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FAO Aquaculture Newsletter

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Will there be enough fish?

The world population is on the rise, as is the demand for aquatic food products. Production from capture fisheries at the global level is levelling off and most of the main fishing areas have reached their maximum potential. Sustaining fish supplies from capture fisheries will, therefore, not be able to meet the growing global demand for aquatic food. At present, the aquaculture sector contributes a little over 40 million tonnes (excluding aquatic plants) to the world aquatic food production. According to recent predictions, in order to maintain the current level of per caput consumption at the minimum, the global aquaculture production should reach 80 million tonnes by 2050. Aquaculture has the great potential to meet this increasing demand for aquatic food in most regions of the world; however, in order to achieve this, the sector (and aqua-farmers) will undoubtedly face significant challenges. The major task ahead for sustainable aquaculture production would be to develop approaches that will increase the contribution of aquaculture, which are realistic and achievable, within the context of current social, economic, environmental and political circumstances.

A recent review conducted by FAO on the status and progress of aquaculture development in Asia, where over 90 percent of global aquaculture is produced, identified several major prospects. It is apparent that the aquaculture sector will continue to intensify and diversify, using new species, systems and practices, requiring responsible use of resources, in particular - the species. Markets, trade and consumption will influence the growth of the sector, factors which will strongly demand for production of safe and quality products, which are affordable, acceptable and accessible to all sectors of society. In achieving this, increased emphasis will be placed to enhance enforcement of regulation and better governance of the sector, focusing on empowerment of farmers and self-regulation. All of the above will have a combined effect that could result in the final overall trend of driving the sector towards improved or better management.

This analysis which reflects the scenario in Asia, may not apply directly to other regions where aquaculture is developing, especially Africa and Latin America. In Europe, although the share of global production is small, the sector management and governance is advanced.

The question now is - will there be enough fish to feed the masses by the year 2050? The FAO's current study on the prospective analysis of future aquaculture development may provide some answers!

See future issues of FAN for details.

Rohana P. Subasinghe
Chief Editor

Cover Photo: Shrimp and fish traps commonly used for capturing wild fish and shrimps in the Red River Delta, Viet Nam, providing additional income to rural fish farmers (Photo Credit: Dave Little, IoA, University of Stirling, Scotland)

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FIRI and FAO Member Governments undertake a Major Review of Aquaculture Development in preparation for COFI's Sub-Committee on Aquaculture – Session III

New Delhi, 4-8 September 2006

In preparation for the Third Session of COFI's Sub-Committee on Aquaculture (SCA) to be held in New Delhi, India from 4-8 September 2006, FAO's Inland Water Resources and Aquaculture Service (FIRI) conducted a number of workshops participated by more than 80 FAO member countries in Africa (20-22 September 2005, Mombasa, Kenya), Asia-Pacific (27-30 September 2005, Ramsar, Islamic Republic of Iran), Central and Eastern Europe (5-7 September 2005, Astrakhan, Russia Federation), Latin America and the Caribbean (4-6 September 2005, Panama City, Panama), and North Africa and Near East (24-25 November 2005, Cairo, Egypt; and 28 November 2005, in Muscat, Oman) to have a better understanding of the challenges currently faced by the sector, as well as progress, trends and prospects in individual countries, at regional and global levels with an overall view of identifying possible solutions to those challenges. The consultations, participated by selected aquaculture experts, used a workshop format which included plenary presentations on major issues affecting aquaculture development followed by working group discussions which tackled on the present and future status of aquaculture for each of the mentioned aquaculture regions. The seven regional reviews (including Western Europe and North America) will be synthesized into a single Global Aquaculture Development Status and Trends Review. Part of the synthesis will be done during the Global Aquaculture Workshop to be held in Guangzhou, China from 12-15 March 2006 (see page 13). The highlights of some of the regional reviews are provided in the following pages.

For more details about COFI's Sub-Committee on Aquaculture – Session III, please contact:

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Participants to the Expert Workshop, Mombasa, Kenya, 20-22 September 2005

Africa Regional Aquaculture Review

Mombasa, Kenya, 20-22 September 2005

John Moehl[1], Matthias Halwart[2] and Rohana P. Subasinghe[3]

The FAO Expert Workshop on Review and Analysis of the Aquaculture Sector in Africa was held in Mombasa, Kenya, from 20-22 September 2005. The Workshop was attended by 35 participants, including participants from 15 countries in the Africa Region (Cameroon, Congo-Brazaville, Cote D'Ivoire, Democratic Republic of Congo, Ghana, Kenya, Liberia, Malawi, Mozzambique, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda, and Zambia) and aimed to: (a) follow-up on the 1999 FAO Africa Regional Aquaculture Review, assess progress made in developing the aquaculture sector and recommend steps/action to stimulate further growth; and (b) obtain relevant information from the region towards compiling two documents, as a request by the Committee on Fisheries Sub-Committee on Aquaculture (COFI-AQ): (i) Review of trends in global aquaculture development – 2005, and (ii) Prospective analysis of future aquaculture development, both will be presented to the Third Session of the COFI-AQ to be held in India in September 2006.

The conclusions of the workshop could be summarized as follows:

'Aquaculture has made considerable progress in the Africa Region since 1999. This progress is seen in production increases as well as growing investment in aquaculture. These events are stimulated by rising prices for aquatic products combined with more friendly investment environments. Over this period, there has been a noteworthy improvement in capacity of public institutions, increased awareness by the private sector, more favourable assessments by lenders, improved seed availability and quality and more ready access to information; although, all these factors are still far from optimal and require continued strengthening. Positive demonstrations and experiences need to be shared and multiplied. At the intra-regional level, the New Partnership for Africa's Development (NEPAD), Regional Economic Communities (RECs) or other vehicles may be efficient tools for the expanded and enhanced sharing and adoption of "what works". But, at the national level, extension remains a serious debacle with which to deal; establishing means and methods to have effective and sustainable extension and outreach a recurring quandary. There may be economies of scale to address some issues such as research and training/ education at the regional or sub-regional level. There are also economies of scale to develop stronger and more resilient links with sister national institutions and agencies such as statistics, water, environment, etc. It has been demonstrated that all of these aspects of aquaculture development can be, and should be satisfactorily addressed to in the process of elaborating national aquaculture development strategies'.

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Latin America and the Caribbean Regional Aquaculture Review

Panama City, Panama, 4-6 September 2005

Doris Soto[1] and José Aguilar-Manjarrez[2]

FAO-FIRI commissioned the Organization of the Fisheries and Aquaculture Sector in Central America (OSPESCA) to collect, review and synthesize the National Aquaculture Sector Overviews (NASO) and Prospective Analyses of Future Aquaculture Development (PAFAD) from the Latin America and the Caribbean (LAC) countries. The purpose of NASO and PAFAD is to provide a concise and comprehensive product that gives a general overview of the aquaculture and culture based fisheries aspects and development outlooks at national level for each country. OSPESCA was also to compile, on their basis, a Draft Regional Review and Synthesis of Aquaculture Development Trends in the LAC Region. To review this draft, FAO-FIRI/OSPESCA jointly organized the FAO Expert Workshop on the Regional Aquaculture Review for Latin America and the Caribbean.

The workshop was hosted by the Government of Panama and was held in the Las Americas Meeting Room of the Hotel Country Inn & Suites, Panama Canal Amador of Panama, Republic of Panama from 4 to 6 September 2005. Twenty three experts from 21 countries of LAC attended the meeting.

The main objectives of the Expert Meeting were to present, discuss and synthesize: (i) the NASO and PAFAD from the countries in the LAC, and (ii) the Draft Regional Review and Synthesis of Aquaculture Development Trends in LAC.

The meeting carried out a comparative analysis of the performance of aquaculture in LAC, grouping the countries by geography and similarities in their aquaculture systems. This grouping of countries was meant to facilitate the regional synthesis, which was the central purpose of the meeting. For the comparative analyses, information provided by national experts from 22 countries in the Region was used. For each group of countries, information was given on land area; human population; Gross Domestic Product; institutions of aquaculture training and research and development; cultured area and cultured aquatic species; and aquaculture production, in volume and value. Indicators of aquaculture productivity or yield, opportunities and trends of the sector, and main problems affecting aquaculture development were also examined. The regional synthesis considered a series of issues selected, such as institutional framework, legislation, environment, marketing and contribution of aquaculture to social and economic development, and the most important trends observed for each issue. Finally, the meeting conducted a SWOT (strengths, weakness, opportunities and threats) analysis of aquaculture development at regional level.

Some of the relevant common issues identified by the experts included: (i) lack of estimation of economic and social impacts of aquaculture as well as the scarcity of information about the impact on local protein consumption; and (ii) weak coordination and management of environmental issues particularly regarding institutional coordination (usually among fisheries and environmental institutions); (iii) need for strengthening of government and institutional frameworks; (iv) the need for enhancing of sub-regional and regional cooperation; and (v) the need to control the

spread of diseases, and particularly regarding movements of exotic species.

The workshop report will be published in Spanish and English and made available to governments, and will be part of the Global Aquaculture Review. FAO is currently working on a database of National Aquaculture Sector and Legislation Overviews, to be made available on FAO's aquaculture gateway http://www.fao.org/figis/servlet/static?dom=root&xml=aquaculture/index.xml

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Doris Soto, FAO

Family type shrimp farms in a river estuary near the city of Recife, Northern Brazil

Doris Soto, FAO

Harvesting of shrimp in a family type aquaculture pond by a river estuary near the city of Recife, Northern Brazil

Doris Soto, FAO

Family aquaculture ponds which produce Tilapia and Tambaqui within cane farming area in Pernambuco State, Brazil

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North Africa and Near East Regional Aquaculture Review

Cairo, Egypt, 24-25 November 2005
Muscat, Oman, 28 November 2005

Alessandro Lovatelli[1] and Sarah Poynton[2]

Aquaculture specialists from 16 countries in North Africa and the Near East recently had the opportunity to meet together in two expert workshops, to critique the first draft of their Regional Review, and articulate priority issues for safeguarding a sustainable future for aquaculture in the region. The stimulating and successful workshops were held in Cairo, Egypt on 24 and 25 November, 2005, attended by Algeria, Egypt, Lebanon, Libyan Arab Jamahiriya, Morocco, Syrian Arab Republic, and Tunisia; and on 28 November 2005 in Muscat, Oman, and participated by Bahrain, Iran (Islamic Rep. of), Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen, respectively. The local hosts were FAO Regional Office for the Near East in Cairo, and the Ministry of Agriculture and Fisheries in Oman. The workshops were each co-chaired by Mr Alessandro Lovatelli, FAO Responsible Lead Officer (Rome), and Mrs Sarah Poynton, Regional Reviewer (FAO Consultant).

The workshops followed an intense interactive format, opening with brief introductions, and identification of the positive and negative forces impacting aquaculture in each country. Then followed discussion and critique of the draft regional review (the 50 page document had been circulated to the expert participants some 10 days in advance of the workshops). Subsequently, structured debate of priority issues facing the aquaculture sector took place, with the experts identifying four issues: farming systems, technologies and species; health and diseases; policies, legal frameworks and institutions; and marketing and processing. For each issue, we discussed and documented justification of the issue as a priority, recognition of the four top problems, and specific needs and solutions.

Participants provided abundant and constructive input, to ensure that the regional review will reflect not only the current status of aquaculture across North Africa and the Near East, but – more importantly – the challenges being faced and solutions to be employed. An additional benefit fostered by the collegial atmosphere was the identification of new linkages between countries to support each others needs, particularly regarding expertise.

The FAO Lead Officer and the Regional Reviewer would like to take this opportunity to warmly thank all of the participants, and the local hosts, for their contributions to the enjoyable and rewarding workshops, and to wish all participants and their colleagues well for the fostering of new cooperations.

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Asia-Pacific Regional Aquaculture Review

Ramsar, Islamic Republic of Iran, 27-30 September 2005

Rohana P. Subasinghe[1]

The Asia-Pacific Regional Aquaculture Review Workshop was held in Ramsar, Islamic Republic of Iran on 27-30 September 2005. The workshop, organised and conducted in collaboration with the Network of Aquaculture Centres in Asia-Pacific (NACA) and hosted by the Iranian Fisheries Organization (IFO or Shilat), was attended by technical experts from a number of FAO/NACA member countries as well as representatives of a number of technical organizations such as South Pacific Commission (SPC) and the South East Asian Fisheries Development Centre (SEAFDEC). The workshop reviewed the draft Asia-Pacific Regional Aquaculture Development Review and provided necessary clarification/feedback and amendments. In addition, the workshop focussed strongly on the aspect of future trends in aquaculture for the region and some of the forthcoming needs to support or address these emerging issues. The workshop was chaired by the Director of Shilat, Mr Ebrahim Maygoli.

Several major trends in aquaculture development in Asia-Pacific were observed and identified during the workshop. It was apparent from the discussions that aquaculture will continue to be intensified instead of expanding due to various limiting factors, although in some places, a reverse trend may happen. The sector will also continue to diversify in terms of species as well as systems practiced, which will therefore call for more responsible use of species and other inputs. It is also clear that, at least for the regionally or internationally traded commodities, the driving forces will include markets, trade and consumption which will greatly influence production and producers. As aquaculture continues to intensify and diversify, there will be need for stringent regulations, better law enforcement, and improved governance at national levels. All these will compel the sector towards better management (at all levels) in order to keep up with the current performance of the sector.

The participants at the workshop comprised of representatives of a selection of FAO/NACA member countries (Cambodia, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Viet Nam). The workshop process was based around a number of plenary presentations and a series of working group discussions that were aimed at validation of the information, addition of missing points and the elaboration of future trends (in effect the prospective analysis). The outcome of the workshop will be published as an FAO Fisheries Circular and all the seven regional reviews (Asia-Pacific, Africa, Latin-America, North America, Western Europe, Eastern Europe, and the Near East) will be synthesised into a single Global Aquaculture Development Status and Trends Review and published in due course.

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Central and Eastern Europe Regional Aquaculture Review

Astrakhan, Russian Federation, 5-7 September 2005

Anca Sfetcovici[1] and Uwe Barg[2]

The FAO Inland Water Resources and Aquaculture Service (FIRI), and the Research Institute for Fisheries, Aquaculture and Irrigation (HAKI), Szarvas, Hungary, as coordination institution of the Network of Aquaculture Centers in Central and Eastern Europe (NACEE) and the Pedigree Fish Breeding Centre – Moscow Branch of the Federal Center of Fish Genetics and Selection, jointly organized the FAO Expert Workshop on the Regional Aquaculture Review in Central and Eastern Europe (CEE). The meeting took place in Astrakhan, Russian Federation, 5-7 September 2005, in conjunction with the Second Meeting of the NACEE Directors, 8-9 September 2005. Both meetings were hosted by BIOS, the Research and Production Center for Sturgeon Breeding who proved to be an excellent host of these events.

The meetings were attended by 50 participants from 16 countries, representatives of research institutes, universities and governments of CEE. Representatives of international organisations such as: European Aquaculture Society (EAS), Network of Aquaculture Centers in Asia-Pacific (NACA) and Eurofish have been invited to attend the meetings and make presentations.

Thirteen country review studies have been presented and discussed. The country reviews have been analysed, summarised and synthesized into a Regional Aquaculture Review. As part of FAO's ongoing global aquaculture review process, this and other regional aquaculture reviews in Africa, Asia, the Americas and Western Europe, will be presented at the FAO-COFI Sub-Committee on Aquaculture to be held in September 2006 in India. A series of common issues, constraints and trends have been identified for CEE during the presentations and the discussions that followed. These include: predomination of carp production, low production levels, inefficient farm management and marketing, lack of qualified staff, financial and legal problems. Four major thematic areas were identified and analysed, in the field of (a) policy framework, legislation and institutional systems; (b) farming systems, species and technologies; (c) processing and marketing (consumers' demand, labelling, certification) and (d) social aspects (food supply, employment, income generation).

Among the findings, conclusions and recommendations of the meeting were: (a) the significance of the aquaculture development in CEE has to be recognised and emphasised; (b) governments and other policy makers should be informed about the characteristics, opportunities and need of developing a sustainable aquaculture sector; (c) aquaculture producers should acknowledge the consumer demands and be aware of the increased market competition with other market commodities; and (d) NACEE can play an important role in facilitating the information exchange in aquaculture within the region.

The workshop report will be published in English and Russian and will be made available to governments, and to the Global Aquaculture Review. FAO is currently working on a database of National Aquaculture Sector and Legislation Overviews, to be made available on FAO's aquaculture gateway http://www.fao.org/figis/servlet/static?dom=root&xml=aquaculture/index.xml

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Second Meeting of Directors of the Network of Aquaculture Centers in Central and Eastern Europe (NACEE)

Astrakhan, Russian Federation, 8-9 September 2005

Anca Sfetcovici[1] and Uwe Barg[2]

Central and Eastern Europe (CEE) is an emerging region of Europe where aquaculture can play an important role in rural development. Knowledge and experience are available in various aquaculture research institutions in the region, however, there are a series of constraints such as financial, infrastructure, language barriers, which hamper the utilisation of the research results and transfer of technologies and information. The R&D field has still a long road to make before being part of the European Research Area; however, NACEE could contribute to this process. This was the background of the Second Meeting of Directors of NACEE which took place in Astrakhan, Russian Federation, 8-9 September 2005, in conjunction with the FAO Expert Workshop on the Regional Aquaculture Review in CEE. The meeting was hosted by BIOS, the Research and Production Center for Sturgeon Breeding.

This meeting followed up on the formal founding of NACEE which took place in November 2004. Over 40 people representing research institutions, universities, governments and international organisations and associations from 16 countries participated. NACEE has currently a membership of 31 institutions from 13 CEE countries. Several issues of interest for the network have been discussed and agreed, such as the progress and financial reports, the by-laws and Rules of Procedure of NACEE, future planned activities and follow-up steps. Although recently established, the network has already a web address (http://agrowebcee.net/subnetwork/nacee/), hosted by the AgroWeb network, in English and Russian, and is being continuously updated. The importance of the exchange of information among the NACEE members was emphasized as well as partnerships with already established international organisations such as EAS (European Aquaculture Society), NACA (Network of Aquaculture Centers in Asia-Pacific) and Eurofish. The FAO's aquaculture service has provided support to NACEE through collaboration with HAKI, (Research Institute for Fisheries, Aquaculture and Irrigation, Szarvas/Hungary), the coordinating institution of the Network. Eurofish highlighted its activities and publications targeting in particular the challenges of the fisheries and aquaculture sectors in CEE, and offered assistance, in particular in the areas of trade, fish processing, marketing and aquaculture and related training.

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The future of mariculture: A regional approach for responsible development of marine farming in the Asia-Pacific Region

FAO/NACA/China Regional Workshop

Shenzhen/Guangzhou, Guangdong Province, P.R. China, 6–11 March 2006

Alessandro Lovatelli[1]

Aquaculture in the Southeast Asian region has been expanding steadily over the last few decades. The main forms of farming practices taken up by the private sector (both large commercial companies and smaller operators) have been mainly those, in terms of space usage, with farming infrastructures based on coastal land. One key example is coastal earth pond using brackish water for farming a variety of shrimp species and to a lesser extent finfish. The rapid expansion of the industry and the demand for more land space has reached a point where future land use will need to be much more carefully planned. This will hopefully (i) ensure the appropriate land allocation for different usage (agriculture, aquaculture, urban development, recreational activities, etc.) and (ii) a greater control on the environmental impact and monitoring of any given activity. The search for additional areas to expand the aquaculture industry as a whole and the identification of new farming species of commercial value to satisfy the growing local and export markets are pushing the sector in some countries to expand its activities in the sea, including further offshore where more space is available and where, to a lesser extent, competition is currently not so intense.

During the latest session of the FAO Committee on Fisheries (COFI) and the Sub-Committee on Aquaculture (COFI-SCA), country Members have requested FAO to look into issues related to the sustainable development of coastal aquaculture and in particular mariculture. The FAO Fisheries Department through the Inland Water Resources and Aquaculture Service (FIRI) is collaborating with the Network of Aquaculture Centres in Asia and Pacific (NACA) and the Government of PR China with regards to the preparation of a targeted workshop entitled "*The future of mariculture: A regional approach for responsible development of marine farming in the Asia-Pacific Region*" which will be organized in Guangdong Province from 6 to 11 March 2006. This workshop will assist the development of sustainable planning and management strategies in farming of the Asian seas.

The aim of this mariculture workshop is to bring together expertise from major producing countries in the Asian region to establish a collaborative research and development programme that will support responsible mariculture, and social and economic development among coastal communities in the Region. This is furthermore supported by a number of regional fishery organizations such as the Secretariat of the Pacific Community (SPC) and its Member countries.

The expected outcomes from this workshop will include the: (i) identification of key issues, opportunities and constraints faced by the mariculture sector; (ii) identification of strategies required to address such key issues (i.e. better practices identified); (iii) establishing appropriate foundations for national and regional action programmes to implement such strategies (including national research and development initiatives; regional/national research and development partnerships working on key researchable issues; communications activities; education and training activities; market/fair trade opportunities/partnerships and investment opportunities identified). To support discussions during the workshop, a number of thematic reviews will be commissioned as follows: (i) Regional Review on Marine Aquaculture Products Demand, Trade and Markets, (ii) Regional Review on Livelihood Opportunities related to Mariculture Development, (iii) Regional Review on Existing and

Potential Mechanisms for Technology Transfer, and (iv) Regional Review on Existing Major Mariculture Species and Farming Technologies. The workshop will also include two innovative consultation sessions: one to be held in a major fish market in Guangzhou to gather feedback from the private and public sectors on future fish demand and marketing in southern China; and one to be held in a major fish and mollusc farming centre in Guangdong for wide ranging discussions on future trends in production and farming in southern China. The location for the workshop in Guangdong is ideal because of China's long experience in mariculture development, and as the world's largest market for marine aquaculture products.

The outcome of the meeting will be reported in one of the next issues of FAN. Further details can be obtained by writing to:

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FAO Expert Workshop

"Global Review of Aquaculture Development Trends and Prospective Analysis of Future Aquaculture Development"

Shenzhen, Guangdong Province, P.R. China, 12-15 March 2006

As part of the Regular Programme activities of the Fisheries Department as well as a move towards implementing certain recommendations by the COFI's Sub-Committee on Aquaculture, this workshop is being convened to embark a global review of aquaculture development trends and prospective analysis of future aquaculture development. The global review and analysis will be based on seven Regional Aquaculture Reviews (see sections on Regional Aquaculture Reviews) and will consists of a number of chapters dealing with the following major subjects: (a) Characteristics and structure of the sector, (b) Production, species and values, (c) Economics and trade, (d) Contribution to food security, access to food, nutrition and food safety, (e) Environment and resources, (f) Legal, institutional and management aspects of the aquaculture sector, (f) Social impacts, employment and poverty reduction, and (g) Development trends. Invited experts (from Australia, China, Chile, India, Italy, Hungary, Mexico, Philippines, Norway, South Africa, Uganda, UK, USA) were selected on the basis of their long experience and knowledge of the aquaculture sector and are expected to provide valuable contribution to the process.

For more details about the Global Aquaculture Review Workshop, please contact:

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FAO Expert Workshop

Use of feed and fertilizer for sustainable aquaculture development

Wuxi, Jiangsu Province, P.R. China, 18-21 March 2006

in collaboration with the Network of Aquaculture Centres in Asia-Pacific (NACA) and the Freshwater Fisheries Research Centre (FFRC), Wuxi, China

Mohammad R. Hasan[1]

Aquaculture has achieved a spectacular growth over the last three decades and it is anticipated that global aquaculture production will continue to increase. The average growth rate of the sector during 1970 and 2003 is 8.68 percent per year while that of capture fisheries during this period is 1.15 percent. Aquaculture has been the fastest growing food production sector in many countries of the world for the last two decades while the capture fishery is experiencing a declining trend. Aquaculture has therefore, contributed significantly to food security and poverty alleviation in different parts of the world in parallel with the development of profit-oriented entrepreneurship.

Feed accounts for about 60-80 percent of operation cost in intensive aquaculture, while feed and fertilizers represent about 30-60 percent of the total cost of aquaculture production in semi-intensive aquaculture system. Fertilizers and feed resources will, therefore continue to dominate aquaculture needs. To address the issues of feed and fertilizer use for sustainable aquaculture development, the FAO Fisheries Department through its Inland Water Resources and Aquaculture Services (FIRI) has initiated a work programme "Study and analysis of feed and nutrients (including fertilizers) for sustainable aquaculture development". After careful review of the existing status of aquaculture in relation to feed and fertilizer and with due recognition to the recommendations made by the First and Second Sessions of the COFI Sub-committee on Aquaculture (SCA) in Beijing, Peoples' Republic of China and Trondheim, Norway, respectively, the following key issues have been prioritized: a) analysis of status and trends in aquaculture production (with particular reference to fish and crustacean species that feed on aquafeeds); and b) analyses of issues, trend and challenges of feed and fertilizer resources for sustainable aquaculture development with particular reference to extended extensive, semi-intensive and intensive farming systems in developing countries of Asia, Africa and Latin America.

The above work programme is being executed by FIRI in close collaboration of FAO regional and sub-regional offices and in consultation with Regional Organization (e.g., NACA), government Department of Fisheries, Universities and National Research Institutions of FAO member countries. As a part of this work programme, a number of country reviews from Asia (e.g., Bangladesh, China, India, Indonesia, Iran, Thailand, the Philippines, Viet Nam), Africa (e.g., Cameroon, Ghana, Kenya, Malawi, Nigeria, Uganda and Egypt) and a regional review on Latin America (to include Mexico, Venezuela, Brazil, Ecuador, Peru and Cuba) have been commissioned. Further, the country reviews of Asia and Africa are planned to be synthesized into Asia and Africa regional reviews, respectively; and these three regional reviews are to be synthesized into one global synthesis. Further six country case studies on "economics of aquaculture feed management" are being carried out in six countries in Asia (e.g., Bangladesh, China, India, Thailand, the Philippines and Viet Nam).

To broaden the horizon of the consultative process, it has been decided to organize a targeted workshop on "Use of feed and fertilizer for sustainable aquaculture development", in Wuxi, Jiangsu Province, P.R. China on 18-21 March 2006. Experts from FAO member countries, regional organizations and FAO headquarters and regional offices are expected to participate and the results of the country reviews, regional and global synthesis and synthesis of the case studies on economics of feed management will be presented in the workshop. Results drawn from the reviews, case studies and presentations will be analyzed during the workshop, relevant management options/ measures will be examined and

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Broodstock of African catfish (Clarias gariepinus) fed with pelleted diet in an outdoor rearing tank, Ibadan, Nigeria

Mohammad R. Hasan, FAO

Groundnut husk thrown in a corner of a pond to feed Nile tilapia (Oreochromis niloticus), Kumasi, Ghana. Groundnut husk is one of the most commonly used supplemental feeds for tilapia farming in Ghana

Mohammad R. Hasan, FAO

African catfish fed with pelleted diet using a locally manufactured demand feeder, Ibadan, Nigeria

further issues of immediate concern will be identified. Eventually, it is expected that it will assist the FAO to develop policy guidelines and strategies to implement the management options for optimal and sustainable utilization of feed and fertilizer resources for aquaculture development with due recognition of variability between regions with respect to farming systems and practices. The output in the form of management options and policy guidelines thus generated by the consultative process including the workshop will eventually assist the FAO member countries in the implementation and promotion of relevant provisions of FAO's Code of Conduct for Responsible Fisheries. It is expected that workshop proceedings, country, regional and global reviews/synthesis will be published as an FAO Fisheries Technical Paper "Wise-use of feed and fertilizer resources for sustainable aquaculture development". The location of the workshop was chosen because of the importance and experience of freshwater aquaculture in China and the contribution of aquaculture research and development by the Freshwater Fisheries Research Centre (FFRC), located in Wuxi.

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FAO Expert Workshop

Freshwater Seed as Global Resource for Aquaculture

Wuxi, Jiangsu Province, P.R. China, 23-26 March 2006

Melba B. Reantaso

Dave Little, IoA, University of Stirling, Scotland

Shrimp and fish traps commonly used for capturing wild fish and shrimps in the Red River Delta, Viet Nam, providing additional income to rural fish farmers

Melba B. Reantaso
Inland Water Resources and Aquaculture Service,
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Land, water, seed and feed constitute the four most important resources to aquaculture. Efficient use of these resources are necessary to guarantee optimum production from aquaculture. Availability of quality fish seed is a pre-requisite for adoption of sustainable aquaculture especially for smallholders.

A number of regional and international events have highlighted some of the most pressing issues concerning seed in global aquaculture development. The proceedings of a special session on 'Rural Aquaculture' convened during the Fifth Asian Fisheries Forum, International Conference on Fisheries and Food Security Beyond the Year 2000, held in November 1998 in Chiang Mai, Thailand, Edwards *et al.* (2002)[1] identified seed as one of the five major issues affecting rural aquaculture development and considered two aspects: (a) role of the private sector; and (b) types of hatcheries (i.e. large, centralised government or small, decentralised hatcheries – which need further consideration in seed production. As part of the same publication, Little *et al*. (2001)[2] reported poor quality seed as a major constraint to the success of fish culture, especially for new entrant farmers and poorer smallholders.

Regional reviews (Asia, Africa and Latin America) from the Conference on Aquaculture in the Third Millemium (NACA/FAO 2001)[3], held in Bangkok, Thailand in February 2000, recognized important issues concerning seed as a significant resource for aquaculture. In the Asian region, Kongkeo (2001)[4] emphasized that one of the technical constraints in Asian aquaculture is the inadequate and unreliable supply of quality fish seed. Machena and Moehl (2001)[5] identified the lack of fish seed as a serious restriction to aquaculture development in sub-Saharan African region. In Latin America, Hernandez-Rodriquez *et al.* (2001)[6] reported that for tilapia culture, maintenance of high genetic quality within the stock as well as development of disease-resistant

strains are important issues for consideration as they adversely affect growth, harvest size and profitability. In general terms, broodstock and seed supply have been identified as representing a major constraint to production increases not only in terms of availability but also health management. Several major initiatives are underway to develop methods for the use of specific-pathogen-free and high-health seed production. Such strategies involve domestication allowing the development of commercial breeding programmes for the establishment and maintenance of desirable traits. El-Gamal (2001)[7] in a review of the status and development trends of aquaculture in the Near East concluded that availability of seed is a crucial technological constraints to future development of aquaculture in the Near East region. In Egypt, insufficient numbers of tilapia fingerlings are produced in governmental hatcheries and do not match the need for fish farm requirements. He concluded that promotion of aquaculture should not be made unless there is an assured supply of seed from hatchery sources. De Silva (2001)[8], in his global perspective of aquaculture in the new millenium, suggested that in culture-based fisheries one of the major limitations is the lack of suitably sized fingerlings for stocking due to inadequate hatchery technology, inadequate facilities for fry to fingerling rearing and distribution mechanisms.

The ASEAN-SEAFDEC Conference on 'Sustainable Fisheries for Food Security in the New Millenium' held in Bangkok in November 2001, identified four major elements affecting quality of seed resources for sustainable aquaculture. These are: (a) seasonality and inconsistency of seed supply; (b) inadequate support for seed production; (c) deterioration in quality of seed stocks; and (d) impacts of releases of cultured seed stocks (Mair, 2002)[9].

The report of the Second Session of the Sub-Committee on Aquaculture (Norway, 2003) highlighted the lack of seed as an important issue in culture-based fisheries (Section xxii, para. 53) and which requires further work in order to promote this important sector of aquaculture (FAO, 2003)[10].

Most recently, the Thirteenth Session of the Committee for Inland Fisheries of Africa (CIFA) held from 27 to 30 October 2004 highlighted two important points: (a) lack of quality seed as one of the important factors limiting the contribution of aquaculture to food security and economic growth; and (b) availability of strong and disease-free seed as one of the major

Pham An Tuan, RIA1, Viet Nam

Small-sized incubation jars used in common carp and catfish hatcheries in Viet Nam

constraints to aquaculture development in the region. The meeting also recognized that seed shortage represents the failure of government hatcheries to meet the expressed demand; noted the progressive involvement of the private sector to revive the seed production industry and the need for more private hatcheries with business orientation.

Outlook and prospects

The above-mentioned meetings/events have repeatedly highlighted the various issues surrounding seed as an important resource for sustainable aquaculture development. The factors affecting seed availability, seed quality, seed production technologies and support services, seed distribution networks, etc. need to be understood well if resources are best to be targeted and policy decisions on future investment and management options improved. The development of breeding and hatchery technology, genetic improvement and domestication are additional key objectives for securing the seed supply for major aquaculture species.

The FAO Fisheries Department through the Inland Water Resources and Aquaculture Service (FIRI) is organizing an Expert Workshop on Freshwater Seed as Global Resource for Aquaculture in Wuxi, China on 23-26 March 2006, in order to present the regional syntheses of freshwater seed resources used for aquaculture in Asia, Africa and Latin America based on a number of case studies from a number of selected countries (Bangladesh, Brasil, Cambodia, Cameroon, China, Colombia, Cuba, Ecuador, Egypt, Ghana, India, Indonesia, Mexico, Pakistan, the Philippines, Sri Lanka, Thailand, Uganda, Viet Nam and Zimbabwe)

from the three regions. In addition, reviews on selected themes, e.g., (a) seed quality (hatchery health management, seed health management, risk analysis for seed movement; criteria for seed quality prior to stocking), (b) genetics and breeding of important freshwater species, (c) seed production network and entrepreneurship, (d) seed technology, (e) role in rural aquaculture, (f) economics of seed production; and (g) experiences using farmer innovations and women involvement in seed production, will also be presented. All the information collected will form the basis for the working group discussions of the major issues faced by the seed sector. We hope that the various processes undertaken leading to the expert workshop will provide useful lessons and a better understanding of the seed sector. The proposed workshop will evaluate current constraints and challenges faced by the seed sector as basis for identifying measures and generating action that will contribute to its further development and sustainable use for global aquaculture with special reference to rural aquaculture.

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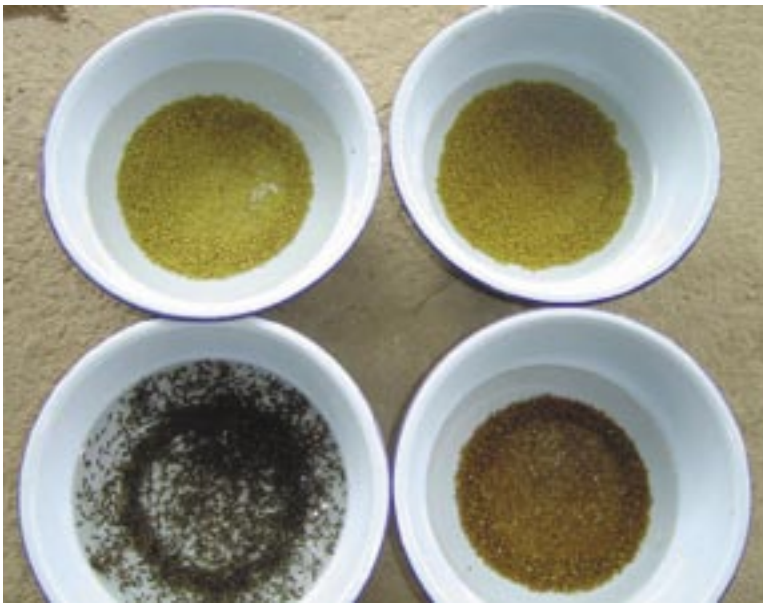

Grading of tilapia eggs and larvae prior to incubation (Viet Nam)

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FAN FAO Aquaculture Newsletter No. 34

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Melba B. Reantaso, FAO

Participants to the workshop

Development of Technical Guidelines for the Responsible Movement of Live Aquatic Animals

Dambulla, Sri Lanka, 1-4 November 2005

Melba B. Reantaso[1]

Like other farming systems, aquaculture is plagued with disease problems resulting from its intensification and commercialization. Disease is now considered as a major threat to aquaculture development impacting many aquaculture regions.

This FAO Expert Workshop was convened to prepare the Technical Guidelines on "Health Management for Responsible Movement of Live Aquatic Organisms" as part of the Technical Guideline series of FAO's Code of Conduct for Responsible Fisheries (CCRF) in order to assist countries that are in the process of developing or improving aquatic animal health programs to meet international standards (e.g. trade standards under WTO's Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and aquatic animal health standards of the World Organisation for Animal Health (OIE).

Twenty six experts on aquatic animal health who participated in the workshop were divided into 4 Working Groups (WG) and tackled the following major issues:

i. Guiding Principles and Regional and International Cooperation

ii. Risk Assessment and the Precautionary Principle for Pathogens of Concern at the National, Local Authority and Farm/Fishery Level

iii. Infrastructure for Disease Diagnosis, Surveillance and Zonation, Reporting and Emergency Response

iv. Integration of National Authority, Local Authority and Farm Management Programs

Working Group 1 expanded on Article 9 of CCRF and developed the Guiding Principles addressing movement associated with disease and pathogen transfer but not on ecological or genetic issues. The WG elaborated on the role of regional and international cooperation in providing appropriate information, advisory and guidelines, in building consensus, resolving disputes, developing harmonized risk assessment approaches and implementing practical national aquatic animal health

management stategies This WG also elaborated on the role of regional and international cooperation in providing appropriate information, advisory and guidelines, in building consensus, resolving disputes, developing harmonized risk assessment approaches and implementing practical national aquatic animal health management strategies to reduce the risk of introduction and spread of diseases.

Working Group 2 developed a scheme for incorporating the precautionary approach into risk analysis procedures when there is scientific uncertainty. Under the FAO/Sweden operational definition of a precautionary approach, a proposal to import aquatic organisms is examined, reference points are established, surveillance and monitoring programmes put in place, contingency plans such as quarantine or destruction of stocks agreed upon, and the proposal or operating procedures are modified accordingly, unless the import is flatly denied as being too risky. The precautionary approach, thus, has elements of adaptive management, i.e., feedback and modification, once it has been decided that the risk of an imported species could at least be evaluated with the species in the importing country. The WG recommended that using the term adaptive management, rather than "precautionary approach" for these latter stages of risk analysis was preferred.
Working Group 3 identified two major areas of concern with respect to aquatic animal movement:

(a) Fundamental Infrastructure - basic broad infrastructure components which need to be considered at each step in the movement of live aquatic animals: human resources, communication, proficiency/training, equipment and materials and regulatory framework; and (b) Conceptual Framework – the five steps which are common denominators in the thought process when considering the movement of live aquatic animals – risk analysis, regulatory requirements, health status of animals, transportation and deposit of aquatic animals. The WG presented options for integrating the Fundamental Infrastructure and the Conceptual Framework and mechanisms for building capacity for country's fundamental infrastructure which could range from simple and inexpensive to complicated and expensive, or anything in between where one is not necessarily better than the other, but a progressive program that will regularly review, adjust and improve the concept and the application of integration. In this manner, countries will be given ample room to identify areas for practical, possible and immediate improvement.

Working Group 4 defined the meaning of integration and described the benefits of integration and identified National Aquatic Animal Health (NAAH) Strategy and Plan as the focal action program which will identify institutional needs, responsibilities and the stakeholders who should be involved in this process; identification and description of stakeholders; and legal and institutional needs and arrangements.

The Technical Guidelines and the Workshop Report are being finalised and expected to be presented during the Third Session of COFI's Sub-Committee on Aquaculture to be held in India in September 2006.

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M. Shariff, UMP, Malaysia

Lake Dambula, Sri Lanka

Simple processing of small low value fish drying on racks. These are often staple foods for coastal communities when caught from small scale vessels

Regional Workshop on Low Value and "Trash Fish" in the Asia - Pacific region

Hanoi, Viet Nam, 7-9 June 2005

Simon Funge-Smith[1]

The Regional Workshop on Low Value and "Trash Fish" in the Asia-Pacific Region was held in Hanoi, Viet Nam, from 7 to 9 June 2005, in collaboration with regional partner organizations, namely the Australian Centre for International Agriculture Research (ACIAR), the Mekong River Commission (MRC), the Network of Aquaculture Centres in Asia-Pacific (NACA), Southeast Asian Fisheries Development Center (SEAFDEC), the WorldFish Center (WFC), and the Reversing Environmental Degradation in the South China Sea (UNEP/SCS).

The workshop reviewed the current trends and status of "trash" fish production and their utilization in the Asia Pacific region and discussed a variety of issues relating to "trash fish". Based on this background information, the workshop developed strategies to address the identified issues and designed action oriented outputs to implement the strategies, at national, sub-regional and regional levels. These outputs will be fed through to the Asia-Pacific Fishery Commission (APFIC) Session in 2006 for action.

The Asia-Pacific region dominates many aspects of world fishery production. In 2002, total production was in the magnitude of 133 million tonnes, where Asia-Pacific countries were responsible for 50 percent of capture fishery production and 89 percent of aquaculture production. The reliance of the region on fishing as a means of creating employment and providing export earnings and food security is apparent. Throughout the region, captured and cultured marine fisheries continue to play an important role in the food security, poverty

alleviation and economies of many countries. Marine fisheries resources have been largely overexploited and, as a result, development of coastal aquaculture has been encouraged to provide the protein, income, employment and export earnings for some countries. Such a policy trend implies, however, that sufficient food for aquaculture production will be available. Inevitably, a dangerous spiral has evolved where the demand for low value/trash fish has supported increased fishing pressure on already degraded resources. This raises some important questions regarding the social, economic and ecological costs and benefits of the system, its sustainability and future trends.

The marine capture fishery sector is dominated by small-scale, labour intensive vessel operations that use multiple gears to catch an extremely diverse species composition. Local markets and processing techniques are specialised and are generally geared towards the needs of the local community. Fisher folk are often considered to be among the poorest of the poor and the small fishing communities are highly dependent on fishing for their survival. This pressure seemingly fuels overexploitation and ecosystem degradation. The lack of appropriate management measures as well as conflicting short-term goals of production growth by national administrations provide further challenges to the development of sustainable fisheries in the region. The increasing importance of low value/trash fish is very influential in this regard. Low value/trash fish can be defined in many ways and important regional differences exist. For the purpose of the regional workshop, low value/trash fish is defined as: "Fish that have a low commercial value by virtue of their low quality, small size or low consumer preference. They are either used for human consumption (often processed or preserved) or used for livestock/fish, either directly or through reduction to fish meal/oil".

There is, in general, a lack of accurate information on how much low value/trash fish use is present in Asia-Pacific, but a conservative estimate is that 25 percent of the total marine capture is destined for livestock and aquaculture feed, based on the best available evidence. The uses of low value/trash fish are diverse and include:

- local consumption (e.g., fresh, dried);
- direct feed (e.g., livestock, high value species aquaculture);
- fish meal/oil production (e.g., for poultry, aquaculture); and
- value-added products (e.g., fish sauce, surimi, protein concentrates).

Several issues concerning the production and use of low value/trash fish need to be resolved in order to ensure that fisheries in Asia-Pacific contribute to the region's sustainable development. These include:

- increasing use of low value/trash fish for aquaculture and other animal feeds;
- competition between use of low value/trash fish for fish meal versus use of low value/trash fish for human food;
- sustainability of the current system;
- amount of fish that becomes trash due to poor handling and post-harvest strategies;
- growth overfishing – harvesting of juveniles of commercial species; and
- discarding of unwanted fish.

It is the continued expansion of aquaculture and its dependency on capture fisheries for low value/trash fish that is the main driver of the discussions during the workshop. The expansion is in response to stagnating marine catches worldwide, and the continued need for fish supply, employment creation and export earnings. The use of low value/trash fish as direct feed or fish meal for aquaculture is economically viable, and the increasing low value/trash fish prices reflect the fact that their supply is unable to meet the demand for fish feed. There is a general concern that the rapid expansion of aquaculture may ultimately be constrained by the dependence on low value/trash fish and fish meal, popularly referred to as the "fish meal trap". Further, if one accepts that supplies of low value/trash fish are limited and that prices are increasing, Asia-Pacific countries may need to increase imports of fish meal from the global market for the aquaculture industry, or replace them with other feed materials. The replacement of fish meal in aquaculture diets is, hence, a major international research priority. There is also an increasing conflict between the use of low value/trash fish for feed and human consumption. It has been argued that it would be more efficient and ethical to divert more of the limited supply to human food, using value-added products. Proponents of this suggest that using low value/trash fish as food for domestic consumers is more appropriate than supplying fish meal plants for an export, income oriented aquaculture industry, producing high-value commodities. On the other hand, food security can also be increased by improving the income generation abilities of poor people, and it can be argued that the large volume of people employed in both fishing and aquaculture has

a beneficial effect. The money made from low value/trash fishing is now also a main reason why many vessels continue to be economically viable and remain in fisheries. However, the increased exploitation levels of fish lower down the food chain could be important in the longer term. In fact, there is currently a lack of scientific evidence to inform fisheries managers of how sustainable the ecosystem is, and more research is needed in this regard. From a socio-economic perspective, the gains from current fishing practices are clear, but perhaps more information should also be gathered on who the main beneficiaries are, and how a change in the fishery/aquaculture relationship would impact the community and its dependents.

The role of poor handling and post-harvest in small-scale fisheries continues to play a role in the supply of low value/trash fish. Even if it were possible for fishers to adopt better practices to land a better catch, the benefits of doing so are probably outweighed by the costs of capital investments. Indeed, if prices of low value/trash fish remain high then the incentives to land better quality fish for human consumption will not be strong. The same can be argued for growth overfishing that will likely need an overall reduction of fishing effort by the fleet (at a social cost) to allow juveniles to grow to a larger size before being harvested.

One positive outcome of the current low value/trash fishing practice, however, is that, given the high level of utilisation of catches, the problem of discarding unwanted catch is rather negligible.

One obvious but important conclusion is the strong inter-dependency between capture fisheries and aquaculture, which will require more coordinated management in the future. There is still an urgent need to understand the overall system better and, although we now have an initial understanding and quantitative data to start addressing the management issues, we now need to urge the research community to take up the challenge.

Background papers presented at the workshop can be downloaded from the APFIC website: http://www.apfic.org/modules/xfsection/article.php?articleid=1 while the report of the meeting can be found at:
http://www.apfic.org/modules/mydownloads/visit.php?cid=5&lid=130
http://www.apfic.org/modules/mydownloads/visit.php?cid=5&lid=131

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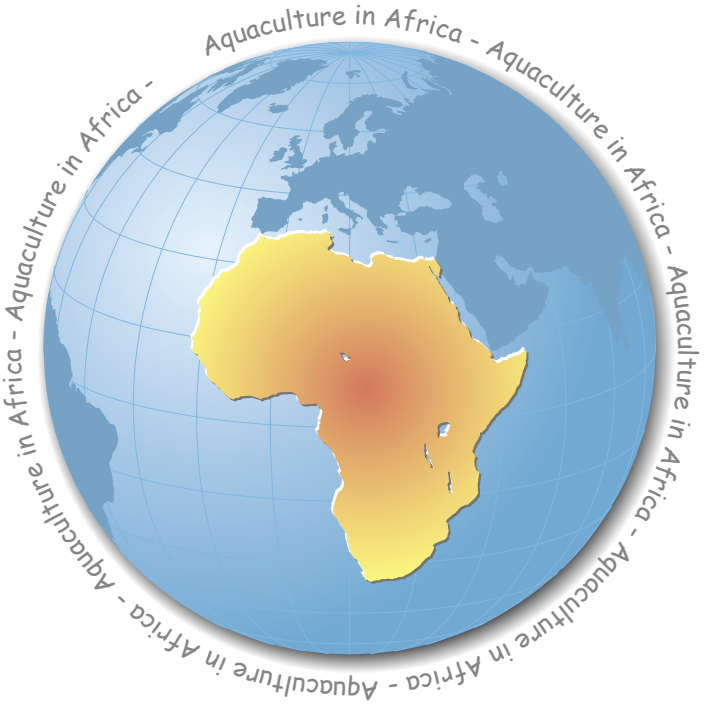
Light attracting anchovy fishing boats high quality fish is made into fish sauce and lower quality catch is directed into aquaculture



Aquaculture and Food Security in the Africa Region: the Dilemma of the Remote Rural Fish Farmer

John Moehl[1]

Aquaculture has been promoted in the Africa Region for more than four decades because of its professed positive effects on family nutrition and income. With this aim, multi- and bi-lateral donors, in collaboration with a wide variety of NGOs sponsored aquaculture, specifically fish farming. As a result of these interventions, there are now thousands of small fishponds scattered across the African landscape. These are accompanied by many testimonies that document aquaculture's positive dietary and economic impacts on smallholder integrated farmers; benefits including a ready source of high quality animal protein (often in protein deficient areas), a non-cyclical non-traditional source of cash for essential family expenses (e.g., for education, healthcare, etc.), risk reduction and diversification, improved resource use and even an enhanced professionalism among farmers leading to increases in production from the whole farming system.

These widely spread farms frequently received support from an aquaculture extensionist; a specialist who obtained his or her training through donor-funded fish culture development projects, who operated out of a donor-supported government station using transport maintained by donor resources. Commonly, these farmers adopted aquaculture for a variety of reasons, adapting the technologies to their own needs. Although they produced what was considered by most as sub-standard yields, they relied heavily on subsidised public sector support.

This scenario changed in the 1990s when there was a dramatic decrease in external support to aquaculture and, at the same time, significant efforts at national levels to tighten belts and work within shrinking budgets. Dedicated aquaculture extensionists were often molded into generalist extension services, government infrastructure was quasi-abandoned and overall public sector services became erratic. In many countries in the Region, this "transitional" austerity stage led to a new view of aquaculture where the private sector was encouraged to assume ever-increasing importance whilst Government targeted producer associations and commercial enterprises; both considered as more achievable targets as outreach programmes became less and less able to reach out.

At the same time, the scattered rural fish farmers assisted in earlier periods continued to raise some fish, but now effectively in the absence of any public assistance. Many of these isolated farmers lacked the ability to coalesce into a critical mass capable of "pulling down" scarce Government support and became solitary farmers with fishponds; fishponds that continued to be a part of their farming system and to provide some food and cash income.

While national programmes evolved to develop private hatcheries and feed mills to address the chronic constraints of poor access to high quality seed and feed, the remote rural fish farmer did not benefit from these improved inputs as he/she could not overcome the density-dependant factors that limited access to "new" aquaculture programmes, as well as the distribution of improved production inputs. These out-of-the-way fish producers had become in many ways disenfranchised actors, no longer the beneficiaries of developmental efforts. Yet, these secluded fish farmers were often numerous and, in the aggregate, produced a considerable quantity of fish for home consumption and local markets.

John Moehl, FAO

A hole in the forest or a family resource? Remote fishponds may not be well managed but they can be important sources of food for the family and even offer some fish for sale

Herein lies the dilemma of these isolated (programmatically) farmers who raise fish. How can they receive support and how can they be monitored such that their harvests are considered in national databases?

In many cases, the hard truth is that apparently they can't, at least not directly! Their principal recourse would be to form producer organisations that could lobby for necessary assistance. But, their seclusion makes this clustering difficult and, moreover, the relatively extensive technologies practised by many of these farmers mean that they have comparatively little to gain from access to improved factors of production and markets – the main benefits many producers should derive from group participation.

The best case realistic tactic within prevailing resource restraints is to try and account for (monitor) these individuals through some standardised system of sub-sampling similar to a frame survey, combining this with efforts by Government to reach these far-flung fish farmers through mass media as countries become more and more connected.

There are tens of thousands of remote rural fish farmers (or farmers with fishponds) in Africa, detached from service providers and markets; many self-reliant and enthusiastic fish raisers. Although fish may be very important in their family economy, they are by and large outside the formal structure of the sub-sector. Their isolation can lead to exclusion but national programmes need to remember this group of stakeholders, even if they are not able to provide many meaningful services.

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FAO

Sixth from left, J. Moehl (Regional Aquaculture Officer of Africa) during a recent visit to FAO HQ in Rome with FIRI Service Chief Jia Jiansan and FIRI officers

John Moehl, FAO

Private/Public Partnerships with

Lionel Awity[1], Tim Buchanan[2],
Randall E. Brummett[3], Chet Aeschliman[4],
Mulonda Kalende[5],
John Moehl[6]

Surface mining is big business in Ghana and other parts of the Africa Region where gold and other minerals are extracted by excavating surface soils to expose ore-rich layers. The mining industry is not only subject to close environmental control and monitoring during the extraction process but also during the decommissioning of mine sites when disturbed areas are reshaped and the land prepared for alternative forms of production before being returned to the State.

In nearly all cases, regardless of the post-extraction renovations undertaken, the mining process leaves in its wake a pit which usually fills with water; the size and shape of the pit along with the water overflow pattern are determined during the course of decommissioning. These flooded pits can become utilisable surface waters with areas ranging from a few to many hectares.

In planning for productive use of decommissioned pits, fisheries options were at the forefront for those sites with suitable water quality. In pits at the inactive Resolute Mine, brood fish were kept in cages for reproduction; fingerlings stocked into the pits for capture by fishers from the local communities. While these methods of fisheries exploitation proved less than ideal due to the rapid overpopulation of the waters and difficulties in catching the multitude of small tilapias, they did demonstrate that fisheries should be part of the post-mining use of facilities.

More recent examinations of the fisheries and aquaculture options have focused on the possibilities of raising fish in cages in the pits. Cage production could also be extended into the numerous surface waters that are found on mining properties.

In addition to pits and other surface waters, gold mines that use the heap/leach method have ponds which become redundant at the closure of mining operations. Teams of experts from the Ghana Ministry of Fisheries, World Fish Centre and FAO, with the support of Gold Fields Ghana are now evaluating ways of converting these ponds to fish production at the cessation of mining.

The effective conversion of surface mining sites into productive aquaculture units has wide application across the Africa Region as well as elsewhere in the world. As communities in mining areas must adapt to lower levels of economic growth with the closure of mines as ore deposits are depleted, profitable fish farming in cages and ponds offers a new source of income that can help offset the social and economic impacts of mine decommissioning.

Aerial view of part of Gold Fields Ghana facilities at Tarkwa

Tim Buchanan, GOLD FIELDS GHANA, Ltd

Decommissioned pit at Amensia (Resolute Mine) where cages are used for rearing fingerlings

Randall E. Brummett, CGIAR

Surface waters that could be put to productive use in raising caged fish

the Mining Industry in Ghana

John Moehl, FAO

Extraction ponds which have the potential to be transformed into fishponds

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Chen Jiaxin, FAO Consultant, China PR

View of the sea area in the vicinity of the Hongwon Fisheries and Maricultures Cooperative. Cooperative members attending polyculture longlines

TCP/DRK/3001

Addressing Food Security in DPR Korea through Marine Aquaculture

Alessandro Lovatelli[1]

Kim Myong Hyok[2]

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Inland Water Resources and Aquaculture Service,
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Pyongyang, DPR Korea

A medium income industrialized country, the Democratic People's Republic of Korea (DPR Korea), with a population of about 30 million, is predominantly mountainous with 15 percent of total land area utilized for agriculture. Livestock has a relatively minor contribution to food production where only 0.3 percent of landmass is used for permanent and improved pastures. Because of these limitations of arable land and livestock production, aquaculture and fisheries have played an important role in the livelihood of the North Koreans, whose rural population comprise about one third of the total population.

The Government has thus recognized the significant contribution of fisheries to the economy and food security and the potential for aquaculture to further contribute to food production both for local consumption and for export to generate additional revenues. This is particularly important for coastal dwelling population who have limited access to arable land and who derived much of their livelihood from sea-based fishing, foraging and aquaculture activities such as culture and harvest of mollusk bivalves, such as the short-necked clam (*Ruditapes philippinarum*), oysters (*Crassostrea gigas*), ark shell (*Arca inflata*) as

well as a variety of seaweed species (*Porphyra tenera*; *Gracilaria verrucosa*) including the large Japanese kelp (*Laminaria japonica*).

There has been a great decline in domestic food production since the early 1990s due to successive natural disasters and input shortages, making the production below the level for minimum subsistence. The aquaculture sector was severely affected by the lack of feeds for hatcheries and fish ponds causing aquaculture production to drop by half from 13 500 tonnes in 1994 to 7 000 tonnes in 1996. In 2001, marine aquaculture production of 444 000 tonnes mainly from *Laminaria* seaweed decreased to 300 000 tonnes in 2002.

The FAO Technical Cooperation Project "Strengthening Marine Aquaculture Development" (TCP/DRK/3001), was implemented from January 2004 to December 2005, with the Ministry of Fisheries (MoFi) as the responsible government agency for project implementation, and with the overall objective of introducing and transferring the technology of sea cucumber aquaculture, scallop spat production and kelp-scallop-sea cucumber polyculture in the north-east coast of DPR Korea.
The major outcomes of the TCP include:

(a) Establishment of sea cucumber hatchery. The hatchery in the Hongwon Fishing and Mariculture Cooperative, with a floor space of 1 550 m² is equipped with 36 spawning and juvenile rearing tanks, microalgae culture facilities, breeding equipment and laboratory facilities. The facility currently has the capacity to produce not only sea cucumber juveniles, but also kelp seedlings, scallop and ark shell spats and sea urchin spawns. One million sea cucumber juveniles and, through experimental artificial breeding, 3 million ark shell spats were produced in December 2005. Current production capacity of the hatchery includes: (a) one million sea cucumber juveniles (2–3 cm body length) sufficient to stock culture areas of the Hongwon Cooperative and with surplus production to be supplied to neighboring cooperatives; (b) enough kelp seedlings to supply a 25 hectare culture site; and (c) 3 and 5 million ark shell and scallop spats, respectively, for use in Polyculture activities.

(b) Demonstration of sea cucumber-scallop-kelp polyculture. A model sea cucumber–scallop–kelp polyculture demonstration area was established. Over 1 500 stone heaps were placed in a 1.5 hectare polyculture area to serve as habitat for sea cucumbers. Marketable sized scallops were harvested during the second year from stocking, gaining an average production of 17–20 tonnes/hectare; while 2.5–3 tonnes/hectare of sea cucumbers were harvested, and 30 tonnes of kelp produced from 5 hectares. The Hongwon Fishing and Mariculture Cooperative, who owns 500 hectares of culture area suitable to marine aquaculture, plans to utilize 50 hectares for sea cucumber–scallop–kelp polyculture, 40 hectares for sea cucumber culture and 50 hectares for ark shell and 300 hectares for scallop.

(c) Capacity building. The three technicians from the Cooperative, who were trained in neighboring China PR, will play a key role in the activities of the hatchery as well as in the polyculture work. Furthermore, 26 hatchery workers and laboratory workers from the Cooperative received hands-on training in polyculture techniques, microalgae production and artificial breeding of sea cucumber.

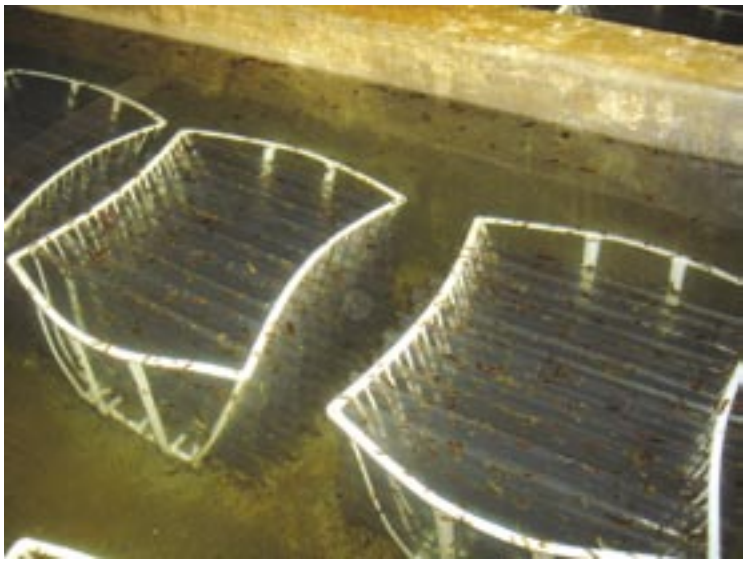
(d) National strategy for promotion of artificial breeding and polyculture. The Hongwon Fishing and Mariculture Cooperative has been designated as the main extension and training centre for production of sea cucumber juveniles and scallop

Alessandro Lovatelli, FAO

Broodstock of the Apotichopus japonicus maintained in the hatchery prior to spawning induction

Chen Jiaxin, FAO Consultant, China PR

Internal view of the small Hongwon Fisheries and Mariculture Cooperative multipurpose hatchery showing purposely built trays containing sea cucumber juveniles



Alessandro Lovatelli, FAO

Juvenile Seacucumber on specifically designed trays

and ark shell spats thanks to the technical expertise acquired and facilities available. For dissemination of knowledge acquired to other fishing and mariculture cooperatives, the Government has plans of establishing model centres of 5 hectares each in Samho Fishing and Mariculture Cooperative for a sea cucumber–kelp polyculture model and Lyongdae Marine Aquaculture Cooperative for a sea cucumber–sea urchin–kelp polyculture model.

Conclusion

A total of 350 cooperative members of the Hongwon Fishing and Mariculture Cooperative benefited directly from the project implementation. This project was designed as a technical transfer project with wide ranging opportunities for Korea DPR to improve aquaculture production. The benefits of the project will be full felt as the techniques introduced are fully developed and tested. It is essential that follow-up actions of the government are implemented to ensure the wider dissemination of the learning experiences acquired from TCP/DRK/3001.

On the occasion of the "World Food Day", many officials from the Government and provincial authorities visited Hongwon Fishing and Mariculture Cooperative and congratulated its members for the progress made in the area of science-based marine polyculture system.

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TCP/RAS/2908 Poverty Alleviation through Improved Aquatic Resources Management in Asia-Pacific

Graham Haylor[1], Paul Bulcock[2] and Simon Funge-Smith[3]

FAO PROVIDES CATALYTIC SUPPORT TO REGIONAL INITIATIVE

The recent FAO Technical Co-operation Program project (TCP/RAS/2908) entitled "Poverty Alleviation through Improved Aquatic Resources Management in Asia" has provided catalytic support to participating member countries and the Network of Aquaculture Centres in Asia-Pacific (NACA), to better provide to its members the "rural development support" which forms an important part of the role of NACA and of fisheries line agencies around Asia-Pacific.

In early 2001, fifteen Asian governments – all NACA member countries – requested FAO for assistance to build on the FAO Code of Conduct for Responsible Fisheries (CCRF), and its call for action towards responsible aquatic resources management, and the World Food Summit declaration about the potential contribution of aquaculture and aquatic resources to poverty alleviation and food security.

Through these requests, the governments of the region sought better documentation of lessons learned, more opportunities for dialogue and mutual learning, better dissemination and coordinated efforts to inform policy-makers. At the time, in collaboration with UK's Department for International Development (DFID) and Volunteer Service Organization (VSO), FAO and Australian Agency for International Development (AusAID), NACA were already in the process of developing a vehicle to deliver this, called the "Support to Regional Aquatic Resources Management" (STREAM) Initiative, and preliminary activities had already started in some member countries. The request to FAO was intended to enable more NACA member countries to become involved in the activities of the STREAM Initiative. The commencement of STREAM and the catalytic FAO support through the TCP were timely since 2004 was the "International Year of Freshwater" and attention was being focused on availability and use of freshwater, irrigation and sanitation.

STREAM

Livelihoods capacity building workshop in Rangoon, Myanmar, May 2004

FOCUSING ON LIVELIHOODS APPROACHES, STRENGTHENING INSTITUTIONS, INFORMING POLICY, AND COMMUNICATIONS TO ADDRESS THE ISSUES OF POVERTY AND AQUATIC RESOURCE USERS

With FAO support, NACA, through its STREAM Initiative and rural development focus, is building capacity to support aquaculture and living aquatic resources for rural livelihoods of poor people in the region, and to identify ways to expand the potential of improved aquaculture and aquatic resources management for poverty alleviation and food security, under four themes:

- *Livelihoods* – highlighting the value of livelihoods approaches, promoting their adoption and building skills for their implementation
- *Institutions* – supporting institutions to work towards poverty alleviation, developing local-level institutional models to better service the objectives of rural farmers and fishers
- *Policy development* – encouraging the development of policies that respond to the needs and support the objectives of farmers and fishers who are poor, including investigating approaches to giving poor people a voice in policy development processes, and
- *Communications* – improving the sharing of better practices appropriate to poor people in rural areas

Catalyzed by the TCP, these four themes are being taken up in a range of countries, including Cambodia, India, Indonesia, Iran, Lao PDR, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Viet Nam and China P.R.

Bringing the issues of aquatic resource users into focus and strengthening in-country capacity to recognize and deal with them

Through this TCP, activities have begun to assist governments in identifying and answering the needs of poor people with the aim of improving their livelihoods. A network of multilingual Communications Hub Managers has been established, linking national stakeholders, service providers and farmers, so far in 12 countries. New communications vehicles (e.g., netmeetings) and local-language media (including drama, video documentaries, and Better-Practice Guidelines) have been developed and shared through this multilingual network.

The Initiative has, through capacity building, worked to promote greater understanding of livelihoods approaches, and facilitated institutional development and policy change in support of farmers and fishers who are poor. Livelihoods teams have been trained in Cambodia, India, Indonesia, Lao PDR, Myanmar, Philippines, Sri Lanka, Viet Nam and China P.R.. Innovative livelihoods approaches have been developed with and shared among NGOs, government departments, international organizations [e.g., the European Union (EU)], sub-regional organizations [e.g., Asia-Pacific Economic Cooperation (APEC) and Mekong River Commission MRC)], national development projects, federations of Self-Help Groups, and donors such as DFID and the German Agency for Technical Cooperation (GTZ).

The STREAM Initiative has already contributed to important legal and policy changes, including, through a change in the law by the government of Cambodia, decriminalizing poor, often landless fishers who can now legally sell their small fish catches in support of their livelihoods. In India, Self-Help Groups are now encouraged by the government to bid for leases to raise fish in local water bodies and can now avail of longer lease periods, allowing them to conserve and manage their assets over a longer timeframe, making aquaculture more profitable and more attractive.

Through complementary low-resolution (for people with limited connectivity) web-based and people-based networks, the NACA-STREAM Initiative has reached hundreds of thousands of stakeholders, including farmers and policy-makers, developing approaches to working across languages and cultures, and is increasingly engaged in work on needs analysis (communication and information needs especially).

A regional partnership that draws on respective strengths

FAO and NACA have united in the STREAM Initiative to facilitate governments in their efforts to support poor people's livelihoods, through improved communications and by influencing institutions and policy development to better support the needs of poor people who are involved with fishing and small-scale fish farming. At the culmination of the TCP, a "Framework for a Pro-Poor Regional Strategy on Sustainable Aquatic Resources Management in Asia-Pacific" was agreed by all stakeholders and endorsed by the NACA Governing Council at its 16th Meeting in Los Baños, Philippines in March 2005. In addition to promoting the use of livelihoods approaches, the Framework also mandated the STREAM Initiative to continue to support governments in learning and communications around livelihoods and poverty alleviation until 2010.

What has emerged strongly from the TCP is an effective partnership between a modern multilingual, livelihoods-focused network which is effective on the ground and an international organization with the will and remit to support development and promote food security in this way.

STREAM

Philippines Livelihoods capacity building workshop, June 2003

NACA, through the STREAM Initiative, is already finding utility in the ongoing work of FAO, supporting learning about co-management approaches in Cambodia and the Philippines (through the compilation of two system requirements reports on data collection and sharing mechanisms in fisheries co-management for national management institutions); identifying livelihoods needs of tsunami-affected communities in Sri Lanka (through the "Integrated Program for the Rehabilitation of the Fishery Sector in the Tsunami-affected Districts of Hambantota, Ampara and Batticaloa" [OSRO/SRL/505/ITA]); and facilitating consultations with community-based stakeholders in defining a new fisheries policy in Pakistan (through "Support to Fisheries Sector Policy and Strategy Formulation" [TCP/PAK/3005(A)]).

If you wish to know more, or see a role for the NACA-STREAM Initiative in your work, go to www.streaminitiative.org and let's continue to support poverty alleviation through improved aquatic resources management in Asia-Pacific.

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TCP/BRA/0065

Small-scale seaweed farming in North East Brazil

Amedeo Freddi[1] and José Aguilar-Manjarrez[2]

The poor living conditions of the coastal communities have been a constant matter of concern for the Brazilian governments during the last decades. These communities appear to be particularly isolated along the North east coast. In addition, the area has witnessed a strong migration of inland populations towards the coast, caused by the decline of the main crops (cotton, cacao and sugar cane) in the agriculture sector. These migrants brought about a dramatic increase of the number of artisanal fishers that resulted in an increased fishing effort that proved to be unsustainable for most of the stocks.

Since the eighties, the FAO has promoted in Brazil several projects in favour of small scale aquaculture development as a way of generating a significant growth of local production opportunities for coastal communities, at the same time privileging eco-friendly and sustainable practices and favouring the preservation of the natural resources. In the mid–eighties, the FAO executed a Regional Project AQUILA which started Technical Cooperation among Developing Countries (TCDC) projects on coastal lagoon management, seaweed cultivation and molluscs farming. Together with another FAO executed project "Martim Pescador", these two projects concurred to catalyze the impressive development of mussels farming in the state of Santa Catarina at the beginning of the nineties, resulting in a small scale industry which progressively reached a global production of 12 000 tons/year. In 1998, FAO proposed through a TCP project the idea of a Unilateral Trust Fund (UTF) project in support of aquaculture development which widely included small scale marine aquaculture programmes, shrimp farming in pens and small cages, support and diversification of mollusc farming and seaweed cultivation. Unfortunately, although parts of the ideas were included in the programmes of the production chains adopted by the federal administrations, the attention was mainly focussed on strengthening of the oceanic fishery and the project was not implemented.

In 2001, after the conclusion of the "Martim Pescador" project, the Brazilian government started an FAO Technical Cooperation Project (TCP/BRA/0065) for the development of seaweed cultivation this time for costal communities of three States of the North East Region, Ceará, Rio Grande del Norte and Paraiba. The counterpart institution was the Brazilian Cooperative Organization (OCB) in collaboration with the Ministry of Agriculture. The design of this project followed the criteria of previous FAO interventions addressing the development of poor coastal communities through the introduction of simple aquaculture practices within their immediate reach. This intervention in the northeast was justified by the presence in Paraiba of a seaweed processing industry (Agar Brasileiro Ltd.) which utilised seaweed collected from the natural banks principally by women of the coastal communities of the northeast region. Many of these banks were already overexploited and the introduction of seaweed farming represented a way of preserving and increasing this source of income for the local population and, at the same time protecting the natural seaweed banks. The scope of the project was to test farming techniques in pilot communities, verify the technical and financial feasibility of the packages, and at the same time promote the associative work among the producers, monitor the social impact of the introduction of this new techniques, and favour the establishment of an institutional framework for the future coordination/support of the development of this new production sector. The project also conducted a marketing analysis for seaweed derived products in Brazil and evaluate the potential for expansion in the three Northeast states involved.

The first phase of the TCP project concluded in June 2003 after showing the technical and financial feasibility of longline culture of *Gracilaria* sp, training fishers in farming practices and establishing some associations of producers, concluding a market analysis and the preparation of a marketing strategy for seaweed derived products and identifying new areas and communities in the three states for further expansion of this practice. The project showed that the technicalities of seaweed cultivation are easily and quickly learned by the members of the communities and that seaweed farming can be a very significant source of income in particular for the poorer segments of the coastal fishing population. The farmed product has been of excellent quality resulting

in a five fold increase in the prices paid by the processing industries versus the dry seaweed collected from natural banks of from the beaches. However, the project also showed that special efforts had still to be addressed towards the organization and management of the new fisher associations, as a first step towards the eventual establishment of cooperatives. In addition, it showed the difficulty to organize the fishers to work in groups so to develop the necessary routine to keep the production constant during the year and then progressively increase it. After the first phase, a second and final phase was approved to conclude mainly the training activities and to discuss and prepare a UTF[3] project with the Brazilian government as a follow-up to continue the development initiated under the TCP.

The new UTF project is entitled "Coastal Communities Development (UTF/BRA/066/BRA)". It is a five year project with a budget of $US 5 million that will start in April 2006. It has been conceived as a multi-state intervention for northeast Brazil, similar to the design of the initial TCP project whose objective, in fact, was to verify the feasibility of seaweed cultivation by developing pilot projects in the three states selected and then, on the basis of the results, expand eventually the activity to other areas and communities in the same states and to the other states of the North-East Region.

The main goal of the project would be to reduce poverty in coastal communities and to ensure a more sustainable utilization of marine resources through: (a) the introduction and expansion of economically viable and simple mariculture techniques, and (b) the involvement of the communities in co-management of the resources.

There are four immediate objectives in this new UTF project:

1. Consolidation of the *Gracilaria* seaweed culture in the communities involved in the TCP project in Ceará, Rio Grande del Norte and Paraiba and expansion of this type of farming to other communities in the same states and in other states participating in this project. This consolidation of *Gracilaria* farming would also involve the consolidation of marketing of *Gracilaria* derived products and the necessary research elements, as well as the eventual development of producers associations into cooperatives with particular attention to the insertion of women in production and organization activities.

2. Diversification of mariculture production by introduction of simple farming of other organisms in the area of the project. The purpose is to build up on the longline techniques introduced in the states and to use other simple techniques (i.e., bottom lines) to diversify production to enlarge the market prospects for the coastal communities. Important aspects like eventual seed production should also be considered in this mariculture diversification objective. Elements related to research, site identification and marketing analysis will be part of the objective.

3. Development of pilot projects on co-management of marine resources involving the coastal communities with experience in cooperative work and mariculture. The scope of this objective is to promote a more sustainable use of the costal natural resources and the permanent monitoring of their state of health while at the same time raising awareness and training communities on sustainable use of renewable resources and their conservation, promoting the creation of associations to allow a better organization of the work, promoting a better collaboration of the coastal population with the institutions in charge of monitoring, and preservation of the resource. Amongst communities involved in seaweed farming or other mariculture activities, the project will select three of them to establish three pilot projects on alternative economic activities based on new forms of employment such as eco-tourism, diving centers, learning fishing ("pesca-conosco"), or new sustainable forms of artisanal fishery.

4. Establishment and organization of inter-institutional committees, both at federal level and in each one of the participating States, in order to create a permanent inter-institutional framework, through mariculture development, to decrease poverty rates in coastal communities The creation of the inter-institutional set-up would optimise the integration of specific institutional competences and favour the sharing of experience throughout the Region and could be a model for future expansion of this approach throughout the country.

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[3]Technical assistance projects financed by the recipient countries themselves from their own national resources or from loans, credits and grants made by International Financing Institutions, are called Unilateral Trust Funds (UTF) at http://www.fao.org/tc/tca/trust_en.asp

Evaluation of the National Fisheries Institute (INP) in Mexico

J. González de la Rocha[1] and J. Aguilar-Manjarrez[2]

One of FAO's primary roles is to provide technical assistance to their member countries in various areas. The present evaluation was a request for technical assistance by the Secretary of Agriculture, Animal Production, Rural Development, Fisheries and Food (SAGARPA) in Mexico to evaluate its National Fisheries Institute (INP).

In April 2004, SAGARPA consulted with FAO if the organization can conduct an evaluation of the INP. The Mexican government has had fruitful cooperation with FAO in fisheries related matters in the past, and has benefited from positive experiences in various technical assistance projects executed by FAO, amongst which of most importance/relevance are the results of a previous evaluation of the INP carried out by FAO (Csirke, Gumy and DeBoer, 1991)[3]. As a consequence of these consultations, it was determined that the most adequate mechanism for the new and present evaluation was to include it as part of the national evaluations already taking place as part of the activities of the project SAGARPA-FAO UTF/MEX/053/MEX "Evaluación de Alianza para el Campo".

In December 2004, the Mexican government finalized its formal request for FAO's technical assistance for the evaluation and strengthening of the INP.

The present evaluation of the INP was completed by FAO/FI in September 2005. The main recommendation was to convert INP from a detached entity of SAGARPA into a decentralized institution with its own autonomy and budget. The results of the evaluation were presented during meetings held in June 2005 by the FAO/FI multidisciplinary mission in collaboration with the Mexican counterpart headed by Mr Usabiaga, former Secretary of SAGARPA in Mexico and the fisheries community of the country. The representatives of the social sector (fisheries cooperatives) and CANAINPESCA (Chamber of the Fisheries Industry) who attended one of the meetings, while expressing their satisfaction for the high quality of the evaluation and the recommendations for improving the INP, also suggested that an evaluation of the entire fisheries sector be undertaken as soon as possible by FAO (as was done for the INP). It was mentioned that, if formally requested, the FAO would be prepared to undertake such an evaluation. It was also mentioned that the mechanism used in the case of the evaluation of the INP could be used (that is the SAGARPA-UTF Project "Evaluation of Alianza para el Campo"). The representatives of the two sectors were further adviced that their request has to be submitted to SAGARPA-CONAPESCA at the first instance, who if in agreement would then make the request to FAO through the FAO Representation in Mexico.

During a meeting with the Mexican Delegation participating at the 33rd Sessions of the FAO Conference, Mr Francisco Mayorga Castañeda (current Secretary of SAGARPA) and Mr Ramón Corral Ávila, National Fisheries Commissioner of CONAPESCA (National Commission on Aquaculture and Fisheries) commented that the evaluation of the entire fisheries sector is a major exercise that will require more inputs, efforts and funds than those required for the evaluation of the INP. Therefore, while agreeing on the importance of undertaking an evaluation of the whole sector as suggested, there is a need to first identify a proper source of funding for an exercise of that scale, and will report on the efforts that will be made in this direction.

The evaluation report is cited as: J. Csirke, A. Gumy, J. Lleonart, J. González de la Rocha, J.C. Seijo, E. Sosa y F.J. Martínez Cordero. 2005. Informe de la Evaluación para el Fortalecimiento del Instituto Nacional de la Pesca de México. Proyecto UTF/MEX/053/MEX. FAO, Rome. 47pp. (available at: http://www.inp.sagarpa.gob.mx/Nuevos/evaluacionINP/informefinal.pdf).

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[3]Csirke, J., Gumy, A. y de Boer, E.J. 1991. La estructura y funcionamiento del Instituto Nacional de la Pesca. FAO, Informe de Pesca no. 91/6: 55 pp.

Eighth Annual Meeting of the SIPAM[1] Network

Split, Croatia, 21-23 June 2005

The Eighth Annual Meeting of the Information System for the Promotion of Aquaculture in the Mediterranean (SIPAM) of the General Fisheries Commission for the Mediterranean (GFCM) Committee on Aquaculture (CAQ) was held in Split, Croatia, from 21 to 23 June 2005. The Meeting was organized and hosted by the Institute of Oceanography and Fisheries, the Croatian National SIPAM Centre. It was attended by the National Coordinators of eleven countries and officers from the SIPAM Regional Centre, FAO and the GFCM Secretariat. The full report of this meeting is available on the GFCM web site at http://www.fao.org/fi/body/rfb/GFCM/gfcm_home.htm as an information document (see GFCM/XXX/2006/Inf.13).

During the meeting the importance of timely and reliable aquaculture statistics and information was recognized as a priority for the development of the aquaculture sector in the region. The role played by SIPAM in this regard was fully acknowledged by the participants. A project proposal describing possible ways of revitalizing SIPAM in order to meet new requirements expected from the GFCM and the private sector was presented by the Secretariat.

It was agreed that the conceptual and system-development tasks will be carried out under the full responsibility of the Mediterranean Fishery Statistics and Information System (MedFisis) project. Its staff and a recruited Information and Communications Expert in close collaboration with the GFCM Secretariat and the SIPAM Regional Office, and in consultation with selected SIPAM Member country experts, will re-design, supervise and implement the new information system. The databases, the portal and its potentialities will be reshaped according to new required functionality.

The FAO, the GFCM Secretariat and the SIPAM Regional Centre are grateful to all the participants, and the host country, for their contributions to a fruitful meeting, and wish all participants encouragement to continue cooperation for the improvement of the SIPAM Network.

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Participants attending the Third Session of the Commission (RECOFI)

Third Session of the Regional Commission for Fisheries (RECOFI)

Doha, Qatar, 9 - 11 May 2005

Alessandro Lovatelli[1]

The Third Session of the Regional Commission for Fisheries (RECOFI) was held in Doha, State of Qatar, from 9 to 11 May 2005. All eight member countries were represented in this session as well as observers from the Gulf Cooperation Council (GCC), the United Nations Environment Programme (UNEP) and the WorldFish Center. The Commission reviewed the activities that have taken place during the intersessional period, in particular those related to the implementation of the recommendations of the Second Session as well as meetings of the RECOFI Working Group on Aquaculture (WGA). The Commission adopted its programme of work and budget as well as a number of decisions and recommendations on several issues, including those related to aquaculture in the RECOFI area.

The Secretariat presented a summary of the status of aquaculture in the RECOFI Member countries. The total aquaculture output in 2003 was estimated at around 108 000 tonnes representing an increase exceeding 28 percent from the 1999 total of approximately 40 000 tonnes. Such growth was also visible in terms of a steady increase in the production share coming from aquaculture in relation to the total annual output of the whole industry. It was noted that total production from capture fisheries had grown at a much lower rate over the last decade.

Inland aquaculture currently accounts for over 80 percent of the total aquaculture production with four carp species accounting for 58 percent of the total production in 2003. However, mariculture was the fastest growing sector making up for nearly 20 percent of the production in 2003. The majority of this consisted of Indian white shrimp (*Penaeus indicus*) with Saudi Arabia (9 160 tonnes) and the Islamic Republic of Iran (7 462 tonnes) as the major producers. Commercial-scale production of the exotic Gilthead seabream (*Sparus aurata*) and the native Sobaity seabream (*Sparidentex hasta*) have increased in recent years with more countries in the Region reporting production.

During the Session, the Secretariat presented a document on the progress made with regards to the establishment of the RECOFI Aquaculture Information System (RAIS). The development of a regional information system had been requested by the Member countries during the Second Session of the Commission in response to the rapid development of aquaculture in the Region. At the same meeting, the

Government of Kuwait expressed their strong interest in hosting the RAIS Regional Centre and subsequently confirmed that they would provide the necessary funds to develop the system through the FAO Fisheries Department. A prototype of the system has since been developed and was presented to the RECOFI WGA Focal Points during their second meeting held in Muscat, Oman, from 28–30 November 2005. The RAIS will be developed as soon as the funds are made available.

In relation to its aquaculture initiatives, a regional project proposal to strengthen the legal and policy framework for aquaculture in the RECOFI Member countries was also presented at the Session. The project proposal preparatory mission took place from 13 to 26 March 2005. The mission visited Bahrain, Oman and Saudi Arabia. The main objective of the project is to strengthen the policy, institutional and legal framework for aquaculture in the RECOFI Member countries in order to increase the contribution of the sector to the economy and food security, and to develop and manage the sector in a sustainable manner. The final project proposal was further discussed at the second meeting of the RECOFI WGA. FAO reiterated its commitment to cooperate and to provide technical support to the implementation of this activity.

Among other activities discussed were: (i) the concern of several Member countries over the introduction of exotic species by individual countries which could impact the entire region, and (ii) the need to further discuss issues related to marine stock enhancement and artificial reefs.

Further details and copies of the report (FAO Regional Office for the Near East. Report of the third session of the Regional Commission for Fisheries, 2005. Doha, Qatar, 9–11 May 2005. *FAO Fisheries Report.* No. 783. Rome, FAO. 18p. (Bilingual version English/Arabic) can be obtained by writing to:

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FAO Fisheries Department, Rome

Alessandro Lovatelli, FAO

Representatives of the RECOFI Secretariat and RECOFI Working Group on Aquaculture (From left: Mr A. Lovatelli – FAO, Rome; Mr D. Suleiman Al-Yahyai – WGA Focal Point in Oman; Mr V. Crespi – FAO, Rome; Mr A.R.J. Shams – WGA Focal Point in Bahrain)

Alessandro Lovatelli, FAO

Fresh brown spotted grouper (Epinephelus tauvina) *on sale at the central fish market in Doha, Qatar*

FAO World Food Day Model Farmer 2005 from Vanuatu

FAO Sub-Regional Office for the Pacific Islands

Although the nation hosts an abundance of resources conducive to aquaculture, there is no tradition of aquaculture in Vanuatu. In the last few decades, Vanuatu fisheries has been involved in researching and developing several potential aquaculture species such as giant clams, trochus, green snails, and *Kappaphycus* seaweed, with limited success. Commercial aquaculture ventures in Vanuatu have only recently emerged, mainly Mriven by interests from the private sector.

Mr Felix Nguyen, Senior Fisheries Officer of Vanuatu's Department of Fisheries, was awarded the FAO World Food Day Medal 2005, as the model farmer during the World Food Day celebration held at the FAO Regional Office for Asia and the Pacific in Bangkok, Thailand, in 17 October 2005. He has been working with the Department of Fisheries since 1986 and has been involved in several aquaculture research projects.

Following the FAO study in November 2003, on the potential of farming tilapia (*Oreochromis niloticus*) and freshwater prawns (*Macrobrachium rosenbergii)* in Vanuatu, and with assistance from the Secretariat of the Pacific Community, Mr Nguyen started a freshwater aquaculture demonstration farm in Erapo in 2004. The farm consists of two ponds, 1000 m^2 each. Tilapia fry (GIFT - Genetically Improved Farmed Tilapia – *Oreochromis niloticus*) was imported from Fiji, and successfully grown to maturity. At harvest, fish sizes ranged between 400 – 800 g. Some fish retained as broodstock now weigh well over 1,000 g. Tilapia was well received by local consumers who are very eagerly waiting for the next harvest, expected later in December 2005.

Declining marine fish supplies, occurrences of ciguatera poisoning in reef fish and increasing fish retail prices are necessitating the need to find alternatives. Aquacultured fish such as tilapia is expected to serve as a safer and cheaper alternative, particularly for inland communities. The retail price of tilapia in Vanuatu is expected to be around U$5.00 per kilogram.

There is an immense interest by many ni-Vanuatu to embark on tilapia as well as freshwater prawn aquaculture, however, the current impediment is non-availability of feed. Mr Nyugen now prepares his own feed from locally available materials using a small kava grinding machine. At this stage, the feeding requirements of the fish at the demonstration farms are sufficently supplied; however, in order to cater for more tilapia farms, there is a need for a larger feed preparation and production plant. Funding and technical assistance is being sought in this area, and it is hoped that by overcoming this limitation, many ni-Vanuatu will venture into freshwater aquaculture activities.

FAO congratulates Mr Nguyen for his hard efforts in initiating freshwater aquaculture activities in Vanuatu, and his contributions towards building sustainable livelihoods and food security for rural communities living on the remote islands of Vanuatu.

FAO Regional Office for Asia and The Pacific

FAO World Food Day Acelebration - Award Ceremony in Bangkok, Thailand (2nd from left: Mr He, Assistant Director-General of FAO and Regional Representative of the FAO Regional Office for the Asia and the Pacific, 3rd from left: Mr Nguyen, middle: Her Royal Highness Maha Chakri Sivindhorn)

Fisheries Department receives "Professor Kazimierz Demel Medal" from Poland's Sea Fisheries Institute

P. Komorowski, SEA FISHERIES INSTITUTE

From left: Mr Tomasz Linkowski, Director of the Sea Fisheries Institute, FAO ADG Mr Nomura, J. Pilarczyk, Minister for Agriculture and Rural Development during the award ceremony held on 12 October 2005 at the Sea Fisheries Institute in Gdynia, Poland

The FAO's Fisheries Department was presented with the "Professor Kazimierz Demel Medal" in recognition of its contributions to fisheries science by Poland's oldest and leading marine science center, the Sea Fisheries Institute (SFI), on 12 October 2005, at a ceremony held in Gdynia, Poland. The award ceremony was attended by Mr Jerzy Pilarczyk (Minister for Agriculture and Rural Development), Mr Wojciech Szczurek (President of Gdynia), Professor Marcin Weslanski (Chairman of the Scientific Council), Mr Tomasz Linkowski (Director of the Sea Fisheries Institute) and about 50 guests. Mr Steve Karnicki (Deputy Director of the Sea Fisheries Institute and former Director of FIP) was also present.

The award is the highest Polish distinction granted to organizations and individuals both of Polish and foreign origin, for outstanding scientific and organizational research achievements in the fields of biology, ecology and fisheries sciences as well as achievements in popularizing knowledge of the sea.

The FAO was selected for this illustrious award in light of its "consistent promotion of responsible fisheries and inestimable contribution to the development of fishery sciences in the world," according to Poland's Minister of Agriculture, J. Jerzy Pilarczyk.

"FAO is deeply honoured to have our work on fisheries science and responsible fisheries recognized by receiving this prestigious medal," said FAO's Assistant Director General for Fisheries, in remarks made at the award ceremony. ADG Nomura also gave a brief presentation on the state of world fisheries and aquaculture.

The SFI in Gdynia, Poland started way back in June 1921 when the Sea Fisheries Laboratory was established in Hel for the purpose of conducting research in hydrology and marine biology. From late 1938 to present, the SFI has been located in Gdynia and has occupied its new headquarters since 1991. Supervised by the Ministry of Agriculture and Rural Development, the SFI conducts research in the area of fisheries biology, fisheries oceanography and marine ecology, fish processing and fisheries economics. The Ministry of Education and Science (MES) provides primary funding for the institute's statutory activities; and additional funding are provided by other sources such as MSIT and European Union research grants, research and development projects and summary evaluations contracted by MES, scientific services provided to Polish and foreign institues and firms and commercial contracts.

More information about the institute can be found at:

http://www.sfi.gdynia.pl/inst/inst.php

FAO/NACA Publication appreciated in Guayaguil Jail, Ecuador

Below are two correspondences from Ms Monica Ramirez of Concepto Azul requesting for and upon receipt of the FAO/NACA publication - Asia Diagnostic Guide to Aquatic Animal Diseases – FAO Fisheries Technical Paper 402/2, 2001.

Editor's Note:
This publication resulted from FAO's TCP/RAS/6714 (A) and 9065 (A) "Assistance for the Responsible Movement of Live of Aquatic Animals", a regional project launched in 1998, participated by 21 countries in Asia and implemented by NACA. This publication ranks No. 1 as the most downloaded document from the publication page of the NACA website – http://www.enaca.org

15 November 2005

Dear Mr Subasinghe,

In Guayaquil, Ecuador, we are a group of biologists who are working in the field of biotechnology for the development of sustainable aquaculture. We are now starting a few social projects with coastal communities and particularly another one with the Guayaquil jail.

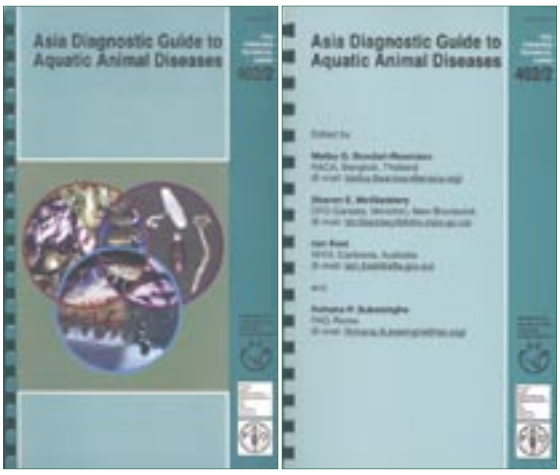
We have been teaching biology and aquaculture to a group of 40 prisoners who are very motivated in carrying on this theoretical and practical course. We are now carrying out experimentations on the culture and pathology of native freshwater fishes inside the jail.

We are very interested in the FAO Aquaculture initiatives and documentations. Could you please send us a copy of your following publication (printed version)? Please send it to our address mentioned at the bottom of this message.

Ref: Asia Diagnostic Guide to Aquatic Animal Diseases.
Bondad-Reantaso Melba G., McGladdery Sharon E., Iain East and Rohana P. Subasinghe (Eds). FAO and NACA,(2001)

Thank you very much for your interest in our project.

Sincerely yours,
Monica Ramirez



1 December 2005

Dear Mr Subasinghe,

What a great surprise! Many thanks for your collaboration with your book "Asia Diagnostic Guide to Aquatic Animal Diseases" and for your moral help. This guide is such a valuable tool.

Our jailer students keep motivated with our program in aquaculture in spite of a few difficulties at the Guayaquil jail such as strikes and water starvation. We are carrying on courses in biology and aquaculture. The men have begun culture experimentations of native freshwater fishes. We are also starting to study fish pathology and to carry out experimental infections. We are planning to work on molecular diagnostic, together with the women jailers who have implemented a small laboratory of molecular biology.

3 weeks ago, the men and the women jailers organized an "open house" in order to present their projects. They prepared posters on microbiology, the cell, DNA extraction, PCR and also fishes. They were proud to explain what they had learnt. You can have a look at the 3 pictures that I am enclosing.

I hope that I could give you good news about the advances of those projects. On behalf of our students, thank you very much for your collaboration.

Best regards,
Monica

Concepto Azul
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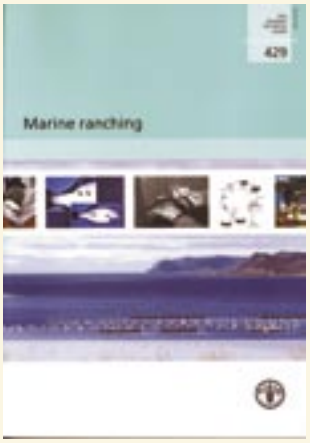
Cdla. Vernaza Norte
Mz 10, villa 34
Guayaquil - ECUADOR

Telfax: (+593) 42 284 066
Tel.: (+593) 42 284 615
concepto@gye.satnet.net

A public corporation in Ecuador, *Concepto Azul* specializes in modern biotechnology using molecular biology and genetic engineering for the sustainable development of aquaculture and agriculture. Concepto Azul counts on a group of scientists at the levels of PhDs, Masters, specialists, biologists and technicians. This organization maintains technical and scientific consultancies in the field of pathology, epidemiology, immunology and genetics with different public and private institutions, local and foreign. It has also gained international recognition, particularly in programmes for the prevention of diseases and genetic improvement of shrimp with Panama-nian, Brasilian and Peruvian companies.

More information about Concepto Azul can be found at:
http://www.uees.edu.ec/bio/htm/azul.htm

Bartley, D.M. & Leber, K.M. (eds). 2004. Marine ranching. *FAO Fisheries Technical Paper.* No. 429. Rome, FAO. 213p.



With coastal fisheries in decline around the world, there is mounting concern about how long current sources of seafood can supply world needs. Governments, resource managers and those who make their livelihood from fishing are seeking better ways to improve fishing yields. Many seek greater emphasis on restocking and aquaculture-based stock enhancement as a way of rapidly replenishing depleted fish stocks and increasing fishery landings. This volume presents case studies that represent various scenarios and situations that use sea ranching and marine hatchery enhancement to generate income, re-establish fisheries and conserve aquatic biodiversity. The case studies include an integrated development programme for marine stocking in Norway; stock enhancement of barramundi in Australia for recreational fisheries; restocking sea cucumbers in Pacific Islands; sturgeon stocking programmes in the Caspian Sea with an emphasis on Iran; and an assessment of stocking effectiveness of flounder in Miyako Bay, Japan, through a fish market census. The studies demonstrate that stocking can clearly work in some cases to increase fishery landings, but that economic success will depend on many factors such as the management system, survival rates, culture costs and how the resource is valued.

Sea ranching technologies and strategies need more scientific development before stocking can be generally accepted as an economically effective fishery management tool in coastal regions.

For more information please contact:
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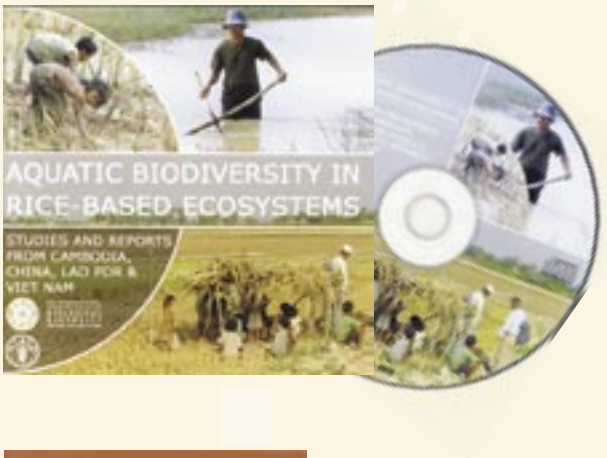
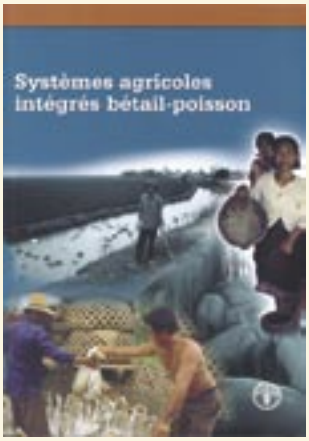
Halwart, M. & Bartley, D. (eds). 2005. Aquatic biodiversity in rice-based ecosystems. Studies and reports from Cambodia, China, Lao People's Democratic Republic and Viet Nam. (CD-ROM). Rome, FAO.

This CD-ROM illustrates the vital role that aquatic biodiversity from rice-based ecosystems plays for the livelihoods of rural people in southeast Asia. It contains the findings of five case studies on the availability and use of aquatic biodiversity as well as local management arrangements from Cambodia, China, the Lao People's Democratic Republic (Lao PDR), and Viet Nam. The rich variety of utilized aquatic species (fishes, reptiles, amphibians, crustaceans, molluscs, insects and plants) collected by farmers in their rice field is presented together with information on traditional practices and local knowledge regarding collection tools and methods, species availability, consumption preference and preparation methods.





Advertised in FAN 31 (July 2004) "Integrated livestok-fish farming systems" is now available in French:
Little, D.C. , Edwards, P. Systèmes agricoles intégrés bétail-poisson. Rome, FAO. 2005. 197p.

For more information please contact:
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Helm, M.M., Bourne, N. et Lovatelli, A. (comp./éd). 2005. Ecloserie de bivalves. Un manuel pratique. *FAO Document technique sur les pêches*. No. 471. Rome, FAO. 184p.

In the FAO Aquaculture Newsletter (FAN) of December 2004 (No. 32) the FAO Fisheries Technical Paper No. 471 on "Hatchery culture of bivalves: a practical manual" was promoted. Since then this publication has been among the top requested among the technical publications prepared by the Inland Water Resources and Aquaculture Service (FIRI). We are pleased to communicate that the manual has been translated and now available in French, Spanish and Chinese. The French translation was carried out by Ms Zakia Massik working at the Institut national de recherche halieutique (INRH) in Casablanca, Morocco, and Mr René Robert based at the Institut français de recherche pour l'exploitation de la mer (IFREMER) in Brest, France. The Chinese translation was made by Prof Chen Jiaxin former Director of the Yellow Sea Fisheries Research Institute (YSFRI) in collaboration with Mr Chang Yaqing, Deputy Director of the College of Life and Technology, Dalian Fisheries University, PR China. Ms Marie-Louise Tall of the Instituto Agronómico Mediterráneo of Zaragoza (IAMZ) and Mr Juan Cigarría of Tinamenor (S.A) have translated the manual in Spanish.

This manual is a synthesis of the current methodologies applicable to the intensive hatchery culture of bivalve molluscs covering similarities and differences in approach in rearing clams, oysters and scallops in different climatic regions. All aspects of the culture process are described, together with considerations in choosing a site for hatchery development and in the design of suitable facilities. The manual also includes the post-hatchery handling of "seed" bivalves in land- and sea-based nursery culture preparatory to on-growing. This publication is intended to assist both technicians entering this field as well as investors interested in evaluating the complexity of intensive hatchery production. The authors bring together a combined 80 years of experience in the biology, management and operation of hatcheries encompassing a range of the more commonly cultured bivalve species in different parts of the world. (The Arabic version is under preparation).

Further details can be obtained by writing to:
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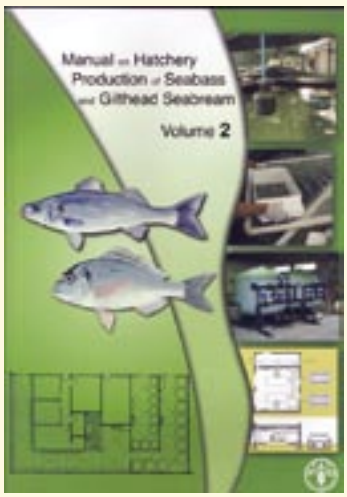
Moretti, A., Pedini Fernandez-Criado, M. & Vetillart, R. 2005. Manual on hatchery production of seabass and gilthead seabream. Volume 2. Rome, FAO. 152p.

This is the second and final volume of a manual on hatchery production of seabass and gilthead seabream. It is part of the programme of publication of the Inland Water Resources and Aquaculture Service (FIRI). The manual has been written based on the direct experience of technicians and managers of commercial hatcheries operating in the Mediterranean. It is intended to assist both technicians entering this field as well as investors interested in evaluating the complexity of hatchery production of seabass and gilthead seabream. The manual has been prepared by the authors under the overall support and supervision of FIRI and direct technical coordination of Mario Pedini, Aquaculture and Fisheries Development Officer of the FAO/World Bank Cooperative Programme. Numerous colleagues have collaborated, contributing



comments to sections of the manual, and ideas and assistance for its finalization.

Seabass and gilthead seabream are the two marine fish species which have characterized the development of marine aquaculture in the Mediterranean basin over the last three decades. The substantial increase in production levels of these two species, initially of very high value, has been possible thanks to the progressive improvement of the technologies involved in the production of fry in hatcheries. As a result of this technological progress, more than one hundred hatcheries have been built in the Mediterranean basin, working on these and other similar species. At present the farmed production of these two species derived from hatchery produced fry is far greater than the supply coming from capture fisheries.

The development of these techniques, based originally on Japanese hatchery techniques, has followed its own evolution and has resulted in what could be called a Mediterranean hatchery technology that is still evolving to provide higher quality animals and to reduce the costs of production. This is a dynamic sector but it has reached a level of maturity which merits the production of a manual for hatchery personnel that could be of interest in other parts of the world.

The manual has been divided in two volumes. The first one was finalized in 2000, and covered historical background, biology and life history of the two species, especially hatchery production procedures (this volume is currently also available as a PDF document on the FAO web site). This second volume is divided in four parts. In the first, it tries to cover the aspects related to hatchery design and construction, from site selection to hatchery layout, and description of the various sections of a commercial hatchery. The second part covers engineering aspects related to the calculation and design of seawater intakes, pumping stations, hydraulic circuits, and pumping systems. The third part deals with equipment in the hatcheries such as tanks, filters, water sterilizers, water aeration and oxygenation, temperature control, and auxiliary equipment. The last part covers financial aspects. This section, rather than explaining the way to calculate cash flows, tries to highlight aspects that managers and investors should consider when entering this business. Volume two also includes a series of technical annexes, and a glossary of scientific and technical terms used in the two volumes.

Further details can be obtained by writing to:
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FAO/General Fisheries Commission for the Mediterranean/International Commission for the Conservation of Atlantic Tunas. 2005. Report of the third meeting of the Ad Hoc GFCM/ICCAT Working Group on Sustainable Bluefin Tuna Farming/Fattening Practices in the Mediterranean. Rome, 16–18 March 2005. *FAO Fisheries Report* No. 779. Rome, FAO. 108p.

The Ad Hoc GFCM/ICCAT Working Group on Sustainable Bluefin Tuna Farming/Fattening Practices in the Mediterranean was set-up following a 2002 decision by the General Fisheries Commission for the Mediterranean (GFCM) which, in view of the expansion of bluefin tuna farming in the Mediterranean, decided that practical guidelines to ensure the sustainability of this activity were required. The work plan of the Working Group (WG) was discussed and proposed by a Coordinating Committee which met in January 2003 (Madrid, Spain) as agreed during the twenty-seventh session of the GFCM. At its first meeting (Rome, Italy, 12–14 May 2003) the WG produced a survey form that would enable to produce a summary of the current situation of bluefin tuna farming in the Mediterranean, identify problem areas with respect to the issues to be addressed, and propose solutions. During the second meeting (Izmir, Turkey, 15–17 December 2003) the WG finalized a first snapshot on the current situation of bluefin tuna farming based on the information made available in the survey forms and progressed with the drafting of the guidelines. The summary snapshot consisted in three documents covering capture fisheries, farming and marketing/trade of bluefin tuna in the Mediterranean. The WG held its third and final meeting in Rome, Italy, from 16 to 18 March 2005. The meeting was attended by 19 experts representing 10 Mediterranean countries, Japan and the European Commission, and representatives from the Secretariats of

the GFCM and the International Commission for the Conservation of Atlantic Tunas (ICCAT). The WG completed its mandate and finalized and adopted the "Guidelines on Sustainable Bluefin Tuna Farming Practices in the Mediterranean". Furthermore updated summaries on capture fisheries, farming and marketing/trade of bluefin tuna in the Mediterranean were also prepared by selected participants of the WG.

Further details and copies of the report can be obtained by writing to:
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The report is also available on the FAO web site at http://www.fao.org/docrep/008/y8870e/y8870e00.htm or ftp://ftp.fao.org/docrep/fao/008/y8870e/y8870e00.pdf

★★★★

Moehl, J., Halwart, M. & Brummett, R. 2005. Report of the FAO WordFish Center Workshop on Small scale Aquaculture in sub-Saharan Africa: Revisiting the Aquaculture Target Group Paradigm. Limbé, Cameroon, 23-26 March 2004. *CIFA Occasional Paper.* No. 25. Rome, FAO. 54p.

In response to an increasing interest in sustainable aquaculture among governments and international donors, the Food and Agriculture Organization of the United Nations (FAO) and the WordFish Center undertook a review of how aquaculture is targeted in sub-Saharan Africa as a first step in the identification of appropriate extension approaches and production strategies that would suit the various technology user-groups. Representatives of senior fisheries management agencies from nine countries in the region met to discuss progress, opportunities and key constraints to aquaculture development.

Through a series of presentations, working group sessions and plenary discussions, broad consensus was achieved on the way forward for African aquaculture. In an effort to realize the goals of aquaculture, an attempt was made to develop a set of practical recommendations that can be used by national governments to insure that the major constraints are being addressed and that the major opportunities for aquaculture are capitalized upon to increase the contribution of aquaculture to food security and economic growth.

For further information please contact:
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Moehl, J. & Halwart, M. (eds). 2005. A synthesis of the formulated animal and aquafeeds industry in sub Saharan Africa. *CIFA Occasional Paper.* No. 26. Rome, FAO. 61p.

This document contains five country reviews (South Africa, Nigeria, Côte d'Ivoire, Kenya and Zambia) and one regional synthesis paper on the animal and aquafeed industry in sub-Saharan Africa. Surveys of the existing aquaculture and aquafeed industries were undertaken with the purpose to determine the status of commercial aquafeed production in sub-Saharan Africa, and to provide an indication of the region's potential to produce aquafeeds.

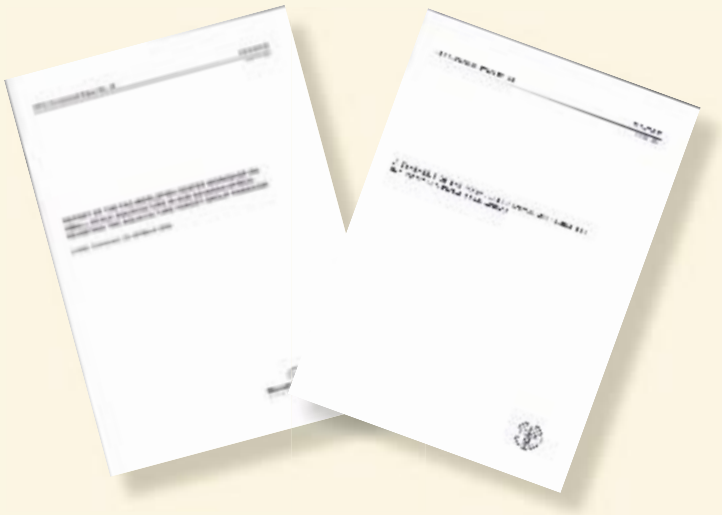
Main findings were the following:

Aquaculture production reported for the five countries was found to vary between 1 000 and 30 776 tonnes per annum. While Nigeria was the largest producer, Zambia reported the lowest production. Nigeria was the largest producer of manufactured aquafeeds (10 760 tonnes both in 2000 and 2001). With the exception of South Africa, farm-made feeds were found to supply a significant proportion of all the countries' aquafeed requirements.

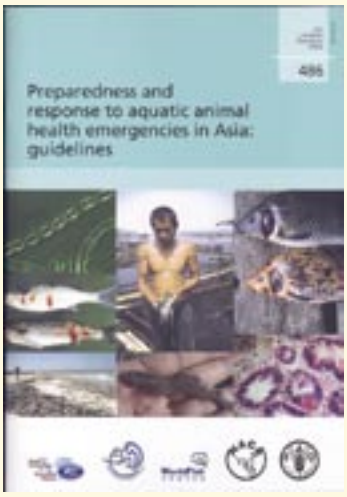
Major feed ingredients that are used in livestock feed production were generally available across the region. In some countries, difficulties were reported in obtaining supplies of fish oils as well as specialised vitamin and mineral mixes.

- A projection of future aquafeed requirements for 2015 suggests that all countries will have the potential to produce sufficient aquafeeds using existing production capacities.

- Key indicators identified for a country's ability to produce aquafeeds were existing livestock feed manufacturing capacity, availability of suitable feed ingredients for incorporation into aquafeeds, availability of suitably trained personnel, and favourable legislative and taxation system.



Arthur, J.R., Baldock, F.C., Subasinghe, R.P. & McGladdery, S.E. 2005. Preparedness and response to aquatic animal health emergencies in Asia: guidelines. *FAO Fisheries Technical Paper.* No. 486. Rome, FAO. 40p.



This document provides guidance to assist developing countries in improving national emergency preparedness in order to maximize the efficiency of response to serious outbreaks of aquatic animal diseases. It is a product of the Food and Agriculture Organization of the United Nations (FAO)/Network of Aquaculture Centres in Asia-Pacific (NACA)/ WorldFish Center (WFC) Regional Workshop on Preparedness and Response to Aquatic Animal Health Emergencies, held in Jakarta, Indonesia from 21–23 September 2004. The workshop, which was hosted by the Government of Indonesia, Ministry of Marine Affairs and Fisheries (MMAF), was attended by 51 participants, including national policy-makers and scientists from the Asian Region, and international experts and resource persons from both the region and elsewhere.

The primary objective of biosecurity arrangements is to prevent the incursion of exotic pathogens and pests. Knowing, however, that the risk of such incursions can never be reduced to zero, such arrangements must also include plans to ensure a rapid, well organized and appropriate response to an emergency disease incident. Infectious disease emergencies may arise within a country through incursions of known exotic diseases (transboundary aquatic animal diseases, TAADs), by a sudden change in the behaviour or distribution of endemic diseases, or via the appearance of previously unrecognized diseases. Effective emergency preparedness through contingency planning, early detection and a rapid response is critical to the successful management of such disease outbreaks. A strong national approach to contingency planning is essential to ensure that the necessary operational capability is in place so that early detection and effective responses are achieved. Recovery from an emergency disease response must be followed by measures to ensure that freedom from the particular disease is again maintained.

Having the capability to deal with emergency diseases involves systematic planning, training, and simulation exercises (field trials or "dummy runs"), as well as having access to an appropriate level of resources, including trained personnel, essential equipment and the necessary financial and legal mechanisms. Although a comprehensive capability in many countries will take a long time to achieve, it is hoped that this manual will assist developing countries in laying foundations within the framework of whatever resources presently exist.

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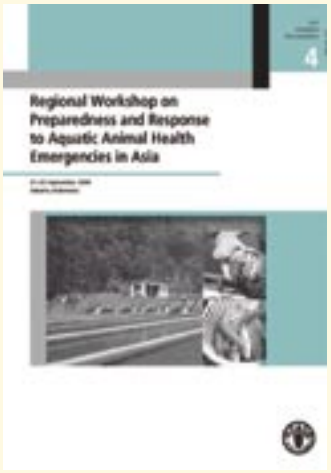
Subasinghe, R.P. & Arthur, J.R. (eds). 2005. Regional workshop on preparedness and response to aquatic animal health emergencies in Asia. Jakarta, Indonesia, 21–23 September 2004. *FAO Fisheries Proceedings.* No. 4. Rome, FAO. 178p.



This document contains the proceedings, including the texts of 14 papers presented, the Working Group reports and resulting recommendations of the Regional Workshop on Preparedness and Response to Aquatic Animal Health Emergencies, held in Jakarta, Indonesia from 21-23 September 2004. The workshop was jointly organized by the Food and Agriculture Organization of the United Nations (FAO) Inland Water Resources and Aquaculture Service (FIRI), the Network of Aquaculture Centres in Asia-Pacific (NACA) and the WorldFish Center (WFC), and was hosted by the Government of Indonesia, Ministry of Marine Affairs and Fisheries (MMAF). The workshop was attended by 51 participants, including national policy-makers and scientists from the Asian region, and international experts and resource persons from both the region and elsewhere.

The papers contained herein cover a wide range of topics related to emergency planning and response to serious outbreaks

of aquatic animal diseases, including a review of the history, current status and socio-economic impacts (including implications for international trade) of transboundary aquatic animal diseases (TAADs) in Asia; impacts of exotic diseases on aquatic biodiversity; experiences in the aquaculture and livestock sectors in developing and developed countries in the Asia-Pacific region and elsewhere (e.g. Canada, Norway) in dealing with major disease epizootics (including reviews of recent efforts in Indonesia and Japan to deal the serious outbreaks of Koi herpes virus disease); the role of national governments and the private sector; and analyses of regional needs in areas such as contingency planning, legislation (institutional and regulatory frameworks) and capacity building (training, infrastructure, disease diagnostics, surveillance, monitoring and reporting).

The major recommendations of the Workshop are:

(i) at the national level, the capacity and awareness of personnel at producer, disease support and decision-making levels, should be strengthened and adequate resources allocated to support implementation of emergency preparedness strategies; (ii) at the regional level, existing disease reporting systems (e.g. NACA/FAO/OIE Quarterly Aquatic Animal Disease Reports) should be further strengthened to ensure increased sharing of information on national aquatic animal disease status and emerging aquatic animal diseases of significance to Asia; (iii) regional technical support mechanisms (e.g. the NACA Regional Advisory Group) should be used to provide expert teams and information to countries in order to assist in early response to disease problems; (iv) research to support early warning and early response should be targeted to rapid diagnostics (e.g. assessment of the accuracy of Level I diagnosis), epidemiology, risk assessments and biosecurity; (v) detailed post-mortem analyses of the outbreaks of Koi herpes virus (KHV) in Japan and Indonesia should be conducted to understand the actions taken by the government and private sector, the extent of their success and the lessons learned; and (vi) core funding should be allocated at national and regional levels to provide ready resources to respond rapidly to emergencies.

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Briggs, M., Funge-Smith, S., Subasinghe, R.P. & Phillips, M. 2005. Introductions and movement of two penaeid shrimp species in Asia and the Pacific. *FAO Fisheries Technical Paper.* No. 476. Rome, FAO. 78p.

Both *Penaeus vannamei* and *P. stylirostris* are introduced species in Asia and the Pacific. They have now become important commercial shrimp species in many countries in Asia. The main reason behind the importation of *P. vannamei* to Asia has been the perceived poor performance, slow growth rate and disease susceptibility of the major indigenous cultured shrimp species, *P. chinensis* in China and *P. monodon* virtually everywhere else. However, for many reasons, particularly with the evidence of the introduction of exotic viruses to the region, there has been caution on the part of many Asian governments for the introduction of *P. vannamei* and *P. stylirostris*. Nevertheless, this caution has not been demonstrated by the private sector, which has been bringing stocks of illegal and often disease carrying *P. vannamei* into Asia from many locations, as well as moving infected stocks within Asia. The commercial success of these introductions, despite disease problems, has allowed the development of substantial culture industries for these alien penaeids within Asia, particularly in China and Thailand. One effect of this is that it is rapidly becoming difficult to control the importation and development of this new industry. This report attempts to gather all of the currently available data on the extent of *P. vannamei* and *P. stylirostris* importation and culture in Asia, its potential problems and benefits, and in this way to serve as a source document from which to investigate further means by which control over this issue might be re-established. Recommendations aimed at controlling the importation, testing and culture of these species have been made for all levels and are included in this report. This publication is also available in French, Spanish and Chinese.

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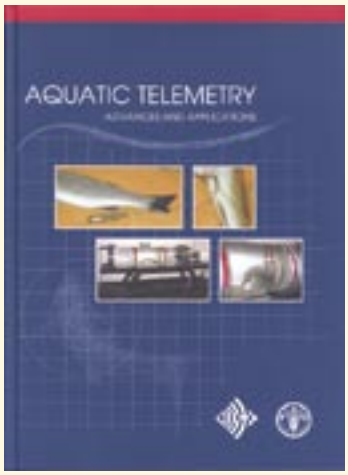
Spedicato, M.T., Lembo, G. & Marmulla, G. (eds). 2005. Aquatic telemetry: advances and applications. Proceedings of the Fifth Conference on Fish Telemetry held in Europe. Ustica, Italy, 9-13 June 2003. Rome, FAO/ COISPA. 295p.



Freshwater and marine resources, especially fish, have long provided a valuable source of food for mankind. However, heavy fishing pressure and the environmental impacts associated with the fast growing human population are increasing the stress on the aquatic resources and this calls for the strict application of management regulations. To protect biodiversity and assure the sustainability of the resources for the future, sound and responsible management is today more important than ever before. Ideally, current regulations are to be based on various criteria including the biology of the species concerned, as outlined in the FAO Code of Conduct for Responsible Fisheries and the related Technical Guidelines.

Telemetry, i.e. the remote measurement of biological variables, is a viable tool to obtain, in a limited time, information on the biology and the behaviour of the animals, one of the important preconditions for management decisions. The use of this technology in the aquatic environment has seen a rapid increase in the last two decades, as evidenced by the growing number of studies being undertaken.

The Fifth Conference on Fish Telemetry held in Europe, organized by COISPA Tecnologia & Ricerca in June 2003, brought together researchers and fisheries biologists involved in telemetry and biotelemetry studies on marine and freshwater ecosystems. The central theme of the conference was the interdisciplinary approach to provide the scientific basis for the conservation and rational management of natural resources. With the present book, FAO and COISPA are now publishing the Proceedings of a conference that was of particular relevance to all those involved in the field of fish ecology, aquaculture and fisheries management.

In an attempt to make the use of resources more sustainable, FAO is promoting the idea of using telemetry to study characteristics of fish, with a view to increase benefits for fisheries and aquaculture while maintaining a balance between exploitation and conservation. As part of its work under the Major Programme on Fisheries, the FAO Fisheries Department is active in raising the awareness of managers and scientists regarding the potential use of telemetry for supporting the management decision process. In this context, the FAO Fish Telemetry Web site 2, which was launched on the occasion of the Fifth Fish Telemetry Conference, provides access to technology to help foster sustainability, addresses key management issues, and promotes information and technology exchange between managers and researchers in fisheries and aquaculture. FAO also co financed a pilot workshop on the application of biotelemetry to fish studies for the management of inland fisheries in West Africa and is planning to provide inputs to training courses in future. Furthermore, a manual on telemetry is in preparation.

We trust that the compilation of excellent papers in these Proceedings, intended to serve as a showcase for the latest developments in aquatic telemetry and to give technical guidance to managers, will help provide concrete answers to questions in relation to fisheries management.

Foreword by Serge M. Garcia, Director,
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Bartley, D.M., Bhujel, R.C., Funge Smith, S., Olin P.G. & Phillips M. J. (comps./eds). 2005. International mechanisms for the control and responsible use of alien species in aquatic ecosystems. Report of an Ad Hoc Expert Consultation. Xishuangbanna, People's Republic of China, 27-30 August 2003. Rome, FAO. 195 p.

The use of alien species is a proven means to increase production and value from aquatic ecosystems. In the Mekong/Lanchang Basin, alien species such as tilapia *(Oreochromis spp.)* play an important role in providing cheap and readily available protein to rural and poor sectors. However, alien species are now recognized as one of the most significant threats to aquatic biodiversity. Members of FAO and signatories to the Convention on Biological Diversity have obligated themselves to manage and control alien species that may adversely impact ecosystems. There are a range of international mechanisms that have been established to assist countries in meeting international obligations and responsibilities. The coverage of these international instruments, the signatory countries and the degree to which they are implemented varies throughout the world. Implementation is often difficult due to lack of awareness at national level of responsibilities under the respective instruments, problems with enforcement, and lack of basic information and capacity to undertake risk assessment. Several steps are necessary for effective use and control of alien species, but one of the most important was identified to be following codes of practice similar to that developed by the International Council for the Exploration of the Sea. The development and use of indigenous species are options to the use of alien species. However, indigenous species have not received the same amount of attention, research, development and use as many alien species. Regional coordination of policies and practices on alien species is needed for effective national management. National policies need to be in place and the population needs to be aware of issues before countries can implement international mechanisms. Thus, regional coordination and national policy development are necessary actions that should go hand in hand in order to facilitate implementation of broader international agreements.

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The FAO Fisheries Technical Paper. No. 451 advertised in FAN 31 (July 2004) Surveillance and zoning for aquatic animal diseases has been published in French, Spanish and Chinese.

Subasinghe, R.P., McGladdery, S.E. et Hill, B.J. (éd). 2005. Surveillance et zonage des maladies des animaux aquatiques. *FAO Document technique sur les pêches.* No. 451. Rome, FAO. 78p.

Subasinghe, R.P., McGladdery, S.E. y Hill, B.J. (eds) 2005. Vigilancia y zonación de enfermedades de animales acuáticos. *FAO Documento Técnico de Pesca.* No. 451. Roma, FAO. 76p.

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FAN

FAO Aquaculture Newsletter

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The FAO Aquaculture Newsletter (FAN) is issued two times a year by the Inland Water Resources and Aquaculture Service, Fishery Resources Division, of FAO's Fisheries Department, Rome, Italy. It presents articles and views from the FAO aquaculture programme and discusses various aspects of aquaculture as seen from the perspective of both headquarters and the field programme. Articles are contributed by FAO staff from within and outside the fisheries Department, from FAO regional offices and field projects, by FAO consultants and, occasionally, by invitation from other sources. FAN is distributed free of charge to various institutions, scientists, planners and managers in member countries and has a current circulation of about 3,000 copies.

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