



HAVE FISH CATCHES BEEN DECLINING IN THE MEKONG RIVER BASIN?

Eric Baran¹ & Chris Myschowoda²

¹ WorldFish Center, Phnom Penh, Cambodia

² Consultant, Phnom Penh, Cambodia

The fish catch in the Mekong is said to have considerably declined over the past years.

This hypothesis was tested in the Tonle Sap Basin (Cambodia), which yields 16% of the Mekong fish. In fact, the catch has approximately doubled between 1940 and 1995, but in the meanwhile the population has tripled. Thus, the catch per fisher is less than before, even though the overall biomass harvested is higher than in the past, which leads to the impression of a declining resource.

I Trends in Mekong fish catches: Claims and knowledge gaps

A commonplace among both fishers and commentators is the claim that fisheries production in the Mekong Basin has been declining considerably over past years (e.g. Watershed, 2002; MRC, 2003a; Pearce, 2004; Wain, 2004). The exact figures associated with current fisheries production basinwide are an issue of contention. Various statistics have been published, and many of them are widely divergent. Therefore, an

initial challenge in questioning the reality of this perceived decline is simply to arrive at a reasonable current estimate of fisheries production in the Mekong Basin.

In all Mekong Basin countries, official statistics manifest a general disinterest in accuracy. This is seen most clearly in the underestimation of the importance of small-scale fishing activities and the deficiency in recording levels of participation in capture fisheries. Indeed, most published figures regarding inland capture fisheries, according to Coates (2002, 2003), do not even qualify as “statistics” because they are not based on any data. The different values inherent in approaches toward fisheries taken by environmentalists, biologists, economists, and social and political

Corresponding author:

Eric Baran

WorldFish Center

PO box 1135

Phnom Penh, Cambodia

Email: e.baran@cgiar.org

commentators can be seen in other published figures, while institutions, the private sector, and non-governmental organisations often have their own agendas (Hirsch, 2004).

Nevertheless, the application of more rigorous scientific methods, improvements in data collection and analysis, new studies and household surveys have seen the figures for fisheries production in the Mekong Basin evolving upward and becoming more reliable and accurate. Reports from as early as 1991 estimate the total catch in the Mekong Basin at 357,000 tonnes including aquaculture. In the following years, this figure was boosted again and again. At the Mekong River Commission (MRC), the catch was estimated at 620,000 tonnes (Jensen 1996), at close to one million tonnes (Jensen 2000), then at 1.53 million tonnes (Sverdrup-Jensen 2002). More recently, estimates for capture fisheries in rivers in the Lower Mekong Basin have increased to 2.64 million tonnes (MRC, 2004; Van Zalinge *et al.*, 2004) and in 2005 the catch was even considered to exceed 3 million tonnes (MRC, 2005).

This evolution in the figures does not reflect actual changes in fish catch in the Mekong Basin. Indeed, basinwide fisheries production has never been monitored over a period of years. Rather, the increase reflects growing recognition of the incredible diversity and productivity of the Mekong Basin fisheries. This is, however, an ironic aspect of the claim that fisheries production has been declining over the years. For, at the same time as many people claim fisheries are in decline, they also recognise the fact that fisheries production is much greater than has ever been reported in the past.

In this paper we aim at testing the hypothesis that fisheries production has declined over the years in the Mekong Basin. Such an analysis requires a comparison of current figures with reliable data from previous decades; unfortunately, the rarity of data in the basin does not allow such global comparison. What is possible is to analyse trends of a representative region where more data is available and generalize to the whole basin.

The only basinwide production figures until recently were those of Lagler (1976). Including reservoir fisheries, he calculated the total fisheries production of the Lower Mekong River from Laos to Vietnam at 500,000 tonnes in 1975. Without more historical data, it is virtually impossible to test the trend in Mekong fish catches over the years. We propose below an alternative approach, focussing on Cambodia and the Tonle Sap Lake for which more data are available.

2 Fish catches in Cambodia: Doom or boon?

With much of its landmass covered by mighty rivers and the vast Tonle Sap Lake, Cambodia has long been regarded as a land of almost unbelievably plentiful fish stocks and has historically derived aspects of its national identity from its fisheries. As Henri Mouhot noted in 1858, “the [Tonle Sap] Great Lake is in itself a source of wealth for a whole nation; it is so full of fish that at the time of low waters they are crushed under boats; and rowing is often hampered by their number” (Mouhot, 1868).

Today, Cambodia’s freshwater capture fisheries rank as the fourth most productive worldwide after China, India, and Bangladesh, with an annual production of between 300,000 and 400,000 tonnes. In 2001 and 2002 for instance, according to FAO statistics the inland fish production of Cambodia (a country of 182,000 km²) was superior to that of North America (19.4 million square kilometres). When this figure is divided by population, Cambodia has the most intense inland fishery in the world with 20 kilograms of fish caught per inhabitant per year (Baran, 2005).

Like basinwide statistics, fish catch figures in Cambodia have been evolving upward over the years. This increase does not result from comprehensive long-term scientific monitoring of the catch, which still does not exist despite the efforts of the MRC over the past decade, but reflects the inclusion of such previously neglected sectors as subsistence fisheries and rice field fisheries (Van Zalinge *et al.*, 2000; Coates, 2002).

The different figures cited in various publications are all derived from three basic sources: official national statistics, catch statistics from the MRC project “Management of the Freshwater Capture Fisheries in Cambodia” based partly on field sampling, and consumption studies led by the MRC from 1995 to 1996. These different calculations have been reviewed in Baran *et al.*, (2001a) and are stated in the table below.

Like the basin as a whole, many people claim that fisheries production has been declining in Cambodia. This is not only the case with fishers themselves, but also with commentators (e.g. Mak Sithirith 2000, FACT 2001, DoF 2001, Agrisystems 2004). The causes for this perceived decline are believed to be widespread illegal fishing, over-fishing caused by an increasing number of fishermen, and ineffective fishing management by the government. Fishermen themselves state illegal fishing and over-exploitation are the main reasons for the decline (e.g. Keskinen *et al.*, 2002).

3 Investigating the history of fish catches in the Tonle Sap Basin

In the absence of data allowing comparison of basinwide trends, we propose to focus on a

representative sub-basin for which more data exist and analyses are possible: the Tonle Sap Basin in Cambodia.

According to current estimates, Cambodian fisheries comprise 26% of the total catch for the Mekong Basin. The Tonle Sap Lake is the most productive fishing ground in the country, contributing 60% of the annual catch, or 179,500 to 246,000 tonnes, over the 1995-2000 period (Ahmed *et al.*, 1998; Lieng & Van Zalinge, 2001). This means that the Tonle Sap Lake yields around 16% of the total catch in the Mekong Basin. The species that constitute this catch are highly migratory and are found in Laos, Thailand and Vietnam, (Bao *et al.*, 2001; Poulsen *et al.*, 2002), the Tonle Sap being the heart of this ecological system (van Zalinge *et al.*, 2004). A sample consisting of 16% of a population is large enough to be considered valid and therefore permits generalisations concerning basinwide trends.

Since the beginning of the 20th century, the Tonle Sap Great Lake’s amazing fish production has always attracted the attention of scientists (e.g. Pellegrin, 1907), and several detailed studies now allow a comparison of trends over time. The work of Chevey & Le Poulain (1940) remains the most

Table 1 Fish catch statistics for Cambodia.

Figure (tonnes of inland fish per year)	Source	Note
Catch varying between 50,500 and 75,700 tonnes between 1981 and 1998	Department of Fisheries data and DoF 2001	Statistics not based on any scientific monitoring (Coates 2002, 2003)
255,000 - 380,000 tonnes	Van Zalinge <i>et al.</i> , 1998	First post-war assessment partly based on a scientific monitoring
237,000	Baran <i>et al.</i> , 2001a	Compilation of scientific assessments dated 1994-1996 (5 different fisheries)
289,000 - 431,000 tonnes	Van Zalinge & Nao Tuok 1999, Van Zalinge <i>et al.</i> , 2000, Hortle <i>et al.</i> , 2004	Most commonly agreed figure, including results from scientific studies about catches of the dai fishery and rice field fisheries, and “guesstimates” about middle-scale and lot fisheries
Catch varying between 231,000 and 385,000 tonnes between 1999 and 2002	Department of Fisheries data	Upgraded national statistics (still not based on extensive monitoring) integrating catches of subsistence fisheries

comprehensive study of the Cambodian fishery sector to date; these authors amounted the annual Tonle Sap fish production to 100,000 tonnes. Thirty years later, Lagler (1976) also undertook a extensive review of these fisheries, and amounted the production to 85,000 tonnes.

Two major factors must be considered when comparing historical and modern statistics: the existence of fisheries previously neglected, and evolution of the population density.

Subsistence and rice-field fisheries are only taken into account in recent statistics. In 1995, subsistence capture fisheries were said to contribute 71,500 tonnes of fish per year, and rice field fisheries were said to contribute another 12,900 tonnes of fish per year.

In the past fifty years there has also been a rapid population growth, which corresponds to a dramatic increase in the fishing effort. In the forties, the population amounted to 3.2 million inhabitants (Blanc, 1959), and to 6.3 million in 1975 (MRCS, 1992). In 1995-1996 the Cambodian population reached 10.7 million, fishing-dependent communities around the Tonle Sap Lake making up 1.2 million people (11.2% of the total population; Ahmed *et al.*, 1998). Following Ahmed *et al.*, (1998), these people are considered as fishers in our analysis.

Data standardization before comparisons (Table 2): in the absence of specific information, we assumed

that the proportion of the total population living and fishing around the lake remained unchanged, and we used the 1995 figures to calculate the 1940 and 1975 figures by interpolation. Similarly, the catches of the subsistence and rice field fisheries, not accounted for in 1940 and 1975, have been calculated backward by assuming a contribution to total fisheries similar to that of 1995. The resulting figures are slightly different from those previously published (Baran *et al.*, 2001b) but are also more accurate, and the trend remains exactly the same.

Figure 1 illustrates the changes in fish catches and catch per fisher for the Tonle Sap Lake area between the 1940s and 1995. While overall catches have almost doubled since the 1940s, the catch per fisher has been reduced to almost half of what it was just six decades ago. This result is consistent with reports from fishers around the Tonle Sap Lake (Ahmed *et al.*, 1998) and from fishers along the Mekong River (Roberts, 1993; Hill, 1995), and it is a classic symptom of a fishery under heavy exploitation (Welcomme, 1995).

The increase in fishing effort has clearly come from the small and middle-scale fisheries (more operators, motorization of boats, increased dimension of gears, reduction of mesh size, etc). The large-scale fisheries, on the other hand, have declined by about two-thirds since 1919. This is because many of the large-scale fishing lots were gradually converted into public access fishing areas (in particular since 1989; detailed chronology in Baran, 2005).

Table 2 Catch per fisher over time in the Tonle Sap Great Lake.

Period	Catch of Tonle Sap commercial fisheries (tonnes)	Catch of Tonle Sap subsistence fisheries (49% of commercial catch in 1995; tonnes)	Catch of Tonle Sap rice field fisheries (9% of commercial catch in 1995; tonnes)	Overall Tonle Sap catches (tonnes)	Total population in Cambodia (million)	Number of Tonle Sap fishers (11.2% of total pop. in 1995)	Catch per fisher and per year (kg)
1940	100,000	49,000	9,000	158,000	3,2	0,36	441
1975	85,000	41,650	7,650	134,000	6,3	0,71	190
1995	152,200	71,500	12,900	237,000	10,7	1,2	198

How reliable are these conclusions and the data they are based on?

The 1940 and 1995 figures can be considered reasonably reliable as they are based on extensive sampling and a scientific approach, and are documented by a number of studies and publications. The 1975 figure is probably more of a “guesstimate” although it is qualitatively backed by an extensive series of surveys basinwide. Despite the annual production of national fisheries statistics, scientific assessments of catch per type of fishery are not available since 1995-1996, hence the limitation to this period in the above analysis.

It should be noted that Van Zalinge *et al.* (2004), based on a re-analysis of unpublished consumption studies by Hortle & Bush (2003), have recently upgraded the Cambodian fish harvest to 682,000 tonnes; this would correspond to about 400,000 tonnes of fish from the Tonle Sap Lake. However in the past ten years the population fishing around the lake has paradoxically remained constant, demographic growth being offset by urban pull (Haapala, 2003). In this context, the harvest claimed by Van Zalinge *et al.* would correspond to a catch of about 570 kg/fisher/year. This figure, implying that fishers catch on average three times more nowadays than 10 years ago, is not credible to anybody familiar with Cambodian fisheries.

To sum up, the fisheries production in the Tonle Sap Lake area has actually increased over the years, rather than declined as many people assume, but it seems that the amount of fish per fisher, or the amount of fish per unit of effort, has declined as competition for the resource has become more intense.

4 Population growth, technology, and fisheries production basinwide

Despite the myth of declining fisheries, fish catches in the Tonle Sap area are greater now than at any other time in the past (Baran *et al.*, 2001b; Van Zalinge *et al.*, 2001). However, the increase in population has outstripped the increase in fisheries production resulting in a diminishing catch per fisher. Overall, this trend is set to continue. With an annual population growth rate of 1.6%, it is estimated that the population of Cambodia will reach 16.6 million by 2010 and over 20 million by 2020 (Degen *et al.*, 2000). However, as highlighted above, the fishing pressure around the lake is also influenced by two other opposing factors: i) harsh local conditions and emigration towards urban centres tend to keep the lake’s fishing population rather constant, and ii) the spread of increasingly efficient if not radical fishing methods that have a very high catch rate.

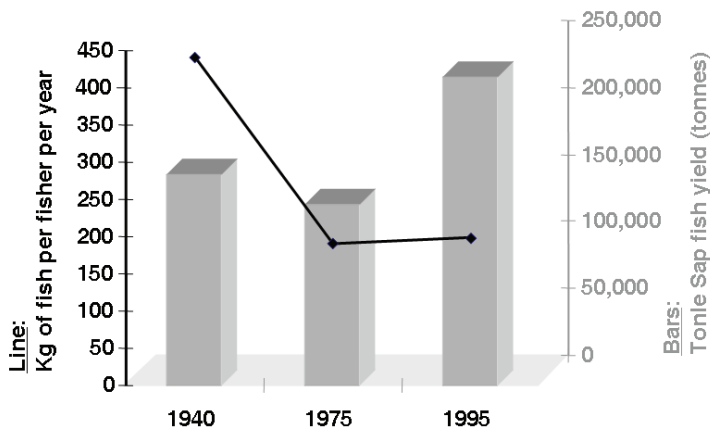


Figure 1 Production and productivity of the Tonle Sap area over time (standardised basis).

From a demography perspective, a possible bias inherent to studies based on local population statistics is that temporary migrant fishers are overlooked, although their role is considered quite significant in the Tonle Sap area (Keskinen, 2003; Nettleton & Baran, 2004).

On the fishery side, the harvest might also be increasingly captured by a small number of unmonitored specialised fishers (using motorised and electrified gears, small mesh-size dragnets harvesting river stretches to exhaustion, mosquito nets, etc), when the bulk of traditional fishers actually catch less than ten years ago. This likely heterogeneity is not reflected in analyses limited to average catches per fisher.

Obviously, population growth rates outstripping fisheries production is not just a cause for concern in Cambodia. A similar trend is happening right across the rest of the Lower Mekong Basin, as the population living within the watershed amounts to 53 million people, and this figure is set to rise to up to 90 million by 2025 (MRC, 2003b). While Cambodia's population growth rate is 1.6%, the population growth rates in Laos and Vietnam are 2.3% and 1.16% respectively. Only Thailand, which participates least in Mekong fisheries, has a relatively low population growth rate of 0.6%.

Another factor that should be mentioned in conjunction with population growth rates is the development of new fishing technologies. The increased annual fish catch is not only a result of a growing number of fishers but also of new, inexpensive, and efficient fishing gears. Until recently, most fishers used traditional gears that were time-consuming to construct and could only be used over relatively small areas. These traditional gears have been supplanted to a great extent by nylon monofilament gill-nets and fine-mesh fences with traps made of modern materials (Hortle *et al.*, 2004).

In conclusion, it is reasonable to infer that the perceived decline in fisheries production basinwide is attributable to increased fishing pressure driven by population growth as well as

new technologies. In this context the clarifications about the difference between a decline of the overall biomass harvested and a decline in catch per fisher might qualify as a quibble, as the bottom line is that there is less fish available per inhabitant than in the past.

5 The decline in size and quality of fish in Cambodia and basinwide

While the decline in fisheries production in the Mekong Basin might be a myth, one should not ignore the fact that the size and quality of the fish caught are changing. In the production figures for the Tonle Sap area, there is no distinction made between the species, size, or quality of the catches. What is evident from other sources, however, is that large migratory species have declined compared to small migratory and non-migratory species (Van Zalinge *et al.*, 2000), and the proportion of low-value opportunists is thought to be increasing as a result of over-exploitation (Baran *et al.*, in press.)

The same trend has been noted basinwide (e.g. Baird & Flaherty, 2002; Sverdrup-Jensen, 2002): year after year, total catches seem to contain a higher proportion of less valuable small fish and a lower proportion of medium and big sized fish. This trend is similar to that in other freshwater fisheries (Welcomme, 1995). Regardless of the causes of the change, the fact that the Mekong fisheries are changing in terms of their makeup may be construed as a decline. While the small, opportunistic species that are now caught in such great abundance have a high nutritional value, the medium and large fish that are becoming less prevalent have a much higher market value, and the decrease in the number of large migratory species represents a loss of biodiversity.

6 Threats to Mekong fisheries production

Despite the lack of clear evidence of a decline in the overall production of the Mekong fish catches in the past, there are actual reasons why we should fear such a decline in the future. The perception of declining fisheries is often based on very real

threats, and it is perhaps only a matter of time until those things blamed for the mythical decline result in a real, measurable decline. These threats are multiple, and they affect, not only Cambodia, but, to varying degrees, the Mekong Basin as a whole.

Among the threats that can be listed here are industrial development; upstream damming; disruptive fishing methods, such as explosives, mosquito nets, electric fishing and poisoning; and the use of highly hazardous chemicals imported from neighbouring countries and used indiscriminately, for instance to harvest fish or to preserve dry fish (FACT, 2001; Touch Seang Tana & Todd, 2003). Particularly in Cambodia, the degradation of wetlands and floodplain habitat

caused by increased agricultural activities and the modification of river-flows is yet another reason for concern.

Furthermore, even if these threats do not ultimately reduce the fisheries production in the Mekong Basin, the problem will remain that the fish availability does not match the demand of a burgeoning population. In this context what fishers experience individually is much the same as a decline in fish stocks.

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