Annual Report 2002

WorldFish Center

WorldFish
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CGIAR
FUTURE HARVEST

WorldFish Center is one of the 16 international research centers of the Consultative Group on International Agricultural Research (CGIAR) that has initiated the public awareness campaign, Future Harvest.

Contents

Overview from the Board Chair and Director General

In 2002, with great satisfaction, the WorldFish Center completed its 25th year of operations. In this Annual Report, we look back on a quarter century of scientific achievements. To inform our partners, donors, and supporters, we are pleased to feature some of the highlights of the work of the WorldFish Center in an article that traces the evolution of the Center's research, placing the work in the context of the changing circumstances of the living aquatic resources most critical to the livelihoods of the poor in developing countries.

WorldFish was created in 1977 as the International Center for Living Aquatic Resources Management. At the time, natural fish stocks were thought to be capable of yielding further catches and when, despite some early frustration at the low contributions of cultured fish, aquaculture was considered worthy of increased research effort in developing countries. The overriding concerns of the early years were to find simpler assessment methods to understand the status and sustainable exploitation levels of tropical multi-species fish stocks. Later, fisheries resource assessments became more oriented to studying the resources and their whole ecosystems, leading, in the 1990s, to comprehensive statements on the extent of over-exploitation of the world's fisheries, including those in developing countries.

Policy research was of early interest during the lead-up to the signing of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the WorldFish research really came into its own during the 1990s when fisheries management and other social and economic studies became more central to the mission. The current focus of policy research is on people and the formal and informal institutions that govern access to fisheries resources. New community-based and co-management approaches are being studied and lessons drawn for wider applications and further examination.

Early in its history, WorldFish initiated multi-disciplinary approaches to fisheries and aquaculture research that have become one of its characteristics. It conducted the world's first multi-disciplinary study of a tropical fishery in San Miguel Bay, Philippines, and followed this with integrated approaches to coastal resources management and aquaculture-agriculture. Today, we are embarking on studies that consider the place of fish in world food models and we are constructing regional fisheries sector models.

WorldFish has always carefully chosen the types of aquaculture it helps develop, focusing on species and production systems that are productive, environmentally friendly, and accessible to the poor. Each location presents its own set of conditions and aquaculture opportunities. Such selection usually means that the species chosen are low on the food chain and require few external inputs. However, the aquaculture technology options on which WorldFish has worked can surprise. They range from different species of the humble tilapia in Africa and Asia to sea cucumbers, giant clams, and blacklip pearl oysters in the Pacific.

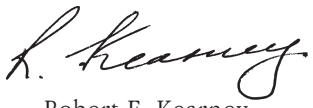
We are proud to do all our work in a diverse array of partnerships and networks which we believe is critical for technology uptake. In 2002, for instance, we conducted our work in partnership with 260 institutes of governmental and non-governmental nature, from local and national to regional and international status. Mindful of the need to learn from and contribute to the capacity of our developing country partners, we have constructed several successful knowledge-bases, most notably on the world's fish (www.fishbase.org) and coral reefs (www.reefbase.org). These knowledge-bases are among the most successful of their type in any scientific field and are fully accessible on the Internet. Over the years, we have also maintained and developed our unique, world-class library, information services, and publishing in the service of our partners, researchers and resource managers.

In 2002, the Center turned its attention to how to make a bigger impact to fulfill its mission and expand its geographic coverage. Asia and the Pacific have long been our priorities, but now our African and West Asian efforts are increasing. In Asia, we are focusing more attention on the fish and poverty hotspots, for example in the Mekong River Basin where we are significantly increasing our resources. Our small presence in the Caribbean is being replanned and we expect to embark on Latin American priorities in the next 5 years. These geographic shifts have been reflected in our presence on the ground - from a single site in the Philippines in 1977 to ten sites in Africa, the Asia-Pacific region, and the Caribbean in 2002, and an eleventh site, in Cambodia, added in mid-2003, plus work on the ground in a further thirteen countries.

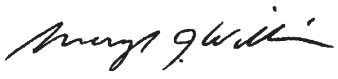
Faced with continued deterioration of the world's fisheries resources and the promise and challenges of increasing aquaculture production, we recognized that the public and political profiles of fish issues must be much higher on world and national agendas. To help achieve this, we created an inclusive initiative called *Fish for All*, and launched it at the *Fish for All* Summit on 2 November 2002 in Penang, Malaysia. Fish for All is intended to galvanize attention to the many fish-relevant commitments of the 2002 World Summit on Sustainable Development (WSSD), provide a platform for inclusive dialogue on the complex issues surrounding fish and, over a 10-year period, serve as the outlet for many studies, actions, and debates aimed to find solutions for poor people and the environment.

Finally, we recognize that the challenges facing the sustainability of living aquatic resources and those who depend on them will require the hard work and team spirit of all employed by the Center, and the policy guidance of the committed multi-national expert Board. All those at WorldFish are ready to give their best efforts to these ends.

On this note, we commend the Annual Report 2002 of the WorldFish Center to you.



Robert E. Kearney
Board Chair



Meryl J. Williams
Director General

Scientific Highlights of a Quarter of a Century

Compiled by K.I.Matics

M. Prein

A handful of fish: Awareness-building of the nutritional value of fish and promoting the consumption of fish as a regular dietary staple are important steps towards the further development of the fisheries sector.

1. History endows the present

The WorldFish Center is committed to contribute to food security and poverty eradication in developing countries. By working with the actual users of the results derived from scientific research, the Center aims for a healthier and better nourished global society. Through its people-centered policies for sustainable development, it helps reduce pressures on fragile natural resources worldwide. Its focus is on how living aquatic resources can sustainably benefit the poor in developing countries.

WorldFish undertakes innovative scientific research that provides products and results to help current and future generations sustain the productivity of fisheries and aquaculture systems, protect the aquatic environment and preserve aquatic biodiversity. The Center formulates policies and options for the sustainable use of aquatic resources, and helps strengthen the capacity of national programs to support such development.

The stated goals of the Center are: equity of the benefits from capture fisheries, better quality of life for rural households, improved access to fish at affordable prices for consumers, and protection of the aquatic environment.

The WorldFish Center is an autonomous, non-governmental and non-profit organization that originated from a 1975 program of the Rockefeller Foundation in Honolulu, Hawaii, USA. It was conceived to implement a multi-disciplinary action program on living aquatic resources for the benefit of economically challenged countries. In the beginning there was a series of short-term, exploratory projects on subsistence fisheries and aquaculture in the Pacific Basin. Subsequently, the Center was established as an independent international institution on 20 January 1977 and two months later moved to Manila, the Philippines. During this initial phase, many of the Center's long-term projects were implemented in Southeast Asia.

The WorldFish Center was founded because of the need for an integrated and cohesive research institution at the international level. It was meant to serve as a complement to inter-governmental organizations mainly concerned with development. The Center is now a leading scientific institution conducting, stimulating and accelerating cross-cutting research on fish and the aquatic environment in tropical areas. The holistic development efforts of the Center have played a major part in improving the quality of life and the livelihoods of poor people in developing countries for more than 25 years. This is because the WorldFish Center targets the ultimate beneficiaries - those who use and depend on fish and other living aquatic resources in the developing world. From rather modest beginnings with a dozen scientists, the Center now has offices in eleven countries in Africa, the Asia-Pacific region, and the Caribbean, with approximately 280 employees of 20 nationalities. They are involved in research in 22 project countries. In 2002 the Center worked with over 250 partners from 58 countries. The annual budget is almost 15 million dollars. Plans are afoot to increase this amount and the Center's activities by 2010.

In May 1992 the Center was admitted to the Consultative Group on International Agricultural Research (CGIAR) that is under the umbrella of four co-sponsors - the Food and Agriculture Organization of the United Nations (FAO), the World Bank, the United Nations Development Programme (UNDP), and the International Fund for Agricultural Development. WorldFish joined 15 other international research centers in this consortium.

2. Scope and intention of this article

The following account describes some of the major scientific achievements in the life of the WorldFish Center, from the conceptual phase in 1973-74 to the present day. Such milestones reflect its growth and evolution over a quarter of a century.

This information should be read in tandem with another publication of the Center, *A Lasting Catch*, which focuses on the people impacted by the Center's research and development work. Both documents celebrate the 25th Anniversary of the WorldFish Center.

No organization can afford to be complacent about its past achievements, but looking at the accomplishments through the eyes of those who sought help is a useful test of progress. *A Lasting Catch*, a volume of grassroots stories, shows how some of the WorldFish Center's work in Africa, the Asia-Pacific region, and the Caribbean has really helped rural people.

Behind the success stories told in *A Lasting Catch* stands modern science in action at the grassroots level in tropical locales. Hence, the information cited below focuses on the Center's scientific achievements in sites established around the world, namely in Bangladesh, Cambodia, Cameroon, the Caribbean and Eastern Pacific, Malawi, Malaysia, New Caledonia, the Philippines, Solomon Islands, and Vietnam. In addition, the research approaches developed and used by WorldFish have influenced how aquatic resources science is done all over the world and has often led the way in research themes and directions.

The Center has led the world in many fields of scientific research ranging from breeding larger "super" fish to finding appropriate ways for communities to effectively manage their fish resources and habitats so that their children and grandchildren will be able to reap the future bounty. It has provided critical data, training opportunities, and informed advice to scientists, research planners, fisheries managers, and extension agencies in approximately 100 countries to influence effective fisheries management.

Although some general models of "typical" research projects can be developed, each case is different, depending on the expected results, the particular locale, the capability of disseminating partners, and so on. In fact, much of the Center's work revolves around producing "intermediate products", that is, products that are used by others, perhaps through several steps such as in the case of policy advice for fisheries management, before they can have an impact at the grassroots level.

WorldFish Center Photo Library Collection

A Filipino woman has a basket full of mackerel. Unfortunately, due to poor fish handling and lack of refrigeration facilities, some of her catch will spoil before people can benefit from it.

Assessing the impacts

Given the finite resources available for aquatic research, it is important to know past and likely future impacts of research in order to allocate scarce resources and to target efforts to the most productive tasks. The success of applied research is measured by not only how good it is and how highly it is regarded by its peers, but also according to the impact it has in practice. The CGIAR and, therefore, WorldFish stake their reputations on the actual impact of their work on the lives of people they intend to help. For example, how many people are using a new technology or improved breed? How has the innovation improved the quality of life? What government fisheries policies have been influenced by research reports? How has the information helped rural and coastal people?

WorldFish Center Photo Library Collection

Traditional gear reflect subsistence fisheries: pro-poor technologies will become more meaningful and more beneficial to the poor when they are reinforced by effective development policies and planning in the fisheries sector.

The WorldFish Center has developed a conceptual framework to study the impact of its work in terms of its economic, social, and environmental goals. The framework covers the continuum from planning (ex-ante assessment of impact), through monitoring and evaluation, to post-project (ex-post) assessments. The Center has focused on the former in several major areas, especially fish genetic improvement projects and the supply and demand studies. The results of some of these studies are reported below but we leave it to a later report to deal, in depth, with the full impacts of research.

3. Major scientific themes

The WorldFish Center's dynamic research activities cover both marine and fresh waters in tropical ecosystems, namely, coastal waters, coral reefs and inland water bodies. The guiding principles of the applied research undertaken are sustainability, equity, gender awareness, and full participation of all the stakeholders. Major themes covered in this publication include assessing fisheries resources, emphasizing integrated approaches to fisheries development, creating new aquaculture technologies, working closely with poor people in developing countries and a variety of institutions (through partnerships and networks), building up fisheries information systems, and getting the message across to different stakeholders.

3.1 Pushing the frontiers of fisheries resources assessment

In the 1970s, scientists began to realize that the limit to marine capture fisheries were being reached (see Box 1), but very little was known about the true state of fisheries resources in tropical developing countries. Better knowledge of stocks was felt to be germane to better manage the fisheries. Stock assessment was thus one of the top priorities of the preparatory phase when the Center was being conceived.

Many scientists may recall that in the early 1980s several developing country fisheries managers recognized that their country's fish harvests had leveled off or were declining at an alarmingly rate. For example, the bans on trawling in some Southeast Asian countries indicated attempts to control the competition between modern, efficient harvesting methods and the artisanal, sometimes traditional, technology of small-scale, subsistence fishers. The public became aware of conflicting goals of fishery management. Scientists reiterated that they lacked the necessary information and data, mainly because of inadequate, partial, and ad hoc research. Being aware of the issues, the WorldFish Center has sought to fill some of the gaps.

Box 1: The State of the World's Fisheries: The Decline of the World's Fisheries Resource Base.

All over the world, fisheries started to expand from the 1950s onwards and the increases in catches from the wild did not slow until the 1980s. Since 1984, the catch from wild fisheries resources increased by only 1.6% annually until the early 1990s. In 1992, FAO reported that 70% of the world's major fish species and eleven of its 15 primary fishing areas are declining and need urgent management measures. Symptoms of fisheries in decline include ever-declining catches of major species, a high proportion of juveniles and smaller fish in the nets, and increasing fishing effort to maintain catches.

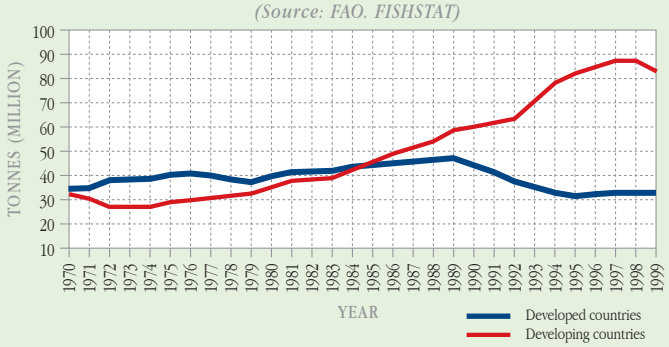
The catch per unit of fishing effort (CPUE) has nose-dived in most fisheries and recent scientific studies report a 90% decline in large predatory fish in the world's oceans since the 1950s. Commercial fishing has decimated populations of large tuna, swordfish, marlin, and other fish species. Over-exploitation of natural stocks and large-scale alterations of river systems have contributed to the severe degradation of several species in the wild. Wastage on board fishing vessels and on shore through improper handling accounts for substantial extra losses of aquatic resources. Overall, poorly managed fisheries resulting in declining catches adversely impact not only the fishers, but also the consumers, especially the local people whose nutrition and livelihoods depend directly on the sustainability of the fishing industry.

At the same time that wild fish stocks are being decimated, world aquaculture production has grown by about 10% per year, although this growth has been concentrated in a few countries such as Bangladesh, China, India, and the Southeast Asian countries. Africa has been late to show much aquaculture production although this is now starting to occur.

Despite these problems, fisheries are valuable. In 2000, the value of global exports of fish and fish products was US$125 billion, with developing countries accounting for nearly half of the total. In terms of monetary value, shrimp was the most valuable commodity traded. Since the mid-1980s, more fish were caught from the wild in developing countries than developed countries due to the collapse of many fisheries in the latter and tighter catch controls.

According to the FAO, fish supplies about 30% of the total animal protein in the diet of people in Asia, 20% in Africa, and 10% in Latin America. Most poor people in developing countries have a high carbohydrate, low protein diet or are dependent on lower quality cereal proteins. Fish as a nutrient-dense commodity can enhance the quantity and quality of food for poor people.

World Fish Production
(Source: FAO. FISHSTAT)



Lack of data and methods for analysis when data were scarce caused WorldFish to focus first on developing methods for analysis in these types of situations, then on making any available data as accessible as possible and generating enthusiasm for collecting more basic data for tropical fisheries.

In the case of methods for analysis, in 1981 the WorldFish Center began developing a new method called Electronic Length Frequency Analysis (or ELEFAN). The ELEFAN suite of microcomputer programs was used to extract a vast amount of information useful for stock assessment from data routinely and simply gathered in many developing countries.

Such stock assessment tools have been more often applied in tropical countries than age-based methods, because age structure information has proven to be difficult and expensive to obtain for the large number of tropical species caught. ELEFAN and other stock assessment programs from WorldFish were combined with those from FAO and other sources in FAO-WorldFish Stock Assessment Tools (FiSAT) software distributed first in 1996. The FiSAT software package that was designed as a basic training tool was developed as a result of the needs identified in the joint FAO and WorldFish Center stock assessment courses that were conducted in the 1990s and that were so vital to upgrading scientific capacity in tropical regions around the world.

The WorldFish Center also developed a method for ecosystem analysis of multi-species fisheries and other biological production systems in the 1990s. This was based on a stock assessment approach originally conceived in the early 1980s by researchers in Hawaii. The approach incorporated in the Ecopath software has been widely used for constructing food web models of marine and other ecosystems, including terrestrial farming systems.

By 2000, Ecopath was employed to describe more than 100 ecosystems. On a regular basis it is used in university courses and for post-graduate work. There are no comparable methodologies for ecosystem analysis and biological management of multi-species fisheries.

New methodologies called Ecosim and Ecospace, which describe ecosystem time and spatial dynamics, have been developed and are now integrated in Ecopath. Ecosim makes it possible to simulate the impact of changes in fishing pressure on ecosystems, while Ecospace is developed to address spatial dynamics, including studies of the effects of protected areas over time.

The methods for ecosystem analysis and extensive data on the fish catch and fish species characteristics were used in global analyses by WorldFish scientists in 1995 and 1996 to draw attention to the fact that capture fisheries annually were removing nearly 35% of the productivity of the world's oceans and that the fisheries were "fishing down" the food web.

This modeling approach was also used recently to construct models for coastal fisheries systems in South and Southeast Asia. The eight-country coastal fisheries study produced much more than the use of ecosystem models. In it, the WorldFish Center developed a database system called TrawlBase, a valuable tool to establish resource benchmark information and supplement existing statistical baselines. This database system is used for compiling survey data, thereby enabling national fisheries managers to have documentation on the stock and biomass decline in most countries in South and Southeast Asia. Researchers now have a better understanding of species composition and can better evaluate the effects of over-fishing on fragile aquatic resources. The Center also conducted a strategic review of national and regional fisheries scenarios of these eight countries and identified fisheries management issues as well as recommended mitigating measures. It continues to strengthen the capabilities of national partners in coastal fisheries assessment and management.

WorldFish Center Photo Library Collection

A fisher's life is an active one. Casting a net in the Delta, Vietnam.

WorldFish Center Photo Library Collection

This Filipino man is mending or fixing the nylon net.

In the next section, we describe more about how these cross-cutting and integrated approaches were developed by the Center. Indeed, the WorldFish focus broadened in the 1990s as it became clear that even the best stock assessment advice did not, on its own, lead to better management, although it remains a vital element of integrated fisheries management. The following section will describe how integrated approaches guided many of the Center's approaches.

3.2 Integrated approaches

Since the beginning, the founders of the WorldFish Center saw the need for integrated inter-disciplinary approaches to most fisheries problems. Fisheries science, sociology, ecology, and economics need to be brought together to generate action plans and policies for the sustainable use of aquatic resources. Thus, the second major science theme concerns the Center's recognition of the complexity and interlocking nature of the scientific, economic, social, legal, institutional, and environmental issues involved in the development and management of aquatic resources.

Coastal Fisheries Case Studies in the Philippines

From the early 1980s multi-disciplinary case studies of particular small-scale fisheries were undertaken by WorldFish in collaboration with national research organizations. During 1981-83 the Center conducted the pioneering work of the first socio-economic study of a fishery involving integrated coastal zone management (ICZM) in San Miguel Bay, the Philippines. The three-year study concentrated on the multi-species and multi-gear fisheries in San Miguel Bay in cooperation with the College of Fisheries, University of the Philippines in the Visayas (UPV). The study showed that fishing grounds need a viable fisheries management program to reduce competition between trawlers and small-scale fishers. This was because approximately 5 000 small-scale fishers had to compete with 95 trawlers. As a consequence of the pioneering research, the subsistence fishing communities were encouraged to participate in all management decisions from then on.

The San Miguel Bay case study documented the full exploitation of the fisheries resource, its value and the incomes of fishers from those using small-scale gear (for example, gillnets and fixed gears) in contrast to trawlers with which they compete. Alternative management approaches were analyzed and legislative change with respect to trawler activities resulted from this study. The WorldFish Center tested stock assessment tools referred to above and provided useful guidelines for assessments in other developing countries. In this way the Center put fisheries in the context of the broader coastal resources management debate. Lessons learned included the efficacy of the research-cum-planning approach, the importance of stakeholder participation, and the use of decision tools to structure research and planning activities.

This study was the first of its kind in Asia and it was used as a model for similar studies elsewhere in the Philippines, Indonesia and Thailand. To ensure wide dissemination of the results, the English texts of numerous technical reports and papers were translated into some languages of the Philippines (i.e., Tagalog, Bicol and Bicolano).

Ten years after its initial work in San Miguel Bay, the Government of the Philippines requested WorldFish to spearhead further research and planning activities in support of integrated fisheries management efforts in San Miguel Bay. The process spanned a two-year period (March 1992-February 1994) and the principal partner was the Fisheries Sector Program of the Philippines Department of Agriculture. The initiative resulted in a coastal environmental profile, a technical report detailing the status of the fisheries, and an integrated fisheries management plan. The San Miguel Bay Fisheries Management Council was formed to execute the plan. The San Miguel Bay study also became the successful model for similar approaches in 11 other bays under the Fisheries Sector Program.

WorldFish Center Photo Library Collection

This picture taken in the Philippines shows two types of gear. In the background is a fish corral. The people in the foreground are using gillnets with their distinctively Filipino boats.

To spur more effective management of coastal fisheries, a number of experiences may be drawn from the San Miguel Bay experience. These include the crucial role of human perceptions or "cognitive maps" of the situation (i.e., the analytic framework) to fully elaborate the problems and interventions at hand. In addition, the importance of stakeholder participation at key stages of the research, planning and management process was reiterated.

To test the applicability of non-market valuation techniques and to examine people's preferences for environmental amenities in coral reefs, a valuation study was undertaken on the Bolinao coral reefs in the Philippines in collaboration with the University of the Philippines (UP). In this study in 2000, the people who visited the beaches were surveyed to estimate their willingness to pay for the protection of the coral reefs. The study confirmed that in developing countries "coral reef protection" elicits little willingness to pay for preserving the environment. However, the study revealed that there is potential for charging "user fees" for recreation to generate revenue that can be used for the protection of the reefs.

Coastal Resources Management Project in Southeast Asia

Whereas the San Miguel Bay study concentrated on the fisheries activities in the context of coastal resources management, WorldFish also pioneered more multi-sectoral approaches to integrated coastal zone management (ICZM) through the Coastal Resources Management Project (CRMP) (1986-92). As a major regional undertaking, the project generated substantial information and training opportunities. The main component was the development of site-specific integrated coastal zone management plans in the participating countries (i.e., Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand). The WorldFish Center executed the project and provided technical and administrative support. The achievements and lessons learned from the pioneering project shaped an integrated coastal zone management framework applicable to other developing countries.

The project "sensitized" policy-makers in the ASEAN countries to the importance of sustainable coastal area management and thus has contributed to a greater commitment of political will and national resources dedicated to integrated coastal zone management in almost all countries in Southeast Asia. Southeast Asia developed a pool of resource persons and a network of organizations with the knowledge and expertise in ICZM to assist national governments within or outside the region. The ASEAN members could therefore play a leading role in Agenda 21 of the UN Conference on Environment and Development in Rio, November 1992. The project generated substantial documentation on the environment and development of the coastal areas of Southeast Asia. Useful databases were enriched for the future planning and management of the coastal resources.

The CRMP led to many other regional initiatives, the most important of which has been the Partnerships in Management of the East Asia Seas, conducted under the auspices of the International Maritime Organization (IMO) since 1993 and leading to a 2003 regionally approved vision for the sustainable management of the marine environment and resources of east Asia.

A consequence of the trend towards integrated coastal zone management has been the need for training officials and community workers on how to do it. To help generate a pool of coastal resource managers, WorldFish and partners initiated the Broad-based Coastal Management Training Program in 1994 among coastal governmental and non-governmental organizations in the Philippines. The approaches have now spread, through "training-of-trainers" projects carried out by WorldFish experts in the Philippines, Indonesia and Vietnam. The initial National Course on Integrated Coastal Management trained 217 coastal middle managers in the Philippines. There are now 11 trainers in Indonesia, 23 in the Philippines, and 11 in Vietnam.

WorldFish Center Photo Library Collection

Children struggle with the lift net in a pond beside the rice fields of rural Thailand.

A network of course and module developers was set up in the process. In Indonesia, the Indonesian Network on Coastal Management (InCOM) was set up - another result of the WorldFish initiative.

Integrated Aquaculture-Agriculture (IAA): Introducing Aquaculture into Traditional Farming Systems

While most of aquaculture development was focusing on shrimp, grouper and other higher value species, WorldFish has led the way in integrated aquaculture-agriculture (IAA) research focused on poverty alleviation and targeting new entrants. It has formulated concepts and developed tools to monitor nutrient recycling to maximize the total output for small-scale farms while minimizing purchased inputs. This ecologically sound method converts agricultural waste and manure into high quality fish protein, uses nutrients in the pond as fertilizers for growing plants on the land, and reduces the need for off-farm inputs. Moreover, aquaculture is accepted as a strategy to control pests on rice farms. Recognizing the myriad of small farm types, the circumstances of their households, and that there is no single technology package that is applicable everywhere, WorldFish adopted a participatory approach to encourage farm-specific and sustainable uptake. Success in introducing IAA into poor farming communities depends on the existing ecological, social, and economic conditions.

The participatory approach ensures that the operational methods are appropriate to the ecology and resources. WorldFish has worked with farmers, researchers and development extensionists on thousands of small-scale farms in different biophysical and agro-ecological systems in Africa, Asia, and Latin America. It has carried out experiments on various types of IAA systems in Bangladesh, Cameroon, Ghana, Malawi, the Philippines, Thailand, Zambia, and Zimbabwe. Experience in one country has usually led to developments in other neighboring countries with similar agro-ecologies.

For example, from the Center's base for eastern and Southern Africa in Malawi, where it has been active for more than 15 years, methodologies have been extended to neighboring countries, such as Mozambique, Zambia, and Zimbabwe, for broader testing and uptake.

IAA helps with better water management, which is particularly useful in the arid countries of Africa, and during droughts. Using this experience in southern Africa, the WorldFish initiated in September 2000 a five-year research project in Cameroon in west Africa. The water and soil resources for aquaculture in Cameroon are far superior to those in Malawi, thereby offering a valuable opportunity to measure the true potential of integrated aquaculture-agriculture. A considerable number of village groups in Cameroon offer mechanisms for disseminating information and maximizing the impact of integrated aquaculture-agriculture.

The impact of integrated aquaculture-agriculture practices developed by WorldFish in Bangladesh, Cameroon, Ghana, Malawi, Zambia, and several countries in Southeast Asia have been studied to assess the potential impact on users (i.e., producers and consumers) and resource systems in terms of sustainability, biodiversity, soil nutrients, water usage, etc. For example, farmers on Malawi's Zomba plateau feed their tilapia fish with weeds and use mud from the fishpond as a rich, organic fertilizer for their agricultural crops. These farmers produce more crops, are better nourished, and earn, on average, six times more income than non-fish farming households.

WorldFish Center Photo Library Collection

A WorldFish expert (at left) involves African men, women and children in this participatory-style assessment of farm resources and opportunities to recycle them.

WorldFish Center Photo Library Collection

Feeding time on a Vietnamese farm. The water teems with fish, some of which will be sold to neighbors, while others will be raised to a marketable size.

The target beneficiaries of IAA are small-scale and subsistence farmers and other rural people, who do not have the know-how or financial resources for intensive, high-capital commercial activities. Farm ponds provide remunerative opportunities for women who normally stay close to home.

The potential benefits of IAA are far greater than the value of the fish produced. IAA has demonstrated how a family can improve its nutrition as well as increase the productivity of the other farm plants and animals. Experience has shown that most small-scale or subsistence farmers start by growing fish as a part of their existing farming activities with minimum additional inputs or capital investment. For the small-scale farmer it is a relatively low risk, low investment option.

WorldFish attempts to regenerate the natural resource base and encourages the adoption and/or adaptation of technologies appropriate for attaining optimum productivity in the long-term. After farmers have mastered the basics of aquaculture and established markets for their products, they can then begin to acquire additional external inputs to further increase their fish production. Many fish produced by IAA are relatively low priced because they are herbivorous or omnivorous species that feed low on the ecological food chain. Thus, those that are not eaten by the farmers are sold as affordable fish to other impoverished rural people.

3.3 Farming the right fish the right way

Even though harvests of natural marine and freshwater fish stocks have reached their limits, the demand for fish continues to increase, not least because each year another 77 million people are born who must be fed. Most of them are poor and live in developing countries where fish make a greater relative contribution to nutrition than in the developed world. To maintain the fisheries output, it is necessary to reduce fishing pressure and rejuvenate stocks. A further increase in supply could be provided by aquaculture.

Aquaculture is certainly not a new concept. It is thought to have originated in ancient China around 1100 BC. The first cultured fish was probably the common carp. Aquaculture did not take off in earnest until the 1960s in China with the technical advances in hatchery rearing, and later policy and structural reforms. Today China's aquaculture accounts for nearly 70% of the world production in terms of quantity and 45% in value.

Around the world, intensive and semi-intensive aquaculture has grown steadily in the past 20 years and now plays a significant role in meeting fish demand. Aquaculture production has increased at an annual rate of 11% and now approximately 30% of the fish consumed worldwide comes from aquaculture systems. The projected growth of the commercial aquaculture sector may reach 50% of the world's total fish production by 2020. The cost of fish is estimated to rise 4-16% by then (excluding inflation).

P. Thompson

Indigenous materials are used to herd the fish for future harvesting in Bangladesh.

An important objective of WorldFish scientific research on aquaculture has been to identify and develop systems and species that are ecologically appealing, and provide food and employment for the growing world population, especially the poor and malnourished. A major achievement of the WorldFish Center was bringing improved aquaculture methods to thousands of farmers in many developing countries.

The WorldFish Center's focus has been on aquaculture practices that consider not only the technical and economic aspects of fish production, but also the environmental, social, and cultural contexts involved, so that they are feasible options for the target groups, and are sustainable and environmentally friendly. Moreover, the Center has taken into account the interdependence of aquaculture and the environment and seeks a balanced approach. This environmental approach has two main facets, namely, the dependence of aquaculture on natural resources and the environment, and the impact of aquaculture on the environment.

To achieve its mission, WorldFish has also identified pro-poor technologies to allow small-scale farmers to augment their sources of protein and livelihoods through aquaculture. Semi-intensive technologies have proven to be sustainable, technically viable, economically feasible, and able to contribute significantly to the income of small-scale farmers. The Center has focused on native species or those that have become well established to avoid the dangers associated with the random introduction of exotic species.

The Governments of Bangladesh, P.R. China, India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam are drawing up aquaculture national action plans. The first step is to identify and prioritize aquaculture technologies best suited for the respective countries, based on several criteria and indicators. A few of the indicators focus on efficiency (fish production), food security (ensuring the availability of fish for poor households), employment (generation of jobs including a larger share for women), the environment (sustainability), and acceptability by the poor. During the process of formulating development plans, there is a mutual exchange of views with the stakeholders, thus all parties improve their capacity to help make aquaculture more equitable and sustainable.

Benefiting farmers through fish genetic improvement

Research conducted on tilapias in the late 1970s by WorldFish and its African and Asian partners led to the conclusion that the lack of productive stock was a major limiting factor to the expansion of the aquaculture industry. With the assistance of African, Belgian, German, and Israeli scientists, four wild populations of Nile tilapia (*Oreochromis niloticus*) from Africa (i.e., Egypt, Kenya, Ghana, and Senegal) were transferred to the Philippines. These and four other strains that were used by farmers in Asia (known as the Israel, Singapore, Taiwan, and Thailand strains) were bred to build up a base population for selective breeding.

The WorldFish Center is credited with the development of the first-ever successful breed improvement program for tropical food fish. Over a dozen countries have now adopted the methods used in this major scientific breakthrough. One result is that farmers and their families can now generate more income and meet their nutrition needs.

WorldFish Center Photo Library Collection

Many hands make light work of the harvesting at this village. All will get a fair share in the Philippines.

The Genetically Improved Farmed Tilapia (GIFT) Project bred a new strain of improved Nile tilapia for Asia that grows up to 85% faster and has a 50% higher survival rate than other strains after 6 months. In some trials adults were produced with 20-30% lower production costs. They were also less likely to breed when small. The new breed captured 25% of the tilapia fingerling market in the Philippines in only its third year of commercial distribution and this level has continued to the present.

From 1994 to 1997, the genetically improved breed was tested in the P.R. China in different agro-ecological regions in controlled trials on farms and at testing stations. Similar trials were carried out in Bangladesh, the Philippines, Thailand, and Vietnam. In the P.R. China, although tilapia aquaculture was already well established, the GIFT strain still achieved remarkable success, with an 18% higher growth rate than existing strains that were being farmed in similar conditions. The GIFT strain is now being multiplied all over the P.R. China. Research is underway to assess its adaptability to varying climatic conditions, in order to make further genetic improvements to suit these conditions.

The methodologies developed in the GIFT Project comprising crossbreeding and selection has also been applied to other fish species that are commercially important in the P.R. China, such as the common carp and blunt snout bream.

Thus, WorldFish has developed a holistic and multidisciplinary methodology in assessing the impact of aquaculture technologies at the start of the adoption phase. This was applied in determining the impact of genetically improved farmed tilapia and is widely applicable to the agriculture sector in general. Such activities are aimed at ensuring that aquaculture and fisheries technologies and the associated extension methods are socially and economically appropriate to poor households in the developing countries.

To help disseminate the strain, in 1997 WorldFish and its research partners in the Philippines established the GIFT Foundation International, Inc., as an independent, non-profit organization to make sure that the poorer farmers had access to the GIFT strain. The new strain is now being distributed through the Foundation.

In the context of a new research program developed with Malaysian partners in 2002, families of GIFT tilapia were received from the GIFT Foundation in the Philippines and successfully introduced at the Jitra Research Station, Malaysia. Their first progeny were produced during January-February 2002. The parents of the next generation were selected on the basis for a new breeding program that is currently underway. The new breed is being trialed on farm now.

Mariculture Options: Developing Scientific Techniques for Village-based Farming of Species to Provide an Alternative Source of Income

Apart from fishing, remote coastal communities adjacent to coral reefs in developing countries have few opportunities to engage in low cost industries capable of generating income and food on a sustainable basis. As natural fish stocks become more depleted, WorldFish has pioneered the development of scientific techniques for village-based farming of marine species such as giant clams, sea cucumbers, and pearl oysters. Although these species produce high value products, they fit the WorldFish criteria of being low on the food chain, environmentally benign, and able to be managed by village farmers. These species produce beneficial effects on water quality because they actually clean the environment. The culture of these species not only helps coastal communities that depend on marine products for food and income, but can also restore depleted natural stocks through restocking programs.

The Solomon Islands underwater culture of giant clams requires expertise and know-how.

Research throughout the 1980s and 1990s by the Micronesian Mariculture Development Center, James Cook University in northern Queensland, Australia, the University of the Philippines (UP) and the WorldFish Center at its Coastal Aquaculture Center (CAC) in the Solomon Islands, resulted in the formulation of reliable methods for the spawning and land-based larval rearing of giant clams (*Tridacna* spp.). The CAC is now completing experiments on farming giant clams by applying techniques to reduce the cost of producing seed in hatcheries, adding value to cultured products and improving the survival of giant clams.

Jobs are scarce in the conflict-shattered economy of the Solomon Islands. Many of the reefs are now over-fished as local people fish for food and eke out a meagre living. Black pearl farming may offer hundreds of poor, coastal communities a viable alternative to fishing. Pearl farming is a US$ 1.5 billion global industry and black pearls account for a quarter of the market. Only the black-lipped oyster (*Pinctada margaritifera*) produces black pearls.

The WorldFish Center's researchers working in the Solomon Islands used cultured oysters to produce black pearls. The first two crops were recently auctioned on the Internet for approximately US$22 000. The profit was donated to a local hospital. The scientists are also providing similar technical assistance to Fiji and Tonga.

In the Black Pearl Farming Project in the Western Pacific, the third crop of pearls was harvested and the fourth pearl seeding took place in April 2002. Maintaining the demonstration farm as an incentive to potential investors is seen as important in view of the great economic difficulties experienced by the Solomon Islands.

The culture of black-lipped oysters is now established as an income generating activity for local village communities. The pearl oysters are collected from the wild using methods scientifically adapted by WorldFish from the standard collection methods used in French Polynesia and the Cook Islands.

Concerning the sea cucumber called the sandfish (*Holothuria scabra*), the WorldFish Center's research aims at developing methods for the mass production of larvae and juveniles. They are being released into the wild to restore depleted natural stocks and enhance local fisheries. In New Caledonia, the project on developing optimal release strategies for restocking the tropical sea cucumber continues to make steady progress.

Having first developed the hatchery technology for the sandfish in the late 1990s, one biological breakthrough in 2002 was the WorldFish Center's success in finding out about the life cycle of the sea cucumber in 12 months in Vietnam. This shows the way to practical approaches to large-scale rearing of sea cucumbers.

Pens were built in the Hon Mun Marine Protected Area (MPA) of Nha Trang Bay in collaboration with the MPA Management Project and local farmers. A pilot-scale pen was built in an MPA by the International Marine-life Alliance and stocked with animals averaging 100 g to provide an alternative source of income for fishers.

Alternative Livelihoods

Coastal and flood plain ecosystems provide some of the greatest challenges to fisheries management - due to the increasing use of the fisheries resources directly and the burgeoning threats to the aquatic ecosystems from other sectors such as industrial development, ports and navigation, pollution, and water diversions and agriculture. Small-scale fisheries are prevalent in tropical developing countries and their associated marine and freshwater ecosystems. In many cases, small-scale fisheries are based in rural coastal communities that are spread over a large geographic area (e.g., Indonesia, the Philippines, Pacific Islands, the Mekong and Amazon Rivers and flood plains).

P. Thompson

Even children get into the swing of using scoop nets and push nets to fish in Bangladesh.

Many involved in fisheries are seasonal participants, migrants, laborers and/or ethnic minorities. Women, children and youths are heavily involved in the catching and post-harvest sectors and fishing is often restricted to certain cultural, tribal or family groups. Many people having access to such resource systems are familiar with aquatic organisms and so alternative livelihoods such as aquaculture may be attractive.

WorldFish has been pioneering several innovative options for landless people through aquaculture activities and community-based management, often combining the two. For example, successful trials for community managed aquaculture during the flood season in Bangladesh and Vietnam started trials with approximately 900 farmers and landless migrants. The community-managed aquaculture brought an annual increase in their net returns by US$220-400 per hectare and a reduction in the cost of rice production for the farmers by about 10%. Extensionists and NGOs are taking the methods to thousands of people in the two countries and WorldFish has commenced similar work in West Bengal, India.

In the Solomon Islands, research to develop new artisanal fisheries based on the capture and culture of post-larval coral reef fish has shown that such capture and culture fisheries are feasible for the growing aquarium trade. Indeed, it could be based almost entirely on crustaceans (shrimps and spiny lobsters), complemented by high-value finfish species. Fish from 50 families and about 215 species are collected in light traps along the Islands' coastlines. In 2002, 46 species of fish, together with the spiny lobsters and shrimp grown-out in land-based raceways, survived for extended periods. Some were sent to an aquarium exporter for appraisal and others were released into the Solomon Islands' Nusa Tupe marine reserve. The advantage of doing this is because of the significantly higher survival rate under controlled conditions.

3.4 People and institutions: the Center's leading role

The WorldFish Center has played a leading role in the social sciences and policy research. See Box 2 concerning People and Fisheries.

Box 2: People and Fisheries

Fisheries resources are essential to the lives and livelihoods of about 51 million people, including some of the world's poorest who are directly involved in the harvesting and processing of fish and other aquatic products, and 98% of whom are from developing countries. About 30 million of these people are full-time fishers. These numbers have more than doubled since 1970 in the developing world, but have actually declined in developed countries. If an average household size of five persons is assumed, then 250 million people in developing countries are directly dependent on the fishing sector for food, income and livelihoods.

WorldFish estimated that, additionally, fish production employs some 150 million people in developing countries in associated sectors such as marketing, boat building, gear making, and bait. FAO further estimated that at least 20% of the world's full-time fishers earn less than US$ 1 per day, and that 90% of the world's fishers are from Africa and Asia. Most of these fishers and their families do not have a safety net in case of emergencies. They tend to live from one day to the next, not knowing what will happen - either for the good or bad.

Fishing at sea is by far the most dangerous occupation in the world. More than 24 000 deaths are reported annually. Sea safety regimes are weakest for artisanal and small-scale fishers of developing countries. Fishers are also more likely to be HIV positive than other workers. In Tanzania, they are five times more likely to die of AIDS than farmers.

It should also be recalled that at least 50 million women in developing countries are employed in the fishing industry, often in low paying jobs such as net making, processing and marketing. In Bangladesh, the introduction of fish farming is helping thousands of women take greater control of their lives.

In 2000, 77 families in Kampong Thom Province, Cambodia, protested for six weeks outside the National Assembly in Phnom Penh after losing access to community fishing areas. As a consequence, the government was forced to take notice and in 2001 over half (56%) of the private concessions called "fishing lots" (formerly auctioned and consigned to big business) were opened up to the public. With such open access, the fisheries now lack a legal management scheme to ensure their sustainable use. Moreover, much of the fish is used in Cambodia as fertilizer and feed for higher value aquaculture products, rather than for poor people.

In many countries that depend on the sea for their economic security, life-support systems and communication, numerous government agencies may be responsible for maritime and riparian enforcement. The wide array of stakeholder interests, responsibilities and authorities does not guarantee efficiency and may often lead to a lack of coordination. This is apparent in the failure to stop illegal fishing, piracy against fishers and others, and unauthorized activities of foreign vessels in a country's exclusive economic zone (EEZ).

Co-Management and Community-Based Fisheries

The United Nations' Convention on the Law of the Sea in 1982 meant that fisheries were no longer "common property". This Convention was an international response to the wave of national sovereignty claims on the oceans. It was also a wake up call for both fishers and fisheries managers and in the lead up to it, countries and regions prepared themselves for the changes. The WorldFish Center led the vanguard with the "Workshop on the Law of the Sea: Problems of Conflict and Management of Fisheries in Southeast Asia" in November 1978. The Center undertook a comparative study of the effects of the Law of the Sea on changes in the management and distribution of fishing effort in Southeast Asia and the Southwest Pacific.

P. Thompson

Four fishers work as a team in Bangladesh.

By the end of the 1980s, it was apparent that resource over exploitation and environmental degradation were not solved by national controls alone. In developing countries, national capacity was often weak and leaned more towards large-scale fisheries, often ignoring small-scale fishers even as their numbers escalated.

By the early 1990s, people engaged in institutional analysis and academic research in fisheries began to analyze and promote the possibilities of managing common resources through participatory, community-based institutions and to question the actual role of government in the day-to-day management of the resources. Soon, the balance of discussion moved more towards concepts of co-management - defined as the sharing of responsibility and authority between the government and local resource users/community to manage the fishery or resource (e.g., coral reefs, mangroves, shoreline habitats, etc.).

P. Thompson

A participatory approach is used in this Bangladesh village to identify fish species caught on a daily basis. Experts may "talk shop" with the village head, but many children hang around, taking an interest in the fisheries of their future.

WorldFish commenced its first community-based and co-management studies in Bangladesh in 1989 and, in 1994, in cooperation with researchers, government agencies and community organizations from Africa and Asia, began a major comparative case study and policy analysis of coastal fisheries co-management. These studies and others undertaken by WorldFish in the Mekong region and Bangladesh found that projects promoting community-based approaches must grapple with understanding how fisheries management is influenced by the characteristics of the resource systems (e.g., coastal enclosed bays, riparian flood plains, lakes, etc.), the local group characteristics, institutional arrangements, the external environment, and relationships among all these factors.

WorldFish studies showed that co-management is best driven from the bottom up. That is, from the community level. Co-management is often introduced at the same time as various types of government decentralization as they both appear to offer greater democracy, empowerment, local capacity building and development. In the case of fisheries, co-management is often introduced to solve a resource management problem (e.g., declining stocks, conflicts among users, other stakeholders and government agencies, failure to contain fishing effort despite mounting investment in monitoring, control and surveillance) or to create an opportunity (e.g., resource rehabilitation).

The comprehensive reviews found that co-management partnerships in tropical fisheries often begin as pilot projects on a few sites before or along with a more general policy decision to adopt the approach. It often takes many years to arrive at the stage where policies and then laws/regulations change to accommodate the new way of doing business.

For example, in Bangladesh, after more than a decade of experimenting, one of the major achievements of WorldFish was the establishment of the first successful nationwide community-based fisheries management (CBFM) program in the world. WorldFish is now working with communities, non-government organizations and several government ministries on a national scale set of pilot sites (over 100). Informal policy arrangements have been made between some ministries involved, but there is still no change of major legislation to formalize the co-management. A different approach was taken in the Philippines where devolution occurred early and began with national legislation. The Philippines Local Government Code of 1991 applied devolved natural resource management arrangements down to the local government units for all sectors.

To help build capacity for this new approach to fisheries management, in 2002 WorldFish conducted its first formal training program for 42 participants from eight countries in Africa and Asia.

The WorldFish Center's definitive review of ongoing experiences in co-management and related governance experiments across five of its own major studies in Africa and Asia have drawn attention to the inadequate property rights arrangements in all cases, the importance of supportive decentralized and devolved government powers, many scale issues for the resources, the populations and the institutions, changing land-water interactions and the impingement of market forces and changing policy environments on co-management.

P. Thompson

Many hands share the work and share the harvest in Bangladesh.

The review stressed that self-governance takes time to establish and the attributes of the resources and the users affect the costs and benefits of management, monitoring, and enforcement. Rules developed by self-organized groups differ in important ways from current textbook regimes. National rules adopted locally were seen as most effective. Larger regimes, such as national or state governments, can facilitate local self-organization by providing accurate scientific information, conflict resolution arenas, effective technical assistance, and mechanisms to back up local monitoring and surveillance.

But aquatic ecosystems are complex adaptive systems and thus not amenable to simple panaceas. The review revealed some surprises, such as that the importance of the size and heterogeneity of the local managing group are contested variables. The studies showed that, so far, little attention has been paid to the important question of who are the stakeholders, and how they should be represented. For example, minority and low power groups such as fisheries laborers, migrant fishers, women in the fishing or post-harvest sector, are seldom represented at all in co-management arrangements, despite making up a large share of the labor force dependent on the fisheries.

Given the different conditions, processes, needs, and demands within small-scale fisheries, there is no simple management solution appropriate for every fishery or country. As such, co-management should not be viewed as a single strategy to solve all of the problems of small-scale fisheries management, but rather as a process of resource management, maturing and adjusting to changing conditions over time, and involving aspects of democratization, social empowerment, power sharing and decentralization.

The work on co-management and community-based fisheries, as well as the legal and institutional analysis, has brought to the forefront the importance of people, organizations, and institutions in managing the fisheries themselves. Understanding the conditions of the fishers and the institutions that govern them and developing new institutions founded on community-based management have been important achievements of the WorldFish Center in Bangladesh, Indonesia and the Philippines. The Center has influenced some government policies and increased understanding through developing research methods and models, and tested them through an interactive participatory approach when conducting pilot projects. In the past, case studies have been undertaken by WorldFish in collaboration with partners in Bangladesh, Cambodia, Indonesia, Palau, the Philippines, Thailand and Vietnam. Case studies on community participation and attitudes toward co-management in Cambodia, Indonesia and Vietnam were documented during 2002.

P. Thompson

The scorching sun is just one of the hardships facing this fisher.

Marine Protected Areas and Marine Conservation Areas

One of the most commonly promoted and easily understood tools in fisheries management is the use of protected areas. Many of the sites in the community-based management studies incorporate protected areas, yet little biological evidence has been collected to better understand whether these are effective. WorldFish, therefore, has conducted basic research into the effects of MPAs on the conservation and enhancement of marine fisheries and biodiversity. In the Pacific, the Center studied a Marine Consevation Area of 83 sq km established near Arnavon Island, Solomon Islands. The baseline and follow-up surveys showed that, in the first years after the declaration of the area, the decline of stocks of giant clam and some species of sea cucumber, such as sandfish (*Holothuria scabra*), was halted and the abundance then began to increase. In the early stages, the reserve had no effect on the abundance of other holothurians or on the giant clam.

Research by WorldFish on small-scale fisheries in the Caribbean has demonstrated that the introduction of progressively larger escape gaps in fish traps in Jamaica will lead to substantial increases in the value of the catch, and help to replenish the fishery. The studies also demonstrated that the fish stocks were largely self-recruiting and, therefore, stocks of severely depleted fish species would take a long time to rebuild.

The Center's Unique Role in the Mekong Region

Following decades of conflict, Cambodia, the Lao PDR, and Vietnam are among the poorest countries in the world and among the most dependent on fish. The Mekong River and Tonle Sap Lake create a vast freshwater system covering 1.8 million hectares - the world's fourth largest inland fishery. The landless families in the Mekong River Basin earn an average daily income from fishing of only from US$ 1.80 to US$ 6.60, and US$ 0.97 from aquatic plants, yet many are highly dependent on fish for their food and livelihoods.

In the Mekong River Basin, WorldFish has engaged in studies to better understand the situation of the different stakeholders in the Mekong countries, help build national research and management capacities, and develop mathematical models to assist management decisions affecting water flows, fisheries production and fishing. The dependence of all three countries on the resources of the Mekong River means that the studies have to be framed in the context of the whole watershed.

Starting with studies of the ecological, social, and economic benefits provided by aquatic resources, particular attention was given to the contribution of fisheries to food security of poor communities in the Mekong region and the impacts of interventions both on the health of the resources and on the livelihoods of the communities dependent on them. For example, a study of two fishing-farming communities in the Mekong Delta of Vietnam undertaken in 2000 revealed that fish populations have been decreasing over the past 30 years and consequently the protein intake of the people has been reduced as well. The dependence on aquatic resources as a source of income and food for home consumption is highest in the lowlands and flooded communities of the Mekong Delta. Compared to the Vietnam national average of 15 kg fish per head per year, in An Giang province of the Delta, average consumption is perhaps as much as 58 kg/person/year (54 kg was fresh fish and 4 kg of processed fish) (see FAO/RAP publication 2002/11 quoting 1999 statistics compiled during a Mekong River Commission study).

Every year during the rainy season, floods in Cambodia and southern Vietnam submerge vast areas of forests and paddy fields. Three-quarters of the freshwater species in the Lower Mekong River Basin migrate to these flooded areas to spawn, feed and grow. Despite the huge variety and apparent abundance of life in the Mekong River tributaries, flood plains and delta, it is also home to some of the world's most endangered and threatened animals. Here is where you find the freshwater Irrawaddy dolphin (*Orcaella brevirostris*) and the endemic giant catfish (*Pangasianodon gigas*) that can reach up to 350 kg. The Sarus crane (*Grus antigone*), the world's tallest flying bird, also nests and winters in the Mekong Delta.

WorldFish Center Photo Library Collection

The pick-up truck is filled to the brim with baskets of fish in Cambodia. The young girl is sorting through the catch, but much of it will be churned into fertilizer and fish feed.

WorldFish Center Photo Library Collection

Women at this Vietnamese fish market sell a variety of fish laid out on woven trays. The commodities sold include tuna and goatfish.

For the impoverished in the region, fish, snails, mollusks, and aquatic plants gathered from the wetlands are eaten as part of the daily diet or sold for subsistence income. In the flooded rice fields, 28 different kinds of fishing gear are used, and 39 species of fish are caught. Yields of fish, frogs, and shellfish can be as high as 100 000 tonnes, enough to meet the needs of over one million people, and a huge addition to the production from the Mekong River and Tonle Sap Lake.

As a result of the WorldFish agro-ecosystem study, fish sanctuaries were set up in pilot sites in Cambodia and Vietnam to rehabilitate and protect the aquatic resources as well as ensure food security through community management. The Mekong Delta experience was extended to other parts of the Mekong River Basin, initially in the Lao PDR. In all of these activities, capacity building of partner institutions has been an important goal.

As wetlands and wetland resources are vital to the people and the development of the Mekong River Basin, the WorldFish Center embarked on a wetlands approach in collaboration with the Mekong River Commission's Wetlands Program, Asian Institute of Technology Aqua Outreach, International Union for the Conservation of Nature (IUCN), Mekong Wetlands Biodiversity, ADB/Greater Mekong Sub-Region, along with Swedish collaborators.

Recognizing the intricate interrelationship between people and the environment, the regional project addressed the national legal and institutional framework for wetlands and strengthened local capacity to manage them. As a direct consequence of regional awareness of the significance of wetlands among decision-makers at the local, provincial, and national levels of Cambodia, the Lao PDR, Thailand and Vietnam, new policies for wetlands are being framed nationally.

Fragile wetlands may be the first ecosystems affected by changes in water flows but they will not be the only fish production systems to change. For example, the Tonle Sap Lake and its fisheries have been the mainstay of more than a million desperately poor people in Cambodia. Upstream the Mekong River, ambitious plans are underway to transform the ecosystem by damming the Mekong River and its tributaries. When this happens, no one can exactly predict what will happen downstream. But the annual floods and the regular rise and fall of the Tonle Sap Lake will certainly be affected, threatening its finely tuned environment and the very existence of the people harvesting its bounty.

WorldFish has worked with river basin managers to develop a user friendly model of the Mekong fish production, linking hydrological and flood plains parameters. This is called the BayFish Model, which was fully functional in 2002. It includes three Mekong catchment sub-sections, namely the upper catchment, Tonle Sap Lake, and the Mekong Delta. The model allows for the prediction, in relative terms, of fish production depending on the interactions between the flood level and its duration, and several other hydro-environmental parameters. The model indicates that certain species of fish migrate in and out of the river to flood plains and inundated forests during certain stages of their lifecycle. It reinforces the fact that the management of the Mekong River should extend to its flood plains, flooded forests and other associated habitats.

P. Thompson

A Cambodian using his cast net in the fisheries habitat of Tonle Sap. There are over one million such subsistence fishers living around the Great Lake.

The Law of Supply and Demand: Integration of Fish into the Global Food Model

The WorldFish Center, jointly with the International Food Policy Research Institute (IFPRI), and in cooperation with FAO and others, has integrated fish in a global food model called IMPACT (Integration of Fish into Global Food Model and Improvement of the Analysis of Fish Supply and Demand in Developing Countries). Preliminary projections of the production, consumption, and trade to 2020 for eight aggregate categories of fish for 15 geographic regions of the world have been made and the first full report of the model will be released in 2003.

WorldFish has developed the "Asian Fish Sector Model" and improved the methodology for disaggregated analysis of fish supply and demand in developing countries. Understanding the nature of fish supply and demand by species group and socio-economic classes has been an important achievement of the WorldFish Center. Starting in 2002, a regional collaborative effort of the WorldFish Center and partner institutions in nine major producing and consuming countries (i.e., Bangladesh, the PR China, India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand and Vietnam) are now using the Asian Fish Sector Model to assess fish supply and demand at the grassroots level in the nine countries. This is the first such attempt to model the fish supply and demand and determine the impacts on the poor in Asia, such as to forecast prices of fish and the effects they will have on indigent people.

3.5 Researchers working together through partnerships and networks

A unique feature of WorldFish is the way it undertakes its research and related activities in many countries and through multi-site projects and networks. From single country projects to multi-country initiatives, multi-site projects are the Center's norm by which it is possible to ensure cohesion, synergy, and comparative insights from among various national institutions and studies in a given country. WorldFish regional efforts have covered such topics as coastal resources management, co-management, coastal fisheries, tilapia and carp aquaculture production, and fish supply and demand.

Formal and informal networking has been one of the main modes of operation of WorldFish since the very beginning. Starting from 1977, linkages and relationships are continually explored with national, regional, and international organizations to create a global network of institutions to undertake cooperative research with the Center and to identify expertise that can be tapped to solve specific research problems. In 1996 the Center released a formal Partnership Policy to emphasize the importance of partnerships for better utilization of available resources (i.e., human, infrastructure, and financial), and quicker gains from strategic research. Since then, its linkages have increased in number, diversity, and strength. As mentioned in the introduction, in 2002 the Center worked with over 250 partners from 58 countries.

P. Thompson

Bangladeshi women assemble at this "Problem Census Workshop" - Methods for Consensus Building for Management of Common Property Resources - to learn ways to become more empowered.

Research and dissemination partners at the national level are particularly critical to the work of WorldFish. The Center recognizes the need for strong national research systems. As a result, it has been undertaking research and carrying out related activities such as workshops, conferences, training programs, joint publications, etc., in partnership with the national partners. Most of these activities are made possible by matching complementary skills of different agencies including government and non-government organizations, advanced scientific institutions, regional and international organizations, individual scientists, farmers, fishers, and the private sector.

Formal Networks and Associations Established

WorldFish has addressed major technical and socio-economic constraints to production through cooperative research networks comprising institutes in developing and developed countries. It has always sought the constructive participation of experts to help achieve its objectives. Described below are just a few formal networks and associations that have resulted from pursuing inter-disciplinary approaches.

Asian Fisheries Social Science Research Network

WorldFish has helped build the capacity in social science research among countries in Asia through the Asian Fisheries Social Science Research Network that it set up and sustained. Many of the scientists educated by and developed through the Network have become influential national and international leaders and partners in implementing research programs. Formed in April 1983, this Network has increased regional capacity to address the social, economic, and policy issues impacting fisheries in Asia. This Network essentially evolved from a capacity building network to a research partnership network, being the key collaboration forum for the global fisheries co-management project described in 3.4.

International Network on Genetics in Aquaculture

Another success story is the International Network on Genetics in Aquaculture (INGA) established in 1993 by WorldFish that now comprises members and observers from 21 countries and two regional and international organizations. The network was set up to spread the methodology and results of the GIFT Project's research and to encourage national institutions in member countries to commence and strengthen genetic research for their own aquaculture systems. The Network supports the exchange of information, methodologies, germplasm, acquisition of fingerlings for propagation, and training programs for capacity building. WorldFish runs the Secretariat for INGA.

The impact of the Network is evident from the progress in developing research projects and in disseminating improved breeds of fish in the member countries. For example, during 1999 the WorldFish Center's Regional Research Center for Africa and West Asia in Abbassa, Egypt, implemented the first phase of the INGA Project on the documentation and characterization of tilapia genetic resources for aquaculture in Africa. This included the establishment of four base populations of Nile tilapia from various sites in Egypt and initial screening for cold tolerance. They were evaluated for productivity in rice/fish, cage and pond cultures in the cold season.

An important part of INGA's work has been the promulgation of fish genetic resources policy statements, informed by the best available scientific advice, to guide national efforts. The key statements to date have been the 1997 Manila Resolution and the 2002 Nairobi Declaration.

The 1997 Manila Resolution resulted from INGA organizing a meeting of the Senior Planners/ Administrators from member-countries in February 1997 in Manila, Philippines. This meeting was jointly hosted by the Philippines Bureau of Fisheries and Aquatic Resources (BFAR) and WorldFish. The participants discussed the widening gap between the supply and demand for fish, declining catches from natural resources, the major role aquaculture has to play in meeting the future needs of increasing populations, importance of genetics in sustaining aquaculture production, gains made in improving productivity through selective breeding and the urgent need for conserving and utilizing the fish genetic resources. At the end of the meeting, the participants agreed on the need for concerted international efforts for advancing the science of fish breeding and genetics through networking. The resulting agreement is called the Manila Resolution.

Germplasm enhancement to develop better fish breeds is one of the priority areas of research for WorldFish and its partner institutions. Africa is the world's largest repository of diverse freshwater fish fauna and the only home to native tilapias. With the increasing interest in promoting aquaculture and genetic enhancement of tilapias, the possibility exists for improved strains. These can result from genetic improvement research. Yet the exotic species introduced for aquaculture escape into natural waters and adversely impact the native populations and biodiversity. Hence, while there is an urgent need to enhance fish production by developing improved fish breeds, it is also imperative that valuable native genetic resources and biodiversity are conserved and protected.

The 2002 Nairobi Declaration was one of the outcomes of an "Expert Consultation on Biosafety and Environmental Impact of Genetic Enhancement and Introduction of Improved Tilapia Strains/Alien Species in Africa", was convened in Nairobi, Kenya, during February 2002 under the sponsorship of the WorldFish Center, CTA, FAO, IUCN - The World Conservation Union, UNEP, and the Convention on Biological Diversity, to discuss and develop guidelines that will foster the development of aquaculture, as well as maintain biodiversity.

The meeting that was attended by aquaculturists, geneticists and conservation specialists from Africa and international organizations, resulted in a formal statement called the Nairobi Declaration: Conservation of Aquatic Biodiversity and Use of Genetically Improved and Alien Species for Aquaculture in Africa.

Network of Tropical Aquaculture and Fisheries Professionals

The Network of Tropical Aquaculture and Fisheries Professionals (NTAFP) was set up in April 1982 by WorldFish as two networks, one on aquaculture and one on fisheries. These later merged. The objective of the Network is to identify fisheries scientists and other experts working on tropical fisheries and aquaculture problems in tropical countries. Formerly working in relative isolation, the Network enables them to contact fellow experts with mutual interests. Membership in the Network has been on a personal basis. The principal vehicles for communication include a periodic newsletter that has now become included in the quarterly magazine, *NAGA*, and the ubiquitous Internet. In this way scientists exchange information notes, news, and views on tropical fish stock assessment and management. Some of the members have received assistance in data analysis, including periods spent at the WorldFish Center's headquarters.

8.6 Knowing what we know: information systems and databases

Less developed countries are distinguished from the more developed ones not only by overall levels of income and industrialization, but also by wide gaps in information and knowledge of natural resources. Recognizing this, one of the WorldFish Center's major thrusts was to maximize the benefits of knowledge and research through making knowledge accessible and disseminating it in as many ways as possible - from the traditional written form to the latest electronic innovations. The Center's electronic knowledge databases (i.e., FishBase, ReefBase) gain higher and higher hit rates on the Internet and count as among the major achievements of WorldFish. These databases help bridge the "digital divide" as measured by the greater, albeit more modest, gains made in the usage by developing countries.

Development of Global Decision-making System (FishBase)

FishBase has detailed information on almost all of the known world fish species (27 000+ species representing 96% of the known species) and receives a rapidly growing number of hits - currently approximately 8 million hits per month and 200 000 user sessions, which include 2 000 individuals who visit the site more than 10 times in the same month. In 2002 it had over 22 million Internet hits and over 1.2 million user sessions. It is an invaluable guide that serves as an independent tool for conservation and management of fish.

FishBase had its origin in the "ICLARM Software Project" begun in 1988. FAO was a partner from the start. FishBase began as one of the Center's major initiatives in 1990. In 1994, the first in-house production of the complete FishBase on CD-ROM was available. In 1995, one thousand copies of "FishBase 1.2" were widely distributed and helped to broaden the number of collaborators. From 1998, the FishBase data have been searchable on the Internet at www.fishbase.org. Since 2001, WorldFish has produced FishBase with a consortium of partners including FAO, universities, and museums in Europe and Canada.

Access to information in FishBase is through searches of either the scientific or common name, which is done by approximately 66% of on-line users. Common names are in 97 world languages including names written in Arabic, Chinese and Greek characters.

FishBase can generate customized reports through database queries or public information exchange through its "Fish Forum" and "Guest Book". FishBase has grown into the premier internationally recognized single most authoritative source of scientific information on all the world's fish. It makes available in a multi-language and multi-media framework the essential information required for conservation (including biodiversity), management, and increased production. The database also provides user-friendly analytical tools and a networking mechanism to connect scientists and managers worldwide. FishBase uses state-of-the-art programming techniques, to generate web-based dynamic links to other Internet sources of information and in packaging the information in thematic, ecosystem, and country formats. Certain information in FishBase has been consolidated from fish reference collections that represent over 250 years of fish taxonomic collections. By putting these collections on-line, users have immediate access to occurrence (geo-referenced) data in one site and can associate them with their own country or region. FishBase has a number of tools that can be used to monitor fisheries and identify whether patterns of fishing are sustainable.

WorldFish Center Photo Library Collection

This Vietnamese fish market sells a variety of fish laid out on woven trays. The commodities sold include tuna, goatfish and mullet (on the right).

ReefBase - A Global Information System on Coral Reefs

Increasing populations, coastal development, and increasing international demand for live fish have led to over-exploitation and destructive fishing in some countries of Southeast Asia and the South Pacific. Managing fragile coral reefs for multiple uses is becoming a great challenge. Tools such as ReefBase, an on-line information system on coral reefs launched by WorldFish in CD-ROM format in 1996 and on-line in April 2002 (www.ReefBase.org), provide reef managers, scientists, divers, students, and the general public with instant, online information on the world's reefs. ReefBase is designed to provide relevant data and information to reef managers and scientists as well as the general public in order to promote better management and conservation. It contains data, summary reports, graphs, charts, GIS data and maps, on-line documents, on most topics relevant to reef conservation and management. For example, through partnerships with UNEP and coral reef management agencies around the world, as well as the National Aeronautics and Space Agency of the USA, ReefBase contains the most comprehensive information on coral bleaching events and severity anywhere in the world.

It is the official database for the Global Coral Reef Monitoring Network (GCRMN), with summaries on the status of the world's reefs, reports from 92 countries, 13 000 references, and 2 500 images of 10 000 coral reefs. ReefBase provides a listing of coral reefs and their distribution with descriptions for most of the reefs. It includes ecological surveys on benthic and reef fish communities, existing stresses on the reefs, and much more. ReefBase has compiled information on the political, socio-economic, and cultural variables related to reef use.

ReefBase also includes data on the magnitude and distribution of various benefits of coral reefs, paying particular attention to environmental impacts, social indicators, and economic values, associated with the sustainable management of coral reefs. It also includes "Reefs at Risk" that specifies national risk indicators such as coastal development, pollution, over-exploitation and upstream land use.

A revised ReefBase website was launched in April 2002. By December 2002, it was receiving over 700 000 hits per month from over 24 000 visitor sessions. The new GIS facility, which enables a user to create maps of coral reef areas and overlay key management and threat information, has proved to be very popular. ReefBase is now assisting countries to develop similar national information systems. For example, in 2002, WorldFish assisted the COREMAP project in Indonesia with the development of a web-based GIS for its Coral Reef Information and Training Center.

WorldFish has linked global climate change science with global coral reef monitoring and mapping through ReefBase. The climate change issues related to ocean temperature, projections of sea level rise, and carbon sinks and sources are related to the synoptic information accumulating in ReefBase.

8.7 Getting the message across through information dissemination

Success Story, A Wealth of Information via the Library and Information Services

A premier library on fish science and development caters to the WorldFish Center's scientists and the public (particularly developing country scientists). The demand and potential demand for library services is enormous. The library, named after former Director General Dr Ian R Smith, is currently in the process of becoming an e-library. Current holdings include more than 15 000 books, 1 300 serials and 50 journals. WorldFish is one of the two paramount fisheries libraries for developing countries (along with the FAO Headquarters Fisheries Library in Rome). The Center's library is also part of a greater network of international research libraries of the CGIAR Centers. These 16 libraries share electronic subscriptions to scientific journals from the major publishing houses.

As an integral part of its role, the WorldFish Center's library operates a much sought-after information service to address the continuing need for information in a usable form for developing countries. It disseminates research findings of the Center and its cooperating institutions through special technical series and other publications. These activities were implemented at the very beginning and have grown from strength to strength to the present day. The Center's library supports information needs in advance of research and during development planning. It is, of course, tapped during the implementation of programs and projects, as well as during post-project evaluations.

NAGA - Always Newsworthy

NAGA - WorldFish Quarterly (originally called the ICLARM Newsletter) was launched in July 1978 and now enjoys a wide distribution (i.e., 6 500 subscribers). Quarterly issues are sent to relevant libraries, institutions, and scientists. NAGA provides access to scientific fisheries information to developing country scientists at no charge.

The main purpose of the newsletter is to disseminate information generated by the researchers and specialists on developing countries' living aquatic resources. It also serves as a unique tool that assists developing country scientists to publish their own research results. To facilitate this, the Center provides free advice and assistance in writing up their results according to international scientific publishing standards. The annual NAGA Award is given to an outstanding author for a significant article or book.

Other WorldFish Center Publications, CDs and Websites

The Center's publications document scientific information and make it available to a large and growing number of fisheries scientists and managers. On an annual basis the Center produces numerous scientific publications and technical reports, as well as several corporate publications (between 300 - 3 000 for each distribution).

The corporate website makes the WorldFish Center's research work, databases, publications, and library resources available on the Internet. Its timeliness makes it a more valuable tool for fisheries managers, scientists, and fish farmers.

Fish for All Inititative

The WorldFish Center launched the *Fish for All* initiative in November 2002. This is a global initiative aimed to ensure that policies and fish resource management worldwide are in the best interests of developing as well as developed countries, now and in the future. If senior policy-makers and opinion leaders actively participate at all levels of the community, the current challenges of fish for food, livelihoods and the environment can be addressed. The launch of the initiative brought to global attention the deplorable state of aquatic resources, the urgent need to address issues at hand for the sustainable management and development of these resources and to sustain the livelihoods of those who depend on them. It created a new focus for the World Summit for Sustainable Development agenda on fish.

Over a 10-year period (2003-2013), *Fish for All* aims to achieve an informed public dialog on urgent issues through the following means: by establishing a high profile steering committee of the highest level policy-makers from various parts of the world; by organizing events such as policy-science-stakeholder workshops and conferences and dialogs; and by disseminating information through studies, policy analyses, opinion pieces, newsletters, and a website on critical issues and solutions.

4. Overall review – looking forward to the next 25 years

As the WorldFish Center celebrated its 25th Anniversary in 2002, it reflected on its past achievements and the changes in the global outlook for the management of living aquatic resources. The Center has taken stock of its past accomplishments and looks forward to future initiatives.

The past 25 years have been a period of considerable progress for WorldFish. The goals of research for increasing incomes and employment opportunities, as well as improving nutrition of the poor through prudent resource use have been followed rigorously. The social and economic aspects of fishery development have been explored along with biological elements. Training opportunities and education have played significant roles in the Center's approach. Organizations that are responsive to the needs of a changing world must be dynamic entities themselves, and WorldFish has clearly demonstrated the importance of its flexibility, scientific versatility, and independence throughout a quarter of a century.

WorldFish passed through a conceptual phase (1973-74), an exploratory phase (1975-76), an establishment phase (1977-79), and various implementation cycles (1980 to the present). It is a unique and adaptable fish research center that is autonomous, international and non-governmental in nature, with an administrative and technical infrastructure, as well as a firmly established program of work. Similar to any other organization, the Center has undergone a process of evolution that required clear perspectives and focused orientation at each stage. These have culminated in its present policies and programs as described in this report.

Owing to the Center's track record, as well as recognized and credible performance, the WorldFish Center expects to serve developing countries for a long time to come. The Center has developed viable agreements with governments, international bodies, and research institutions. Funding agencies have recognized the value of its mode of operation in strengthening the research capabilities of existing institutions, and noted the appropriate focus of its research programs over the years. In many ways its flexible operational policy, its non-governmental status, and its perceptive research orientation are rare among international fisheries agencies. Great efforts have been expended to accelerate research and serve as a catalyst to stimulate development.

But most of all, the WorldFish Center's research work is valued because of its relevance to the needs of the stakeholders. The focus in all programs has been on mission-oriented research in support of rural development, and on sustainable development to ensure the rational management of aquatic resources. Since the beginning, it has emphasized partnerships, teamwork, communication, efficiency in its program delivery, continuous growth in basic scientific knowledge, and thorough understanding of the aquatic resources.

The overriding emphasis in the years to come will be strengthening the commitment of WorldFish to use research as a tool to eradicate poverty, ensure food security, and conserve the environment. To do this, the Center intends to continuously align the direction of its programs, strengthen its internal organization and capacity, and foster mutually beneficial external partnerships and relationships.

One objective for the future is taking the Center's mission further geographically, maintaining the Asia-Pacific work, increasing the effort in Africa, and starting substantive work in Latin America. Greater attention will also be paid to understanding the dissemination pathways of the research results right through to their eventual adoption and impact. Another goal is to continue to raise awareness and greatly increase the resources available to the Center's mission, by diversifying the funding base and building on the successes of the new, stronger WorldFish Center image and the *Fish for All* Initiative.

In addition, the Center will continue to cultivate more diverse partnerships and the participatory approach necessary for imaginative research planning and expeditious delivery. The views of end users and stakeholders, such as farmers and fishers, and intermediate contacts including governmental and non-governmental officers, as well as other scientists, scientists, are recognized. WorldFish ascertains their requirements for research products, be it new technologies, management advice or information in a database.

Internally, the Center is also developing leaders at all levels. Senior and middle management leadership training will continue and expand in future.

WorldFish will also play an active role in the CGIAR's programs. In the new CGIAR Challenge Programs, starting with the Water and Food Challenge Program, the Center will be leading one of the five major themes and is developing a Coastal Zone Challenge Program as well. WorldFish will continue to play an active role in activities that aim to improve the overall CGIAR system governance and performance, as exemplified by the projects on Gender and Diversity, Human Resources, and the Internal Audit. The Center will also provide support to the system-wide activities on information (i.e., CGIAR's Information Office) and on the Millennium Assessment.

Above all else, the WorldFish Center's productive years ahead will be devoted to all those who use and depend on global aquatic resources.

E. Baran

Women play a key role in fisheries: Gender in fisheries should be fully recognized, as it is in Don Khong, the Lao PDR.

A Lasting Catch

Some Impacts on the People

A Lasting Catch, a separate book to celebrate the 25th anniversary of WorldFish, focuses on some of the people impacted by the WorldFish Center's research and development work. The grassroots stories compiled by Ebbe Schiøler show how the Center's work has really helped rural people. Some thumbnail sketches follow.

Where women are experts too

Could you feed and support four children if you owned only one-fifth of an acre of land? Sumitra Biswas and her husband, Gopal, do. In fact, using knowledge gained from a variety of courses on aquaculture, they are prospering. But, while they share their pond and farm work more or less equally, the "know how" which has transformed their small holding into a model of integrated agriculture and aquaculture is being channelled through Sumitra.

Sumitra has attended a number of courses run by WorldFish and its partners specifically for women in south-western Bangladesh. The knowledge she has gained and shared with her husband, and the techniques they have applied, have significantly improved the output of their small holding. In fact, with the help of her trainers, Sumitra has calculated that her family's annual income has more than doubled. Now this husband-and-wife team can do more than simply feed their children, they can afford to send them to High School!

Spreading the news

The best word to describe Nazmy Abdel Rahman Shafi is "dynamic". At 73 he runs, with his partner Mohammed Gouda, a successful fish farm in the Fayoum province of Egypt. Not only were these men the first to begin farming fish in this area, they were also the first to really grasp the benefits of efficient management.

As self-taught aquaculturists, they recognized the opportunity offered by the establishment of a new WorldFish Center office in Egypt in 1995. So they volunteered to take part in an experiment on fish farm management. They learned that you don't have to produce more fish to make more profit. You only have to be more efficient. By gaining a better understanding of how their ponds worked, they learned that they did not need to continuously fertilize their ponds or provide excess food. By providing just the right amount of everything and reducing wastage, they doubled their annual profits.

E. Schiøler

The modest offices of the Fayoum Fish Farming Association. Membership is growing fast, as people recognize the key role it plays in making modern pond management a success in this area.

Fish in the tea

When the rains fail in Malawi, life gets really tough. But in the Thylo district, Nikoloma has discovered integrated agriculture and aquaculture. This allows him to produce more, and to keep his crops green, even if the rains fail.

Back in 1986, on a two-week course run by the WorldFish Center and its partners, Nikoloma learned how to use agricultural waste to fertilize his ponds, and pond water to irrigate his crops. But, being a true visionary, he did not simply apply the techniques he learned—he actually improved upon them! Perhaps most impressively, Nikoloma realized that, by running water downhill through progressively narrower pipes, he could create enough pressure to run a sprinkler system. Now, water management on his farm is so efficient that, whilst producing fish, he is able to irrigate not only his own crops, but also those of his neighbors.

E. Schiøler

Near the edge of the pond, Nikoloma has built a small cage of branches. The grass cuttings and other weeds it contains will fertilize algae in the pond, thus helping to feed the fish. In addition, they are a great place for fish fry to hide and grow.

E. Schiøler

Because fish farms have a readily available water supply, fields like this can be kept green even in the dry season. To local fish farmers, this can mean the difference between food security and starvation.

E. Schiøler

No wonder Pham Van Ung and Ta Thi Tram are smiling!

On her own feet

Jessie Kaunde is proud to be one of the small, but growing, number of women who farm fish on their own. She recognized fish farming as an opportunity to provide herself with a better future back in 1999, when she heard a radio program describing the technique. But what has made Jessie so successful is that she really took to heart the idea of integrated farm management. So, as well as growing crops and fish, she also raises more than 500 chickens and ducks at a time, and uses their droppings to fertilize her ponds. Having sought expert advice from the WorldFish Center, Jessie is now digging more ponds and improving the design of the first one she built. After all, as she said herself, "fish in the pond are like money in the bank".

A growing success

The early years of Pham Van Ung's marriage to Ta Thi Tram weren't easy. Born and raised in Tam Hiep Village, to the west of Hanoi (Vietnam's capital), they and their four children struggled to survive as subsistence level farmers. But help was on the way – from Africa!

In a bid to increase their income, they took up fish farming about ten years ago, which certainly helped. But things really began to improve for them in 1996, when they were given an improved strain of the African fish tilapia. The new fish, developed and distributed as part of an international effort led by the WorldFish Center, increased their income tenfold. Why? Because the farm, efficiently run by the newly trained couple, now produces 25 tonnes of fish a year, as well as extra baby fish (fingerlings) which can be sold to other farmers. No wonder they are smiling.

More than just a rice field

Would you risk a long journey just to see if there was a better way of farming? Tran Van Viet did. But then, he is a remarkable man. In 1997, when Vietnam began to redistribute state-owned land as part of the country's economic reforms, Viet acquired a total of 3.5 hectares of land and decided to travel to learn how best to make use of it.

When he returned, he dug canals around his fields, raised dikes, and began to farm fish in the same water as his rice. When the researchers responsible for these techniques learned of his endeavors, they visited Viet in order to offer him, and the other farmers in Dao village, their advice. Now, as well as providing a few home comforts, Viet's improved income has allowed him to send his children to school and buy new agricultural equipment – further improving the productivity of his farm.

E. Schiøler

Vietnamese farmer Tran Van Viet takes advantage of a quiet moment to reflect on the profitable new method he is using to grow rice and fish together.

A living gift

What do cutting-edge technologies and international breeding programs have to do with fish farming in rural Thailand? Quite a lot actually, as Preecha Nawatrilap and his son, Prachaya, will tell you if you visit their farm in Chachoengsao province. By stocking a hardy, fast-growing tilapia developed by the WorldFish Center and its associates as part of the Genetic Improvement of Farmed Tilapia project (GIFT), and by eagerly embracing the latest technologies and applying stringent quality control measures, Preecha has transformed the 4-acre holding he began with 25 years ago into a modern, 300-acre hatchery operation. Now the P. Chareon farm produces over 100 million fingerlings annually, and sells these high-quality baby fish to local fish farmers. So, not only has Preecha's dedication ensured the financial security of his own family, it has had an enormous, positive effect on the quality of fish farmed and sold throughout this part of Thailand.

E. Schiøler

This tilapia is just about the right size to be harvested. It will be sold, either for local use or export and at a very good price.

E. Schiøler

A salesperson carries baby fish (fingerlings) to sell to pond owners. He might come back and transport them to market in half a year's time, once they have grown to a marketable size.

Common sense

Like most of those living in Goakhola village in Bangladesh, Basonti Audhikary has benefited greatly from the village's new policy of cooperative management of its water resources. Traditionally, when the rains created temporary lakes (called "beels"), villagers would catch as many fish as they could. As Bangladesh's population grew, such opportunism meant that these waters were quickly fished out.

WorldFish solved this when researchers and villagers decided that the fish needed somewhere safe to breed and grow. So Goakhola's management committee (on which Basonti sits) banned fishing in five local water-holes (or "kuas"). When the next rains came, they contained a good stock of well-grown fish which were washed into the "beel".

Basonti, who wisely invested in land and fishing rights in the middle of the "beel", prospered. So now, as well as land, she has a new toilet and well and, very soon, she will have a new concrete roof for her house.

E. Schiøler

This farmer is able to save money by feeding left-overs to his fish. The fish seem to consider yesterday's bread to be a delicacy, and rush over to grab the best bits.

They don't see it's ugly

It's mean in looks and personality – so why is Egyptian fish farmer Hamid Mohammad Abdel Semi keen to breed the native catfish in his ponds? Because, as well as being tasty and fetching a good market price, the Egyptian catfish is tough. It can survive in water with low oxygen levels, is far less sensitive to agricultural pollution than other fish and requires little extra feed. What stopped Hamid stocking catfish in the past was the cost of catfish fry. But now, research by the WorldFish Center has overturned the myth that catfish have to be bred in laboratories or caught in the wild, which pushed costs up. They taught Hamid that, by lowering the water level of his pond at the critical time, he could "trick" his catfish into breeding. With the potential to produce 900 fingerlings or more, Hamid looks forward to profiting greatly from raising his own stock of catfish.

Fish for All Initiative

Fish is a key ingredient on the global menu, a vital factor in the global environmental balance and an important basis for livelihoods worldwide. So let us place it where it belongs: high on the global agenda and integrated into thinking, action and policies by all nations. **Join forces to make *Fish for All* a global initiative.**

Fish *for* All Initiative

Sustainable practices dominate discussion as global "Fish for All" Initiative is launched

Many poor coastal, lake and river-based communities and even the urban poor are losing their access to fish as prices rise with increasing demand, delegates heard at the first-ever Fish for All Summit on 3 November 2002 in Penang, Malaysia.

Nearly 300 participants from over 40 countries – including fisheries specialists, development assistance experts, fishers organizations, civil society representatives, and several government fisheries ministers from Asia and Africa took part in the Summit.

With opening ceremonies highlighted by the remarks of Minister **Tan Sri Koh Tsu Koon**, Chief Minister of Penang, the conference affirmed that, given the many benefits of wholesome food, livelihoods and environments that are based on fish and other aquatic life, all people should embrace the vision of "*Fish for All* – forever".

The Summit served to launch a decade-long *Fish for All* initiative, coordinated by the WorldFish Center. Other interested agencies will develop and refine an action agenda to build on the outcomes of the Summit.

Major international interest was shown in a new analysis by the WorldFish Center and the International Food Policy Research Institute (IFPRI) warning that global fish production may not keep pace with population growth, a shortfall that could have disastrous consequences for more than 1 billion people in developing countries.

Speakers **Dr. Mahfuz Ahmed** of the WorldFish Center and **Dr. Chris Delgado** of IFPRI described the first major attempt to put fish into the world food models, concluding that, on average, fish will become more expensive as growth in demand outstrips most supplies.

Fish is a major player in the world food marketplace. The value of international annual trade in fish is now greater than that of sugar, tea, coffee and cocoa combined and an important factor in many developing country balances of payments. "The best way for the poor to benefit from fish production is to participate in the fish production chain, including small-scale aquaculture where new technologies could make a real difference," said Dr. Mahfuz.

In his keynote address, **Dr. Ian Johnson**, World Bank VP for Ecologically and Socially Sustainable Development and Chair of the CGIAR, said the *Fish for All* Summit "was the first meeting to take the World Summit on Sustainable Development (WSSD) seriously." He highlighted the Bank's own long-term forecasts to 2050 including a tripling of the GDP, the addition of another 2 billion people on earth, most in developing countries, soaring water demands and climate change.

All these will result in environmental, social and economic challenges for the supply of the world's fish needs – challenges that the world must prepare to meet now. The Johannesburg WSSD recognized this by agreeing on a plethora of key issues, such as a target to restore fish stocks to maximum sustainability by 2015, supporting small-scale aquaculture, stopping illegal fishing, protecting the marine environment from land-based degradation and bolstering the science and technology capacity to do all this.

Prof. M.S. Swaminathan, chair of the *Fish for All* Global Steering Committee, said that in the context of the initiative, the term "fish" means all living aquatic resources, or "aquatic-based food sources". Likewise, "*Fish for All*" is concerned with aquatic food sources whether in coastal, marine, freshwater or brackish waters.

"In all that we do, we should be mindful of whether our actions support the four pillars of sustainable fish production," he said, explaining that they should be pro-environment, pro-poor, pro-women and pro-livelihood opportunities (job-led).

C. Tan

Dr. Chris Delgado, Senior Research Fellow, International Food Policy Research Institute

C. Tan

Dr. Ian Johnson, Vice President, World Bank, and Chair of the CGIAR

C. Tan

Prof. M. S. Swaminathan, Chair of the M.S. Swaminathan Research Foundation, and Chair, Fish for All Global Steering Committee

Governments have produced a large number of treaties and conventions and coordination is needed among them, he said. Often these treaties and conventions are negotiated and managed by officials from ministries without direct experience and knowledge of fisheries (e.g. development assistance, agriculture, health, trade, etc.) and so their implications for fish are not directly included.

As well, the great importance of the media in getting messages across needs to be emphasized, he noted. The internet has also opened up many opportunities for fishers. In India, for example, at local knowledge centers, semi-literate women download information about sea conditions from NOAA satellites, and broadcast it through loudspeakers to the fishers preparing to put out to sea in their small craft.

Unfortunately, conflicts already abound over the use of natural resources such as fish, land and water, conflicts over access to fishing grounds, conflicts between fishers and environmentalists, and trade conflicts. Good mechanisms for conflict resolution will become increasingly important, Prof. Swaminathan said.

Food and livelihoods

Summarizing panel discussions on Food and Livelihoods, **Dr. Doris Capistrano** said fisheries provide significant employment in developing countries, but often fishers are marginalized, lack a voice and thus have little say in their futures. New perspectives on sustainable livelihoods are required to change this.

Fish and other living aquatic resources are frequently overlooked in environmental and development assessments, she added. The Intergovernmental Panel on Climate Change, for example, should address the impacts of different scenarios on fish. The Millennium Ecosystem Assessment should also ensure that the status of fish and other aquatic resources are well incorporated.

The Summit found that data available to assess access to fish were too aggregated to be useful for designing interventions (e.g. per capita consumption patterns were usually only available at the national level and gender, household, and local distinctions were seldom made).

Prof. Robert Kearney, Chair of the WorldFish Center Board of Directors, summarized panel discussions on the environment, saying coordination between international conventions is badly needed, as are implementation and compliance measures.

The sustainability of aquaculture is contentious, involving issues of scale and its interaction with the environment and other sectors such as agriculture.

To achieve *Fish for All* forever, education needs to be emphasized – both the generation of knowledge and its dissemination, he added. Creative solutions will have to make use of knowledge (the facts), research (to find more facts) and stories with good human interest to help disseminate the message. Identifying problems is key but efforts must go well beyond this to start finding solutions.

Centralize or decentralize resource management

Many Summit participants identified the critical issue of property rights in better fisheries management but caution was also expressed that great care and responsibility should be taken in assignment of rights. Empowering stronger groups could disenfranchise those for whom fishing rights were most critical and lead to much worse poverty, not less.

Panelist **Dr. Raymond Offenheiser**, President of Oxfam America, said the poor need to be clearly linked to the *Fish for All* initiative's goals despite problems of barriers and exclusion, and even of definitions of poverty.

When moving from fishing to aquaculture, little is understood about how the change affects access to local, small fish that are important in the peoples' diets, the conference heard. These small fish and other aquatic organisms can be lost altogether or even go to feeding aquaculture species.

Fish for All Initiative

C. Tan

Dr. Rebecca Goldburg, senior scientist, Environmental Defence Fund

C. Tan

Dr. Meryl Williams, Director General, WorldFish Center

Dr. Rebecca Goldburg, senior scientist with the Washington-based Environmental Defence Fund, said there are no economic incentives for fishers to conserve fish resources. She advocated the reduction of fisheries subsidies, marine protected areas, an end to illegal fishing, and individual fishing quotas. She said the rapid rise in aquaculture, which now supplies one-third of the fish consumed by humans, had caused wetlands destruction, the spread of non-native species and fish diseases, and water pollution.

Among other comments and observations aired at the Summit:

The initiative should stress the importance of communications, providing a depth of analysis and fostering understanding, outlining the background problems and educating people.

Many members of the public had a fundamental mistrust of science and technology and science often lacked credibility, particularly among the poor who ask: what is it for, how is it used?

The urgency of the problems faced demands much faster turnaround between the identification of the problem and the drafting of solutions. Peer to peer learning on the ground also has a major role in capacity building. Local knowledge has its limitations, however, and has to be supplemented by scientific approaches.

The importance and power of the fisheries sector

WorldFish Center Director General **Dr. Meryl J. Williams** said the Summit, the first, scene-setting event of the *Fish for All* initiative, introduced participants to some of the challenges faced in putting fish on the global, and indeed on some national, agendas.

The WorldFish Center will develop *Fish for All* plans and actions with collaborators from the scientific world and more broadly among stakeholder groups, she said. A 10-year investment is envisioned.

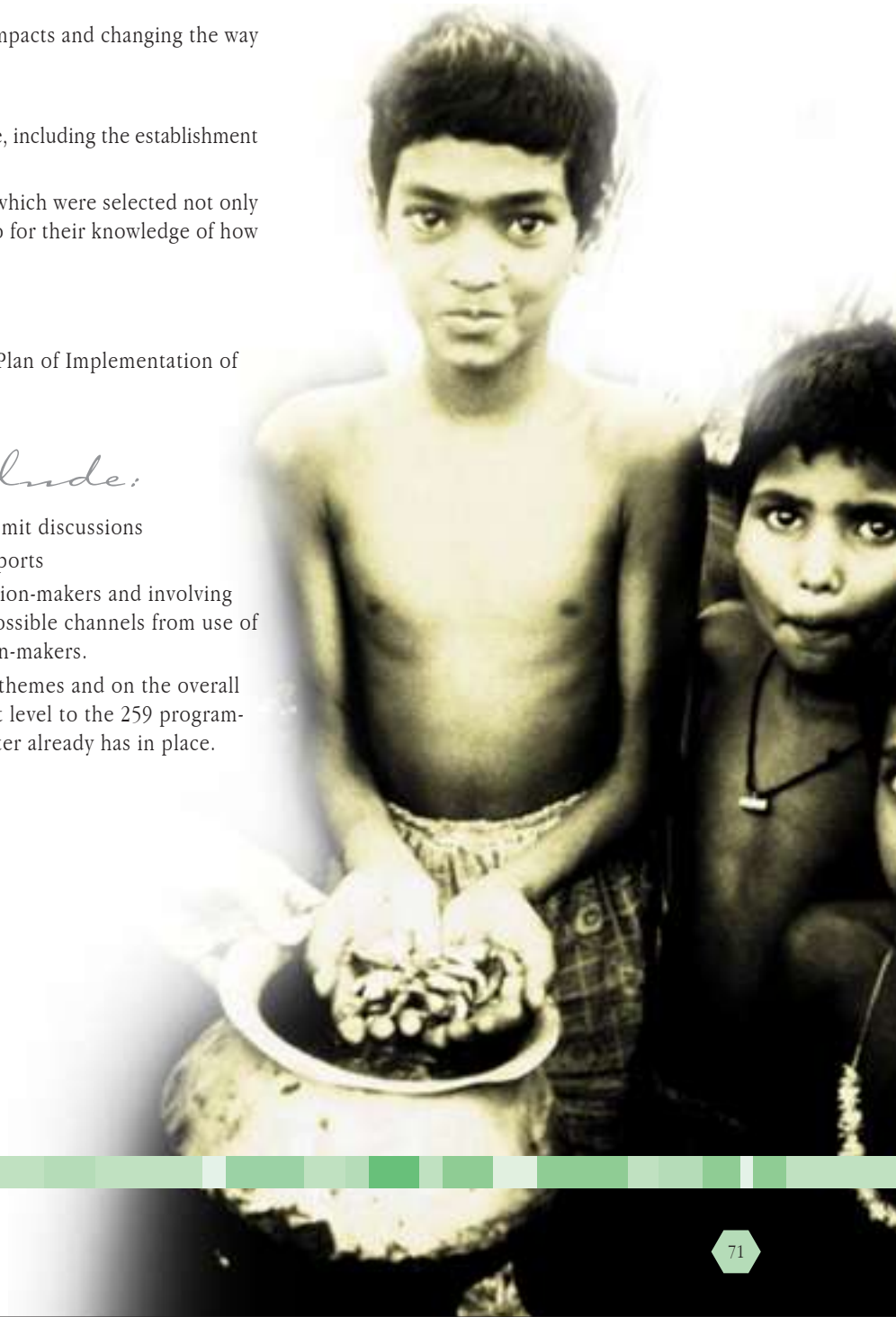
"We are adamant that *Fish for All* is about having impacts and changing the way business is done," she said.

She noted several of the concrete steps taken to date, including the establishment of:

- A Global Steering Committee, the members of which were selected not only for their experience and achievements, but also for their knowledge of how to influence opinion and get things done
- Website and e-forum
- *Fish for All* background concept paper
- A guide to the Fish-Related Paragraphs of the Plan of Implementation of the WSSD

Next steps include:

- Identification of priority themes from the Summit discussions
- Promote the outcomes and finalize Summit reports
- Explore new ways of reaching policy and decision-makers and involving stakeholders on the themes, considering all possible channels from use of the internet to targeted meetings with decision-makers.
- Form high-level strategic alliances on priority themes and on the overall initiative. These alliances will be on a different level to the 259 program-based formal partnerships that WorldFish Center already has in place.



Key Research Outcomes

Our programs provide the means for the WorldFish Center to meet our stated goals of:

- Improved equity of benefits from fisheries catches and aquaculture production
- Improved livelihoods of fishing and fish farming households
- Improved access to fish at affordable prices for consumers
- Reduced impact of fishing
- Protection of the aquatic environment.

Research at the WorldFish Center for 2002 was conducted using, as the contextual framework, the Medium Term Plan 2002-2004 and its accompanying Operational Plan 2002. Research and training activities were conducted in five programs, and through a total of 14 thrusts. Work was done at our headquarters in Malaysia, at our Abassa regional site in Egypt, and in collaboration with our partners at outreach sites in eight other countries. The year 2002 represents the first full year that the Center has been operational at its new headquarters in Batu Maung, Penang, Malaysia.

This chapter provides, by Program, a succinct summary of key outcomes in research and research support during 2002.

Biodiversity and Genetics Resources Research Program

The Biodiversity and Genetic Resources Research Program (BGRRP) plans and implements research on aquatic biodiversity and genetic enhancement, ensuring that the benefits of the work reach the poor in the developing world, and that this is done in a sustainable manner. To achieve this, the program has three main thrusts: (1) conservation of aquatic biological diversity; (2) genetic improvement and breeding; and (3) mitigation against adverse impacts of alien species on aquatic biological diversity.

Program Achievements

- FishBase continued to be the most frequently accessed website in fisheries and among the websites hosted by a CGIAR center, receiving up to 4 million internet hits per month through over 550 000 users globally. Towards the end of 2002, FishBase contained key management information (trophic ecology, population dynamics, nomenclature, morphology, physiology, images, maps, graphs, etc.) for over 27 000 species of finfish (including over 135 750 common names in over 413 languages, 33 100 images and pictures). FishBase has promoted distance learning activities by developing an online (internet-based) ichthyology course "Fish Online" for upgrading skills of fishery biologists; the interactive "Fish Forum" to provide international users seeking information and experts in several fields and a "Down-Loads" module that provides ready-to-run training materials for seminars and workshops.

- In the context of a new research program developed with Malaysian partners, several batches of GIFT tilapia were received from the GIFT Foundation in the Philippines and successfully adapted to the collaborative site at Jitra Research Station, Malaysia. Their first progeny were produced during January and February 2002. The parents of the next generation were selected on the basis of estimated breeding values.

- The process of transferring of GIFT technology to Africa progressed substantially. Domesticated and wild populations of Nile tilapia (*Oreochromis niloticus*) in Côte d'Ivoire, Egypt and Ghana, and of *O. shiranus* in Malawi, were collected within these countries and used as a first step in the establishment of base populations for national selective breeding programs. Fish in these base populations are currently being tested for growth and survival rate in intensive and non-intensive production systems.

- At Abbassa, Egypt, mass selection for increased growth rate in Nile tilapia and blue tilapia (*O. aureus*) is progressing as scheduled. The fourth generation of mass-selected fish in both species is currently under on-station pond evaluation. Identification of farmers to conduct a field evaluation study in summer 2003 is underway. Family-within-family selection for increased growth rate under prevailing commercial aquaculture conditions is ongoing.

- Parallel to the above, another line is being selected under low input conditions in collaboration with Wageningen University, The Netherlands. Blood samples have been sent to Wageningen to identify characteristic molecular markers to be used in evaluating progress of the selectively bred strain.

- The field data collection phase of a joint project between the Africa and West Asia Regional Research Center, Abbassa, Egypt, and Auburn University, USA, was completed in 2002 with two environmental challenge tests with tilapia, one for low dissolved oxygen, and the other for high ammonia. Analysis of blood samples for molecular markers is in progress to determine whether the variations present have a strong genetic component, which could be traced via markers.

- A major effort was made in the area of capacity building of staff in partner countries. Two training courses (one in Abbassa, Egypt, and another one in Bangkok, Thailand) were run in the areas of quantitative genetics and its application to the genetic improvement of fish, conducting genetic improvement programs, considering population size in genetic improvement, and estimating genetic parameters and breeding values in fish. A total of about 35 persons from Africa, Asia and the Pacific attended.

- A user-friendly model of the Mekong fish production in relation to hydrological and floodplains parameters was fully developed in 2002. It includes three sub-sections: upper catchment, Tonle Sap Great Lake and the Mekong Delta. The BayFish model is based on Bayesian networks and allows the prediction, in relative terms, of fish production depending upon the interactions between flood level, flood duration, flooded vegetation and six other hydro-environmental parameters.

- Priority areas for the conservation of three West African lagoon tilapia species have been determined, based on the identification of distinct population genetic units over their entire distribution range. The profitability of pen culture of potentially cultivable *Sarotherodon melanotheron* and its' acceptance by the local community was demonstrated. In both *S.melanotheron* and *O.niloticus*, distinct differences in growth were observed between populations that are genetically different and these populations could be used in developing aquaculture programs.

Coastal and Marine Resources Research Program

The Coastal and Marine Resources Research Program (CMRRP) strives to equip developing countries with the means to increase the productivity of inshore fisheries resources on a sustainable basis. The Program has developed three major thrusts for this purpose aimed at: (1) increasing and sustaining coastal fisheries production; (2) restoring and protecting coastal habitats; and (3) improving information for decision-making.

Program Achievements

- The FiSAT package (software, user's guide and reference manual) and support was provided to scientists in Asia and Africa in 2002. Such assistance has led to contributions by developing country scientists to the FishByte section of *NAGA*. FiSAT is widely used for length-based stock assessments. Continuing technical support to users of the software is a primary activity of the program.

- The application of the EwE modeling approach (Ecopath with Ecosim) to construct trophic models for coastal fisheries systems in South and Southeast Asia continued in 2002. Since the release of the current version of EwE, the emphasis in the project has been on user support and project development for site applications. A total of eight Ecopath models have been validated and documentation of the models is included in the technical publications of the TrawlBase Project.

- A Resource and Social Assessment (RSA) Project in Honda Bay and Puerto Princesa Bay, Palawan, Philippines, was concluded with the final project reports and databases submitted to the Philippines Bureau of Fisheries and Aquatic Resources in June 2002. The project was initiated in February 2000, and the accomplishments were presented in a multi-sectoral workshop conducted during 2-6 April 2001 in Puerto Princesa, Palawan.

- The first phase of an eight-country project to provide a comprehensive biological and socio-economic assessment of the coastal fisheries of Asia drew to a conclusion in 2002. The project showed the severe extent of overfishing in all coastal fisheries and the impacts on national economics. All countries have developed policy and management options to act on the results of the studies. WorldFish will be working closely with the countries in the implementation of the options. A second phase of this project is proposed. The objectives are: (1) to assist selected developing Asian countries enhance information, assessments, capabilities and action programs for sustainable use of their coastal fishery resources; and (2) to strengthen regional collaboration in coastal fisheries assessment and management.

- A PISCES project inception and coordination meeting for assessing genetic variations in a wider range of coral reef species from the South China Sea and the Gulf of Thailand was held at the Research Institute for Aquaculture in Nha Trang, Vietnam. Participants from six countries discussed the research design and identified the fish species *Caesio cuning* and the invertebrate *Holothuria scabra* as commercial species to be investigated in the first instance. Partners also described on-going research programs to which the results from the project may provide added value. Sampling trips and the development of microsatellite markers for these new species have now been initiated. Arrangements are still being made to obtain samples from the Spratley Islands. The genetics laboratory of the WorldFish Center headquarters, where much of the analysis will be done, is now set-up to analyze microsatellite DNA and to accommodate participants for workshops and training.

- A workshop on "Population Genetics in Fisheries Management" was held during 8-18 October 2002. The workshop covered the current use of molecular markers for fisheries management in the region, the existing expertise, the locations of research programs in the participating institutions, the theoretical and practical aspects of population genetics studies as they apply to capture fisheries management, broodstock development for aquaculture and restocking programs, and biodiversity conservation. The activity was attended by 28 participants from the PISCES partner institutions and other organizations.

- The establishment of a marine conservation area (MCA) of 83 km^2 on Arnavon Island, Solomon Islands, has resulted in increases in abundances, or prevented further declines of *Trochus niloticus* and some species of holothurians. The reserve had no early effect on the amount of other holothurians or on the giant clam, *Tridacna maxima,* whereas abundances of the non-exploited top-shell, *Tectus pyramis*, decreased in the MCA. There was a significant increase in the size of *T. niloticus* within the reserve, and no evidence of juvenile recruitment, which is attributed to the fact that the juvenile habitat is not represented in the shallow subtidal waters where the survey was conducted. The study demonstrates clearly that closure to fishing over long timeframes is likely to be needed to restore populations of many tropical marine invertebrates to pre-exploitation levels.

- Work in the Caribbean on spiny lobster (*Panulirus argus*) showed that post-larvae settled throughout most of the year and proved to be amenable to rearing on a diet of dwarf herring (*Jensinsia lamprotaenia*) and beach clams (*Donax* sp.), both of which are unutilized and locally abundant. The smallest lobsters grew best on a diet of fish and clams, while the larger lobsters grew well on fish alone. Data suggest that the target marketable size of 250g would be attained in 15 months from settlement. Proposals were submitted to various agencies for funding to undertake large-scale collection and grow-out trials.

- Monitoring of reef fish stocks in the Discovery Bay Fishery Reserve in Jamaica was continued until December 2001 and several papers relating to the status of the Discovery Bay reserve and local fish stocks were prepared for publication.

- Funds were obtained to undertake a survey of the status of fish spawning aggregation sites in the north-eastern Caribbean during January-February 2003 and the necessary preparatory arrangements were completed.

- Work in 2002 on the restocking of giant clams continued to be affected by the permanent closure of the Center's Coastal Aquaculture Centre on Guadalcanal, Solomon Islands, in 1999 due to a local insurgency. As a result, the project has continued to focus on: (1) maintaining the numerous cohorts of cultured giant clams at the Nusa Tupe field-station in the Western Province for future broodstock; and (2) construction of a small-scale hatchery to assist other Pacific island countries with restocking programs. Most of the larger hatchery-reared *T. gigas* have been translocated to the reef margin in the marine reserve at the field station to reduce the density of giant clams in the net exclosures which have improved conditions for growth and survival. More than 650 F1 broodstock, representing six species, are currently being held. Of these, all the males are mature, however, only 40-45% of the female *T. gigas* and *T. derasa* are ready to use for spawning.

- In the Black Pearl Farming project in the Western Pacific, a third crop of pearls was harvested and a fourth pearl seeding took place in the Solomon Islands during April 2002. The pearls from the second and third crops are being prepared for an auction at the Center's headquarters in Penang in 2004 to promote opportunities for pearl farming in the developing countries of the Pacific. Maintaining the demonstration farm as a showcase and incentive to potential investors is seen as particularly important in view of the great economic difficulties being experienced by the Solomon Islands. Regular monthly harvests of spat to supply the demonstration farm continued during 2002.

- The project on "Development of New Artisanal Fisheries Based on the Capture and Culture of Postlarval Coral Reef Fish" completed its fourth year. A total of 92 693 fish from 50 families and about 215 species were collected in light traps (ignoring small larvae and schooling, pelagic species such as sprats). Of these, 72% were apogonids, 16% were pomacentrids and 6% were gobies. From crest nets, 147 665 fish from at least 81 families and about 390 species were recorded. Crest net catches were dominated by labrids (27%), gobies (22%), apogonids (11%), and leptocephalus eel larvae (9%). In addition, crest nets captured 2 858 cleaner shrimp and 262 lobster pueruli. Multivariate analysis indicated that the species compositions of catches from the two methods were very different. No strong seasonality was observed in the catches. The exception was spiny lobsters which were more abundant between June and September in 2001 - 2002. Ornamental species made up approximately 15% and 5% of the light trap and crest net catches**,** respectively. Forty-six species of fish, together with the spiny lobsters and shrimp grown-out in land-based raceways, survived for extended periods and were sent to an aquarium exporter for appraisal or released into the Nusa Tupe marine reserve. Economic analysis shows that an artisanal fishery, based on the capture and culture of postlarvae for the aquarium trade, is feasible. Indeed, it could be based almost solely on crustaceans (shrimp and spiny lobsters) complemented by high-value finfish species.

- In Vietnam, the program's focus continues to be on practical approaches to large-scale rearing and release of tropical sea cucumbers. Adults can be induced to spawn throughout the year and larvae reared though metamorphosis to the juvenile phase using simple hatchery methods (large indoor tanks, partial water changes, outdoor batch-cultured phytoplankton). However, on transfer outdoors into the first nursery (bare) tanks, survival has been variable. At the second nursery stage (in tanks with sand) survival has been good. Eight pens (46 m) have been built in the Hon Mun Marine Protected Area (Nha Trang Bay), in collaboration with the Marine Protected Areas Management Project, for local farmers to study the survival and growth of juveniles of different sizes from 2g to 30g. A pilot-scale commercial pen (1600 m) has been built in an MPA set up by the International Marinelife Alliance and stocked with animals averaging 100g to provide an alternative source of income for fishers.

- In New Caledonia, the project on the development of optimal release strategies for restocking the tropical sea cucumber, sandfish (*Holothuria scabra*) has made steady progress. In 2002, a new hatchery was completed with the assistance of the Provinces and ACIAR. By the end of the year, two batches of larvae had been produced, resulting in ~100 000 settled juveniles ready for on-growing for field experiments in 2003.

- The completely revised ReefBase website was launched in April 2002. By November, it received over 700 000 hits per month, and over 24 000 visitor sessions. The new GIS facility, which enables a user to create maps of coral reef areas and overlay key management and threat information, has proved to be very popular. Information from the Global Coral Reef Monitoring Network status reports is being added on a continual basis and currently there are reports and thematic summaries available for >50 countries.

- ReefBase also assisted the COREMAP project in Indonesia with the development of a web-based GIS for its Coral Reef Information and Training Centre (CRITIC). Plans are being developed to provide training in database development and web-based database access to COREMAP personnel. ReefBase has revised the coral bleaching database originally developed by UNEP World Conservation Monitoring Center so that it is now the most comprehensive source of information on coral bleaching events and severity anywhere. The data have been made available on ReefBase in report, graph and map formats.

- Training Needs Assessment for training in integrated coastal management (ICM) has been completed in Vietnam and Indonesia, resulting in module and curriculum designs for both countries. The collaborators are committed to finalizing the modules and implementing the training curriculum at selected pilot areas, and to addressing the ICM training needs of particular stakeholder groups: the kecamatan stakeholders in Indonesia and the provincial decision-makers in Vietnam. Training of Trainers (TOT) is expected to boost the training and presentation capability of module developers and improve their confidence as training facilitators.

Freshwater Resources Research Program

The goal of the Freshwater Resources Research Program (FRRP) is to improve the livelihoods of freshwater living aquatic resources dependent beneficiaries (poor fishers, fish farmers and consumers) in developing countries. Its two intermediate goals are: (1) fish farming households realize sustained production for own consumption and cash income from aquaculture, leading to improved availability for consumers; and (2) fishing households realize sustained production for own consumption and cash income from freshwater fisheries, leading to improved availability for consumers. The main objectives are: (a) small-scale farmers in Africa and Asia are to practice appropriate aquaculture on a sustained basis; (b) national partners promote appropriate aquaculture technologies through efficient and efficacious diffusion pathways; (c) an improved portfolio of sustainable and appropriate technology options for integrated land and water management are to be made available; (d) improved knowledge of efficient and efficacious policies and local governance strategies are to be made available; (e) improved understanding of fish and fishery resources (biology, ecological roles and economic and social values) is achieved and widely shared with national partners. The Program has two thrusts: (1) Strategies and options for realizing gains from sustainable freshwater aquaculture systems; and (2) Research for freshwater fisheries in an integrated land and water management context.

Program Achievements

- *RESTORE*: In Malawi and Cameroon, RESTORE is an established tool in on-farm research and monitoring activities on the introduction of IAA as conducted by the Center and its GO and NGO partners. In Bangladesh, where a training course was held in Dhaka for 16 project participants, the approach has been implemented as a key component of its on-farm monitoring activities.

- *Bangladesh - Aquaculture Extension*: Memoranda of Agreement with 13 new NGOs were signed bringing the number of partner NGOs (technical and financial support) to 27. Five training courses were organized for 181 field workers. One training course on financial management was held for 58 NGO administrators and managers. 7 650 new farmers and 4 800 carried-over farmers were trained (foundation and follow-up) and on-farm aquaculture demonstrations in ponds and flooded rice paddies are receiving support. 88 field-days/rallies were organized for interested neighbors of year 2001 demo farmers. Agreements with 69 Associate Partner NGOs (technical support but no financial support) for the 2002 program were finalized. 140 senior staff of NGOs received foundation training. 203 imams participated in a one-day training and field visit on carp polyculture for resource-poor farmers.

- *Bangladesh - Aquaculture Research*: A stratified random sample of 832 record books from the aquaculture (in ponds and rice-paddies) field demonstrations in 2000 was analyzed. The data of the economic survey (430 households) of aquaculture demonstrators in 2001 and control farmers, as well as a stratified random sample of 775 record books from the 2001 extension program are being analyzed. Six small research grant projects were completed, three are still ongoing, and 12 proposals for new grants are under review. Preliminary results of the 2001 surveys indicate that of the selected demonstration farmers are landless (10%), marginal (10%), small-scale (25%), and medium/large-scale (55%) farmers (based on land and income criteria). The average fish yields from ponds and rice field culture (alternate rice-cum-fish culture) were 2 780 and 1 520 kg/ha respectively, which was three and 15 times more than before extension intervention. The total fish production from the year 2001 extension effort was approximately 3 860 metric tonnes with a total actual sales value of US$ 2.39 million produced by 19 400 demonstrators, supported by partner and associate partner NGOs. The cooperating demonstration farmers included 35 per cent women.

- *Bangladesh - On-Farm Impact Monitoring*: Eight Research Assistants (monitoring) were recruited and their initial training (Participatory Rapid Appraisal and RESTORE) completed. The selection of 240 participating households (2003 demo farmers) was completed and the baseline survey is ongoing.

- *Malawi - Aquaculture Research and Extension*: Expansion of the Research Extension Teams approach is currently underway in central Malawi, and similar activities were initiated in the Chipata District, Eastern Zambia. Training in participatory aquaculture research and extension was conducted for NGOs and technical backstopping trips were made to neighboring Zambia and three satellite stations in Malawi. Socio-economic survey data analysis of Phase 1 was conducted at the headquarters and results are currently being summarized.

- *Malawi - Nitrogen Retention in IAA*: The third and fourth cycles of the experiment were successfully completed. A successful open day and farm visits were conducted for 110 farmers to disseminate research results directly to farmers. Pond sediment removal frequencies (none, 6 or 12 months) and application to maize fields had a negative effect on the fish yield, meaning that the effort only needs to be invested annually to gain increased maize yields. Gross margins were significantly higher in treatments where pond sediments were recycled once yearly to the maize, rather than in treatments where only organic fertilizer was applied to the maize.

- *Cameroon - Integrated Agriculture-Aquaculture*: The first two cycles of research into the performance of the FSRP approach were completed. RESTORE impact assessment of the first year's work was conducted. The draft report on the study of women's farming systems was completed and is now under review for translation. The study of Yaoundé periurban IAA was also completed, and a sensitivity analysis underway. Studies on markets and user satisfaction with IAA technology in the Southwest province were completed and are awaiting publication and distribution in conjunction with SOWEDA (Southwest Development Agency - a project of the African Development Bank). A small-scale IAA Credit Workshop was conducted. Early findings indicate a clear difference between periurban and rural farmers in terms of group cohesion, associated with technology adoption and participation in the operation of collective credit schemes and marketing with technology transmission among farmers being an order of magnitude higher in the most remote site.

- *Cameroon - Aquaculture Technology*: Over twenty ornamental fish species from three forest river systems now in captivity. *Chromidotilapia* spp. now being spawned in small ponds. Mormyrid broodfish are being held in tanks at the University of Buea in preparation for artificial spawning. A monitoring and broodfish collection program was established with local fishers. Training activities in fish handling and transport were established. Marketing options are being investigated. Participatory research into locally relevant African catfish spawning technology has identified several key constraints (e.g., undrainability of ponds, high sediment loading, low temperatures), and a number of farming systems within which to work.

- *Egypt - African Catfish Natural Spawning*: Experiments were conducted in June 2002 to identify and verify African catfish (*Clarias gariepinus*) broodstock manipulation types and the optional levels required for stimulating spawning. Statistical analysis of the data revealed the positive effect that the treatment of lowering the pond water level had on the spawning response of females. The percentage of spawning females was significantly higher when broodstock fish were stocked into the spawning hapa nets at two and four pairs per hapa (1.5 m^2 surface area) at either 25 cm or 50 cm water level, compared to 75 cm water level that had lower spawning responses. At 50 cm water level, the spawning response from a stocking density of six pairs per hapa net was significantly lower than two or four pairs. There was no significant difference in average spawning responses at 25 and 50 cm water depth, while a highly significant difference was observed between 75 cm and shallower water levels of 25 and 50 cm. A three-day practical training course was conducted during the first week of June 2002 for six fish farmers from four different regions in the country. Six weeks later the trainees were invited to witness the fingerlings produced from the spawning trials they conducted earlier. This was a very successful approach that has encouraged them to pursue this approach on their own farms.

- *Egypt - Aquaculture Development*: A pilot study on production economics was initiated in the Fayoum region in collaboration with the Fayoum Fish Farming Association including over 20 fish farms representing different fish farming levels in this region. Data were collected through the end of 2002 to assess its economic viability.

Partnerships, Information and Training Program

The Partnerships, Information and Training Program (PITP) strengthens existing collaborations and develops new partnerships with national institutions and agencies, regional and international organizations, advanced scientific institutions and other partners, in research and related activities and contributes to increasing the impact of the WorldFish Center's research by communicating the Center's work to its partners and aquatic resource users, providing information services to support the work of the Center's staff, raising public awareness of fisheries issues, and capacity building among institutions. The two main thrusts of the program are: (1) improved partnerships and capacity building among developing country institutions; and (2) access to information for the sustainable development of fisheries and aquatic resources.

Program Achievements

- Assistance with the launch and marketing of the *Fish for All* initiative (including branding, web development, preparation of many issue-based and promotional materials, and attaining major international media coverage),

- Major developments of the Center's corporate identity (including the creation and launch of a new name and logo)

- Assistance with 25th anniversary activities and outputs including the production of the 25th anniversary book, *A Lasting Catch*

- Automation of a number of library services

- The corporate website was given a face lift. All new Center publications are now published on the web site.

- One of the important milestones in 2002 was the development of strategies for greater involvement of National Aquatic Research System (NARS) partners in the Center's research agenda. Through consultation meetings with NARS institutions, the Center has established new collaborations and strengthened partnerships with NARS in the P.R. China, Malaysia and the Philippines. The year also marked an increased participation of the Center in various regional/international fora. The Center convened the Asia-Pacific Group of Fisheries and Aquatic Research (GoFAR) meeting in November 2002. It also hosted the Seventh General Assembly of Asia-Pacific Association of Agricultural Research Institutes (APAARI) in December 2002.

- Development of a revised version of Partners database that has been integrated with other Center's databases was another important activity.

- The Program coordinated the research network called INGA (International Network on Genetics in Aquaculture) and the information network NTAFP (Network of Tropical Aquaculture and Fisheries Professionals). INGA successfully held two expert consultations during 2002: (1) *Expert Consultation to Develop Strategies and Plans for Dissemination of Improved Fish Breeds to Small-Scale Farmers*, attended by scientists from member countries and Associate Member institutions of the network and resource persons from crops and livestock sectors, government/non-government organizations, the private sector and farmers associations; and (2) *Expert Consultation on Biosafety and Environmental Impact of Genetic Enhancement and Introduction of Tilapia Strains/Alien Species in Africa* organized in collaboration with FAO, CTA, IUCN and CBD, to address the pressing issues on the potential impact of introducing improved strains of tilapia and other fish to Africa and the need for guidelines that will help foster the development of aquaculture while maintaining the biodiversity in the region.

Policy Research and Impact Assessment Program

The main objective of the Policy Research and Impact Assessment Program (PRIAP) is to examine policies and options in fisheries, aquaculture and coastal and freshwater resources management to ensure wider adoption and benefits of research by the poor in the developing world. At present PRIAP conducts research, training and capacity-building activities around three thematic thrusts: 1) social, economic and policy analysis, and valuation of aquatic resources in developing countries; 2) aquatic resources planning and impact assessment; and 3) legal and institutional analysis for aquatic resources management. The core competencies of the Program are in the areas of socio-economic analysis of the fisheries sector in developing countries and institutional analysis for the governance of aquatic resources.

Program Achievements

- A framework for research on coral reefs management was developed with emphasis on capturing economic, social and livelihoods values of coral reefs. Methodologies for determining economic values of Caribbean coral reefs were presented at the "Reefs at Risk" Workshop as part of the International Coral Reef Action Network (ICRAN) activity held in Florida, USA, during September 2002.

- Work by WorldFish and IFPRI to incorporate fish into the IMPACT World Food Model was completed. Preliminary projections of production, consumption and trade to 2020 for eight aggregate categories of fish for 15 geographic regions of the world were made. A Stakeholders Workshop on "Fish to 2020: Implications of Global Fish Outlook for Developing Countries" was organized on 2 November 2002 in Penang. The Workshop discussed the implications of the model projections on food security, poverty elimination, public health, environment and technology development in developing countries.

- A detailed and disaggregated assessment of fish supply and demand in nine major fish producing and consuming countries of Asia (Bangladesh, China, India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam) was initiated. Information and data were compiled and analyzed on key aquaculture technologies and fishing practices in these countries. Major policies, institutional mechanisms and support services affecting fish production and consumption were analyzed. Surveys and/or appraisals of major fish producers, consumers and traders were initiated in the nine countries. Training on estimating supply and demand functions for different types/species of fish was conducted during June-August 2002 in Bangladesh, Indonesia, the Philippines, and Thailand. Special sessions were organized at the World Aquaculture Society Conference, 23-27 April 2002, Beijing, China, and at the International Institute of Fisheries Economics and Trade (IIFET) Conference, 19-22 August 2002, Wellington, New Zealand, where nineteen research papers on project findings were presented.

- Bioeconomic models were developed for the analysis of fisheries capacity in the Gulf of Thailand. Results from the estimation of Schaefer and Fox surplus production models were used to evaluate how to reduce the over-fishing of demersal fisheries. The analysis also examined fishery policies aimed at strengthening fishery management through limited access combined with complementary management measures such as co-management, decentralization of fisheries management, license fees, and a shrimp export tax.

- Work has started in collaboration with Stirling University, U.K., to investigate the implications of different aquaculture systems in Bangladesh on market chains and access particularly for poor farmers. Its main focus is on understanding the marketing systems of poor fish farmers and the implications of increasing market dependence on the livelihoods of these people along with harvesters, intermediaries, and traders.

- A common research framework for baseline surveys, monitoring and impact assessment of community-based fisheries management (CBFM) projects was agreed upon with partners. In Bangladesh over 120 project water bodies are covered, along with a further 17 control sites in Vietnam one project and one control site were covered. Analysis of the baseline data is underway. In Bangladesh about 1 500 project households at 12 locations and over 500 control households are being monitored every two months to understand their use of aquatic resources. Impact surveys of 15 sites in Bangladesh showed a substantial improvement in housing.

- Training and technical support on fish sanctuary/conservation were provided to communities in the Lao PDR and Vietnam. A fish sanctuary was established in An Binh, Vietnam. Impact indicators and monitoring schemes for the research activities were developed together with partners.

- The main findings from the co-management research undertaken over the period from 1999 to 2002 were synthesized into a policy brief for distribution to policy-makers in the developing countries. The key problems in implementing co-management of aquatic resources such as empowering poor communities, managing conflicts, importance of traditional authorities, compliance management, etc., were examined through case studies carried out in Africa (i.e., Malawi, Mozambique and Zambia) and in Asia (i.e., Cambodia, Indonesia, the Philippines, Thailand, and Vietnam). The results of the research were used to implement a five-day training program on co-management for fisheries managers from these developing countries.

- Participatory action research methods were used to improve the management of aquatic resources at local and national levels. In Bangladesh a total of 17 Participatory Action Plan Development Workshops were held. This method was presented in Nairobi at a workshop of the system-wide program for Collective Action and Property Rights (CAPRi) during February 2002. In 17 working areas where community-based management has started, partner NGOs, in some cases with WorldFish help, facilitated local primary stakeholders to identify key problems and find solutions. This led to establishing local organizations and committees that will implement the community plans and actions, such as conservation areas, closed seasons, habitat restoration and restrictions on critical gears. Two participatory awareness meetings and exchange visits to other project sites were arranged for government officials and fishers in An Giang province, Vietnam.

- The institutional arrangements for governing wetlands in Cambodia, the Lao PDR, Thailand, and Vietnam were examined and working groups formed to collect information on them. A Regional Workshop was conducted during 23-26 June 2002, Nha Trang, Vietnam, where the partners discussed the outcome of the first year, methodologies, and modalities for institutional analysis and economic valuation work.

Collaborative Projects

Biodiversity and Genetic Resources Program (BGRRP)

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Development of FishBase Application	WorldFish Center core funds	May 2002 - Dec 2005	Germany: Institut für Meereskunde, Kiel (IFM-K) Belgium: Musée Royale de l'Afrique Centrale (MRAC) Sweden: Swedish National Museum (NRM) International: Food and Agriculture Organization of the United Nations (FAO) Canada: University of British Columbia (UBC)	Generic website prototype developed. Technical options identified for global FishBase site and local site data/information exchange. Priority encoding focused on the Philippines species. Generic website prototype developed for fish reference collections with four universities. Prototype presented to NARS/WorldFish Center meeting and inter-agency consultative workshop. The Philippines egistered user list updated for specific national user-need feedback. Tables on artificial propagation (such as Broodstock, Eggs Nursery, Fry Nursery, Larval Nursery) created to capture larval rearing information for species. Country-based table for parasites and diseases of cultured species designed to complement rearing information. Aquaculture profiles for commercially important species (such as *Chanos chanos*) assembled. Consultations initiated with the University of the Philippines to extend independent reef transect surveys to include species and trophic level trends. Work initiated with Academia Sinica (Taiwan) on developing Chinese language version of FishBase; and for access to FishBase using Thai language scripts. National consultative workshop and meetings convened with governmental agencies to promote linkages with FishBase and customisation for the Philippines. Work initiated on developing guidelines for customized database searches; and manual on developing FishBase mirror sites produced.
Floodplains Initiatives	WorldFish core funds; Comprehensive Assessment of Water Management in Agriculture	January 2002 - December 2005	Cambodia: Mekong River Commission (MRC), Phnom Penh Sri Lanka: International Water Management Institute (IWMI), Colombo South Africa: University of Cape Town Australia: Griffith University UK: Imperial College, London France: University Paul Sabatier, Toulouse Lao PDR: Global Association for People and the Environment (GAPE)	Project being implemented through partnership with the Inland Fisheries Research and Development Institute in Cambodia. Study and mapping of the Tonle Sap fisheries stakeholders initiated. Partnerships developed with: WWF Cambodia (Mekong Initiatives) on floods valuation; WWF Laos on Mekong pools sanctuaries; MRC/Basin Development Plan for integration of hydrological and fishery model; Oxfam America for the identification of fisheries stakeholders around the Tonle Sap Great Lake; IWMI,

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				University of Cape Town, Griffith University, MRAG on integration of river and fisheries models. Collaboration with PRIAP for the setting up of an integrated livelihood-oriented DFID project initiated. A report on the data analysis of the Lao database completed. Integrated the modeling approach for river management in WorldFish Center's proposals to the Challenge Program on Water and Food. Publications submitted; contribution made to the Large Rivers International Symposium, February 2003, Phnom Penh, Cambodia.
Transfer of Selective Breeding (GIFT) Technology for Aquaculture Improvement from the Philippines to Sub-Saharan Africa and Egypt		2000 – June 2002 (anticipated extension to June 2004)	Cote d'Ivoire: Centre National de Recherché Agronomique Egypt: WorldFish Center's Regional Center for Africa and West Asia; Central Laboratory for Aquaculture Research Ghana: Water Research Institute Malawi: University of Malawi; National Aquaculture Center Philippines: GIFT Foundation International, Inc.	In Egypt, Ghana and Malawi, progeny from planned tilapia matings being evaluated. Data for the estimation of phenotypic and genetic parameters collected and analysed. The workshop on design of genetic improvement programs and data analysis for genetic evaluation took place at Abbassa, Egypt, during 12-16 May 2002. Some sections of the practical manual being revised and updated prior to publication. Representatives from Nigeria, Kenya and South Africa attended training at Abbassa in May 2002, and expressed interest in genetic improvement programs along the lines of those being developed in the present project. A proposal is being developed and discussed with UNDP for a second project phase that would integrate the African countries into the project, and emphasize the dissemination of improved fish to farmers.
Genetic Enhancement of Nile Tilapia and Utilization of F_1 Crossbred Clones as Control Populations	DFID; WorldFish Center core funds	2001 - 2004	Malaysia: Fisheries Research Institute Philippines: Freshwater Aquaculture Center/Central Luzon State University; GIFT Foundation International UK: Fish Gen Ltd.; University of Sterling	Eighty-four families were produced. Meetings will be conducted in early 2003. Appropriate red tilapia broodstock has been sought for comparison which should begin with the next mating. The progeny born this year assessed in ponds and cages. This will enable the estimation of "family by environment" interaction. Production of F_1 clones will take place using the fish received from Stirling University.

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Genetic Improvement of Tilapia	WorldFish Center core funds	2002-2005	USA: Auburn University, Alabama	Breeding completed using brood fish from crosses between four strains to produce the required full and half-sib groups. Full-sib groups (122) were produced among 66 groups involved in half-sib combinations. Fish individually tagged and evaluated for growth. After the performance test was completed in November 2002, blood samples were shipped to Auburn. The analysis is in progress.
Selection of Tilapia in Low Input Farming Systems	INREF	September 2001-September 2004	Netherlands: Wageningen University (WU) WU Staff: Dr. Hans Komen (Coordinator)	Reproduction conducted to produce full and half-sib families. Progeny tagging completed. Performance evaluation in progress. Analysis will be conducted after completion of pond evaluation and harvesting.

Coastal and Marine Resources Research Program (CMRRP)

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Assessment of Tropical Coastal Fisheries Resources	WorldFish Center core funds; Asian Development Bank (ADB); Danida	Indefinite	Canada: Fisheries Centre, University of British Columbia (UBC) Denmark: North Sea Centre (NSC) Philippines: SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA); Bureau of Fisheries and Aquatic Resources (BFAR); State Polytechnic College of Palawan – Aquatic Science Technology Institute (SPCP-ASTI); Palawan Council for Sustainable Development Staff (PCSDS)	Distribution of FiSAT package (DOS version of software, guide and reference manual) provided to fisheries scientists mostly from Africa and Asia. Publication of FishByte articles for *Naga* 2002 issues. Held consultation with NARS partners in the Philippines in June 2002. Training on resource/stock assessment identified as one of the areas for future collaboration. A concept note proposal submitted to BFAR/FRMP for possible funding in 2003. The EwE software system used to construct eight trophic models of coastal fisheries in South and Southeast Asia. Documentation of the Ecopath models will be published as part of the TrawlBase technical series.
Regional Technical Assistance on Sustainable Management of Coastal Fish Stocks in Asia (TrawlBase Phase I & II)	Asian Development Bank; WorldFish Center core funds	1998-2005	Bangladesh: Bangladesh Fisheries Research Institute (BFRI); Department of Fisheries (DOF); University of Chittagong India: Central Marine Fisheries Research Institute (CMFRI); Indian Council for Agricultural Research (ICAR) Indonesia: Central Research Institute for Fisheries (CRIFI); Directorate of Fisheries	Editing of technical reports of various research components (resource analysis, socio-economic, policy/planning)for publication in 2003. Concept note for TrawlBase Phase II submitted to the Center's research and management committee. Project Proposal for TrawlBase Phase II submitted to ADB. Provided inputs for PRIAP/CMRRP Project Proposal on "Fish Fights over

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
			Resource Management Malaysia: Department of Fisheries (DOF); Fisheries Research Institute (FRI) Philippines: Bureau of Fisheries and Aquatic Resources (BFAR); University of the Philippines in the Visayas (UPV) Sri Lanka: Ministry of Fisheries and Aquatic Resources Development Thailand: Department of Fisheries (DOF); Southern Marine Fisheries Development Center (SMFDEC) Vietnam: Ministry of Fisheries; Research Institute for Marine Products (RIMP)	Fish Rights" for funding by the Ford Foundation in 2003. Prepared technical reports on resource analysis for inclusion in technical publication.
Population Interdependencies in the South China Sea Ecosystems (PISCES)	UNEP-UNFIP, WorldFish Center core funds	July 2001 - June 2004	Malaysia: Borneo Marine Research Institute, University of Malaysia, Sabah Thailand: Aquatic Resources Research Institute, Chulalongkorn University, Bangkok; and DNA Technology Laboratory (BIOTEC); Katsetsart University, Nakornpathom Taiwan: Institute of Zoology, Academia Sinica, Taipei Vietnam: Institute of Oceanography, Department of Marine Living Resources, Nha Trang Indonesia: Research Center for Oceanography-Indonesian Institute of Sciences, Jakarta Philippines: Silliman University Angelo King Center for Research and Environmental Management (SUACKREM), Dumaguete	Partners meeting held at the Research Institute for Aquaculture No. 3 in Nha Trang. Project partners from six countries (Indonesia, Malaysia, the Philippines, Taiwan and Vietnam) attended. Training held during 8-18 October at genetics laboratory in Penang, Malaysia. Nine project partners and 15 other participants attended. Marker development completed for *D. trimaculatus* in September 2002. Optimizing conditions for amplification of the segments identified. Work on *C. cuning* will follow in early 2003. A summary of tests developed for both fish and non-fish species is in progress for adaptation to coral reef species; expected to be completed by the end of 2003. Field trips conducted during the southwest monsoon season June and November 2002. Data from resource assessments in Puerto Princesa Bay, Honda Bay, San Miguel Bay and Lagonoy Bay being analysed to estimate contribution of coral reef or reef-associated species to total landed catch. Initial results presented as case study at preparatory conference for WSSD meeting in Johannesburg in August 2002. Also presented as a case study to spin off discussions at the Larval Connectivity Working Group meeting in Miami in September 2002.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Testing the Use of Marine Protected Areas to Manage Fisheries for Tropical Coral Reef Invertebrates on Arnavon Island, Solomon Islands	ACIAR; WorldFish Center core funds	October 1994 - December 2003	Australia: Great Barrier Reef Marine Park Authority (GBRMPA) Solomon Islands: Ministry of Agriculture and Fisheries (MAF); Ministry of Forests, Environment and Conservation USA: The Nature Conservancy (TNC)	Conducted the pilot survey of the MCA to assess compliance.
Caribbean Marine Protected Areas Project: The Role of Marine Protected Areas in Fisheries Management and Biodiversity Conservation in Coral Reef Ecosystems	DFID: Environmental Defense; WorldFish Center core funds	January 1996 - February 2003	British Virgin Islands (BVI): Department of Marine Studies, H. Lavity Stoutt Community College; Conservation and Fisheries Department, Ministry of Natural Resources and Labour U.S. Virgin Islands: McLean Marine Science Center, University of the Virgin Islands Jamaica: Centre for Marine Sciences and Discovery Bay Marine Laboratory, University of the West Indies	Three papers were published, four others are in press. One is in review and another nine are in an advanced stage of preparation. Proposals were sent to a number of possible donors. The project will terminate in mid-2003 if no further funding is obtained. A preliminary investigation was made on the relative availability of spiny lobster pueruli in BVI waters and of the feasibility of grow-out to marketable sizes. Initial results were positive.
Village Farming and Restocking of Giant Clams	WorldFish Center core funds	Current phase, mid-1995 - December 2003	Australia: James Cook University Fiji: University of the South Pacific Solomon Islands: Ministry of Agriculture and Fisheries (MAF); US Peace Corps Japan: Overseas Fishery Co-operation Foundation of Japan	Stocking densities were continually reduced by translocation to the reef margin to accommodate increasing biomass of giant clam broodstock. Small-scale hatchery being built for re-stocking giant clams in the Philippines and Vanuatu. Discussions are continuing to finalize work to be done in Malaysia.
Development of Black Pearl Farming in the Western Pacific	WorldFish Center core funds	Operational since 1993. Current phase, early 1998 - December 2003	Australia: James Cook University Fiji: Fisheries Division Solomon Islands: Ministry of Agriculture and Fisheries Tonga: Ministry of Fisheries	Third crop of pearls harvested and fourth seeding completed. Arrangements for sale of second and third crops of Solomon Islands pearls in progress. Spat collection and grow-out of juveniles continued. Monitoring of monthly spat fall completed. Publications in preparation on comparative growth and survival of wild and hatchery-reared spat. Guidance given to Solomon Islands Fisheries Division on draft legislation for sustainable pearl industry.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Development of New Artisanal Fisheries Based on the Capture and Culture of Postlarval Coral Reef Fish	ACIAR	January 1999 – December 2003	Australia: Australian Institute of Marine Science (AIMS); Queensland Department of Primary Industry Solomon Islands: Ministry of Agriculture and Fisheries (MAF)	Samples completed, data entered into database and checked, then used to compile final report to ACIAR. Ontong Java surveyed in January 2002 but westerly winds hampered attempts at crest netting. Nonetheless, large numbers of valuable fish collected. A second trip in July 2002, with prevailing easterly winds, yielded lower catches of finfish and less valuable species. Valuable invertebrate catches were higher. Small "portable" sea cages in use since late 2001. In August 2002, a 5x7 m floating sea-cage deployed at Nusa Tupe. Rearing fish in the ocean resulted in improved growth and survival of many valuable fish. Spiny lobsters and shrimp found to prefer static environment. Developed a fixed cage system for these species. ACIAR reviewed project and the outcome very positive. Plans for a 12-month extension submitted to ACIAR. Final report submitted in December 2002.
Development of Methods for the Mass-Rearing and Release of Tropical Sea Cucumbers to Assess the Potential for Restocking and Farming	ACIAR; WorldFish Center core funds; New Caledonian Provincial Governments; Danida – Support for Marine Aquaculture (SUMA); Crawford Fund	Operational since 1993. Current: Vietnam July 2000 - June 2002; New Caledonia July 2001 - June 2005.	Australia: Advisory Panel from Advanced Scientific Institutions in Australia; ACIAR; University of Sydney; Australian Institute of Marine Science (AIMS) New Caledonia: Secretariat of the Pacific Community, IFREMER, Northern Province, Southern Province, Island Province (Loyalty Islands) Vietnam: Ministry of Fisheries Research Institute for Aquaculture No. 3	Ongrown wild broodstock in Vietnam spawned regularly, since September 2001. Most batches of larvae reared through settlement. Pond-reared F_1 animals spawned for the first time. Spawning appears possible year-round in animals held in seabed pens. Chlorinated-dechlorinated water now used routinely for algal culture, and bag cultures set up, but cultures remain labile and short-lived. Different diets for sandfish (mixtures of dry algae, ground seaweed and shrimp starter feed) used in early and later nursery in tanks, but none in ponds. The greatly increased growth rate on transfer to ponds suggests these diets are not effective. Some improvement possible by frequently thinning and sorting tanks, but density main limit and little intensification achieved. Nursery and growout in ponds without shrimp showed remarkably high growth rates but variable survival. RIA3 shrimp co-culture pond trial in progress using hatchery-bred juveniles. Tank trials show apparent predation when shrimp larger than sandfish and at high density. A replicated salinity trial by RIA3 mollusc group, using hatchery-bred

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				juveniles. Oxytetracycline against skin lesions used on a small scale without mishap. Free sandfish seed distributed to farmers, in exchange for feedback on culture conditions, problems and results. Publicity effort showed considerable interest in sandfish as alternate crop in shrimp ponds and in pens and cages. Seabed babylon culture cages used for nursery trial of three sizes of sandfish, with fair survival and growth. Continued on a bigger scale by farmer. Seed of different sizes supplied to RIA3 used as follows: stocked in co-culture trials in ponds and tanks, reared in first-nursery tanks, used for salinity trials, or grown with blood cockles. Seed provided to Ninh Thuan Extension Office stocked in new (fully plastic lined) sand ponds in arid region near Phan Ran, 120 km south of Nha Trang. For seabed trials, 8 fifty m pens stocked with different seed sizes in collaboration with Hon Mun MPA Project (Nha Trang Bay) as part of their Alternative Income Generation trials. One 1600 m pen stocked (for growout) in collaboration with the International Marinelife Alliance at Ran Trao MPA (Van Ninh). In New Caledonia, plans prepared in collaboration with IFREMER for a new hatchery for sea cucumber culture in the Northern Province. Grant applications submitted to the French Government, Crawford Fund and Provincial Governments of New Caledonia. Greenhouse facility at Saint-Vincent constructed for culturing sandfish; 2 induced pond spawnings of sandfish broodstock. Tissue samples of sandfish collected from 9 sites for genetic variation analysis in collaboration with AIMS.
International Coral Reef Action Network (ICRAN)	UNEP/UNFIP	June 2001-June 2005	International: Coral Reef Alliance (CORAL); Global Coral Reef Monitoring Network (GCRMN); International Coral Reef Initiative-Coordinating and Planning Committee (ICRI-CPC);	Major revision of ReefBase launched on web; during first month of operation over 15 000 hits per day, climbing to over 24 000 by November 2002. Workshop in December 2001 used as a basis for further planning for collaborative work in the Caribbean.

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International Coral Reef Initiative (ICRAN) continued			World Conservation Monitoring Centre (WCMC); World Resource Institute (WRI); United Nations Environment Programme (UNEP)	WorldFish Center elected Chair of the Steering Committee in December 2001, and is a member of the ICRAN Executive Committee. WorldFish participated in the ICRI regional meeting and the CPC meeting in Mexico. Provided input at various levels in planning and management of ICRAN fundraising program, through chairmanship of Steering Committee, participation in ICRAN Board Meetings.
ReefBase	WorldFish Center core funds; Sida; UNFIP/UNF	January 1999 - June 2005	International/Regional: Global Coral Reef Monitoring Network (GCRMN); World Conservation Monitoring Centre (WCMC); ReefCheck International; WWF International; CORDIO; International Coral Reef Initiative; UNEP Regional Seas Programs USA: Office of Earth Sciences, NASA-Johnson Space Center; National Center for Atmospheric Research (NCAR); World Resources Institute (WRI), National Oceanographic and Atmospheric Administration (NOAA) Australia: Australian Institute of Marine Science; Great Barrier Reef Marine Park Authority Others: Institutions and individuals contributing data and pictures to the database	Numerous website improvements made allowing better access, and significant expansion of content. Communication on GCRMN training/collaboration with Indonesian counterparts. Liased with Caribbean expert on monitoring programs, results to be made available to ReefBase. Canadian intern to assist in further developing this review. World's most comprehensive database on coral bleaching now on ReefBase; online forms allow users to report coral bleaching events. Review of coral bleaching in progress; to be published on website. New section to be made public shortly under development, incorporating geo-referenced Space Shuttle and Space Station images. Initiated collaboration with NOAA on sharing GIS-data on coral-bleaching hotspots (AVHRR), and global shallow water algorithm (SEAWIfs). Continued work with NASA partners for a standardized global map of coral reefs based on Landsat 7 data.
Coastal Management Training Program	Indonesia: The David and Lucile Packard Foundation	December 2000 - December 2003	Indonesia: WWF Wallacea Biregional Program Telapak Indonesia Indonesian NGO Network for Marine and Coastal Resources (Jaringan Kerja untuk Pesisir dan Laut - JARING PELA Puter) The Nature Conservancy (Proyek Pesisir Lampung PKSPL-IPB) Center for Coastal and Marine Resources Studies-Bogor Agricultural University (Pusat	*Indonesia*: Module Developers' Write-Shop and Training of Trainers for Coastal Management Training Program (CMTP) collaborators from Indonesia held at Laguna during 22 –29 April 2002. The workshop organized by the Broad-Based Coastal Management Training Program-Philippines (BCMTP-Philippines) headed by WorldFish Center, in collaboration with PCAMRD, DA-BFAR, DENR-CEP and Haribon Foundation. Eleven participants from CMTP Indonesia attended. "Pendoman Pelatihan - Pengelolaan Pesisir Terpadu

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
			Kajian Sumberdaya Pesisir dan Lautan-Institut Pertanian Bogor – PKSPL-IPB) Bahtera Nusantara Indonesia Coastal and Marine Foundation (Yayasan PESUT) The Indonesian Coral Reef Foundation (Yayasan Terumbu Karang Indonesia -TERANGI) Department of Marine Resources Utilization-Bogor Agricultural University Directorate of Coastal Affairs, Directorate General of Coasts and Small Islands, Ministry of Marine Affairs and Fisheries, Republic of Indonesia Indonesian Biodiversity Foundation (KEHATI)	di Indonesia", (module plans and trainer's guides) with revisions presented in Bahasa Indonesia. Establishment of the InCom – Indonesian Network on Coastal Management (Jaringan Kerja Indonesia untuk Pengelolaan Pesisir). Participants prepared and signed agreement. They proposed to pursue institutional interest upon their return to Indonesia.
Coastal Management Training Program continued	Vietnam: The John D. and Catherine T. MacArthur Foundation	December 2000 - December 2003	Vietnam: Ministry of Science, Technology and Environment (MOSTE) Hai Phong Institute of Oceanology (HIO) College of Agriculture, Can Tho University (CTU) Committee of the Government on Frontier Issues (CFI) National Steering Committee for Biendong Sea and Islands Department of Fisheries (DoFi) of Khan Hoa Department of Science, Technology and Environment (DOSTE) of Danang Hanoi Institute of Oceanography (HNIO) Hanoi University of Science (HUS) International Marinelife Alliance (IMA) National University of Hanoi (NUH) Nha Trang Institute of Oceanography (NIO) Research Institute of Marine Products (RIMP) Sub-Institute for Water Resources Planning (SIWRP) of Southern Vietnam World Conservation Union (IUCN) Institute of Fisheries Economics and Planning (IFEP)	*Vietnam*: Training Needs Assessment (TNA) Presentation and Curriculum Development Workshop held 20–23 May 2002, presentation of results of TNA conducted by Institute of Fisheries and Economics Planning (IFEP), Institute of Oceanography - Nha Trang (ION) and the Can Tho University (CTU) to determine integrated coastal management training needs, and to develop curriculum design. A total of 17 participants from 13 organizations attended. Preliminary modules established were: Survey and Assessment, Monitoring, Awareness Education and Training, Master and Action Plan Development and Implementation and Plan Evaluation. The Training of Trainers (TOT) survey implemented. TOT modules finalized and prepared in following formats: trainers notes, session guide, powerpoint presentations and hand-outs. Modules include: General Methodical Skills, Effective Use of Visual Media, Communication, Presentation Techniques, Facilitation Skills and Networking. Module Developers Write-Shop and Training of Trainers at Laguna - 11 participants from various agencies in Vietnam attended. Participating institutions include: HUS, NUH, HNIO, IMA, IFEP, RIMP, HIO, DOSTE-Da Mang, CTU, and MET

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
			Ministry of Education and Training (MET) University of Agriculture and Forestry	
Population, Consumption and Environment Coordination	The John D. and Catherine T. MacArthur Foundation; WorldFish core funds	January 1998 - January 2003	Ecuador: Fundacion Natura; The Nature Conservancy El Salvador: Center for Environmental and Social Studies on Sustainable Development (CEASDES) Federated States of Micronesia: Department of Agriculture and Land Gabon: World Wildlife Fund - Central Africa Region Office Ghana: Marine Fisheries Research Division, University of Ghana Hong Kong: World Wide Fund for Nature, University of Hong Kong Honduras: Committee for the Defense and Development of the Flora and Fauna in the Gulf of Fonseca (CODDEFFAGOLF) India: Tata Energy Research Institute (TERI) Indonesia: Bogor Agricultural University; Indonesian Institute of Science; University of Indonesia Madagascar: Madagascar University Museum; Universite d'Antananarivo Norway: Christian Michelsen Institute (CMI) Philippines: University of the Philippines (UP) Thailand: Institute of Social and Economic Policy; Kasetsart University UK: University of East Anglia; University of York USA: Duke University; International Center for Research on Women (ICRW);	Work has just commenced on analysis of PCE work over the past 6 years.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
			Princeton University; Stanford University; The Nature Conservancy - Latin America and Carribean Division; University of Connecticut; University of Rhode Island; Forest Service - US Department of Agriculture (USDA) Vietnam: Center for Environmental Research and Education (CERED) Zambia: Ministry of Agriculture, Food and Fisheries Zimbabwe: Center for Applied Social Sciences (CASS), University of Zimbabwe	

Freshwater Resources Research Program (FRRP)

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Integrated Resources Management (IRM) Group and Development of RESTORE Software		ongoing	Bangladesh: National collaborators Vietnam: National collaborators Malawi: National collaborators Cameroon: National collaborators	In Malawi and Cameroon, the RESTORE process was an established tool in on-farm research and monitoring activities on the introduction of IAA as conducted by the Center and its GO and NGO partners. In Bangladesh, the approach was implemented as a key component of its on-farm monitoring activities. Several papers on the implementation of RESTORE were revised. In Bangladesh, a training course was held in Dhaka, 8-16 June 2002, for 16 participants, 14 of whom were WorldFish Center staff, 12 involved in the WorldFish – DSAP Project.
Determination of High-Potential Aquaculture Development Areas and Impact in Africa and Asia		October 2002 - September 2005	International/National: Hohenheim University; Kassel University; GTZ; FAO; NARS in Bangladesh, Cameroon, Malawi and Thailand	Work continued on analysis of potential and impacts in Africa and Asia.
Development of Sustainable Aquaculture Project (DSAP)		June 2000 - July 2005	Bangladesh: Bangladesh Fisheries Research Institute (BFRI); local NGOs; Bangladesh Agricultural University (BAU)	MOAs with 13 new NGOs signed - number of Partner NGOs (technical and financial support) now 27. Five training courses (2 foundation and 3 follow-up) organized for 179 field workers (151 field assistants and 28 project coordinators). Training course on financial management held for 58 NGO administrators and managers.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Development of Sustainable Aquaculture Project (DSAP) continued				Total of 7 650 new farmers and 4 800 carried-over farmers trained (foundation and follow-up), and on-farm aquaculture demonstrations in ponds and flooded rice paddies receiving support; 88 field-days/rallies organized for interested neighbors of year 2001 demo farmers. Extension officers from 8 regional field liaison offices supported partner and associate-partner NGOs in implementing their aquaculture support programs. Stratified random sample of 832 record books from aquaculture (pond and rice-paddies) field demonstrations in 2000 under previous project (RDSAP) analyzed. Data of economic survey (430 households) of aquaculture demonstrators in 2001 and control farmers as well as stratified random sample of 775 record books from the 2001 extension program analyzed. The TAPP and research work plans for July 2002-June 2003 approved; implementation of collaborative research program with BFRI started July 2002. Three new small research grants awarded to researchers from BAU. Six studies were completed: - Improved preservation of *Macrobrachium rosenbergii;* - Value-added products from silver carp; - Utilization of Azolla in rice-cum-fish culture; - Ecology of euglenophytes in fish culture ponds; - Economic analysis of supplementary feed-based fish culture; and - Inbreeding effects in Thai pangas (*Pangasius sutchi*) in the Mymensingh region. Three studies are ongoing: - Socio-economic aspects of *Macrobrachium* culture in Mymensingh; - Management of euglenophytes blooms in fish culture ponds; and - Inbreeding effects in Thai pangas (*Pangasius sutchi*) in the Bogra region.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Development of Sustainable Aquaculture Project (DSAP) continued				Twelve new concept notes reviewed; selection among full proposals in process. Work plans for impact assessment study of IAA practices (RESTORE) finalized. Eight Research Assistants (monitoring) recruited, initial training (PRA and RESTORE) completed. Selection of 240 participating households (2003 demo farmers) completed, baseline survey (May 2002-April 2003) is ongoing. MOAs with 69 Associate Partner NGOs (technical support but no financial support) for the 2002 program finalized; 140 senior staff of AP-NGOs received foundation training. A total of 203 imams participated in a one-day training/field visit on carp polyculture for resource-poor farmers.
Aquaculture Research and Development for Small-scale Farms in Southern Africa	Danida; WorldFish Center core fund donors; The Rockefeller Foundation	1996 - 2004	International/Regional:, FAO; ICEIDA Malawi; Malawi Fisheries Department; Malawi Ministry of Natural Resources and Environmental Affairs; University of Malawi	Expansion of the RET approach currently underway in central Malawi, and RET activities initiated in the Chipata District, Eastern Zambia. Training in participatory aquaculture research and extension conducted for NGOs and technical backstopping trips made to Zambia and 3 satellite stations in Malawi. Third and fourth cycles of the experiment on nitrogen retention in IAA systems completed. Data analysis underway. Successful open day and farm visits conducted for 110 farmers. Further work on MSEP not initiated because Danish Government withdrew support to the Malawi Government. Technical report prepared and submitted to the Royal Danish Embassy in Malawi. On farm trials of hapa-based natural spawning of African catfish initiated on five farms.
Famine Mitigation and Food Security through Integrated Aquaculture	USAID-OFDA; WorldFish core funds	June 2001 - September 2003	Malawi: Department of Fisheries; Concern Universal; Action Aid (Malawi) Zambia: Department of Fisheries	Pilot activities initiated in Eastern Zambia. USAID-OFDA funding for second year activities approved for October 2002-September 2003. Socio-economic survey data from southern Malawi analysis conducted at headquarters and results currently being summarized.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Integration of Aquaculture into Irrigated Small-Farming Systems in Southern Africa	IFAD; WorldFish core funds	June 2000 - May 2003	International/National: FAO (lead agency); ALCOM; IFAD Projects in Malawi, Zambia, Zimbabwe	WorldFish Center involved in development of monitoring and evaluation activities, and activities for introduction of aquaculture into irrigation schemes in Malawi were planned to occur with direct WorldFish supervision during first year. However, implementation in target countries (Malawi, Zambia and Zimbabwe) delayed by administrative issues. Note: The project is being reformulated by FAO.
Development of integrated aquaculture-agriculture systems for small-scale farmers in the forest margins of Cameroon	DFID; World Fish core funds	September 2000 - August 2005	Cameroon: International Institute of Tropical Agriculture (IITA), Institut de Recherche Agricole pour le Dévelopement de Cameroun (IRAD), Ministere de l'Elévage, des Pêches et des Industries Animales de Cameroun (MINEPIA).	First two cycles of FSRP research completed. RESTORE impact assessment of first year's work in hand. Draft study on women's farming systems completed, now under review for translation. Study of Yaoundé peri-urban IAA completed, sensitivity analysis underway. Studies of markets and user satisfaction with IAA technology in the Southwest province completed and awaiting publication and distribution in conjunction with SOWEDA. A small scale IAA Credit Workshop conducted. Over 20 ornamental fish species from 3 forest river systems in captivity. *Chromidotilapia spp.* now spawned in small ponds. Mormyrid broodfish held in tanks at University of Buea in preparation for artificial spawning. Monitoring and broodfish collection program established with local fishers. Training in fish handling and transport underway. Local markets investigated through sales; international market investigations currently on hold pending support from headquarters for these activities. Country reports from Cameroon, Côte d'Ivoire, Kenya, Madagascar and Zambia reviewed. Draft synthesis and analysis completed. Extension materials received from Cameroon, Côte d'Ivoire, Kenya, Zambia. Final draft in preparation for submission to FAO. Study of reproductive seasonality of several Nyong River fishes nearing completion. Concept paper for follow-up work developed. Discussions with 3 village groups (Nyong, Ntem and Moliwe Rivers) underway.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Aquaculture Research for Africa and West Asia at Abbassa	WorldFish Center core funds; Wageningen University (INREF Program)	Ongoing	Egypt: CLAR; Cairo University; Zagazig University; FAO; AOAD Malawi: Malawi National Aquaculture Center Cameroon: Institut de Recherche Agricole pour le Développement; Ministère de l'Elévage, des Pêches et des Industries Animales de Cameroun; IITA-HFC USA: Auburn University; State University of New York The Netherlands: Wageningen University, Institute of Animal Sciences (INREF-POND project)	Profit generated by producing different sizes of marketable tilapia and targeting different consumer groups being investigated at Abbassa and compared with on-farm trials at Fayoum by testing different culture periods, fish stocking densities and sizes and also different cultured species such as tilapia, mullets and African catfish. In June 2002 statistically designed experiment conducted in concrete tanks for identification and verification of broodstock manipulation types and levels required for spawning stimulation in *Clarias gariepinus*. A 3-day practical training course conducted during June 2002 for 6 fish farmers from 4 different regions. Six weeks later, the trainees were invited to witness the fingerlings produced from the spawning trials they conducted earlier. Fish health monitoring and control measures administered at the Abbassa facility. Experiments for evaluating the effect of immunostimulants on growth and disease resistance in tilapia showed promising results.Field experiments underway to determine dose dependent response. Pilot study of production economics initiated in collaboration with the Fayoum Fish Farming Association which includes over 20 fish farms representing the different fish farming levels in this region. Data collected through the end of 2002 to assess economic viability. Brainstorming session held 21 May 2002 to discuss fish supply and demand in Egypt, current and future trends and concerns. Attended by participants from fisheries and aquaculture sector as well as social science researchers in Egypt. Follow-up meetings with potential partners are continuing. Workshop on fish health organized by WorldFish Center and FAO held in Nairobi during February 2002. Database on fish health research in Africa being developed.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Accelerating Poverty Elimination through Sustainable Resource Management in Coastal Lands Protected from Salinity Intrusion: a Case Study in Vietnam	DFID; WorldFish Center core funds	April 2000 - March 2003	International: International Rice Research Institute (lead institution for project) UK: CLUWRR-University of Newcastle (Center for Land Use and Water Resources Research) Vietnam: Can Tho University (several institutes)	Sampling carried out by project partners at Can Tho University. One researcher from Can Tho University worked at Penang headquarters on exploratory data analysis of fisheries, ecological, and environmental data for 3 sampling tours in August 2001, January 2002 and June 2002. Results presented at the interim workshop in BacLieu, 25-27 June. Initial discussions held on management options; project partners achieved regulatory changes in saltwater control to area, providing shrimp farmers in part of the area (locations with high soil salinity and high acid-sulphate content) with the basis for continued shrimp production.
Lake Chilwa Wetlands and Catchment Studies	Danida-Malawi; WorldFish Center core funds	January - November 2001; follow-up activities until December 2003	Malawi: Department of Fisheries; Ministry of Agriculture and Irrigation	Activities in Likingala and Domasi River catchments not funded – donor withdrew from Malawi. Project on brushparks enhancing fishery productivity in Lake Chilwa completed, report submitted to donor and *Naga* paper accepted for publication. Meetings with local communities and Malawi Department of Fisheries to discuss implementation of brushpark technology and/or its modifications conducted. Preliminary proposals being reviewed before submission to donor. Paper by D. Jamu, J.Chimphamba and R. Brummett: "Land use cover changes in the Likangala Catchment of the Lake Chilwa Basin, Malawi: Implications for managing tropical wetlands in Malawi, Southern Africa" accepted for publication in the *African Journal of Aquatic Science*.
Increasing Water Productivity by Managing the Land-Water Interface: Effective Water Control for Solving Conflicts Among Agriculture-Fisheries-Aquaculture in Coastal Zones	System-Wide Initiative on Water Management Phase 2, Comprehensive Assessment (SWIM2-CA) donors; WorldFish Center core funds	October 2002 - September 2004	Vietnam: Can Tho University (CTU); University of Agroforestry (UAF) Ho Chi Minh City; Sub-Institute of Water Resources Planning (SIWRP); Bac Lieu Province: Department of Agriculture and Rural Development, Department of Fisheries. Philippines: International Rice Research Institute (IRRI) UK: CLUWRR-University of Newcastle	Work continued on managing the land-water interface in coastal zones of the Philippines and Vietnam.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Lake Chilwa Catchment and Wetlands Research: Linking Mnembo River Catchment Processes and Fish Production in Lake Chilwa	Canadian International Development Agency (CIDA)	July 2002 - June 2005	Malawi: Bunda College of Agriculture, University of Malawi; Ministry of Natural Resources and Environmental Affairs Mozambique: Institut Nacional de Investigacao de Pesqueira (IIP), Ministry of Fisheries Canada: Memorial University of Newfoundland	Networking began in 2002.

Policy Research and Impact Assessment Program (PRIAP)

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Valuation and Policy Analysis for Sustainable Management of Coral Reefs (in conjunction with CMRRP)	ICRAN; WorldFish Center core funds	July 2001 - June 2005	Regional Seas Programs of UNEP, World Resources Institute (WRI); Natonal Center for Caribbean Coral Reef Research (NCORE); Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami	Project papers from the Philippines study submitted for clearance. Proceedings and policy brief from December 2001 workshop submitted for clearance. Initial agreement achieved between WorldFish Center and CPACC/MACC on collaboration of economic valuation and policy analysis for sustainable management of coral reefs in the Caribbean. Financial support is expected from USAID/UNEP Caribbean Office.
Aquatic Resources Valuation and Policies for Poverty Elimination in the Lower Mekong Basin	DFID	January 2003 - December 2004	International/Regional: MRC; IUCN; WWF UK: Centre for the Economics and Management of Aquatic Resources (CEMARE), University of Portsmouth Cambodia: Department of Fisheries (DOF)	Networking began in 2002.
Database for the Assessment of Developing Country Fisheries WorldFish Center staff	WorldFish Center core funds	1997 - 2003	International/Regional: International Food Policy Research Institute (IFPRI); Food and Agriculture Organization of the United Nations (FAO); INFOFISH	Fishery statistics gathered from literature. Integration of fisheries sector into IMPACT World Food Model developed by IFPRI. World Food Model finalized with incorporation of fisheries sector. Data on fisheries sector provided by WorldFish Center to IFPRI. Report outline for "Fish to 2020" completed and 8 chapters currently undergoing review in IFPRI. A narrative final report was submitted to IDRC in August 2002. Two papers presented by IFPRI staff in international workshops: "Modeling fish to 2020: methods and first results", Ad-Hoc Conference on Fisheries Consumption Projections, 27-29 May, FAO, Rome, Italy; "Fish as food: projections to 2020",

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				International Institute of Fisheries Economics and Trade (IIFET) Conference, 19-23 August, Wellington, New Zealand Co-Stakeholders Workshop entitled "Fish to 2020: Implications of Global Fish Outlook for Developing Countries" at 2 November 2002 at the WorldFish Center, Penang, Malaysia.
Community Assessment, Management and Monitoring of Local Aquatic Resources System for Improved Food Security in the Mekong Basin	Oxfam America-Southeast Asia Regional Office	July 2000 - September 2003	International/Regional: International Institute of Rural Reconstruction (IIRR) The Lao PDR Pakse Southern Agricultural College (PSAC) Vietnam: Can Tho University (CTU)	Training on field monitoring formats (catch, consumption, household expenditure-income, market survey) developed with inputs from different stakeholders. Five monitors from An Binh village trained in catch monitoring, and 30 household members trained in consumption monitoring. Data entry system developed and two participants received training on data entry. Technical feasibility of fish sanctuary assessed and fish sanctuary established in Loi Du B hamlet of An Binh village. In the Lao PDR partners not ready with the sites. New sites proposed. Impact indicators were developed through participation of all stakeholders. Baseline socio-economic survey at household level in the Lao PDR, and resource assessment and community assessment in the Lao PDR were carried out.
Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in Asia	Asian Development Bank (ADB)	March 2001 - February 2004	Bangladesh: Department of Fisheries (DOF); Bangladesh Agricultural University (BAU); Chittagong University (CU) Peoples' Republic of China: Center for Chinese Agricultural Policy (CCAP); Freshwater Fisheries Research Center (FRRC) India: National Center for Agricultural Economics and Policy Research (NCAP); Indian Agricultural Research Institute (IARI); Central Marine Fisheries Research Institute (CMFRI); Central	Information analyzed on key aquaculture technologies and fishing practices in 8 participating countries. Draft technical paper entitled "Socio-economics of fish farming in Asia" currently undergoing review. Major policies, institutional environments and support services affecting fish production and consumption analyzed in 9 participating countries. Two draft technical papers entitled "Fisheries sector policy: a cross analysis in Asia" and "Liberalization vs. barriers: experiences from the leading fish exporting countries" being finalized. Surveys/appraisals of major fish producers, consumers and traders in 9 participating countries initiated.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
			Inland Capture Fisheries Research Institute (CICFRI); University of Agricultural Sciences (UAS) Indonesia: Research Center for Marine and Fisheries Product Processing and Socio Economic (RCMFPPSE); Ministry of Marine Affairs and Fisheries; Directorate General of Capture Fisheries (DGCF); Directorate of Aquaculture (DGA); Diponegero University; Institut Pertanian Bogor; Hassanudin University Malaysia: Ministry of Agriculture (MOA); Department of Fisheries (DOF); Lembaga Kemajuan Ikan Malaysia (LKIM); Universiti Putra Malaysia (UPM) Philippines: Bureau of Fisheries and Aquatic Resources (BFAR); College of Economics and Management, University of the Philippines Los Banos (CEM-UPLB) SriLanka: Department of Fisheries and Aquatic Resources (DFAR); National Aquaculture Development Authority (NAQDA); National Aquatic Resources Research and Development Authority (NARA) Thailand: Department of Fisheries (DOF); Coastal Resources Institute (CORIN) Vietnam: Institute of Fisheries Economics and Planning (IFEP); Vietnam Agricultural Science Institute (VASI); Research Institute for Aquaculture No. 2 (RIA2); An Giang University (AGU)	Training on estimation of supply and demand functions for different types/species groups of fish conducted in June-August 2002 for Bangladesh, Indonesia, the Philippines and Thailand. Mid-project review in India, Indonesia, Sri Lanka and Vietnam. Training on estimation of demand functions for different types/species and groups of fish for Bangladesh, Indonesia, the Philippines and Thailand, and conducted at the WorldFish Center. Collaborators worked with the Center's staff on estimation of fish demand. Semi-annual progress reports submitted since 2001 to ADB Officer. Progress of 5 research components per country discussed. ADB Officer and expert from WorldFish Center proceeded to Indonesia for project site visit during 14-19 November 2002 where they discussed project activities with partners. Project staff organized 2 special sessions on "Strategies and Options for Sustainable Aquaculture Development in Asia" at World Aquaculture Society Conference during 23-27 April 2002, Beijing, China. Ten research papers presented. "Fish in Food Security and Income in Developing Countries: Role of Growing Aquaculture and Changing Trade Regime" presented at the International Institute of Fisheries Economics and Trade (IIFET) Conference during 19-22 August 2002, Wellington, New Zealand. Nine research papers likewise presented.
Impact of Production and Marketing of Freshwater Aquatic Products on Rural Livelihoods	DFID	2003 - 2005	Bangladesh: Bangladesh Agricultural University; Bangladesh Aquaculture Development Society; University Grand Commission of Bangladesh India: Central Inland Capture Fisheries Research Institute (CIFRI) Thailand: Aquaculture and Aquatic Resources Management-Asian Institute of Technology (AARM-AIT); DOF UK: University of Stirling	Preparatory work ongoing during 2002.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Legal and Institutional Frameworks and Economic Valuation of Resources and Environment in the Mekong River Region - A Wetlands Approach	Preparatory phase, October 1998 - June 2000 (finalized); Implementation phase, July 2000 - December 2003	Swedish International Development Cooperation Agency (Sida)	International/Regional:Aquaculture and Aquatic Resources Management Program-Asian Institute of Technology (AIT), Bangkok; Mekong River Commission (MRC) Secretariat, Phnom Penh; International Union for Conservation of Nature (IUCN), Bangkok Sweden: University of Gothenburg Cambodia: Ministry of the Environment; AIT Aqua Outreach-Asian Institute of Technology (Cambodia); Department of Agronomy and Agricultural Land Improvement; Department of Fisheries; Wetlands International; IUCN-Cambodia; Ministry of Tourism; Cambodia National Mekong Committee The Lao PDR: Regional Development Coordination-Department of Livestock and Fisheries; Science, Technology and Environment Agency-Office of the Prime Minister; Lao National Mekong Committee Secretariat; Living Aquatic Resources Research Center Thailand: Udon Thani Fisheries Development Center; Department of Land Development; Coastal Resources Institute-Prince of Songkla University; UNEP/East Asia Program; Department of Fisheries; Office of Environmental Policy and Planning Vietnam: Ministry of Science Technology and Environment; Research Institute for Aquaculture No. 2-Ministry of Fisheries; Ministry of Planning and Investment; Fisheries Resources and Environment Conservation Department - Ministry of Fisheries; Sub-Institute for Water Resources Planning; Sub-National Institute of Agriculture Planning and Projection (Sub-NIAPP); Vietnam National Mekong Committee;	Continuous dialogue with partners held as part of implementation process. The counterparts have successfully been maintained as the main actors in the implementation. Papers for workshop proceedings currently in last stages of editing. Information being compiled for publication of awareness-raising materials in Cambodia, the Lao PDR, Thailand and Vietnam. Workshops been featured on local TV channels. A draft terms of reference (TOR) developed and is presently with Sida for their comments, but will be changed to an independent review for 2003. Project website launched in second quarter of 2002 Regional Workshop conducted during 23-26 June 2002 in Nha Trang, Vietnam. Partners discussed the outcome of the first year of field implementation and framework, methodologies and modalities for institutional analysis and economic valuation; in particular, (1) review of collected information to identify gaps; (2) selection of pilot (representative) sites with a view to filing in those gaps; and (3) primary surveys (possibly through Participatory Rural Appraisal (PRA)-Rapid Rural Appraisal (RRA) to collect other information on these pilot sites. A series of national and provincial workshops (arranged as on-the-job training) have been held in all four countries in cooperation with the MRC, AIT and IUCN.

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			Sub-Institute for Water Resources Planning- Ministry of Agriculture and Rural Development; Ministry of Forestry; University of Agriculture and Forestry; Ministry of Fisheries	
Coastal Resource Co-Management Project: A Worldwide Collaborative Research Project (Phase II)	Danida; WorldFish Center core funds	January 1999 - December 2003	International/Regional: CARICOM Fisheries Resource Assessment and Management Program; Program for Integrated Development of Artisanal Fisheries in West Africa (IDAF); Southeast Asian Fisheries Development Center-Aquaculture Department (SEAFDEC-AQD); Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) Cambodia:Department of Fisheries Denmark: Institute of Fisheries Management and Coastal Community Development (IFM); North Sea Centre (NSC) Indonesia: Directorate General of Fisheries; Indonesian Fisheries Socio-economic Research Network; Research Institute for Marine Fisheries (RIMF); Universitas Pattimura Ambon; Yayasan Hualopu; Universitas Diponegoro The LaoPDR: Living Aquatic Resources Research Centre (LARReC) Malawi: Fisheries Department Malaysia: Universiti Putra Malaysia Mozambique: Institute for Development of Small-Scale Fisheries The Philippines: College of Public Administration, University of the Philippines (UP); Department of the Environment and Natural Resources (DENR); Haribon Foundation; Palawan Council for	Eight projects funded in Africa and Asia to test hypothesis on legitimacy, local leadership and issues of co-management being completed by the NARs partners. Policy brief submitted for publication and presented at IIFET 2002 conference. Workshop proceedings and technical reports in final stages for submission. Steering committee meeting held in Wellington, New Zealand in conjunction with IIFET 2002 meeting during 20-24 August 2002. Co-management training held during 18-22 November 2002 at Penang, Malaysia. Provided research support for the NARs partners in Cambodia, Thailand, and the Philippines. Project Leader at IFM provided support to the NARs partners in Mozambique, Malawi and Zambia. Panel session on co-management organized by African partners at the IASCP conference. Panel session proceedings on Institutions and Community Issues in Fisheries Management expected to be completed soon. Synthesis workshop on governance organized in March 2002 and report prepared for comments from partners. Seminal paper on governance incorporating the experience of the WorldFish Center is expected to be completed in 2003.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
			Sustainable Development (PCSD); Tambuyog Development Center (TDC); University of the Philippines in the Visayas (UPV) South Africa: Sea Fisheries Research Institute; University of Cape Town; Program for Land and Agrarian Studies, School of Government, University of the Western Cape Thailand: Department of Fisheries (DOF); Kasetsart University; Prince of Songkhla University, Andaman Sea Fisheries Development Center Vietnam: Can Tho University (CTU); Institute for Fisheries Economics and Planning, Ministry of Fisheries; National Center for Social Sciences Zambia: Department of Fisheries (DOF) Zimbabwe: Center for Applied Social Sciences, University of Zimbabwe; Lake Kariba Fisheries Research Institute	
Community-Based Fisheries Management in Bangladesh, Phase 2	DFID	2001 - 2006	Bangladesh: Banchte Shekha; Bangladesh Environmental Lawyer's Association (BELA); Bangladesh Rural Advancement Committee (BRAC); Caritas; Center for Natural Resources Studies (CNRS); Department of Fisheries (DOF); FemCom; Proshika Manobik Unnayan Kendra	Mobilization completed except for Department of Fisheries. Conducted 4 regional orientation meetings with partners. Training needs assessment carried out in February to May. Project inception workshop in May attended by all partners, other projects and senior government staff. Training on group formation and another on micro-enterprise planning arranged for partner NGOs. Courses on community management skills and fisheries management in preparation. One NGO partner held several participatory planning/consensus-building workshops, the Center providing assistance. Staff of other NGO partners will be invited to observe and on that basis identify their needs and use this approach in other sites. Sets of tables for 15 sites under Phase I being compiled. Two case studies for 4 sites from Phase I drafted, plus analysis of fisheries data from a third site. Surveys in new and control sites conducted during June-

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				September 2002 covered about 4 000 households. System set up and about 80 local monitors employed to cover 10 project and 5 control sites from July. Monitoring of fish catches and effort introduced in main clusters of sites and many individual project sites plus control sites. Fish stock assessment planned for 4-5 representative project sites. Process documentation and institutional monitoring system operational since July 2002. Negoiations still in progress for study of fisheries policy formulation process.
Community-Based Fisheries Management Program in South and Southeast Asia	IFAD	2001 - 2006	Bangladesh: Sunamganj Jonokallan Sangsta (SUJON); Department of Fisheries (DOF); Bangladesh Efforts for Rural Advancement (ERA) Vietnam: Can Tho University (CTU); People's Organization of An Giang Province	MOAs signed with partners in Vietnam (Can Tho University and An Giang province) in April 2002, in Bangladesh (ERA and Sujon – two NGOs; also an agreement to collaborate with DOF through CBFM-2) in May. Agreement reached in July to support two MSc students of local university. Inception workshop and exchange visit by 12 Vietnamese to Bangladesh held during 15-21 February 2002. The team visited project sites in Sunamganj, and related community fishery activities of CBFM-2, Management of Aquatic Resources through Community Husbandry (MACH) and Dhampara projects. One project site selection was finalized in Vietnam with the An Giang People's Organisation. Seven project sites selected by two NGOs in Bangladesh. Fisher groups representing 1000 households in 3 working areas established. Temporary management bodies also established. Baseline household surveys finalized in Bangladesh and due for completion in Vietnam soon. Fish catch and household catch and consumption monitoring started on participatory basis at Bangladesh sites. In Vietnam, site monitoring design done. An awareness campaign on fish conservation underway at the Vietnam site.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
				One participatory appraisal for livelihoods strategy assessment conducted in Bangladesh. Review done by donor in Bangladesh for CBFM-2 and CBFM-SSEA.
Understanding Livelihoods Dependent on Inland Fisheries in Bangladesh and Southeast Asia	DFID; MRAG	February 2002 - January 2003	UK: University of Durham; Imperial College Bangladesh: BCAS The Lao PDR: Living Aquatic Resources Research Center (LARReC)/NARI Cambodia: Department of Fisheries (DOF) Vietnam: Can Tho University (CTU); An Giang University	Project memorandum signed with MRAG (program manager). MOAs signed with partner organizations (3 universities/research organizations in UK, 2 universities in Vietnam, government agencies in Cambodia and the Lao PDR and an NGO in Bangladesh). Inception and planning workshop held in Phnom Penh in April 2002 – stakeholder analysis and study sites and methods agreed upon. Report circulated summarizing the results. Secondary data and literature collected and reviewed. PRAs in all partner countries done. Regional workshop held at headquarters during November 2002.
Fish Fights Over Fish Rights-Managing Exit from the Fisheries and Security Implications for Southeast Asia	Ford Foundation	2003 - 2005	Cambodia: Department of Fisheries The Philippines: Bureau of Fisheries and Aquatic Resources; SEMEO Regional Center for Graduate Study in Research in Agriculture (SEARCA); University of the Philippines in the Visayas (UPV) Thailand: Department of Fisheries; Southern Marine Fisheries Development Center (SMDEC); Prince of Songkhla University, Andaman Sea Fisheries Development Center	Preparatory work ongoing.
Capacity Building of the Inland Fisheries Research and Development in Cambodia	ADB	February 2003 - January 2004		Preparatory work ongoing.

Information and Communication Division (ICD)

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Information and Communication Management	WorldFish Center core funds	ongoing		A number of cross unit and interdisciplinary teams were established. These include: setting up a photo database; creating the 25th Anniversary book; development of the *Fish for All* website; developing and communicating the corporate identity; e-publications; creating the corporate imagery; and the development of the DFID-WorldFish Center calendar. Efficiency gains: Reviewing the numerous forms for the clearance process and streamlining them into one form to reduce duplication in reporting. Editing and writing skills: The editor position was advertised. As the Center has continual need for writers and editors, names solicited and standard editing and writing test given to each person. Key information such as availability and costs also recorded. A list of editors now developed with clear understanding of each person's strengths and limitations. A temporary programmer employed to assist with automation of library services. A temporary assistant employed to clear backlog of publication orders. An electronic forum developed via the web for *Fish for All* issues. *Fish for All*: A logo and imagery developed. Text prepared and standardized on how to describe the initiative and the Summit. Background concept paper prepared with an external writer. Assistance given with the planning and coordination of the *Fish for All* activities. New WorldFish entity launched, with new logo, on 3 November 2002 and transition strategy adopted in interim. The 25th anniversary celebrations: The 25th anniversary book preparation was managed. Assistance with sponsorship activities given and display ideas created. Fund raising: Contributed input to the fundraising committee focusing on large donations that can really make a difference to the "impact" of the Center. Strategic marketing: Contributed to task force for the Strategic Marketing Plan development. Contributed to the e-mail discussions on CGIAR system public awareness and resource management for Community of Practice.

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Communications Unit (CU)	WorldFish Center core funds	ongoing		Responded to requests for producing publications in shorter time. Developed shortlist of reliable editors. Completed publications in collaboration with partner organizations. Exchanged publications with partner organizations. Produced Operational Plan 2002; Medium-Term Plan 2002-2004; Annual Report 2001; two issues of *NAGA*; one Conference Proceedings; one Technical Report; six issues of Fish Tales; one issue of Co-Management newsletter. Readership survey and re-registration of subscribers included in *NAGA* Vol. 25, No. 3. Editorial assistance provided in-house or outsourced for printed and electronic publications. Publication assistance provided in-house or outsourced. Mailing list updated. The Unit works with projects to identify key target groups. Publications produced in 2002 available as full-text on Center's website. Coordinated translation of publications and prepared various presentations, posters, and folders for public awareness activities. Coordinated the translation of "Genetic improvement of tilapia for Africa at the WorldFish Center", a report to donor, from Japanese to English. Designed the Center logo.Planning a new set of corporate items – print and electronic copies. Designed the 25th anniversary logo and *Fish for All* logo. Assisting in design of *Fish for All* webpages. 2003 calendar was developed with the sponsorship of DFID, featuring and promoting fish issues.

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Library and Information Services Unit (LISU)	WorldFish Center core funds	ongoing		The InMagic library software was installed and a one-week training course conducted. All databases now on internet and updated monthly. Software also keeps track of borrowers, inter-library loan requests, route serials, and streamlines book-buying. Books being bar-coded. Information section of *NAGA*: Four hundred bibliographic entries indexed and provided for the January-March and April-June issues of *NAGA* including comprehensive indexes (subject, taxonomic and geographic). Fifty selected websites on fisheries, aquaculture and marine resources management provided for the issues. Acquisitions list: Five electronic issues of New Acquisitions prepared and disseminated to all Center staff and names on a mailing list. Collection: In 2002, 372 books added to the collection, bringing the total to 15 453. 57 subscribed journals renewed, 12 of which are online subscriptions. Inter-library loan service: A total of 318 requests were processed, of which 227 were fulfilled. Technical information and reference services provided to 3 315 on-site users and visitors. Briefings on library and information services provided to new Center staff, workshop participants and visitors. Borrowing: Center staff borrowed 770 books/journals. The number of materials used in the library was 1 958. Circulated 247 media alerts to Center headquarters staff. External Information Service: ISU responded to 154 requests, out of which 120 requests were from developing countries. Continuous effort being conducted through WorldFish gift and exchange program, responding to document delivery and information requests, and sending out duplicates to libraries in developing countries. CG InfoFinder: 110 electronic documents indexed for the InfoFinder. The CG Library Group currently working on joint journal subscription;

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LISU continued				joint catalogue of CGIAR library holdings; and a CGIAR image library. The group is working with its FAO counterparts on subject tree. A web-based Table of Contents (TOC) service introduced in July 2002. As ASFA contributing partner, Center receives internet version of ASFA, accessible throughout the Center. Subscription to *AGRIVISTA's eCAB*, electronic database that covers the most comprehensive source of international agricultural and applied life sciences literature. This is now accessible via IP addresses. Subscription to 12 online journals activated via IP addresses in January 2002. Website: Revised and updated in March. A virtual library was included. The Manager attended ASFA training course held during 24-28 June 2002 at FAO headquarters, Rome. To date, 251 records sent to the ASFA publishing partner for inclusion in its database.
ECommunications Unit	WorldFish Center core funds	ongoing		Website updating plan introduced, with selected content providers to maintain timeliness of web page contents and facilitate web publishing schedule. Program Leader's clearance and editing provide better quality assurance to information disseminated. Two databases developed to facilitate operation of web publishing: web job request database and web assets registration database. Three databases in the Center, the International Partnership Database, Information and Communication Database and Donors Database, being integrated into a central database with a web interface. With secure log-in and search features, users will be able to generate reports from web database. System available online and in the data-inputting stage. Developed *Fish for All* global initiative website. Relevant project websites updated for targeted audience of donors and partners. Selected previously published Center publications available in electronic format on the website, including the Strategic Plan, Operational Plans, *NAGA* and scientific publications. User-friendly

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				web features like search engine implemented. An electronic enquiry form developed for website for online enquiry and feedback suggestions. An e-forum message board developed for website to invite participation from the public for online discussions.
Public Awareness Unit (PAU)	WorldFish Center core funds	ongoing		Center's scientific views on biotechnology issues featured in Malaysian newspapers. The *Fish for All* Summit widely published in the Malaysian media(23 articles), international media and online wire services. Issues raised by speakers at the Summit widely taken up by the media. Summit reported in at least 10 languages internationally. Translated information given to vernacular newspapers boosted coverage in those languages. Media relationship building with journalists in the English, Bahasa Malaysia and Chinese print and broadcast media in Malaysia ongoing through proactive timely release of scientific information, and discussions on stories with individual journalists. Radio interviews arranged through Wrenmedia, a DFID/CG project, and information was disseminated to radio stations worldwide. Assisted in development of corporate section of exhibition for the Biotechnology Exhibition in Kuala Lumpur. News coverage and feature stories written for "Reefs at Risk in Southeast Asia". A media conference conducted in conjunction with a "Millenium Ecosystem Assesment" board meet event in Kuala Lumpur. An opinion editorial based on the *Fish for All* Summit was featured in the *Bangkok Post* in Thailand.

International Relations and Partnerships (IRP)

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
International Partnerships	WorldFish Center core funds	Ongoing since 1996	National, regional and international research institutions and non-governmental organizations.	Developed new collaborations and strengthened partnerships through organization of meetings with the NARS partners (China, Malaysia and the Philippines); participation in regional/global fora (such as NACA, AFS). Held meeting with the Philippines NARS and identified areas and institutions for collaboration; meeting with Bangladesh NARS rescheduled for 2003. The Center organized 3rd GoFAR meeting in November 2002, in conjunction with *Fish for All* Summit. The Center hosted Asia-Pacific Association of Agricultural Research Institutions (APAARI) Expert Consultation; and interactions with FAO, MRC, NACA, SEAFDEC, among others, on various activities.
International Network on Genetics in Aquaculture (INGA)	Government of Norway; WorldFish Center core funds; IDRC	Ongoing since 1993	International/Regional: Southeast Asian Fisheries Development Center (SEAFDEC) Aquaculture Department; Food and Agriculture Organization of the United Nations (FAO) Bangladesh: Bangladesh Fisheries Research Institute (FRI) China: Shanghai Fisheries University; Freshwater Fisheries Research Centre (FFRC) Côte d'Ivoire: Centre National de Recherche Agronomique (CNRA) Egypt: Central Laboratory for Aquaculture Research (CLAR) Fiji: Ministry of Agriculture, Fisheries and Forestry Ghana: Water Research Institute India: Central Institute of Freshwater Aquaculture (CIFA); National Bureau of Fish Genetic Resources (NBFGR); University of Agricultural Sciences (UAS) Indonesia: Research Institute for Freshwater Fisheries (RIFF) Malawi: University of Malawi; National Aquaculture Center Malaysia: Universiti Malaya; Department of Fisheries The Philippines: Bureau of Fisheries and Aquatic Resources	Organized 3-week training course on quantitative genetics in aquaculture for 28 geneticists from 12 INGA member countries. National breeding programs reviewed; breeding programs have progressed in member countries as evidenced by development of more improved carp and tilapia breeds. Continued coordinating exchanges of fish germplasm using Material Transfer Agreement and INGA protocol for transfer. A total of 49 shipments of tilapia and carp have taken place through the network. Preliminary arrangements made with the Government of Bangladesh for co-hosting the 7th INGA Steering Committee meeting in April 2003. "Expert Consultation on Strategies and Plans for Dissemination of Improved Fish Breeds" convened in Thailand in June 2002. Follow-up action in progress based on recommendations. Discussions held with INGA members and genetics resource conservation experts for a workshop on "Ecological Risk Assessment" scheduled for April 2003 in Bangladesh; preparation of background document in progress.

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
			(BFAR); Freshwater Aquaculture Center/Central Luzon State University (FAC/CLSU); GIFT Foundation International Inc. Thailand: National Aquaculture Genetics Research Institute (NAGRI) Vietnam: Research Institute for Aquaculture (RIA) No. 1; Research Institute for Aquaculture (RIA) No. 2 Australia: Queensland University of Technology; Deakin University Hungary: Fish Culture Research Institute Israel: Agricultural Research Organization Japan: National Research Institute of Aquaculture The Netherlands: Wageningen Agricultural University Norway: Institute of Aquaculture Research Ltd. USA: Auburn University UK: University of Wales Swansea; University of Stirling	
Network of Tropical Aquaculture and Fisheries Professionals (NTAFP)	WorldFish Center core funds		Various	Two issues of Aquabyte and Fishbyte sections published in *NAGA*, during 2002.
Development and Implications of Public-private Partnerships in Fish Genetic Research: the Philippines Experience	IDRC		The Philippines: National Freshwater Fisheries Technology Center/Bureau of Fisheries and Aquatic Resources; Freshwater Aquaculture Center, Central Luzon State University; GIFT Foundation International Inc.	Planning workshop was held in November 2002 to discuss and finalize methodologies, workplans, and implementation arrangements. Discussions were held among partners in preparation of field questionnaire surveys; gathering of secondary data initiated.

Africa and West Asia (ODDG-AWA)

TITLE	SOURCE OF FUNDS	DURATION	RESEARCH PARTNERS	MILESTONES ACHIEVED IN 2002
Office of the DDG-AWA	WorldFish Restricted core (Government of Egypt; Government of Japan; USAID); DFID; USAID	Ongoing since January 1997	Egypt: Agriculture Research Center, General Authority for Fisheries Resources Development, Ministry of Agriculture; Multi-Sector Support Program Cameroun: Institut de Recherche Agricole pour le Dévelopement de Cameroun (IRAD); Ministère de l` Elévage, des Pêches et des Industries Animales de Cameroun (MINEPIA); Malawi: Department of Fisheries. Regional: Ministries of Fisheries and/or Natural Resources, and research institutions in Zambia, Kenya, Tanzania, Ethiopia, Mozambique, South Africa, Côte d` Ivoire, Ghana, Nigeria, Kuwait, Jordan, UAE and Oman; SADC, LVFO, AOAD, Arab Fund, FAO, PERSGA, IUCN, IITA, IWMI.	The program development process pursued in 2001 has continued over the course of 2002 with specific areas for collaboration discussed with partners in Mozambique, Zambia, Malawi, Ethiopia, Cameroon, Nigeria, Ghana, Kuwait, Jordan and Oman. These have focused on the management of river and lake fisheries, the development of small-scale aquaculture, the use of small water bodies to enhance fish production, and supply and demand of fish products. Detailed project proposals are now under development.
Training Activities for Africa and West Asia	Multi-Sector Support Programme (Egypt); FAO Regional Office; Arab Organization for Agricultural Development (AOAD); ICLARM restricted core	Ongoing since January 1999	International: FAO, Regional Office for the Near East Regional: Arab Organization for Agricultural Development (AOAD) Egypt: Multi-Sector Support Programme (MSSP);	One national training course held on nutrition (with MSSP); four local field days held with fish farmers reporting on results of field research (with MSSP); one regional training course on tilapia farming (with FAO); one regional training course on environmentally sound coastal aquaculture and fisheries (with FAO)

Workshops

The WorldFish Center conducted or was involved in the following workshops during 2002.

EVENT/TOPIC/DATE	LOCATION	NUMBER OF PARTICIPANTS	PARTICIPATING COUNTRIES/ INSTITUTIONS	RESOURCES AND COLLABORATIVE SUPPORT
DSAP Workshop of Year 2001 Stakeholders 21 January 2002	Dhaka, Bangladesh	>40	local NGOs, USAID	DSAP-USAID
Stakeholders workshop 4-9 February 2002	Youndé, Cameroon	111	local farmers' organizations, NGOs, IRAD, MINEPIA	IAA Cameroon-DFID Project
Population Interdependencies in the South China Sea Ecosystem (PISCES) Project, Phase II, Inception Workshop 19-20 February 2002	Research Institute for Aquaculture No. 3, Nha Trang, Vietnam	18	Indonesia, Malaysia, the Philippines, Taiwan, Thailand, Vietnam	Funding from International Coral Reef Action Network and WorldFish Center core funds
Expert consultation on Biosafety and Environmental Impact of Genetic Enhancement and Introduction of Tilapia strains/Alien Species in Africa 20-23 February 2002	Nairobi, Kenya	44	Belgium, Cameroon, Cote d'Ivoire, France, Ghana, Kenya, Malawi, Nigeria, the Philippines, South Africa, Tanzania, Uganda, UK, USA, Zambia, ACTS, CBD, CTA, FAO, ILRI, IUCN, WorldFish	CTA, FAO, IUCN, WorldFish
DSAP Selection Workshop for New NGOs 28 February 2002	Dhaka, Bangladesh	>50	local NGOs	DSAP-USAID
National Project Mid-term Workshop (Wetlands Project) 5-7 March 2002	Savannakhet, Lao PDR	22	Lao Working Group, Mukdahan and Savannakhet, DLF, LNMC, LARREC, AIT, SIDA	RDC
Provincial Workshop on Wetlands Project to report results from provincial working groups and set targets for the coming period 21-23 March 2002	Ben Tre Province and Ho Chi Minh City, Vietnam	18	Vietnam working group, Provincial representatives, VAF, Sub-Fipi VAF	
Integrating Lesson on Institutional Analysis and Governance Across Projects 11 March 2002	WorldFish Center Headquarters, Penang, Malaysia	19	CNRS Bangladesh, WorldFish Center Malaysia, UPV Philippines, CORIN Thailand	
Provincial Workshop on Wetlands Project to report results from provincial working groups and set targets for the coming period 13-29 March 2002	Strung Treng, Cambodia	16	Local administration, local NGOs	DOF, IUCN, WI, MRC
Wetlands Inventory Workshop, Phnom Penh, Cambodia 8-9 April 2002	Phnom Penh, Cambodia	35	Various institutions involved in "Wetlands" in Cambodia	Wetlands International, MRC
CBFM-South and Southeast Asia (CBFM-SSEA) Inception Workshop for project partners 18-26 April 2002	Dhaka, Bangladesh	32	Bangladesh, Vietnam	CBFM-SSEA

EVENT/TOPIC/DATE	LOCATION	NUMBER OF PARTICIPANTS	PARTICIPATING COUNTRIES/ INSTITUTIONS	RESOURCES AND COLLABORATIVE SUPPORT
AARM Advisory Group Workshop 29-30 April 2002	Bangkok, Thailand	11	Advisors connected to AIT AARM	AIT AARM
Inception Workshop on Community Based Fisheries Management Project Phase 2 12 May 2002	Dhaka, Bangladesh	120	Bangladesh	CBFM-2, DOF, DFID
Basin Development Plan Inception Workshop 13-15 May 2002	Ho Chi Minh City, Vietnam	100	Vietnam	MRC
Planning workshop for the Challenge Program: Increasing Productivity in the Coastal Zone 3-4 June 2002	WorldFish Center Headquarters, Penang, Malaysia	22	Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Vietnam	Funding from WorldFish Center unrestricted core funds. Travel by collaborators.
Expert Consultation on Development of Strategies and Plans for Dissemination of Improved Breeds 4-7 June 2002	Bangkok, Thailand	43	Australia, Bangladesh, P.R.China, Cote d'Ivoire, Egypt, Fiji, Hungary, Indonesia, India, Malawi, Malaysia, the Philippines, Thailand, UK, USA, Vietnam, AIT, EMBRAPA, FAO, NACA, SEAFDEC-AQD, WorldFish	NORAD, WorldFish
Workshop on Accelerating Poverty Elimination through Sustainable Resource Management in Coastal Lands Protected from Salinity Intrusion 25-28 June 2002	Bac Lieu, Vietnam	25	Vietnam	MF-VN
Biodiversity, Management and Utilization of West African Fishes Conference 2-4 July 2002	Accra, Ghana	42	14 African, European and Asian countries	Supported by GTZ, Germany; organized in collaboration with WRI, Ghana
ALARD workshop 8-9 July 2002	Vientiane, Lao PDR	10	Collaborating partners to DLF in the Lao PDR	AIT, NACA, DLF
WWF Workshop on Blue Vision for Pulau Langkawi 16-17 July 2002	Pulau Langkawi, Penang, Malaysia	60	DOF Malaysia, WWF Malaysia, LADA Malaysia, Malaysian Nature Society	WWF International, DOF Malaysia, LADA Malaysia, WorldFish Center
Workshop on Participatory Action Plan Development, Livelihoods Assessment and Livelihoods PRA for CBFM – SSEA project July 2002	Dhaka, Bangladesh	60	Local partners	CBFM-SSEA-IFAD
Learning Workshop and Partners Meeting on Mekong Learning Initiative Project 4-10 August 2002	Can Tho, Vietnam	40	Cambodia, the Lao PDR, Vietnam	MLI-OXFAM

EVENT/TOPIC/DATE	LOCATION	NUMBER OF PARTICIPANTS	PARTICIPATING COUNTRIES/ INSTITUTIONS	RESOURCES AND COLLABORATIVE SUPPORT
Cambodia National Project Planning Workshop 8-10 August 2002	Siem Reap, Cambodia	16	Local administrations from three province and Phnom Penh	MRC, AIT, IUCN, WI
Open day for farmers at the research station to view experiment results on nitrogen retention in IAA (maize-next-to-pond) systems 19 September 2002	Domasi, Malawi	110	Local farmers	Rockefeller Foundation African Career Awards; WorldFish Center
Reefs at Risk at the Caribbean Threat Assessment Workshop 22-24 October 2002	Miami, USA	35	Local NGOs, Mexico, Washington DC, USA, WorldFish Malaysia, INVEMAR Colombia, United Kingdom, Belize, Virginia, Jamaica, Bermuda, St. Lucia, NRM CERMES Barbados, Virgin Islands, Puerto Rico	International Coral Reef Action Network, World Resources Institute, NCORE from Univ. of Miami
Fish to 2020: Implications of Global Fish Outlook for Developing Countries Workshop 2 November 2002	WorldFish Center Headquarters, Penang, Malaysia	67	Australia, Bangladesh, Cambodia, Canada, P.R.China, Fiji, India, Indonesia, the Lao PDR, Malaysia, Malawi, Mozambique, Nigeria, Papua New Guinea, the Philippines, Scotland, Thailand, US, Vietnam	ACIAR, CIDA, WorldFish Center, IFPRI, OXFAM America, FAO, INFOFISH, SEAFDEC, NACA
Fish for All Summit 3 November 2002	WorldFish Center Headquarters, Penang, Malaysia	350	Scientists, planners, administrators.	WorldFish
Third Meeting of Asia-Pacific Group of Fisheries and Aquatic Research (GoFAR) 4 November 2002	WorldFish Center Headquarters, Penang, Malaysia	36	Cambodia, P.R.China, Fiji, India, Indonesia, Iran, South Korea, the Lao PDR, Malaysia, Nepal, Pakistan, Papua New Guinea, the Philippines, Samoa, Sri Lanka, Thailand, Vietnam, FAO, NACA, SEAFDEC, SIFR, WorldFish	AusAID, APAARI, WorldFish
Understanding Livelihoods Dependent on Inland Fisheries in Bangladesh and South East Asia Workshop 11-14 November 2002	WorldFish Center Headquarters, Penang, Malaysia	13	Bangladesh Center for Advanced Studies (BCAS), DOF Cambodia, the Lao PDR (LARREC), Durham University UK, Oxfam America, OXFAM UK, Aid Interns (at DOF), Imperial College UK, MRAG Ltd. UK, Can Tho University Vietnam, An Giang University Vietnam, Living Aquatic Resources Research Center, Mekong River Commission (MRC)	DFID
Planning Workshop on Public-Private Partnerships in Fish Genetic Research: Philippine Experience, 12-13 November 2002	Pampanga, Philippines	16	The Philippines	IDRC, NORAD
DSAP Workshop of Year 2002 Stakeholders, 18-19 Dec 2002	Dhaka, Bangladesh	>70	local NGOs, BFRI	DSAP-USAID, BFRI

Training Courses

The WorldFish Center conducted or was involved in the following training courses during 2002.

EVENT/TOPIC/DATE	LOCATION	NUMBER OF PARTICIPANTS	PARTICIPATING COUNTRIES/ INSTITUTIONS	RESOURCES AND COLLABORATIVE SUPPORT
Case studies and implementation of integrated agriculture-aquaculture in Southeast Asia and Africa 15-18 February 2002	Hohenheim, Germany	13	Hohenheim University (11 students from developing countries in Africa and Asia)	World Fish Center; U. of Hohenheim
Follow-up #3 (for 2001 recruited partner NGO staff) 2-4 March 2002	Bogra, Bangladesh	20	local NGOs	DSAP-USAID
Follow-up #3 (for 2001 recruited partner NGO staff) 9-11 March 2002	Jessore, Bangladesh	25	local NGOs	DSAP-USAID
Training on Applications of nutritional principles and practices in various farming systems 10-14 March 2002	WorldFish Center, Abbassa	16	Egypt	MSSP
Follow-up #3 (for 2001 recruited partner NGO staff) 12-14 March 2002	Mymensingh, Bangladesh	25	local NGOs	DSAP-USAID
Foundation training (for 2002 recruited partner NGO staff) 7-10 April 2002	Jessore, Bangladesh	35	local NGOs	DSAP-USAID
Foundation training (for 2002 recruited partner NGO staff) 20-23 April 2002	Mymensingh, Bangladesh	40	local NGOs	DSAP-USAID
Intensive training course on tilapia in aquaculture 21 April - 2 May 2002	WorldFish Center, Abbassa	5	Jordan (1); Lebanon (2); Palestine (2)	FAO-Near East
The Module Developers' Write-Shop and Training of Trainers for Coastal Management Training Program (CMTP) - Indonesia 22-29 April 2002	IRRI College, Laguna, Philippines	11	Indonesia	Organized by the Broad-based Coastal Management Training Program-Philippines (BCMTP-Philippines), headed by WorldFish Center, in collaboration with PCAMRD, DA-BFAR, DENR-CEP and Haribon Foundation
Foundation training (for 2002 recruited partner NGO staff) 27-30 April 2002	Pabna, Bangladesh	41	local NGOs	DSAP-USAID
Quantitative Genetics and its Application to fish improvement 1-5 May 2002	Abassa, Egypt	16	Côte d'Ivoire, Egypt, Ghana, Malawi, Malaysia, Nigeria, South Africa	Resource persons: WorldFish and supported by United Nations Development Programmes (UNDP)

EVENT/TOPIC/DATE	LOCATION	NUMBER OF PARTICIPANTS	PARTICIPATING COUNTRIES/ INSTITUTIONS	RESOURCES AND COLLABORATIVE SUPPORT
African catfish natural spawning techniques for fish farmers 2-4 June 2002	Abbassa, Egypt	6	Local fish farmers	WorldFish Center; Egyptian Fish Farmers Association
Follow-up #1 (for 2002 recruited partner NGO staff) 8-11 June 2002	Savar, Bangladesh	41	local NGOs	DSAP-USAID
Follow-up #1 (for 2002 recruited partner NGO staff) 11-13 June 2002	Jessore, Bangladesh	30	local NGOs	DSAP-USAID
RESTORE training course 8-18 June 2002	Dhaka, Bangladesh	14	local NGOs, BAU	DSAP-USAID
Foundation training (for 2002 recruited associate partner NGO staff) 14-17 June 2002	Jessore, Bangladesh	18	local NGOs	DSAP-USAID
Foundation training (for 2002 recruited associate partner NGO staff) 23-26 June 2002	Savar, Bangladesh	39	local NGOs	DSAP-USAID
Financial management for partner NGOs 25 June 2002	Dhaka, Bangladesh	31	local NGOs	DSAP-USAID
Financial management for partner NGOs 30 June 2002	Chapai Nawabganj,	27	local NGOs	DSAP-USAID
Follow-up #1 (for 2002 recruited partner NGO staff) 30 June-3 July 2002	Bangladesh	39	local NGOs	DSAP-USAID
Quantitative Genetics and its Application to Aquaculture 1-21 July 2002	Pabna, Bangladesh	28	Bangladesh, P.R. China, Ghana, Egypt, Fiji, Hungary, Indonesia, India, Malawi, Malaysia, the Philippines, Thailand, Vietnam, GFII	NORAD, WorldFish
Participatory Rural Appraisal training course 9-15 July 2002	Bangkok, Thailand	15	DSAP staff	PromPt (local NGO)
GIFT seed production training 11 July 2002	Dhaka, Bangladesh	18	local NGOs, DSAP staff	Dr. B. Barman
Aquaculture training for Imams, foundation training 17-18 July 2002	Dhaka, Bangladesh	100	local Imams	DSAP-USAID

EVENT/TOPIC/DATE	LOCATION	NUMBER OF PARTICIPANTS	PARTICIPATING COUNTRIES/ INSTITUTIONS	RESOURCES AND COLLABORATIVE SUPPORT
Aquaculture training for Imams, foundation training 23-24 July 2002	Khulna, Bangladesh	102	local Imams	DSAP-USAID
Foundation training (for 2002 recruited associate partner NGO staff) 8-11 September 2002	Barisal, Bangladesh	33	local NGOs	DSAP-USAID
Follow-up training #1 (for 2001 recruited associate partner NGO staff) 14-17 September 2002	Mymensingh, Bangladesh	21	local NGOs	DSAP-USAID
Environmentally friendly aquaculture and fisheries 15-17 September 2002	Hurghada, Egypt	40	Bahrain, Djibouti, Egypt, Iran, Kuwait, Oman, Saudi Arabia, Somalia, Sudan, Syria, Yemen	FAO-Near East; PERSGA; ROPME; WorldFish Center; Policy Reform Project
Follow-up training #1 (for 2001 recruited associate partner NGO staff) 22-25 September 2002	Jessore, Bangladesh	29	local NGOs	DSAP-USAID
Small-scale credit needs workshop 8-10 October 2002	Yaoundé, Cameroon	73	IRAD, MINEPIA, NGOs, local banks	IAA Cameroon-DFID Project
Third Training on Quantitative Genetics and its application to Aquaculture 1-20 October 2002	Pathumthani, Thailand	29	Bangladesh, P.R. China, Egypt, Fiji, Ghana, India, Indonesia, Malawi, Malaysia, the Philippines, Thailand, Vietnam	Resource persons: WorldFish and supported by NORAD
Population Genetics Applications in Fisheries Management 8-18 October 2002	WorldFish Center Headquarters, Penang	26	Indonesia, Malaysia, the Philippines, Taiwan, Thailand, Vietnam,	Supported by International Coral Reef Action Network and WorldFish Center core funds.Collaborators are: Academia Sinica, Taiwan; Aquatic Resources Institute, Thailand; CSIRO Tasmania, Australia; United Nations Environment Programme, South China Sea Project and UP Marine Science Institute
Principles of Integrated Agriculture Aquaculture (IAA) and participatory research and development 15-26 October 2002	Domasi, Malawi	10	DOF, local NGOs	USAID-OFDA; OXFAM-Malawi; World Vision International-Malawi; Action Aid-Malawi; Canadian Physicians for Aid and Relief.
Integrated Aquaculture 26 October-3 November 2002	Alage, Ethiopia	14	NARS	Ethiopian Federal Ministry of Agriculture

EVENT/TOPIC/DATE	LOCATION	NUMBER OF PARTICIPANTS	PARTICIPATING COUNTRIES/ INSTITUTIONS	RESOURCES AND COLLABORATIVE SUPPORT
Participatory Rural Appraisal training (for 2001 and 2002 recruited partner NGO staff) 16-21 November 2002	Jessore, Bangladesh	29	local NGOs	PromPt (local NGO)
Training on Fisheries Co-management 18-22 November 2002	WorldFish Center Headquarters, Penang	42	National Aquatic Resources Research Development Agency Sri Lanka, Ceylon Fisheries Corporation Sri Lanka, DOF and Aquatic Resources Sri Lanka, DOF Sri Lanka, Ceylon Fishery Harbour Corp. Sri Lanka, Sri Lanka National Aquaculture Dev. Authority, Ministry of Fisheries and Ocean Resources Sri Lanka, DOF Bangladesh, Ministry of Land Bangladesh, Central Marine Fisheries Research Institute India, MRC Lao PDR, Pakse Southern Agricultural College, the Lao PDR, DOF Malaysia, Marine Institute of Malaysia, Fisheries Dev. Authority of Malaysia, Dept. of Agriculture Sarawak East Malaysia, WorldFish Center, Dept. of Fisheries and Natural Resources Mgmt., Vietnam, Community Fisheries Dev. Office Cambodia, DOF Cambodia, UPV Philippines, Kenya Marine and Fisheries Research Institute, Ministry of Marine Affairs and Fisheries Indonesia, SEAMEO Regional Center for Graduate Study and Research in Agriculture, the Philippines	
The Module Developers' Write-Shop and Training of Trainers (TOT) for the Coastal Management Training Program (CMTP) - Vietnam 18-25 November 2002	IRRI College, Laguna, Philippines	11	Vietnam	Dr. Rafael D. Guerrero III, Executive Director of the Philippine Council for Aquatic and Marine Research and Development delivered the opening remarks
Participatory Rural Appraisal training (for 2001 and 2002 recruited partner NGO staff) 23-28 November 2002	Jessore, Bangladesh	12	local NGOs	PromPt (local NGO)
Participatory Rural Appraisal training (for 2001 and 2002 recruited partner NGO staff) 23-28 November 2002	Comilla, Bangladesh	15	local NGOs	PromPt (local NGO)
Participatory Rural Appraisal training (for 2001 and 2002 recruited partner NGO staff) 28 December 2002 - 2 January 2003	Bogra, Bangladesh	29	local NGOs	PromPt (local NGO)

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Financial Summary

The 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. The 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 2002 was US$12.60 million, about the same level of income as in 2001, US$12.56 million. This income was distributed as follows (in millions)

TOTAL INCOME	
Unrestricted	US$ 6.05
Restricted	US$ 6.45
Other Income	US$ 0.10

The Statement of the Financial Position, the Statement of Activities and the Statement of Cash Flows summarize the WorldFish Center's finances in 2002. These Financial Statements are presented below. A complete, audited financial statement by Ernst & Young is published separately and can be requested from the Associate Director General.

Statement of Financial Position

DECEMBER 31
(US Dollar '000)

	Note	Total 2002	2001
ASSETS			
CURRENT ASSETS			
Cash and cash equivalents	3	8,932	7,515
Accounts receivable			
Donors	4	3,700	3,012
Employees		114	193
Others	5	1,765	1,537
Inventories		2	4
Other current assets	6	2,443	2,434
TOTAL CURRENT ASSETS		**16,956**	**14,695**
PROPERTY AND EQUIPMENT, net	7	356	337
OTHER ASSETS	8	325	320
TOTAL ASSETS		**17,637**	**15,352**

DECEMBER 31
(US Dollar '000)

	Note	Total 2002	2001
LIABILITIES AND NET ASSETS			
CURRENT LIABILITIES			
Accounts payable			
Donors	9	3,590	2,979
Employees	10	79	137
Others	11	896	401
Funds in trust	12	858	735
Accruals and provisions	13	2,715	2,634
TOTAL CURRENT LIABILITIES		**8,138**	**6,886**
LONG-TERM LIABILITIES			
Accounts payable - Employees	14	501	478
TOTAL LIABILITIES		**8,639**	**7,364**
UNRESTRICTED NET ASSETS			
Appropriated	15	1,994	1,302
Unappropriated		7,004	6,686
TOTAL NET ASSETS		**8,998**	**7,988**
TOTAL LIABILITIES AND NET ASSETS		**17,637**	**15,352**

FUNDING BY CGIAR UNDERTAKING:	%	US$ MILLION
Increasing Productivity	18%	2.20
Protecting the Environment	41%	5.08
Saving Biodiversity	1%	0.09
Improving Policies	28%	3.46
Strengthening National Research Systems	12%	1.45
TOTAL	**100%**	**12.28**

FUNDING BY WORLDFISH CENTER PROJECT THRUSTS (US$ MILLION)	2002 ACTUAL
Conservation of Aquatic Biodiversity	1.22
Mitigation of Adverse Impact of Alien Species on Aquatic Biodiversity (New Emphasis)	0.23
Genetic Improvement and Breeding	0.50
Strategies and Options for Realizing Gains from Sustainable Freshwater Aquaculture Systems	2.62
Freshwater Fisheries in an Integrated Land and Water Management Context (New Emphasis)	0.48
Increased and Sustained Coastal Fisheries Production (Redefined)	1.61
Restoration and Protection of Coastal Habitats (Redefined)	0.38
Knowledge Bases and Training for Improved Management of Coastal Resources (Redefined)	0.70
Economic, Policy and Social Analysis and Valuation of Aquatic Resources in Developing Countries	0.87
Aquatic Resources Planning and Impact Assessment	0.54
Legal and Institutional Analysis for Aquatic Resources Management	1.91
Improved Partnerships and Capacity Building Among Developing Country NARS (Redefined)	0.64
Access to Information for Sustainable Development of Fisheries and Aquatic Resources (Redefined)	0.58
TOTAL	**12.28**

Statement Of Activities

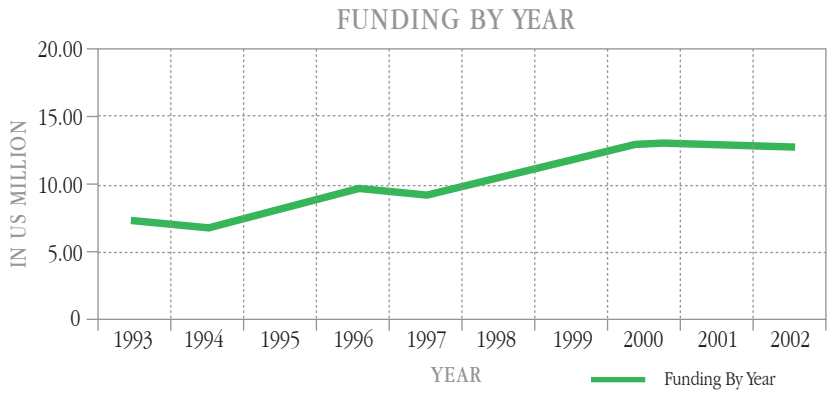
FOR THE YEARS ENDED DECEMBER 31
(US Dollar '000)

	Unrestricted	Permanently Restricted	Total 2002	Total 2001
REVENUES, GAINS AND OTHER SUPPORT				
Grants	6,046	6,446	12,492	12,125
Other revenues	110	-	110	431
Total revenues, gains and other support	**6,156**	**6,446**	**12,602**	**12,556**
EXPENSES AND LOSSES				
Program related expenses	4,200	6,446	10,646	9,026
Management and general expenses	2,263	-	2,263	2,237
General operations	123	-	123	2,638
Total expenses	6,586	6,446	13,032	13,901
Recovery of indirect costs	(748)	-	(748)	(778)
Total expenses and losses	**5,838**	**6,446**	**12,284**	**13,123**
CHANGE IN NET ASSETS	318	-	318	(567)
NET ASSETS				
Beginning of the year	7,988	-	7,988	8,315
Appropriated for acquisition of equipment	692	-	692	240
End of the year	8,998	-	8,998	7,988
MEMO ITEM				
Operating expenses - By natural classification				
Personnel costs	3,604	1,649	5,253	4,608
Supplies and services	1,578	4,302	5,880	7,568
Travel costs	514	495	1,009	854
Depreciation	142	-	142	93
	5,838	**6,446**	**12,284**	**13,123**

Funding by Year, 1993 - 2002

(US Dollar '000)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Funding By Year	7.155	6.80	7.917	9.935	9.390	10.860	11.860	12.874	12.556	12.602
Consists of										
Grant	6,840	6,595	7,776	9,574	9,047	10,548	11,606	12,379	12,125	12,492
Other income	315	205	141	361	343	312	259	495	431	110
	7,155	**6,800**	**7,917**	**9,935**	**9,390**	**10,860**	**11,865**	**12,874**	**12,556**	**12,602**
Grant										
Unrestricted	2,758	3,285	4,293	5,793	5,630	6,772	6,139	7,014	6,346	6,046
Restricted	4,082	3,310	3,483	3,781	3,417	3,776	5,467	5,365	5,779	6,446
	6,840	**6,595**	**7,776**	**9,574**	**9,047**	**10,548**	**11,606**	**12,379**	**12,125**	**12,492**



Funding by CGIAR members (2002)

(US$ millions)

UNRESTRICTED SUPPORT		RESTRICTED SUPPORT	
EUROPE		**EUROPE**	
Belgium	0.09	Denmark	0.04
Denmark	0.52	Germany	0.45
European Comm.	0.98	Norway	0.23
Germany	0.23	Sweden	0.62
Netherlands	0.84	United Kingdom	1.69
Norway	0.33	**NORTH AMERICA**	
Sweden	0.27	USA	1.25
NORTH AMERICA		Canada	0.01
Canada	0.22	**PACIFIC RIM**	
USA	0.67	Australia	0.31
PACIFIC RIM		NZODA	0.13
Australia	0.21	**INTERNATIONAL AND REGIONAL ORGANIZATIONS**	
Japan	0.24	ADB	0.26
DEVELOPING COUNTRIES		IDRC	0.06
Egypt, Arab Republic	0.30	IFAD	0.09
India	0.04	UNDP	0.10
Thailand	0.02	FAO	0.05
Philippines	0.03	World Bank	0.13
China	0.01		
INTERNATIONAL ORGANIZATION			
World Bank	1.05		
SUBTOTAL	**6.05**	**SUBTOTAL**	**5.77**
MEMBERS SUBTOTAL	**11.82**		

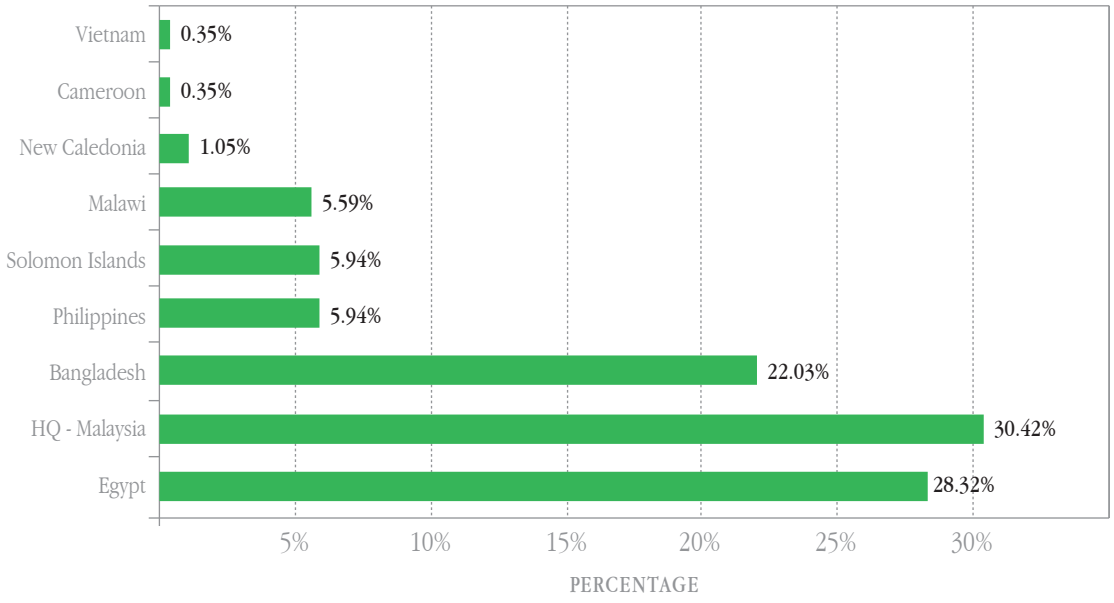
Funding by non-CGIAR members (2002)

(US$ millions)

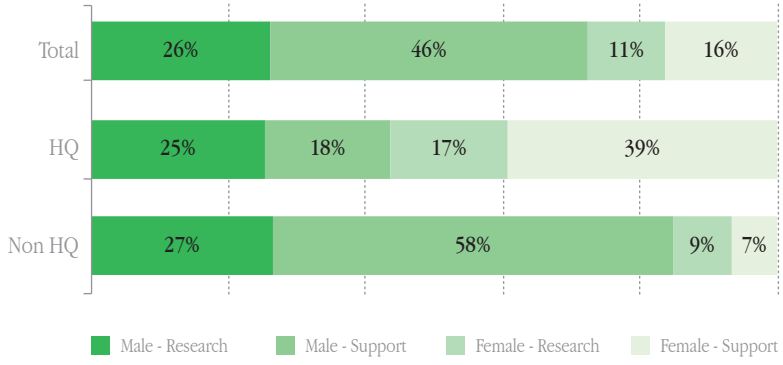
UNRESTRICTED SUPPORT	
MacArthur Foundation	0.14
OxFam America	0.06
Province of New Caledonia	0.08
David & Lucille Packard Foundation	0.11
UNFIP	0.35
CAS	0.08
Others (Multidonors)	0.21
NON-MEMBERS SUBTOTAL	**1.03**
TOTAL FOR MEMBERS & NON-MEMBERS	**12.85**

Staff

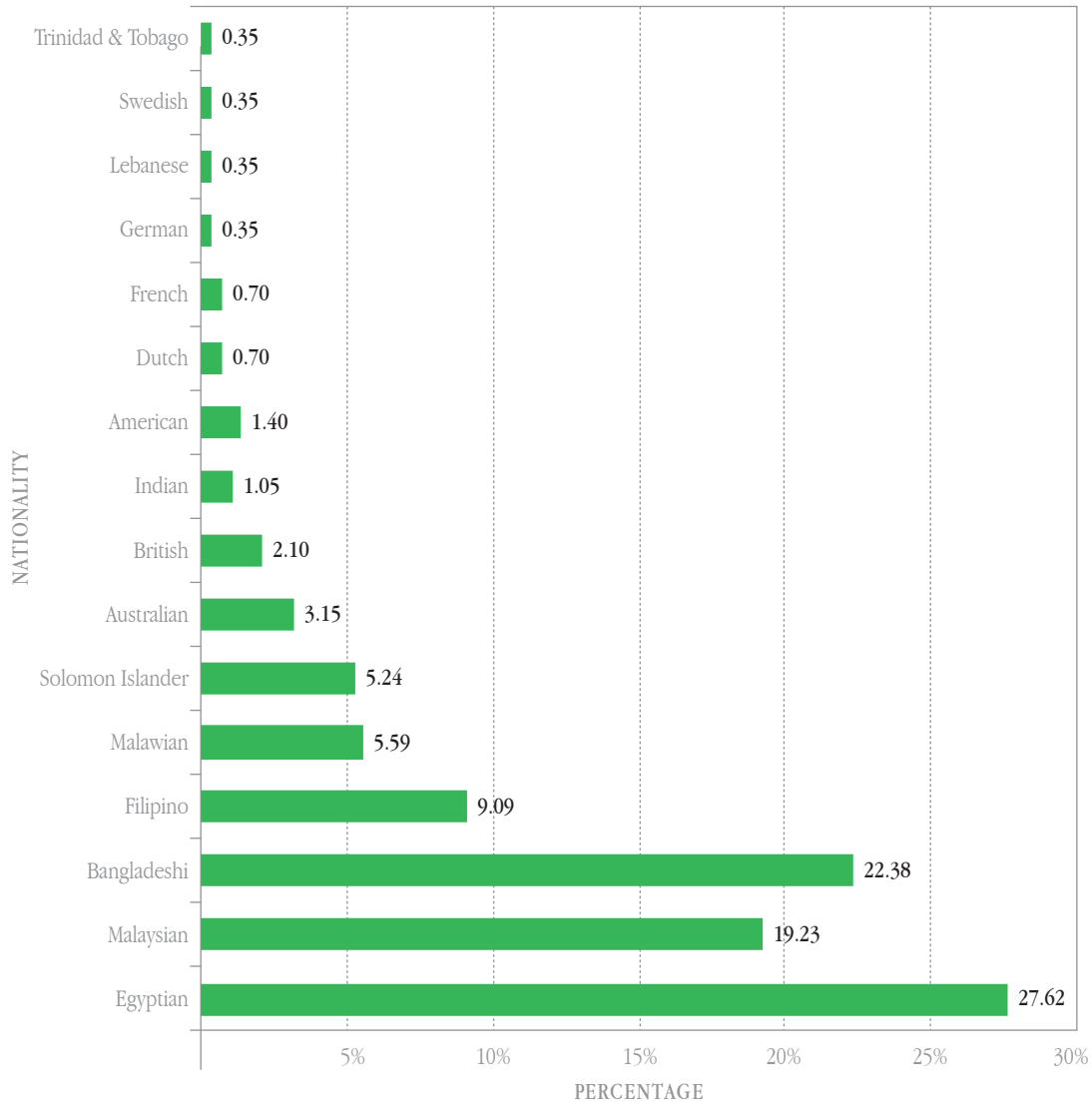
Worldwide Staff Distribution (31 December 2002)



Gender Comparison by Site (31 December 2002)



Staff By Nationality (31 December 2002)



BOARD OF TRUSTEES

Prof. Robert E. Kearney
Board Chair
Prof. Of Fisheries, University of Canberra, Australia

Dr. Linxiu Zhang
Board Vice Chair and Chair, Audit Committee
Deputy Director, Center for Chinese Agricultural Policy, Chinese Academy of Sciences P.R., China

Prof. Katherine Richardson Christensen
Chair, Program Committee
Pro-rector, University of Aarhus, Denmark

Prof. Trond Bjorndal
Chair, Nominating Committee
Imperial College, London, UK

Ms. Joan Joshi
Chair (up to 3/2003)
Independent Management Consultant, USA

Dato' Hashim bin Ahmad
Board Member (Ex-Officio, Malaysia)
Director General, Department of Fisheries, Malaysia

Dr. Meryl J. Williams
Board Member
Director General, WorldFish Center, Malaysia

Dr. Asger Kej
Board Member
Managing Director, DHI Water & Environment, Denmark

Dr. Serge Garcia
FAO Representative
FAO Representative (Ex-Officio), Italy

Prof. Yehia Hassan Khalil
Board Member (Ex-Officio, Egypt)
Head, Food Science Department, Faculty of Agriculture, Ain Shams University, Egypt

Dr. Takeshi Nose
Board Member
Adviser, Japan National Federation of Fisheries, Cooperative Associations, Japan

Dr. Stella Williams
Board Member
Professor, Obafemi Awolowo University, Nigeria

Dr. Aprilani Soegiarto
Board Member (up to 3/2003)
Prof. in Oceanology, Indonesian Institute of Sciences (LIPI), Indonesia

Dr. S. Ayyappan
Deputy Director General (Fisheries)
Indian Council of Agricultural Research, India

STAFF INFORMATION (31 December 2002)

NAME	POSITION
EXECUTIVE OFFICE	
OFFICE OF DG (ODG)	
Williams, Meryl J.	Director General
Choo Poh Sze	Science & Policy Specialist
Tan, Su Ching	Internal Auditor
Maizurah Bt Abdullah	Office Manager
Lim, Cheng Cheok Julie	Senior Secretary
PROJECT DEVELOPMENT AND COORDINATION UNIT (PDCU)	
Gonzalez, Rizalina C.	Manager
OFFICE OF DDG - SCIENCE, QUALITY ASSURANCE AND PROJECT DEVELOPMENT (SQAPD)	
Gardiner, Peter	Deputy Director General - SQAPD
OFFICE OF DDG - Research (ODDGR)	
Teng, Paul S.	Deputy Director General - Research
PROGRAMS	
BIODIVERSITY AND GENETIC RESOURCES RESEARCH (BGRRP)	
Alphis G. Ponniah	Program Leader
Baran, Eric	Research Scientist
Ponzoni, Raul	Geneticist
Gagalac, Florabelle	Assistant Scientist
Norhidayat bin Kamaruzzaman	Research Assistant
Philippines Research Site	
Fabres, Boris	Project Leader / Officer-in-Charge, Philippines
Atanacio, Rachel	Senior Artist
Capuli, Estelita Emily	Research Associate
Casal, Christine Marie	Research Associate
Reyes Jr, Rodolfo	Research Associate
Wee, Jen Sherry	Research Programmer (Web Developer)

Ruis, Ma. Josephine	Senior Research Programmer
Binohlan, Crispina	Senior Research Assistant
Luna, Susan	Senior Research Assistant
Pablico, Grace	Senior Research Assistant
Casten, Lemuel	Artist / Research Assistant
Sampang, Arlene	Research Assistant
Robel, Milagros Irene	Program / Budget Asst.

FRESHWATER RESOURCES RESEARCH (FRRP)

Prein, Mark	Program Leader
Paraguas, Ferdinand	Assistant Scientist

Cameroon Research Site

Brummett, Randal	Senior Aquaculture Scientist

Malawi Research Site

Daniel Matthews Jamu	Project Team Leader/ Officer-in-Charge, Malawi
Emma Vera Kambewa	Socio-Economist
Henry Geoffrey Hunga	Aquaculture Technician
Patience Tinenenji Kananji	Project Assistant
Asafu D.G. Chijere	Technical Assistant
Foster Makuwa	Foreman
Silence Nsonthi	Technical Assistant
Yusuf Fulaye	Office Assistant
Issa Jafali	Field Assistant
George Mwalabu	Field Assistant
Frackson Lifa	Field Assistant
Lackson Maluwa	Field Assistant
Bosco Kalipalire	Field Assistant
Bester Chimbalanga	Watchman
Lackson Pondiya	Watchman
Bwana Chipire	Watchman

Bangladesh Research Site

Janssen, Johannes	Senior Aquaculture Scientist
Md. Ferdous Alam	Field Coordinator/ Researcher
Hasan Ahmmed Chowdhury	Research Associate
Bijoy Bhusan Debnath	Administrative Officer
Khan Golam Rasul	Accounts Officer
Kh. M. Shameem Kamal	Research Assistant
Manuara Azim	Research Assistant
Mohammand Abdul Latif Siddique	Research Assistant
Md. Jahirul Hoque	Research Assistant
Mohammaed Mokhlesur Rahman	Research Assistant
Bijan Majumder	Research Assistant
Md. Abul Kashem	Research Assistant
Mohammand Mamunor Rashid	Research Assistant
Md. Billal Hosain	Data Entry Operator
Md. Abdur Razzak	Driver
Md. Dulal	Driver
Md. Nazrul Islam	Driver
Tapan Chandra Sarker	Messenger

COASTAL AND MARINE RESOURCES RESEARCH (CMRRP)

Bell, Johann	Program Leader
Oliver, James K	Research Scientist
Silvestre, Geronimo	Research Scientist
John Munro	Principal Scientist
Stobutzki, C. Ilona	Fisheries Resources Scientist
Noordeloos, Marco	Reefbase Manager
Ablan-Lagman, Carmen	Assistant Scientist
Garces, Len	Assistant Scientist
Meii Bt Mohamad Norizam	Research Assistant
Nasir Bin Nayan	GIS Assistant
Foo, Kar Keat Calvin	Web Programmer
P. Shamala Shubashini a/p Palaniappan	Research Assistant
Fadhilatul Shahriyah Bt Mohd Shukri	Research Aide
Yusri bin Yusuf	Research Assistant
Leng, Shan Sandra	Program Associate (BGRRP & CMRRP)

Tan, Moi Khim	Database / Web Administrator
Chew, Guat Khim	Program Assistant (CMRRP & BGRRP)

Philippines Research Site

Vergara, Sheila	Senior Research Associate
Glorioso, Joann	Research Assistant (Researcher)
Serrano, Audrey Marie	Senior Research Assistant

Solomon Island Research Site

Idris Lane	Manager / Officer-in-Charge, Solomon Islands
Cletus Oengpepa	Assistant Manager
Cathy Hair	Senior Research Associate
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

Vietnam Research Site

Pitt, Rayner	Scientist / Officer-in-Charge, Vietnam

New Caledonia (SPC)

Nash, Warwick	Senior Scientist / OIC, Sec. of Pacific Community
Purcell, Steven	Ecologist
Danty, Eric	Aquaculture Research Assistant

POLICY RESEARCH & IMPACT ASSESMENT (PRIAP)

Ahmed, Mahfuzuddin	Program Leader
Kuperan, Viswanathan	Research Scientist
Torell, Magnus	Secondment from SIDA
Dey, Madan Mohan	Senior Research Scientist
Sultana, Parvin	Project Scientist
Rab Mohammed A.	Project Scientist (Economist)
Roehlano M. Briones	Post-Doctoral Fellowship (Economics)
Santos, Rowena A.	Assistant Scientist
Vasheela Balakrishnan	Research Assistant
Azmarya Azhar	Program Assistant (FRRP & PRIAP)
Roslina Kamaruddin	Research Assistant
Chong, Chiew Kieok	Research Associate
Tay Puay Kiang	Research Assistant
Ng Li Ping	Program Associate (FRRP & PRIAP)
Jenny Chua Yu Chin	Research Assistant

Bangladesh Research Site

Thompson, Paul	Social Scientist & OIC, Bangladesh
Maksuda Khanam	Computer Operator
Mir Mostaque Ahamed	Extension Officer
Md. Abdur Razzaque	Extension Officer
Md. Nazim Uddin	Extension Officer
Syed Arifuzzaman	Extension Officer
Naseen Ahmed Aleem	Field Coordinator/ Researcher
Chaman Ara Begum	Research Assistant
Md. Khabirul Hasan	Research Assistant
Md. Asadul Hoque	Extension Officer
Md. Shakil Ahmed Khan	Research Assistant
Md. Abu Sayed	Research Assistant

Saiful Islam	Research Assistant
Dr. Md. Matiar Rahman	Training Coordinator
Dr. Golam Mostafa	Fisheries Coordinator
Gazi 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
Md. Delwar Hossain	Secretary
Ms. Leena Razzaque	Accounts Officer
Mr. Arif Hossain	Research Assistant
Habib Ahmed	Research Assistant
Md. Khalilur Rahman	Research Assistant
Md. Mizanur Rahman	Research Assistant
Md. Rayhan Uddin	Computer Operator
Kazi Mazbauddin Ahmed	Field Investigator
Md. Akram Hossain	Field Investigator
Md. Anwar Hossain	Driver
Md. Abdul Karim	Messenger
Md. Nurunnabi	Field Investigator
Md. Abu Taleb Mollah	Field Investigator
Md. Kamrul Islam	Field Investigator
Md. Mirjahan Ali	Field investigator
Sabinoy Chakma	Computer Operator
Mozaffar Ahmed Khan	NGO Coordinator
Md. Mohiuddin	Driver
Md Abubaker Siddique	Research Assistant
Mahadi Hasan	Research Assistant
Md. Idris Ali	Messenger
Md. Abdul Wahab	Messenger
Md. Mahade Hasan Babul	Messenger
R.M.A. Kareem	Office Manger
Hilda Sobita Rozario	Receptionist

INTERNATIONAL RELATIONS OFFICE (IRO)

Gupta, Modadugu	Director - International Relations Office
Acosta, Belen	Assistant Scientist
Norhalida Bt Hashim	Program Assistant

PARTNERSHIPS, INFORMATION & TRAINING (PITP)

Gupta, Modadugu	Program Leader
Kane-Potaka, Joanna	Head - Information & Communications
Kamsiah Mohd Ali	Information & Services Manager
Wong, May Chin Janet	Communication Manager
Ooi, Yook Chu Sabrina	Public Awareness Associate
Loh, Thiam Yoong	E-Communication Coordinator
Tan, Lee Mei Catherine	Graphic Designer
Chew, Bee Leng	Info. & Comm. Asst.
Ang Poon Wei	E-Communication Assistant
Tan, Huck Jin Garrick	Graphic Designer
Junainah Bt Abu Seman	Librarian
Julita Zam Bt Zainal Abidin	Info. & Comm. Asst.

REGIONAL RESEARCH CENTER FOR AFRICA & WEST ASIA

Dugan, Patrick	Deputy Director General -AWA
John, George	Senior Aquaculture Scientist
Abdel Rahaman El-Gamal	Senior Aquaculture Scientist
Mahmoud Ali Rezk	Researcher/Genetics
Ebtehag Abdel-Razek Kamel	Researcher/Genetics
Ahmed Said Deyab	Fish Health Research
Mohamed Yehia Abou Zaid	Research Technician
Yasser Mohamed Abdel Hadi	Research Technician
Diaa Abdel Reheem Kenawy	Research Technician
Tharwat Ismael Dawood	Lab. Technician
Gamal Othman El-Naggar	Research Co-ordinator
Fawzi Mohamed Hassan	Pond Worker
Mohamed Ali Attiatullah Ahmed	Senior Accountant
Essam Abdel Salam Mourad	Accountant/Cashier

Tawfik George Yanni Antoun	Administration and Finance Manager
Ahmed Hassan Dabour	Public Relations & Customs
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. & 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 Alsaid 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
Mohamed Alsaid Abdel-Rahman	Diesel Mechanic
Abdullah Mohamed Abdel-Aal	Diesel Mechanic
Mamdouh Mohamed Deibis	Gasoline Mechanic
Gameel Abdullah Khalil	Heavy Equipment Driver
Fathey Ahmed Abdullah	Tractor Driver
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 & Grounds Supervisor
Abdel Hay Hassan El-Sobky	Pond & 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

CORPORATE SERVICES DIVISION (CSD)

Sayegh, Edward N.	Associate Director General / CSD
Tan, Khar Hoay	Manager - HR & Administration
Khoo, Lay Keem	HR Associate
Ng, Hooi Hean William	Finance Manager
Chong, Ee Fung Desmond	Accountant
Yeoh, Poh Bee Joyce	Accountant
Ho, Lin-Li Karina	Accountant
Lye, Chooi Kuan	Accountant
Yoon, Mun Har	Accountant
Ng, Hung Yee June	IT Manager
Lee, Hoong Fei	Network Engineer - IT
Cheang, Ming Sung Vincent	Technical Assistant - IT
Koh, Siew Hua	Admin. Associate
Ahmad Kamal B. Anuar	Admin. Assistant
Norhaslinda Bt Hashim	Secretary / Receptionist
Koid, Soo Thai	Facilities Coordinator
Tan, Ee Lin	Admin. Associate: Procurement & Services
Yeoh, Li Lian	Budget Supervisor
Mohamad Haris Bin Kader Sultan	Program & Budget Assistant
Lim, Pei Yen	Program & Budget Assistant
Ampil, Rainelda	Manager (FAST)
Saw, Wei Hoong Lasker	Analyst Programmer

Philippines Research Site

Pasamba, Ceres	Management Consultant

MILLENNIUM ECOSYSTEM ASSESSMENT

Reid, Walter	Director
Lim Bee Leng, Belinda	Program Associate
Marcus John Lee Jin Sarn	Sub-Global Working Group Coordinator

CGIAR

Porcari, Enrica M.	Chief Information Officer

Acronyms

ACRONYM	TITLE
A	
AARM-AIT	Aquaculture and Aquatic Resources Management - Asian Institute of Technology
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
ADB/GMS	Asian Development Bank - Greater Mekong Sub-region
ADG/CS	Associate Director General/Corporate Services
AFS	Asian Fisheries Society
AFSSRN	Asian Fisheries Social Science Research Network
AGM	Annual General Meeting
AGU	An Giang University
AIARC	Advanced Institutions of Agricultural Research
AIMS	Australian Institute of Marine Science
AIT	Asian Institute of Technology
AKVAFORSK	Institute of Aquaculture Research
ALCOM	Aquatic Resource Program for Local Communities Development
AOAD	Arab Organization for Agricultural Development
AOU	Administration and Operations Unit
AP	Associate Partner
APAARI	Asian-Pacific Association of Agricultural Research Institutes
APFIC	Asian-Pacific Fisheries Commission
APO	Associate Professional Officer
ARI	Advanced Research Institutes
ASEAN	Association of Southeast Asian Nations
ASFA	Aquatic Sciences and Fisheries Abstracts
ASFIS	Aquatic Sciences and Fisheries Information Service
AU	Auburn University
AusAID	Australian Agency for International Development
AVHRR	Advanced Very High Resolution Radiometer
B	
BACI	Before After Control Impact
BAU	Bangladesh Agricultural University
BCAS	Bangladesh Centre for Advanced Studies
BCMTP	Broad-Based Coastal Management Training Program
BELA	Bangladesh Environmental Lawyers Association
BFAR	Bureau of Fisheries and Aquatic Resources, Philippines
BFPM	Bayesian Fish Production Model
BFRI	Bangladesh Fisheries Research Institute
BGRRP	Biodiversity and Genetic Resources Research Program
BMZ	Bundesministerium fur Wirstschaftliche Zusammenarbeit (Germany)
BOT	Board of Trustees
BRAC	Bangladesh Rural Advancement Committee
BVI	British Virgin Islands
C	
CAC	Coastal Aquaculture Center
CARICOM	Caribbean Community
CASS	Center for Applied Social Sciences
CBD	Convention on Biological Diversity
CBFM	Community-Based Fisheries Management
CBFM-SSEA	Community-Based Fisheries Management - South and Southeast Asia
CCAP	Center for Chinese Agricultural Policy
CDC	Center Directors Committee
CDDC	Center Deputies Committee
CEASES	Center for Environmental and Social Studies on Sustainable Development
CEM-UPLB	College of Economics and Management - University of the Philippines Los Banos
CEMARE	Center for the Economics and Management of Aquatic Resources

CERED	Center for Environmental Research and Education
CFI	Committee of the Government on Frontier Issues
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical
CICFRI	Central Inland Capture Fisheries Research Institute
CIDA	Canadian International Development Agency
CIFA	Central Institute of Freshwater Aquaculture
CIFOR	Center for International Forestry Research
CIMMYT	International Maize and Wheat Improvement Center
CIRAD	Centre de Cooperation International en Recherche Agronomique pour le Developpement
CGIAR	Consultative Group on International Agricultural Research
CLAR	Central Laboratory for Aquaculture Research
CLOFFSCA	Catalogue of Freshwater Fishes of South Central America and the Caribbean
CLSU	Central Luzon State University
CLUWRR	Centre for Land Use and Water Resources Research, University of Newcastle
CMFRI	Central Marine Fisheries Research Institute
CMI	Christian Michelsen Institute
CMRRP	Coastal and Marine Resources Research Program
CMTP	Coastal Management Training Program
CNRA	Centre National de Recherche Agronomique
CNRS	Center for Natural Resources Studies
CODDEFFAGOLF	Committee for the Defense and Development of the Flora and Fauna in the Gulf of Fonseca
CORAL	Coral Reef Alliance
CORDIO	Coral Reef Degradation in the Indian Ocean
COREMAP	Coral Reef Rehabilitation and Management Program
CORIN	Coastal Resources Institute
CP	Challenge Program
CPACC	Caribbean Planning for Adaptation to Global Climate Change
CRIFI	Central Research Institute for Fisheries
CRITIC	Coral Reef Information and Training Centre
CRM	Coastal Resources Management
CRODT	Centre de Recherche Oceanographique, Dakar Thiaroye
CSD	Corporate Services Division
CTA	Technical Center for Agriculture and Rural Cooperation
CTU	Can Tho University, Vietnam
CU	Chittagong University, Bangladesh
CU	Communications Unit

D

D-IRO	Director - International Relations Office
DA-BFAR	Department of Agriculture - Bureau of Fisheries and Aquatic Resources
Danida	Danish International Development Assistance
DENR	Department of the Environment and Natural Resources
DENR-CEP	Department of Environment and Natural Resources - Coastal Environment Program
DFAR	Department of Fisheries and Aquatic Resources
DFID	Department for International Development, UK
DGA	Directorate of Aquaculture
DGCF	Directorate General of Capture Fisheries
DHI	Danish Hydraulic Institute, Denmark
D-IRO	Director - International Relations Office
DMC	Developing Member Country
DOF	Department of Fisheries
DoFi	Department of Fisheries (of Khan Hoa)
DOSTE	Department of Science, Technology and Environment (of Danang)
DRIFT	Downstream Response to Imposed Flow Transformations
DSAP	Development of Sustainable Aquaculture Project

E

EC	European Commission
eCU	eCommunications Unit
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ELEFAN	Electronic Length Frequency Analysis (software)
EMT	Executive Management Team
ERA	Efforts for Rural Advancement
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	European Union
EwE	Ecopath with Ecosim

F

FAC/CLSU	Freshwater Aquaculture Center/Central Luzon State University, Philippines
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organization of the United Nations
FAST	Financial and Administrative System Team
FCMRP	Fisheries Co-management Research Project
FFRC	Freshwater Fisheries Research Center
FiRST	Fisheries Resources Information System and Tools
FiSAT	FAO-WorldFish Stock Assessment Tools
FMU	Financial Management Unit
FPFM	Floodplain Fisheries Simulation Model
FRAMP	Fisheries Resources Assessment and Management Program
FRI	Fisheries Research Institute
FRRP	Freshwater Resources Research Program
FSRP	Farmer-Scientist Research Partnerships

G

GAPE	Global Association for People and the Environment
G&D	Gender & Diversity
GBRMPA	Great Barrier Reef Marine Park Authority
GCRMN	Global Coral Reef Monitoring Network
GDP	Gross Domestic Product
GEF	Global Environment Facility
GxE	Genotype x Environment
GFAR	Global Forum on Agricultural Research
GIFT	Genetically Improved Farmed Tilapia
GIS	Geographic Information System
GNP	Gross National Product
GO	Government Organization
GoFAR	Group of Fisheries and Aquatic Research
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit (Technical Cooperation Agency, Germany)

H

HIO	Hai Phong Institute of Oceanology
HNIO	Hanoi Institute of Oceanography
HQ	Headquarters
HRU	Human Resources Unit
HUS	Hanoi University of Science, Vietnam

I

IAA	Integrated Aquaculture-Agriculture
IARC	International Agriculture Research Center
IARI	Indian Agricultural Research Institute
IASCP	International Association for the Study of Common Property
IBI	Index of Biotic Integrity
ICAR	Indian Council for Agriculture Research
ICEIDA	Icelandic International Development Agency
ICM	Integrated Coastal Management
ICRAF	International Center for Research in Agroforestry
ICRAN	International Coral Reef Action Network
ICRI	International Coral Reef Initiative
ICRW	International Center for Research on Women

ICT	Information and Communication Technology
IDAF	Integrated Development of Artisanal Fisheries
IDRC	International Development Research Centre, Canada
IFAD	International Fund for Agricultural Development
IFEP	Institute of Fisheries Economics and Planning
IFM	Institute of Fisheries Management and Coastal Community Development
IFM-K	Institut fur Meereskunde, Kiel, Germany
IFPRI	International Food Policy Research Institute
IFREDI	Inland Fisheries Research and Development Institute, Phnom Penh, Cambodia
IFREMER	Institut Francais de Recherche pour I'Exploitation de Ia Mer (French Research Institute for the Exploitation of the Sea)
IIFET	International Institute of Fisheries Economics and Trade
IIP	Institut Nacional de Investigacao de Pesqueira
IIRR	International Institute of Rural Reconstruction
IITA	International Institute of Tropical Agriculture
IITA-HFC	International Institute of Tropical Agriculture - Humid Forest Center
lMA	International Marinelife Alliance
IMPACT	International Model for Policy Analysis of Agricultural Commodities
INFOFISH	Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fisheries Products in Asia and the Pacific Region
INGA	International Network on Genetics in Aquaculture
INRA	Institut National de la Recherche Agronomiqie
INREF	North-South Interdisciplinary Research and Education Fund, Wageningen University and Research Center
INREF-POND	Optimization of Nutrient Dynamics and Fish for Integrated Agriculture–Aquaculture Systems
ION	Institute of Oceanography - Nha Trang
IPGRI	International Plant Genetic Resources Institute
IRAD	Institut de Recherche Agricole pour le Developpment de Cameroun
IRM	Integrated Resources Management
IRRI	International Rice Research Institute, Los Banos, Philippines
IRS	Internationally Recruited Staff
ISO	International Organization for Standardization
ISTOM	Ecole Superieure d'Agro-Economie Internationale
ISU	Information Services Unit
IM	Information Management
IT	Information Technology
ITU	Information Technology Unit
IUCN	World Conservation Union
IWMI	International Water Management Institute

J

JARING PELA	Indonesian NGO Network for Marine and Coastal Resources (Jaringan Kerja untuk Pesisir dan Laut)
JIRCAS	Japan International Research Center for Agricultural Services
JPO	Junior Professional Officer

K

KEHATI	Indonesian Biodiversity Foundation
KM	Knowledge Management
KU	Kasetsart University, Thailand

L

LARS	Living Aquatic Resources
LaRReC/NARI	Living Aquatic Resources Research Center, Vientiane, Lao PDR
LISU	Library and Information Services Unit
LKIM	Lembaga Kemajuan lkan Malaysia
LME	Large Marine Ecosystem
LVFO	Lake Victoria Fisheries Organization

M

MACC	Mainstreaming Adaptation to Climate Change
MACH	Management of Aquatic Resources through Community Husbandry
MAF	Ministry of Agriculture and Fisheries
MCA	Marine Conservation Area
MINEPIA	Ministere de l'Elevage des Peches et des Industries Animales de Cameroun
MIS	Management Information System
MLI	Mekong Learning Initiative
MNHN	Museum National d'Histoire Naturelle
MOA	Memorandum of Agreement
MOA	Ministry of Agriculture
MODIS	Moderate-Resolution Imaging Spectroradiometer
MOSTE	Ministry of Science, Technology and Environment
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MRAC	Musee Royale de l'Afrique Centrale
MRAG	Marine Resources Assessment Group Ltd.
MRC	Mekong River Commission
MSEP	Mbowe Sustainable Ecofarming Project
MSSP	Multi-Sector Support Program
MTP	Medium-Term Plan

N

NACA	Network of Aquaculture Centres in Asia-Pacific
NAGRI	National Aquaculture Genetics Research Institute
NAQDA	National Aquaculture Development Authority
NARA	National Aquatic Resources Research and Development Authority
NARES	National Aquatic Research and Extension Systems
NARS	National Aquatic Research Systems
NASA	National Aeronautics and Space Administration
NBFCR	National Bureau of Fish Genetic Resources
NCAP	National Center for Agricultural Economics and Policy Research
NCAR	National Center for Atmospheric Research
NEMAP	National Environmental Management Action Plan
NGO	Non-Governmental Organization
NIO	Nha Trang Institute of Oceanography
NMK	National Museums of Kenya
NOAA	National Oceanographic and Atmospheric Administration
NORAD	Norwegian Agency for Development Cooperation
NRM	Swedish National Museum
NRS	Nationally Recruited Staff
NRSP	Natural Resources Science Program
NSC	North Sea Center
NTAFP	Network of Tropical Aquaculture and Fisheries Professionals
NTAS	Network of Tropical Aquaculture Scientists
NTFS	Network of Tropical Fisheries Scientists

O

OADG	Office of the Associate Director General
ODDG-AWA	Office of the Deputy Director General - Africa and West Asia
ODDG-R	Office of the Deputy Director General - Research
ODG	Office of the Director General
OEMT	Office of Executive Management Team
OFCF	Overseas Fishery Cooperation Foundation, Japan

P

PA-RM	Public Awareness-Resource Mobilization
PAU	Public Awareness Unit
PBU	Planning and Budget Unit

PCAMRD	Philippines Council for Aquatic and Marine Research and Development
PCE	Population, Consumption and the Environment
PCSD	Pa1awan Council for Sustainable Development
PDCU	Project Development Coordination Unit
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and the Gulf of Aden
PISCES	Population Interdependencies in the South China Sea Ecosystems
PITP	Partnerships, Information and Training Program
PKSPL-IPB	Center for Coastal and Marine Resources Studies -Bogor Agricultural University (Pusat Kajian Sumberdaya Pesisir dan Lautan -Institut Pertanian Bogor)
PPA	Participatory Poverty Assessment
PRA	Participatory Rapid Appraisal
PRIAP	Policy Research and Impact Assessment Program
PRSP	Poverty Reduction Strategy Papers
PSAC	Pakse Southern Agricultural College, Lao PDR

Q

QTL	Quantitative Trait Loci

R

RAMSAR	International Convention on Wetlands of International Importance
RBF	Rockefeller Brothers Fund
RCMFPPSE	Research Center for Marine and Fisheries Product Processing and Socio-Economics
RDE	Remote Data Entry
RDSAP	Research for the Development of Sustainable Aquaculture Project
RESTORE	Research Tools for Natural Resources Management, Monitoring and Evaluation
RET	Research Extension Teams
RETA	Regional Technical Assistance
RIA	Research Institute for Aquaculture
RIFF	Research Institute for Freshwater Fisheries
RIMF	Research Institute for Marine Fisheries
RIMP	Research Institute of Marine Products
RM	Resource Mobilization
RM-PA	Resource Mobilization-Public Awareness
RRA	Rapid Rural Appraisal
RSA	Resource and Social Assessment

S

SADC	Southern Africa Development Community
SAS	Statistical Analysis System
SEA	Socio-economic Assessment
SEAFDEC	Southeast Asian Fisheries Development Center
SEAFDEC-AQD	Southeast Asian Fisheries Development Center -Aquaculture Department
SEAMEO	Southeast Asian Ministers of Education Organization
SEARCA	Southeast Asian Regional Center for Graduate Study and Research in Agriculture
SEARO	Southeast Asia Regional Office
SEAWlfs	Sea-viewing Wide Fields-of-view Sensor
Sida	Swedish International Development Cooperation Agency
SIWRP	Sub-Institute for Water Resources Planning
SMFDEC	Southern Marine Fisheries Development Center
SOWEDA	Southwest Development Agency
SPC	Secretariat of the Pacific Community
SPCP-ASTI	State Polytechnic College of Palawan -Aquatic Science Institute
SPREP	South Pacific Regional Environment Program
SUAKCREM	Silliman University Angelo King Center for Research and Environmental Management
Sub-NIAPP	Sub-National Institute of Agriculture Planning and Projection
SUJDN	Sunamganj Jonokallan Sangsta

SUMA	Support for Marine Aquaculture
SWIM	System-Wide Initiative on Water Management

T

TAC	Technical Advisory Committee
TAP	Technical Assistance Project
TCDC	Technical Cooperation among Developing Countries
TDC	Tambuyog Development Center
TERI	Tata Energy Research Institute
TERANGI	The Indonesian Coral Reef Foundation (Yayasan Terumbu Karang Indonesia)
TNA	Training Needs Assessment
TNC	The Nature Conservancy
TOR	Terms of Reference
TOT	Training of Trainers

U

UAE	United Arab Emirates
UAF	University of Agroforestry
UAS	University of Agricultural Sciences
UBC	University of British Columbia
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNF	United Nations Foundation
UNFIP	United Nations Fund for International Partnerships
UP	University of the Philippines
UPM	Universiti Putra Malaysia
UPV	University of the Philippines in the Visayas
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

V

VASI	Vietnam Agricultural Science Institute
VRSAP	Vietnam River System and Plains
VIMS	Virginia Institute of Marine Science

W

WCED	World Commission on the Environment and Development
WCMC	World Conservation Monitoring Center
WECAFC	West Central Atlantic Fishery Commission
WRI	World Resources Institute
WSSD	World Summit on Sustainable Development
WU	Wageningen University
WWF	World Wildlife Fund

Z

ZIM/UM	Zoologisches Institut und Zoologisches Museum, Universitat Hamburg

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