



**WorldFish**  
C E N T E R



Annual Report  
2003



**WorldFish**  
C E N T E R



Annual Report  
2003

**WorldFish Center  
Annual Report 2003**

2004

Published by WorldFish Center  
PO Box 500 GPO, 10670 Penang, Malaysia

World Fish Center. 2004. WorldFish Center Annual Report 2003. 56 p.

Perpustakaan Negara Malaysia. Cataloguing-in-Publication Data

**WorldFish Center**

WorldFish Center Annual Report 2003  
ISSN 1675-7491

**Photo credits**

WorldFish Center photo library  
ISSN 1675-7491  
WorldFish Contribution No. 1735

**Design & layout**

Bold Inspiration Sdn. Bhd.

**Printed by**

Print Resources

## Contents

### **Overview from the Board Chair and Director General 02**

---

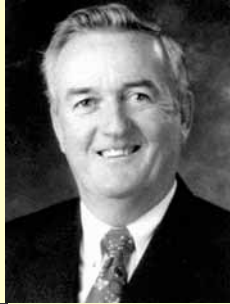
#### **Program Reports**

- Policy Research and Impact Assessment Program • 05
  - Biodiversity and Genetic Resources Research Program • 09
  - Coastal and Marine Resources Research Program • 12
  - Freshwater Resources Research Program • 15
- 

#### **Annexes 2003**

- Workshops, Events, Seminars, Training and Meetings • 18
- Publications • 21
- Financial Summaries • 31
- Partner Institutions • 38
- Board of Trustees • 45
- WorldFish Center Staff • 46
- WorldFish Center Donors • 54
- Abbreviations and Acronyms • 56

## OVERVIEW FROM THE BOARD CHAIR AND THE DIRECTOR GENERAL



A handwritten signature in black ink, appearing to read "R. Kearney".

**Professor Robert E. Kearney**  
Chair Board of Trustees



A handwritten signature in black ink, appearing to read "Meryl J. Williams".

**Dr Meryl J. Williams**  
Director General

In 2003 the WorldFish Center consolidated and built on the achievements of its first quarter century and prepared for a major transition in its senior leadership. In this introduction, we present some of the highlights of the 26th year for the WorldFish Center.

On the world's agendas for development and the environment, fish and those who depend on fish continue to receive strong attention. WorldFish framed its Medium Term Plan 2004-2006 with reference to the global context for human development, including the Millennium Development Goals and the Plan of Implementation of the World Summit on Sustainable Development. The Center contributed to the public profile of fish in human development through its many programs and projects, its 300 institutional partnerships and through the efforts of the Fish for All initiative. At the Annual General Meeting of the Consultative Group on International Agricultural Research (CGIAR) in October in Nairobi, we were honored with the CGIAR Chairman's 2003 Award for Outstanding Communication for the launch of Fish for All. In December 2003, the Fish for All India Summit was held in Kolkata, India, under the sponsorship of the Indian Government and the West Bengal State Government. Chief Ministers, members of the Fish for All Global Steering Committee, private sector and numerous fish stakeholders attended and agreed to form a Fish for All India initiative under the leadership of Professor M.S. Swaminathan, Chair of the Global Steering Committee. In collaboration with a British company, TVE, a major world television series on fish in development and the environment will be launched in 2004. Plans are in hand for an African Fish for All Summit in 2005.

We are pleased to report a productive year by WorldFish programs. In biodiversity and genetic resources research, FishBase continued its strong growth as the world's premier source of information on fish and was receiving nearly 10 million hits per month by the end of the year. The FishBase team focused on building national capacity in fish database construction for use at the country level, with a special focus on the Philippines as a pilot country. In the global database, priority was given to adding information in Chinese and other non-roman scripts. In pond-based studies in Asia and Africa, genetic improvement research and capacity building forged ahead. GIFT tilapia were introduced under suitable controls into Malaysia for collaborative breed improvement work with the Malaysia government through the Jitra station north of Penang. In Egypt, Cote D'Ivoire,



Malawi and Ghana, genetic improvements have commenced with locally available tilapia species, using the rigorous methods developed by the GIFT project. On-farm evaluation trials will commence in 2004. Tilapia production continues to grow worldwide as one of the key species in the 'blue revolution' and WorldFish has played a fundamental role in helping developing countries develop better breeds. A review of the success of such approaches was commissioned by the Asian Development Bank late in 2003 and preliminary results reveal very high internal rates of return.

The seriously depleted state of Asian coastal fisheries was confirmed by the biological, economic and social studies prepared by WorldFish and partners in eight Asian countries. These were presented to a broad audience and discussed in depth at the December 2003 East Asian Seas Congress and its associated Ministerial meeting. WorldFish is working with individual countries to support follow-up management action as recommended by the research and the Congress. The agreed steps are to reduce fishing, build socially just and rights-based fisheries and aquaculture systems, promote locally feasible livelihoods for fishing communities and take urgent action to improve national policy frameworks for aquaculture.

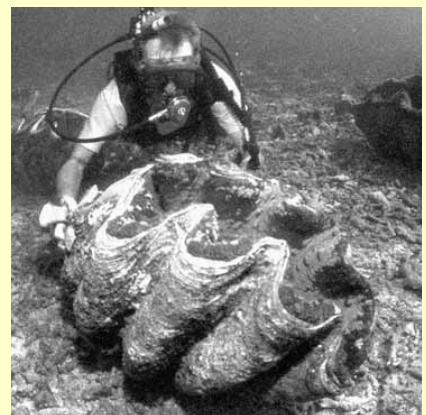
In coastal aquaculture and stock enhancement research in Asia and the Pacific, good progress was made in New Caledonia in 'closing the life cycle' of sea cucumbers, and in mass rearing sea cucumbers in Vietnam. In New Caledonia, the hatchery studies had to contend with a severe cyclone that interfered with operations.

In September 2003 WorldFish was proud to hand over our ongoing operations at Nha Trang in Vietnam to our national counterparts at the Research Institute for Aquaculture No. 3, having proved-up the technology and trained local scientists. In the Solomon Islands, the Nuse Tupe facilities were upgraded to support a hatchery for giant clams. With improvements in the peace and security of the Islands it seems possible to engage once more in an expanded program of aquaculture development there. Local needs are very high due to the economic slide after the civil unrest.

On the other side of the world, WorldFish suspended operations in British Virgin Islands in the Caribbean and handed over its ongoing studies on marine protected areas and coastal aquaculture to local institutions.

With the intention of intensifying complementary operations in key focus regions, WorldFish opened up an office in June 2003 in Phnom Penh, Cambodia, and began new Mekong region studies out of this office. These studies, together with those continuing at our headquarters in Penang, are focused around food security and research capacity building, including a high component of policy research and environmental work. Fish consumption among the people of the lower Mekong river region is double the world average but the fisheries are threatened by unsustainable practices and environmental degradation.

Work on the use of freshwater resource systems progressed on several fronts. In Bangladesh, a national study of small scale adoption and extension entered its third year, reaching 30,000 farmers through government and 35 non-government organization extension partners. In Africa, adoption and extension studies were intensified in Malawi, Zambia and Cameroon. In the latter, constraints such as the depression of growth rates due to in-breeding and other poor genetic management practices were identified through the adoption studies. In Cameroon, over 20 fish species from three freshwater river systems are being tested



for suitability for ornamental fish breeding and trade. In Egypt, good progress was made in refining the simple technology for natural breeding of African catfish and extending this to fish farmers. In farm economics, progress was made in helping the aquaculture industry face the profits squeeze caused by successful production.

A high profile product of our policy research in 2003 was the release and global promotion of the Fish to 2020 report, done in collaboration with the International Food Policy Research Institute of the CGIAR. This report, released simultaneously in Asia, Europe and the United States in October, grabbed world attention with its key message that developing countries are the dominant players in world fisheries and they will increase this dominance out to 2020. Under five different supply scenarios, fish prices will continue to rise as projected demand outstrips fish supply. More detailed fish supply and demand projections were also made by nine Asian partner countries using other models developed by the WorldFish Center. The results of these studies echoed the global situation and gave specificity to the outlook for different income groups in each country and to different fisheries resources.

In 2003, WorldFish achieved its greatest budget expenditure to date, namely US\$ 15.3 million and showed healthy reserves and other financial indicators. Indeed, we are proud to be the only CGIAR Center to have a clear set of all financial indicators for two consecutive years since the start of indicator based reporting in 2002. However, despite this performance, we are very aware that some other aspects of the Center's delivery need improvement. Several projects were behind in their expenditure and steps have been taken to correct this. The proposal pipeline also needs growth and this was commenced through two key steps taken in 2003. Step one, an Integrated Strategic Marketing and Resource Mobilization Plan was developed by internal working groups, supplemented where necessary by external expert advice. The second step was to upgrade internal resource mobilization capacity, appointing a new head to the Resource Mobilization Office in November.

The most notable development in collaborative research in the CGIAR during 2003 was the commencement of the Center's leadership of the Aquatic Ecosystems Theme in the Water and Food Challenge Program, led by the International Water Management Institute. For CGIAR shared services, WorldFish continued to make major contributions in the Association of International Agricultural Research Centers, the Information and Communication Technology and Knowledge Management Program, and several others. As a Center, we are committed to promoting the benefits of the collective work of the CGIAR System and its Centers as well as forwarding the contributions of our own Center.

We are pleased to close this introduction to the 2003 Annual Report with a heartfelt thank-you to all our investors, partners and to the staff of the Center for their commitment to the Center's mission to help those in developing countries that use and depend on fish and other living aquatic resources.



## PROGRAM REPORTS

### POLICY RESEARCH AND IMPACT ASSESSMENT PROGRAM

This has been an extraordinarily successful year for the Policy Research and Impact Assessment Program as it completed two landmark modeling studies and continued to build local competencies. With enhancing the well-being of and promoting sustainable livelihoods among the poor as the WorldFish Center's primary goals, the program also successfully fostered participation in many community-driven fisheries management schemes.



#### **Fish to 2020**

In October 2003, with the world's appetite for fish continuing to soar, the WorldFish Center and the International Food Policy Research Institute (IFPRI) launched a ground-breaking book - *Fish to 2020: Supply and Demand in Changing Global Markets* - that analyzes the critical and changing place of fisheries in global food policy issues. This is the first comprehensive quantitative study of its kind. It examines how likely changes in the world's fisheries sector over the next two decades will impact prices, trade, the environment and the world's poor.

The culmination of several years of work, the book grew out of a global model for the supply and demand of fish developed by scientists at IFPRI and the WorldFish Center. The study drew on the Center scientists' knowledge of the fisheries sector and related policy and technology issues, and the former's expertise in global modeling and food policy analysis. *Fish to 2020* was launched simultaneously in Penang, Washington and Hamburg amid intense media interest.

The book will help in decision-making and guide future development in the fisheries sector. It reflects concerns such as trade restrictions excluding the smaller poorer producers from export markets due to the absence of an affordable certification of food safety and environmentally sound production. It also predicts that low-value fish could become more costly, hurting the poor and becoming a real policy concern. The study also addresses critical questions like 'will fish farming be sufficient to provide affordable fish?' It predicts that more and more of the fish we eat will come from aquaculture, with many wild fish stocks now being fished near to or beyond their sustainable limits.

Finally, it explains why technology, both new and traditional, is crucial to avoiding environmental damage and waste, and how water bodies such as rice paddies, irrigation canals, reservoirs and seasonal or perennial ponds in developing countries can be exploited more efficiently. The book concludes with a range of recommendations on how developed and developing countries can promote sustainable practices that benefit the poor and so reduce poverty in the developing world.

#### **Helping Asian Countries Plan for a Higher and Sustainable Fish Supply**

The WorldFish Center broke new ground in developing the AsiaFish Model in 2003. The study provides the governments of Bangladesh, China, India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand and Vietnam with a powerful and very user-oriented tool to develop strategies and options for sustaining and increasing fish supply up to the year 2020.

Fish is a major source of protein for the poor in these nine countries - it contributes to over 70 per cent of the animal protein consumed in Thailand, China and Bangladesh - and consumption is rising rapidly. The multi-market model allows these countries to make, for the first time, detailed projections of the supply and demand for a large variety of fish (both cultured and wild) as a result of price, policy and technological changes as well as buyer patterns and preferences. Many of these countries, which have growing populations, import low-priced fish and export high-value fish to earn vital foreign exchange.



The study shows that fisheries output in the region will continue to expand from 2005 to 2020, but the rate of increase will be slower than in the previous decade. This is despite production in China surging a possible 70 per cent to 45.3 billion kilograms, which is one-and-a-half times the projected combined output of the other eight countries. The increase in output will come mainly from aquaculture, with China, Malaysia and Thailand likely to experience the largest expansion in the sector. Capture fisheries in the region are becoming overexploited.

The study also reveals that Bangladesh and the Philippines could experience a decline in capture fisheries (which could be a cause for concern) and that China will be the dominant exporter in the region by 2020, dwarfing Southeast Asia whose share of the export market will shrink. Meanwhile, Malaysia's fish consumption could rise a dramatic six fold by 2020, which could mean higher imports if aquaculture cannot keep pace. Building on this success, Center scientists have set out to develop a similar model for African nations, where fish is also a major source of protein.

### **Fostering Aquaculture and Livelihoods**

Aquaculture, especially fresh water aquaculture, benefits many poor rural communities in Asia as countries in the region are endowed with enormous fresh water resources such as ponds, closed water bodies, rivers, estuaries and flood plains. The potential for growth in this area is huge. For example, only 1.5 million of China's 33.3 million hectares of paddy fields are used for fishery purposes at present. In Bangladesh, only half of the total ponds are stocked with fish, which means there is vast potential for the poorest members of society to become fish farmers. Only 10 per cent of the potential has been exploited in India; 28 per cent in Indonesia; and 38 per cent in Vietnam.

With increasing and sustaining aquaculture in Asia a continuing priority, WorldFish Center scientists, in collaboration with researchers from a number of national partner institutions, organized a special issue of *Aquaculture Economics and Management* (a top-of-the-line refereed journal) with 13 papers detailing ways to ensure sustainable aquaculture. This effort will support the identification of appropriate technologies and hence improve efficiency, and so livelihoods, of poor farmers in countries like Bangladesh, Vietnam and India where there is sizeable inefficiency among extensive as well as semi-intensive farms.

In their assessments, Center scientists considered the provision of effective training to increase the number of skilled fishers as being critical to the raising of efficiency, as are the easy availability of seed suppliers and the existence of well-defined land use rights and tenure systems. Building basic infrastructure such as roads that give good access to the nearest market and giving poor farmers who lack collateral better access to institutional credit, particularly in Bangladesh and India, are also crucial to improving efficiency.

Center scientists considered semi-intensive polyculture as the most appropriate of all technologies for many Asian farmers, being the most effective and the most socially acceptable and environmentally sustainable; and while it is possible to improve productivity at intensive farms, this will require the development of new technology.

### **Hazard Analysis Critical Control Point System and Fish Exporters**

In light of the ever more stringent food safety standards in importing countries and with fish and seafood being the single most important exports from many developing Asian countries, WorldFish Center scientists evaluated the costs to exporters of implementing the Hazard Analysis Critical Control Point system (HACCP) and other measures to meet these standards. The study showed that compliance is a strain for many exporters and leads to slower export growth, with Bangladesh, China, the Philippines and Sri Lanka the hardest hit. Many small-scale operators, who are scattered throughout rural and coastal areas, also face being excluded from the export market because of high investment costs, while many others in the post-harvest supply chain require training and motivational work. It also presents a vigorous case for international donors and rich consuming countries to provide technical and financial aid to poor exporting countries to help them meet international food safety and production standards.

### Empowering Poor Fishers

The year saw the WorldFish Center's community-based fisheries management schemes producing substantial impacts in Bangladesh, vividly demonstrating the organization's ability to enrich people's lives. Fish is a major source of nutrition in Bangladesh supplying 46 per cent of the total animal protein consumed. The program gets village communities, NGOs and government agencies (such as the Department of Fisheries) working together to manage fishery resources more efficiently and equitably. It allows local people to make the key decisions and manage their fisheries with the necessary guidance and support. They set and achieve their own management standards within local means.



Local communities have been quick to appreciate the benefits of the program. Since September 2001, with help from the Center, poor fishers have gained access rights over 115 water bodies covering an area of 5,940 hectares (over 16,480 during the monsoon). The yield of fish has also gone up, in some cases by 100 per cent, to over 600 kilograms per hectare in semi-closed water bodies. During the year, stock assessments were completed for a number of water bodies to determine abundance and age distribution; management committees were set up for 104 water bodies; four regional networks were established with over 180 community-based organizations involved in fisheries management; and cluster management committees were launched to coordinate activities between adjacent water bodies. Two TV spots were produced and an extensive series of folk theatre shows was conducted to raise public awareness.



Community-based fisheries management is a key element in the Center's work to improve the livelihoods of poor fishers. Village people can be a strong and effective force for sustainability, using their traditional knowledge and customs to protect fish stocks and biodiversity.

### Development Policies and Wetland Ecosystems

WorldFish Center scientists also focused attention on promoting ecologically sustainable development in the lower Mekong River Basin. The basin, which straddles Cambodia, Vietnam, Thailand and Laos, is experiencing rapid economic development resulting in deforestation, erosion and siltation. The scientists, working collaboratively with researchers and officials from over 30 agencies from the four countries, succeeded in significantly raising awareness of the deleterious effects development policies can have on wetland ecosystems and the livelihoods of the people living there. Sound resource management of the basin is something that matters deeply to the Center as any disruption to the fishing would have serious consequences to the more than 50 million people living there, both nutritionally and economically.

### Training National Fisheries Scientists

As part of its commitment to strengthen local research capabilities, WorldFish Center trained 38 staff from Cambodia's Inland Fisheries Research Institute in research planning, priority setting and project implementation, helping transform it into a fully functional national fisheries research body.

Lack of effective research is hindering efforts to establish management plans for Cambodia's important wetlands that strike a suitable balance between the environment and the existing political and socioeconomic dynamics of the country. To this end, research has been launched to value the economic resources of the Tonle Sap Lake that supports over 1.2 million people, mainly poor fishers. The wetland is also an important source of firewood.

Fishing is extremely important in Cambodia, supplying 75 per cent of the total animal protein consumed by the people. However, fishery resources are declining due to habitat degradation and from such activities as water engineering and land clearing, a result of the rapidly growing population.

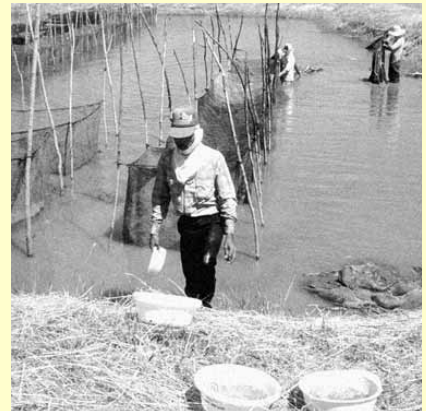
### **Providing Scientific Leadership**

In 2003 WorldFish Center staff organized four regional workshops covering a range of topics from "fish sector modeling" to "natural resources economics" and "research methods and data analysis". These training events, held in Bangladesh and Cambodia, reflect the Center's commitment to enhancing the knowledge of the people it works with. Staff also conducted several important training sessions in Bangladesh on open water fisheries management. Attending the courses were 510 government and NGO staff. Meanwhile, the Center's NGO partners provided extensive training on improving management of water bodies to some 3,200 beneficiaries.



## BIODIVERSITY AND GENETIC RESOURCES RESEARCH PROGRAM

This has been a year of significant progress for the Biodiversity and Genetic Resources Research Program as it expanded the range and scope of its work to ensure that the benefits of aquatic biodiversity are available for the poor in the developing world in a sustainable manner. Geographically the Program focused on Malawi, Ghana and Egypt in Africa, and Malaysia, the Philippines and Cambodia in Asia.



### **An International Effort to Restore Inland Fisheries**

Freshwater fish provide an irreplaceable source of cheap and high quality animal protein in many rural areas in developing countries. Over the past several decades, inland fisheries have suffered greatly from habitat degradation due to industrialization, urbanization, deforestation, mining and agriculture. WorldFish Center has taken important steps to develop a comprehensive strategy to save this vital resource and meet the needs of the poor people who depend on it.

The Center, in collaboration with InWEnt (Capacity Building International) of Germany, hosted an international workshop in Penang to find effective ways to restore inland fisheries to sustainable health and to become capable of supporting viable communities. As a result, an action plan was created that advocates implementing the ecosystem approach to conservation and which serves as a tool for developing effective policies for the sustainable management of inland fisheries and biodiversity. The Penang Action Plan is being taken to policy makers everywhere, including governments.

The ecosystem approach is a new way to tackle the problems of development and environmental improvement. It calls for conservation to be people-orientated and stresses the importance of heeding local knowledge, as local people know their area best and will often have feasible ideas about how to manage and account for natural resources. It also emphasizes capacity building and seeks to get all stakeholders - public, private and civil society - working together to manage natural resources.

### **Expanding FishBase**

FishBase was originally developed in collaboration with the Food and Agriculture Organization (FAO) and other partners. Over the year, WorldFish Center successfully met the challenge of expanding FishBase to meet specific user needs in China, India and the Philippines, countries which rely heavily on fishing. This truly remarkable online database is a powerful tool for fisheries management and research as well as biodiversity conservation. It provides essential information on almost the entire world's known fish species, ranging from their biology, life history, ecology, diet and disease, to taxonomy, aquaculture, ecosystems and even museum information.

New features were launched to strengthen the resource and improve user access. These allow users, for example, to estimate important parameters like total mortality, annual reproductive rate and population growth of fish stocks and to translate the main pages into eight different languages, namely Spanish, Portuguese, French, German, Italian, Dutch, Swedish and Chinese.

Some 47,814 common names for 23,224 species were added to FishBase in 2003, which brought the total to 183,363 common names in 413 languages for 24,539 species. The new non-Roman scripts added during the year included Cyrillic, Chinese, Gurmukhi, Hindi, Japanese, Malayalam, Tamil, Telugu, Marathi, Kannada, Nepali and Bangla. Users frequently access FishBase through fish common names. The website registered nearly ten million page impressions a month towards the end of the year.

During the year, the FishBase team held workshops and conferences in a number of countries including the Philippines, Iran, Vietnam, Malaysia, Canada, Taiwan and the United States to determine user needs. The Philippines-based group also initiated and provided technical support to the Academia Sinica, Taiwan, for the development of a FishBase website in Chinese to meet user demand. The service is due to come online in 2004.

And as the world's leading information system on fish, FishBase continued to act as host to the global databases of key collaborators such as the FAO, the California Academy of Sciences, the International Council for the Exploration of the Sea, and the Natural Resources Institute of the United Kingdom (UK).

Partnerships were also created with 12 new museums and institutions in seven countries, including the Freshwater Biological Association in the UK for the development of an online database for aquatic insects. This will act as a precursor to a database on commercially important freshwater invertebrates using the FishBase database shell.

### **Increasing the Availability of Animal Protein in Africa**

WorldFish Center made good progress transferring its selective-breeding program for developing improved strains of tilapia to Africa. Tilapia is one of the easiest fish to farm, being prolific and exceptionally hardy, and it is ideal for both small farmers and industrial sized aquaculture. It requires little or no expensive feed: the fish eats almost anything from grass clippings and vegetable matter to suspended solids.

The technology to produce GIFT, or Genetically Improved Farmed Tilapia, was originally developed over a 10-year period in Asia, mainly in the Philippines. Technology transfer has taken place in Egypt, Ivory Coast, Ghana and Malawi with the tilapia generation of 2002 having been grown out and evaluated, and the parents of the next generation selected - thus starting the cycle of continued genetic improvement. The technology is now being extended to other African countries.

The GIFT program not only supports the goal of increasing the availability of animal protein in Africa by giving farmers the opportunity to cultivate a fast-growing and high-yielding fish, but also promotes low cost, environmentally friendly aquaculture. The program is funded in part by the United Nations Development Program -- an important recognition of its importance and impact.

As part of the effort to ensure that genetically improved tilapia are readily available to farmers, there are plans for a central breeding station to supply genetically improved fry to specialized fry producers who will then reproduce the fry to supply to fish farmers.

### **Furthering Aquaculture in Malaysia**

The Center's work to develop and disseminate genetically improved tilapia to farmers in Malaysia also proceeded during the year. Selection-breeding programs and a field trial were carried out to further develop the GIFT strain at the Jitra Research Station in Kedah. The GIFT program is being undertaken in collaboration with the Malaysian Fisheries Research Institute. A study was also conducted to compare the growth performance of imported GIFT tilapia with the local red tilapia. The results are due in 2004.

The first steps in the dissemination process in Malaysia were taken during the year, with genetically improved tilapia being sent to the Agriculture Department in Sarawak, a private farm in Selangor, and soon to a Department of Fisheries hatchery.



The Center co-sponsored a seminar organized by the Malaysian Department of Fisheries in March 2003 to discuss tilapia farming in Malaysia and to disseminate information. Tilapia is expected to play a prominent role in Malaysia's effort to expand the aquaculture sector and turn it into a major component of the country's agriculture, which has been identified by the government as the third largest engine of growth for the national economy.

### **Initiating a Bio-ecology Study in the Tonle Sap**

Meanwhile, in Cambodia, the WorldFish Center initiated and completed a study on the bio-ecology (for example, spawning and growth) of the key fish species in the Tonle Sap. The Tonle Sap goes through dry and wet seasons that result in droughts and floods that affect fish and agricultural production. The lake supports huge populations of mainly poor fishers and farmers. It has one of the most intensive freshwater fisheries in the world.

Center scientists, in a pioneering project, have used the information generated from the study to develop a model to predict the influence of floods on fish production in the lake and so guide decision-making. This is important for the sustainable management of the fisheries resource and for protection of its biodiversity. The study was the first of its kind since the 1970s and the model is a first for the lake (Southeast Asia's largest).

The exercise also served as a platform for training Cambodians and building capacity at the country's Inland Fisheries Research and Development Institute (IFReDI). Five biologists and 11 other IFReDI staff received on-the-job as well as formal training in fish taxonomy, fish biology, research methods and data analysis. Some 19 students from the Faculty of Fisheries also received training.



## COASTAL AND MARINE RESOURCES RESEARCH PROGRAM

Restoring capture fisheries and promoting environmentally friendly coastal aquaculture are at the core of the Coastal and Marine Resources Research Program's remit. In 2003 the Program worked with key partners to reverse the decline in coastal fisheries resources, it expanded and strengthened valuable research and management tools, and it achieved substantial successes in rebuilding a valuable resource - sea cucumbers. It also succeeded in developing simple ways for poor coastal communities to harvest and grow-on coral reef fish and invertebrates for the lucrative aquarium trade.

### Rehabilitating Coastal Fisheries

Fisheries resources in Malaysia have experienced rapid and steep declines due to overfishing. While recent interventions have tried to address this, they have not been successful. The resources will suffer irreversible damage unless current practices change. WorldFish Center and partner institutions in Malaysia have helped establish a pilot program to trial new interventions aimed at ensuring long-term sustainable and efficient operations.

Meeting the challenge requires innovative solutions. The Center and Malaysia's Department of Fisheries hosted a conference to address the problem in March 2003, building on previous research. At the Conference strategies and actions were developed to address the issue. These start with the implementation of an integrated fisheries management and rehabilitation program in north-western Peninsular Malaysia, where fish stocks have fallen particularly alarmingly. The scheme will later be extended to other areas.

Besides effective co-management of the resource by government agencies, fishers and other stakeholders, the scheme emphasizes capacity building, strengthening research and the wide dissemination of information.

### FiRST for Effective Management

WorldFish Center expanded the power and utility of FiRST, a regional data storage and management system. FiRST, or Fisheries Resource Information Systems and Tools, provides information to assist policy makers to assess the status and potential of fish stocks for sustainable management and restoration. This is part of the effort to reverse the serious damage to coastal fisheries in Asia.

The Center is the custodian of the regional database, which currently contains species abundance data from over 21,000 locations (335,980 records) in the coastal waters of South and Southeast Asia. The data are obtained from trawl surveys dating back to the 1920s. The partner countries who maintain national databases are Bangladesh, India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, Vietnam and Brunei.

Over the year, Center scientists provided training and technical support to its partners, widened coverage of the database, and helped launch a national database for Brunei. It also facilitated greater data sharing for effective management of marine resources.

### Improving Coral Reef Management

To help preserve coral reefs, WorldFish Center expanded ReefBase. This global information system is the centerpiece in our strategy to improve coral reef management and so benefit the poor who depend on reefs for food and livelihoods. Since its launch in April 2002, the website has gained international recognition and respect. Dynamic and authoritative, it is now recognized as one of the foremost online resources of data and information on coral reef resources. Page impressions (the number of times a page is requested from a server) exceeded the 3.8 million mark in January 2003.

A state-of-the-art interactive mapping system became a strong and distinctive feature of the website during the year. This allows users to create maps of coral reef areas and overlay key management and threat information.

In addition, an extensive collection of information on coral bleaching events was developed in collaboration with the US National Oceanic and Atmospheric Administration. Monthly updated maps of thermal hotspots were also introduced giving early warning of bleaching, which happens when corals stressed by overheating expel the tiny organisms which color their tissues and provide them with essential nutrients. The bleached corals often die if conditions do not improve.

Strong links were forged with the Coral Reef Degradation in the Indian Ocean Project, Reef Check and the COREMAP Project in Indonesia as part of a scheme to widen data sharing with monitoring programs around the world.

Looking ahead, ReefBase is seeking to create a knowledgebase of 'lessons learned' and 'best practices for coral reef management' and to establish a regional coral reef information system in the Pacific based out of the Center's office in New Caledonia.

#### **Stock Structure Studies: fundamental to management**

A sound understanding of the population structure of species is crucial to effective management of coral reefs and inshore fisheries. With this in mind, the WorldFish Center has continued studies on the stock structure of key species at several sites in Asia, including Malaysia, the South China Sea and the Bohol (Mindanao) Sea. The study of the reefs in the Bohol Sea is nearing completion.

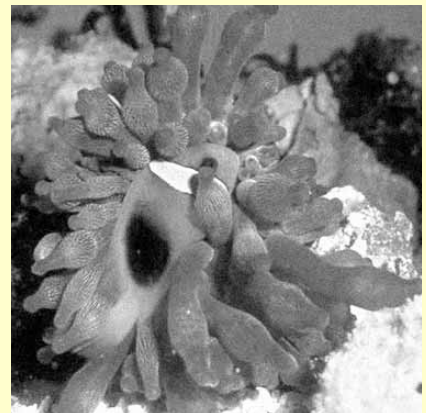
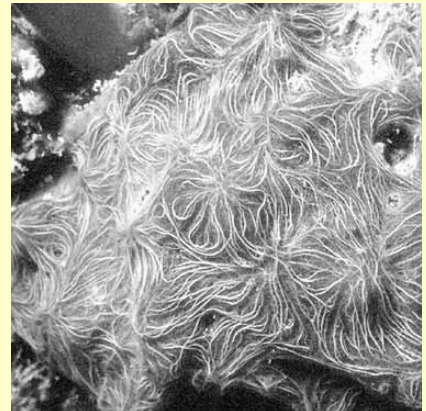
Such studies, using genetic and morphometric analysis as well as local knowledge, are important to determine if populations at separate locations are different stocks or independent breeding units. This knowledge is necessary to determine the appropriate spatial scale for management. The use of local knowledge to validate the genetic patterns is a novel approach being trialed by the Center.

Future initiatives include the linking of a network of molecular genetics laboratories in developing countries to foster studies on the population genetics of coastal fisheries, and assisting national fisheries agencies to understand the production cycle of key species better, gathering critical information on migration patterns, feeding grounds and spawning areas.

#### **Rebuilding Sea Cucumber Populations**

As part of its work on the rebuilding of depleted coral reef invertebrate stocks, WorldFish Center's investment in sea cucumber research has paid strong dividends. Thousands of juveniles or sandfish, from a commercially valuable species, were successfully hatched and reared in New Caledonia in 2003. This was 'a first' for the Pacific island nation.

Releasing large numbers of cultured sandfish into the wild and monitoring their survival until they reach a size at which they can reproduce naturally is the next and final phase of the program. A genetic study was carried out to ensure that the hatchery-produced juveniles would be released into populations of similar genetic make-up to that of their parents.



Center scientists are also assessing the potential to grow sandfish with shrimp in earthen ponds in collaboration with the French fisheries institute, IFREMER. Initial results are promising. Sandfish can provide a by-crop for shrimp aquaculture and represent an environmentally friendly new approach because they eat the waste products from the shrimp.

The Center's work in the Pacific and Vietnam (where research concluded in 2003) has established it as the world's foremost authority on the hatchery production of tropical sea cucumbers.

### **Creating a New Artisanal Fishery**

It was also a year of considerable achievement for Center scientists in the Solomon Islands. They succeeded in developing simple methods for culturing coral reef fish and invertebrates for sale by coastal communities. The new technology can easily be adopted by village communities and could form the foundation of a new artisanal fishery throughout the Asia-Pacific region, furnishing income particularly for women and youths in developing countries where income-producing opportunities are limited.

The methods involve capturing post-larval fish and invertebrates as they settle from the plankton and growing them in simple cages. Developing larvae spend their first few weeks drifting in the plankton until they are ready to settle down and adopt the more sedentary habits of their parents. By harvesting fish from the plankton prior to settlement, adequate numbers of fish can be taken for aquaculture without harming natural replenishment to the reefs.

The targeted fish, cleaner shrimp and lobster, are important in the international ornamental fish trade as well as for the live reef food fish market.

During the year, Center scientists succeeded in modifying capture methods so that they are cheaper, easier to use and cause less mortality. Fine-tuning of culture methods to improve survival and the health of fish was also undertaken. This was partly to meet eco-labeling standards for the live fish trade. A manual on the technology was developed for use by fisheries managers and local people.





## FRESHWATER RESOURCES RESEARCH PROGRAM

The Freshwater Resources Research Program seeks to increase food security and improve the lives of fishers and farmers who depend on freshwater aquatic resources. To this end, it was actively engaged over the past year in boosting the productivity and sustainability of freshwater aquaculture in sub-Saharan Africa as well as in Egypt and Bangladesh.

### Developing Better Integrated Agriculture-Aquaculture systems

With Integrated Agriculture-Aquaculture (IAA) systems becoming widespread in the developing world, WorldFish Center initiated and completed a study to find the best way to optimize nitrogen retention and so improve yield and sustainability in such systems. The availability of this nutrient is the most critical factor limiting farm productivity. It may be lost through water seepage and as a result of anaerobic conditions in pond sediments.

The study was conducted in Malawi, where limited resources and the low fertility of farms are serious problems. The research has led to a better understanding of the factors influencing nitrogen retention in ponds and the development of sounder management strategies. Center scientists found, for example, that applying pond sediments as fertilizers significantly increased maize yield only during the wet season. This implies that farmers need remove sediments from ponds for use as fertilizers only once a year, during the wet season maize crop, so saving labor and money. It was also shown that replacing inorganic fertilizers with pond sediments as a top dressing in maize fields was effective in boosting productivity. The study found that nitrogen leaching can be a serious problem during the wet season and that it can be reduced through better pond construction and proper irrigation.

### Famine Mitigation in Southern Africa

As drought becomes more severe and frequent in southern Africa, the WorldFish Center is helping farmers use their limited resources more wisely through the adoption of IAA systems.

With IAA proving attractive to farmers, the Center created new research-cum-extension teams (RET) to accelerate the transfer of IAA technologies, including pond aquaculture. On-station and on-farm training were conducted in Malawi and Zambia and the groups worked with some 650 farmers in these countries during the year. These countries have a high potential for IAA. To further build capacity the Center trained staff from the countries' Departments of Fisheries, non-governmental organizations and community-based organizations as well as contact (or lead) farmers.

IAA farms are more sustainable and durable than traditional farms that rely on slash-and-burn cropping. They are also more productive and profitable. The presence of fishponds allows vegetables, maize and rice to be cultivated around them and livestock to be watered. Farmers use the water from the ponds directly or utilize the effect of seepage to provide moisture for their crops. IAA also allows farmers to cope better with drought by enabling them to grow vegetables in the residual moisture in pond bottoms and to use pond water for emergency irrigation of seedling nurseries. In years with normal rains, IAA farms can produce fish and vegetables of higher nutrient quality and which are more marketable.

Meanwhile, the RET approach has encouraged farmers to innovate and solve production bottlenecks on their own. This includes fingerling exchange among farmers as a way to reduce inbreeding and maintain high growth performance in cultured tilapia.





### **Improving Aquaculture in sub-Saharan Africa**

Over the year, the Center was also involved in an FAO project to evaluate and improve aquaculture extension systems in sub-Saharan Africa. The study focused on Cameroon, Ivory Coast, Kenya, Madagascar and Zambia. Although parts of the region (mainly in Cameroon, Zambia and Madagascar) have enjoyed some successes, aquaculture in sub-Saharan Africa generally has not shown the hoped-for success, despite significant investments by international donors. Aquaculture can be economically viable in Africa. However development has been hampered by insufficient research, little extension work, lack of or high cost of feeds, and a shortage of fingerlings.

Among the key recommendations of the study are that research must be actively undertaken with both farmers and extension agents to ensure that research relevant to the users' needs is being conducted, and that information and technology is made readily available to farmers.

Many countries in the region now see aquaculture as an important sector because population growth and the decline in capture fisheries is resulting in demand rapidly outpacing supply - and they are laying out new development plans as a consequence.

### **Supporting Aquaculture in Cameroon**

The year 2003 saw the WorldFish Center playing a key role in the creation of a blueprint for the development of a sustainable aquaculture sector in Cameroon also via an FAO project. Like other Africans, Cameroonians rely heavily on fish as a source of animal protein. Fish accounts for almost 50 per cent of the diet of both urban and rural households in the country, and is particularly important among the poor. Aquaculture in Cameroon is small at the moment, but it has strong potential. It can play an important role in meeting local demand and improving the country's balance of trade. Cameroon has to import much of the fish it needs because of limited local supply, losing scarce foreign exchange. Most natural fisheries in the country have reached or exceeded sustainable limits. Aquaculture can also significantly increase employment in both urban and rural areas, so alleviating poverty and reducing pressure on natural resources and the environment.

Center staff and other experts have recommended that the Cameroonian government set up trained and well-equipped mobile outreach teams to provide support to farmers in high priority zones. The teams will combine research and extension to effectively transfer technical knowledge and experience to farmers.

The Center also undertook a study to assess the potential for aquaculture around Yaoundé, the Cameroonian capital. The results are positive. Aquaculture on the periphery of the city can be productive and profitable. The study surveyed five farms and concluded that they could boost their production five fold to 60 tonnes a year if basic principles of fish culture were followed and if there was a better supply of fingerlings and technical assistance.

Meanwhile, to determine the extent to which declines in genetic quality may be affecting yields of farmed Nile tilapia in Cameroon, Center scientists compared the growth performance of domesticated and wild fingerlings. They found that the wild population consistently out-performed the domesticated population, which suffers from inbreeding and inadvertent selection. Curbing these problems will require changes in basic management methods.

### **Providing Scientific Leadership in Improving Fish Supplies**

Aquaculture has been very successful in Egypt enabling the country to become one of the largest fish producers in North Africa and West Asia. Fish is a main source of animal protein in Egypt and supply needs to increase by 20 per cent by 2010 to meet demand from a growing population. The increase must come mainly from aquaculture as capture fisheries have reached full capacity due to overfishing. However, new challenges are emerging which have caused aquaculture production to stagnate. WorldFish Center held an international workshop in Cairo in December 2003 to address the relevant issues.

The Expert Consultation Workshop on Fish Demand and Supply in Egypt was held under the auspices of the country's Minister of Agriculture. Its findings are important for guiding planning and investment decisions. Among the major factors limiting further aquaculture expansion are the rising cost of feeds (Egyptian fish farmers rely heavily on imported feed ingredients) and declining prices for the most common cultured fish, tilapia.

As a result of the workshop, the Center has identified new research priorities for improving fish supply. These include analyzing farm economics and testing new farm management techniques, developing marketing strategies for producers, exploring new aquaculture production systems (including new species), and assessing and monitoring consumer preferences.

### **Boosting Fish Production in Bangladesh**

Fish is also the main source of animal protein in Bangladesh. The country, which suffers from declining capture fisheries, has high potential for aquaculture expansion. As part of its mandate to increase fish production and improve the lives of poor rural households, WorldFish Center trained over 250 extension workers from non-governmental partner organizations to disseminate low-input aquaculture technologies to some 30,000 farmers in Bangladesh during the year. The project is part of a five-year program ending in 2005.

This project also has an important research component aiming at identifying appropriate methodologies for mass dissemination of proven integrated agriculture-aquaculture technologies. Results so far clearly indicate that participatory approaches are crucial to sustain fish culture on the level of small scale households and that smallholders, as poor as they are, are willing to pay for quality extension services provided by non-governmental organizations.

Low-cost technologies for sustainable pond culture and rice-fish farming have been developed and disseminated to farmers. Lack of access to technologies is a major factor limiting farm productivity in the country.

Research was conducted collaboratively with the Bangladesh Fisheries Research Institute to refine and develop new technologies. Grants were also given to local universities and research institutions to conduct socio-economic studies as well as technological research.



## ANNEXES

### WORKSHOPS, EVENTS, SEMINARS, TRAINING AND MEETINGS

#### **Policy Research and Impact Assessment Program (PRIAP)**

1. Global Coastal Resources Co-management Project Steering Committee meeting; Phnom Penh, Cambodia, 6-9 February 2003.
2. Training Workshop on Aquaculture Technology and Fishing Practices in Asia; WorldFish Center, Penang, Malaysia, 17-27 March 2003.
3. National Planning Workshop on Fisheries Research and Development & Expert Consultation on Ecological Risk Assessment of Genetically Improved Fish Breeds; Dhaka, Bangladesh, 2-10 April 2003.
4. Inception Workshop for Tonle Sap Environmental Management Project; Phnom Penh, Cambodia, 14-18 April 2003.
5. Inception Workshop for Valuation and Policy Project at Lower Mekong; Phnom Penh, Cambodia, 21-25 April 2003.
6. Planning Workshop for Aquatic Resources Valuation and Policies for Poverty Elimination in the Lower Mekong Basin; Phnom Penh, Cambodia, 6-7 May 2003.
7. Stakeholder Workshop for Aquatic Resources Valuation and Policies for Poverty Elimination in the Lower Mekong Basin; Phnom Penh, Cambodia, 5-6 June 2003.
8. Training workshop on Analysis and Projections of Fish Demand and Supply in Asia; WorldFish Center, Penang, Malaysia, 28 July-11 August 2003.
9. Internal Workshop on Site Selection and Questionnaire Development for Aquatic Resources Valuation and Policies for Poverty Elimination in the Lower Mekong Basin; Phnom Penh, Cambodia, 22 August 2003.
10. PRIAP Program Retreat; 27-28 August 2003.
11. Enumerator Training for Aquatic Resources Valuation and Policies for Poverty Elimination in the Lower Mekong Basin; Stung Treng, Cambodia, 15-16 September, Takeo, 30 September-1 October, and Siem Reap, 7-8 October 2003.
12. Co-management Data Analysis Workshop; Lusaka, Zambia, 21-26 September 2003.
13. Project Methodology and Framework Review for Aquatic Resources Valuation and Policies for Poverty Elimination in the Lower Mekong Basin; Phnom Penh, Cambodia, 11 September 2003.
14. Launch of Outlook For Fish to 2020 - Meeting Global Demand; WorldFish Center, Penang, Malaysia, 3 October 2003.
15. Data Encoding Training for Aquatic Resources Valuation and Policies for Poverty Elimination in the Lower Mekong Basin; Phnom Penh, Cambodia, 27 October-7 November 2003.
16. Conservation and Sustainable Management of Sea Turtles in the Pacific Ocean; Italy, 17-22 November 2003.
17. Writing Workshop - A Wetlands Approach; WorldFish Center, Penang, Malaysia, 4-6 November 2003.
18. ADB-IFReDI Mid-Term Review Workshop; Phnom Penh, Cambodia, 13-14 November 2003.
19. Regional Technical Workshop on Fish Sector Modeling; Bangkok, Thailand, 17-21 November 2003.
20. Regional Workshop on Fisheries Co-Management for the Coastal Resources Fisheries Co-Management Project; Cape Town, South Africa, 1-5 December 2003.

#### **Biodiversity and Genetics Resources Research Program (BGRRP)**

1. Challenge Program - Comprehensive Assessment Workshop. River Flow-Fisheries Relationships; Phnom Penh, Cambodia, 15-17 February 2003.
2. Mekong Basin Kick-off Workshop; Phnom Penh, Cambodia, 25-27 March 2003.
3. Workshop to Identify Research Areas for Collaboration and Project Implementation; Los Baños, Laguna, Philippines, 28 May 2003.

4. Expert Consultation on Ecological and Genetic Risks Assessment of Genetically Improved Fish (with INGA Coordinator); Dhaka, Bangladesh, 6-7 August 2003.
5. Training in Biology - Research Methods and Tools for Fish Biologists; Phnom Penh, Cambodia, August-October 2003.
6. Annual International Training Program in Aquaculture; The Egyptian International Center for Agriculture, 1 October-15 December 2003.
7. Advanced Course on Quantitative Genetics; WorldFish Center, Penang, Malaysia, 20-31 October 2003.
8. National Workshop on Developing an Information Framework for Building Fish Taxonomic Expertise; Iloilo, Philippines, 29-30 October 2003.
9. National Workshop on Applying FishBase in the Philippines; Los Baños, Laguna, Philippines, 10-11 November 2003.
10. Regional Workshop on Building Capacity for Developing National Aquatic Information Systems; Los Baños, Laguna, Philippines, 2-5 December 2003.

#### **Coastal Marine Resources Research Program (CMRRP)**

1. Undergraduate Training in Genetics; WorldFish Center, Penang, Malaysia, February-March 2003.
2. Culture of Sea Cucumbers; New Caledonia, February-September 2003.
3. National Conference on Management of Coastal Fisheries in Malaysia; Kuala Lumpur, Malaysia, 11-12 March 2003.
4. Undergraduate Training in Genetics; WorldFish Center, Penang, Malaysia, March-May 2003.
5. Development of Knowledgebases for Coral Reefs; WorldFish Center, Penang, Malaysia, 15-17 April 2003.
6. Workshop on Marine Protected Areas (MPAs) and Coral Reef Related Research on Fisheries Management and Biodiversity Conservation in the Bohol (Mindanao) Sea; Philippines, 28-30 May 2003.
7. Fisheries Resource Information System and Tools (FiRST) Technical Workshop; WorldFish Center, Penang, Malaysia, 12-13 August 2003.
8. International Workshop on Coral Reef Monitoring Data Coordination; WorldFish Center, Penang, Malaysia, 2-4 December 2003.
9. Grow-out of Post-larval Fish, Solomon Islands; Periodic throughout 2003.

#### **Information and Communications Program (formerly Information, Communications and Dissemination Division)**

1. On-the-job Library and Information System Training; WorldFish Center, Penang, Malaysia, 10-23 December 2003.

#### **International Relations and Partnerships**

1. Integrated Coastal Zone Management Training at the Kecamatan Level - Kecamatan Tejakula Kabupaten Buleleng Bali (1st Pilot ICM); Denpasar, Indonesia, 18-21 December 2002.
2. Seminar on Outlook for Tilapia Farming Industry in Malaysia; Malacca, Malaysia, 25-26 March 2003.
3. National Planning Workshop on Fisheries Research and Development; Dhaka, Bangladesh, 2-5 April 2003.
4. Regional Milestone and Workshop South East Asia; Cebu, Philippines, 7-11 April 2003.
5. Northern Vietnam Integrated Coastal Management (ICM) Pilot Training Workshop; Hanoi, Vietnam, 9-16 May 2003.
6. Integrated Coastal Zone Management Training at the Kecamatan Level - Kecamatan Penajam, Kabupaten Penajam Paser Utara (2nd Pilot ICM); Balikpapan, Indonesia, 26-30 May 2003.
7. Philippine Bureau of Fisheries and Aquatic Resources (BFAR) - WorldFish Center Workshop; Los Banos, Philippines, 28 May 2003.
8. Central Vietnam Integrated Coastal Management (ICM) Pilot Training-Workshop; Nha Trang, Vietnam, 8-13 June 2003.
9. Southern Vietnam Integrated Coastal Management (ICM) Pilot Training-Workshop; Ho Chi Minh City, Vietnam, 16-22 June 2003.

10. Public-Private Partnerships for Delivery of Tilapia Genetic Research Outputs to End-Users; Angeles City, Philippines, 25-27 June 2003.
11. Integrated Coastal Management Training for Local Executives and Policy Makers in Region 6; Visayan Seas on board MV/DA-BFAR Vessel, 7-10 July 2003.
12. Expert Consultation on Ecological Risk Assessment of Genetically Improved Fish; Dhaka, Bangladesh, 4-8 August 2003.
13. Regional Course on Integrated Coastal Management and Training of Trainers; Cebu, Philippines, 7 August-2 September 2003.
14. Integrated Coastal Zone Management Training at the Kecamatan Level - Kecamatan Kasemen Kabupaten Serang (3rd Pilot ICM); Anyer Banten, West Java, Indonesia, 10-14 September 2003.
15. National Seagrass Networking Conference; Palawan, Philippines, 3-5 September 2003.
16. Training Course on Quantitative Genetics and its Application to Aquaculture; WorldFish Center, Penang, Malaysia, 20-31 October 2003.

#### **Corporate Services Division (CSD)**

1. 1st Board of Trustees Meeting, 3-7 March 2003.
2. 2nd Board of Trustees Meeting, 22-26 September 2003.

#### **Deputy Director General-Research**

1. Risk Communications Workshop, 18 June 2003.
2. In-house Scientific Workshop (Science Week), 25-29 August 2003.



## PUBLICATIONS

### Published By Worldfish Center

Delgado, C.L., N. Wada, M. W. Rosegrant, S. Meijer and M. Ahmed (eds). 2003. Fish to 2020: supply and demand in changing global markets. International Food Policy Research Institute and WorldFish Center. Technical Report 62, 226 p.

Gardiner, P., J. Hagmann and G. Hahne. 2003. Planning in muddy waters - orientation for strategic planning in CGIAR Centers. WorldFish Center Conference Proceedings 66, 38 p.

Silvestre, G., L. Garces, I. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C. Lunar, L. Lachica-Aliño, P. Munto, V. Christensen and D. Pauly (eds). 2003. Assessment, management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 120 p.

Tilapia Science Center, Philippines and WorldFish Center. 2003. Angeles Declaration: public-private partnerships for dissemination of research outputs to end-users. 11 p.

Torell, M., A.M. Salamanca and B.D. Ratner (eds). 2003. Wetlands management in Vietnam: issues and perspectives. WorldFish Center Technical Report 61, 89 p.

Viswanathan, K.K., J.R. Nielsen, P. Degnbol, M. Ahmed, M. Hara, N.M. Raja Abdullah. 2003. Fisheries co-management policy brief: findings from a worldwide study. WorldFish Center Policy Brief 2, 26 p.

WorldFish Center. 2003. Dhaka Declaration on ecological risk assessment of genetically improved fish. 18 p.

Zhang, L.X., J. Liu, S.F. Li, N.S. Yang and P.R. Gardiner (eds). 2003. Agricultural development and the opportunities for aquatic resources research in China. WorldFish Center Conference Proceedings 65, 58 p.

### Published Outside Worldfish Center

#### Refereed

Ahmed, M., P. Boonchuwongse, W. Dechboon and D. Squires. Excess capacity and overfishing in the Gulf of Thailand: policy challenges and bioeconomic analysis. *Marine Resource Economics Journal*. (Forthcoming)

Ahmed, M., G. Umali, C.K. Chong and M.F. Rull. Valuation of recreational benefits: an application of the travel cost model to the Bolinao coral reefs in the Philippines. *Journal of Ecological Economics*. (Forthcoming)

Alam, M.F. and M.M. Dey. Strategies and options for enhancing aquaculture production in Bangladesh. *Aquaculture Economics and Management*. (Forthcoming)

Ayyat, M.S., F.S. Abbas and G.O. El-Gaggar. 2003. Effect of dietary protein level and vitamin C supplementation on performance of Nile tilapia (*Oreochromis niloticus*). *Veterinary Medicine Journal, Giza* 51(3): 287-298.

Bene, C. 2003. When fishery rhymes with poverty: a first step beyond the old paradigm on poverty in small-scale fisheries. *World Development* 31(6):949-975.

Brummett, R. 2003. Aquaculture and society in the new millennium. *World Aquaculture* 34(1):51-59, 70.

Brummett, R. Indigenous species for African aquaculture development. In J. Nielsen and T.M. Bert (eds) *Ecological and genetic effects of aquaculture on the environment, and their solutions*. Kluwer Scientific, Dordrecht, the Netherlands. (In press)

Christie, P., D. Buhat, L.R. Garces and A.T. White. 2003. The challenges and rewards of community-based coastal resources management: San Salvador Island, Philippines. In S.R. Brechin, P.R. Wilshusen, C.L. Fortwangler and P.C. West (eds) *Contested nature: promoting international biodiversity and social justice in the twenty-first century*. State University of New York Press, New York.

Clarke, P.J., T. Komatsu, J.D. Bell, F. Lasi, C.P. Oengpepa and J. Leqata. 2000. Combined culture of *Trochus niloticus* and giant clams (Tridacnidae): benefits for restocking and farming. *Aquaculture* 215:123-144.

Dance, S.K., I. Lane and J.D. Bell. 2003. Variation in short-term survival of cultured sandfish (*Holothuria scabra*) released in mangrove-seagrass and coral reef flat habitats in Solomon Islands. *Aquaculture* 220:495-505.

- Demanou, J. and R.E. Brummett. 2003. Heavy metal and fecal bacterial contamination of urban lakes in Yaoundé, Cameroon. *African Journal of Aquatic Science* 28(1):49-56.
- Dey, M.M. and M. Prein. 2003. Participatory research at landscape level: floodprone ecosystems in Bangladesh and Vietnam, p. 223-225. In B. Pound, S.S. Snapp, C. McDougall and A. Braun (eds) *Managing natural resources for sustainable livelihoods: uniting science and participation*. Earthscan and IDRC, London.
- Dey, M.M. and M. Prein. Economics of community-based fish culture in flooded rice fields in Asia. *Aquaculture Economics and Management*. (Forthcoming)
- Dey, M.M., S. Koeshendrayana and F.J. Paraguas. Technical efficiency of common carp production in Indonesia: an analysis by stages of production. *Aquaculture Economics and Management*. (Forthcoming)
- Dey, M.M., F.J. Paraguas, X. Yuan, N. Srichantuk, R. Bhatta and L.T.C. Dung. Technical efficiency of fish farming under polyculture system in freshwater pond in Asia: a cross-country comparison. *Aquaculture Economics and Management*. (Forthcoming)
- Dey, M.M., M.A. Rab, F.J. Paraguas, S. Piumsumbun, R. Bhatta, M.F. Alam, S. Koeshendrayana and M. Ahmed. Status and economics of freshwater fish farming in Asia. *Aquaculture Economics and Management*. (Forthcoming)
- Dey, M.M., M.A. Rab, F.J. Paraguas, S. Piumsumbun, R. Bhatta, M.F. Alam and M. Ahmed. Fish consumption in selected Asian countries: a disaggregated analysis by types of fish and classes of consumers. *Aquaculture Economics and Management*. (Forthcoming)
- Garcia, Y., M.M. Dey and S. Navarez. Analysis of fish demand in the Philippines. *Aquaculture Economics and Management*. (Forthcoming)
- Jamu, D.M., J.B. Chimphamba and R.E. Brummett. Land use and cover changes in the Likangala catchment of Lake Chilwa basin, Malawi: implications for managing a tropical wetland in Malawi, Southern Africa. *African Journal of Aquatic Science*. (In press)
- Lane, I., C.P. Oengpepa and J.D. Bell. 2003. Production and grow out of the black-lip pearl oyster (*Pinctada margaritifera*). *Aquaculture Asia* 8(1):5-7.
- Morrisey, D.J., R.G. Cole, J.D. Bell, I. Lane and G.B. Read. Low abundances and diversities of benthic faunas of shallow, coastal sediments in the Solomon Islands and their implications for assessing environmental impact of logging. *Pacific Conservation Biology*. (In press)
- Nielsen, J.R., P. Degnbol, K.K. Viswanathan, M. Ahmed, M. Hara and N.M.R. Abdullah. 2003. Fisheries co-management - an institutional innovation? Lessons from South East Asia and Southern Africa. *Marine Policy* 28(2):151-160.
- Pitt, R. and N.D.Q. Duy. 2003. Breeding and culture of the sea cucumber *Holothuria scabra* in Vietnam. *Aquaculture Asia* 8(1):36-39.
- Piumsumbun, S., M.M. Dey and M. Rab. Farming practices and policies for sustainable aquaculture development in Thailand. *Aquaculture Economics and Management*. (Forthcoming)
- Pomeroy R.S. and K.K. Viswanathan. 2003. Experiences with fisheries co-management in Southeast Asia and Bangladesh, p. 99-117. In D.C. Wilson, J.R. Nielsen and P. Degnbol (eds) *The fisheries co-management experience, accomplishments, challenges and prospects*. Kluwer Academic Publishers, Dordrecht.
- Ramofafia, C., S.C. Battaglione and M. Byrne. 2003. Reproduction of the commercial sea cucumber *Holothuria scabra* (Echinodermata: Holothuroidea) in Solomon Islands. *Marine Biology* 142:281-288.
- Ramofafia, C., M. Byrne and S.C. Battaglione. 2003. Development of three commercial sea cucumbers, *Holothuria scabra*, *H. fuscogilva* and *Actinopyga mauritiana*: larval structure and growth. *Marine and Freshwater Research* 54: 657-667.
- Ratner, B. 2003. The politics of regional governance in the Mekong River Basin. *Global Change, Peace & Security (formerly Pacifica Review)* 15(1).
- Ratner, B. Equity, efficiency, and identity: grounding the debate over population and sustainability. *Population Research and Policy Review*. (In press)
- Rezk, M.A., R.O. Smitherman, J.C. Williams, A. Nichols, H. Kucuktas and R.A. Dunham. 2003. Response to three generations of selection for increased body weight in channel catfish, *Ictalurus punctatus*, grown in earthen ponds. *Aquaculture* 228(1-4):69-79.
- Squires, D., I.H. Omar, Y. Jeon, J. Kirkley, K.K. Viswanathan and I. Susilowati. 2003. Excess capacity and sustainable development in Java Sea fisheries. *Environment and Development Economics* 8:105-127.

Thompson, P., P. Sultana and N. Islam. 2003. Lessons from community based management of floodplain fisheries in Bangladesh. *Journal of Environmental Management* 69(3):307-321.

Thompson, P., P. Sultana and F. Khan. Comparison of aquaculture extension impacts in Bangladesh. *Aquaculture Economics and Management*. (In press)

Tomich, T.P., K. Chomitz, H. Francisco, A.N. Izac, D. Murdiyarsa, B.D. Ratner, D.E. Thomas and M. van Noordwijk. Policy analysis and environmental problems at different scales: asking the right questions. *Agriculture Ecosystems and Environment*. (Forthcoming)

Williams, M.J., P.S. Choo, et al. 2003. Chapter 2: Ecosystems and their services, p. 49-70. In *Ecosystems and human well-being: a framework for assessment*. Millennium Ecosystem Assessment. Island Press, Washington, USA.

#### NON-REFEREED

Ahmed, M. and M.A.P. Bimbao. 2003. Considerations économiques pour l'introduction d'une. p. 9-12. In *Integration agriculture-aquaculture: principes de base et exemples*. FAO Document Technique sur les peches. No. 407. FAO, Rome.

Ahmed, M. and K.C. Chong. An overview of problems and issues of coral reef management. In Ahmed, M., Chong, C.K. and H. Cesar (eds) *Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs*. WorldFish Center Conference Proceedings 70:2-11.

Ahmed, M., K.K. Viswanathan and R.A. Valmonte-Santos. 2004. Collective action and property rights in fisheries management. p. 11-12. In Meinzen-Dick, R. and M. Di Gregorio (eds) *Collective action and property rights for sustainable development*. 2020 Focus 11. IFPRI and CAPRI, Washington, DC.

Ahmed, M., M.A. Rab and M.M. Dey. Changing structure of fish supply, demand and trade in developing countries - issues and needs. In *Fisheries in the global economy*. Proceedings of the Biennial Conference of the International Institute on Fisheries Economics and Trade (IIFET), 19-22 August 2002, Wellington, New Zealand. (In press)

Arthington, A.H., E. Baran, C.A. Brown, P. Dugan, A.S. Halls, J.M. King, C.V. Minte-Vera, R.E. Tharme, and R.L. Welcomme. Water requirements of floodplain rivers and fisheries: existing decision-support tools and pathways for development. *Comprehensive Assessment of Water Management in Agriculture*. 59 p. (In press)

Arthington, A.H., K. Lorenzen, B.J. Pusey, R. Abell, A.S. Halls, K.O. Winemiller, D.A. Arrington and E. Baran. River fisheries: ecological basis for management and conservation. In R.L. Welcomme and T. Petr (eds), *Proceedings of the Second International Symposium on the Management of Large Rivers for Fisheries, Volume 1*. Mekong River Commission, Phnom Penh, Cambodia. (In press)

Baran, E. and A.G. Ponniah. 2003. Freshwater resources conservation: an action-oriented overview, p. 400-415. In CIP-UPWARD. *Conservation and sustainable use of agricultural biodiversity: a sourcebook*. International Potato Center - Users' Perspectives with Agricultural Research and Development, Los Banos, Laguna, Philippines. 3 volumes.

Baran, E., I. Makin and I.G. Baird. BayFish: a model of environmental factors driving fish production in the Lower Mekong Basin. In R.L. Welcomme and T. Petr (eds) *Proceedings of the Second International Symposium on the Management of Large Rivers for Fisheries*, 11-14 February 2003, Mekong River Commission, Phnom Penh, Cambodia. (In press)

Barman, B.K., D.C. Little and J. Janssen. 2003. Tilapia culture systems in Bangladesh. *Global Aquaculture Advocate* 6(4):31-33.

Barut, N.C., M.D. Santos, L.L. Mijares, R. Subade, N.B. Armada and L.R. Garces. 2003. Philippine coastal fisheries situation, p. 885-914. In G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A. Valmonte-Santos, L. Lachica-Aliño, P. Munro, V. Christensen, and D. Pauly (eds) *Assessment, management and future directions for coastal fisheries in Asian countries*. WorldFish Center Conference Proceedings 67, 1 120p.

Battaglione, S.C. and J.D. Bell. The restocking of sea cucumbers in the Pacific Islands. In D.M. Bartley and K.M. Leber (eds) *Case studies in marine ranching*. FAO Fishery Technical Paper No 429. FAO, Rome, Italy. (In press)

Bell, J.D. Management of restocking and stock enhancement programs: the need for different approaches. *Proceedings of the Second International Symposium on Stock Enhancement and Sea Ranching*, 28 January - 1 February 2002, Kobe, Japan. (In press)

Bell, J.D. and L. Garces. Potential role of restocking and stock enhancement in the management of marine invertebrate fisheries in the Philippines. *Philippine Marine Capture Fisheries Profile*. (In press)

Bene, C. and A.E. Neiland. 2003. Valuing Africa's inland fisheries: overview of current methodologies with an emphasis on livelihood analysis. *NAGA, WorldFish Center Quarterly* 26(3):18-21.

- Bunce, L., R. Pomeroy, K.K. Viswanathan, E. Ferrer, G. Hodgson, S. Sair, B. Pestano-Smith and J. Tulungen. 2003. Socioeconomic monitoring guidelines for coastal managers in Southeast Asia. World Commission on Protected Areas, IUCN, Gland and Australian Institute of Marine Science, Townsville, Australia.
- Cesar, H. and C.K. Chong. 2004. Economic valuation and socioeconomics of coral reefs: methodological issues and three case studies. In M. Ahmed, C.K. Chong and H. Cesar (eds) Proceedings for International Consultative Workshop on Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs. WorldFish Center Conference Proceedings 70:14-40.
- Chong, C.K., H. Cesar, M. Ahmed and H. Balasubramanian. 2004. Future research directions in coral reef management. In M. Ahmed, C.K. Chong and H. Cesar (eds) Proceedings for International Consultative Workshop on Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs. WorldFish Center Conference Proceedings 70:204-209.
- Choo, P.S. and M.J. Williams. 2003. Fisheries production in Asia: its role in food security and nutrition. NAGA, WorldFish Center Quarterly 26(2):11-16.
- Christensen, V., L.R. Garces, G.T. Silvestre and D. Pauly. 2003. Fisheries impact on the South China Sea large marine ecosystem: a preliminary analysis using spatially-explicit methodology, p. 51-62. In G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A. Valmonte-Santos, L. Lachica-Aliño, P. Munro, V. Christensen and D. Pauly (eds) Assessment, management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 120 p.
- Delgado, C., M. Rosegrant, N. Wada, S. Meijer and M. Ahmed. 2002. Fish as food: projections to 2020 under different scenarios. Markets and Structural Studies Division (MSSD) Paper No. 52. International Food Policy Research Institute, Washington, DC, USA.
- Delgado, C.L., N. Wada, M.W. Rosegrant, S. Meijer and M. Ahmed. 2003. Fish to 2020: supply and demand in changing global markets. International Food Policy Research Institute Washington, DC, USA and WorldFish Center, Penang, Malaysia.
- Delgado, C.L., N. Wada, M.W. Rosegrant, S. Meijer and M. Ahmed. 2003. Outlook for fish to 2020: meeting global demand. International Food Policy Research Institute, Washington, DC, USA and WorldFish Center, Penang, Malaysia. 28 p.
- Dey, M.M., F.J. Paraguas and M.F. Alam. Production, marketing, accessibility and consumption of aquaculture products in Asia: a cross-country comparison. In M.M. Dey and R.P. Subasinghe (eds) Production, marketing, accessibility, and consumption patterns of freshwater aquaculture products in Asia. FAO Fisheries Technical Paper. (In press)
- Dey, M.M., F.J. Paraguas, R. Bhatta, M.F. Alam, M. Weimin, S. Piumsumbun and S. Koeshendrayana. Carp production in Asia: past trends, current status and future prospects. In D. Penman, M.V. Gupta and M.M. Dey (eds) Carp genetic resources for aquaculture in Asia. WorldFish Center, Penang, Malaysia. (Forthcoming)
- Dey, M.M., M. Ahmed, K.M. Jahan and M.A. Rab. 2003. Liberalization vs. barriers: experiences from selected countries in Asia. In Fisheries in the global economy. Proceedings of the Biennial Conference of the International Institute on Fisheries Economics and Trade (IIFET), 19-22 August 2002, Wellington, New Zealand.
- Dey, M.M., M.F. Alam, M. Weimin, S. Piumsumbun, R. Bhatta, S. Koeshendrayana and F.J. Paraguas. Constraints to higher yield in carp farming: implications for future genetic research. In D. Penman, M.V. Gupta and M.M. Dey (eds) Carp Genetic resources for aquaculture in Asia. WorldFish Center, Penang, Malaysia. (Forthcoming)
- Dey, M.M., R. Briones and M. Ahmed. 2003. Modeling the Asian fish sector: issues, framework and method. In Fisheries in the global economy. Proceedings of the Biennial Conference of the International Institute on Fisheries Economics and Trade (IIFET), 19-22 August 2002, Wellington, New Zealand.
- Dugan, P. 2003. Investing in Africa: the WorldFish Center's African strategy in summary. NAGA, WorldFish Center Quarterly 26(3):4-8.
- Froese, R. and R. Reyes. Use them or lose them: the need to make collection databases publicly available. Proceedings of the 18th International Congress of Zoology. (In press)
- Garces, L.R. and G.T. Silvestre. 2003. An overview of the Fisheries Resources Information System and Tools (FIRST) version 2001: a database management system for storing and analyzing trawl survey data, p. 41-50. In G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A. Valmonte-Santos, L. Lachica-Aliño, P. Munro, V. Christensen and D. Pauly (eds) Assessment, management and future directions for coastal fisheries in Asian Countries. WorldFish Center Conference Proceedings 67, 1 120 p.

- Garces, L.R., M. Alias, A. Abu Talib, M. Mohammad-Norizam and G.T. Silvestre. 2003. A trophic model of coastal fisheries ecosystem off the west coast of Sabah and Sarawak, Malaysia, p. 333-352. In G. Silvestre, L. Garces, I. Stobutzki, C. Luna, M. Ahmed, R.A.V. Santos, L. Lachica Aliño, P. Munro, V. Christensen and D. Pauly (eds) Assessment, management and future directions for coastal fisheries in Asian Countries. WorldFish Center Conference Proceedings 67, 1 120 p.
- Gardiner, P.R., L.S. Lim and G. John. 2003. New biotechnology applications in fish. In I. Serageldin and G.J. Persley (eds) Biotechnology and sustainable development: voices of the south and north. p. 113-124. Biotechnology in Agriculture Series No. 26. CABI Publishing, Wallingford, Oxon, UK.
- Gupta, M.V. 2003. Culture d'especies cycle court en etangs saisonniers et fosses au Bangladesh, p. 41-44. In Integration agriculture-aquaculture: principes de base et exemples. FAO Document Technique sur les peches. No. 407. FAO, Rome.
- Gupta, M.V. and F. Noble. Elevage integre poules-poisson, p. 51-56. In Integration agriculture-aquaculture: principes de base et exemples. FAO Document Technique sur les peches. No. 407. FAO, Rome.
- Hair, C. and P. Doherty. 2003. Progress report on the capture and culture of presettlement fish from Solomon Islands. SPC Live Reef Fish Bulletin 11:13-18.
- Jamu, D.M. and O.A. Ayinla. 2003. Potential for the development of aquaculture in Africa. NAGA, WorldFish Center Quarterly 26(3):9-13.
- Jamu, D.M., K. Chaula and H. Hunga. 2003. A preliminary study on the feasibility of using fenced brushparks for fish production in Lake Chilwa, Malawi. NAGA, WorldFish Center Quarterly 26(1):4-8.
- Jamu, D.M., R.E. Brummett, I. Mapeto, A. Monjeza, F. Makuwa and P. Bato. Implementation of a new participatory aquaculture research and extension policy / approach in Malawi: results from pilot phase activities. NAGA, WorldFish Center Quarterly (Forthcoming)
- Noordeloos, M., J. Oliver, N. Nayan, Y. Yusuf, M. Tan, K. Foo and F. Shahriyah. 2003. ReefBase: Improved data and incorporation for coral reef management, research and education. NAGA, WorldFish Center Quarterly 26(2): flyer.
- Oliver, J. and R. Hermes. Information coordination and dissemination: theme report. Proceedings of the 2nd International Tropical Marine Ecosystems Management Symposium (ITMEMS 2), 24-28 March 2003, Manila, Philippines. (In press)
- Oliver, J. and K. Teleki. ICRAN - People and reefs: a partnership for management conservation and prosperity. Proceedings of the 2nd International Tropical Marine Ecosystems Management Symposium (ITMEMS 2), 24-28 March 2003, Manila, Philippines. (In press)
- Pitt, R. and N.D.Q. Duy. 2003. To produce 100 tonnes of sandfish. SPC Bêche-de-mer Information Bulletin 18:15-17.
- Piumsombun, S., M.M. Dey and F.J. Paraguas. 2003. Analysis of demand for fish consumed at home in Thailand. In Fisheries in the global economy. Proceedings of the Biennial Conference of the International Institute on Fisheries Economics and Trade (IIFET), 19-22 August 2002, Wellington, New Zealand.
- Ponzoni, R.W. 2003. A systematic approach to advance and refine genetic improvement programs in aquatic species, p. 9-16. Proceedings of the National Symposium for Genetic and Gene Banking of Fish and Shellfish, 29-20 March 2003, Central Institute of Fisheries Education, Mumbai, India.
- Ponzoni, R.W. Fish genetic improvement from a sustainable perspective. Proceedings of Seminar on Sustainable Fishing and Fish Farming Practices, 8 March 2003, Kuala Lumpur, Malaysia. (In press)
- Power, R.M. Harvest of settlement stage reef fish for small-scale grow-out or stock enhancement; a feasibility study on the French Grunt, *Haemulon flavolineatum*. Proceedings of the 54th Gulf Caribbean Fisheries Institute. (In press)
- Ratner, B. 2002. Sustainability in the Mekong River Basin: an experiment in transboundary governance. In Walter Leal Filho (ed.) International experiences on sustainability. Peter Lang Scientific Publishing, Berlin and New York.
- Ratner, B. 2003. Population, Environment, and Sustainability (Natural Resources 5480 at the University of Minnesota), and Sociology of Environmental Change (Sociology/Anthropology 231 at Carleton College). In R. Scarce and M. Mascarenhas (eds) Syllabi and Instructional Material in Environmental Sociology. 5th ed. American Sociological Association, Washington, DC.
- Silvestre, G.T., L.R. Garces, I. Stobutzki, Ahmed, M., R.A. Valmonte-Santos, C.Z. Luna and W. Zhou. South and South-East Asian Coastal Fisheries: their status and directions for improved management: conference synopsis and recommendations, p. 1-40. In G.T. Silvestre, L.R. Garces, C. Luna, M. Ahmed, R.A. Valmonte-Santos, L. Lachica-Aliño, V. Christensen and D. Pauly (eds) Assessment, management and future directions for coastal fisheries in Asian countries. WorldFish Conference Proceedings 67, 1 120 p.



- Srivastava, S.K., R. Reyes, B. Fabres and A. Ponniah. 2002. Mapping Indian fish diversity using historical occurrence data in FishBase. Proceedings of the Second International Symposium on GIS/Spatial Analyses in Fishery and Aquatic Sciences, The University of Sussex, Brighton, U.K., 3-6 September 2002.
- Sultana, P. and P. Thompson. 2003. Methods of consensus building for community based fisheries management in Bangladesh and the Mekong Delta. CAPRI Working Paper 30, CGIAR Systemwide Program on Collective Action and Property Rights, International Food Policy Research Institute, Washington, DC.
- Sultana, P. and P. Thompson. Use of fishers' knowledge in community management in fisheries in Bangladesh. In I. Baird (ed.) Putting fishers' knowledge to work. (Forthcoming)
- Torell, M. and A.M. Salamanca. 2003. Wetlands management in Vietnam's Mekong Delta: an overview of the pressures and responses, p. 1-19. In M. Torell, A.M. Salamanca and B.D. Ratner (eds) Wetlands management in Vietnam: issues and perspectives. WorldFish Center Technical Report 61, 89 p.
- Torell, M., A.M. Salamanca and B.D. Ratner. Introduction: Cambodian wetlands in perspective. In M. Torell, A.M. Salamanca and B.D. Ratner (eds) Wetlands management in Cambodia: socioeconomic, ecological, and policy perspectives. WorldFish Center, Penang, Malaysia. (In press)
- Williams, M.J. 2003. Fish for All Initiative: a global effort to sustain benefits from fisheries, p. 123-129. In Fish for All: National Launch, Kolkata, India, 18-19 December 2003. WorldFish Center, Government of India & West Bengal and M.S. Swaminathan Research Foundation.
- Williams, M.J. 2003. Message from Dr. Meryl J. Williams. In Fish for All: National Launch, Kolkata, India, 18-19 December 2003. WorldFish Center, Government of India & West Bengal and M.S. Swaminathan Research Foundation.
- Williams, M.J. 2003. A year for action and reflection, p. 24-25. In J. Ingleton (ed.) Freshwater Future. Tudor Rose, UK.
- Williams, M.J. and P.S. Choo. 2003. The digital divide: your role in bridging the gap in aquatic library services for the disconnected, p. 19-32. In J.W. Markham and A.L. Duda (eds) Bridging the digital divide. Proceedings of the 28th Annual Conference of the International Association of Aquatic and Marine Science Libraries and Information Centers (IAMSLIC). IAMSLIC, Fort Pierce, Florida.
- Williams, M.J. and P.S. Choo. Fish production in Asia: its role in nutrition and food security. Proceedings of the Asian Nutrition Conference, New Delhi, India. (In press)
- Williams, M.J. and P.S. Choo. Role of the private sector in technology transfer and capacity building in sustainable aquaculture, p. 161-170. In Proceedings of the Norway/UN Conference on Technology Transfer and Capacity Building. Norwegian Directorate for Nature Management, Trondheim, Norway.

## Papers Presented

Ablan, M.C.A. 2003. Genetic diversity and the management of coral reef resources in the Indo-West Pacific: issues, needs and the way forward. Symposium of Phylogeography of West Pacific, Institute of Zoology, Academia Sinica, 28 February - 6 March 2003, Taipei, Taiwan.

Ablan, M.C.A. 2003. Molecular genetics and their application to the management of coastal fisheries. Recent Advances in Coral Reef Science and Management, 11 April 2003, WorldFish Center, Penang, Malaysia.

Ablan, M.C.A. 2003. Molecular genetics research opportunities for characterization and breeding of fish in developing countries. National Research Institute for Aquaculture, Fisheries Research Agency; Tohoku University and University of Tokyo, 14 July - 23 August 2003.

Ahmed, M., M.S. Haque and R.A. Valmonte-Santos. 2003. A socioeconomic analysis of sustainable management of coastal fish stocks in South and South East Asia. International Consultative Workshop for Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs, 8-10 December 2001, Penang, Malaysia.

Ahmed, M., G. Umali, C.K. Chong and M.F. Rull. 2003. Valuation of recreation benefits: an application of the travel cost method to the Bolinao coral reefs in the Philippines. International Consultative Workshop for Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs, 8-10 December 2001, Penang, Malaysia.

Alam, M.F. 2003. Towards poverty alleviation: the potential of fisheries in Bangladesh. Paper presented at the Fishweek 2003 BIAM auditorium, 13 August 2003, Dhaka, Bangladesh.

Alam, M.F. 2003. Agricultural diversification in Bangladesh. A paper to be presented at an International Workshop on Agricultural Diversification and Vertical Integration in South Asian Countries: Can Smallholders Harness the Opportunities, 5-6 November 2003, FICCI, ICRISAT and IFPRI, New Delhi.

Alam, M.F., M.M. Dey and F.J. Paraguas. 2003. Fish consumption behaviour of different income groups: preliminary findings from inland areas of Bangladesh. A paper presented in a workshop on Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit the Poor Households in Bangladesh, Department of Fisheries, 5 June 2003, Dhaka, Bangladesh.

Balasubramanian, H., M. Ahmed and C.K. Chong. 2003. Estimating the 'total economic value' of coral reefs in South East Asia and the Caribbean: trends identified, lessons learned and directions for future research. Second International Tropical Marine Ecosystems Management Symposium (ITMEMS 2), 24-28 March 2003, Manila, Philippines.

Bell, J.D. 2003. Creating new livelihood options through restocking sea cucumbers and farming pearl oysters. Recent Advances in Coral Reef Science and Management, 11 April 2003, WorldFish Center, Penang, Malaysia.

Bell, J.D. 2003. Restocking sea cucumbers. Bureau of Fisheries and Aquaculture-WorldFish Center Workshop to identify research areas for collaboration, 28 May 2003, Los Baños, Philippines.

Bell, J.D. and D. Jamu. 2003. Assessing the potential for restocking, habitat enhancement, fish sanctuaries and aquaculture to restore production of Chambo in Malawi. National Stakeholders Consultative Forum on Restoration of Chambo, 13-16 May 2003, Malawi.

Bell, J.D. and W.J. Nash. 2003. When should restocking and stock enhancement be used to manage sea cucumber fisheries? Advances in Sea Cucumber Aquaculture and Management, 14-17 October 2003, Dalian, China.

Chong, C.K., M. Ahmed and H. Balasubramanian. 2003. Estimation of economic value of coral reefs at the Caribbean: a meta-analysis. Second International Tropical Marine Ecosystems Management Symposium (ITMEMS 2), 24-28 March 2003, Manila, Philippines.

Garces, L. 2003. Regional overview of the coastal fisheries project in Asia and insights on sustainability indicators for capture fisheries. Demand-Supply Project Workshop on Aquaculture Technologies and Fishing Practices in Asia, 17-27 March 2003, WorldFish Center, Penang, Malaysia.

Garces, L. 2003. Current contents and format of FiRST. Global Public Goods: Databases, Databases Integration Workshop, 29-30 April 2003, WorldFish Center, Penang, Malaysia.

Jahan, K.M. 2003. Transaction cost and resource rent of the fisheries co-management system at the Oxbow Lakes (Baors) in Bangladesh. A paper presented at an international workshop on Community Participation in Fisheries Management on Lake Victoria, 7-9 October 2003, Kisumu, Kenya.

- Kamsiah, M.A. 2003. Bridging the divide: the WorldFish Center initiatives. Conference on Changes and Challenges of Public Library Services to Bridge the Digital Divide, 23-25 June 2003, Penang, Malaysia.
- Munro, J.L. 2003. Assessment and management of Caribbean coral reef fisheries. Recent Advances in Coral Reef Science and Management, 11 April 2003, WorldFish Center, Penang, Malaysia.
- Nash, W.Le. 2003. WorldFish Center dans le Pacifique et Nouvelle Calédonie. Workshop to review the status and potential of aquaculture in New Caledonia, June 2003.
- Noordeloos, M. and J. Oliver. 2003. ReefBase: a global information system to promote sustainable use and management of coral reefs. 2nd International Tropical Marine Ecosystems Management Symposium (ITMEMS 2), 24-27 March 2003, Manila, Philippines.
- Oliver, J.K. 2003. International Coral Reef Action Network. 2nd International Tropical Marine Ecosystems Management Symposium (ITMEMS 2), 24-27 March 2003, Manila, Philippines.
- Oliver, J.K. 2003. ReefBase - a new management tool for coral reefs. Recent Advances in Coral Reef Science and Management, 11 April 2003, WorldFish Center, Penang, Malaysia.
- Oliver, J.K. 2003. ReefBase: a global information system on coral reefs. Poster at the Seminar on Islands and Reefs: Towards Conservation and Sustainable Management, 15-16 August, Cititel Hotel, Mid Valley, Kuala Lumpur, Malaysia.
- Pitt, R. and N.D.Q. Duy. 2003. Sandfish breeding and rearing in Vietnam. Advances in Sea Cucumber Aquaculture and Management, 14-17 October 2003, Dalian, China.
- Purcell, S. 2003. Criteria for release strategies and evaluating the restocking of sea cucumbers. Advances in Sea Cucumber Aquaculture and Management, 14-17 October 2003, Dalian, China.
- Ramofafia, C., I. Lane and C. Oengpepa. 2003. Customary marine tenure in Solomon Islands: a shifting paradigm for management of sea cucumber in artisanal fisheries. Advances in Sea Cucumber Aquaculture and Management, 14-17 October 2003, Dalian, China.
- Ramos, M., Y. Soeripto and M.A. Kamsiah. 2003. Cultivating communities of practice: the CGIAR information management professional's experience. 6th Congress of SEA Librarians Conference, 19-23 October 2003, Brunei.
- Shamsuddoha, M. and J. Janssen. 2003. Integrated Agriculture-Aquaculture (IAA) - A way to Aquaculture Sustainability in the Bhola Island, Bangladesh. East Asia Sea (EAS) Congress 2003, 8-12 December 2003, Penang, Malaysia.
- Silvestre, G. 2003. Regional overview of the coastal fisheries project and key results. National Conference on Management of Coastal Fisheries in Malaysia, 11-12 March 2003, Kuala Lumpur, Malaysia.
- Silvestre, G. 2003. Resource analysis and management recommendations for Malaysia. National Conference on Management of Coastal Fisheries in Malaysia, 11-12 March 2003, Kuala Lumpur, Malaysia.
- Stobutzki, I. 2003. Marathon swimmers and expert navigators: the behavior of larval coral reef fish. Recent Advances in Coral Reef Science and Management, 11 April 2003, WorldFish Center, Penang, Malaysia.
- Stobutzki, I. 2003. Overview of FiRST and its future directions. Global Public Goods: Databases, Databases Integration Workshop, 29-30 April 2003, WorldFish Center, Penang, Malaysia.
- Viswanathan, K.K. 2003. Law, enforcement and monitoring, control and surveillance (MCS) for small-scale fisheries. Paper presented at the ASEAN / SEAFDEC Regional Workshop on Innovative Fisheries Management Approaches in Southeast Asia: Rights based Fisheries and Decentralization, 6-9 May 2003, Phuket, Thailand.
- Viswanathan, K.K. and M. Ahmed. 2003. Findings from co-management activities in different parts of the world. Paper presented at the National Conference on Management of Coastal Fisheries in Malaysia, 11-12 March 2003, Kuala Lumpur, Malaysia.
- Viswanathan, K.K. and M. Ahmed. 2003. Key examples of co-management activities and insights on possibilities of implementation in Malaysia. Paper presented at the National Conference on Management of Coastal Fisheries in Malaysia, 11-12 March 2003, Kuala Lumpur, Malaysia.
- Williams, M.J. 2003. Diversitas: an international framework for biodiversity research. Presented to Steering Committee of the Census of Marine Life, 21 January 2003, Hobart, Australia.

Williams, M.J. 2003. Achieving water and Fish for All in the Philippines. On the Occasion of the 15th Anniversary of the Philippine Council for Aquatic and Marine Research and Development, 30 January 2003.

Williams, M.J. 2003. The role of information and knowledge management in fisheries development. National Fisheries Symposium, 18 February 2003, Renaissance Kota Bharu Hotel, Kelantan, Malaysia.

Williams, M.J. 2003. Report on the 2003 Meeting of the FAO Committee on Fisheries, 24-28 February 2003, Rome. Seminar at WorldFish HQ, March 2003.

Williams, M.J. 2003. Welcome remarks. National Conference on Management of Coastal Fisheries in Malaysia, 11-12 March 2003.

Williams, M.J. 2003. Welcome remarks. Seminar on Outlook for Tilapia Farming Industry in Malaysia, 25-26 March 2003, Melaka, Malaysia.

Williams, M.J. 2003. Overview of WorldFish Center program. Presentation to Sarawak Minister of Agriculture during his visit to WorldFish Headquarters, March 2003.

Williams, M.J. 2003. Fishery trends and research issues. Inaugural Session, National Planning Workshop on Fisheries Research and Development, 2 April 2003, BARC Auditorium, Farm Gate, Dhaka, Bangladesh.

Williams, M.J. 2003. Bangladesh fisheries: future options. Presentation to the Secretary, Ministry of Fisheries and Livestock, 5 April 2003, Dhaka, Bangladesh.

Williams, M.J. 2003. Penang and fish. Presentation to Diversitas Scientific Committee, 9 April 2003, Paris, France.

Williams, M.J. 2003. Future Harvest Alliance. Presentation to Center Directors Committee, 11 May 2003, and to joint meeting of Center Directors Committee and Committee of Board Chairs, 13 May 2003, ISNAR, the Hague, Netherlands.

Williams, M.J. 2003. Full cost recovery. Presentation to Center Directors Committee, 12 May 2003, ISNAR, the Hague, Netherlands.

Williams, M.J. 2003. Opening remarks. Planning Meeting, Bureau of Aquatic Resources and Fisheries and WorldFish Center, 28 May 2003.

Williams, M.J. 2003. Opening remarks. Inception Workshop on Capacity Building for the Inland Fisheries Research and Development Institute (IFReDI), 10-12 June 2003, IFReDI, Department of Fisheries (DOF), Phnom Penh, Cambodia.

Williams, M.J. 2003. Opening remarks: strengthening integrated production systems for environmentally-sound aquaculture. United States Department of Agriculture Conference on Agriculture Technology, 24 June 2003, Sacramento, California.

Williams, M.J. 2003. Role of the private sector in technology transfer and capacity building in sustainable aquaculture. Technology Transfer and Capacity Building, Trondheim Biodiversity Conference, 26 June 2003, Trondheim, Norway.

Williams, M.J. 2003. Fish for All: an initiative of inclusion. Public Lecture presented at the M.S. Swaminathan Research Foundation, 8 July 2003, Chennai, India.

Williams, M.J. 2003. WorldFish Center assets and the private sector. Presentation to the Malaysian members of the WorldFish Business Advisory Group, 15 July 2003, WorldFish Center, Penang, Malaysia.

Williams, M.J. 2003. WorldFish Center assets and the private sector. Presentation to the Australian members of the WorldFish Business Advisory Group, 1 August 2003, Sydney, Australia.

Williams, M.J. 2003. Leaders at all levels: a key initiative of the WorldFish Center. Opening remarks presented at the Leaders at All Levels Retreat, 21 August 2003, Penang, Malaysia.

Williams, M.J. 2003. WorldFish Center in the global food R&D community. Presented at 'Towards a Common Understanding of WorldFish Science, Partnerships and Impact', WorldFish Science Week, 25 August 2003, Equatorial Hotel, Penang, Malaysia.

Williams, M.J. 2003. Financing the research agenda and providing incentives for sound financial management. Presented at 'Towards a Common Understanding of WorldFish Science, Partnerships and Impact', WorldFish Science Week, 26 August 2003, Equatorial Hotel, Penang, Malaysia.

Williams, M.J. 2003. Putting fisheries science to work for the poor. Norway-WorldFish Center Partnership Meeting, 4 September 2003, Institute of Marine Research, Bergen, Norway.

Williams, M.J. 2003. Putting fisheries science to work for the poor. Presentation to Post Graduate Students, 5 September 2003, University of Bergen, Norway.

Williams, M.J. 2003. Global warming and people who live from the sea: change, crisis and conflict management. People and the Sea II, 6 September 2003, MARE, Amsterdam.

Williams, M.J. 2003. Putting fisheries science to work for the poor. United Kingdom - WorldFish Center Partnership Meeting, 8 September 2003, Imperial College, London, UK.

Williams, M.J. 2003. WorldFish Center in 2003: Denmark and WorldFish partnerships in development. Presented at Round-table Discussion, Copenhagen, Denmark.

Williams, M.J. and I. Bryceson. 2003. Learning about Malaysian fisheries. Seminar at WorldFish Headquarters, 6 June 2003.

Williams, M.J. and P.S. Choo. 2003. Achieving water and Fish for All in the Philippines. On the Occasion of the 15th Anniversary of the Philippine Council for Aquatic and Marine Research and Development, 30 January 2003.

Williams, M.J. and P.S. Choo. 2003. The role of information and knowledge management in fisheries development. National Fisheries Symposium, 18-20 February 2003, Renaissance Kota Bharu Hotel, Kelantan, Malaysia.

Williams, M.J. and P.S. Choo. 2003. Opening remarks: strengthening integrated production systems for environmentally-sound aquaculture. United States Department of Agriculture Conference on Agriculture Technology, 23-25 June 2003, Sacramento, California.

Williams, M.J. and P.S. Choo. 2003. Global warming and people who live from the sea: change, crisis and conflict management. People and the Sea II, MARE, 4-6 September 2003, Amsterdam, the Netherlands.

Williams, M.J. and E. Sayegh. 2003. Developing performance indicators for CGIAR Centers. Presented at 'Towards a Common Understanding of WorldFish Science, Partnerships and Impact', WorldFish Science Week, 29 August 2003, Equatorial Hotel, Penang, Malaysia.

Williams, M.J., J. Kane-Potaka and J. Bell. 2003. Resource mobilization and strategic marketing. Presented at 'Towards a Common Understanding of WorldFish Science, Partnerships and Impact', WorldFish Science Week, 26 August 2003, Equatorial Hotel, Penang, Malaysia.



## FINANCIAL SUMMARY

WorldFish Center seeks to ensure that its operating service strategy is built on a client-oriented culture dedicated to delivering carefully targeted services to meet the broad range of needs of its internal and external clients. WorldFish Center adopts a cost-conscious approach and ensures the delivery of high value services at costs comparable to, or less than the market. Senior management, the Board, the internal auditor, and the external auditor (Ernst & Young) provide the financial management and oversight of the Center.

The Center's total income in 2003 was US\$ 16.0 million, and the level of income in 2002 was US\$ 12.6 million. The income for 2003 was received as follows (in millions).

### Total Income 2003 (in millions)

Core Funding	US\$ 6.6
Project Funding	US\$ 8.0
Other Income	US\$ 1.4
<b>Total</b>	<b>US\$ 16.0</b>

The Statement of Financial Position, the Statement of Activities and the Statement of Cash Flows summarize WorldFish Center's finances for 2003. These Financial Statements are presented. A complete, audited financial statement prepared by Ernst & Young is published separately and can be requested from the Associate Director General.

### Funding by WorldFish Center Projects

(in US \$ million)

2003

Sustainable Use of Biodiversity and Genetic Resources	1.83
Improved Livelihoods through Appropriate Inland Aquaculture Technologies and Fisheries Management	4.44
Making the Most of the Coast	3.33
Assessing Technological, Institutional and Policy Options that Benefit the Poor People	4.13
Improved Partnerships and Capacity Building Among Developing Country Institutions and Agencies	1.23
Access to Information for Sustainable Development of Fisheries and Aquatic Resources	0.7
<b>Total</b>	<b>15.66</b>

### Summary by CGIAR Output

Germplasm Improvement	0.78
Germplasm Collection	0.2
Sustainable Production	8.31
Policy	4.26
Enhancing NARS	2.11
<b>Total</b>	<b>15.66</b>

## Statement of Financial Position

	<b>DECEMBER 31</b>	
	2003	2002
<b>ASSETS</b>		
<b>CURRENT ASSETS</b>		
Cash and cash equivalents	8,510	9,178
Accounts receivable		
Donors	4,238	3,700
Employees	118	114
Others	1,374	1,275
Inventories	-	2
Other current assets	3,591	2,933
<b>TOTAL CURRENT ASSETS</b>	<u>17,831</u>	<u>17,202</u>
<b>PROPERTY AND EQUIPMENT, net</b>	394	356
<b>OTHER ASSETS</b>	79	79
<b>TOTAL ASSETS</b>	<u>18,304</u>	<u>17,637</u>
<b>LIABILITIES AND NET ASSETS</b>		
<b>CURRENT LIABILITIES</b>		
Accounts payable		
Donors	4,128	3,590
Employees	79	79
Others	1,413	896
Funds in trust	369	858
Accruals and provisions	2,388	2,715
<b>TOTAL CURRENT LIABILITIES</b>	<u>8,377</u>	<u>8,138</u>
<b>LONG-TERM LIABILITIES</b>		
Accounts payable - Employees	359	501
<b>TOTAL LIABILITIES</b>	<u>8,736</u>	<u>8,639</u>
<b>UNRESTRICTED NET ASSETS</b>		
Appropriated	2,670	1,994
Unappropriated	6,898	7,004
<b>TOTAL NET ASSETS</b>	<u>9,568</u>	<u>8,998</u>
<b>TOTAL LIABILITIES AND NET ASSETS</b>	<u>18,304</u>	<u>17,637</u>

Statement of Activities  
(US Dollar '000)

	FOR THE YEARS ENDED DECEMBER 31			
	Core Fund	Project Fund	Total	
			2003	2002
<b>REVENUES, GAINS AND OTHER SUPPORT</b>				
Grants	6,625	8,007	14,632	12,492
Other revenues	1,365	-	1,365	110
<b>Total revenues, gains and other support</b>	<b>7,990</b>	<b>8,007</b>	<b>15,997</b>	<b>12,602</b>
<b>EXPENSES AND LOSSES</b>				
Program related expenses	4,495	8,007	12,502	10,646
Management and general expenses	3,010	-	3,010	2,263
General operations	921	-	921	123
<b>Total expenses</b>	<b>8,426</b>	<b>8,007</b>	<b>16,433</b>	<b>13,032</b>
Recovery of indirect costs	(774)	-	(774)	(748)
<b>Total expenses and losses</b>	<b>7,652</b>	<b>8,007</b>	<b>15,659</b>	<b>12,284</b>
<b>CHANGE IN NET ASSETS</b>	<b>338</b>	<b>-</b>	<b>338</b>	<b>318</b>
<b>NET ASSETS</b>				
Beginning of the year	8,998	-	8,998	7,988
Appropriated for acquisition of equipment	232	-	232	692
End of the year	9,568	-	9,568	8,998
<b>MEMO ITEM</b>				
Operating expenses - By natural classification				
Personnel costs	3,565	2,296	5,861	5,253
Supplies and services	3,224	5,055	8,279	5,880
Travel costs	676	656	1,332	1,009
Depreciation	187	-	187	142
	<b>7,652</b>	<b>8,007</b>	<b>15,659</b>	<b>12,284</b>

## Statement of Cash Flows

(US Dollar '000)

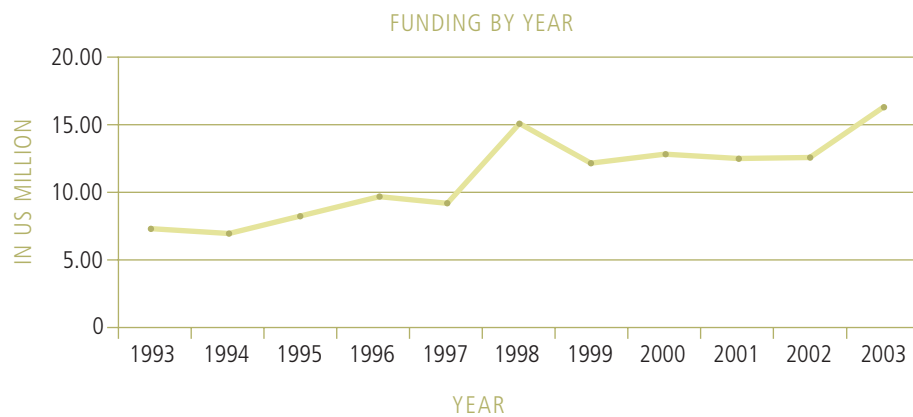
	For the Years Ended December 31	
	2003	2002
<b>CASH FLOWS FROM OPERATING ACTIVITIES</b>		
Change in net assets for the year	570	1,010
Adjustments to reconcile change in net assets for the year to net cash (used in) / provided by operating activities:		
Depreciation	187	142
Provision for doubtful debts	870	-
Gain on disposal of property and equipment	(4)	(2)
Property and equipment written off	-	2
Changes in:		
Accounts receivable	(1,511)	(837)
Supplies inventory	2	2
Other current assets	(658)	(14)
Accounts payable	1,055	1,048
Funds in trust	(489)	123
Accruals and provisions	(469)	104
Net cash (used in) / provided by operating activities	<u>(447)</u>	<u>1,578</u>
<b>CASH FLOWS FROM INVESTING ACTIVITIES</b>		
Acquisition of property and equipment	(232)	(163)
Sales proceeds from disposal of property and equipment	11	2
Net cash used in investing activities	<u>(221)</u>	<u>(161)</u>
<b>NET (DECREASE) / INCREASE IN CASH AND CASH EQUIVALENTS</b>	<b>(668)</b>	<b>1,417</b>
<b>CASH AND CASH EQUIVALENTS</b>		
Beginning of the year	9,178	7,761
End of the year	<u>8,510</u>	<u>9,178</u>

## Funding by Year 1993 - 2003

(' In US 000)	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Funding By Year	6.84	6.80	7.92	9.94	9.39	14.86	11.87	12.87	12.56	12.60	16.00
<b>Consists of</b>	(restated)					(restated)					
Grant	6,840.00	6,595.00	7,776.00	9,574.00	9,047.00	14,543.00	11,606.00	12,379.00	12,125.00	12,492.00	14,632.00
Other income		205.00	141.00	361.00	343.00	312.00	259.00	495.00	431.00	110.00	1,365.00
	6,840.00	6,800.00	7,917.00	9,935.00	9,390.00	14,855.00	11,865.00	12,874.00	12,556.00	12,602.00	15,997.00

### Grant

Unrestricted	2,758.00	3,285.00	4,293.00	5,793.00	5,630.00	6,772.00	6,139.00	7,014.00	6,346.00	6,046.00	6,625.00
Restricted	4,082.00	3,310.00	3,483.00	3,781.00	3,417.00	7,771.00	5,467.00	5,365.00	5,779.00	6,446.00	8,007.00
	6,840.00	6,595.00	7,776.00	9,574.00	9,047.00	14,543.00	11,606.00	12,379.00	12,125.00	12,492.00	14,632.00





## Funding by CGIAR Members (2003)

US\$ millions

<b>Unrestricted Support</b>	
<b>Europe</b>	
Belgium	0.1
Denmark	0.4
European Union	1.0
Germany	0.3
Netherlands	1.0
Norway	0.5
Sweden	0.3
<b>North America</b>	
Canada	0.5
United States	0.7
<b>Pacific Rim</b>	
Australia	0.2
Japan	0.2
<b>Developing Countries</b>	
Egypt, Arab Republic	0.3
<b>International and Regional Organizations</b>	
World Bank	1.0
<b>Others, Multi-donor</b>	
	0.1
<b>Subtotal</b>	<b>6.6</b>
<b>Restricted Support</b>	
<b>Europe</b>	
European Commission	0.0
Germany	0.1
Norway	0.2
Sweden	0.3
United Kingdom	1.9
<b>North America</b>	
United States	1.6
<b>Pacific Rim</b>	
Australia	0.2
Provinces of New Caledonia	0.1
NZODA	0.1

	US\$ millions
<b>International and Regional Organizations</b>	
ADB	0.8
IDRC	0.0
IFAD	0.1
UNDP / UNFIP	0.3
David & Lucille Packard	0.2
World Bank	0.6
World Bank-GEF	0.4
World Bank-CGIAR	0.3
<b>Subtotal</b>	<b>7.2</b>
<b>Subtotal funding by CGIAR members</b>	<b>13.8</b>

#### Funding by Non-members (2003)

	US\$ millions
MacArthur Foundation	0.3
Oxfam	0.0
Others, multi-donor	0.5
<b>Funding by non-members - sub total</b>	<b>0.8</b>
<b>Subtotal funding by CGIAR members</b>	<b>13.8</b>
<b>Total for member and non-members</b>	<b>14.6</b>

## INSTITUTIONAL PARTNERS 2003

Country	Name of Institution
Australia	Advisory Panel from Advanced Scientific Institutions in Australia
Australia	Australian Institute of Marine Science
Australia	Deakin University
Australia	Global Coral Reef Monitoring Network
Australia	Great Barrier Reef Marine Park Authority
Australia	Griffith University Gold Coast
Australia	Queensland University of Technology
Australia	The Australian Centre for International Agricultural Research
Australia	University of Sydney
Bangladesh	Alternative Development Initiative
Bangladesh	Association for Community Development
Bangladesh	Banchte Shekha
Bangladesh	Bangladesh Agriculture University
Bangladesh	Bangladesh Center for Advanced Studies
Bangladesh	Bangladesh Environmental Lawyer's Association
Bangladesh	Bangladesh Fisheries Research Institute
Bangladesh	Bangladesh Rural Advancement Committee
Bangladesh	Barandra Advancement Integrated Committee (BAIC)
Bangladesh	Bikalpa Unnayan Karmasuchi
Bangladesh	CARITAS
Bangladesh	Center for Alleviation of Rural Poverty
Bangladesh	Center for Integrated Rural Progress
Bangladesh	Center for Natural Resources Studies
Bangladesh	Center for Rural & Environment Development
Bangladesh	Coastal Association for Social Transformation Trust
Bangladesh	Department of Fisheries Bangladesh
Bangladesh	Dulai Jana Kallyan Sangstha
Bangladesh	Dustha Mohila Gonoshiksha @ Hasta Shilpo Proshikshan Kendra
Bangladesh	Efforts for Rural Advancement
Bangladesh	Fem Com
Bangladesh	Foundation for Human Development
Bangladesh	Jagorani Chakra
Bangladesh	Landless Distressed Rehabilitation Organization
Bangladesh	Organization for Rural Development
Bangladesh	PADAKHEP Manabik Unnayan Kendra
Bangladesh	PAGE Development Center
Bangladesh	Programme on Agriculture, Nutrition and Environmental Conservation
Bangladesh	Projukti Peeth
Bangladesh	PROSHIKA
Bangladesh	Rural Reconstruction Center
Bangladesh	Samaj Progoti Parishad
Bangladesh	Shahjalal University of Science and Technology

Country	Name of Institution
Bangladesh	Social Advancement Through Unity
Bangladesh	Social Association for Rural Advancement
Bangladesh	Sunamganj Jonokallan Sangsta
Bangladesh	Thengamara Mohila Sabuj Sangha
Bangladesh	University of Chittagong
Bangladesh	Voluntary Paribar Kalyan Association
Belgium	Musee Royal de l'Afrique Centrale
Belize	Caribbean Community, Fisheries Resources Assessment and Management Program
Benin	Integrated Development of Artisanal Fisheries in West Africa
Cambodia	Asian Institute of Technology Aquaculture Outreach
Cambodia	Cambodia National Mekong Committee
Cambodia	Department of Agronomy and Agricultural Land Improvement
Cambodia	Department of Fisheries, Cambodia
Cambodia	International Union for Conservation of Nature (Cambodia)
Cambodia	Mekong River Commission (Secretariat)
Cambodia	Ministry of Environment, Cambodia
Cambodia	Ministry of Tourism
Cambodia	Wetlands International
Cameroon	Institute of Research for Agricultural Development
Cameroon	International Institute of Tropical Agriculture
Cameroon	Ministere de l'Elevage, des Peches et des Industries Animales de Cameroun
Canada	University of British Columbia
China	Center for Chinese Agricultural Policy
China	Freshwater Fisheries Research Center
China	Shanghai Fisheries University
Cote d' Ivoire	Centre National de Recherche Agronomique
Denmark	"Institute of Fisheries Management and Coastal Community Development"
Denmark	North Sea Center
Ecuador	Fundacion Natura
Egypt	Cairo University
Egypt	Central Laboratory for Aquaculture Research
El Salvador	Center for Environmental and Social Studies on Sustainable Development
Federated State of Micronesia	Department of Agriculture and Land
Fiji	Ministry of Agriculture, Fisheries and Forests, Fiji
France	Museum National d'Histoire Naturelle Etablissement
Gabon	World Wildlife Fund (Gabon Country Office)
Germany Zusammenarbeit)	Gesellschaft fuer Technische Zusammenarbeit (Deutsche Gesellschaft fuer Technische
Germany	Hohenhelm University

Country	Name of Institution
Germany	Institut für Meereskunde, Kiel
Germany	Universität Gesamthochschule Kassel
Ghana	Marine Fisheries Research Division, University of Ghana
Ghana	Water Research Institute
Honduras	Committee for the Defense and Development of the Flora and Fauna in the Gulf of Fonseca
Hong Kong	University of Hong Kong
Hong Kong	World Wide Fund for Nature
Hungary	Fish Culture Research Institute
India	Central Inland Capture Fisheries Research Institute
India	Central Institute of Freshwater Aquaculture
India	Central Marine Fisheries Research Institute
India	Indian Agricultural Research Institute
India	National Bureau of Fish Genetic Resources
India	National Center for Agricultural Economics and Policy Research
India	Tata Energy Research Institute
India	University of Agricultural Science
Indonesia	Bahtera Nusantara
Indonesia	Bogor Agricultural University
Indonesia	Diponegoro University
Indonesia	Directorate General for Capture Fisheries
Indonesia	Directorate General of Aquaculture
Indonesia	Directorate General of Capture Fisheries
Indonesia	Directorate of Coastal Affairs
Indonesia	Hasanuddin University
Indonesia	Indonesia Coastal & Marine Foundation (Indonesia Coastal Marine Foundation)
Indonesia	Indonesian Biodiversity Foundation
Indonesia	Indonesian Fisheries Socioeconomic Research Network
Indonesia	Indonesian Institute of Science
Indonesia	Institut Pertanian Bogor
Indonesia	Jaringan Kerja untuk Pesisir dan Laut (Indonesian NGO Network for Marine and Coastal Resources)
Indonesia	PUTER Indonesia
Indonesia	Research Center for Marine and Fisheries Product Processing and Socioeconomic
Indonesia	Research Institute for Freshwater Fisheries
Indonesia	Research Institute for Marine Fisheries
Indonesia	Telapak Indonesia
Indonesia	The Indonesian Coral Reef Foundation (Yayasan Terumbu Karang Indonesia-TERANGI)
Indonesia	The Nature Conservancy (Indonesia)
Indonesia	Universitas Pattimura Ambon
Indonesia	University of Indonesia
Indonesia	WWF Wallacea Bioregion Program
Indonesia	Yayasan Hualopu
Israel	Agricultural Research Organization
Italy	Food and Agriculture Organization of the United Nations



Country	Name of Institution
Japan	National Research Institute of Aquaculture
Lao, PDR	Lao Mekong National Committee (Secretariat) / Mekong River Commission
Lao, PDR	Living Aquatic Resources Research Center
Lao, PDR	Regional Development Coordination, Department of Fisheries and Livestock, Lao
Lao, PDR	Science, Technology and Environment Agency - Prime Minister's Office
Madagascar	Madagascar University Museum
Madagascar	Universite d' Antananarivo
Malawi	ActionAid Africa
Malawi	Cancellor College
Malawi	Department of Fisheries, Malawi
Malawi	International Fund for Agricultural Development (IFAD)
Malawi	Ministry of Natural Resources and Environmental Affairs
Malawi	National Aquaculture Center, Malawi
Malawi	University of Malawi
Malaysia	Borneo Marine Research Institute,
Malaysia	Department of Fisheries, Malaysia
Malaysia	Fisheries Research Institute, Malaysia
Malaysia	Intergovernmental Organization for Marketing Information & Technical Advisory Services for Products
Malaysia	Lembaga Kemajuan Ikan Malaysia
Malaysia	Ministry of Agriculture, Malaysia
Malaysia	University Malaya
Malaysia	University Putra Malaysia
Malaysia	University Sains Malaysia
Mozambique	Institute for Development of Small-Scale Fisheries/ Instituto de Desenvolvimento da Pesca de Pequena
Netherlands	Wageningen Agricultural University
New Caledonia	Delegation pour le Pacifique
New Caledonia	Island Province (Loyalty Islands)
New Caledonia	Northern Province / Province Nord
New Caledonia	Secretariat of the Pacific Community
New Caledonia	Southern Province
Norway	Christian Michelsen Institute
Norway	Institute of Aquaculture Research, Ltd.
Philippines	Bureau of Fisheries and Aquatic Resources
Philippines	College of Economics and Management, University of the Philippines Los Banos
Philippines	College of Public Administration, University of the Philippines
Philippines	Department of Environment and Natural Resources
Philippines	Freshwater Aquaculture Center, Central Luzon State University
Philippines	GIFT Foundation International Inc.
Philippines	Haribon Foundation for the Conservation of Natural Resources
Philippines	International Rice Research Institute

Country	Name of Institution
Philippines	Palawan Council for Sustainable Development
Philippines	SEAMEO Regional Center for Graduate Study and Research in Agriculture
Philippines	Silliman University Angelo King Center for Research and Environmental Management
Philippines	Southeast Asian Fisheries Development Center - Aquaculture Department
Philippines	State Polytechnic College of Palawan-Aquatic Science Technology Institute
Philippines	Tambuyog Development Center
Philippines	University of the Philippines in the Visayas
South Africa	School of Government, University of Western Cape
South Africa	Sea Fisheries Research Institute
South Africa	University of Cape Town
Sri Lanka	Department of Fisheries and Aquatic Resources
Sri Lanka	National Aquaculture Development Authority
Sri Lanka	National Aquatic Resources Research and Development Agency
Sweden	Coral Reef Degradation in the Indian Ocean
Sweden	International Coral-Reef Initiative
Sweden	Swedish Museum of Natural History
Sweden	University of Gothenburg
Switzerland	International Union for the Conservation of Nature
Taiwan	Institute of Zoology, Academia Sinica
Thailand	Andaman Sea Fisheries Development Center
Thailand	Aquatic Resources Research Institute
Thailand	Asian Institute of Technology (Thailand)
Thailand	Coastal Resources Institute
Thailand	Department of Fisheries, Thailand
Thailand	Department of Land Development
Thailand	Institute of Social Economic Policy
Thailand	International Union for Conservation of Nature (Bangkok)
Thailand	Kasetsart University
Thailand	National Aquaculture Genetics Research Institute
Thailand	Office of Environmental Policy and Planning
Thailand	Prince of Songkhla University
Thailand	Southern Marine Fisheries Development Center
Thailand	Udon Thani Fisheries Development Center
Thailand	UNEP Regional Seas Program
Thailand	UNEP / East Asia Program
United Kingdom	Center for Land Use and Water Resources Research, University of Newcastle Upon Tyne
United Kingdom	Durham University
United Kingdom	Fish Gen Limited
United Kingdom	Imperial College
United Kingdom	Marine Resources Assessment Group Ltd.
United Kingdom	University of East Anglia
United Kingdom	University of Stirling

Country	Name of Institution
United Kingdom	University of Wales, Swansea
United Kingdom	University of York
United Kingdom	World Conservation Monitoring Center
United States of America	Auburn University
United States of America	Coral Reef Alliance
United States of America	Duke University
United States of America	International Center for Research on Women
United States of America	International Food Policy Research Institute
United States of America	NASA-Johnson Space Center
United States of America	National Center for Atmospheric Research
United States of America	Princeton University
United States of America	Reef Check International
United States of America	Stanford University
United States of America	The Nature Conservancy (Latin America & Caribbean Division)
United States of America	United State Agency for International Development
United States of America	United State Department of Agriculture
United States of America	University of Connecticut
United States of America	University of Rhode Island
United States of America	World Resources Institute
United States of America	World Wildlife Fund International
Vietnam	An Giang University
Vietnam	Can Tho University
Vietnam	Center for Environmental Research and Education
Vietnam	Committee of the Government on Frontier Issues / National Steering Committee for Biendong Sea and Islands
Vietnam	Department of Fisheries of Khan Hao
Vietnam	Department of Science Technology and Environment of Danang
Vietnam	Fisheries Resources and Environment Conservation Department, Ministry of Fisheries (Vietnam)
Vietnam	Ha Noi Institute of Oceanography
Vietnam	Hai Phong Institute of Oceanology
Vietnam	Hanoi University of Science
Vietnam	Institute of Fisheries Economics and Planning
Vietnam	Institute of Oceanography, Department of Marine Living Resources

Country	Name of Institution
Vietnam	International Marinelife Alliance
Vietnam	Ministry of Fisheries, Vietnam
Vietnam	Ministry of Forestry, Vietnam
Vietnam	Ministry of Planning and Investment
Vietnam	Ministry of Science and Technology and Environment
Vietnam	National Center for Social Science & Humanities
Vietnam	National University of Hanoi
Vietnam	People's Organization of An Giang Province
Vietnam	Research Institute for Aquaculture No 1
Vietnam	Research Institute for Aquaculture No 2
Vietnam	Research Institute for Aquaculture No 3
Vietnam	Research Institute for Marine Products
Vietnam	"Sub-Institute for Water Resources Planning (of Southern Vietnam)"
Vietnam	Sub-National Institute of Agriculture Planning and Projection
Vietnam	University of Agriculture and Forestry, HCMC
Vietnam	Vietnam Agricultural Science Institute
Vietnam	Vietnam National Mekong Committee
Vietnam	World Conservation Union (Vietnam)
Zambia	Department of Fisheries, Zambia
Zambia	Ministry of Agriculture, Food and Fisheries, Zambia
Zimbabwe	Aquaculture for Local Community Development Programme
Zimbabwe	Center for Applied Social Sciences, University of Zimbabwe
Zimbabwe	Lake Kariba Fisheries Research Institute

## BOARD OF TRUSTEES

**Prof. Robert Edward Kearney (Board Chair)**

Professor of Fisheries, University of Canberra, Australia

**Dr. S. Ayyappan**

Deputy Director General (Fisheries), Indian Council of Agricultural Research, New Delhi, India

**Prof. Trond Bjorndal**

Renewable Resources Assessment Group, Imperial College, London, United Kingdom

**Prof. Katherine Richardson Christensen**

Department of Marine Ecology, University of Aarhus, Denmark

**Dato' Hashim Ahmad**

Director General, Department of Fisheries Malaysia, Ministry of Agriculture, Malaysia

**Dr. Serge Garcia**

Director, Fisheries Department, Fishery Resources and Environment, FAO, Rome, Italy

**Ms. Joan Joshi**

Independent consultant, Potomac, United States of America

**Dr. Asger Kej**

Managing Director, DHI Water & Environment, Denmark

**Prof. Dr. Yehia Hassan Khalil**

Head and Professor of Food Science, Ain-Shams University, Cairo, Egypt

**Dr. Takeshi Nose**

Adviser, National Federation of Fisheries Cooperative Associations, Japan

**Dr. Aprilani Soegiarto**

Professor of Oceanology, Indonesian Institute of Sciences, Jakarta, Indonesia

**Dr. Meryl Williams**

Director General, ICLARM - The WorldFish Center, Penang, Malaysia

**Dr. Stella Williams**

Department of Agriculture Economics, Obafemi Awolowo University, Nigeria

**Dr. Lin Xiu Zhang**

Center for Chinese Agricultural Policy, Chinese Academy of Sciences, Beijing, China

## STAFF INFORMATION

NAME	POSITION
<b>EXECUTIVE OFFICE</b>	
<b>OFFICE OF THE DIRECTOR GENERAL (ODG)</b>	
Meryl J. Williams	Director General
Poh Sze Choo	Science & Policy Specialist
Maizurah Bt Abdullah	Office Manager
Cheng Cheok Julie Lim	Senior Secretary
<b>RESOURCE MOBILISATION OFFICE (RMO)</b>	
Helen Leitch	Head - RMO
Ceres Eyette Pasamba	Manager - PDCU
Woon Har Michelle Loh	PDCU Assistant
<b>OFFICE OF ASSISTANT DIRECTOR GENERAL - INTERNATIONAL RELATIONS AND PARTNERSHIPS</b>	
Modadugu Gupta	Assistant DG - IRP
Belen Acosta	Assistant Scientist
Norhalida Bt Hashim	Program Assistant
<b>OFFICE OF DEPUTY DIRECTOR GENERAL - RESEARCH (ODDG-R)</b>	
Paul S. Teng	DDG - Research
Meenalosany a/p M. Arivananthan	Program Associate - DDG Research
<b>PROGRAMS</b>	
<b>BIODIVERSITY AND GENETIC RESOURCES RESEARCH (BGRRP)</b>	
Alphis G. Ponniah	Program Leader
Eric Baran	Research Scientist
Raul Ponzoni	Geneticist / Project Leader
Norhidayat Bin Kamaruzzaman	Research Assistant
Saadiah Shirley Tan	Research Assistant
Khairul Rizal Abu Bakar	Research Assistant
Norainy Mohd. Husin	Research Assistant
<b>COASTAL AND MARINE RESOURCES RESEARCH (CMRRP)</b>	
Johann Bell	Program Leader
James K. Oliver	Research Scientist
C. Ilona Stobutzki	Fisheries Resources Scientist
Marco Noordeloos	ReefBase Manager
Carmen Ablan-Lagman	Assistant Scientist
Len Garces	Assistant Scientist
Nasir Bin Nayan	Research Associate
Kar Keat Calvin Foo	Web Programmer
P. Shamala Shubashini a/p Palaniappan	Research Assistant
Fadhilatul Shahriyah Bt Mohd. Shukri	Research Aide
Yusri Bin Yusuf	Research Assistant
Shan Sandra Leng	Program Associate (CMRRP & BGRRP)

NAME	POSITION
Moi Khim Tan	Database / Web Administrator
Guat Khim Chew	Program Assistant (CMRRP & BGRRP)
Syahzan Amir Bin Endut	Database Programmer / Administrator
Nurulhuda Bt Ahmad Fatan	Research Assistant
<b>FRESHWATER RESOURCES RESEARCH (FRR)</b>	
Mark Prein	Program Leader
Ferdinand J. Paraguas	Assistant Scientist
<b>POLICY RESEARCH AND IMPACT ASSESMENT (PRIAP)</b>	
Maufuzuddin Ahmed	Program Leader
Viswanathan Kuperan	Research Scientist
Blake Ratner	Scientist / Project Leader
Madan Mohan Dey	Senior Research Scientist
Mohammed A. Rab	Project Scientist (Economist)
Roehlano M. Briones	Post-Doctoral Fellowship (Economics)
Vasheela Balakrishnan	Research Assistant
Roslina Kamaruddin	Research Assistant
Li Ping Ng	Program Associate (PRIAP & FRRP)
Noraini Bt Yaacob	Research Assistant (PRIAP & FRRP)
Bee Hong Yeo	Research Associate
Jayamalar Francis	Project Management Assistant
Oai Li Chen	Research Assistant
Meen Chee Hong	Research Assistant
<b>INFORMATION, COMMUNICATION AND DISSEMINATION (ICDD)</b>	
Joanna Kane-Potaka	Head - ICDD
Kamsiah Mohd. Ali	Information & Services Manager
Sabrina Ooi	Public Awareness Associate
Thiam Yoong Loh	E-Communication Coordinator
Catherine Lee Mei Tan	Graphic Designer
Bee Leng Chew	Information & Communication Assistant
Poon Wei Ang	E-Communication Assistant
Garrick Huck Jin Tan	Graphic Designer
Junainah Bt Abu Seman	Librarian
Eng Hoo Ch'ng	Web Programmer
Salina Bt Mustaffa	Information & Communication Assistant

### CORPORATE SERVICES DIVISION (CSD)

#### OFFICE OF ADG

Edward N.Sayegh	Associate Director General / CSD
Douglas E. Dunstan	Associate Director General / CSD
Poh Liew Emily Khor	Corporate Services Associate
Sau Yeng Siew	Costing Specialist



**NAME****POSITION****HUMAN RESOURCES UNIT (HR)**

Khar Hoay Tan	Senior HR Manager
Lay Keem Khoo	HR Associate

**FINANCE MANAGEMENT UNIT (FMU)**

Chew Ngoh Marie Chan	Finance Manager
Poh Bee Joyce Yeoh	Accountant
York Soo Lee	Accountant
Hun Pin Chee	Accountant
Su Ching Tan	Assistant Manager - FMU

**INFORMATION TECHNOLOGY UNIT**

Hung Yee June Ng	IT Manager
Hoong Fei Lee	Network Engineer
Ming Sung Vincent Cheang	Technical Assistant - IT
Hsien Huei Celeste Ong	Web Developer

**ADMIN. / OPERATIONS UNIT**

Siew Hua Koh	Admin. Associate
Ahmad Kamal B. Anuar	Admin. Assistant
Norhaslinda Bt Hashim	Secretary/Receptionist
Soo Thai Koid	Facilities Coordinator
Ee Lin Tan	Admin. Associate: Procurement and Svrs.

**PLANNING AND BUDGET UNIT**

Kar Ling Khoo	Budget Manager
Mohamad Haris Bin Kader Sultan	Program & Budget Associate
Pei Yen Lim	Program & Budget Assistant

**FINANCIAL AND ADMINISTRATIVE SYSTEMS UNIT**

Rainelda Ampil	Manager
Wei Hoong Lasker Saw	Analyst Programmer
Saw Ai Elise Tan	Web Developer

**OVERSEAS OFFICES AND RESEARCH SITES****Bangladesh Research Site**

Johannes Janssen	Senior Aquaculture Scientist
Paul Thompson	Social Scientist & OIC
Mohd. Ferdous Alam	Research Coordinator
Naseem Ahmed Aleem	Field Coordinator
Mohd. Reazul Karim	Research Associate
Israt Zahura	Research Associate
Kh. M. Shameem Kamal	Research Assistant
Manuara Azim	Research Assistant
Mohd. Jahirul Hoque	Research Assistant

NAME	POSITION
Mohammed Mokhlesur Rahman	Research Assistant
Mohd. Abul Kashem	Research Assistant
Mir Mostaque Ahamed	Research Assistant
Mohd. Abdur Razzaque	Research Assistant
Mohd. Nazim Uddin	Research Assistant
Syed Arifuzzaman	Research Assistant
Chaman Ara Begum	Research Assistant
Mohd. Khabirul Hasan	Research Assistant
Mohd. Asadul Hoque	Research Assistant
Mohd. Shakil Ahmed Khan	Research Assistant
Saiful Islam	Research Assistant
Mohd. Ferdous Ali	Research Assistant
Mohd. Shamim Parvez	Research Assistant
Mohd. Zamal Uddin	Research Assistant
Bibhu Bhusan Mazumder	Research Assistant
Bijoy Bhusan Debnath	Administrative Officer
Khan Golam Rasul	Accounts Officer
Mohd. Billal Hosain	Administrative Assistant
Maksuda Khanam	Administrative Assistant
Mohd. Abdur Razzak	Driver
Mohd. Dulal	Driver
Mohd. Nazrul Islam	Driver
Tapan Chandra Sarker	Messenger
Mohd. Muzaffar Ahmed	NGO Coordinator
Mohd. Golam Mostafa	Fisheries Coordinator
Gazi Mohd. Nurul Islam	Research Associate
A.K.M. Firoz Khan	Research Associate
Abdullah-Al-Mamun	Research Associate
Golam Faruque	Research Associate
Khandker Hasib Mahbub	Computer Programmer
Mohd. Delwar Hossain	Secretary
Leena Razzaque	Accounts Officer
Arif Hossain	Research Assistant
Habib Ahmed	Research Assistant
Mohd. Khalilur Rahman	Research Assistant
Mohd. Mizanur Rahman	Research Assistant
Mohd. Abubaker Siddique	Research Assistant
Mahadi Hasan	Research Assistant
Mohd. Rayhan Uddin	Administrative Assistant
Sabinoy Chakma	Administrative Assistant
Mohd. Reazwanul Haque	Administrative Assistant
Kazi Mazbauddin Ahmed	Field Investigator
Mohd. Akram Hossain	Field Investigator
Mohd. Nurunnabi	Field Investigator
Mohd. Abu Taleb Mollah	Field Investigator

**NAME****POSITION**

Mohd. Kamrul Islam  
 Mohd. Mirjahan Ali  
 Mohd. Anwar Hossain  
 Mohd. Mohiuddin  
 Mohd. Abdul Karim  
 Khandker Murshed-e-Jahan  
 Fahmida Ahmed  
 Mohd. Abdul Wahab  
 Mohd. Mahade Hasan Babul

Field Investigator  
 Field investigator  
 Driver  
 Driver  
 Messenger  
 Research Associate  
 Receptionist  
 Messenger  
 Messenger

**Cambodia Office**

Renato Agbayani  
 Danilo Israel  
 Sokhan Choup  
 Ou Sary  
 In Monirith

Institutional Dev. Specialist cum Team Leader  
 Project Scientist  
 LAN Operator / Computer Specialist  
 Accountant / Admin. Asst  
 Research Associate

**Cameroon Research Site**

Randal Brummett

Senior Aquaculture Scientist

**Malawi Research Site**

Daniel Matthews Jamu  
 Henry Geoffrey Hunga  
 Patience Tinenenji Kananji  
 Asafu D.G. Chijere  
 Foster Makuwa  
 Silence Nsonthi  
 Yusuf Fulaye  
 Issa Jafali  
 George Mwalabu  
 Frackson Lifa  
 Lackson Maluwa  
 Bosco Kalipalire  
 Bester Chimbalanga  
 Lackson Pondiya  
 Bwana Chipire

Project Team Leader  
 Aquaculture Technician  
 Project Assistant  
 Technical Assistant  
 Foreman  
 Technical Assistant  
 Office Assistant  
 Field Assistant  
 Field Assistant  
 Field Assistant  
 Field Assistant  
 Field Assistant  
 Field Assistant  
 Watchman  
 Watchman  
 Watchman

**New Caledonia (SPC)**

Warwick Nash  
 Steven Purcell  
 Blockman Bernard  
 Natacha Agudo  
 Johann Le Dreau  
 Nicolas Bolo  
 Geneviève Mirc

Senior Scientist / OIC  
 Ecologist  
 Project Research Assistant  
 Aquaculture Research Assistant  
 Aquaculture Hand  
 Aquaculture student (CREUFOP)  
 Office Assistant (half-time)

NAME	POSITION
<b>Philippines Research Site</b>	
Boris Fabres	Project Leader
Sheila Vergara	Senior Research Associate
Rachel Atanacio	Senior Artist
Estelita Emily Capuli	Research Associate
Christine Marie Casal	Research Associate
Rodolfo Reyes Jr	Research Associate
Jen Sherry Wee	Research Programmer (Web Developer)
Ma. Josephine Ruis	Senior Research Programmer
Crispina Binohlan	Senior Research Assistant
Susan Luna	Senior Research Assistant
Grace Pablico	Senior Research Assistant
Lemuel Casten	Artist / Research Assistant
Joann Glorioso	Research Assistant (Researcher)
Arlene Sampang	Research Assistant
Audrey Marie Serrano	Senior Research Assistant
Milagros Irene Robel	Program / Budget Assistant
Kathleen Patricia Reyes	Assistant Scientist
<b>Solomon Island Research Site</b>	
Cletus Oengpepa	Assistant Manager
Kathy Launa	Finance and Admin. Officer
Aniel Giza	Assistant Admin. Officer
Christian Ramofafia	Scientific Assistant
Mason Tauku	Foreman
Charles Toihere	Senior Technical Aide
Francis Kera	Senior Technical Aide
Regon Waren	Senior Technical Aide
Ambo Tewaki	Technical Aide
Moses Rafeasi	Technical Aide
Clayton Haro	Technical Aide
Alisea Theophilus	Mechanic and Maintenance
Emusasa Masakolo	Artisan
Peter Memo	Groundsman
Harry Tudu	Groundsman
<b>REGIONAL RESEARCH CENTER FOR AFRICA &amp; WEST ASIA</b>	
Patrick Dugan	Deputy Director General - AWA
George John	Senior Aquaculture Scientist
Velijil Vasu Sugunan	Senior Scientist / Coordinator
Christophe Bene	Research Scientist
Simon Heck	Research Scientist - Socio-economics
Abdel Rahaman El-Gamal	Senior Aquaculture Scientist
Mahmoud Ali Rezk	Researcher / Genetics
Ebtehag Abdel-Razek Kamel	Researcher / Genetics

## NAME

## POSITION

NAME	POSITION
Ahmed Said Deyab	Fish Health Research
Mohamed Yehia Abou Zaid	Research Technician
Tharwat Ismael Dawood	Lab. Technician
Gamal Othman El-Naggar	Research Coordinator
Fawzi Mohamed Hassan	Pond Worker
Mohamed Ali Attiatullah Ahmed	Senior Accountant
Essam Abdel Salam Mourad	Accountant / Cashier
Tawfik George Yanni Antoun	Administration & Finance Manager
Ahmed Hassan Dabour	Public Relation & Custom
Tahany Hosny Abdou Hasoub	Personnel Officer
Heba Sayed Khattab	Senior Secretary
Samia Mahmoud Mohd. Gommaa	Library & Information Supervisor
Ayman Ibrahim Dousoki	Purchasing Representative
Samir Ali Zein El-Abdeen	Purchasing Representative
Mahfouz Mohamed Alzainy	Technician It Computer
Mohamed Al Hussainy Abdel Ghany	Mec. Workshop Sup. and Store Keeper
Abdel Nabi Abbas	Fish Feed Store Keeper
Sayed Abdel Rahman	Administration Assistant / Messenger
Abeer Ahmed Harb	Secretary
Heba Fouad Mohd. Ahmed Ayoub	Secretary It Computer
Fatehy M.Waheed Salem	Security Supervisor
Mohamed Alsayed Teialab	Security Supervisor
Mohamed Mahmoud Hassan	Security Driver
Ahmed Abdou Ahmed	Security Driver
Ahmed Mohamed Ali	Pickup Driver
Attiah Ibrahim Gomaa	Driver
Mahmoud Hassan El-Naggar	Engineering Supervisor
Karam Ahmed Khalil	Engineering Technician
Nasser Mohamed Darwish	Engineering Technician
Mohammed Abdel Hadi El-Ngaar	Senior Carpenter
Abdel Hakeem Attia Mahmoud	Senior Electrician
Waheed Abdel Rahman	Workshop Senior Technician
Ibrahim Ahmed Mahmoud	Engineering Service Technician Helper
Mamdouh Khalil Ibrahim	Engineering Service Technician Helper
Mohamed Mahdi Khateeb	Engineering Service Technician Helper
Mohamed Alsaïd Abdel-Hamid	Workshop Technician
Abdel Nasser Mohamed	Workshop Technician
Haggag Hassan Haggag	Pond Worker
Abdel-Megeed Hussein Attiah	Eng. Services Helper
Ali Rizk Attia	Eng. Services Helper
Abdullah Mohamed Abdel-Aal	Diesel Mechanic
Mamdouh Mohamed Deibis	Gasoline Mechanic
Gameel Abdullah Khalil	Heavy Equipment Driver
Fathey Ahmed Abdullah	Tractor Driver

NAME	POSITION
Seliem Eliwah	Landscaping Foreman
Shawki Abou Zied Mohamed	Landscaping Worker
Mahmoud Abdou Mousa	Landscaping Worker
Hussein Zarie Hussein	Landscaping Worker
Abdullah Mohamed Ibrahim	Landscaping Worker
Sabry El-Sayed Ahmed	Landscaping Worker
Fatehy Abdullah Mohamed	Senior Housekeeper
Abdel Nabbi Farag Alsayed	Housekeeper
Ali Ibrahim Ghareeb	Housekeeper
Waheed Elwan Mohamed	Stock Ponds Supervisor
Rezk Fathey Mohamed	Ponds and Grounds Supervisor
Abdel Hay Hassan El-Sobky	Pond and Ground Services Assistant
Ibrahim Abdel Aaty Mohmed	Pond Worker / Tractor Driver
Abdullah Mohamed Hassan	Pond Worker / Tractor Driver
Abdel Aziz Radwan	Pond Worker / Tractor Driver
Othman Fatehi Mahdi	Pond Worker
Mohamed El-Sayed Mahmoud	Pond Worker
Sobhi Mahdi El-Sayed	Pond Worker
Ei-Sayed Attiah Attiah	Pond Worker
Talaat Mohamed Abdullah	Pond Worker
Abdel Kereem Abdel Megeed Mohd.	Pond Worker
Wahba Mohamed Seliem	Pond Worker
Mohamed Abdel-Nabi Abdel Mahdi	Pond Worker
Khairy Ibrahim Mohamed	Pond Worker
Abdullah Mohamed Abdullah	Pond Worker
Adel Hassan Darwish	Pond Worker
Said Abdel Samie Mohamed	Pond Worker
Zakaria Mohamed Badawi	Pond Worker
Naseem Nawar Saad Nawar	Driver
<b>CGIAR - ICT-KM</b>	
Enrica M. Porcari	Chief Information Officer
Pei Pei Florine Lim	Program Associate
<b>MILLENNIUM ECOSYSTEM ASSESSMENT</b>	
<b>Walter Reid</b>	
Bee Leng Belinda Lim	Program Associate
Jin Sarn Marcus John Lee	Sub-Global Working Group Coordinator
Wai Leng Chan	Program Assistant
Ciara Ann Raudsepp-Hearne	Consultant - Assistant Working Group Coordinator
<b>Director</b>	

## MAIN FUNDING BODIES

### WorldFish Center Donors 2003

Arab Fund for Economic and Social Development, Kuwait (AFESD)  
Arab Organization for Agricultural Development, Sudan (AOAD)  
Asian Development Bank (ADB)  
Australian Agency for International Development (AusAID)  
Australian Centre for International Agricultural Research (ACIAR)  
Bangladesh Rural Advancement Committee (BRAC)  
Belgium, Ministry of Foreign Affairs (DGDC)  
Canadian International Development Agency (CIDA)  
China, Ministry of Agriculture  
Conrad N. Hilton Foundation, USA (CNHF)  
Crawford Fund for International Agricultural Research, Australia  
CUSO, Canada  
Danish International Development Assistance (Danida)  
Department for International Development, UK (DFID)  
Egypt, Arab Republic  
European Commission (Division of Rural Development and Food Security) (EC)  
Fisheries Research and Development Corporation, Australia (FRDC)  
Food and Agriculture Organization of the United Nations (FAO)  
Ford Foundation  
France, Ministère de la Recherche  
German Federal Ministry for Economic Cooperation (BMZ), (BEAF), (GTZ)  
German Foundation for International Development (DSE)  
Global Environment Facility (GEF)  
India, Ministry of Agriculture  
Inter American Development Bank, Washington DC (IDB)  
International Development Research Center, Canada (IDRC)  
International Fund for Agricultural Development, Italy (IFAD)  
Japan, Government of (MFA), (JIRCAS), (MAFF)  
Malaysia, Government of  
Marine Institute International, Canada  
Marine Resources Assessment Group Ltd., UK (MRAG)  
The John D. and Catherine T. MacArthur Foundation, USA



Mekong River Commission, Cambodia (MRC)

National Institute for Environmental Studies, Japan (NIES)

Netherlands, Ministry of Foreign Affairs

New Caledonian Provincial Governments

New Zealand, Ministry of Foreign Affairs and Trade/New Zealand Agency for International Development (MFAT/NZAID)

Norway, Ministry of Foreign Affairs (MFA)

Norway, Ministry of Fisheries (NORAGRIC)

Norwegian Centre for International Environment and Development Studies, Agricultural University of Norway

Norway, The Research Council of (NRC)

Norwegian Agency for Development Cooperation (NORAD)

Oxfam-America, SEARO

The David and Lucile Packard Foundation, USA

Philippines, Department of Agriculture (BAR/DA)

Rockefeller Brothers Fund, USA (RBF)

Rockefeller Foundation, USA

Swedish International Development Cooperation Agency (SIDA)

Department for Research Cooperation-(SAREC)

Technical Center for Agricultural and Rural Cooperation, The Netherlands (CTA)

Thailand, Department of Agriculture (DOA)

United Nations Development Program (UNDP)

United Nations Environment Programme (UNEP)

United Nations Foundation (UNF)

United Nations Fund for International Partnerships (UNFIP)

United States Agency for International Development (USAID)

Wageningen University, The Netherlands (WU)

World Bank/CGIAR Secretariat

World Bank

World Wildlife Fund (WWF)

## ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ADG	Associate Director General
AWA	Africa and West Asia
BFAR	Bureau of Fisheries and Aquatic Resources, The Philippines
BGRRP	Biodiversity and Genetic Resources Research Program
CGIAR	Consultative Group on International Agricultural Research
CMRRP	Coastal Marine Resources Research Program
CREUFOP	Centre Régional Universitaire de Formation Permanente des Universités Montpellier II et Perpignan (Regional Centre for Continuing Education, Universities of Montpellier II and Perpignan, France)
CSD	Corporate Services Division
CSD	Corporate Services Division
DDG	Deputy Director General
FAO	Food and Agriculture Organization of the United Nations
FIRST	Fisheries Resource Information Systems and Tools
FMT	Finance Management Unit
FRR	Freshwater Resources Research
GEF	Global Environment Facility
GIFT	Genetically Improved Farmed Tilapia
HACCP	Hazard Analysis Critical Control Point system
IAA	Integrated Agriculture-Aquaculture
ICDD	Information, Communication and Dissemination
ICM	Integrated Coastal Management
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFReDI	Inland Fisheries Research and Development Institute, Cambodia
IFREMER	French Fisheries Institute
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
InWEnt	Capacity Building International of Germany
IT	Information Technology
LAN	Local Area Network
NGO	Non Governmental Organization
NZODA	New Zealand Overseas Development Assistance
OIC	Officer in Charge
PRIAP	Policy Research and Impact Assessment Program
RET	Research-cum-extension team
SPC	The Secretariat of the Pacific Community
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UNFIP	United Nations Fund for International Partnerships
USAID	US Agency for International Development

## WORLD FISH CENTER OFFICES



### MALAYSIA

Jalan Batu Maung, Batu Maung,  
11960 Bayan Lepas, Penang, Malaysia

Mail : PO Box 500, GPO  
10670 Penang, Malaysia  
Tel : (+60-4) 626 1606  
Fax : (+60-4) 626 5530  
E-mail : worldfishcenter@cgjar.org

### WorldFish Center - EGYPT

**Abassa Research Center**  
WorldFish Center  
Abassa, Abou-Hammad, Sharkia, Egypt

Tel : (+20-55) 340 8165  
Fax : (+20-55) 340 5578

#### Cairo Office:

WorldFish Center  
3, Abou El Feda Street  
Zamalek, Cairo 11211 Egypt

Tel : (+202) 736 4114  
Fax : (+202) 736 4112  
Mail : PO Box 1261 Maadi, Cairo, Egypt  
Courier : 3, Abou El Feda Street, Zamalek  
Cairo, 11211 Egypt  
E-mail : worldfish-egypt@cgjar.org

### WorldFish Center - BANGLADESH

Mail : House 22B, Road 7, Block-F  
Banani, Dhaka 1213, Bangladesh  
Tel : (+880-2) 881 3250,  
(+880-2) 881 4624  
Fax : (+880-2) 881 1151  
E-mail : worldfish-bangladesh@cgjar.org

### WorldFish Center - CAMEROON

IITA-Humid Forest Station, BP 2008 (Messa),  
Yaounde, Cameroon

Mail : IITA-Cameroon  
(attn: R.E. Brummett)  
c/o L.W.Lambourn & Co. Ltd.  
Carolyn House, 26 Dingwall Road  
Croydon CR9 3EE,  
United Kingdom  
Tel : (+237) 2237 434,  
(+237) 2237 522  
Fax : (+237) 2237 437  
E-mail : worldfish-cameroon@cgjar.org

### WorldFish Center - MALAWI

National Aquaculture Center, Zomba, Malawi

Mail : PO Box 229, Zomba, Malawi  
Tel : (+265) 01536 298,  
(+265) 01536 313  
Fax : (+265) 01536 274  
E-mail : worldfish-malawi@cgjar.org

### WorldFish Center - PHILIPPINES

Khush Hall, IRRI College, Los Baños, Laguna  
4031, Philippines

Mail : MCPO Box 2631  
0718 Makati City, Philippines  
Tel : (+63-2) 845 0563,  
(+63-49) 536 2701  
Fax : (+63-2) 891 1292,  
(+63-49) 536 0202  
E-mail : worldfish-philippines@cgjar.org

### WorldFish Center - SOLOMON ISLANDS

**Gizo Office:**  
PO Box 77, Gizo, Solomon Islands

Tel : (+677) 600 22  
Fax : (+677) 605 34

#### Honiara Office:

PO Box 438, Honiara, Solomon Islands

Tel : (+677) 250 90  
Fax : (+677) 232 96  
E-mail : worldfish-solomon@cgjar.org

### WorldFish Center - VIETNAM

(Closed September 2003)

Mail : Research Institute for Aquaculture No. 3  
33 Dang Tat Street  
Nha Trang City, Khanh Hoa  
Vietnam  
Tel : (+84-58) 831 138,  
(+84-58) 835 133  
Fax : (+84-58) 831 846  
E-mail : worldfish-vietnam@cgjar.org

### WorldFish Center - CAMBODIA

(Open June 2003)

Mail : c/o Department of Fisheries  
186, Norodom Blvd.  
Phnom Penh, Cambodia  
Tel/Fax : 00-855-23-993598  
E-mail : worldfish-cambodia@cgjar.org

### WorldFish Center - PACIFIC

Mail : c/o The Secretariat of the Pacific  
Community  
B.P. D5, 98848 Noumea Cedex  
New Caledonia  
Tel : (+687) 262 000  
Fax : (+687) 263 818  
E-mail : worldfish-newcaledonia@cgjar.org

### Worldfish Center - CARIBBEAN

(Closed August 2003)

Mail : Suite 158, Inland Messenger Service,  
Road Town Tortola  
British Virgin Islands  
Tel : (+1-284) 495 1291 (office)  
(+1-284) 496 6055 (mobile)  
Fax : (+1-284) 495 1389  
E-mail : worldfish-caribbean@cgjar.org



[www.worldfishcenter.org](http://www.worldfishcenter.org)

