques, and data analysis and interpretation. Specifically, the main topics included:

- An overview of the application of molecular genetics in inland fisheries and aquaculture, and conservation of freshwater fish species.
- Principles and application of commonly used techniques such as allozyme electrophoresis, cloning, DNA sequencing, northern and southern blotting, and real time PCR.
- Hands-on training on the above techniques.
- Data analysis and interpretation.

Resource persons of the training workshop were mainly drawn from institutions in India, and included Dr. W. S. Lakra, Dr. P. K. Mukhopadhyay, Dr. K. D. Mahapatra, Dr. H. K. Barman, Dr. P. K. Meher, Dr. P. Das, Dr. S. Nandi, Dr. A. Barat, Dr. K. K. Lal of CIFA, and Dr. Basavaraju of Central Agricultural University. Dr. Thuy Nguyen, Coordinator of the Genetics and Biodiversity Program of NACA in conjunction with Dr. N. Sarangi, Director, CIFA were responsible for the overall organization. For more information about the workshop or expressions of interest in possible future workshops, contact thuy.nguyen@enaca.org.

Aquaculture without Frontiers: Temporary website relocation

Due to some technical problems the Aquaculture without Frontiers website has been temporarily relocated to the World Aquaculture Society's servers. You can access the Aquaculture without Frontiers website at http://awf.was.org/, it will be republished under its own domain name in due course.

Two new species of spiny eels described from Myanmar

The two new species of spiny eels, *Mastacembelus tinwini* and *M. pantherinus* are recently described from Myanmar waters. The former is from southerm Myanmar (in the Salween and possibly the Sittang river drainages), and the latter is from the Lake Indawgyi in northern Myanmar. Both species belong to the *M. amartus* complex, members of which have a very wide distribution, from Afghanistan to southern China and the Sunda islands, and have been previously thought to belong to a single species.

Mastacembelus tinwini is named for U Tin Win, for providing the author with study material and assisting him in the field, while *M. pantherinus* is named for its spotted pattern (from panther, the Greek name for the leopard).

According to the author, *M. tinwini* can be distinguished from other members of the genus in having "...a unique colour pattern consisting of five regular and parallel, black, longitudinal bands along the body, frequently expressed as a series of interrupted lines or broken up into individual blotches, and a white margin to the soft dorsal, anal, and caudal fins..." while *M. pantherinus* can be distinguished by "...a unique colour pattern that consists of numerous individual spots or irregular marks, sometimes forming short lines and a whitish belly devoid of any marks...".

The author states that given the high amount of variation seen in the vertebral number of the different populations of *M. armatus* throughout South and Southeast Asia, "...it can be expected that a thorough revision of this complex will result in additional species-level taxa to be resurrected from synonymy and new species to be described..."

For more information, see the paper: Britz, R (2007). Two new species of *Mastacembelus* from Myanmar (Teleostei: Synbranchiformes: Mastacembleidae). Ichthyological Exploration of Freshwaters 18, pp. 257–268.

Importance of species identification in conservation

Over the last two decades, fisheries biologist have make attempts to preserve the endangered Greenback cutthroat trout, *Oncorhynchus clarkii stomias* by rearing thousands of fish and stocking them in Colorado rivers, lakes and streams. However, it is so unfortunate to learn that a recent study using mitochondrial and nuclear genetic makers, conducted by scientists from the University of Colorado at Boulder reported that in most cases, the fish used to stock was actually the closely related Colorado River cutthroat trout, *Oncorhynchus clarkii pleuriticus*. The problem is believed to have been caused by misidentifications dating back to the stocking of trout in Colorado waters in the late 1800s and early 1900s, although it is acknowledged that management decisions by federal and state fisheries biologists over the past decades were based on the best reports available by experts at the time. Fortunately, the data is becoming more accurate over time as genetic techniques improve and the peer review process is increasingly incorporated into scientific management strategies. However, this study highlights the need for great care in undertaking the translocation of aquatic animals and for appropriate risk assessments.

For more information see the paper: Metcalf JL, Pritchard VL, Silvestri SM, Jenkins JB, Wood JS, Cowley DE, Evans RP, Shiozawa DK, Martin AP (2007) Across the great divide: genetic forensics reveals misidentification of endangered cutthroat trout populations. Molecular Ecology 2007 Aug 28.

Koh Yao Noi mangrove replanting in celebration of 80th birthday of His Majesty the King of Thailand

A special mangrove replanting programme was opened at Koh Yao Noi (KYN), an island community in Thailand's Phang Nga Bay, in honor of His Majesty the King's 80th birthday.

At the opening ceremony in Koh Yao Noi School, Khun Hassanai Kongkeo, as the representative of Chiba Environmental Education team and NACA, handed over US$1,000 cash contributed from Chiba to KYN School Director. This fund will be used for seedling production and to purchase a water pump.

The school forest replanting programme covers both mangrove and inland areas. 1,000 seedlings of *Rhizophora* and *Avicenia* mangrove and 350 seedlings of timber plants were prepared for reforestation in tidal and inland areas respectively. The original mangroves in this tidal area were heavily damaged by the tsunami of December 2004. The ceremony was attended by 27 KYN school teachers/lecturers, 409 KYN school students, 50 students from Phuket Community College, 10 District Officers, 10 representatives from KYN Communities and a NACA/Chiba representative, totaling 507 people engaged in this activity. The students have also been assigned to nurse these planted seedlings until they become strong. This reforestation programme is considered to be the most successful in the district for this special occasion.

Above: Khun Hassanai offers the donation on behalf of the Chiba Environmental Education Team and NACA to the Director of the Koh Yao Noi school. Below: Students enjoy planting mangroves!

Responsible movement of live food finfish within ASEAN: Implementation workshop

The AADCP-RPS 370-018 project "Operationalise Guidelines on Responsible Movement of Live Food Finfish within ASEAN" has been underway since January 2006. This Implementation workshop, the third in the series, was held in KU Home, Kasetsart University, Bangkok, Thailand, from Monday 8 to Friday 12 October 2007.

The project is coordinated by ASEC, AusVet and NACA and has the active participation of delegates from 10 ASEAN countries. The project has developed "Standard operating procedures (SOPs) for health certification and quarantine measures for the responsible movement of live food finfish within ASEAN". The draft SOPs have been presented at the recent ASWGFi meeting held in Singapore (June 2007) and were also considered by the Special Senior Officials' Meeting (SOM) - 28th ASEAN Ministers for Agriculture, Fisheries and Forestry (AMAF). As per the suggestion of SOM-AMAF, the title of the document has been revised to "Guidelines on development of Standard operating procedures for health certification and quarantine measures for the responsible movement of live food finfish within ASEAN".

The workshop identified specific implementation gaps for the SOPs in all ASEAN member countries and developed a framework within ASEAN for a sustainable network for communication on implementation of the LFF-SOPs and for their future adaptation for trade in other aquatic animals. It also addressed development of a work program for the implementation of the LFF-SOPs and an auditing and monitoring program.

The extension will also develop a framework for technical support within ASEAN under which more developed countries will act as partners for Cambodia, Lao PDR and Myanmar with assistance from NACA and the proposed ASEAN Network of Aquatic Animal Health Centres (ANAAHC).

Consultation on aquaculture certification guidelines

Aquaculture certification meeting was held in Avenue Hotel, Kochi India on 23rd November 2007 in partnership with FAO and hosted by Marine Products Exports Development Authority (MPEDA). This meeting was the third in a series of consultations to bring stakeholders together to prepare international guidelines for aquaculture certification. The meeting was attended by a group of experts who were participating in the 8th Asian Fisheries Forum and involved 20 people representing industry, government and NGOs.

The revised draft Guidelines for Aquaculture Certification, incorporating the comments and discussion points from earlier workshops held in Bangkok (March 2007) and Fortaleza (July 2007), were distributed to the participants and discussed in detail.

Taking into account of the outcomes of this certification meeting during the 8th Asian Fisheries Forum, and the comments, suggestions and recommendations received by many, the Secretariat has revised the draft Guidelines, and the latest version (17/12/07) is available for download from www.enaca.org/certification.

FAO and NACA welcome comments on this draft guideline document, and more generally the sharing of experiences, reports and debate on aquaculture certification. Review comments on this draft document and other information should be sent to:

certification@enaca.org.

Strengthening regional mechanisms to maximize benefits to small-holder shrimp farmer groups adopting better management practices

The first meeting of this ACIAR-funded project, schedule to run until November 2009, was held in MPEDA, Cochin, India on 21 November. The meeting was attended by project partners from India (MPEDA, CIBA, NaCSA), Vietnam (NAFIQAVED), Indonesia, Malaysia, Australia and NACA. Representatives from other BMP projects in the region (IFC, WWF, FAO), and Seafood Alliance also participated. A brief overview of all ongoing BMP projects in the region, including for shrimp and other aquaculture commodities such as catfish, was presented and discussed. The project partners recognized a need to consolidate information on aquaculture BMP activities and agreed to develop a BMP website as a platform to stay in touch and share information on activities underway in different projects and countries in the region. The website will be launched in January 2008, along with a revised shrimp e-newsletter, which will be produced quarterly. Information on linking ongoing research activities to development and implementation of BMP programmes in the region was presented. The need to actively integrate new research findings into the BMP programs and revise/modify BMPs was recognized as very important to keeping the BMPs scientifically sound. Ways to improve market access to BMP compliant small scale farmers was recognized as a key issue; including the need to raise the awareness of consumers in importing countries of both the positive and negative impacts of their purchasing decisions on the small scale farmers in producing countries. The possibilities of developing pilot studies in market access and cluster certification methodology were also discussed and agreed.