1. Introduction

Fisheries research is being carried out in Cambodia to assist the government in formulating and implementing fisheries management policies aimed at sustainable utilization of the resources to benefit especially the rural poor.

It has become clear that the inland capture fisheries yield is at least 300,000-400,000 tones per annum ranking Cambodia fourth among the world's top freshwater fish producers.

Surveys have shown that fish is an extremely important part of national food security especially in the countryside, where more than 85% of the population resides. A household survey (1996-96) suggests that the average fish consumption rate of 4.2 million people in central Cambodia is 67kg/capital/year.

The high productivities stems from the annual inundation by the Mekong River of the large floodplains found in central Cambodia around the Great Lake, Tonle Sap, and the Mekong floodplain northeast and south of Phnom Penh, where important fish habitats such as flood forests area found. Huge seasonal migrations take place between these floodplains and spawning grounds in the Mekong and tributaries in northeast Cambodia and possibly southern Laos.

There is a lack of evidence from the past, but anecdotal information suggests that in particular the catch of many larger migratory and slower reproducing species has declined due to increased fishing pressure. On the other hand the catch of small and fast reproducing species, such as the cyprinid, Henicorhyncus spp. may still be as high as ever.

Nation-wide land cover inventories carried out between 1973 and 1993 indicate that forest coverage has shrunk by a third reducing the potential for freshwater fish production. This may be largely due to the diminished inundation of the floodplains as a result of extensive dam building for hydropower and irrigation in the Mekong watershed upstream of Cambodia (especially in Thailand), which has led to lower average Mekong River flood levels. In addition, the increase in population, low alternative employment opportunities and weak land tenure legislation have caused wide spread habitat destruction in particular in the floodplains south of Phnom Penh.

Assess to the most productive part of the Cambodia fisheries domain has been limited for over a century through a system of government leases, the "fishing lost". Many fishing lost comprise of relatively large areas of floodplain containing flood forest habitats essential for feeding and breeding of many species. These lots provide some habitats protection. As government structure are weak, many conflicts are arising over fishing right between stakeholders, such as lot operators and neighboring fisher/farmer communities. The political climate not seem ripe to allow attempts at conflict resolution through from of commencement.

In order to address these problems with some success, government and donors need to pay much more attention to the problems affecting fisheries, as food security is at present still heavily dependent on fish (especially in Cambodia, but also in parts of the Lao PDR and Vietnam). Moreover, the Cambodian fisheries could even have a greater economic potential in future, as the wild fish stocks in the neighboring countries are likely to decline further contrary to the demand for fish, which will continue to grow. In short, the fish resources are under stress, but most are resilient. In addition the Mekong River in Cambodia is still free flowing and the (Tonle Sap) floodplain habitats are still largely intact. Fisheries still provide employment for millions for people and contribute greatly to the food security of the nation. However, what will happen with Cambodia's fisheries is very much dependent on how the need for fish is seen in the future. The need for fish for in-country consumption, for exports and the need for unspoiled nature will have to be balanced against the need for hydropower, irrigation and a changed environment. It is a matter of choice that has to do with the vision of (mainly) the government on how to shape the future of the country, its people and its resources.
2. Fisheries management challenges

The major problems affecting the Cambodia fisheries are shown on the map. We can divide them into two groups to clarify where responsibilities lie: (1) Problem resolution is outside direct Fisheries Department control and refers to interference due to dam building, water utilization and infrastructure developments. (2) Directly under the jurisdiction of the Fisheries Department come problems related to over-exploitation of the stocks and fishing lot practices.

2.1. Indirect fisheries department responsibilities

Effects of Mekong water regulation

Even though the Fisheries Department may not be consulted directly on issues pertaining to water works for hydropower generation, irrigation, flood control and for improvement of navigation, as well as water pollution and infrastructure developments in the floodplains, it should assert itself and become involved, as all these issues have direct or indirect effects on the fish and fisheries. Below we explain how some of these issues affect fisheries.

Dam building in the Mekong watershed started in earnest in the sixties, especially in Thailand, but also in Cambodia, China, the Lao PDR and Vietnam. Except for the Songkram River, all Thai tributaries to the Mekong have been blocked: the last one was the controversial Par Mun dam. The recently (1998) completed Yali dam on the Sesan river in Vietnam has been wreaking havoc on the livelihoods of the people living along this river in northeast Cambodia (Phnom Penh Post March 2000, Fishery Office Ratanakiri 2000).

Plans for more dams on the Seasan are considered by the ADB. Plans also being developed for a Mekong main stream dam at Sambor in the Kratie province. The Seasan dams and especially the Sambor dam are of vital importance to the fisheries in the Tonle Sap and other flood plains. Building these dams will cut off the link between the breeding grounds of many migratory species and their feeding grounds. In migratory species contributed over 60% to the total catch taken in the Tonle Sap (Van Zalige et al. 2000).

We have looked at peak flows as registered at the water monitoring station in Pakse in Southern Laos and a fuller report is given by Nam Sokleang. It is sufficient to mention here that he found that the average Mekong flood levels 1980-98 were significantly lower (=12% than in 1924-58, while rainfall apparently had not decreased. Of course, lower flood levels mean a lesser inundation of the floodplains and this translates into less fish being produced.

Changes in floodplain habitats

Aerial photo survey for land cover inventories were carried out in 1973-76 and 1992-93. Overall flood forest coverage declined with 33%. The decrease was strongest (46%) in the Mekong floodplains (Kandal, Kampong Cham, Prey Veng etc.) and less (27%) in the floodplains around the Tonle Sap and Great Lake (Mekong Secretariat 1994).

The reduction in flood forest coverage is partly caused by the lesser inundation of the floodplains. Much of the flood forest was also lost due to illegal logging and conversion to rice fields, which is possible due to weak land tenure legislation. Most affected were the flood forests in the Mekong/Bassac floodplains, which were lying in the safest provinces in terms of government control and absence of landmines and, therefore, saw the largest increases in population.

Security has as recently as 1998 also improved in the floodplain around the Great Lake. The opening up of the area brings an increase in population, as it presents a chance to access free land and offers fishing as alternative or secondary employment. Unfortunately, it also intensifies competition for the natural resources. thus, we see increases in land clearance, fuel wood collection and exploitation of fish stocks. In the absence of strong governance structures we see more and more conflicts erupting that involve the fishing lots operators and the communities living in the area. It is the Fisheries Department's task to find solution as by law these matters are within its jurisdiction. This will be discussed in greater detail in the next section.

Effects of possible infrastructure developments

The Tonle Sap has also caught the attention of the donor community. Several projects aim or have aimed at
its development, protection and management. This has led to plans for the setting up of a biosphere reserve (Bonheur 1998), but also for improvement of fishing harbors, rural infrastructure (roads) and the creation of alternative employment around the Great Lake (MRCS/UNDP 1999 and ADB 1998). Even though these last three developments look very positive by themselves, in the environmentally sensitive Tonle Sap floodplains, they would negate the effects of conservation and further exacerbate the problems. This is because they would induce more and more people to settle in the area and thereby increase the demand for land, fish and fuel wood. If this happens, we can expect conflicts to intensify and become more frequent and violent.

2.2. Direct fisheries department responsibilities

New fisheries law

The first and foremost responsibility of the Fisheries Department is ensure that the pending revision of the Fisheries Law is completed soon. Ambiguities should be avoided to make enforcement easier. A consultative process with representatives of the various stakeholder groups in the country needs to be initiated. In particular, during the preparation of the law section on co-management a series of hearings should be organized in the provinces to address the problems arising around the operations of the fishing lots. At hearing representatives of affected communities should be given a chance to express their opinions.

Protection of migratory fish species

Every year long distance migratory fish species drift (in case of fry) or swim (in case of about fish) from their spawning grounds in the Mekong in upland Cambodia (and possibly southern Laos) to their feeding grounds in the Tonle Sap and Mekong floodplains in lowlands of Cambodia and the Mekong delta in Vietnam and back again. The migrations of some the important species have been described by Srun and Ngor, see p. 61 of this report. These are the Cyprinids Riel (Henicorhychus spp.), Chhkok (Cylocheilichthys enoplos), Proul (Cyprinus microlepis), Trasork (Probarbus jullieni) and various Pangasid catfishes (Pangasianodon spp., Pangasius spp.). On this route they are running a gauntlet of many kinds of fishing gear. The catfish Dais, scoop nets and hooks in the Mekong River target the fry on the way down. The barrages of kampong Chhang, the bagnet Dais in the Tonle Sap near Phnom Penh, the floating gillnets, purse seines, beach seines, hooks and lines, and various tras target the sub-adults and adults moving upstream. In October and November 1999 the bagnet Dais in row #2 even caught four Giant Mekong Catfishes (Pangasianodon gigas) ranging from 163-200kg apiece.

Pangasid catfishes are thought to use deep holes and areas with rapids in the Mekong and possibly its tributaries, the Sekong, Sesan and Srepok, for spawning. Each female fish lays enormous numbers of eggs: some 50,000 per kg of body weight this is a typical strategy developed in the evolution of migratory fish species. They produce very large numbers of eggs to counteract the very high mortality of eggs, larvae and juveniles that is caused by natural circumstances. Even of millions of fry are caught for culture (Ngor 199), it is likely to have little or no effect on the overall mortality rates of Pangasid catfishes. In fact, protection of the stocks may be more effectively achieved by protection of spawners. This might be done by stopping all fishing with explosives in the spawning areas, while also the use of gillnets might be discouraged during the spawning period by engaging the responsible communities in a co-management arrangement. Also reducing fishing effort in the capture of mature fish might be effective. Row numbers 1 and 2 of the Tonle sap Dai fishery might eventually be closes entirely or be allowed to operate only from December onward, as catches of large catfish are higher than in any other row and are taken mainly in October and November.

Catches of Pangasid catfish are belived to have declined strongly in the last ten years. This has protected the Fisheries Department to declare a ban on the capture of Pangasid fry in 1994, which has not been very effective, however. In Vietnam this fishery was closed this year, but also these enforcement has been reported not to be effective. So far the ban does not seem to have any clear effect at all, no trends are apparent in the 1995-2000 Tonle Sap Dai fishery catch data (see Ngor p. 38), nor in catches made at the Khone falls between 1994 and 1999 (Baird et al. 2000).

Protection of the resource base and conflict resolution in the fishing lot system

For about a decade, Cambodia has been undergoing a period of rapid institutional transition from a communist to a capitalist economic regime. After a period of 15 years during which access to fishing grounds was governed by collective schemes, the government reintroduced the former system of fishing lots. A lot exclusive use right for two year to private entrepreneurs. They are found in the most productive part of the Cambodian floodplains and contain flood forest and other natural habitats essential for feeding and breeding of many species. Each lot has a “burden book” which contains the specific management program indicating timing and spatial arrangements of the fishing operations.
The open access areas outside the fishing lots are under increasing pressure from people in search of a livelihood. More than 85% of the population in Cambodia live rural areas and survive on agriculture and fisheries. As population growth outpaces growth in alternative job opportunities, the number of farmers/fishes increases. In the absence of well functioning regulatory institutions (such as land tenure laws and registration) natural floodplain habitats are converted for agriculture use and fish catch rates per unit of effort are falling. In addition, conflict over with fishing rights increase. In fishing lot areas households depending on fishing for livelihood and subsistence have been losing out to politically and economically more powerful users. However, the costs of this resource use pattern will have to be shared by all. In the term, badly focussed fishery resource management and an increasing number of users seeking short-term benefits, will negatively affect the recruitment capacity of fish stocks and enhance income and wealth disparities in Cambodia’s rural areas.

One of the principle takes of the Fisheries Department is management of the resources and resolution of conflicts between users. Therefore, a strategy need to be development that addresses these conflicts and stops the decline in fish catches. Part of the problem is that a degree of instability a till exists in the country and the legal framework is weak. Nevertheless, it is suggested that the Fisheries Department starts with the process of enhancing transparency and communication oriented towards the needs of protecting critical fishing habitats. The present revision of the fishery law provides an excellent opportunity to establish a stronger and more focused institutional framework that allows for broader participation of local users in protecting habitats and benefiting from its yields. These comprise lot operators, national and local authorities, military and militia groups, and small scale fishers.

The law should decree the formation of a stakeholder committee for each major lot or group of smaller lots. Organized and chaired by the Fisheries Department these committee might be charged to redefine lot boundaries and group fishing rights and, assist in settling disputes and environmental protection. Lot boundaries should be drawn in such a way as to exclude from the lot area as much as possible villages and agriculture land, while trying to incorporate all natural floodplain habitats. The Fisheries Department would be well advised to develop a capability in applying GIS mapping technology and the use of GPS instruments for boundary verification.

3. How is the MRC/DANIDA Fisheries Program assisting the Department of Fisheries

The MRC/DANIDA Fisheries Program and in particular the Component for Management of the Freshwater Capture Fisheries of Cambodia is in the business of assisting the Fisheries Department since 1994. The main objectives are capacity building of departmental staff and the creation of a knowledge base through research for management of the fisheries.

Capacity building

With the start of Phase II in August 1999 funds have become available for the building of the Inland Fisheries Research Institute of Cambodia (IFRIC). Action is undertaken to obtain permission to build the institute on the premise behind the Fisheries Department in Phnom Penh. Other capacity building activities including scholarships for training abroad will be continued.

Creation of a knowledge base through research

1. Fish consumption surveys

A country -wide fish consumption survey is planed. Its geographical scope will be large than the 1995/6 household survey, but focus will be narrowed down to the estimation of fish consumption, the contribution of the various types of fisheries (including those in rice fields and aquaculture) by gear and species, and the employment and created in fisheries. In addition, it will be attempted to estimate exports. Of course, fish consumption and exports together provide an estimate of what must have been caught. Marine fish consumption is mostly restricted to the Maritime Provinces and very limited farther inland.

The survey will be carried out in 2000-2001, thus some 5-6 years after the (limited) previous one. It is expected that a survey like this can be carried out relatively swift and cheap and yet provide sufficient information on the strength of the sector relative to some 5-6 years ago.

2. Fish yield by habitats type
To better manage and protect the fish resources, we need to earn more about how different habitats types (flood forest, secondary flood forest, grasslands, marshes, rice fields, etc.) contribute fish production and fish species diversity. Studies are starting in Lot 1 of Pursat province.

In addition, by using estimates of the fish yields per unit of habitat type and land cover information on the extent of these habitats, we will be able to determine what the relationship is between maximum inundation levels of floodplain habitats and fish yields. This will help us to predict what effects dam building, irrigation schemes, etc. will have on fish yields. It will also tell us what changes in fish species composition of the catch will occur.

3. Life cycle studies

Of particular interest is the broad view of fish migrations in the country. The Tonle Sap is not an isolated entity, but is part of the Mekong River system. It is not only affected by water level changes in the Mekong, but is linked through fish migrations with the Mekong, Sekong, Sesan and Srepok system in northeast Cambodia and Laos. Just as the fisheries of the floodplains south of Phnom Penh and of the Vietnamese delta are linked to these areas.

A survey of fish landings from the Sesan and Srepok River has started. We hope to learn which species occur here and, where and when they spawn. A study of larval drift in the Mekong River will be started in the year 2001. To follow trends in migratory fish population more closely, we will continue to sample the Dai fishery annually.

4. Co-management and fishing lot studies

The fishing lot inventory is progressing well. The database includes primary information collected through direct field surveys with questionnaires, as well as information on the sequence of ownership of fishing lots since 1989, development of auction prices, and rules for fishing lot operations from the burden books. The types and sources of compatible with Arc View GIS software allowing to display important results of analysis spatially.

A detailed long-term case study is on going in fishing lot 14 in Kampong Chhang province. The purpose is to understand the roles of the various stakeholders by determining what economic gain they derive from the lot resources. A fish catch monitoring system has been introduced, covering both small-scale fishing as well as the fishing lot operations of lot # 14. Discussion meetings are being held with different “dike associations” in Phlong village, in order to study their involvement in local fisheries management activities.

Fisheries management options

The fisheries department will be assisted in formulating management options based on research carried out. Part of the assistance will be an economic analysis of the entire fishery to determine its monetary value, its contribution to the national product (GDP) and its importance for Cambodian food security.

As it is the intention to raise awareness about the importance of fisheries and the need for management, we are in the process of making films/movies about various aspects of the fisheries. We hope to show them on Cambodian television. In addition, there will be a series of informative talks, presentations and workshops, culminating with the international “Symposium on the Management of Large Rivers for Fisheries” to be held in Phnom Penh possibly in February 2002.

4. References


- Bonheur, N. 1998. Project proposal for the Tonle Sap biosphere reserve. Ministry of Environment,
Technical Coordination Unit for the Tonle Sap, supported by UNESCO and the European Commission. 57p.


