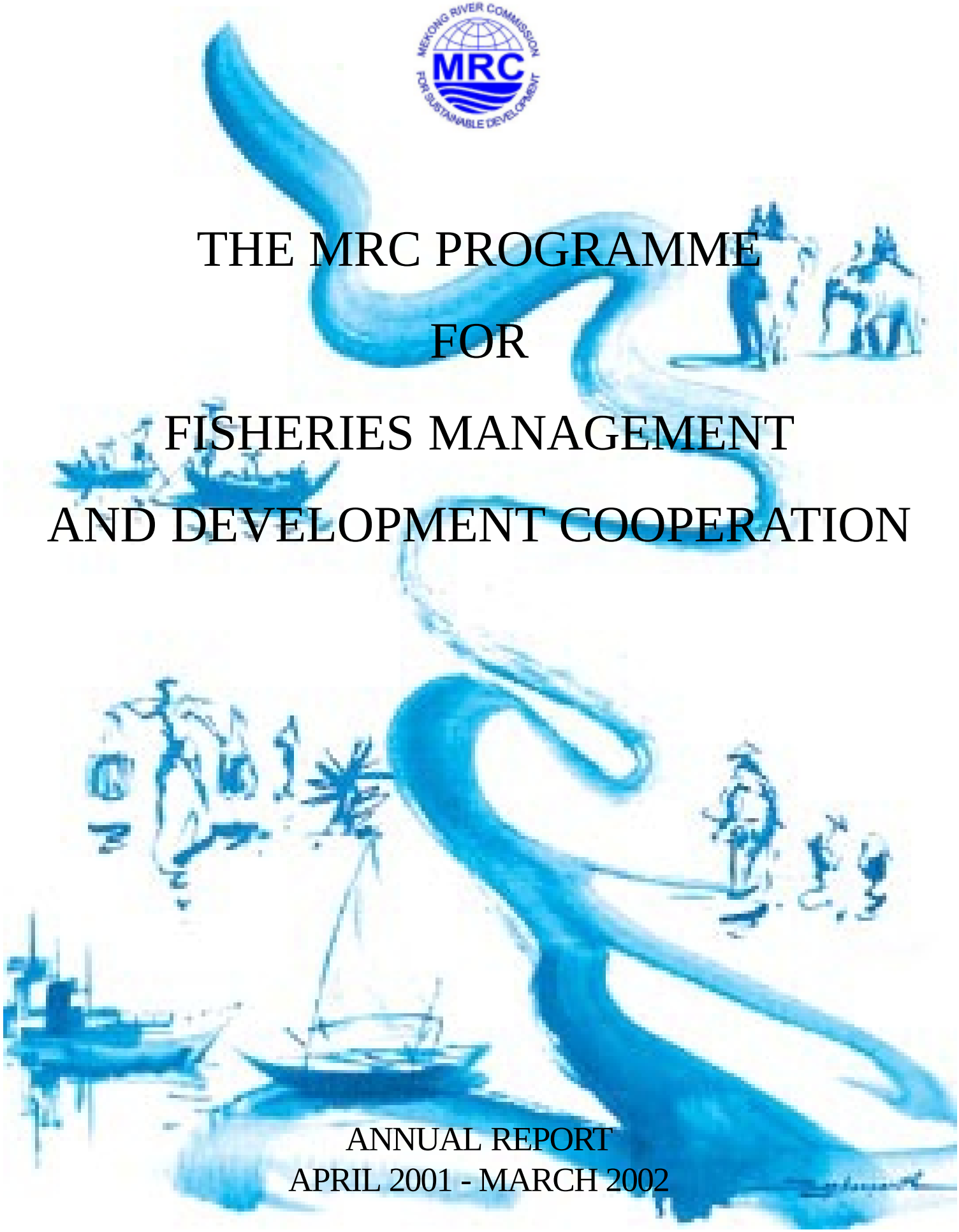
THE MRC PROGRAMME FOR FISHERIES MANAGEMENT AND DEVELOPMENT COOPERATION



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Abbreviations and Acronyms

AIMS	Aquaculture of Indigenous Mekong Species component
AMFC	Assessment of Mekong Fisheries Component
CCF	Cambodian Capture Fisheries component
Danida	Danish International Development Assistance
Lao PDR	Lao Peoples' Democratic Republic
LMB	Lower Mekong Basin
MRF II	Management of Reservoir Fisheries Phase 2
MRC	Mekong River Commission
READ	Rural Extension for Aquaculture Development component
TAB	Technical Advisory Body on Fisheries Management

Foreword

The fisheries resources of the Mekong River system are immensely important to the people of this region. They provide food and employment to millions of people, from the upper tributaries in the Lao PDR to the delta in Viet Nam. Some simple facts about the fishery illustrate its significance.

- It is estimated that approximately 1.5 million tonnes of fish and other aquatic animals are captured annually in the LMB.
- Another 500,000 tonnes are produced annually from reservoir fisheries and aquaculture.
- The value at first point of sale is about US$1,400 million.
- Up to 40 million people, or two-thirds of the population of the LMB, are actively involved, at least part-time or seasonally, in the fisheries.
- The capture fishery in the Mekong represents about 2% of the total world capture fishery (both marine and freshwater).
- There are approximately 1,500 species of fish in the river making it the third richest riverine fish fauna in the world (after the Amazon and the Congo).

A resource of this magnitude and importance needs to be well-managed to ensure its sustainability for future generations. In this task the MRC Fisheries Programme plays a pivotal role. The Fisheries Programme is intimately linked with the work of fisheries agencies in Cambodia, the Lao PDR, Thailand and Viet Nam, to form a cohesive information source for understanding the ecological processes driving the fishery.

The information covers many issues: statistics on fisheries yields and economic importance; the relevance of fisheries to the livelihoods of rural people; the importance of migrations for Mekong fishes; habitat requirements; modelling of relationships between floods and fish production; impacts of industrial and water management developments; processes for involvement of users in fisheries management; and husbandry techniques for indigenous Mekong fishes. Such information is essential for informed management of the fishery, and consequently it is equally important for agencies involved in developmental processes that may impact on the river.

This report covers the activities and achievements of the Fisheries Programme from April 2001 to March 2002. Reference is also made to the future. The funding base for the Fisheries Programme will change significantly in 2003, although the effects of this will start to become apparent in 2002. The challenge ahead for all of us is to define the important elements of a new programme, building on the information and networks developed to date, and to secure new donor support from a variety of sources.

I would like to take this opportunity to warmly thank the national line agencies for fisheries; the National Mekong Committees of Cambodia, the Lao PDR, Thailand and Viet Nam; and the principle donor, Danida, for their cooperation with and support to the MRC Fisheries Programme.

Joern Kristensen
Chief Executive Officer
Mekong River Commission

Objective

The MRC Programme for Fisheries Management and Development Cooperation (the "Fisheries Programme") was formally established in 1995 with the objective of :

"coordinated and sustainable management, use and development of the economic and nutritional potential of the inland living aquatic resources in the Mekong River Basin".

Size and Value of the Mekong Fishery

Estimating the yield from the fishery in the LMB using traditional fisheries data collection systems is impossible, because of the varied and dispersed nature of the fishery. However, it is possible through household surveys to determine the level of fish consumption in the Basin, and to use this as an approximation for fish yield (assuming the export of fisheries products from the region roughly equals the import of fisheries products).

Riverside fish buyers, waiting for fish to be landed from the dai lots

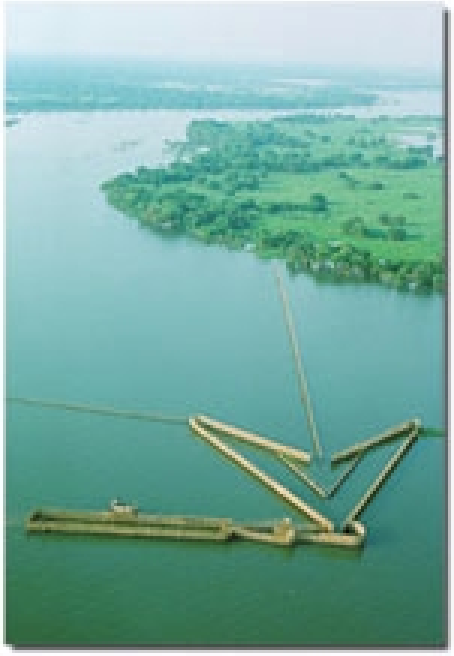
In the 1990s household surveys on the quantities of freshwater fish, fish products and aquatic animals eaten and their supply source were conducted by several different agencies in 15 of 87 provinces in the LMB. The surveys found that people in the region are consuming from less than 20 kg per person in mountainous areas with limited access to fish resources, to about 60 kg per person in flood plain areas of Cambodia and Viet Nam where fish is abundant most of the year. The overall average value for consumption of fish and other aquatic products in the LMB is 36 kg/person/year.

Combining the population figures with the household consumption data gives an annual total consumption of freshwater fish, fish products and aquatic products in the LMB of about 2,033,000 tonnes (see Table 1).

Table 1. Estimated freshwater fish and aquatic product consumption in the LMB.

Country	Population in LMB 1999/2000	Assessed consumption per capita per year of all fisheries products. Average (range), kgs	Assessed total consumption of all fisheries products (tonnes)
Cambodia	10,775,000	47 (10-89)	508,000
Lao PDR	5,087,000	26 (17-36)	133,000
N-E Thailand	22,439,000	35 (20-41)	795,000
Viet Nam Mekong delta	17,958,000	33 (15-60)	597,000
TOTAL	**56,259,000**	**36**	**2,033,000**

There are no reliable data on import and export of fisheries products in the region. Nevertheless, there is considerable export of fisheries products from Cambodia and Viet Nam (many tens of thousands of tonnes), so we can assume that import of product does not greatly exceed export, and consequently the consumption figure of just in excess of 2 million tonnes per annum is approximately the fishery yield in the LMB. In 1999-2000, 260,000 tonnes of fish was produced by the aquaculture industry, and 240,000 tonnes of fish was taken from reservoirs in the LMB. Therefore, the total yield from the freshwater *riverine and wetland capture* fishery is about 1,533,000 tonnes per year. This equates to a yield of about 158 kg/ha of wetlands in the LMB, which is quite realistic.



An arrowhead fish trap in the Great Lake

The value of the fishery in the LMB is very difficult to estimate, because the relative proportions of fish, processed fish products and other aquatic animals are not well described, and the average prices of these different products in different regions are not known. Nevertheless, some preliminary data suggest that we can assume an overall average first sale price of about US$0.70 for the total yield of fish, fish products and aquatic animals. Using this figure, the value of the fishery equates to about US$1,400 million. This estimate is for first sale price only, and so does not include any estimate of the multiplier effects of the fish trade.

This is an immensely important resource, economically speaking, for the region.

Having said that, it is also apparent that these figures are only approximate, and deriving them requires the acceptance of several critical assumptions. The Fisheries Programme and line agencies for fisheries have been planning a new component ("Strengthening of inland fisheries information systems") to develop a sustainable system for collecting fisheries statistics in the region. This component is essential for developing a rigorous estimate of the size and value of the fishery, which in turn will provide managers with information essential for appreciating the importance of the fishery, and hence its importance relative to other developments that might impact on the fishery.

Hauling in the catch at the dai fishery

Is the Mekong River Over-Fished?

The answer is yes or no, depending on what species we are talking about!

The high intensity of the fishing in the LMB gives a general impression that the system is over-fished. This impression is strengthened by anecdotal evidence from many fishers who claim that their catches have been decreasing over time. Fishers perceive the strong decrease in catch-rate as "over-fishing".

In reality, the overall catches in the Mekong are higher now than in the past. However, it is also true that individual catch rates have declined, because the increase in the numbe of fishers has outstripped the increase in catch (Table 2).

A barrage fishery on the Tonle Sap River

Usually we speak of over-fishing when dealing with a single species fishery. In the Mekong, more than 120 species are traded, and virtually every type of fishing gear catches many different commercial species. Fishing pressure impacts differently on different species. Larger species which spawn later in life tend to be depleted more quickly than smaller fish which reproduce at a comparatively young age. Hence, species such as the Mekong giant catfish *Pangasianodon gigas* are probably over-fished (although its population decline is probably due to a number of factors, of which fishing is only one). On the other hand, a small, prolific fish such as trey riel *Henicorhynchus siamensis* is not overfished, and indeed could probably withstand even heavier fishing pressure.

The key to assessing the state of the fishery is to continually monitor the catch, numbers of people involved and the value of the fishery. Over the last few years the Cambodian Capture Fisheries and the Assessment of Mekong Fisheries components have been doing this, albeit on a small scale in comparison with the size of the fishery. Such monitoring is essential in the future to provide the data for sustainable management of the fishery.

Table 2. Changes in population size and fish catch in the Great Lake, Cambodia, between 1940 and 1995/96.

Period	Fishing commune inhabitants (11.2 % of total pop.)	Great Lake fish production (tonne)	Fish catch / fishing commune inhabitant / year	Decline in catch / fisher
1940	0.36 million	125,000	347 kg	
1995-6	1.20 million	235,000	196 kg	44%

The Importance of Fish Migrations

Expert fishers, sharing their local knowledge of fish migrations with researchers

Fish migrations are an important and conspicuous feature of the fisheries of the Mekong River Basin. Many fish species carry out some form of migration at certain times during their life cycle. The most impressive are the masses of fish moving down the Tonle Sap to the Mekong River in November to February. At times of peak migration there are at least 50,000 fish per minute passing any given point in the Tonle Sap. This must surely be one of the most concentrated and massive migrations of freshwater fishes in the World.

Many fisheries activities in the basin are based on the capture of migrating fishes. The most conspicuous examples are the dai fishery of Tonle Sap River in Cambodia and the Khone Falls fishery in the Lao PDR. But in general, villages all along the Mekong and her tributaries have adjusted their daily lives to the coming and going of migratory fishes.

Why do fish migrate? Animal migrations are an evolutionary response to adapt to and take advantage of the particular environmental conditions. In the Mekong, three different general migration patterns have been identified within the LMB (Figure 1).

1) In the lower part of the Basin, large-scale migrations occur between downstream flood plain habitats (that is, the Mekong delta in Viet Nam and southern Cambodia, including the Tonle Sap/Great Lake system) and dry season refuge habitats further upstream near the border between the Lao PDR and Cambodia (in particular, the stretch between Kratie and Khone Falls).
2) Upstream of the Khone Falls, many fishes move seasonally between dry season habitats within the Mekong mainstream and flood season feeding and rearing habitats on flood plains associated with major Mekong tributaries.

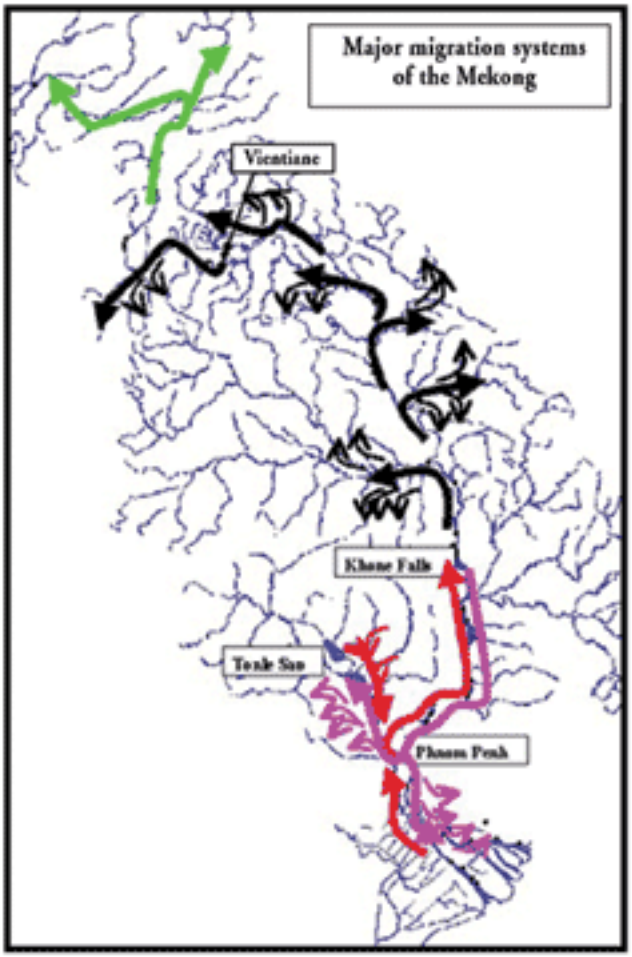


Figure 1. General fish migration patterns in the LMB.

3) In the upper stretches of the Basin (that is, approximately from the mouth of Loei River and upstream), the river becomes a typical mountain river with very little flood plain habitat. Here, fishes mainly migrate between deep pool habitats in the lower stretches and spawning habitats in the upper stretches.

Many migratory fishes of the Mekong carry out their migrations across international borders. Such resources require coordinated management strategies to ensure that they can successfully complete their life cycle.

The greatest danger facing migrating fishes are barriers across streams which effectively block their migration routes. Even low-level weirs can be insurmountable barriers for fish. Barriers stop the migrating fish from completing their genetically imprinted life cycle. Hence, breeding does not take place, and eventually the fisheries resources disappear.

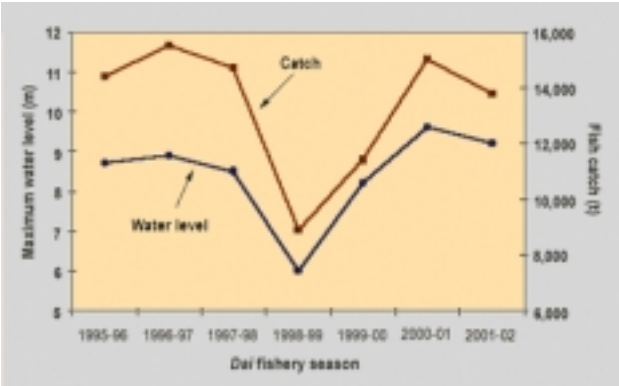
A fisherman cast-netting near Khone Falls

Floods and Fisheries

The primary factor driving the immensely productive Mekong fishery is the annual monsoon and the associated inundation of vast areas of flood plains. The flood plains provide food and habitat for the fish. The inundation and subsequent drying of the flood plains is critically important, as it is this process that renews the nutrient base of the food web for the fishes.

Wetlands reclaimed for agriculture dimishes fisheries productivity

The relationship between the height of the floods and fish production is shown in Figure 2. The data come from only the *dai* fishery in one part of Cambodia, but the relationship is generally true for the riverine fishery – the higher the flood, the greater the fish production.



Flooded forest around the Great Lake is prime fisheries habitat

Both the flood and the habitat of the flood plains are important – without one or the other, the fisheries resources would be catastrophically reduced. Any developments that may lower peak flood levels or reduce wetland habitats will be detrimental to the fishery. These include dams, water diversion for irrigation purposes, and conversion of flooded forest to agricultural land.

The Tonle Sap river forms a large delta before it joins the Great Lake. Here the floating town of Chhnuoc Tru is found

Figure 2. Relationship between the maximum flood level of the season and the fish catch of the *Dai* or Bagnet fishery in the Tonle Sap River. This is a small fishery of 63 bagnet units (60 in 2001-02) targeting "white" fish migrating out of the flood plains around the Great Lake to the Mekong River.

Dams and River Fisheries

Dams invariably cause changes to rivers and their ecology. They interfere with the natural ecological processes of the river, and have been the most significant cause of declines in many wild fisheries on all continents.

Nam Ngum hydropower dam in Lao PDR

Dams have three major impacts on fisheries. Firstly, they are barriers to migration, and so preclude migrating fish from completing their life cycle. Secondly, dams cause hydrological changes. In particular, they store water and release it at a time when natural flows are at their lowest. The effect is that the natural flow cycle of the river is changed. Flooding is reduced, so diminishing the habitat and food supplies for the fishes. Moreover the unnatural flow regime is out of synchrony with the biology of the fishes, which can impact on both the spawning and survival of young fish. Abstraction, diversion or daily releases of water for electricity generation are other types of hydrological effects.

Thirdly, dams change water quality, because they trap nutrients, sediment and detritus, thus starving the river downstream of these essential inputs from the catchment, and reducing the overall productivity of the system. At the same time, stratification of the water in a reservoir (i.e. warm water overlying cold water) results in stagnant oxygen-deficient bottom water, with elevated sulphides and ammonia, which when released may kill fish downstream.

Even so-called run-of-river dams cause such impacts, because all entail some level of storage, and if the river is diverted or abstracted, the effects are greater. Combined with other more subtle secondary changes to habitat, these changes have been catastrophic for river fisheries throughout the world. This is particularly so for fisheries in flood plain rivers, such as the Mekong, where the basis of production is the annual flood and the inundation of the flood plains.

More dams are being planned for the Mekong Basin. Ideally, the impacts on fisheries will be understood, the worst schemes eliminated at the planning stage, and mitigation and management incorporated in those dams that are built.

Fish ladders can help some fish species swim past barriers

To improve the LMB countries' capacity in fisheries impact assessment, the Assessment of Mekong Fisheries Component (AMFC) has been organising field training for counterparts in fisheries agencies. Dams have been inspected in Thailand, Laos and Cambodia, and a range of documents on these dams are being reviewed by staff. The AMFC will then produce Guidelines for Fisheries Impact Assessment, with practical lessons from the case studies in the Mekong River Basin. The Guidelines will be used for training, and will provide information on assessing projects, and on producing and reviewing impact assessments, with an emphasis on understanding and mitigating or managing impacts.

Regional Concerns, Local Solutions: Training in Co-management of Inland Fisheries

Involving all users and sharing local expert knowledge is fundamental for effective co-management of natural resources

A Regional Training Course in Co-management of Inland Fisheries was held as a "transboundary event" out of Mukdaharn, Thailand and Savannakhet, Lao PDR, in May 2001. This was later followed by four national workshops in November/December 2001 and January 2002 in all four riparian countries. These events were the first two in a three-year programme (2001-2004) of "sustained" training in participatory aquatic resource management or "co-management". The training course was developed by MRF II on a request made by the Technical Advisory Body of Fisheries Management (TAB) at its first meeting in Pakse in June 2000.

In designing and implementing the process, MRF II started from three premises. First, that co-management is basically a social process, which cannot be "trained" by attending a conventional, often once-only and stand-alone event, but, instead, requires constant learning and adaptation. Thus, each ("main") course is succeeded by a follow-up workshop. This will enable a continuous adjustment of training course content to the work situation experienced by participants and the testing of strategies at different locations and experimentation. Furthermore, this may lead to a network of government staff involved and experienced in participatory aquatic resources management in the region.

On-the-job training – harvesting a fish pond

Co-management of fisheries – all stakeholders sharing knowledge and responsibilities

Mekong giant catfish about to be released. This fish was 2.35 m long and weighted 260 kg.

Second, the complex and continuously changing situation of aquatic management in the region must be based on a process of active adaptive management, or "learning-by-doing". In this, the design and implementation of the proposed course resembles an undertaking in co-management itself. It was therefore proposed to conduct the training course as a co-management exercise with characteristics such as: a process aimed at creating ownership of results; an action- and process-oriented approach in a complex environment with a high degree of uncertainty; equal participation by all stakeholders involved; valuation of local knowledge and respect of existing experiences and practices; and a cyclical, reiterative approach.

And thirdly, co-management is field-based. Co-management happens in the field and communities are a priority. Thus, more than half of the time was spent on fieldwork, in order to give the participants: the chance to gain shared experience; insights into diverse aquatic (co-) management situations, such as in reservoirs, lakes, estuaries and rivers; opportunities to practice interaction with local villagers in the important management function of information collection and analysis; and an exposure to a variety of other issues that surround co-management of inland fisheries.

The 2001-02 events were extremely well received by the participants, of which 35% were women staff of fisheries line agencies. Process-orientation, adaptive management and adaptive learning became buzzwords of the training process. Suggestions gleaned from the evaluations of the events and discussions with participants will be taken up in programming subsequent workshops, of which the next will be the 2nd Regional Training Course to be held in Viet Nam, in September 2002.

Aquaculture in the Mekong Region

Aquaculture is part of MRC's Fisheries Programme, in areas where the issue is not being dealt with by other agencies, and where MRC is ideally suited to implement work related to the particular issues. One such issue is aquaculture of indigenous Mekong species. This is not being researched by other agencies in the Mekong region, and it is needed for both industry development and ecological safety reasons.

Aquaculture has great potential to increase fish production and income for small-scale farmers as well as for more commercial operations. However, unwise aquaculture practices pose a threat to the aquatic environment and the ecological balance of the River. Fish often escape from aquaculture farms during floods. Exotic species that establish in the basin may affect the indigenous wild fish resources by competition, predation, hybridisation and habitat alterations. Conversely, the development of sustainable aquaculture systems using indigenous species is dependent on healthy wild populations.

Harvesting native catfishes from a pond

Village level aquaculture can contribute to poverty alleviation

The Aquaculture of Indigenous Mekong Fish Species (AIMS) component addresses these issues by

1. assisting with research into alternative, indigenous species, with genetic make-up that is appropriate for the planned use of the seed, and
2. increasing the capacity of line agencies to identify, implement and manage more environmentally friendly aquaculture systems.

Another important role of AIMS is to facilitate regional networking to enhance the development and dissemination of improved aquaculture management practices.

Increasing the capacity of the riparian line-agency staff to carry out research and development work is a central task of the AIMS Component. Several training events have been carried out, including on Participatory Research and on Experimental Design, as well as more general training in English and computer use. On average, the percentage women in the 2001 training events was 26%. On-farm tests and training involving local farmers are increasing, and will form the basis for developing extension approaches for indigenous species.

Financial Impact of Fisheries Development Work

Information on financial returns and risk assessment of development activities are essential for sound decision-making, especially with respect to resource allocations and livelihood options. Such information should be a major part of all development planning: otherwise, effort may be expended in areas which are not viable in the long-term.

During 2001, the Fisheries Programme undertook a review of some aquaculture and reservoir fisheries developments to assess their financial feasibility. The study concluded that several different forms of pond and cage aquaculture are financially attractive, with acceptable levels of risk, and offer significant potential for poverty alleviation.

Feeding fish in cages

Pond aquaculture as promoted under the MRC's Rural Extension in Aquaculture Development component (READ) in Cambodia appears to be very attractive from a financial perspective, generating much higher returns to land and labour than rice farming (Figure 3).

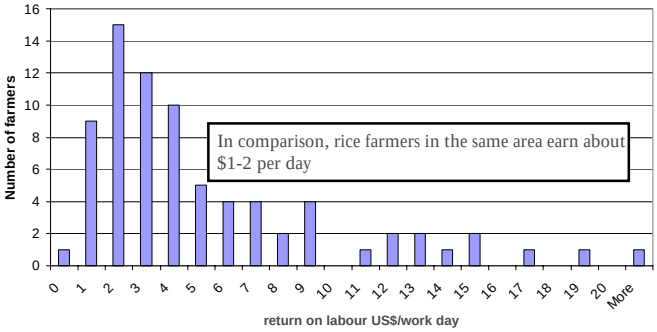
Stocking of small reservoirs appears to generate high returns, and can be organised as a managed "enterprise" relatively easily. The financial benefits of stocking larger

Fish cages in a reservoir in Lao PDR

reservoirs are more ambiguous, and the social and economic issues, including resource access and allocation, are complex, requiring wide-ranging social and economic analyses.

The full results of the survey have been published in the MRC Technical Report Series under the title "Financial analysis and risk assessment of selected aquaculture and fishery activities in the Mekong Basin". The report contains valuable guidelines on monitoring financial impacts of fisheries development activities, and so is a very useful reference for designing and implementing development projects.

Figure 3. Return on labour for fish farmers taking part in READ trials in Cambodia, in 2000



Women in Fisheries

Since 1996 the MRC Fisheries Programme has facilitated the establishment of four National Networks in Cambodia (October 1997), the Lao PDR (October 1999), Thailand (February 2000) and Viet Nam (March 1999). The four are integral parts of the Network for Women and Gender in Fisheries Development in the Mekong Region launched in May 2000. The Programme has continued to offer an annual venue for this regional forum to meet, exchange views and seek solutions to the challenges facing women in fisheries. The most recent Annual Meeting for the National Coordinators was hosted by the Ministry of Fisheries of Viet Nam in Hanoi (5-7 March 2002), back-to-back with the Women's Action and Resource Initiative Conference on Gender and Indochina held in Bangkok (1-3 March).

Women have an important role in fisheries

During the Global Symposium on Women in Fisheries held in Kaohsiung, Taiwan, in conjunction with the Asian Fisheries Forum (26-30 November 2001), riparians showed that women are involved in fish processing, marketing and trading. The impact of women on the economic and social development of the countries is substantiated by the national statistical data.

Processing the catch is a family affair

Women need to participate fully in the planning of future development initiatives that will affect them and their families. They especially want to contribute in tandem with men to develop the fisheries, so important to the nutrition, health and well being of their families. The National Networks seek equal access to training opportunities including extension services, which formerly were accorded to male partners or village heads.

The Rural Extension for Aquaculture Development (READ) component incorporated gender equity considerations in implementing its work. During 1998-2001, READ trained nearly 3,500 women (34% of the total) in appropriate fish spawning, nursing and grow-out systems. In addition, READ instructed 215 key staff (21% women) from various formal and informal extension agencies at the community level on basic small-scale integrated aquaculture systems including livestock-crops-fish and rice-fish culture. These key people became Trainers of Trainers and instructed 225 rural people (33% women) on integrated pond culture. The women trained under this informal small-scale integrated aquaculture programme are continuing to assist others, both men and women, even after READ ended in December 2001. The use of women farmers as trainers is a good example of women's ability to successfully engage in aquaculture.

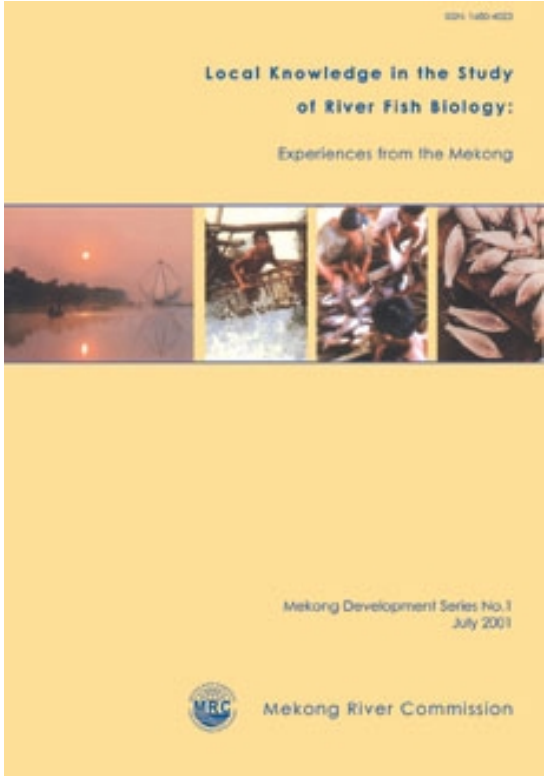
Communications

During the last 12 months, more attention has been given to publishing the results of the Fisheries Programme's work. The "*Catch and Culture*" newsletter has continued with 4 issues per year being disseminated world-wide. In addition, publications on various aspects of the Fisheries Programme's work have been produced in the newly developed MRC Technical Report Series, MRC Development Series and MRC Conference Proceedings.

Sharing expertise and management experiences

The first six issues of the Technical Report Series are on fisheries matters, and include final reports on topics identified by the Technical Advisory Body for Fisheries Management. The aim of these reports is to document the results of technical work so that the information is available for scientific workers from fisheries and other disciplines.

The Development Report Series is a highly attractive publication aimed at a broad audience, including managers and policy makers in the Mekong Region. The first issue was on the use of local ecological knowledge to identify migration patterns of fishes. Another is planned in the near future on biodiversity of fishes in the Mekong.



Papers presented at the 2000 and 2001 Technical Symposiums on Fisheries in the Mekong have been published in the first two editions of the MRC Conference Series. Our appreciation is extended to the staff of the line agencies who have documented their work for inclusion in these important proceedings.

In addition to the publications, a film on the fisheries of Cambodia has been produced in both the English and Khmer languages. The film will be shown on local and international television. In this way, we hope to spread the message of the importance of fisheries in the Mekong to the people of the region.

But we must remember that these publications are only part of the communication process that we are all involved in. Our collective task is to disseminate the message of the importance of fisheries to the people of the region, in terms of nutrition, employment and income generation. This message must be spread using a variety of formats to policy makers in the region, so that the value of a healthy fishery in the Mekong River system is truly appreciated and considered in all development planning processes.

Future Planning

During the year, the MRC was informed that the principal donor, Danida, would be reducing its allocation to the MRC as a consequence of changes in government policy in Denmark. The funding reduction applies to programmes all over the world, and is in no way related to the performance of the Danida-funded activities within the MRC.

The funding reduction will result in a scaling-down of the scope of work undertaken over the next couple of years. The immediate task is for the Fisheries Programme to redefine its future priorities which accordance with the needs of the MRC core programmes and its line agency partners. Initial steps in this direction have been taken with a review of the Programme (which will be reported at the 2002 Annual Meeting). Thereafter, donor agencies willing to develop new funding arrangements with the MRC need to be identified, so that the Fisheries Programme can continue to meet its objective of:

coordinated and sustainable management, use and development of the economic and nutritional potential of the inland living aquatic resources in the Mekong River Basin.

Jeanineke Dahl Kristensen
Manager, Fisheries Programme
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