

Status of the Cambodian Inland Capture Fisheries Sector with Special Reference to the Tonle Sap Great Lake

by

Nicolaas van Zalinge¹, Nao Thuok² and Sam Nuov³

1. CTA, MRC/DoF/Danida Management of the Freshwater Capture Fisheries of Cambodia
2. Director, Department of Fisheries
3. Deputy Director, Department of Fisheries and NPD MRC/DoF/Danida Project

ABSTRACT

Cambodia has very few income generating possibilities beyond her natural resources – agriculture, forestry and fisheries – and is economically almost fully dependent on them. The paper gives a brief overview of the country's inland fisheries, which support a thriving industry of great economic and social importance and have a potentially bright future. It aims to improve understanding of the issues at stake for the continued sustainable utilization of the resources.

1. FISH PRODUCTION

Reasonably accurate statistics are critical for a proper perspective on the importance of the sector, for both society and the economy, as well as for rational decision-making on the development of the country. In addition, Cambodia may want to discuss the loss of fish productivity caused by the cumulative effects of upstream dam building and erosion in the Mekong watershed with the other countries involved.

- a) The most comprehensive independent data (1996) are largely based on MRC/DoF socio-economic and catch assessment surveys of parts of the country (Ahmed *et al.* 1998, Van Zalinge *et al.* 1999, 2000b).
 - Cambodia's freshwater capture fisheries production of over 400,000 tons per year is large, even by world standards (it is the 4th largest in the world after China, India and Bangladesh). This figure is still believed to be an under-estimate.
 - Estimated value at the landing sites is ≈US\$ 200 million; estimated retail value ≈US\$ 300 million.
 - Exports are under-estimated, but exceed 50,000 tons/year. Product quality and transportation need to be improved to raise the value.
 - The Tonle Sap annual catch is about 235,000 tons/year.
 - More than 1.2 million people in the Tonle Sap area alone depend on fishing for their livelihood.
 - Fish diversity. More than 100 species regularly occur in the Tonle Sap catches, although up to 200 species have been recorded in the Tonle Sap and more than 500 in the freshwaters of Cambodia. There are no species found only in the Tonle Sap, but there are several Mekong endemics. No known species has become extinct.
- b) The 1999 socio-economic survey of the National Institute of Statistics (NIS, 2000) estimated that 6,386 Riel per person per month is spent on buying freshwater fish for home consumption. At an average fish price of 2600 Riel per kg this is more than 300,000 tons/year. Not included are fish captured and consumed by the people themselves or bartered fish.

2. FOOD SECURITY

- An MRC/DoF socio-economic survey of 4.2 million people in central Cambodia estimated that average fish consumption was 67 kg/person per year (in fresh weight equivalents, 1995/96 data, Ahmed *et al.*, 1998).
- Nation-wide fish consumption is probably close to 40 kg/person per year.

- Most fresh fish or fish products (e.g. *prahoc*) are still very cheap and affordable for the rural poor. After rice, fish is the most important food item on which people spend money.
- There is no other food supply – readily available and cheap – that can replace fish in the diet of the Cambodian people.

3. ARE THE FISH RESOURCES OVER-EXPLOITED? YES AND NO!

Overall catches are higher now than in the past, although individual catch rates have declined because the increase in population and number of fishers have outstripped the increase in catch (Van Zalinge *et al.*, 2000a). Fishers perceive the strong decrease in catch-rate as "overfishing". However, in fisheries management we refer to "overfishing" as a situation whereby the same amount or more fish could be taken by fishing less. Usually we speak of overfishing when dealing with a particular species.

Multi-species river systems cannot be exploited intensively without loss of the larger elements of the fish population, which are less abundant and reproduce slowly. When fishing effort increases, the pressure on the large and medium-sized fish species may be above that which provides maximum sustainable yield of these species, but the yield from other species and the total fisheries may be still increasing. Species do not usually become extinct and the potential for fish productivity does not diminish as long as the natural habitats remain intact and the average level of flooding remains stable.

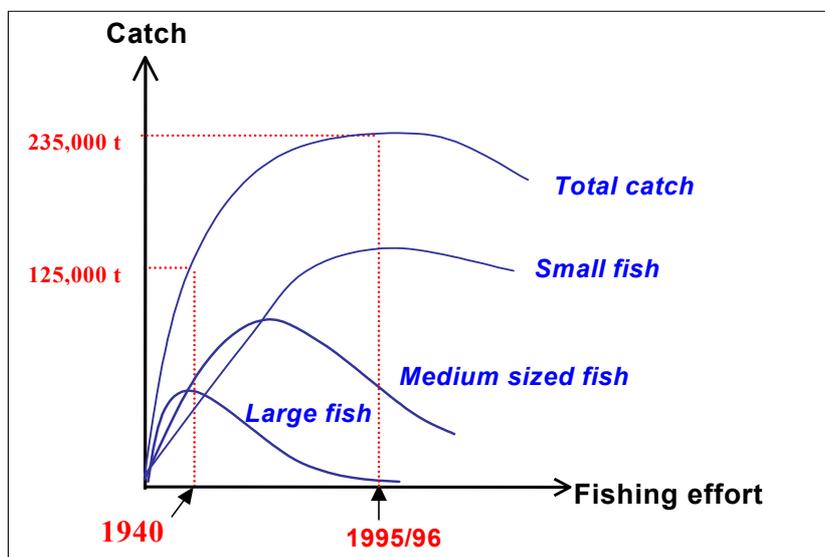
The catch figures in Table 1.1 and Figure 1.1 refer to all species caught. Overall, there is no "overfishing" and if fishing pressure were to increase further, we would expect the catch still to increase a little. However, at species level the situation is more complicated, as discussed below.

Table 1.1. Tonle Sap Great Lake region: Changes in population size and fish catch between 1940 (Chevey and Le Poulain) and 1995/96 (MRC/DoF data)

Period	Cambodian population	Fishing commune inhabitants (11.2 % of total pop.)	Increase in population	Great Lake fish production (t ons)	Increase in fish catch	Fish catch/ fishing commune inhabitant/year (kg)	Decline in catch/ fisher
1940's	3,200,000	0.36 million		125,000		347	
1995-6	10,700,000	1.20 million	3.3 x	235,000	1.9 x	196	44%

Figure 1.1: Illustration of the fishing-down process

In 1940 the Tonle Sap Great Lake region catch of 125,000 tons consisted mainly of large and medium sized fish, while the 1995/96 catch of 235,000 tons contained hardly any large fish and was strongly dominated by small fish.



3.1 Long-distance migratory species or "white" fish (more than 60% of total catch)

Annually, migrations take place between the spawning areas in the Mekong in southern Laos and north-eastern Cambodia and the floodplains around the Tonle Sap, south of Phnom Penh and the Vietnamese Mekong delta and back.

- **Larger fish species** tend to spawn later in life. Many larger species have strongly declined, some nearly to extinction, such as the famous Mekong Giant Catfish *Pangasianodon gigas* (Fig. 1.2) and the Giant Barb *Catlocarpio siamensis* (Fig. 1.3). The Catfish is reported to spawn for the first time at a weight of 150 - 250 kg; it may then be six or more years old (Pholprasith and Tavarutmaneegul 1997). Clearly, very few individuals survive the heavy fishing pressure long enough to reach sexual maturity. (In the year 2000, 11 Giant Catfish were caught in the *dai* fishery.) Thus, the later in its life a species matures, the more vulnerable it is to overfishing.

In the dry season illegal fishing with explosives takes place in the deep pools and channels of the Mekong in the northeast of Cambodia. This strongly reduces the spawning populations of some of the bigger species.

- **Smaller fish species** usually are early spawners. Most smaller species have not declined and dominate present catches; a good example is the Cyprinid, Trey Riel *Henicorhynchus* spp. (Fig. 1.4). It spawns for the first time when about 1 year old. As most of the larger species are predators, a decrease in number leads to an increased survival of their prey (small species). Smaller species are not overfished and thus could be fished harder.

3.2 Short-distance migratory species or "black" fish (less than 40% of total catch)

Movements of short-distance migratory species or "black" fish are much more limited, e.g. from flooded forest to lake/river and back. Stocks have probably not declined, as these fish do not run the same gauntlet of fishing gears that the long-distance migratory species encounter. Snakeheads *Channa* spp. (Fig. 1.5) are the most important species group. They are the most valuable part of the catch of the Great Lake fishing lots.

3.3 Conclusion

Due to the reduction of larger fish species in the catch and the shift to smaller sizes, the average value per kg has decreased. Thus, not only has the catch rate per fisher dropped, the value of his catch has also decreased. Nevertheless, the overall tonnage of fish caught is still increasing. A number of larger species are overfished, but most of the smaller species are not overfished at all.

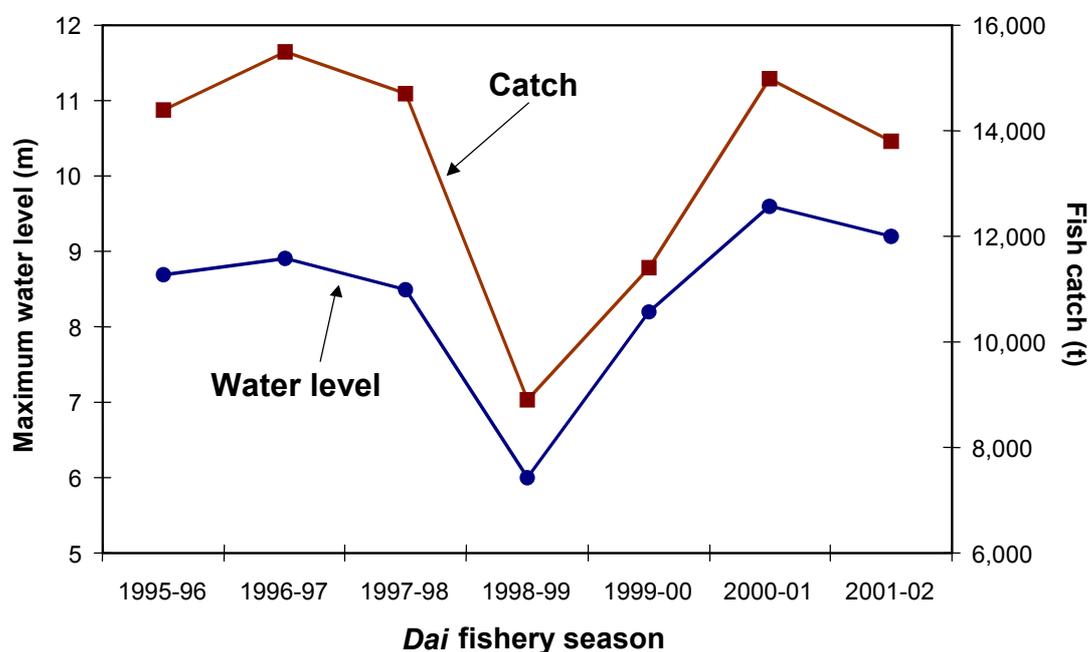
4. WHY IS THE FISH PRODUCTION SO LARGE IN CAMBODIA?

The primary reason for the enormous fish wealth in Cambodia is the monsoon, which each year swells the river and creates a flood of water that inundates the highly productive floodplains. The temporary access to enormous quantities of food (in particular from flooded forest habitats) drives the huge production of fish. White fish have evolved to synchronize their time of spawning with the onset of the monsoon, so that fry and juveniles are ready to enter the plains when they are being flooded. Black fish spawn and feed in the inundated floodplains. Without the floods and the floodplains the fish catch would be only a small fraction of what it is now.

The Tonle Sap floodplain at maximum inundation varies considerably in size from year to year (roughly between 10,000-15,000 km²). Thus, in a dry year (e.g. 1998/99) fish production is much less than in a wet year (e.g. 1996/97), as much less land is inundated. This is illustrated for the *dai* fishery in Figure 1.6 below. The relationship between the maximum flood level of the season and the fish catch shows that a permanent lowering of the average peak flood levels (e.g. due to flood controls) would result in a probably more than proportionally lower fish catch.

- Fish productivity is (among other variables) related to the extent of floodplain inundation. Thus, flood controls like dams, irrigation, river canalization and diversions have a negative effect, as they lower peak flood levels.
- Natural floodplain habitats, like the flood forests, have the highest productivity and species diversity. Hence, flood forest destruction or conversion to rice fields, etc. also has a negative effect.

Figure 1.2: 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 targeting white fish migrating out of the floodplains around the Great Lake to the Mekong River.



5. FISHERIES MANAGEMENT SYSTEM

Fishery laws. A new Fishery Conservation, Management and Development Law was drafted with World Bank assistance in August 1999. Unfortunately, it has not yet been finalized.

The following sub-decrees have been drafted: (1) Legalizing Community Fisheries Management, (2) Hiring and Management of Fishing Lots.

Types of fisheries. The fisheries of Cambodia can be divided in two broad categories (Van Zalinge *et al.*, 2000a):

- Limited access fisheries: the fishing lot system

The most productive part of the Cambodian fisheries domain had been privatized for more than a century through a system of government leases, the “fishing lots”. However, nowadays less than half of the original area of fishing lots remains. The other part is open-access.

Resource rent. In the recent past the lot system provided over US\$ 2 million in tax revenues annually, and more in an informal way. The open-access fisheries, however, do not contribute to public taxes.

Fishing lots vary from a simple anchoring position (*dai*) in the Tonle Sap River to a large piece of floodplain (the largest Great Lake lot is 500 km²). Their value depends on the perceived fish production.

Many fishing lots occupy relatively large areas of floodplain. The Tonle Sap Great Lake lots contain mostly natural habitats, but there are also rice fields and sometimes villages inside the lots. The natural habitats comprise flooded forests, shrub forest and grasslands, which are essential to the feeding and breeding of many fish species.

In the recent past open-access property rights have led to a rapid expansion of fishing effort in waters outside the lots. Catch rates have been falling and this has caused an increase in conflicts over fish resources. Many conflicts between lot operators and local villagers have occurred because of:

- different interpretations of the boundaries of the lot and the public access areas,
 - conversion of flood forest for other uses (e.g. rice fields) by the villagers,
 - illegal fishing operations by lot operators and villagers
 - competing uses of water: for fishing and irrigation.
- Open-access fisheries
- Open-access fisheries have grown strongly in the past two decades and have contributed mainly to the recent increase in fishing pressure.
- Middle-scale fisheries. A number of gears specified by the fishery law require a license (such as gillnets, seines, arrow-shaped traps, etc.).
 - Small-scale or family fisheries. The remainder of gears, such as small castnets, small dipnets, small gillnets, certain traps, etc., are free for anyone to use, although not everywhere nor at any time. Rice-field fisheries fall in this category.
 - Illegal fisheries. A number of gears and methods (such as brush parks, explosives, poisons, electric gears, etc.) have been declared illegal.
- Note that close to 200 different fishing gears and methods have been identified in Cambodia. They are practically all indigenous, i.e. developed or adapted in the region or the country.

6. A STEP TOWARD COMMUNITY FISHERIES DEVELOPMENT

On 24 October 2000, the Cambodian Prime Minister proclaimed fundamental changes in fishery policy by reducing the fishing lot areas and allowing community fishing in the areas that were released. A Sub-decree on Community Fisheries is being drafted and a new office for community fisheries development is being set up in the Department of Fisheries (DoF) with the support of the MRC Fisheries Program. Except for a small core staff in the central DoF, few people in the government, provinces or communities have a clear understanding of what community fisheries management entails (Degen *et al.*, 2000).

When community fisheries were suddenly introduced, the donors and NGOs were caught by surprise. Only MRC/DoF, FAO Siem Reap and a few NGOs were prepared to assist, but they are overwhelmed by the sheer size of the exercise. Recently, the Asian Development Bank has proposed providing a major loan to the government for community fisheries development.

7. POTENTIAL PROBLEMS: DEVELOPMENT ISSUES

Certain development plans threaten the viability of the fisheries and thereby food security, as well as the future of a thriving industry and a rich source of government revenues.

- Tonle Sap.
- Development projects for the Tonle Sap lake and floodplains, such as the building of harbors, roads, oil and gas explorations, etc. will have a negative effect on the existing ecology, as they will increase the accessibility to and the employment in the area. This will increase the population pressures on the environment through the destruction of natural habitats due to the increased needs for farmlands, fuelwood, fishing, etc. A better alternative is creation of employment in the areas directly outside the floodplains, as this would relieve these pressures. In addition, settlements in the floodplain are disaster prone.
- Competition for the use of the water resources of the Lower Mekong Basin.
1. Water demands from other sectors, such as electricity generation, water extraction for a variety of purposes and irrigation, are likely to increase with industrialization of the region. Already, the cumulative effects of upstream dam building and erosion in the Mekong watershed are noticeable. Pre-1965 Mekong flood levels were on average ca. 12% higher than in the last two decades (MRC Pakse data, 1924-98). In other words the present floodplains and thus fish productivity are on average somewhat smaller than in the past (but **not** fish catches! These depend mainly on fishing effort). In addition, annual variations have become more erratic. Eventually, minimum levels of peak floods and dry season flows will have to be set (as high as possible), if fishery production is to be maintained at a certain level.

2. Flood control measures and (in particular main stream) dam building will disrupt the connectivity between spawning and feeding grounds. Flood control will block access from the river to the floodplain. A main stream dam, e.g. the Sambor, will prevent the migration of adult white fish from the floodplains (e.g. Tonle Sap and others) to their spawning areas upstream (i.e. in northeast Cambodia). Fish ladders or similar devices will not be of help, as the migrations are huge. At peak migration times more than 2 million fish per hour pass by Phnom Penh on their way from the Tonle Sap to the Mekong!

8. OVERALL CONCLUSION

The fish resources are renewable provided the natural habitats they depend on and their annual inundation are maintained.

The management problems in the Tonle Sap are caused by lack of governance and public sector reform, which hinges on two main issues:

1. Absence of a proper legal framework, especially with regard to the community fisheries.
 2. Government staff (DoF, military, police, commune heads) not being paid wages on which they can live, hence they have to use the power of their authority to make ends meet. In addition, they often have to invest large sums of money in purchasing their position in the government hierarchy.
- The problem of overfishing is one of perception. Overall catches are still rising, but individual fishers do not perceive this because the larger the number of people sharing the same resource, the smaller the piece each gets.
 - Certain fish species (the larger ones) are definitely overfished, but others (the smaller ones) are not. No species has yet become extinct.
 - Maintenance of high flood levels is essential for the health of the floodplains and the fish stocks.
 - Illegal fishing leads to conflicts as some people gain an advantage over others by breaking the law. The use of explosives, especially in the deep channels of the upper Mekong in Kratie and Stung Treng, is particularly bad as it targets spawning populations sheltering there during the dry season. This is done mainly by fishers under military protection, but also by villagers on their own initiative.
 - In the Tonle Sap area, natural habitats are largely intact – and as long as this remains so, the depleted stocks of the larger fish species can recover, if fishing pressure decreases. However, the lack of law enforcement and compliance may lead to an increase in fishing pressure and a more rapid destruction of these habitats. It is therefore essential for the DoF to convince communities in charge of fisheries management of the need to conserve the resource base through effective habitat protection. This is an urgent matter, as loss of critical fish habitats is usually irreversible.

9. REFERENCES

- Ahmed, M., Hab Navy, Ly Vuthy and M. Tiengco, 1998. Socio-economic assessment of freshwater capture fisheries of Cambodia: a report on a household survey. Mekong River Commission Secretariat, Phnom Penh. 185pp.
- Chevey, P. and F. Le Poulain, 1940. La pêche dans les eaux douces du Cambodge. Travaux de L'institut Océanographique de l'Indochine. 5e Mémoire, Gouvernement Générale de l'Indochine, Saigon. 241pp.
- Degen, P., F. van Acker, N. van Zalinge, Nao Thuok and Deap Loeung, 2000. Taken for granted. Conflicts over Cambodia's freshwater fish resources. Presented at the IASCP Common Property Conference, Indiana, USA, 31 May - 4 June 2000.
- NIS, 2000. Report on the Cambodian socio-economic survey 1999. National Institute of Statistics, Ministry of Planning, Phnom Penh., Cambodia. 156pp.

- Pholprasith, S. and P. Tavarutmaneeagul, 1997. Biology and culture of the Mekong giant catfish, *Pangasianodon gigas*. Extension paper 31. National Inland Fisheries Institute, Bangkok. 79 pp.
- Van Zalinge, N.P., Nao Thuok and Deap Loeung, (Eds), 1999. Present status of Cambodia's freshwater capture fisheries and management implications. Nine presentations given at the Annual Meeting of the Department of Fisheries, Phnom Penh, 19-21 January 1999. Mekong River Commission Secretariat and Department of Fisheries. Phnom Penh. 149pp.
- Van Zalinge, N.P., Nao Thuok, Touch S. Tana and Deap Loeung, 2000a. Where there is water, there is fish? Cambodian fisheries issues in a Mekong River Basin perspective. In: Common property in the Mekong: issues of sustainability and subsistence. *ICLARM Studies and Reviews* 26, p. 37-48.
- Van Zalinge, N., Nao Thuok and Lieng Sopha, (Eds.), 2000b. Management aspects of Cambodia's freshwater capture fisheries. Twelve presentations given at the Annual Meeting of the Department of Fisheries, Phnom Penh, 27-28 January 2000. Mekong River Commission Secretariat and Department of Fisheries, Phnom Penh. 170pp.



Figure 13
 Mekong endemic:
 Giant Catfish or Trey Reach about to be set free alive.

This fish was 2.35 m in length and weighed 260 kg.
 (Photo Zeb Hogan)

Figure 14
 Giant Barb or Trey Kolreang
 m and 86 kg
 Released alive
 (Photo Zeb Hogan)



1.62



Figure 15
 Trey Riel forms ~40% of the *Ds*/catch
 and reproduces within one year of its birth.
 (Photo N. van Zalinge)

Figure 16
 Snakehead or Trey Chhdaur
 (Photo N. van Zalinge)

