

## Fisheries Research and Development in the Mekong Region

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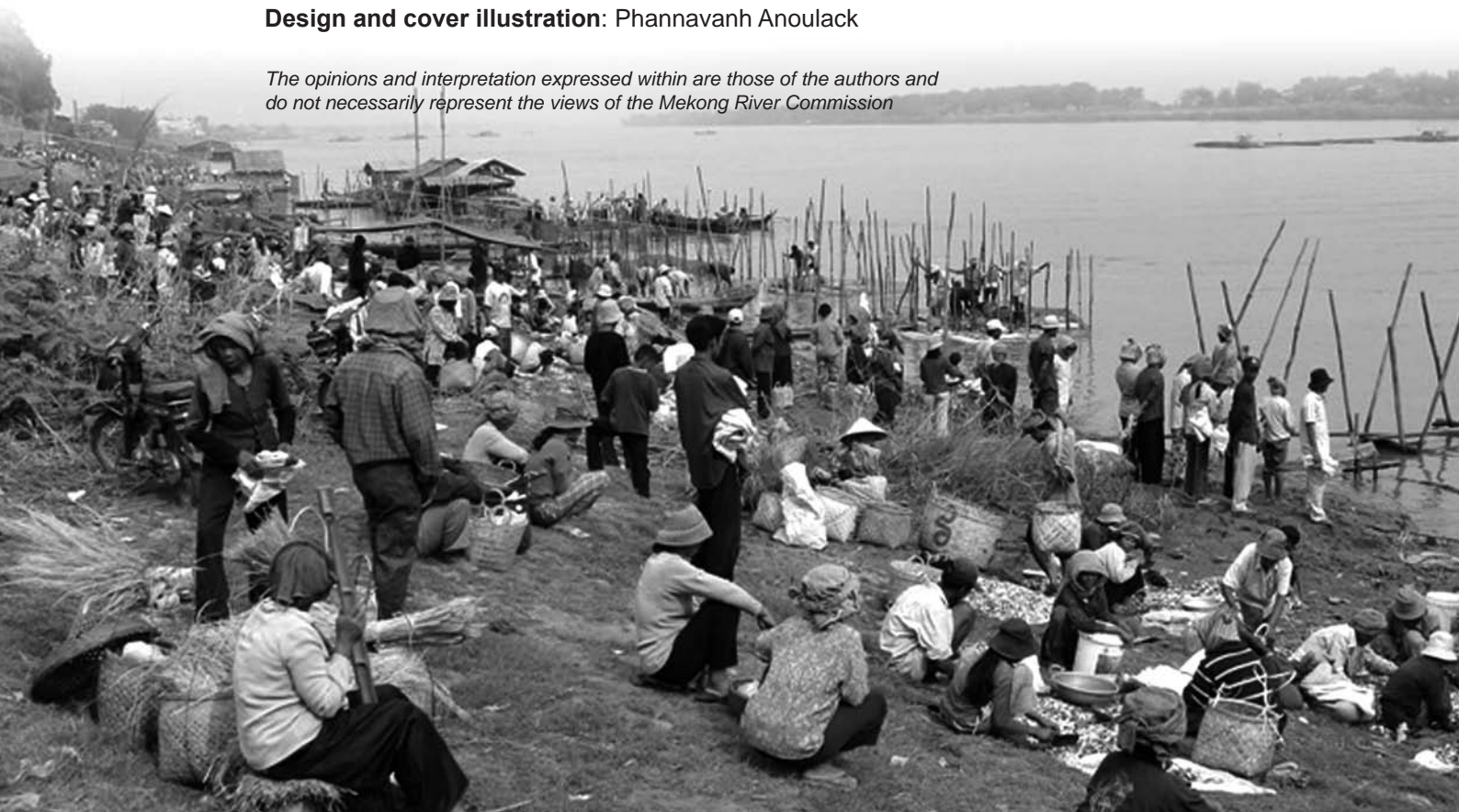
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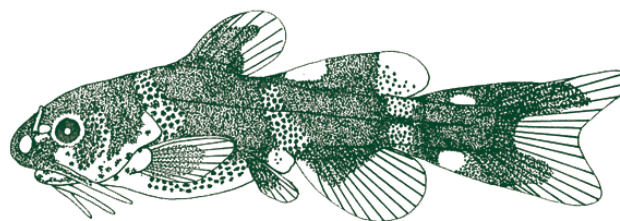
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# Editorial



This issue of *Catch and Culture* is largely devoted to the hundreds of fish species found in the Mekong. Our lead article examines the considerable taxonomic work that has been done since the MRC Fisheries programme published the Mekong Fish Database in 2003. With many changes to the classification of Mekong fishes and descriptions of at least 15 new inland species over the past six years, an updated count finds that the system has about 1,100 species including about 850 “freshwater” species known to scientists. This estimate includes some undescribed species as well as brackish water and “visitors” from marine or coastal waters.

The use of indigenous and alien species in aquaculture is the theme of a series of three articles on fish farming in the lower basin. We look first at recent developments with the nine native Mekong species that the programme has targeted to complement or replace alien species. The second article examines some of the alien species introduced into the lower basin over the past century and recent efforts to address the limited supplies of native fingerlings, one of the biggest constraints to farming native species. The third article looks at the business of running a fish farm in Cambodia, as related first-hand by a farmer who has been raising, nursing and breeding four species of Mekong fishes over the past six years.

Another article covers this year’s fishing quota for the Mekong giant catfish, the critically-endangered flagship species of the lower basin. Our special insert in this edition is on another critically-endangered giant species—Jullien’s golden carp. This was the species targeted for a trans-boundary release of 200,000 fingerlings by Lao and Thai authorities in April this year. In a separate National Fish Day ceremony in Cambodia in July, Prime Minister Hun Sen presided over the release of one million fish and other aquatic animals including prawns, turtles and frogs. Most of the fingerlings released were cyprinid species.

Also in this issue is an update on how community fisheries are evolving in Cambodia and an interview with Yasuhisa Kato, who recently returned to Japan after 11 years with the Southeast Asian Fisheries Development Center in Bangkok. We also feature a newly-published book with wonderful images of life along the Mekong.

Finally, we recognise the significant contributions to Mekong fisheries by Chris Barlow and Ashley Halls. After eight and half years with the programme, including six years as manager, Dr Barlow has returned to Australia where he has been appointed fisheries manager of the Australian Center for International Agricultural Research. Dr Halls, who joined the programme in early 2007, has returned to Britain where he will continue to work as an MRC consultant while running his consulting company.



# Fishes of the Mekong – how many species are there?

By Kent G. Hortle \*

***Recent records suggest that about 850 'freshwater' fish species occur in the basin, but many more marine and coastal fishes may at times enter the waters of the Mekong delta***

## Introduction

Loss of biodiversity is a major concern for biologists, who warn that we are now well into 'the century of extinctions' during which conservation biology is likely to become an increasingly important discipline (Dubois 2003). While there is increasing understanding of the need to manage habitat to maintain biodiversity, there is much less awareness that rational management of ecosystems faces a major 'taxonomic impediment', the incompleteness and inaccuracy of inventories of biodiversity, which are the starting point for any conservation program .

Tropical rivers are generally among the most diverse ecosystems and their biodiversity is particularly threatened by habitat changes and introduction of exotic species (Coates et al. 2003, Dudgeon et al. 2006). The Mekong system is thought to be an international 'hotspot' of unusually high biodiversity, so there is an urgent need for an up-to-date inventory of the system's biodiversity, both in an absolute sense and relative to other larger tropical rivers, as well as accurate information on individual species' distribution and migration patterns.

One element of biodiversity is species richness, the number of species present in a defined area, an easily understood notion and one that is useful in comparisons between systems. The fish species richness of the Mekong system is a topic of particular

interest, given the importance of fisheries to Mekong peoples and the claim by many authors that the system has unusually high biodiversity.

It should also be noted that apart from species richness (the subject of this article), other features of biodiversity ensure that the Mekong deserves the title of a biodiversity hotspot and should be given a high priority in conservation. These include the apparently large number of fish families (Kottelat, 2001), a significant proportion of endemic species (about 24%) which include several large or giant fishes, the persistence of the natural flood pulse, and an extraordinary dependence on fisheries by expanding rural populations (Hortle 2009).

## What is a species?

The biological species concept (BSC) has been generally accepted by zoologists as the most useful and practical definition of a species as 'actually or potentially reproductively isolated' population(s) of organisms (de Queiroz 2005)<sup>1</sup>. The BSC can be seen as a special case of the broader 'evolutionary species concept', which covers asexually reproducing organisms and fossils, and which defines each species as a separately evolving lineage (Wiley 1978). Although there is a lively and ongoing debate about the nature and definition of 'species' (de Queiroz 2005; Hey 2006), in practical terms testing for reproductive isolation is usually not feasible, and genetic studies to reveal phylogeny (evolutionary relatedness) are too expensive to be applied to the many wild populations which require classification. To deduce relationships and to diagnose 'species' taxonomists continue to rely on morphology—variation in features, such as number of gill rakers, number of scales, counts of

<sup>1</sup>An alternative 'phylogenetic' system based only upon degree of genetic relationship has been developed recently and is being increasingly used in cladistics (Rieppel 2006).

<sup>2</sup>The basis for the current system of scientific classification (taxonomy) of animals was set out over 200 years ago by Linnaeus in his *Systema Naturae*, with rules now formalised in the Code set by the International Commission on Zoological Nomenclature ([www.iczn.org](http://www.iczn.org)).

fin rays or even shape and coloration<sup>2</sup>. Taxonomists generally adjust classifications when evidence is found of intermediates between what were thought to be reproductively isolated populations, or if genetic studies indicate the presence of sympatric but reproductively isolated populations of morphologically similar fishes. The very limited resources available to study in the Earth's biodiversity in detail, and differences in opinion between taxonomists, ensure that revisions to classification of species that have been described on morphological grounds are likely to continue for the foreseeable future.

### **The need to adjust for taxonomic effort**

The number of species recorded from any particular system tends to increase as species are collected and recorded for the first time (new records) and as new species are found and described, with the rate of addition of species tending to decrease over time to an asymptote. Figure 1 suggests that there are still likely to be many more fish species described from the Mekong catchment, as is also evident from listings of un-described species in recent literature (see below). However, this is not an unusual situation for tropical river systems, indeed it seems likely that the Mekong has by now received comparable or more attention than many other large tropical river systems which are less accessible or subject to security risks. It is also highly likely that in many other tropical river systems flow and habitat alterations and the impact of species introductions may have caused the extinction of many fish species before they could be described. This inference can be reasonably drawn based on the situation in well-studied regions: for example in North America 61 taxa of inland fish are thought to have become extinct and about one third of all inland fish species are considered imperilled (Jelks et al. 2008).

### **Some other factors that affect species richness**

As well as possible artefacts introduced by differences in taxonomic effort, comparisons between systems should take account of other factors which are well-known to be correlated with species richness; for example, the ecoregion in which the system is situated (Abell 2008), the fact that tropical systems are generally richer in species than temperate systems, and the 'species-area effect': more species are found in larger areas, other factors being equal. Welcomme (1985 Fig 5.1) used data from 47 major rivers to show that fish species richness is well correlated with the

size of the river catchment, one indicator of available habitat area. Lévêque et al. (2008) provide updated graphs of the relationship between the size of some major river systems and their species richness, and de Silva et al. (2007 Fig 1.) show that land area alone accounts for over 70% of the variance in published 'finfish' species estimates between countries in east and southeast Asia. It is to be expected therefore that the Mekong will support more species than other smaller tropical river systems in the Oriental region because of the large extent of available aquatic habitat within its catchment of about 800,000 km<sup>2</sup>.

### **The limits of the Mekong**

Defining a river system's boundaries by its catchment is straightforward, but defining its seaward extent is more problematic. MRC publications generally define the boundary geographically as a line across the mouth, but a more useful ecological boundary would be based on salinity. In the dry season, saline water extends at least 60 km inland, whereas in the wet season a surface layer of fresh water extends several kilometres offshore in the river's plume. Although not well-documented for the Mekong, it can be assumed that the downstream limit of distribution of strictly freshwater species, as well as the penetration of marine species into the estuary changes with season. Estuary fishes tend to prefer water of a particular salinity so they are also likely to move seasonally. Any reference to species counts of the system should therefore refer to whether the figure includes fishes normally found in brackish or marine waters that may only be present in the 'Mekong' seasonally or occasionally.

### **Published species estimates**

Published estimates of the number of species in the Mekong system appear to have increased rapidly in the last few years, as can be seen from the following brief chronology:

- Taki (1978) reviewed information up to the early 1970s and estimated that there were about 300 species known from the lower Mekong basin.
- Welcomme (1985 Fig 5.1) estimated that there were about 600 species in the Mekong, and ranked the system third in terms of its species richness after the Amazon and the Zaire, both of which are larger rivers.

- Rainboth (1996) recorded 475 species from Cambodia and estimated that the Mekong “has about 1200 species of fish” (p. 14) and reiterated this estimate in an interview (Jensen 1996). This estimate however was clearly his expectation of the total that might be eventually found after more collection and taxonomic work.
- Kottelat (2001 p19) stated that there were documented records of about 700 species from the Mekong basin, and because there were no data to support claims of higher figures he suggested that they should not be quoted.

Several authors provided similarly high but unsubstantiated figures, perhaps based on Rainboth’s estimate, but misused his figure as if it were a count of species actually recorded or a minimum estimate. In some cases, authors implied that the species count was for the river, when many species are found only in upland tributaries or in the estuary or in specialised habitats such as lakes or caves. Some of these recent species estimates include the following.

- ‘There are 1200 recorded fish species’ (Sverdrup-Jensen 2002).
- ‘It (the Mekong) is a hot spot for biodiversity with between 1200 and 1600 described species of fish’ (Campbell 2002).
- ‘There are at least 1200 and possibly as many as 1700 (species of fish) living in the Mekong Basin’ (Coates et al. 2003).
- ‘There are more than 1200 species in the river’ (sic) (MRC 2003).

The MRC Fisheries Programme published the first compendium of species of the Mekong, the Mekong Fish Database (MFD), in 2003 and widely distributed it as a CD to fisheries scientists in the region. The MFD contained information on 898 indigenous fishes as well as 24 introduced species that were recorded from or thought likely to be present in the lower Mekong basin

and in Yunnan. The fishes can be grouped according to their known occurrence in water of different salinities, using information which has been obtained from FishBase (Froese and Pauly 2009).

Freshwater only:	539 species
Freshwater-brackish:	79 species
Fresh- brackish marine:	113 species
Brackish only:	4 species
Brackish and marine:	115 species
Marine:	48 species

The marine species and many of the brackish/marine species have only been recorded from the sea off the mouth of the Mekong or from nearby marine waters, and records for several of the freshwater species are questionable, so the MFD supports an estimate of about 750 species likely to be found at times within freshwaters of the system, which can be loosely defined as ‘freshwater’ species<sup>3</sup>. This figure is quite consistent with Kottelat’s estimate, nevertheless higher unsubstantiated estimates continued to be published, for example:

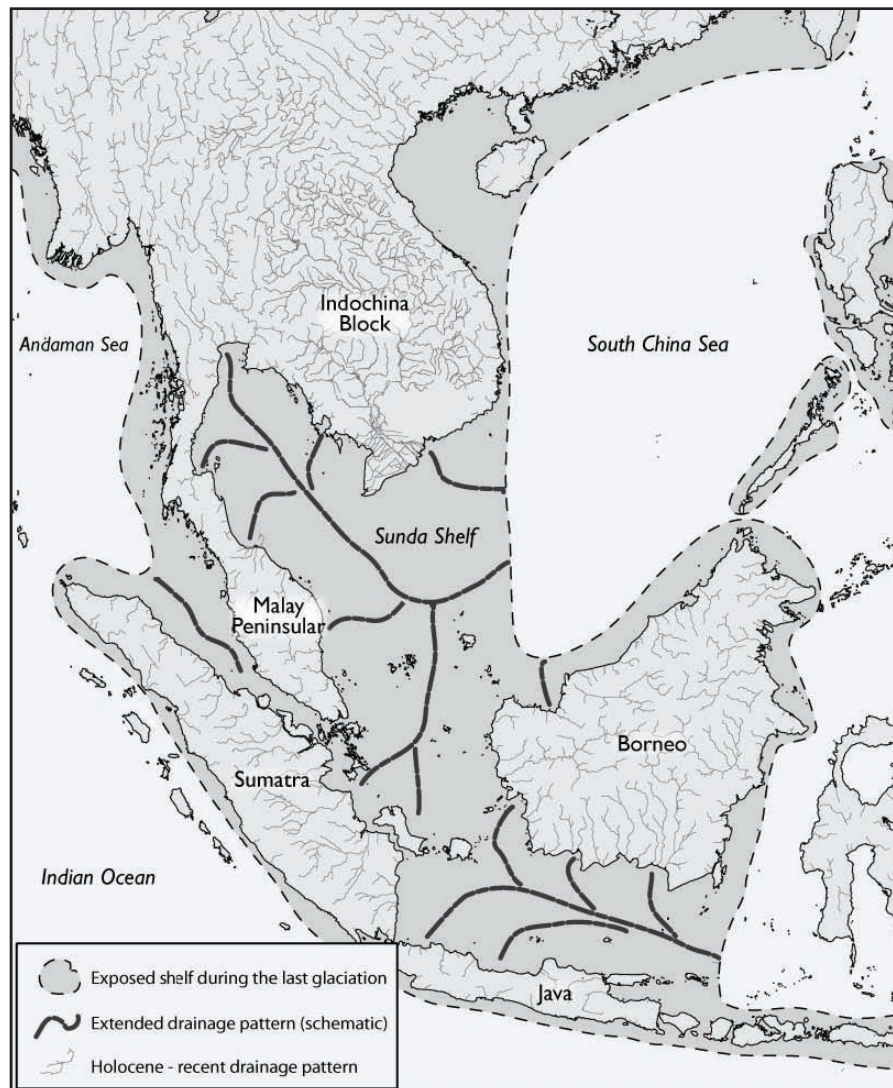
- ‘The number of fish species is at least 1200’ (Mattson 2004)
- ‘The number of fish species that has been found in the (Mekong basin) exceeds 2000’ (van Zalinge et al. 2004).

The citation of species numbers seems to represent a case of ‘escalation bias’, where a figure is quoted that supports a commonly-held belief (the Mekong has ‘high’ biodiversity) while ignoring the actual counts of species from the system published by Kottelat in 2001 and in the MFD in 2003. The variability between recent published estimates of species richness certainly creates a credibility issue for those seeking to promote conservation of the system’s biodiversity, as well as highlighting the practical problems of classification and nomenclature facing those engaged in field studies or management of habitat for fisheries.

<sup>3</sup>It should be noted that ‘freshwater’ species have been defined by some authors as only those within primary freshwater families, i.e. families which have a long history of evolution in freshwaters, and if this approach were used the total for the Mekong system would fall to about 530 species because many Mekong fishes are within peripheral division families, those with recent marine ancestors. See: Berra TM (2001) Freshwater Fish Distribution. Academic Press: San Diego, USA.

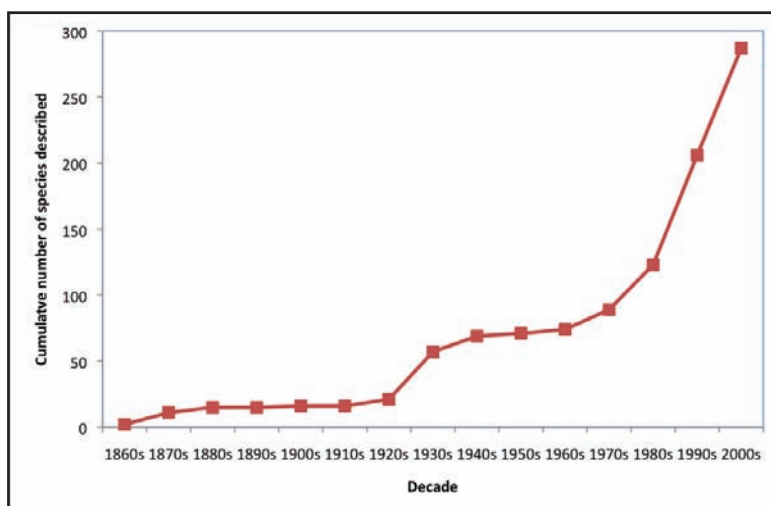
**Figure 1: The Sunda shelf**

Showing the maximum extent of sea level regression over the last 250,000 years, the -120 m contour. Based on (Voris 2000)



**Figure 2: Species described from the Mekong River system**

Cumulative count does not include species recorded that were first described from elsewhere



**Table 1. Species 'split' since material was compiled for publication of the MFD in 2003**

The newly described Mekong species is shown in bold after the species which was formerly considered to occupy a large range on both sides of the Sunda shelf, including the Mekong system

Sister species	Revised distribution summary
<i>Amblyrhynchichthys truncatus</i> (Bleeker, 1851)	Malay Peninsula and Borneo
<b><i>Amblyrhynchichthys micracanthus</i> Ng &amp; Kottelat, 2004</b>	<b>Lower and Middle Mekong to Vientiane, Chao Phraya, Mae Khlong, Tapi River</b>
<i>Bagrichthys macracanthus</i> (Bleeker, 1854)	Sumatra, Peninsular Malaysia, northern Borneo (Sarawak)
<b><i>Bagrichthys majusculus</i> Ng, 2002</b>	<b>Lower and middle Mekong River system</b>
<i>Balantiocheilos melanopterus</i> (Bleeker, 1851)	Kalimantan, Malay Peninsula, Sumatra
<b><i>Balantiocheilos ambusticauda</i> Ng &amp; Kottelat, 2007</b>	<b>Lower and middle Mekong upstream to Nam Ngum, Chao Phraya</b>
<i>Hemiarus stormii</i> (Bleeker, 1858)	Eastern Malay Peninsula and west Borneo
<b><i>Hemiarus verrucosus</i> (Ng, 2003)</b>	<b>Lower Mekong to Khone Falls and possibly Bang Pakong R., Southeast Thailand</b>
<i>Kryptopterus schilbeides</i> (Bleeker, 1858)	Borneo, Java, Sumatra and Malay Peninsula
<b><i>Kryptopterus paraschilbeides</i> Ng, 2003</b>	<b>Lower and middle Mekong, Mae Khlong, Bang Pakong R., Chao Phraya</b>
<i>Kryptopterus schilbeides</i> (Bleeker, 1858)	Eastern Sumatra and western and southern Borneo
<b><i>Kryptopterus paraschilbeides</i> Ng, 2003</b>	<b>Lower and middle Mekong upstream to Vientiane</b>
<i>Ompok hypophthalmus</i> (Fang & Chaux, 1949)	Java and southern Borneo (Barito River drainage)
<b><i>Ompok urbaini</i> Ng, 2003</b>	<b>Mekong, Chao Phraya and Pasak River drainages</b>
<i>Ompok rhadinurus</i> Ng, 2003	Sumatra, the Malay Peninsula and Borneo
<i>Ompok eugeneiatus</i> (Vallant, 1893)	Peninsular Malaysia, central Sumatra and western Borneo
<b><i>Ompok pinnatus</i> Ng, 2003</b>	<b>Lower Mekong River and Chao Phraya drainages</b>
<i>Pangasius kunyit</i> Pouyaud Teugels & Legendre, 1999	Sumatra and Kalimantan (southern Borneo)
<b><i>Pangasius mekongensis</i> Gustiano, Teugels &amp; Pouyaud, 2003</b>	<b>Lower Mekong River system</b>
<i>Pangasius sabahensis</i> Gustiano, Teugels & Pouyaud, 2003	Sabah, northern Borneo
<i>Pangasius polyuranodon</i> Bleeker, 1852	Sumatra and Borneo
<b><i>Pangasius elongatus</i> Pouyaud, Gustiano &amp; Teugels, 2002</b>	<b>Chao Phraya, Mekong and Bang Pakong basins</b>
<i>Pangasius mahakamensis</i> Pouyaud, Gustiano & Teugels, 2002	Mahakam River, East Kalimantan, Borneo
<i>Polynemus dubius</i> Bleeker, 1853	Malay Peninsula, Sumatra, Kalimantan
<b><i>Polynemus aquilonaris</i>* Motomura, 2003</b>	<b>Chao Phraya and Mekong River basins</b>
<i>Wallago leerii</i> Bleeker, 1851	Southern Thailand, Malay Peninsula and western Indonesia
<b><i>Wallago micropogon</i> Ng, 2004</b>	<b>Lower and middle Mekong to Luang Phabang, and middle Chao Phraya</b>

\*also includes material formerly identified as *Polynemus longipectoralis*



### An updated species count

Since the MFD was published there has been considerable taxonomic work which has resulted in many changes to classification of Mekong system fishes, which include the following.

- ‘Splitting’ of species: in at least 12 cases a species that was considered widespread in rivers that formerly ran across the Sunda shelf has been ‘split’ into ‘sister’ species, a mainland Indochinese (including Mekong) species and one or more ‘Sundaic’ species, found in river systems to the south (Figure 2, Table 1). Such splitting does not change the species count for the Mekong, only the name applied to the Mekong species. But it can cause confusion and double-counting when distribution records for the Sundaic species are not updated, which is a problem for example in the current version of FishBase. Examples of split species are shown in Table 1 with updated distribution information.
- Description of new species: new species are still being described, either from new collections or when taxonomists re-examine existing collections which may have been stored in museums for many years. At least 16 new inland species have been described from the Mekong River system since the MFD was published in 2003 (Table 2), adding to the species count for the system.
- ‘Lumping’: two or more species formerly thought to be distinct are synonymised when additional examination shows that there is overlap in the range of variation of diagnostic characters between populations that have been named as separate species, or when it is found that a species has been named more than once. Since 2003 ‘lumping’ of species has reduced the count for the Mekong system by about 20 species, more than compensating for the effect of description of new species.
- Revisions of groups: several groups (genera or families) have been revised since the MFD was published, with many new generic names created to better define relationships between species. For example, the widespread genus *Botia*, which includes several common Mekong species, was split into seven genera by Kottelat (2004), with Mekong species now falling within three genera. Thus the red-tailed botia, formerly *Botia modesta* is now known as *Yasuhikotakia modesta*. A revision of the catfish family Ariidae

**Table 2. New species described from the Mekong River system**  
Since material was compiled for publication of the Mekong Fish Database in 2003

Species	Distribution summary
<i>Scizothorax nudiventris</i> Yang Chen & Yang, 2009	Upper Mekong, Yunnan
<i>Bangana brevirostris</i> Liu & Zhou, 2009	Upper Mekong, Yunnan
<i>Mekongina lancangensis</i> Yang, Chen & Yang, 2008	Upper Mekong, Yunnan
<i>Minyclupeoides dentibranchialis</i> Roberts, 2008	Lower Mekong, Cambodia
<i>Oreoglanis jingdongensis</i> Kong, Chen & Yang, 2007	Upper Mekong, Yunnan
<i>Pareuchiloglanis abbreviatus</i> Li, Zhou, Thomson, Zhang & Yang, 2007	Upper Mekong, Yunnan
<i>Pareuchiloglanis prolixidorsalis</i> Li, Zhou, Thomson, Zhang & Yang, 2007	Upper Mekong, Yunnan
<i>Tonlesapia tsukawakii</i> Motomura & Mukai, 2006	Great Lake, Tonlé Sap drainage in Cambodia.
<i>Polynemus bidentatus</i> Motomura & Tsuwaki, 2006	Mekong delta, Viet Nam
<i>Pseudobagarius filifer</i> (Ng & Rainboth, 2005)	Tonlé Sap drainage near Phnom Penh, Cambodia
<i>Pseudobagarius nitidus</i> (Ng & Rainboth, 2005)	Mekong River downstream of Khone Falls near Cambodia-Lao border
<i>Akysis fuliginatus</i> Ng & Rainboth, 2005	Lower Mekong River in northern Cambodia
<i>Betta stiktos</i> Tan & Ng, 2005	Mekong Drainage, Cambodia
<i>Schistura bannaensis</i> Chen, Yang & Qi, 2005	Upper Mekong, Yunnan
<i>Oreoglanis macronemus</i> Ng, 2004	Xieng Khouang, Lao PDR
<i>Hemimyzon ecdyonuroides</i> Freyhof & Herder, 2002	Headwaters of Se San River, Viet Nam

has also led to many new names for genera (Marceniuk and Menezes 2007). Such name changes are relatively easy to follow by updating species lists using FishBase and do not affect the species count for the system.

- Additional distribution records: species that are already described from elsewhere are recorded for the first time in collections from the Mekong system. Such information has not been updated in any systematic way since the MFD was published. Summary distribution records are often woefully inadequate for assessing whether it is likely that a species is present in the area of interest, in some cases simply reading "Asia", while original locality data on museum specimens are often incomplete or erroneous. The lists of fishes published in ecological surveys typically include incompletely identified species (usually noted as 'sp1', 'sp2' etc.) or may contain errors (for example non-Mekong species), hardly surprising where there are many similar species of fishes that are difficult for non-specialists to identify correctly. Ideally, distribution data for inland species in FishBase would accurately identify the major river basins in which each species has been definitely recorded, but it is a major task to check and carefully summarize and update such information. A review and cross-checking of Mekong system species listed in Baird et al. (1999), Kang et al. (2009), Kottelat (2001), Rainboth (1996) and Vidthayanon (2008) suggests that there are about 100 additional species that have been recorded from freshwaters of the Mekong basin, although most of these are not formally described or are of uncertain taxonomic status. Therefore it is reasonable to estimate that there are about 850 'freshwater' species known from the system.

The count of all fish species from 'the river system' is likely to be heavily influenced by the coastal species which enter fresh water for short periods, or marine species which may cross the geographical boundary (a line across the mouth) during dry periods. Systematic collection and accurate identification of fishes from the delta region would do much to remove the uncertainty in species counts and resolve the discrepancies in published estimates. If marine and coastal 'visitors' are

included, there are about 1100 species recorded from or thought likely to occur in the system at times based on their occurrence in the Mekong's plume. More species will continue to be found, but at present there are no grounds for quoting higher estimates.

### Conclusion

The available data indicate that there are about 850 freshwater fish species recorded from the Mekong (a total that includes some undescribed species of uncertain status), with a total estimate of about 1100 if the possible coastal or marine visitors are included. As mentioned above, comparison with other river systems should take into account the biogeographic province or ecoregion, the area of each system, the relative taxonomic effort that has been applied, and the extent to which biodiversity may have been lost before it could be documented. If it is evident that the Mekong does indeed have more species than expected for a river of its size and location, it would be of interest to explore the possible causes, which might include its recent geological history and the geography of the system.

Unless great care is taken, comparisons with other river systems may lead to erroneous conclusions. For example, according to FishBase there are 405 species recorded from the Zaire (Congo) and 1212 species recorded from the Amazon, but these are clearly under-estimates, both because existing records have not been systematically compiled and because many species remain to be described. Roberts (1975) recorded 650 fishes from the Zaire basin and Tedesco et al. (2005) quoted a figure of 686 species, but Lévêque et al. (2008) cautioned that existing information for this basin needs to be synthesised and that many new discoveries are anticipated. For the Amazon, Tedesco et al. (2005) used an estimate of 1761 species and Lévêque et al. (2008) recorded 2416 species, but Kottelat (2001) cited an opinion that the number of species in South America could more than double with new collections and taxonomic effort. The Amazon's catchment is about seven times and the Zaire five times the size of the Mekong's, so it is likely that they support more fishes, but at present it is impossible to know whether any of these large river system's species richness is above or below the average that would be predicted for large tropical rivers of their size.

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## References

- Abell (2008) Freshwater ecoregions of the world: a new map of biogeographic units for freshwater biodiversity conservation. *BioScience* 58, 403-414.
- Baird IG, Inthaphaisy V, Kisouvannalath P, Phylavanh B, Mounsouphom B (1999) The Fishes of southern Lao. Ministry of Agriculture and Forestry, Vientiane, Laos. 161 pages. (In Lao).
- Berra TM (2001) *Freshwater Fish Distribution*. Academic Press: San Diego, USA. 604 pages.
- Campbell IC (2002) The Mekong River - water, people and fisheries in a politically complex river basin. Paper presented in 'Enviro Flows 2002 4th Ecohydraulics Conference, 4th February 2002, Capetown, South Africa.' 15 pages.
- Coates D, Ouch P, Suntornratana U, Nguyen TT, Viravong S (2003) Biodiversity and fisheries in the Mekong River Basin. *Mekong Development Series* 2: 1-30.
- de Queiroz K (2005) Ernst Mayr and the modern concept of species. *Proceedings of the National Academy of Sciences* 102: 6600-6607.
- de Silva SS, Aberly NW, Nguyen TTT (2007) Endemic freshwater finfish of Asia: distribution and conservation status. *Diversity and Distributions* 13: 172-184.
- de Queiroz K (2005) Ernst Mayr and the modern concept of species. *Proceedings of the National Academy of Sciences* 102, 6600-6607.
- Dubois A (2003) The relationships between taxonomy and conservation biology in the century of extinctions. *Comptes Rendus Biologies* 326, Supplement 1: 9-21.
- Dudgeon D, Arthington AH, Gessner MO, Kawabata Z-I, Knowler DJ, Lévêque C, Naiman RJ, Anne-Hélène, Prieur-Richard, Soto D, Stiassny MLJ, Sullivan CA (2006) *Freshwater biodiversity*: importance, threats, status and conservation challenges. *Biological Reviews* 81: 163-182.
- Froese R, Pauly D (2009) (Eds) FishBase. World Wide Web Electronic Publication. www.fishbase.org, version (03/2009).
- Hey J (2006) On the failure of modern species concepts. *Trends in Ecology and Evolution* 21, 447-450.
- Hortle KG (in press) Fisheries of the Mekong River basin. Ch 9 in: The Mekong: Biophysical Environment of an International River Basin. (Ed. IC Campbell). Elsevier Publishers Amsterdam, the Netherlands.
- Jelks HL, Walsh SJ, Burkhead NM, Contreras-Balderas S, Diaz-Pardo E, Hendrickson DA, Lyons J, Mandrak NE, McCormick F, Nelson JS, Platania SP, Porter BA, Renaud CB, Schmitter-Soto JJ, Taylor EB, Warren ML (2008) Conservation status of imperiled North American freshwater and diadromous fishes. *Fisheries* 33: 372-386.
- Jensen JG (1996) 1,200 different fish species in the Mekong basin. *Catch and Culture* 2: 4-5.
- Kang B, He D, Perrett L, Wang H, Hu W, Deng W, Wu Y (2009) Fish and fisheries in the Upper Mekong: current assessment of the fish community, threats and conservation. *Reviews in Fish Biology and Fisheries*.
- Kottelat M (2001) Fishes of Laos WHT Publications Pty Ltd: Colombo, Sri Lanka. 198 pages.
- Kottelat M (2004) *Botia kubotai*, a new species of loach (Teleostei: Cobitidae) from the Ataran River basin (Myanmar), with comments on botiine nomenclature and diagnosis of a new genus. *Zootaxa* 401: 1-18.
- Lévêque C, Oberdorff T, Paugy D, Stiassny MLJ, Tedesco PA (2008) Global diversity of fish (Pisces) in freshwater. *Hydrobiologia* 595: 545-567.
- Marceniuk AP, Menezes NA (2007) Systematics of the family Ariidae (Ostariophysi, Siluriformes), with a redefinition of the genera. *Zootaxa* 1416: 1-126.
- Mattson NS (2004) Conservation and enhancement of fisheries - the case of the lower Mekong basin. Paper presented in 'INTECOL, 7th International Wetlands Conference, 23-30 July 2004'. Utrecht, the Netherlands 16 pages.
- MRC (2003) *State of the Basin Report 2003*. Mekong River

Commission: Phnom Penh, Cambodia. 300 pages.

Rainboth WJ (1996) *Fishes of the Cambodian Mekong*. FAO: Rome, Italy. 265 pages + plates pages.

Rieppel O (2006) The PhyloCode: a critical discussion of its theoretical foundation. *Cladistics* 22: 186-197.

Roberts TR (1975) Geographical distribution of African freshwater fishes. *Zoological Journal of the Linnean Society* 57, 249-319.

Sverdrup-Jensen S (2002) Fisheries in the lower Mekong Basin: status and perspectives. *MRC Technical Paper* 6: 1-95.

Taki Y (1978) An analytical study of the fish fauna of the Mekong Basin as a biological production system in nature. *Research Institute of Evolutionary Biology Special Publications* 1: 1-77.

Tedesco PA, Oberdorff T, Lasso CA, Zapata M, Hugueny B (2005) Evidence of history in explaining diversity patterns in tropical riverine fish. *Journal of Biogeography* 32 1899-1907.

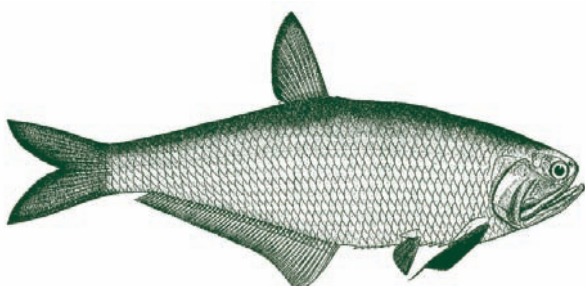
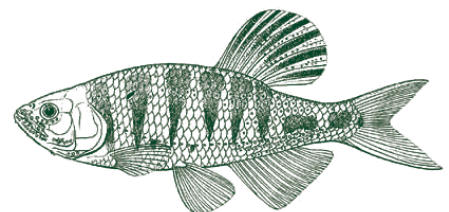
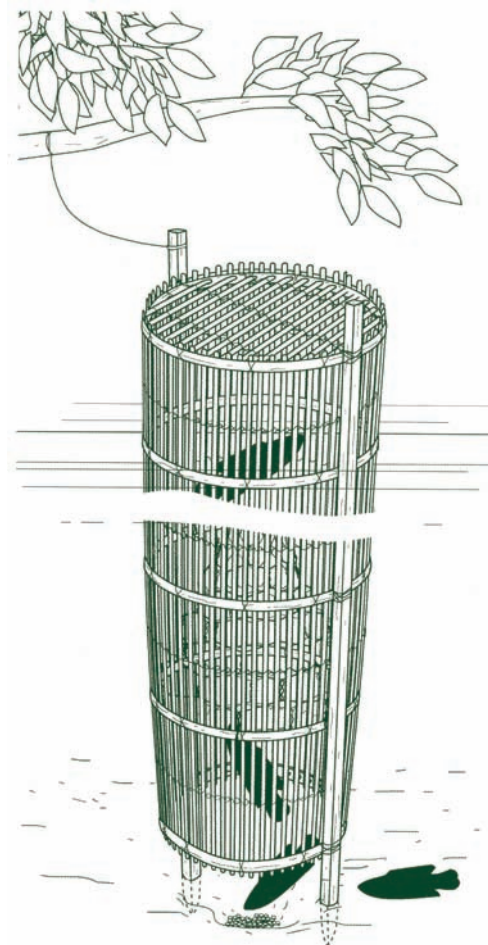
van Zalinge NP, Degen P, Pongsri C, Nuov S, Jensen JG, Nguyen VH, Choulamany X (2004) The Mekong River system. *RAP Publication* 2004: 335-357.

Voris HK (2000) Maps of Pleistocene sea levels in Southeast Asia: shorelines, river systems and time durations. *Journal of Biogeography* 27: 1153-1167.

Vidthayanon C (2008) Field Guide to Fishes of the Mekong Delta. (Mekong River Commission: Vientiane, Lao PDR).

Welcomme RL (1985) River fisheries. *FAO Fisheries Technical Paper* 262: 1-358.

Wiley EO (1978) The evolutionary species concept reconsidered. *Systematic Zoology* 27, 17-26.



# Better cooperation, communications vital to success of next phase

***As the second phase of the MRC Fisheries Programme starts to wind down, representatives of the Cambodian, Lao, Thai and Vietnamese governments agree that engagement between the fisheries and hydropower sectors must be a key theme in the third phase starting in 2011. They also agree that the next phase needs to address issues such as overfishing, governance, small-scale aquaculture and global factors like climate change.***

More than 80 delegates attended the 16th annual meeting of the MRC Fisheries Programme in Siem Reap in June. The two-day meeting featured presentations by regional fisheries agencies as well as the United Nations Food and Agriculture Organization (FAO), the WorldFish Center, the Southeast Asia

Fisheries Development Center (SEAFDEC), France's Agricultural Research Centre for International Development (CIRAD), the Wetlands Alliance, the Worldwide Fund for Nature (WWF) and the Australian Centre for International Agricultural Research (ACIAR), the latter in collaboration with the University of Lao PDR. Representatives of the Danish and Swedish donors Danida and Sida also took part.

In an opening address, MRC chief executive officer Jeremy Bird noted that the livelihoods of many people in the Lower Mekong Basin (LMB) relied on the regional fish catch which is worth billions of dollars a year. In Viet Nam alone, fishing and fish farming had become a leading export sector with tens of thousands working in the processing industry. To a large extent, regional fisheries had insulated the poor from the impacts of the global economic crisis. "However, the



From left, Mr Bird, Cambodian National Mekong Committee Secretary General Pich Dun, Fisheries Administration Director General Nao Thuok, Siem Reap Deputy Governor Bun Narith and MRC Operations Director Do Manh Hung

PHOTO: LEM CHAMNAP

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***‘The impact of hydropower on fisheries is fast becoming one of the biggest issues for the programme’***

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expectations are that economies of the region will again witness high levels of growth. With that will come increased pressure to build hydropower schemes both for domestic electricity consumption and export,” Mr Bird said.

**Hydropower becoming a major issue**

The CEO acknowledged that modelling techniques and past experience could be used to predict some of the positive and negative consequences of the 11 dams proposed for the mainstream of the Mekong in Cambodia, Lao PDR and Thailand. “What we cannot predict as easily is the potential impact that the barrier effect of proposed dams could have on fish migration—and hence fisheries and food security.” Mr Bird said that recent efforts by the Fisheries Programme to develop a model to forecast how fish will respond to the potential changes from dams was now central to the MRC’s river management planning. “The impact of hydropower on fisheries is fast becoming one of the biggest issues for the programme and I am pleased to see we are making a significant effort to understand it,” he said.

Fisheries Programme Coordinator Xaypladeth Choulamany noted that Mekong fisheries were worth at least \$2.5 billion a year and were an important part of food security in a region where people rely on fish for as much as 80% of their animal protein. The sector also provides direct or indirect employment to about 40 million people. Other strengths include small upfront costs for investment, rich diversity second only to the Amazon, common access rights and the fact that fisheries is environmentally friendly compared with other sectors like mining, agriculture and hydropower. On the other hand, Mr Xaypladeth said, the Mekong fisheries sector is probably approaching its maximum sustainable size, with little potential for growth of more than 20%. The sector also has a low profile, attracting little in terms of large or foreign investment. Moreover, its value is largely unreported and is unrecognised outside the fisheries sector. And as part of the traditional economy, it is not seen as adding to

**Engaging the media**

Nguyen Viet Manh, the senior Vietnamese member of the Technical Advisory Body for Fisheries Management (TAB), told the annual meeting that the Fisheries Programme should engage more actively with mass media in the Lower Mekong Basin to broaden communications to a wider audience. He proposed a workshop on Mekong fisheries involving journalists from the leading newspapers and television networks in the four member countries. Mr Manh, a senior official at the Ministry of Agriculture and Rural Development in Hanoi, stressed the need for such workshops to use interpreters to ensure that technical issues are fully understood by Cambodian, Lao, Thai and Vietnamese journalists communicating to non-technical audiences.



Mr Manh addresses the meeting

PHOTO: LEM CHAMNAP



Cambodian Fisheries Administration Director General Nao Thuok (centre) talking with Mr Bird (right) as Mr Xaypladeth (left) looks on

PHOTO: LEM CHAMNAP

new wealth. The fisheries sector is also vulnerable to other resource sectors and climate change.

#### **Scope for more added value**

Yet Mekong fisheries still offer many opportunities. The resource is still large, with no indication of an upward or downward trend in yield. There is also scope for more value to be added through improved processing and reducing waste and for better fishing practices through the curtailment of illegal fishing. Other opportunities exist with co-management as well as reservoir and ricefield fisheries. "Governments are largely supportive," Mr Xaypladeth said, pointing to the implementation of pro-fisheries regulations. At the same time, mitigating negative impacts on fisheries is possible through dialogues with developers and government agencies.

Mr Xaypladeth said overfishing and loss of habitats such as wetlands were among the major threats to Mekong fisheries. While the size of the catch has been constant, the average size of fish has been falling

and population pressures mean that more people are fishing in the basin. Habitat losses reflect development in the hydropower, mining, navigation and agricultural sectors as well as climate change. Another major threat is that the development of mainstream dams and transport infrastructure will have a barrier effect on fish migration. Mekong fisheries are also threatened by changes in the annual "flood pulse" with 2-3 week delays in the onset of the flood season. Related threats are increased dry-season flows, reduced wet-season flows and climate change.

#### **Governments face difficult decisions**

Fisheries Programme Advisor Chris Barlow told the meeting that mainstream dams would lower fisheries yields by blocking fish migration and reducing fish habitats. "Fish ladders are not a solution, nor will aquaculture development replace lost fisheries," Dr Barlow said. "Governments face difficult decisions balancing hydropower development and maintaining fisheries." At the same time, the importance of

fisheries is not fully understood in terms of the sector's economic and nutritional value and its contribution to the livelihoods of poor people. To minimise the adverse impacts of hydropower on fisheries, policymakers should "think of dams on tributaries, not on the mainstream," he said.

A statement adopted at the end of the meeting noted that while the fisheries sector in the LMB faced several challenges, the success of the next phase of the programme would rely on closer cooperation with agencies involved in developing fisheries and other water resources as well as better communications with a broad range of stakeholders. Building on the achievements of Phase Two of the programme from 2006 to 2010, planning for Phase Three from 2011 to 2015 is scheduled to start during the September quarter of this year. Among future challenges, the statement highlighted the development of regional hydropower potential as "clearly an important issue", particularly proposals for mainstream dams. "Engagement between the fisheries and hydropower sectors must be a key theme during the next phase," the statement said. "Nevertheless, other internal and external issues also demand attention if the fisheries resources are to be preserved for the benefit of future generations. Among these are overexploitation, issues of governance and global factors such as climate change. Conversely, small-scale aquaculture provides opportunities for enhancing food security and livelihoods."

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***'The Programme must find ways to spread its message to a broad and more diverse audience'***

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### **Cooperation and communication**

The statement stressed, however, that the success of the next phase would rely on two other factors. "The first is closer cooperation and closer links with the agencies and bodies concerned in the development of fisheries and other water resources. These include representatives from government departments, the private sector, NGO's and academia. Communications, the statement said, are the second factor. While the quality of its technical work is recognised by fisheries professionals, the programme "must find ways to spread its message to a broad and more diverse

audience if the value of the Mekong fishery is to be acknowledged fully by government agencies, the private sector and the general public."

Among the achievements of the programme's second phase, the statement noted that it had helped raise the profile of Mekong fisheries so they are now at the centre of the development agenda. "The size and value of the resource and its importance to the countries of the Basin, and the wellbeing of their people, is recognised widely. Understanding the relationship between fish ecology and fisheries production provides a scientific foundation on which to make judgements concerning the development of the fisheries resource and the basin's other water resources. Co-management has become the primary approach to fisheries management in the LMB and improved production techniques are in place for the culture of indigenous species. Information on Mekong fisheries is disseminated widely in a variety of media, and the capacity of riparian professionals has been developed through a broad spectrum of channels."

During the annual meeting, programme coordinators and officers presented annual reports on the key programme components dealing with Fisheries Ecology, Valuation and Mitigation, Fisheries Management and Governance, and Aquaculture of Indigenous Mekong Fish Species (see articles on page 17). Annual reports of the Technical Advisory Body for Fisheries Management and the Gender in Fisheries Network were also presented. Representatives from the WorldFish Center made several presentations, especially in the area of cooperative work with the programme in assessing the impacts of mainstream dams. Among other speakers, a Cambodian fish farmer talked about his experience raising indigenous fish species in Takeo province (see article on page 25) while a Cambodian fisherman described resource management in his community fishery in Prey Veng province (see article on page 27). In addition to other presentations by the WorldFish Centre, the Wetlands Alliance and SEAFDEC on their regional work, FAO made a presentation on the importance of small-scale fisheries, WWF on managing the critically-endangered Mekong giant catfish and ACIAR/University of Lao PDR on fish gates and flood passages in a Mekong tributary. Viet Nam is scheduled to host the 17th annual meeting in 2010.



# Recent developments in promoting the farming of indigenous species

By Suchart Ingthamjitr \*

## ***The first of three articles on the region's booming aquaculture sector***

The Mekong's fisheries are still productive, but the warning signs are clear. Although the size of the overall catch appears stable, the catch of some large, late-maturing species is declining and the average size of several other commercial species is getting smaller. These are the symptoms of approaching over-exploitation. In cooperation with the fisheries agencies of the four member countries, the MRC Fisheries Programme promotes management in the Lower Mekong Basin in ways that will preserve productivity. However, the demands of the basin's growing population mean that capture fisheries alone may not be able to guarantee food security in the long term. Aquaculture is a way to increase fish production and help meet growing demand while addressing the issues of food security and poverty alleviation.

## **Why indigenous species?**

The main factors causing loss of biodiversity are habitat loss followed by alien species (Table 1 page 21). Indiscriminate introduction of alien species into the basin represents a serious threat to fisheries and can cause great economic and environmental damage. Invasive alien species can cause habitat alteration, increased competition and predation, and further losses through co-introduction of disease. Past

extension of aquaculture techniques promoting alien species in the basin reflected a lack of knowledge of the biology and culture of indigenous species. The introduction of established alien species was expedient because seed production and culture systems could be extended rapidly and successfully without lengthy research and domestication processes.

## ***'The introduction of established alien species was expedient'***

Under its Aquaculture of Indigenous Mekong Fish Species (AIMS) component, the Fisheries Programme aims to develop economically-feasible aquaculture techniques for nine indigenous species to complement or replace the use of exotic species. This is being achieved through on-station and on-farm research into broodstock management, breeding, nursery and grow-out techniques for the selected species. This is being followed by the development of extension materials and packages. The immediate target group is government researchers working for aquaculture research and development institutions in the four countries. The development target groups are small-scale farmers.

Phase 2 of the component's operations focus on three main areas—propagation techniques, genetic

Table 1: Target species

English name	Scientific name	Khmer	Lao	Thai	Viet
Java barb	<i>Barbonymus gonionotus</i>	Trey chpin	Pa pak	Pla pak	Ca me vinh
Small-scale river carp	<i>Cirrhinus microlepis</i>	Trey prul	Pa phon	Pla nuan chan	Ca duong
Mud carp	<i>Cirrhinus molitorella</i>	Trey phkar kor	Pa kaeng	Pla kaeng	Ca troi trang
Red tail catfish	<i>Hemibagrus wyckioides</i>	Trey khya	Pak kherng	Pla kung	Ca lang xanh
Hoeven's carp	<i>Leptobarbus hoevenii</i>	Trey prurlung	Pa poeng	Pla poeng	Ca long tong soi
Elephant ear gourami	<i>Osphronemus exodon</i>	Trey romeas	Pa ment	Pla rad	Ca tai tuong
Bocourt's catfish	<i>Pangasius bocourti</i>	Trey pra	Pa suay keo	Pla saa whai	Ca tra song
Sutchi river carp	<i>Pangasianodon hypophthalmus</i>	Trey pra kchau	Pa nyang	Pla yang	Ca ba sa
Krempf's catfish	<i>Pangasius krempfi</i>	Trey pra bong lao	Pa suay sor	Pla suay sor	Ca bong lao

information and stock enhancement. These three areas complement each other, and can support the activities of other components. For example, indigenous fish seed produced by the developed propagation techniques has been used not only for aquaculture but also for stock enhancement. Genetic information has been used for selective breeding programmes, appropriate stocking and the movement of indigenous fish. The information is also useful for modelling the impact of dams on fisheries. Altogether, outputs generated under these three areas significantly contribute to food security, poverty alleviation and fish biodiversity in the basin.

### Propagation techniques

About 1,100 species of fish live in the Mekong River (see page 4). These range from very small species to well-known large species such as the Mekong giant catfish (*Pangasianodon gigas*). Given this wide diversity, the AIMS Component has had to target its resources on species that are commercially important. The study of propagation techniques focuses on four main factors—broodstock management, breeding, nursing and grow-out. With the progress made so far, we can now produce seed of all nine target species by using captive and wild brood fish but with different levels of success for each species. To improve economic feasibility, issues that need to be further investigated include broodstock conditioning for maturation, breeding techniques to increase fertilisation and hatching rates, nursing techniques to increase survival and growth, and cost-effective culture techniques to increase production.

To support complementary research of existing techniques and avoid repeating or duplicating research efforts, information sharing and exchange is necessary for cooperation in regional aquaculture development. Sharing and exchanging information between researchers in the four countries is normal practice for the AIMS network. The component has, however, also cooperated with France's Agricultural Research Centre for International Development (CIRAD) in organising the "Participatory Research Training on Mekong Indigenous Fish Propagation" in Champasak in southern Lao PDR last year. The field activity aimed to share and exchange propagation information on four indigenous species—the small-scale river carp (*Cirrhinus microlepis*), Krempf's catfish (*Pangasius krempfi*), the red tail catfish (*Hemibagrus wyckioides*)



Dr Suchart addressing the annual meeting of the MRC Fisheries Programme in Siem Reap in June

PHOTO: LEM CHAMNAP

and Jullien's carp (*Probarbus jullieni*)—among researchers of the four countries.

### Genetic information

Domestication of broodstock is a prerequisite for aquaculture development and is part of the long-term strategy of the AIMS Component. Many indigenous fish species have been domesticated in captive conditions for broodstock in the four countries. Genetic investigation of these captive as well as wild stocks across the region aims to provide genetic information for proper broodstock management and breeding schemes. Good seed quality therefore supports aquaculture development. DNA analysis of both natural and hatchery populations of the Sutchi river catfish (*Pangasianodon hypophthalmus*) in the basin has indicated that the species is genetically separated into several sub-populations and that natural populations are at risk. Upgrading of hatchery broodstock quality and management plans are urgently required. Genetic information is also important for stock enhancement and the movement of fish. Movement of domesticated fingerlings of the small-scale river carp from Lao PDR to Cambodia in 2008 benefited from the use of genetic information. DNA testing showed that the populations of this species in the two countries were genetically identical. Similarly,

Table 2: Broodstock management

Species	Year	Status
Small-scale river carp <i>Cirrhinus microlepis</i>	2006	Complete
Sutchi river carp <i>Pangasianodon hypophthalmus</i>	2007	Complete
Krempf's catfish <i>Pangasius krempfi</i>	2007	Complete
Black shark minnow* <i>Labeo chrysophekadion</i>	2008	Analysis
Mud carp* <i>Cirrhinus molitorella</i>	2008	Analysis
Climbing perch <i>Anabas testudineus</i>	2009	Collection
Red tail catfish <i>Hemibagrus wyckioides</i>	2009	Collection

\*in collaboration with NACA

stocks of Krempf's catfish in Lao PDR, Cambodia and Viet Nam are the same genetically.

Genetic information is also a significant input into the model developed to assess the impact of dams on fisheries. Long-distance migratory fishes are likely to be the species most threatened by mainstream dam development. Genetic information tells us whether fish distributed along a stretch of the Mekong are from single or multiple stocks. Fish from single stocks are more susceptible than those from multiple stocks. Genetic information can therefore help fisheries managers mitigate the likely impacts of dams.

### Stock enhancement

Fish stocking has been widely practiced in the basin but it is generally associated with ceremonies or raising awareness. Normally, only small numbers of fingerlings are released. In addition, there is no post-assessment of the stocking exercise. As a result, it is

Table 3: Stocking programme

Species	Year	Country
Mud carp <i>Cirrhinus molitorella</i>	2007	Lao PDR
Black shark minnow <i>Labeo chrysophekadion</i>	2007	Lao PDR
Hoeven's carp <i>Leptobarbus hoevenii</i>	2008	Cambodia
Java barb <i>Barbonymus gonionotus</i>	2008	Cambodia
Giant barb <i>Catlocarpio siamensis</i>	2009	Viet Nam

not known how well the stocking programmes succeed in terms of diversity and maintaining production.

Stock enhancement initiated by the AIMS Component focuses on aspects of diversity and production. To monitor viability and growth of the stocked fish, post-stocking assessment is undertaken in conjunction with either the Fisheries Ecology, Valuation and Mitigation Component of the Fisheries Programme or the Fisheries Management and Governance Component. Stocking of economically-important species in Lao PDR and in Cambodia is a good example of aiming to increase production and raise incomes of the rural poor. Our stocking programme has also been extended to include diversity maintenance. Stocking of the giant barb (*Catlocarpio siamensis*) will be initiated this year in Viet Nam. The stocking programme will increase its role in conserving fish species vulnerable to water development projects. Many white fish such as the Mekong giant catfish, Jullien's barb and the giant barb can adapt well in closed water. Breeding and stocking of these species as well as many other species will be an opportunity to ensure their viability and sustainability, make the techniques already developed for indigenous fish species more complete and competitive while increasing incentives for small-scale farmers. However, the success of small-scale aquaculture of indigenous fishes requires government support to complement technical information. A training of trainers programme developed by the Southeast Asian Fisheries Development Center (SEAFDEC) is a good example of technology transfer from research institutions to the rural poor by extension officers. The project, entitled "Promotion of Community-based Aquaculture in Remote Rural Areas of Southeast Asia", is also an example of complementary activity in promoting aquaculture development in the region.

\* Dr Suchart is the coordinator of the Aquaculture of Indigenous Mekong Fish Species (AIMS) component of the MRC Fisheries Programme. This article is based on a presentation he gave to the annual meeting of the programme in Siem Reap in June.



# Why raise native fishes if it's easier to farm alien species already introduced?

**Riverside restaurants in the Lao capital often hawk their barbecued fish as “Mekong fish” to unsuspecting tourists. What they’re usually offering is a farmed African species introduced into the region from Japan to Thailand more than 40 years ago. This same species is increasingly seen in Cambodia and is now being stocked in Vietnamese ponds in the Mekong Delta that used to raise native catfish. Can real Mekong fishes really compete with these alien species?**

Introductions of alien fish species into the countries of the Lower Mekong Basin date back to the late 17th century. According to the United Nations Food and Agricultural Organisation (FAO), the common goldfish (*Carassius auratus*) was introduced from China to Thailand between 1692 and 1697. Three centuries later, it was among at least 12 alien species established in the wild in Thailand. Although its date of introduction is not known, the same goldfish species has also been introduced from China to Viet Nam where it is now among at least 10 alien species established in the wild. In 2003, a study by British biologist Robin Welcomme and his Thai colleague Chavalit Vidthayonom identified 17 alien species that had either formed established populations in the Mekong Basin or had a strong possibility of doing so (see MRC Technical Paper No 9). Among them was the common carp (*Cyprinus carpio*). It was introduced from China to Thailand in 1913 and from Hungary to Viet Nam between 1969 and 1975 (the common carp is believed to be not one species but two groups from Asia and Europe). The study by Welcomme and Chavalit noted “considerable movement” of the common carp from Thailand and China to Lao fish farms and reservoirs. Of the major alien species introduced into the basin, they also found that at least three have been introduced into all four countries.

## Out of Africa

The African catfish (*Clarias gariepinus*) was originally introduced from the Central African Republic to Viet Nam for aquaculture in 1974. It then spread internally throughout the countries of the basin, initially from Viet Nam to Cambodia and Lao PDR in the early 1980s and then from Lao PDR to Thailand towards the end of the decade. Male African catfish have since formed hybrids with females from an indigenous

## Nile tilapia

Khmer	Trey lapia chhnoht
Lao	Pa nil
Thai	Pla nil
Viet	Ca ro phi van

## African catfish

Khmer	Trey andaing afrik
Lao	Pa dug russia
Thai	Pla dug russia
Viet	Ca tre phi

## Red-throat tilapia

Khmer	Trey lapia khmao
Lao	Pa nindeng
Thai	Pla mor thes
Viet	Ca ro phi thuong

species from the same genus, the big head walking catfish (*Clarias macrocephalus*). While the alien species is not as commercially popular as the various native species of walking catfish, Welcomme and Chavalit found that the hybrid was “preferred” by farmers for its better growth rates and eating quality. The Nile tilapia (*Oreochromis niloticus*), also native to Africa, arrived in the region in 1965 when it was introduced from Japan to Thailand.

Between the early 1970s and early 1990s, it was then introduced from Taiwan, the Philippines and Thailand to Viet Nam. It's not clear when the species was introduced into Lao PDR and Cambodia. The red throat tilapia (*Oreochromis mossambicus*), also known as Mozambique tilapia, arrived in the region much earlier. It was first introduced from Malaysia to Thailand in 1949. It was then introduced from Africa and the Philippines to Viet Nam between 1951 and 1955, the same year it was introduced from Thailand to Lao PDR. The year of its introduction into Cambodia is not clear. According to Welcomme and Chavalit, the red-throat tilapia is not as highly-appreciated for its eating qualities as the Nile tilapia. Moreover, its former popularity has “waned” in favour of the more recently-

Table 1: Ten farmed alien species introduced into the Mekong Basin

Species	Route of introduction	Year
Mrigal carp ( <i>Cirrhinus cirrhosus</i> )	India → Lao PDR	1977
	India → Thailand	1979
	Lao PDR → Viet Nam	1984
African catfish ( <i>Clarias gariepinus</i> )	Central African Republic → Viet Nam	1974
	Viet Nam → Lao PDR	1980
	Viet Nam → Cambodia	1982
	Lao PDR → Thailand	1987
Grass carp ( <i>Ctenopharyngodon idella</i> )	China, Hong Kong → Thailand	1932
	China → Viet Nam	1958
Common carp ( <i>Cyprinus carpio</i> )	China, Japan, Israel, Germany → Thailand	1913 +
	Hungary → Viet Nam	1969-75
	Thailand, India → Lao PDR	1977
Catla ( <i>Gilbelion catla</i> )	India → Lao PDR	1977
	India → Thailand	1979
	Lao PDR → Viet Nam	1984
Silver carp ( <i>Hypophthalmichthys molitrix</i> )	China → Thailand	1913
	China → Viet Nam	1958
Bighead carp ( <i>Hypophthalmichthys nobilis</i> )	China → Thailand	1932
	China → Viet Nam	1958
Rohu ( <i>Labeo rohita</i> )	India → Thailand	1968
	Thailand, India → Lao PDR	1977
	Lao PDR → Viet Nam	1982-84
Nile tilapia ( <i>Oreochromis niloticus</i> )	Japan → Thailand	1965
	Taiwan, Philippines, Thailand → Vietnam	1973-74
	? → Cambodia	?
	? → Lao PDR	?
Pacu ( <i>Colossoma macropomum</i> ) *	? → Thailand	?

\* Pacu is native to the Amazon and Orinoco Basins in South America. In 2003, it was listed as introduced into adjacent waters (the Chao Praya Basin in Thailand). It has since been found in the Mekong Basin. According to Fishbase, the species was introduced into Thailand from Hong Kong and Singapore. It is considered a threat to humans as it has strong teeth that can chew hard nuts.

Source: MRC

introduced species of the same genus. Nile tilapia is now widely disseminated as fry from hatcheries and is “part of established commercial practice in support of stocking and aquaculture.” The authors of the study also noted that the Thai government hatchery at Khon Kaen was rearing and distributing the GIFT strain of tilapia developed by the WorldFish Center and that several private hatcheries were licensed to produce and sell the fish for both cage and pond culture.

### Strong demand for indigenous species

With their characteristics not well known and with limited supplies of fingerlings, how can indigenous Mekong fishes compete with such alien species whose characteristics are well known and which

have better supplies of fingerlings for local farmers? According to Cambodian fish farmer Sieng Phan, one of the most compelling reasons for raising indigenous species is that they tend to command higher prices as local people usually prefer them to alien species (see page 25). Lem Hai, another Cambodian fish farmer who also runs a family catering business near Phnom Penh, agreed. Even though he and two of his brothers farm one of the cheapest indigenous species—the Sutchi river catfish (*Pangasianodon hypophthalmus*)—he says prices compare favourably with tilapia, for example. “Tilapia can be more expensive but we get higher stocking densities with catfish,” he said. “Also some people don’t like tilapia which is usually just barbecued. Catfish is better for many Cambodian

and Vietnamese dishes.”But this is not just a matter of Cambodian or Vietnamese taste. Philippe Cacot of France’s Agricultural Research Centre for International Development (CIRAD) surveyed Lao prices for 14 indigenous fishes and five alien species at Savannakhet market in 2005. He found that the average price of indigenous species was about \$2.40/

**Dr Cacot’s scorecard**

Potential for Sutchi river catfish

Reproduction	5/5
Growth	4/5
Hardiness	4/5
Feeding	3/5
Market value	2/5

kg—double the price of the alien species which averaged \$1.20/kg. Twelve of the indigenous fishes (various species of catfishes, carps and featherbacks as well as an eel and a snakehead) all fetched higher prices than the three most expensive alien species (common carp, tilapia and African catfish). And while the indigenous Sutchi river carp and small cyprinids were cheaper than these three alien species, they still fetched more than the other two alien species (silver carp from China and Mrigal carp from India) which were even cheaper.

**Expanding native fingerling production**

Dr Cacot has been working with the Living Aquatic Resources Research Center (LARReC) in Vientiane

to address one of the biggest constraints of the indigenous aquaculture sector—the limited supply of fingerlings. His approach involves collecting breeders from the wild and either stocking them in ponds to develop new broodstock or transferring them to hatcheries to reproduce. After spawning, the breeders in the hatcheries are released back into the wild and the eggs produced are nursed in tanks or ponds. After 6 to 8 weeks, some of the fingerlings are released back into the wild while others are transferred to grow-out ponds or cages to be sold on the market. Speaking at the annual meeting of the MRC Fisheries Programme in Siem Reap in June, Dr Carcot asserted that the benefits of the approach were twofold. By diversifying production and improving hatchery and nursery techniques, it was contributing to aquaculture

**Krempf’s catfish**

Khmer	Trey pra bong lao
Lao	Pa suay sor
Thai	Pla suay sor
Viet	Ca bong lau

**Jullien’s carp**

Khmer	Trey trawsok
Lao	Pa ern ta deng
Thai	Pla yee sok thong
Viet	Ca tra soc trung

development in the basin. And by reducing the use of alien species and possibly protecting the wild breeders, the approach was also contributing to biodiversity conservation.

In Viet Nam, Sutchi river catfish is already a \$1 billion export industry. But what about other Mekong species, apart from the

nine already being promoted by the MRC Fisheries Programme? Dr Cacot identified krempf’s catfish (*Pangasius krempfi*) as having “strong potential” for aquaculture in brackish water in the Mekong Delta, noting that the key location for this highly-migratory fruit-eating species was the Khone Falls area in southern Lao PDR. He estimated that about 55,000 breeders were caught every year around the falls as floodwaters rise in June and July. Another native fish with good potential for aquaculture, he says, is Jullien’s carp (*Probarbus jullieni*), an endangered species that grows to 150 cm.

**Faster growth but higher mortality**

More than 300 individuals of this species are caught every year in



At the Lem Brothers pond near Phnom Penh, catfish farmer Lem Hon (holding rope) works with Cambodian and Vietnamese labourers to set an encircling seine net (*uon hum*) as they prepare to harvest fish for a provincial wholesaler in May. The price of such nets can range from as little as 200,000 riel (\$50) to as much as almost 40 million riel (\$10,000). The nets are considered medium-sized fish gear and usually last about three years.

PHOTO: LEM CHAMNAP

Table 2: Species farmed in the region

Native species	No	Alien species	No	Hybrids	No
Carps	8	Chinese carps	3	Shark catfishes	3
Shark catfishes	7	Indian carps	3	Walking catfishes	1
Other catfishes	6	Common carp	1		
Climbing perches	5	Tilapia	1		
Featherbacks	2	African catfish	1		
Eels	2	Pacu	1		
Other prey fishes	2				
<i>Total</i>	32		10		4
<b>Annual production *</b>	<b>545,000</b>		<b>191,000</b>		<b>114,000</b>

\*FAO estimates in tonnes (2005). Production estimates for alien species and hybrids are believed to be conservative. Estimates for native species do not reflect the surge in annual Mekong Delta production of the Sutchi river catfish (*Pangasianodon hypophthalmus*) which recently exceeded 1 million tonnes. Production of the other dominant native species in regional aquaculture, the Java barb (*Barbonymus gonionotus*), is estimated at 100,000 tonnes a year.

Source: Philip Cacot, Agricultural Research Centre for International Development (CIRAD)

December and January at a fishing ground next to Kho island, about 14 km upstream from Pakse in southern Lao PDR. Using a temporary hatchery on the island, the French biologist said that initial trials showed that “stripping” the spawning breeders for artificial propagation produced about 210,000 eggs of which about 150,000 actually hatched, resulting in 70,000 fingerlings after 6-8 weeks. The initial trial found that Jullien’s carp grew much faster than the common carp during the first eight weeks after hatching. Growth rates were similar in the first few weeks, although the indigenous species was slightly larger at about 23mm after 25 days compared with about 20mm for the alien species. But the growth rates then started to diverge dramatically and after 60 days, the Jullien’s carp fingerlings were about 50mm compared with only 30mm for the common carp fingerlings. On the other hand, the alien species had a higher survival rate of 39% which compared with only 16% for the indigenous species. Could production of these fingerlings be an alternative or complementary form of income for fishermen around Kho island? Dr Cacot reckons fingerling production for this species could be even more profitable than the fish catch now if fishing restrictions are put into place. The local Jullien’s carp fishery currently involves about 55 boats from three villages. Assuming an annual catch of 400 fish weighing a total of 4.4 tonnes and a wholesale price of \$3.50/kg, he estimates annual net income of about \$12,400 from the existing fishery. At the same time, however, an estimated 42 million eggs are lost every year.



Dr Cacot addressing the annual meeting of the MRC Fisheries Programme in Siem Reap in June

PHOTO: LEM CHAMNAP

### A model for the region

If fishing restrictions reduce the catch by 75% to only 100 fish a year weighing 1.1 tonnes, he forecasts that wholesale prices will double to about \$7/kg. But that still won't be enough to compensate fishermen whose combined net incomes would then be \$6,200, only half as much as they were before. The solution? A modest investment of \$10,500 to build fifty 30m<sup>2</sup> canvas ponds. By stocking the ponds at a density of 250 fingerlings per square metre, Dr Cacot estimates that the additional eggs no longer lost as food could produce 375,000 fingerlings a year. If these fingerlings are sold to farmers at a rate of five cents



Vietnamese employees of a Cambodian fish wholesaler get ready to harvest several tonnes of catfish at the Lem Brothers fish farm on the outskirts of Phnom Penh in May. After setting the encircling seine net (*uon hom*) in the late afternoon, the fish were harvested shortly after midnight and transferred live by truck to markets in Kampong Cham, about three hours away by road.

PHOTO: LEM CHAMNAP

each, estimated revenues would be \$17,600 a year, generating net income of \$7,100 once the investment costs are taken into account. Combined with the net income from the restricted fishing catch, total net income would be \$13,300 a year, which is 7.3% more than what the fishery is earning now. Dr Cacot believes this model is sustainable for the whole region. So what next? “The use of the wild fish breeders seems to be a promising means of developing aquaculture while preserving the wild broodstock,” Dr Cacot told the annual meeting in June. Moreover, “there is an urgent need to protect fish reproduction.” Mature breeders make up about 40% of the total catch in Champassak province in Lao PDR and the Cambodian provinces of Stung Treng and Kratie. The combined catch is estimated at 2,000 tonnes every year, with many of the fish—and millions of eggs—ending up in fancy restaurants in Thailand. “Further research is necessary to fully control reproduction and nursing of the fish, checking the feasibility of production in various conditions, assessing the market for fingerlings, and assessing the effective potential for grow-out,” Dr Cacot said “At the same time, regional

exchanges are needed among the four MRC countries in areas such as information, study tours and training. The four countries could also exchange fishes in accordance with genetic considerations.” But other steps are also needed by policymakers to promote indigenous species for commercial aquaculture. According to Dr Cacot, “public agencies should assist the private sector in providing fingerlings, broodstock and technical support.” He also called for controlling the “footprint” of alien species by banning hybrids as well as the practice of using methyltestosterone to induce sex reversals in tilapia. Methyltestosterone is an anabolic steroid used to treat men with testosterone deficiency and women with breast cancer as well as breast pain and swelling following pregnancy. It is also combined with estrogen to treat symptoms associated with menopause.

#### Further reading

Welcomme, R and Chavalit Vidthayanom (2003), *The impacts of introductions and stocking of exotic species in the Mekong Basin and policies for their control*, MRC Technical Paper No 10, Mekong River Commission, 38 pp



# Propagating indigenous fish species is a profitable business in Cambodia

## A Takeo fish farmer tells his story

Apart from strong local demand, there are several other reasons for farming indigenous Mekong fish species. In some Cambodian provinces, for example, a lack of water supply means that farmers cannot rely entirely on growing rice for their income. For Sieng Phan, a farmer from Takeo province, raising indigenous fish species is an alternative to rice which helps diversify his source of income while sustaining the environment. "Propagation of indigenous fish is a profitable business," he told the annual meeting of the MRC Fisheries Programme in Siem Reap in June. Mr Sieng Phan has been farming fish for only six years. He started in 2003 with a 550m<sup>3</sup> earthen pond. After receiving some basic training from the then Department of Fisheries, he removed all predators from the pond and prepared it with 40 kg of lime. He then fertilized it with 5kg of urea, 2.5 kg of diammonium phosphate and 200 kg of cow manure. When the water turned green after about a week, he stocked the pond with 1,250 fingerlings of four indigenous species (see Table 1). The fish were feed with cooked rice bran with broken rice, vegetable waste, duck weed and termites. After 10 months, Mr Sieng Phan harvested more than 90 kg of fish which he sold for almost \$220, making a net profit of \$150 which was used to build two more ponds.

Table 1: First pond (2003)

Indigenous species	Ratio (%)	Yield (%)
Sutchi river catfish (trey pra) <i>Pangasianodon hypophthalmus</i>	30	40
Java carp (trey chpin) <i>Barbonymus gonionotus</i>	30	38
Hoeven's barb (trey priorlong) <i>Leptobarbus hoevenii</i>	20	15
Snakeskin gourami (trey kawnthor) <i>Trichogaster pectoralis</i>	20	7

Under the supervision of MRC Fisheries Programme staff, Mr Sieng Phan started nursing 25 to 30-day-old fry from three of the four original species in 2005. The three species were Sutchi river catfish (*Pangasianodon*



Mr Sieng Phan, fish farmer from Takeo province

PHOTO: LEM CHAMNAP

## Rapid growth

Cambodia's aquaculture sector is projected to grow 50% to about 60,000 tonnes in 2009, according to a report delivered by Agriculture, Forestry and Fisheries Minister Chan Sarun. Speaking at the National Fish Day ceremony in Kep on July 1, the minister noted that Cambodia ranked seventh worldwide in terms of annual growth in aquaculture last year. Production totaled 40,000 tonnes in 2008, up from 35,000 tonnes in 2007. Dr Chan Sarun said the country now had 165 hatcheries capable of producing 60 million fry a year. In 2008, he said, Cambodia had about 50,000 fish farming households with about 50,000 earthen ponds and 3,800 floating cages.

Table 2: Production and earnings (2003-2009)

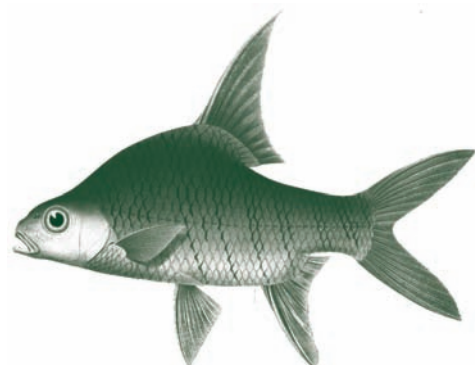
Year	Activity	Inputs	Outputs	Net profit	
				KHR	USD
2003	Grow-out	Fingerlings: 1,650 (4 species) Feed: cooked rice bran with broken rice, vegetable waste, duckweed and termites	Harvest: 192 kg (4 species)	594,000	\$149
2005	Nursing	Fry: (3 species) Feed: home-made (20-25% protein)	Fingerlings: (3 species)	760,000	\$190
2005	Breeding	Broodstock: 60 (2 species) Feed: formulated from fish meal, rice bran, broken rice, soybean meal, rice germ and vitamin premix (25% protein) Hormones: Suprefact + motilium	Fingerlings: 112,000 (2 species)	1,000,000	\$250
2007	Breeding	Broodstock: 60 (2 species) Feed: formulated from fish meal, rice bran, broken rice, soybean meal, rice germ and vitamin premix (25% protein) Hormones: Suprefact + motilium	Fingerlings: 130,000 (2 species)	2,000,000	\$500
2008	Breeding	Broodstock: 60 (2 species) Feed: formulated from fish meal, rice bran, broken rice, soybean meal, rice germ and vitamin premix (25% protein) Hormones: Suprefact + motilium	Fingerlings: 127,000 (2 species)	3,000,000	\$750
2009	Breeding	Broodstock: 60 (2 species) Feed: formulated from fish meal, rice bran, broken rice, soybean meal, rice germ and vitamin premix (25% protein) Hormones: Suprefact + motilium	Fingerlings: 130,000 (1 species) Fry: 410,000 (2 species)	NA	NA

*hypophthalmus*), the Java barb (*Barbonymus gonionotus*) and Hoeven’s carp (*Leptobarbus hoevenii*). When the fingerlings reached 5cm, he sold them to other fish farmers living in the same village for 80 riel (two cents) each. With production costs amounting to only 25 riel for each fingerling, he made a net profit of almost \$200. During 2005, the farmer also received training in propagating these three species. He built a breeding system—comprising a spawning tank, two nursing tanks and an overhead tank—and dug 13 more ponds. He obtained 60 brooders (30 Java carp and 30 Hoeven’s barb), transferred them to fertilised earthen ponds at a stocking density of one fish per 7m<sup>2</sup> and fed them a formula made from fish meal, rice bran, broken rice, soybean meal, rice germ and a vitamin premix. For breeding, he applied a single-injection technique for the hormone (Suprefact + motilium) that was introduced by the government fisheries research station at Chrang Chamres near Phnom Penh. All brooders spawned and the fertilised eggs were incubated in a hatching tank at a density of 2,000 eggs per litre of water. Java barb production has also almost doubled from 70,000 fingerlings in 2006 to 130,000 fingerlings in 2009. The farm also produced 200,000 fry this year. Hoeven’s carp production fluctuated between 42,000 and 45,000 fingerlings between 2006 and 2008. The farm produced no fingerlings of this species this year but did

produce 210,000 fry. Net earnings amounted to \$750 last year.

**‘Techniques adopted from the research station are workable’**

Mr Sien Phan says he has used his increased income to pay for a son’s wedding, expand his nursing tanks and restore his house. He has also trained 60 local people in fish farming, provided fingerlings to poor farmers and released 30,000 indigenous fish into a local reservoir. Moreover, he has been educating people to avoid releasing alien species into local waterways. “The techniques adopted from the research station are workable,” he said.



# From anarchy to harmony: fisheries in transition as reforms spread

***A Cambodian village on the border with Viet Nam reaps early benefits from its newly-established community fisheries. But longer term challenges remain.***

Ten years ago, Prime Minister Hun Sen acknowledged that escalating social conflicts over fishing rights had created “anarchy in fisheries” in Cambodia. Since then, the government has released 56% of the area covered by state-owned fishing lots to local communities under a series of reforms which have evolved into the current system of community management launched in 2005. Although many “closed” fishing lots remain in Cambodia, especially on the highly-productive fishing grounds of the Tone Sap Lake, the lots released have effectively been abolished and are no longer leased out to the highest bidders who previously enjoyed private access and exclusive fishing rights.

Among the many fishing grounds that went from private to public and ultimately community hands over the past decade is former Fishing Lot No 17 in Prey Veng province, one of the country’s poorest provinces. Located in Kah Samoeuv commune in Peam Chor district near the border with Viet Nam, these fishing grounds stretch across 3,133 ha. Although still state-owned, they are now governed by a body known as the Phoum Khsach Community Fisheries (CF). Set up in 2008 with help from the Fisheries Administration and the Fisheries Management and Governance component of the MRC Fisheries Programme, the Community Fisheries has 306 members including 64 women. According to Mr Meng Monorom, the Phoum Khsach Community Fisheries chief, one of the first steps taken in setting up the new body was to raise awareness of the government’s Community Fisheries management policy among the 531 households in Khsach and Toul Sang village. Interested villagers then registered to become members, by-laws and regulations were drafted and elections were held from among nine candidates. Five of the candidates were elected to form a Community Fisheries Committee



Mr Meng Monorom, the Phoum Khsach Community Fisheries chief

PHOTO: LEM CHAMNAP

## **Hundreds of thousands community members now run former fishing lots**

Over the past nine years, the government has released more than half a million hectares of fishing lot areas to local communities across Cambodia.. Previously auctioned off to private bidders, these fishing grounds are now used for family subsistence According to a report delivered by Agriculture, Forestry and Fisheries Minister Chan Sarun. the country now has 468 community fisheries of which 433 are involved in inland fisheries. Speaking at the National Fish Day ceremony in Kep on July 1, the minister said the latest figures showed that community fisheries had 227,044 members spread across 126, 390 households. At the same time, he said, the ministry had promoted the establishment of 229 community fisheries conservation areas.

(CFC) which then distributed the by-laws and regulations to villagers and began preparing a map of the Community Fisheries to be signed by commune, district, provincial and national authorities. Work also started on a Fishing Area Agreement (to be signed by the Community Fisheries chief and chief of Prey Veng Fisheries Administration Cantonment) and a Management Plan (to be signed by the Community Fisheries chief, the local commune chief and the director general of the Fisheries Administration). The three-year management plan included establishing a fish sanctuary, stopping the use of illegal fishing gear and protecting the fisheries domain. The plan also included the creation of alternative livelihoods to sustain local fishery resources and alleviate poverty.

### Catches increasing as Illegal fishing declines

Speaking at the annual meeting of the MRC Fisheries Programme in Siem Reap in June, Mr Meng Monorom said the Community Fisheries had been operating for more than a year and now had its own patrol groups with regular schedules. Members have cooperated with fisheries officers in 34 cases of illegal fishing and have twice distributed information about the community fishery to neighbouring Vietnamese fishermen. Moreover, cases of illegal fishing and conflicts with non-members and outsiders are declining. "People now understand the importance of taking part in our fisheries resource management," the Community Fisheries chief told the meeting. "Since having the Community Fisheries in our villages, we generally see that illegal fishing and conflicts have notably decreased and that the fish catch has increased so people are happy." So too, it would seem, are the fish—as part of conservation efforts, a half-hectare fish sanctuary has been established around a deep pool.

Among future challenges, Mr Meng Monorom said that demarcating the Community Fisheries boundary with concrete poles was an urgent priority. He also highlighted the need to strengthen compliance through continued distribution of by-laws, regulations and related material and expressed a desire to share experiences with other Community Fisheries. Other challenges included solving trans-boundary issues with Vietnamese fishermen, replanting flooded forest areas, strengthening patrol groups and creating alternative livelihoods to generate funds for the Community Fisheries and its members to help reduce overfishing and alleviate poverty. At the moment, he said, about

85% of the villagers in Khsach and Toul Sang villages rely on fishery resources for their livelihoods.

The Cambodian government seems to be under no illusion that its policy for Community Fisheries management—embodied in a sub-decree issued by the prime minister in 2005—is a magic solution to all challenges faced by the fisheries sector. A policy paper published in 2006 by the then Department of Fisheries noted that "the transition to new forms of rights is always accompanied by fresh conflicts, new alliances, windows of opportunity and a variety of threats. In Cambodia's transition to Community Fisheries, many of these possibilities are likely to emerge."

### Further reading

Kurien, J, So N. and Mao S.O. (2006) *Cambodia's Aquarian Reforms: the Emerging Challenges for Policy and Research*, Inland Fisheries Research and Development Institute, Phnom Penh, Cambodia, 32 pp

### Correction

In the last issue of *Catch and Culture* (Vol 15, No 1), we identified a fish on the second page of the special insert on Thai freshwater aquariums as an Indo-Pacific tarpon (*Megalops cyprinoides*). In fact, the fish pictured is a species of sorubim (genus *Pseudoplatystoma*) from the long-whiskered catfish family (Pimelodidae) native to South America. Sorubim is also a popular game fish in Thailand.



# Mekong giant catfish quota limited to eight following two incidental catches

By Naruepon Sukamasavin \*

The Mekong giant catfish (*Pangasianodon gigas*) is one of the world's largest freshwater fishes. Its status as a critically-endangered species led to the establishment of the Mekong Giant Catfish Working Group in 2005 (see *Catch and Culture*, Vol 12, No 1). Since then, a mathematical model has been used to reconstruct the dynamics of the population and predict its future development under different scenarios out to 2050 (see *Catch and Culture*, Vol 13, No 1). Given the depleted state of the population, the working group has developed a conservation strategy with annual harvesting restricted to no more than 10 adults under current conditions and no more than 20 in the longer term.

## Fishing limits

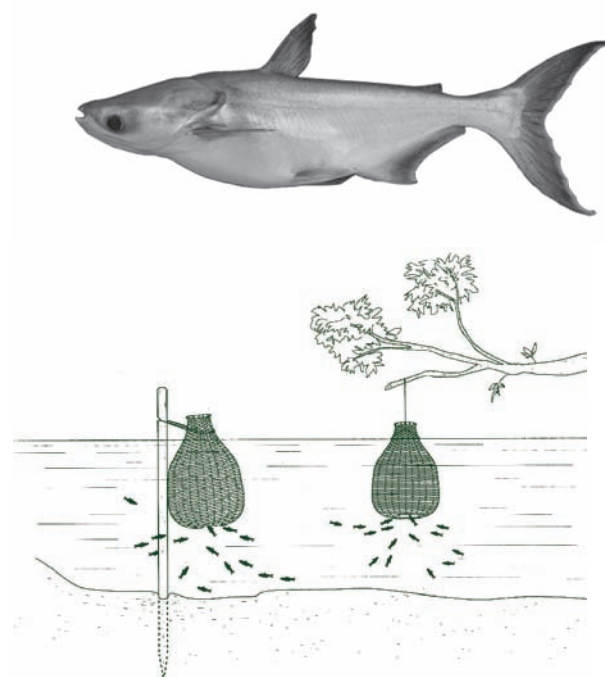
At the working group's latest meeting in Udon Thani in April, it was recommended that only eight mature or nearly mature individuals could be caught in 2009 since Cambodia had reported incidental catches of two fish between October and December last year. Since the fishing limit recommended by the working group relies solely on the quantitative assessment model which has still not been intensively reviewed by scientists, it was also recommended that the model be published and disseminated for intensive peer review. The working group recommended that all targeted and known incidental fishing for the species, including a recently-reported site in a li trap fishery in southern Lao PDR, should be carefully monitored for research and population assessment as well as the enforcement of regulations where these are in place. At the same time, regional cooperation in reporting, exchanging information and setting biological limits to fishing should be maintained and strengthened.

## Conservation, captive breeding and aquaculture

Habitat and ecosystem conservation are still very important to ensuring the long-term survival of the Mekong giant catfish in the wild. Specific habitat use and migrations for the species should be identified and conserved. The possibility of more spawning grounds

in the north of Cambodia or other places needs to be investigated and confirmed. For conservation in captivity, the breeding programme in Thailand is very important. It should be conducted using the breeding plan developed by Kasetsart University in Bangkok in order to maintain the genetic diversity of the species. Since cryo-preservation of sperm is essential for the captive breeding programme, cryo-preservation units should be established to provide genetic material when needed. While aquaculture is very important for food security, the high value of the species needs to be maintained. Developing Mekong giant catfish hybrids for aquaculture should be avoided. Membership of the working group includes the Cambodian, Lao and Thai fisheries agencies as well as the MRC Fisheries Programme and the Network of Aquaculture Centres in Asia-Pacific (NACA). Other members include Kasetsart University, WWF, IUCN and Imperial College, London.

\* Dr Naruepon is the director of the Information Technology Centre of the Thai Department of Fisheries and is also chairman of the Mekong Giant Catfish Working Group



# Hun Sen appeals for local support in cracking down on illegal fishing



Prime Minister Hun Sen (left) and Deputy Prime Minister Men Sam An (right) using hand-held scoop nets to release fish into the Veal Vong Reservoir on July 1 as ministers, senior government officials and international guests look on

PHOTO: LEM CHAMNAP

***In his annual National Fish Day address, the Cambodian prime minister also calls for “firm measures” against people who destroy flooded forests and concrete steps to reforest such areas. At the same time, he noted that other serious threats to fisheries included dam construction, the digging of canals for illegal land ownership and population resettlement.***

By Peter Starr \*

Cambodian Prime Minister Hun Sen and numerous cabinet ministers celebrated National Fish Day in Kep province this year with the release of one million fish and other aquatic animals including prawns, turtles and frogs into a local reservoir. Broadcast on national

television, the two-hour ceremony took place on July 1 at Veal Vong reservoir in Domnak Chang Ar district with thousands of people gathered on the site of a former Japanese airfield close to the Vietnamese border.

### **‘Dramatic changes’**

In a speech, the prime minister asserted that Cambodia’s natural resources, especially fishery and forestry resources, had undergone “dramatic changes” over the past five years. “The number of fishermen has increased rapidly,” he said, noting that Cambodia now had an estimated 1.4 million full-time fishermen and about 6 million people engaged in related activities and part-time fishing. Accompanied by limited knowledge of modern fisheries technologies and limited public awareness of the importance of natural resources, the environment, regulations and the concept of

sustainable development, the surge in numbers is leading to the depletion of aquatic and resources. Moreover, the rapid increase in the number of people fishing “is still the main constraint to achieving the policy of sustainable use and development of the fishery resource and other natural resources.”

#### **‘Anarchic actions’**

Samdech Hun Sen said fisheries are a “priority sector” in government efforts to promote agricultural production in terms of quantity, quality, competitiveness and efficiency. “Along with that, we have recognised that the inundated forest is the life of fishery sector,” he said. “Without the inundated forest, we cannot be rich in fishes.” Moreover, rapid population along the Tonle Sap River and Mekong River has led to overfishing “which is seriously threatening the types of fishes which are economically vital.” Other “anarchic actions” have led to the loss and degradation of refuge habitats. “The building of dams, digging of canals for illegal land ownership, resettlement, the transformation of the forest land into agricultural land, the burning of natural forest and the increase in illegal fishing pressure are ... the most serious threatening factors.”

### ***‘We must prepare fields for growing inundated trees’***

With the aim of cracking down on illegal fishing and related offenses, the prime minister urged government officials not to forget cooperation from local authorities and joint reports from people to the authorities concerned. “We have to continue to preserve the conservation areas appropriately, and continue to curb illegal fishing and take all measures to cooperate with relevant agencies to comprehensively prevent those highly dangerous fishing offenses such as the use of electric instruments and nets,” he said. The prime minister also called for “firm measures” against people who destroy flooded forest areas, particularly around the Tonle Sap Lake. Maps should be created to identify flooded forests, people should be educated about their importance and the flooded forests should be protected. “They are very vital for the fishery sector,” he said. “At the same time, we must prepare fields for growing inundated trees and set up (an) annual ceremony for replanting inundated trees.” To help prevent annual fires, “we should also consider the building of paths inside the inundated forest.”



Prime Minister Hun Sen arriving in Kep on July 1 with Agriculture, Forestry and Fisheries Minister Chan Sarun (left) and Fisheries Administration Director General Nao Thuok (right)

PHOTO: LEM CHAMNAP

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## **'We have to safeguard fish spawning areas'**

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Among other recommendations, Samdech Hun Sen urged government officials to promote small-scale family fish farming across the country by encouraging farmers to dig small ponds. He also called for the establishment of community fish ponds at the village and commune levels and the creation of fish sanctuaries in community fisheries, public fishing grounds and private fishing lots. "We have to safeguard fish spawning areas," he said. At the same time, government agencies have to make utmost efforts to collect revenues from fisheries, taking "strong measures" against fishing lot owners who violate agreements and falsify record books.

In a separate speech, Agriculture, Forestry and Fisheries Minister Chan Sarun stressed the importance of developing aquaculture and community fisheries across Cambodia while cracking down on illegal fishing. He also highlighted the importance of researching the livelihoods of those involved in fisheries while protecting and conserving fishery resources in a sustainable way.

### **Small species catch down, large species catch up**

The minister noted that last year's fishing season was marked by declining catches of small low-value species like the Siamese mud carp (*Henicorhynchus siamensis*), the lesser silver mud carp (*Henicorhynchus lobatus*) and the lesser bighead carp (*Thynnichthys thynnoides*). Compared with previous years, however, there were increased catches of large high-value species such as the soldier river barb (*Cycloceilichthys enoplos*), the striped snakehead (*Channa striata*), the giant snakehead (*Channa micropeltes*), the small-scale croaker (*Boesemania microlepis*) and the clown featherback (*Chitala ornata*).

Overall fisheries production amounted to about 471,000 tonnes last year comprising 365,000 tonnes from freshwater catches, 66,000 tonnes from marine catches and 40,000 tonnes from aquaculture. "Fisheries production could meet the demand of the majority of the population and the excess was exported to international markets," the minister said.

In terms of political recognition, the Seventh National Fish Day was by far the most high profile ever with nine ministers taking part including Deputy Prime Minister Men Sam An as well as Senior Ministers Mok Mareth, who is also the environment minister, and Cham Prasidh, who is minister of commerce. Apart from Chan Sarun, other ministers included Water Resources and Meteorology Minister Lim Kean Hour, who also chairs the Cambodian National Mekong Committee, Rural Development Minister Chea Sophara, Information Minister Khieu Kanharith, Post and Telecommunications Minister So Khun and Industry, Mines and Energy Minister Suy Sem. Ambassadors and other foreign guests from Brunei, Denmark, Hungary, Japan, South Korea, Lao PDR and Malaysia also joined the fish-release ceremony, along with representatives of the MRC Fisheries Programme and the WorldFish Center.

The fish released into Veal Vong reservoir were mainly cyprinid species, notably Siamese mud carp, Hoeven's carp (*Leptobarbus hoevenii*), Java barbs (*Barbonymus gonionotus*), pelagic river carp (*Paralabuca typus*) and small-scale mud carp (*Cirrhinus microlepis*). Other species included marbled gobies (*Oxyeleotris marmorata*), a highly-prized fish which is often exported live to Chinese restaurants in Hong Kong and Singapore, and giant freshwater prawns (*Macrobrachium rosenbergii*).

Amid growing awareness of the importance of fisheries to the Cambodian economy, Samdech Hun Sen has presided over most National Fish Day ceremonies since the event was held in Kampong Speu province in 2003. National ceremonies have since been held in Kandal province in 2004, Prey Veng province in 2005, Sihanoukville municipality in 2006, Takeo province in 2007 and Kampong Chhnang province in 2008. Over the past four years, smaller fish-release ceremonies have also taken place at the commune level, often involving senior politicians including politburo members from the ruling Cambodian People's Party.

\* Mr Starr is the editor of Catch and Culture





# Growing regional awareness of fisheries highlights need for greater recognition of food security issues

*Yasuhisa Kato returned to Japan earlier this year after 11 years as special advisor to the Southeast Asia Fisheries Development Center (SEAFDEC) in Bangkok. Before that, he spent eight years with the Fisheries Department of the Food and Agriculture Organization (FAO) in Rome. In his new position as professor at the Center for International Planning at Kagoshima University, Dr Kato is working to expand regional cooperation with ASEAN countries and Pacific island nations. Here he speaks to Catch and Culture about his time in Bangkok and Rome—and his hopes for the university in Kagoshima which has eight faculties, 1,000 researchers and 10,000 students.*



Dr Kato

**How visible are Southeast Asian fisheries today compared with 1997 when you arrived at SEAFDEC and how have collaborative mechanisms with ASEAN and its members evolved during this period?**

SEAFDEC was not very internationally visible when I joined. Even FAO did not clearly understand SEAFDEC's functions and activities in those days. After I joined, SEAFDEC developed a strategic plan which clarified the needs for international visibility. Since then, international activities have included organising the ASEAN-SEAFDEC Millennium Conference with 800 participants and developing a regional policy on fisheries and an organisational partnership with ASEAN in 2001 and regionalising the Code of Conduct program between 1998 and 2005. Before 1998, SEAFDEC hardly promoted regionally-recognised projects. It had been developed as an organisation to transfer fisheries-related technologies, mainly from Japan to other member countries. This reflected development needs over the 30 years since its establishment in 1967.

However, due to the declining trend of fisheries resources, the development focus shifted internationally towards the sustainable use of resources from 1992. Reflecting such a drastic shift in international fisheries policy, SEAFDEC approached ASEAN for an organisational partnership. This was mainly due to the need for regional policy support, first to regulate fisheries—that is an extremely difficult task for individual fisheries-related agencies—and second to address the external threats caused by various globalisation initiatives.

One of the visible effects was Cambodia, Indonesia, Lao PDR and Myanmar joining SEAFDEC. International and regional cooperation have been drastically improved since 1998. For funding support and collaborative work, cooperation related to the Lower Mekong Basin has included ASEAN, the ASEAN Foundation, FAO, APFIC, MRC, the Swedish Board of Fisheries, SIDA, UNEP and other regional organisations.

**ASEAN agriculture ministers have been meeting on an annual basis since 1979 and collectively with their Chinese, Japanese and Korean counterparts since 2001. In your opinion, do these meetings of ASEAN Ministers in Agriculture and Forestry (AMAF) sufficiently recognise the importance of fisheries? Has the ASEAN+3 process with China, Japan and Korea had any impact on how fisheries issues are addressed by ASEAN members?**

SEAFDEC has regularly participated in the ASEAN Sectoral Working Group on Fisheries, Senior Officials Meetings and AMAF meetings since 1998. Due to the active participation of SEAFDEC, it is understood that the fisheries sector can be recognised as one of the most active sectors in AMAF meetings. The ASEAN+3 process with China, Japan and Korea has not yet reached an active level for the fisheries sector as far as I understand.

AMAF has endorsed regional Guidelines for Responsible Fisheries in Southeast Asia and the Resolution and Plan of Action for Sustainable Fisheries for Food Security adopted at the Millennium Conference in 2001. The guidelines have been popularised in SEAFDEC and ASEAN member countries including translation into national languages. Regional recognition of SEAFDEC initiatives has led to an FAO award related to the Code of Conduct for SEAFDEC, the Margarita-Lizzaraga Medal in 2008.

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***‘Government sectors in the region are not serious about the issue of fisheries contribution to food security’***

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**How important is fisheries to food security in Southeast Asia in general and the four Mekong members of ASEAN in particular?**

It is very important although government sectors in the region are not serious about the issue of fisheries contribution to food security. As far as I remember, FAO defines foreign exchange earnings through the export of foodstuffs as having an effect on food security. But this may ignore the effects on poor people who produce their food and do not purchase it. Although most Southeast Asian countries have

promoted exports of aquaculture products to earn foreign exchange, they are forgetting that a major amount of feed derived from low-value fish is a major source of protein for poor people. Low-value fish have been taken away from the poor and used in aquaculture, which is a market for rich people. In this connection, freshwater fisheries resources will be increasingly important for the food security of people in the Lower Mekong Basin.

**What were the greatest challenges of being in charge of FAO fisheries policy and planning between 1994 and 1997?**

My work experience before joining the FAO Policy and Planning Division involved assisting fisheries development in developing countries. So I had difficulties with the Code of Conduct for Responsible Fisheries because it was not prepared for these developing countries but based on requirements for developed fishing nations. Although I proposed regionalising the Code of Conduct to accommodate specific issues for developing countries, such initiatives were not popular in FAO, which had a strong focus on taking a global approach to promoting sustainable fisheries. It might be considered that the regionalised approach deviated from the global approach. That can be one of the reasons why I moved to SEAFDEC and initiated the regionalisation of the Code of Conduct.

**You contributed to the establishment of the Network of Aquaculture Centers of the Asia-Pacific while you were in Rome. How long did it take from the Bangkok conference in 1988 for NACA to be up and running properly and what were the biggest obstacles in the early days?**

One of the large-scale projects operating in the Mekong Basin was a UNDP regional aquaculture project that was the forerunner of NACA. I do not recall any obstacles in the early days because of the fact that such an aquaculture network was supported by the region reflecting the boom in aquaculture in those days and the strong leadership of the project director, Mr Chen Foo Yan. As the project office was located in Bangkok, I do not recall any big argument for hosting arrangements by other countries.

**Did any of your work running a fisheries consulting company before joining FAO bring you**

### into contact with fisheries in Mekong Basin?

I was a team leader of a large-scale aquaculture project in Thailand—mainly shrimp pond culture together with pen, cage and integrated fish farming for various species. It was a 5-year project in the early 80s funded by ADB. The project was successfully implemented and connected to the aquaculture boom afterward in Thailand.

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### ***‘Thailand, Lao PDR and especially Viet Nam are seriously investigating the implementation of rights-based fisheries’***

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**You worked as a small-scale fisherman for a fisheries cooperative in Hokkaido as a student in the late sixties and mid-seventies. Are you aware of any examples of where the Japanese model for fisheries cooperatives has successfully been emulated in freshwater fisheries in the Mekong Basin?**

My work experience in the fisheries cooperatives became a basis to develop the SEAFDEC regional guidelines for rights-based fisheries. SEAFDEC published the guidelines in 2005 as one of the regional guidelines for the Code of Conduct. Thailand, Lao PDR and especially Viet Nam are seriously investigating the implementation of rights-based fisheries using a co-management approach.

**When was Kagoshima University’s collaborative relationship with SEAFDEC established and what have been some of the major achievements?**

The collaborative relationship started in 2003. As the nature of activities of a regional organisation and a university are quite different, the main achievements have been confined to the exchange of students and staff in areas of mutual interest and participation in meetings. Kagoshima University has been cooperating mainly with Indonesia, Malaysia Philippines Thailand and Viet Nam on an individual basis with researchers. Based on its past experience, it has recently clarified its policy for international cooperation as a university targeting Asia and Pacific Islands with specific focus on Southeast Asian countries. This is the reason

why I moved to the university—not to the Fisheries Faculty but to an advisory function attached to the President’s office. In the first few months, I have been busy developing the university’s policy for international cooperation as a think tank.

**Is Kagoshima University involved with any other projects in the Mekong Basin or is it considering any plans for such cooperation? How does fisheries research and development fit into the university’s strategic plan?**

Kagoshima University has collaborated with Thailand in fields such as forestry dynamics, biological research including insects, microbiology, biomass and productivity of inshore water, bamboo resources, tropical foodstuffs, tree crops, legumes and field work in social sciences. The university has also collaborated with Myanmar in agriculture and Viet Nam in the fields of microbiology, forestry rehabilitation and bamboo resources. However, it should be noted that such cooperation has been in an ad-hoc manner based on projects promoted by individual researchers. International cooperation in fisheries has the most advanced status at the university due to the efforts made by researchers in the Fisheries Faculty, which has initiated close linkages with University of the Philippines and SEAFDEC. Fisheries research and development is therefore one of the focuses of the strategy for international cooperation.



# Senior management changes at Cambodian Fisheries Administration

***Srun Limsong, Kaing Khim and Kao Sochivi have been appointed as deputy directors general of the Cambodian Fisheries Administration. With seven deputies to Director General Nao Thuok, who is also the fisheries adviser to Prime Minister Hun Sen, the agency now has a senior management structure similar to most Cambodian government ministries.***

His Excellency Srun Limsong, who has also been appointed as deputy secretary-general of Cambodia's national committee for the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), was previously director of the administration's Inland Fisheries Research and Development Institute (IFReDI). He was also

a member of the MRC Technical Advisory Body for Fisheries Management (TAB). In his new position as deputy director general, he is in charge of overseeing the aquaculture development activities of the Fisheries Administration. He remains with the MRC Fisheries Programme as the national programme coordinator and component coordinator for Cambodia.

Ms Kaing Khim, who is also chief of the Fisheries Administration Women's Association and national director of the Fisheries Management and Governance Component of the MRC Fisheries Programme, was previously deputy director of the Community Fisheries Development Office. In her new position, she oversees all MRC Fisheries Programme activities in Cambodia. She has also been appointed as one of the country's three TAB members. Ms Kaing Khim has been working with MRC Fisheries Programme in the fields of capture



HE Srun Lim Song  
PHOTO: LEM CHAMNAP



Ms Kaing Khim  
PHOTO: LEM CHAMNAP

fisheries, aquaculture, management and gender promotion since 1996.

Dr Kao Sochivi, who is also deputy chief of the Fisheries Administration Women's Association and national technical advisor to the Community-Based Natural Resource Management Learning Institute of Cambodia, was previously deputy director of the Institute of Fisheries Post-Harvest Technologies. In her new position, she is in charge of IFReDI and the Department of Fisheries Post-Harvest Technology and Quality Control. Dr Sochivi joined the then Department of Fisheries in 1994 and was responsible for the Asian Institute of Technology Aquaculture Outreach Programme in Cambodia for two years.

Among the other deputy directors general of the Fisheries Administration, Sam Nuov is responsible for planning, accounting and international cooperation, Ing Try oversees conservation and marine fisheries, Eng Cheasan heads the fisheries domain and fisheries affairs departments as well as Tonle Sap research while Long Chheang is in charge of administration. Dr Sam Nuov is also the senior Cambodian member of the TAB.



Dr Kao Sochivi

PHOTO: LEM CHAMNAP

### **New director at Inland Fisheries Research and Development Institute**

So Nam has been appointed director of the Inland Fisheries Research and Development Institute (IFReDI) of the Cambodian Fisheries Administration. Dr So Nam was previously director of the administration's Marine Aquaculture Research and Development Center, which he co-founded and helped to develop, and deputy director of IFReDI between 2005 and 2008. Before that, he was deputy director of the Fisheries Domain Division of then Department of Fisheries between 2000 and 2004.

Dr So Nam joined the department in 1994 as national fisheries and aquaculture extension coordinator after completing his B.Sc. in fisheries science at the Royal University of Agriculture in Phnom Penh. He completed his M.Sc. in aquaculture at Ghent University in Belgium and Wageningen University in the Netherlands in 1998 and a Ph.D. in biology at Catholic University of Leuven in 2005.



Dr So Nam

PHOTO: LEM CHAMNAP

# Chris Barlow

Chris Barlow has been appointed Fisheries Manager with the Australian Centre for International Agriculture Research (ACIAR) in Canberra after eight and a half years with the MRC Fisheries Programme. Dr Barlow joined the programme in early 2001 as senior programme officer in Phnom Penh where he was mainly responsible for communications. His wide experience in international fisheries research and development, including several Southeast Asian countries, was the ideal background for helping to launch what are now many of the commission's flagship publications, notably the MRC Technical Paper series. Books and films have also been produced and much material has been translated into riparian languages.

In mid-2003, Dr Barlow became programme manager, succeeding Jeaninke Dahl-Kristensen. In his six years as manager in Phnom Penh and Vientiane, Dr Barlow worked closely with three different CEOs and several division directors as well as various international

experts. Despite constant funding cuts, he found balanced compromises, keeping the programme on track and delivering significant outputs. His dynamic leadership along with his scientific and technical inputs into the programme made a tremendous contribution to the sustainable development of fisheries in the Lower Mekong Basin. Dr Barlow also provided significant technical assistance to the line agencies and Mekong fisheries in general. In addition, he oversaw the development of annual omnibus editions of *Catch and Culture* in Khmer, Lao, Thai and Vietnamese.

MRC chief executive officer Jeremy Bird said Dr Barlow had been a "driving force" behind the success of Fisheries Programme. "He has helped raise awareness of the critical importance of the basin's fisheries for peoples' livelihoods as well as its diversity," Mr Bird said. "At an institutional level, he has built a strong network of committed professionals among fisheries agencies in the four member countries to continue this important partnership. Chris will be sadly missed at MRC, but we wish him all the best in



Dr Barlow (second from right) and Dr Halls (right) with MRC Fisheries Programme Coordinator Xaypladeth Choulamany (left) and MRC Operations Director Do Manh Hung (second from left)

PHOTO: LEM CHAMNAP

the next stage of his career in Australia. “

For his invaluable contribution to the programme and fisheries development in the basin, Dr Barlow has received various medals, certificates and awards from riparian governments. The programme congratulates him on his prestigious new position in Australia and wishes him every success in the new assignment. With ACIAR's portfolio of many projects in the region, staff of the programme and line agencies in the countries will no doubt see Dr Barlow again soon.

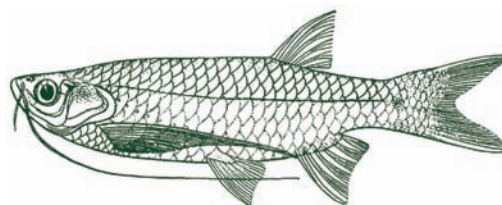
## Ashley Halls

Ashley Halls has returned to England where he will continue to work as a consultant for the MRC Fisheries Programme while running his consulting company Aquae Sulis Ltd from Wiltshire in southwest England. Dr Halls joined the programme in Phnom Penh in early 2007 as coordinator of the Fisheries Ecology, Valuation and Mitigation (FEVM) Component. His experience, scientific skills and hard work enabled him to bring the component and its outcomes to the forefront of planning discussions in the basin. His contribution to Mekong fisheries science was deeply appreciated by all the line agencies

Before joining the MRC, Dr Halls had taken part in several regional meetings, notably the Large Rivers Symposium, where he shared experience acquired in lake and floodplain management in South Asia, particularly Bangladesh, as well as Africa and other parts of the world. Under his close guidance and technical support, the FEVM component made considerable achievements. Among the latest is a collaborative study with the WorldFish Center on modelling the cumulative effects of mainstream dams on migratory fish populations in the Lower Mekong Basin. As acknowledged by MRC chief executive officer Jeremy Bird during the programme's annual meeting in Siem Reap in June, recent efforts by the Fisheries Programme to develop a model to forecast how fish will respond to the potential changes from dams are now central to the MRC's river management planning. The study itself will soon be published as MRC Technical Paper No. 25.

To help with important further studies in the basin, Dr Halls will continue working for the programme

on a part-time basis while serving as director of his consulting company. His new contacts in Britain are listed in the new 2008 edition of the Fisheries Programme Staff Directory alongside those for national programme coordinators and coordinators. He returns to Wiltshire with his wife, two sons and a daughter born in Bangkok.



# Wonderful images of life on the river

*A new book touches on issues central to the debate surrounding the Mekong's future, capturing some of its great beauty and the fragility of the ecosystems it nourishes*

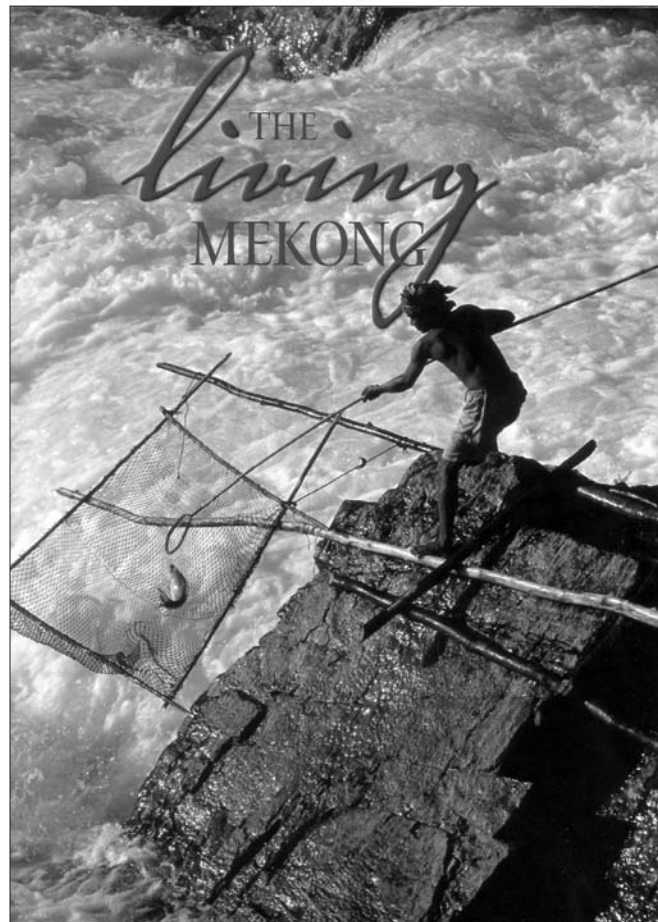
**The Living Mekong.** By Joe Garrison (photography) and Delia Paul (text); Silkworm Books; 146 pages; THB 850.

Drawn on research about fisheries and the environment by the Mekong River Commission and the World Wide Fund for Nature, this book shows how the Mekong's seasonal rise and fall shapes daily life for the people who live on and around it, in matters from transport to festivals to fish trap design. By world standards, the Mekong fishery is immense in scale, producing around 2.5 million tons of wild fish a year, or roughly two per cent of the entire world catch. In numbers of fish species, the Mekong is second only to the Amazon.

This unique collection of photographs takes us beyond the familiar postcard views of the Mekong to sites rarely seen by the public—from secluded natural pools known only to local fishers, to factory floors that package the fillets appearing on restaurant platters all over the world. Aerial images, captured from helicopters, show habitats that are critical to the survival of many species. This book will appeal to everyone with a heart for this mighty river, an eye for a fast-changing way of life and a mind for the choices the Mekong's people face today. It serves as a reminder that knowledge sharing, informed planning and cooperation are essential to achieve a balance between rapid economic progress and the sustainable development of rural livelihoods.

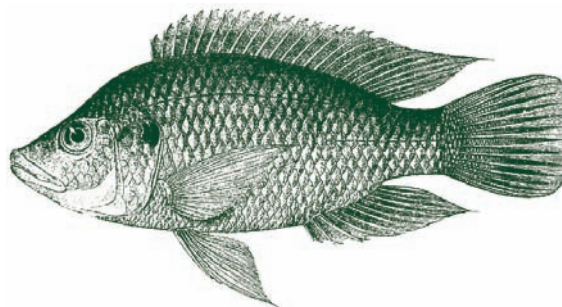
## About the contributors

Joe Garrison is a photographer and scientist who specialises in documenting the people of Southeast Asia and their interactions with the natural environment. An environmental toxicologist by training, Joe previously worked as a research consultant with the MRC Fisheries Programme, and now operates



his business, Garrison Photographic, in Phnom Penh, Cambodia.

Delia Paul is a researcher and writer on environment and development issues who has lived in the Mekong region for many years, working with leading agencies for environmental management and poverty reduction.

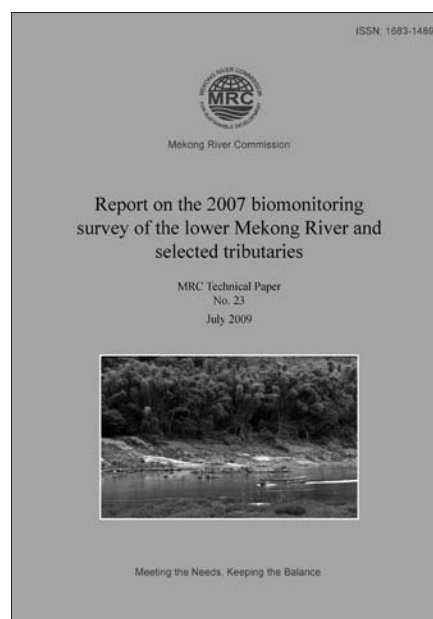
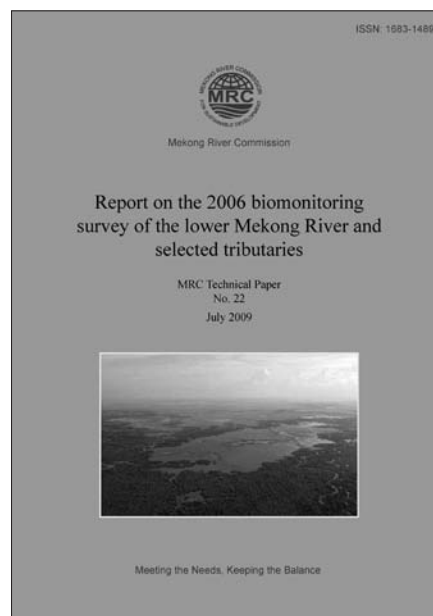
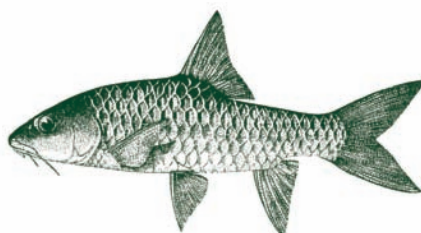




# Ecological health still good at most sites monitored in 2006 and 2007

## *Newly-published reports on the latest biological monitoring of the lower Mekong and selected tributaries*

MRC Technical Papers 22 and 23 report on biomonitoring surveys undertaken in 2006 and 2007. These surveys were part of a five year programme of sampling and analysis conducted by the MRC to develop a protocol for assessing and monitoring the ecological health of the Mekong River and its major tributaries. The programme helped establish which are the most suitable taxonomic groups for monitoring purposes and the appropriate metrics with which to assess the ecological health of the river system. The abundance, diversity, and tolerance to pollution of diatoms, zooplankton, and benthic and littoral macroinvertebrates are used as criteria for the assessment. Over 50 sites are monitored across the basin from the northern borders of Lao PDR in the north to the Mekong Delta in the south. So far the assessments conclude that the ecological health of most of these sites is good. Having established an ecological baseline the programme will continue to monitor the sites over the coming years in order to get advanced warning of changes to the health of river system caused by human activities or natural phenomena such as climate change.



# Mekong Fisheries Index

## Catfish plan threatens trade war between US and Viet Nam

AFP - 7 August 2009

After years of arguing that Vietnamese catfish isn't catfish – so that it attracts a U.S import tariff - and winning a federal law saying as much - fish farmers in the U.S now seem to have changed their minds. Under their latest lobbying strategy, they want the Vietnamese imports considered catfish so that they will be covered by new tougher inspections regimes that were pushed through Congress last year as part of the 2008 Farm Bill.

The move could block Vietnamese imports and risks a broader trade war says the AFP story. Since June last year, the FDA has rejected catfish products imported from China, Thailand and Vietnam a total of thirty one times. Thailand was responsible for two refusals, China was responsible for thirteen, and Vietnamese catfish products were rejected a total of sixteen times. These rejections could increase if the lobbying tactic is successful.

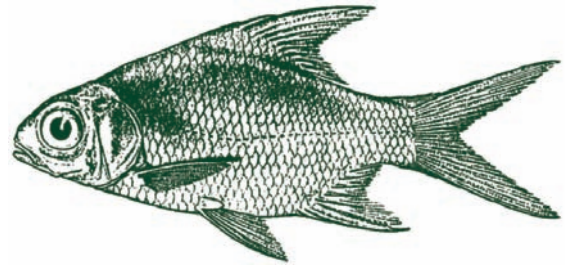
The AFP says that if the Obama administration signs off on the plan, the fish that's long been a staple of Southern cooking and is a significant export earner for Viet Nam could unravel years of improving relations between the U.S. and its former enemy.

The inspections feud is the latest in a long-running battle between a \$400 million domestic farm sector that raises catfish in ponds across the Mississippi Delta and a burgeoning industry in Viet Nam, where fish are raised in ponds and cages – many along the Mekong River.

The U.S. industry — mostly located in Mississippi, Alabama and Arkansas — has had a string of successes on Capitol Hill and in Southern legislatures.

Along with winning frequent federal aid, it pushed a labeling law through Congress in 2002 that forced the Vietnamese fish to be sold in the United States under less familiar names to consumers, such as pangasius, basa or tra. A year later, it won an antidumping

case authorizing tariffs of up to 64 percent on the Vietnamese fish. The southern states where most catfish farming is done now require restaurants to disclose where their fish was raised.



## MRC calls for public submissions on proposed Mekong hydropower schemes

14 July 2009 – MRC Press Release

The Mekong River Commission (MRC) has established a web page to allow the public to make submissions regarding the 11 hydropower schemes proposed for construction along the mainstream Mekong.

The submissions, which can be made at <http://www.mrcmekong.org/ish/hydro-submit.asp> or by post or fax, will provide input to the MRC's Strategic Environmental Assessment that is looking at the wider economic, social and environmental implications of the proposed dams in Cambodia, Laos and Thailand. MRC member countries will use information presented by the study to guide their decisions on these projects.

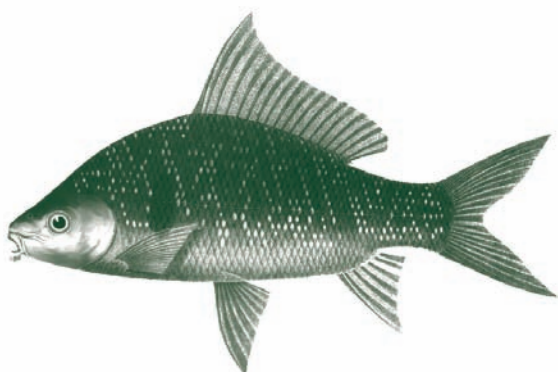
Jeremy Bird, Chief Executive Officer of the MRC Secretariat, said that Mekong governments (include Cambodia, Laos, Thailand and Vietnam) have expressed a strong desire to understand the full range of opportunities and risks of any proposed mainstream hydropower project, particularly those of a regional nature, before a decision is taken to proceed.

“In order to do this effectively, it is important to have a broad consultation process that allows us to hear the views of communities, NGOs, researchers and businesses. These web page submissions provide one of the tools to help achieve this.”

As set out in the 1995 Mekong Agreement, MRC

Member Countries must undergo a formal inter-governmental consultation process prior to building any dams on the river. Projects proposed for development on the mainstream in the lower Mekong Basin will come to the Commission for consultation, with a view to assisting member countries to reach consensus.

Past studies have shown that the development of hydropower can be both positive and negative. For example, the electricity generated and foreign exchange earnings can support a country's development programs. "However, a major concern is the effect that proposed dams could have on fish migration and numbers, and ultimately on the people that live in the river system and who rely on fish for their livelihoods and protein intake," says Xaypladeth Choulamany, a Fisheries Program Co-ordinator at the MRC. "What we need to do is to fully understand the basin wide implications of this and other impacts."



### **Catfish? You must be codding!**

*Catfish bred in Viet Nam is being passed off as cod in UK's fish and chip shops*

15 August 2009 - Taken from various UK Media

British fans of fish-and-chips were aghast to discover in August that experts believe that catfish farmed in Viet Nam is being passed off as cod throughout the country.

Catfish sells for less than half the price of real cod in wholesale markets, but customers at the chippy are being charged as if it is the real thing.

Trading standards officers in Worcestershire successfully prosecuted one shop for passing off as cod *Pangasius hypophthalmus*, also known as river cobbler, basa, or iridescent shark. Two other prosecutions are in the pipeline.

The catfish typically sells for £5 a kilo wholesale, compared with £11.75 for cod. As a raw fillet catfish looks different to cod – it doesn't have the same flakes. But battered, it is difficult to tell the difference. Neither cod or catfish have a strong taste, particularly when masked by batter, salt and vinegar.

Trading standards officers were alerted by complaints from customers and sent in officials to buy samples. The Officers claim that with the UK recession, food is being doctored more, particularly in restaurants.

Disclaimer: These stories are for general information only and are not meant as a statement of official endorsement by the Mekong River Commission.

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