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Expert Workshop on Guidelines for Aquaculture Certification

An expert workshop convened in Bangkok from 27-30 March to start a process for the development of guidelines on aquaculture certification. The guidelines were requested by member governments at the COFI Sub-Committee on Aquaculture (SCA), at its third session in New Delhi, September 2006.

The need for the guidelines stems from the fact that aquaculture is currently the fastest growing agricultural sector in the world, currently contributing around 45% of the global supply of fisheries products. Driven by concerns over food safety and the environmental and social sustainability of rapidly expanding aquaculture production, there have been many attempts to introduce certification schemes for various aspects of aquaculture. More than 30 schemes in place today.

While certification schemes are generally intended to improve some aspect of the performance of aquaculture, concerns have been expressed about their potential negative impacts. Many certification schemes have resulted in higher costs for producers without delivering significant price benefits, most severely affecting small-scale farmers, who are already among the most disadvantaged. The proliferation of a wide range of certification schemes and accreditation bodies has the potential to create confusion amongst producers and consumers alike. There are also serious concerns about the potential for certification schemes to be misused as a new form of trade barrier.

SCA stated that there is a need for more globally accepted norms for aquaculture production that can serve as a basis for improved harmonization of certification, thereby facilitating mutual recognition and equivalence of aquaculture certification schemes.

The objective of the workshop, which was requested by SCA, was not to develop an aquaculture certification scheme per se. Rather it was to begin scoping out general guidelines around which aquaculture certification schemes can be built, whether they be for systems, practices or products. The workshop was a first step in bringing together stakeholders to examine the key issues concerning aquaculture certification, to build consensus on the scope of certification guidelines and to lay the groundwork for their development. The workshop also discussed certification issues that are specific to the Asian region, the outcomes of which will complement a regional analysis for Latin America that will be conducted in a workshop in Brazil, in July 2007.

The workshop, hosted by the Department of Fisheries of Thailand, and co-organized by FAO and NACA brought together 72 participants, including experts from certification bodies, aquaculture farmer associations, governments, major buyers and other stakeholders from 20 countries across the worlds largest aquaculture producing and importing regions.

This wide range of stakeholders from producing and importing countries addressed many of the key issues around the growing interest in certifica-

tion of aquaculture products. The status and trends in aquaculture, experiences in certification of aquaculture products, certification standards, harmonization and equivalence among certification schemes, stakeholder involvement and ownership, costs and benefits, and the participation of small-scale farmers were among the wide ranging issues discussed during the workshop.

The outcomes from the Expert Workshop included consensus on many key points to be addressed in the preparation of global guidelines on aquaculture certification to be considered for international agreement; such as the need for core standards, procedures for certification, an approach to harmonization among different schemes, stakeholder participation, and others. The aquaculture certification guidelines were also recommended to give special attention to the needs of small-scale farmers in developing countries.

The participants agreed to continue to cooperate to share information and experiences to develop the aquaculture certification guidelines. The next formal workshops to continue the work of guideline development will be held in Brazil and India in July and November 2007. The draft guidelines are expected to be ready for international consensus by the end of 2008. Additional consultations and feedback sessions are also expected during the next year.

The Expert Workshop report will be available soon. Existing workshop documents and presentations, including an MP3 recording of the opening address and comments on certification by NACA's Director General, are available for download from:

http://www.enaca.org/modules/tinyd11/index.php?id=16.

Responsible movement of live food finfish within ASEAN: Cebu Workshop finalizes the standard operating procedures

The Second Policy Workshop under the AADCP-RPS 370-018 project "Operationalise Guidelines on Responsible Movement of Live Food Finfish within ASEAN" was held at the Costabella Tropical Beach Hotel, Cebu City, Philippines from 12-13 February 2007. AusVet, NACA, and ASEC organized the workshop in collaboration with BFAR, Philippines. The objective of the workshop was to develop the final draft of the Standard Operating Procedures (SOPs) for Health Certification and Quarantine Measures for the Responsible Movement of Live Food Finfish within ASEAN. The workshop was attended by 21 government nominated representatives from all the 10 ASEAN countries and 5 Resource experts from partner organizations (ASEC, AusVet, FAO and NACA).

International trade in live aquatic animals and their products is growing at a phenomenal rate. This is in fact very essential to support the development of sustainable and profitable aquaculture. However, with trade comes the risk of introduction and spread of pathogens. Various global and regional instruments and standards provide guidance to trading partners to minimize the risk of introduction and spread of dangerous aquatic animal pathogens. Developing operational strategies to effectively implement the guidelines is very important. In this direction, ASEAN has taken a small step forward. In order to enhance the bio-security of food finfish industries, ASEAN Member Countries have come together under an AusAid supported project to develop standard operating procedures (SOPs) for health certification and quarantine measures for responsible movement of live food finfish (LFF) within ASEAN. These SOPs have been developed under the AADCP:RPS project 370-018, Operationalise Guidelines on Responsible Movement of Live Food Finfish. This project is coordinated by ASEC, NACA and AusVet for Cardno ACIL who manage the AADCP:RPS program for ASEC and AusAID.

A goal of the Vientiane Action Program (VAP) is to develop, harmonise and adopt quality standards and regulations for food, agriculture and forestry products. The workplan for this goal further specifies the need to collect and compile national fisheries SPS measures and regulations; harmonisation of national sanitary measures into an ASEAN sanitary measure and publication of the harmonised ASEAN sanitary fisheries measures. The ASEAN Sectoral Working Group on Fisheries (ASWGFi) and the Senior

Participants in the workshop.

Official Meeting for ASEAN Ministers on Agriculture and Forestry (SOM-AMAF) are responsible for this initiative.

A Regional Seminar on Harmonisation of Quarantine Procedures for Live Fish among ASEAN Member Countries in February 2003 in Penang, Malaysia resulted in draft guidelines for the international movement of live fish. The draft guidelines was presented and agreed at the 11th Meeting of ASWGFi in May 2003 in Vientiane, Lao PDR. The Meeting agreed that the scope and title of the guidelines be changed to General Guidelines on Responsible Movement of Live Food Fin Fish and that comprehensive procedures for implementation of the Guidelines at the operational level should be developed. The SOPs have built on the recommendations of the Guidelines.

They also are consistent with the Asia regional technical guidelines on health management for the responsible movement of live aquatic animals and the Beijing consensus and implementation strategy, 2000 (TG) and the Manual of procedures for the implementation of the TG (2001). The OIE Aquatic Animal Health Code (Ninth Edition, 2006) and Manual of Diagnostic Tests for Aquatic Animals (Fifth Edition, 2006) have been used in the development of the SOPs. The SOPs complement national responsibilities under existing international standards for management of food safety and residues (for instance, Codex Alimentarius) and other environmental considerations (for instance, CITES).

The first step in developing the SOPs was to develop an inventory of countries' current practices in early 2006 and to hold a First Policy Workshop in Bangkok, Thailand in April 2006 at which all 10 ASEAN countries were represented. The workshop developed a draft Table of Contents for the SOPs and allocated tasks and selected the leaders and members of four working groups. ASEC and NACA briefed ASWGFi on progress at its meeting in Manila, the Philippines in June 2006. The leaders communicated with their group members to prepare for a leaders' workshop in Johor Bahru in September 2006 at which the first draft of the SOPs were developed. This draft was circulated to members of the work groups for consideration and comment and members of ASWGFi for information before a second policy workshop which was held in Cebu City in Philippines in February 2007 and agreed on the Final Draft SOPs. It is expected that the ASEC will place it before the ASWGFi for formal review and endorsement.

These SOPs are a set of documents for health certification and quarantine measures to be used by CA for the responsible movement of LFF by land, sea and air among ASEAN Member Countries. The SOPs recognise the existing variation in capacity among ASEAN Member Countries but the SOPs have been designed so that they can be adopted and implemented within the specific policy and legal framework of each country. These SOPs have been written to help manage the movement of LFF for immediate consumption as human food.

Information and capacity requirements for maintaining aquatic animal biosecurity identified

FAO and NACA in collaboration with BFAR, Philippines organized a three day workshop on Information Requirements for Maintaining Aquatic Animal Biosecurity from 15-17 February 2007, in Park Lane Hotel, Cebu City, Philippines. The objective of the workshop was to increase awareness and build capacity on general principles of biosecurity and to deliberate on key information required for maintaining aquatic animal biosecurity focusing on aspects of risk analysis; diagnostics, health certification and quarantine; and epidemiological surveillance and reporting. The workshop was attended by fourteen delegates from seven ASEAN countries, four delegates from SAARC, one from China and twelve delegates from local host institution BFAR. Resource persons from FAO, AusVet, NACA and SEAFDEC participated in the workshop.

In brief, the workshop involved presentation of resource papers (a) General principles of Biosecurity (b) General principles of diagnostics, health certification and quarantine (c) general principles of risk analysis and (4) Principles of epidemiological surveillance and reporting by resource experts. Following resource paper presentations and general discussions, the participants worked in three working groups on the following themes:

- Risk analysis.
- Diagnosis, health certification and quarantine.
- Surveillance and reporting.

Guidelines for the working group were provided and resource experts facilitated the working group discussions and assisted the groups to come up with a list of key information and capacity building requirements for practical implementation of the three identified themes. The working group findings were presented at the plenary session, reviewed, and discussed by participants and resource persons.

Participating countries were pleased with the outcomes and were of the opinion that the information and capacity building requirements identified in the workshop would enable them to initiate specific actions to implement programs in some of the identified thematic areas. A final workshop report is being prepared by FAO and NACA and will include recommendations for implementation of workshop findings.

China-ASEAN efforts to minimize risk of spread of aquatic pathogens

The General Administration of Quality Supervision, Inspection and Quarantine of the P.R. China (AQSIQ) organized the "China-ASEAN Symposium on import and export aquatic animal safety" from 1-2 March 2007 at Grand Hotel, Kylin Villa, Shenzen. The Shenzen Entry-Exit Inspection and Quarantine Bureau of the PR China (SZCIQ) co-sponsored the event. The objective of the symposium was to strengthen China-ASEAN cooperation in aquatic animal inspection and quarantine, and facilitate aquatic animal trade between China-ASEAN. The symposium was attended by government nominated representatives from nine ASEAN countries, representatives from Macao; Hong Kong; representatives from key provinces in China (Yunnan CIQ; Hainan CIQ; Guangxi CIQ; Hubei CIQ; Zhejiang CIQ; Jiangsu CIQ; Beijing CIQ; Shanghai CIQ; Xiamen CIQ; Fujian CIQ; Liaoning CIQ; Jinan CIQ; Shenzen CIQ; Zhuhai CIQ; Tianjin CIQ; Guangdong CIQ), and representatives from key national institutions (Department of Animal and Plant Supervision and Quarantine,-AQSIQ; Department of International Cooperation-AQSIQ; The National Fishery Technical Extension Center-MOA; Division of Aquaculture, Bureau of Fisheries-MOA; Zhejiang Freshwater Aquaculture Institute).

The Symposium was formally opened by Dr You Zhongming, Director from the Department of Animal and Plant Quarantine Supervision, AQSIQ. In his opening remarks he highlighted the increasing trade in live aquatic animals and their products between China and ASEAN and stressed the need for better health management to minimize the risk of spread of trans-boundary pathogens. The need for developing and adopting harmonized approaches in inspection, certification and quarantine, amongst trading partners was recognized as important to promote trade. Welcome speech was given by Mr Qu Haifeng, Deputy Director General from Shenzen CIQ.

Dr You Zhongming, Director Biosecurity Chaired the technical sessions. The key note presentation titled "Trade in aquatic animals: tools to minimize aquatic animal health risks" was delivered by CV Mohan of NACA. The presentation dealt in detail various guidance (international agreements and standards; regional agreements, technical guidelines and SOPs; national strategies; farm level strategies) and implementation tools (diagnostics; risk analysis; health certification; quarantine; surveillance and reporting; contingency planning; farm level disease control strategies) available to minimize the aquatic animal health risks, which are an inherent part of aquaculture and trade.

Three important presentations from China (a) Control of aquatic animal diseases in China by Prof Jiang Yulin from the Key lab of Aquatic animal diseases, Shenzen CIQ, (b) Aquatic animal epidemic prevention in China by Dr Chen Jiayong, Bureau of Fisheries, MOA and (c) Introduction on inspection and quarantine of import and export of aquatic animal in China by Dr You Zhongming, AQSIQ, provided very useful information to workshop participants. The General Administration of Quality Supervision, Inspection and Quarantine of the P.R. China (AQSIQ) is a ministerial administrative organ directly under the state Council of the PR China in charge of national quality, entry-exit commodity inspection, entry-exit health quarantine, entry-exit animal and plant quarantine, import-export food safety, certification and accreditation, standardization as well as administrative law enforcement. AQSIQ has set up 35 entry-exit inspection and quarantine bureaus (CIQ) in China's 31 provinces, near 300 branches, and more than 200 local offices across the country with employees over 30,000 at sea ports, land ports and airports.

Representatives from six ASEAN countries (Singapore, Thailand, Vietnam, Philippines, Indonesia, Malaysia) provided overviews of Quarantine and disease control systems for import and export of aquatic animals and their products in their respective countries. The symposium provided an excellent opportunity for delegates from China and ASEAN to exchange information, understand each others inspection and quarantine system, discuss issues that affect trade and identify areas that need future collaboration and cooperation.

As a symposium outcome, the delegates produced a resolution calling for further strengthening the cooperation between China and ASEAN and identified some key areas. The workshop agreed that the resolution would be submitted to MOA, PR China and ASEAN Secretariat for initiating some follow up actions.

INDAQUA 2007 in Chennai, India

NACA was well represented at the INDAQUA 2007 meeting held in Chennai, India from 11-13 January. More than 600 participants attended, comprising planners, developers, private sector representatives and most of all farmers. The primary focus of the meeting was on shrimp culture. In particular, the meeting showcased the improvements that have been brought about through the adoption of Better Management Practices (BMPs), especially to small-scale farmers, with the Marine Products Export Development Authority (MPEDA) and NACA jointly organizing a special session to present the latest results from the MPEDA village demonstration programme, information on the newly established NACSA (National Centre for Sustainable Aquaculture), and experiences in BMP implementation from Indonesia and Thailand.

In addition to shrimp farming, Indaqua 2007 also dealt with common issues such as species selection, risk assessment related to species introduction and market development. The increasing importance of organic aquaculture was exemplified by MPEDA entering an agreement with a Swiss food importer.

The presentations from the session are available in PDF format from the publication section of the NACA website:

http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=71&lid=788.

National Centre for Sustainable Aquaculture inaugurated

The National Centre for Sustainable Aquaculture (NaCSA), the first of its kind in India, was inaugurated in Kakinada on the 3rd March 2007 with an impressive line up of senior Indian government officials. The Union Minister of State for Commerce Jairam Ramesh inaugurated the centre, saying it would pave the way for empowerment of farmers by extending necessary extension services and keeping them abreast with latest advancements in the field. The Union Minister of State for Defence Pallamraju, who presided over the programme, stressed the need for adopting scientific farming techniques so as to achieve better production and earn good profits.

The new centre, an outcome of the recent MPEDA/NACA cooperative project on shrimp disease control and promotion of better management practices, is registered as a Society under the Society Registration Act of Andhra Pradesh. NaCSA's Headquarters are at Kakinada, with Regional Units planned in various coastal States.

The long term objective of NaCSA as stated in the newly released NaCSA brochure for sustainable aquaculture is "to enable aquaculture farmers to adopt sustainable and environmentally friendly farming practices to produce quality and safe aquatic products such as shrimps, scampi and fish for export and domestic markets". NaCSA is intended to facilitate links between aquaculture stakeholders and strengthen aquaculture farmers to organize into self-help groups, or farmer societies. The approach, a pioneering one in the region, is intended to strengthen farmers problem solving, planning and management abilities and the capacity of farmers to adopt and develop new and appropriate technologies/innovations. NaCSA's main objectives are:

i. Promoting better management practices to improve aquaculture productivity and profits.
ii. Capacity-building and empowerment of primary producers and improving services.
iii. Facilitating improved service provision.
iv. Connecting farmers to markets to receive a better price for quality product.
v. Technology transfer and diversification to other commercially important species.
vi. Supporting improved food security and sustainable livelihoods in aquaculture communities.

The MPEDA/NACA project team outside the new Centre in Kakinada.

The inauguration also included a distribution of Registration certificates to six MPEDA registered societies and release of the NaCSA brochure for Sustainable Aquaculture.

The MPEDA Chairman G. Mohan Kumar, Collector M. Subrahmanyam, Commissioner of Fisheries N. Narasimha Rao, Dr Michael Phillips of NACA Deputy Director-General, ICAR, S. Ayyappan, former ADG, World Fish Centre, M. Vijaya Guptha, MLAs - M Gopalakrishna and A. Bulleabbai Reddy also participated in the ceremony. Also present were a number of pioneering farmer societies, formed under the MPEDA/NACA project, members of the Andhra Pradesh Shrimp Farmers Association, Seafood Exporters Association of India and All India Shrimp Hatchery Association representative.

NACA Better Management Practices program expands in Indonesia

In cooperation with WWF, a new partnership was established on 17 March with aquaculture farmers in Mesjid Utue village, Pidie district of Aceh, Indonesia. The partnership will assist 70 villagers to implement a set of "better management practices" developed for the shrimp and milkfish farming systems in this tsunami affected village of Aceh. NACA and WWF, supported by a grant from the David and Lucile Packard Foundation, will provide technical assistance to the villagers to adopt a set of better management practices designed to enhance farm sustainability, reduce shrimp disease risk and improve shrimp quality and profits. Some support for provision of key quality pond inputs is also provided. The BMPs were developed through a participatory process involving village farmers, NACA and WWF and their implementation will be supported by two locally recruited and trained Acehnese aquaculture and community mobilization specialists, linked to the small but growing NACA network of BMP specialists and farmers across Asia.

Market studies supported through the David and Lucile Packard Foundation grant, showed considerable buyer interest in the high quality "udang windu" or Penaeus monodon, of Aceh and further efforts will be made during 2007 to "connect" farmers with markets for high quality Acehnese shrimp. Whilst the extended and fragmented market chains, and lack of many essential services, are significant challenges, successful "connection" could bring substantial benefits to Acehnese aquafarmers, providing both incentives for better management of aquaculture and improved farmer incomes from sale of quality product to premium markets.

NACA is contracted by the Asian Development Bank to support implementation of the "Earthquake and Tsunami Emergency Assistance Project", for rehabilitation and reconstruction of aquaculture and fisheries sector in Aceh and Nias. NACA also works with a number of national and international partners, including ACIAR, ADB, BRR, FAO, GTZ, IFC, MMAF and WWF, to support responsible rehabilitation and better management of aquaculture in Aceh and Nias.

Manual on Application of Molecular Tools in Aquaculture and Inland Fisheries Management

NACA is pleased to announce the release of a new manual on the application of molecular tools in aquaculture and inland fisheries management. The aim of the manual is to provide a comprehensive, practical tool for the generation and analysis of genetic data for subsequent application in aquatic resources management, in relation to genetic stock identification in inland fisheries and aquaculture. The material provides a general background on genetics in relation to aquaculture and fisheries resource management, the techniques and relevant methods of data analysis that are commonly used to address questions relating to genetic resource characterisation and population genetic analyses. The manual is available for free download from the links below.

The manual includes two 'standalone' parts: Part 1 - Conceptual Basis of Population Genetic Approaches provides a basic foundation on genetics in general and concepts of population genetics. Issues on the choice of molecular markers and project design are also discussed. Part 2 - Laboratory Protocols, Data Management and Analysis provides step-by-step protocols of the most commonly used molecular genetic techniques utilised in population genetics and systematic studies. In addition, a brief discussion and explanation of how these data are managed is also included.

This manual is expected to enable NACA member country personnel to be trained to undertake molecular genetic studies in their own institutions, and as such is aimed at middle and higher level technical grades. The manual can also provide useful teaching material for specialised advanced level university courses in the region and postgraduate students. The manual has gone through two development/improvement stages. The initial material was tested at a regional workshop and at the second stage feedback from participants was used to imprve the contents.

The manual was co-written by NACA's Dr Thuy Nguyen; Dr David Hurwood and Associate Prof. Peter Mather from the Queensland University of Technology, Australia; Prof. Uthairat Na-Nakorn from Kasetsart University, Thailand; Dr Wongpathom Kamonrat, Department of Fisheries, Thailand and Dr Devin Bartley, FAO. Financial support for publication of the manual was provided by FAO and the Mekong River Commission.

Part 1 available from:

- http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=63&lid=799.

Part 2 available from:

- http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=63&lid=800.

For more information about the manual please contact thuy.nguyen@enaca.org.

Please see the NACA website for these and many more great aquaculture publications, **www.enaca.org**.

Research Needs to Sustain Asia-Pacific Aquaculture to 2025 and Beyond

Arrangements have been finalized by NACA to hold a workshop on the "Research Needs to Sustain Asia-Pacific Aquaculture to Year 2025 and Beyond", at Rayong, Thailand, 4-7 June 2007, with funding support from the International Development Research center, Canada (IDRC). The workshop is essentially a brainstorming session that will bring together 25 to 30 leading aquaculturists from the region. Some of the issues that will be addressed are:

- Background material on predicted population and relevant demographic changes and consumer demand for aquatic foods.
- Investment in fishery/aquaculture research; potential changes in trade; impacts on these on socio-economic aspects and livelihoods and required policy changes.
- Effect of climate change including monsoonal rain patterns on aquaculture, breeding and reproduction.
- Aquaculture resource demands including water, space, and biological resources such as fish meal/ fish oil.
- Events such as "bird flu'/new diseases and other potential non-fish pathogens on aquaculture.
- Poverty and employment changes in relation to aquaculture; rural, urban, large scale.
- Role of GMOs on aquaculture usage and ethical issues in the region.
- Application of gene technology in aquaculture.
- Aquaculture impacts on biodiversity; alien species; what are the strategies Changes in polyculture technology?
- Tilapia culture; lessons learnt from the Philippines in relation to rural development.
- GIFT: lessons learnt.
- Giant freshwater prawn - successes in Thailand.

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NACA is a network composed of 17 member governments in the Asia-Pacific Region.

Endemic freshwater finfish of Asia: Distribution and conservation status

This article has been published in Diversity and Distributions (2007) 13, 172–184.

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Keywords: Asia, native species richness, endemic species, river basins, conservation status, habitat.

Abstract: Freshwater finfish species richness and level of endemism in East, and South and South-East Asia that included 17 nations were studied using available databases, and included nation-wise distribution, habitat types, and conservation status. The number of endemic finfish species in the region was 559, belonging to 47 families. Families Cyprinidae and Balitoridae accounted for 43.5% and 16.2% of the total number of endemic species in the region, respectively, followed by Sisoridae (25), Gobiidae (20), Melanotaeniidae (19), and Bagridae (16), and the other 41 families had at least one endemic species. Nation-wise the most number of endemic freshwater finfish species occur in India (191), followed by China (88), Indonesia (84), and Myanmar (60). In India, the endemic species accounted for 26.4% of the native freshwater fish fauna, followed by South Korea (16.9%), the Philippines, (16.3%) and Myanmar (15.7%).

Statistically significant relationships discerned between the number of indigenous and endemic species richness to land area (Xla in 103 km^2) of the nations in the region were, Yin = 218.961 Ln(Xla) – 843.1 (R2 = 0.735; P < 0.001) and Ye = 28.445 Ln Xla - 134.47 (R2 = 0.534; P < 0.01), respectively, and between indigenous and endemic species richness was Ye = 0.079Xn - 1.558 (R2 = 0.235; P < 0.05).

The overall conservation status of endemic finfish in Asia was satisfactory in that only 92 species were in some state of vulnerability, of which 37 species (6.6%) are endangered or critically endangered. However, the bulk of these species (83.7%) were cave- and or lake-dwelling fish. However, nation-wise, the endemic freshwater finfish fauna of the Philippines and Sri Lanka, based on the imperilment index, were found to be in a highly vulnerable state. Among river basins, the Mekong Basin had the highest number of endemic species (31.3%). The discrepancies between databases are highlighted and the need to consolidate information among databases is discussed. It is suggested that the Mekong Basin be considered as a biodiversity hotspot, and appropriate management strategies be introduced in this regard.

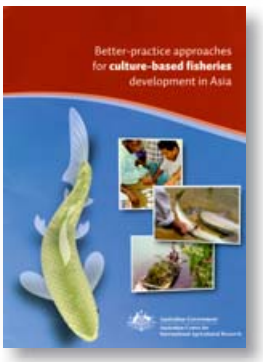
For full content of the article, email: thuy.nguyen@enaca.org.

NACA Bookshelf: Highlighted publications

Manual on the Application of Molecular Tools in Aquaculture and Inland Fisheries Management

The aim of this manual is to provide a comprehensive practical tool for the generation and analysis of genetic data for subsequent application in aquatic resources management in relation to genetic stock identification in inland fisheries and aquaculture. It provides general background on genetics in relation to aquaculture and fisheries resource management, the techniques and relevant methods of data analysis that are commonly used to address questions relating to genetic resource characterisation and population genetic analyses. Published in two parts, the first dealing with concepts, and the second lab protocols:

- **Download Part 1**: http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=63&lid=799
- **Download Part 2**: http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=63&lid=800



Better-practice approaches for culture based fisheries development in Asia

The primary objective of this manual is to provide guidelines for attaining better practices in culture-based fisheries, an emerging practice in rural areas in the Asian region. It deals will the principles of culture-based fishery practices, primarily based on relatively long-term experiences in Sri Lanka and Vietnam. It is not only targeted at researchers per se, but also at stakeholders at the grass root levels, as well as planners and policy developers, particularly those of Asian nations embarking on culture-based fisheries as a strategy to enhance fish food production in rural areas. The manual is divided into two parts: Part 1 provides general information on what is called 'better-practice approaches' to culture-based fisheries; and Part 2 provides experiences from Sri Lanka and Vietnam and includes a marketing study.

- **Download**: http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=3&lid=709

A guide to small-scale marine finfish hatchery technology

Recent improvements in hatchery production technology for high-value marine finfish species such as groupers have led to an increased interest in setting up hatcheries to produce fingerlings for aquaculture. Small-scale hatcheries make this technology available to poor people in developing countries. Capital costs for small-scale hatcheries are relatively low, and the profitability of these ventures ensures rapid payback of capital investment. This guide provides an outline of the requirements to establish a small-scale marine finfish hatchery, particularly the economic aspects. It is intended to provide sufficient information for potential investors to decide whether investment in such ventures is appropriate for them.

- **Download**: http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=75&lid=582

Asia Diagnostic Guide to Aquatic Animal Diseases

Simply the most comprehensive aquatic disease guide ever published in the region, and the single most popular NACA publication ever! With contributions from recognised experts in the field from all over the world, the guide covers economically significant diseases of molluscs, fish and crustaceans. Contains information on laboratory and diagnostic techniques, causative agents and distribution, host range, clinical aspects, screening methods, diagnostic procedures, modes of transmission, control measures. The guide includes contact details for technical support services throughout the region and national health coordinators. It is an important supporting document for the Technical Guidelines on the Responsible Movement of Live Aquatic Animals. 237 pages.

- **Download**: http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=10&lid=7

Shrimp health management extension manual

This extension manual summarizes farm level risk factors and practical management practices that can be used to reduce risks of shrimp disease outbreaks and improve farm production. The recommendations are based on a study conducted in Andhra Pradesh, India. The publication is therefore of particular relevance to Andhra Pradesh, but many recommendations are still of use to farmers from other areas. The study was conducted by NACA, MPEDA, the Aquatic Animal Health Research Institute (Thailand), Siam Natural Resources and AusVet Animal Health Services and ACIAR. (1MB, 46 pages)

- **Download**: http://www.enaca.org/modules/wfdownloads/singlefile.php?cid=10&lid=55