

A decorative horizontal line of fish icons is positioned above the title. To the right of the title is a detailed illustration of a traditional fish trap, which is a cylindrical basket-like structure made of woven material.

# Catch and Culture

## Fisheries Research and Development in the Mekong Region

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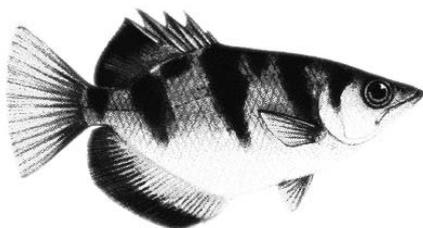


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### **Editorial panel**

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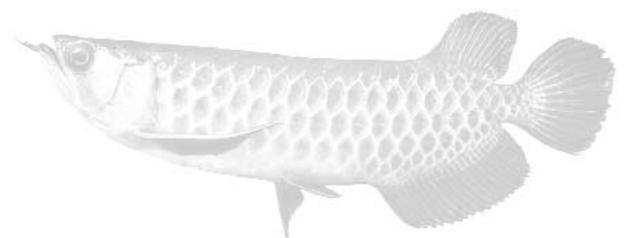
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# Editorial

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Fish catches from Cambodia's dai fishery reached a record low this season. While dry conditions were partly to blame, there are other worrying factors. The commercial dai fishery is a small part of the total Cambodian fishery, but often serves as a useful indicator of the overall situation - which is now poised to become a major policy issue for Cambodia and its neighbours.

*Catch and Culture* examines the situation with a special report from Chnoh Dtrou at the mouth of the Tonle Sap, and an in-depth analysis of river levels correlated with fish catches.

In Thailand and Viet Nam, meanwhile, more than a million people working in shrimp aquaculture will be among the first to suffer if the US imposes anti-dumping duties on shrimp imports this June. But unlike the case of the Vietnamese catfish producers, these producers won't be alone - there are many American allies on their side, and the WTO's influence may be brought to bear. See our discussion of the issues inside.

Finally, *Catch and Culture* takes note of a Cambodian first from the Mekong River Commission Fisheries Programme: a comprehensive catalogue of fishing gears, precisely described and beautifully illustrated with line drawings. This now joins the only other published catalogue in the basin - IUCN's 1997 book "Community fisheries in Lao PDR: A survey of techniques and issues". The MRC's gear catalogue, just released in March this year, is a must not only for fisheries professionals, but for anyone interested in the culture and practices related to fishing in Cambodia.

Selected articles from *Catch and Culture* are now being translated into the Khmer, Lao, Thai and Vietnamese languages. The PDF files can be downloaded from [www.mrcmekong.org](http://www.mrcmekong.org) as can all the features in English. Please enjoy.

The Editors

# Low water blues

By Peter Starr

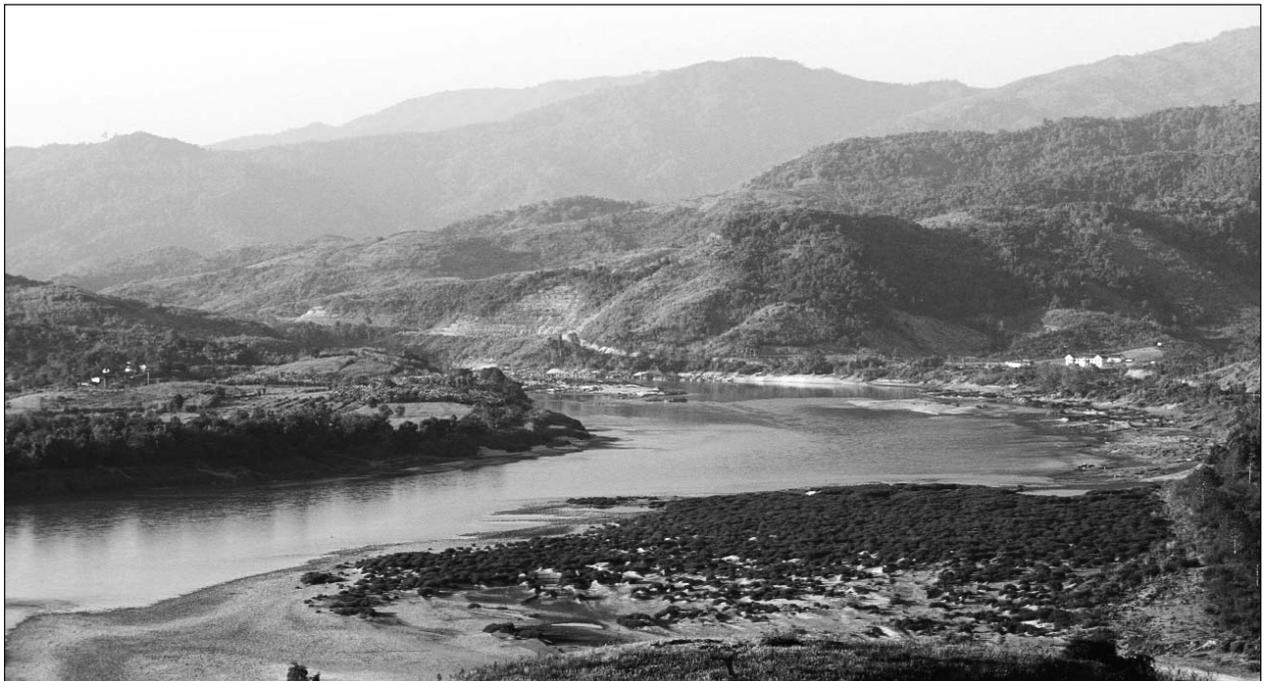
***Following unusually low rainfall last year, Mekong water levels during this year's dry season have been among the lowest recorded in 44 years. In Cambodia, fish catches are down by half in some grounds, including the Tonle Sap bagnet fishery, which has just suffered its worst season on record. Prices have skyrocketed.***

Sieng Komsing steps on to the landing of her houseboat to greet a young fisherman clutching a couple of live marbled sleepers (*Oxyeleotris marmorata*) a highly-prized fish considered a delicacy over much of East Asia, especially among the Chinese.

The Cambodian fish trader weighs the modest catch, stuffs a wad of notes into the man's hands and puts the latest specimens into the near-empty fish tank that dominates her tiny living room. Known as *trey damrei* in Khmer and *shunke yu* in Chinese, the live fish will be shipped by road to Phnom Penh and flown to markets such as Hong Kong and Singapore.

Sieng Komsing reckons water levels are among the lowest she's seen in the decade that she's lived in Phum Kandal, a floating village of hundreds of houseboats on the banks of the provincial capital in Kampong Chhnang. In terms of volume, she said, business is down by about 50 percent.

In Chnok Trou, a sprawling floating village of almost 1,700 households near the Great Lake, local fisheries officials tell a similar story. In mid-March, water levels were half a metre lower than they were at the same time last year. "It's the driest year I've seen since 1987, when we could actually walk between houses," said one long-time resident.



At the height of the season, Chnok Trou is a major trans-shipment point for fishing vessels from all five provinces around the Great Lake with as many as 400 boats offloading their catch every day. With barely two months of the eight-month fishing season left in March, fisheries officials said volumes were also down by about 50 percent from the previous season.

Throughout the Lower Mekong Basin, people are slowly coming to terms with last year's unusually light rainfall, low water levels, smaller catches and a subsequent surge in fish prices. With the region's highest rate of fish consumption (up to 90 kilograms a year), people living in the flood plain area of Cambodia and the delta in Vietnam are particularly vulnerable.

For those who make their living from fishing, however, falling incomes resulting from smaller volumes have been partly offset by soaring prices.

Sieng Komsing said prices for mid-sized *trey damrei* had more than doubled to 15,000 riel (\$3.75) a kilo in March, up from 6,000 riel (\$1.50) a year earlier. The prices for smaller fish of around 200 grams were about 60 percent higher at 4,000 riel (\$1.00) a kilo while prices for bigger fish of up to one kilo were 40 percent higher at 35,000 riel (\$8.75) a kilo.

Prices of other species have shot up even more dramatically. In Chnok Trou, the fisheries officials said the small river carp species known locally as *trey riel* was fetching as much as 1,000 riel (25 cents) a kilo in March, up from as little as 100 riel (2.5 cents) a year earlier. These small migratory fish are a major contributor to the Cambodian catch and are widely used in processed products such as dried and fermented fish as well as fish sauce.

The species accounts for about half of the annual catch of the Tonle Sap's *bagnet* fishery, located further downstream near Phnom Penh where the river joins the Mekong. This year's catch was only 6,550 tonnes, down 47 percent from 12,427 tonnes a year earlier and the lowest on record (see accompanying story on page 7).

Chris Barlow, manager of the MRC's fisheries program, is concerned about the lower catches in Cambodia. "Fish catches have declined alarmingly," he said.

"While this is partly due to the lower and shorter flood last wet season, there are indications that overfishing may be involved.

"Low catches have dramatically increased fish prices to the point that rural people who depend on fish for their nutrition have been priced out of the market. This highlights the crucial link between water flows in the river, fish production and the livelihoods of rural Cambodians."

In Kampong Chhnang, provincial fisheries officials noted that the Tonle Sap system is especially sensitive to dry years, as flooded forest habitats are rich feeding grounds for migrating fish. During the wet season, the Great Lake can expand to between four to six times its dry-season area, inundating huge areas of forest. Dry years like 2003 have a direct impact on the feeding of young fish and the spawning of adults.

Provincial fisheries officials say this year's catch is also being adversely affected by illegal practices such as electro-fishing and the use of mosquito nets, which tend to catch small fry while injuring adult fish. "People are using mosquito nets a lot this year," said one official in Chnok Trou, adding that 22 suspects had already been arrested so far this season and that some confiscated nets were up to a kilometre long.

Ian Campbell, an environmental specialist with MRC, dismisses recent reports blaming Chinese dams for this year's lower water levels and says reduced water levels are clearly linked to lower rainfall during the wet season last year.

"We looked at it from June to September when it started to become an issue," said Campbell. The MRC selected 16 sites based on past records and reliability.

The figures show clearly that the amount of rainfall was unusually low in June and July last year as well as November. In July alone, average rainfall at the 16 sites was 231 millimetres, well below the 261 millimetres recorded during the same month in 1992, the driest year for the river since 1960. Rainfall between July and October accounts for most of the Mekong's average water flow every year. In Phnom Penh alone, these four crucial months account for 74 percent of the average annual flow.

The wettest parts of the Mekong Basin are usually the Northern Highlands (Lao PDR) and the Eastern Highlands (Lao PDR, eastern Cambodia and central Viet Nam) with average rainfall of between 2-3 metres a year. In terms of sub-basin areas, central Lao PDR is the single biggest contributor of water to the Mekong, accounting for 20 percent of the mean annual discharge every year. The next biggest sub-basin area is the Se San and related tributaries in eastern Cambodia, central Vietnam, and southern Lao PDR contributing about 16 percent of the discharge.

Campbell said daily readings in March this year showed that Chiang Saen was less affected by low water flows than the southern Lao port of Pakse. "If low flows in the Lower Mekong were caused by retention of water in dams, we would expect to see flows at Chiang Saen more strongly affected than flows further down the basin where inflows from tributaries would ameliorate the impact," he said.

The MRC has thousands of daily measures of river height for Chiang Saen and Pakse going back to 1960. For Chiang Saen, 12 percent are equal to or below the lowest level recorded in March this year. For Pakse, only five percent of the measures over the past 44 years are so low.

Campbell also noted that China's existing dams on the Mekong were used to generate power - not to divert water for irrigation. Hydropower dam flows tend to differ from the natural river as operators generally store excess water in the wet season and release more in the dry season when natural flows are often not enough to generate power.

"So the expected impact of Manwan and Dachaoshan dams would be to increase dry season flows rather than decrease them," he said.

**Peter Starr is an economics writer and the editor of Catch and Culture.**



# Trends in the Cambodian dai fishery: floods and fishing pressure

By Kent G. Hortle, Ngor Pengbun, Hem Rady and Lieng Sopha

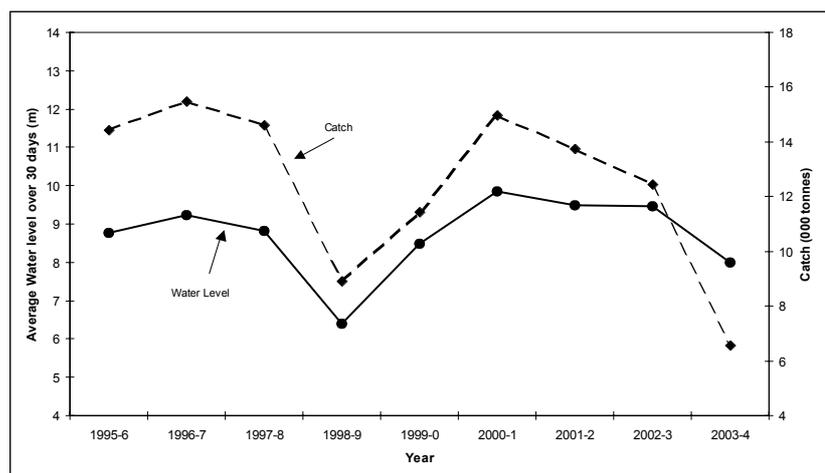
***Cambodia's bagnet catch this season is the lowest on record at 6,550 tonnes, down 47 percent from a year earlier. Low water levels are partly to blame but the catch has now declined for three years in a row, indicating increased pressure from fishing.***

The Tonle Sap reverses around July each year when rising Mekong waters flow 'up' the system towards the Great Lake, flooding the surrounding plains and wetlands. The floodwaters bring millions of fry, the progeny of fish, which have spawned upstream in the Mekong and its tributaries. The small fish feed and grow rapidly in the flooded areas and are joined by larger adult fish, some of which spawn.

Water levels begin to fall in October and the Tonle Sap starts to flow back to the Mekong. Fish are forced to follow the receding waters back into watercourses, and eventually

migrate en masse down the Tonle Sap. The largest migrations are in January and February, when fishing activity of all kinds is intense.

The largest type of fishing gear along the Tonle Sap is the bagnet, known as dai in Khmer. Suspended in one location to filter the current, they are similar to trawl nets. French researchers have dated their use back to 1884. Each net is about 25 metres wide and about 120 metres long, extending a few metres to the bed of the river. Several nets are set across the river in a row. For the latest season, there were 63 nets in 13 rows. Peak



**Figure 1 Total catch of the dai fishery each year (x1,000 tonnes) and peak water levels in the Tonle Sap (mASL)**

Data from Phnom Penh Port, which are well correlated with water levels in the Tonle Sap and the Great Lake.

catches are in January and February, and mainly comprise small cyprinids known as *trey riel*, *Cirrhinus siamensis* and *C. lobatus*. Classed as fishing lots and auctioned every two years, the government earns about \$182,000 a year from bagnet licenses.

French estimates put the catch at 13,569 tonnes in 1938-9 (Chevey and Le Poulain, 1940), and various estimates based on incomplete sampling were subsequently made (Lieng *et al.*, 1995). Since 1995-6, accurate monitoring has provided the only continuous long-term data set for an inland fishery in Cambodia.

The yield from flood plain fisheries is mainly determined by flooding (Welcomme, 1985). A larger flood creates more habitat and food, so fish production is higher, other factors being equal. If the fishery is based on young fish spawned in the same year, the best correlation is with the flood height in the same year. But if the fishery comprises mainly older fish, the height of floods in prior years affects catches.

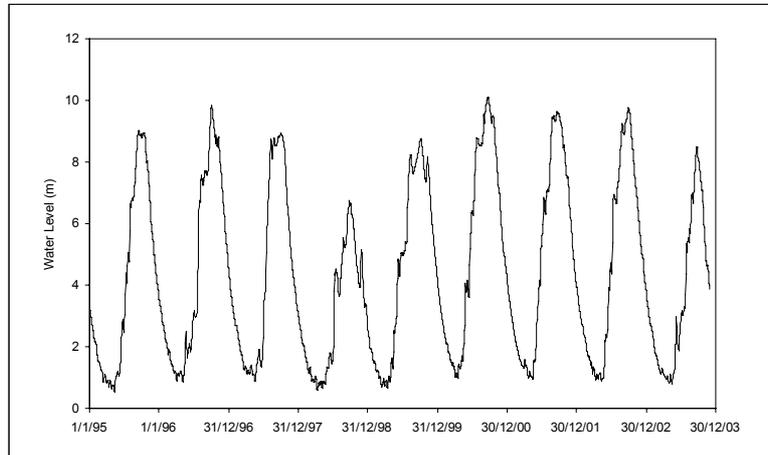
The Tonle Sap fishery comprises mainly small fish spawned in the same year. Between 1995-6 and 2000-1, total catches were closely correlated with the height of the flood (Figure 1). Note that catches recovered after the 1998 drought but did not reach levels that might be expected based on the pre-1998 data, suggesting some lag in the recovery. But after 2001-2, catches were much lower than would be predicted from flood level alone. The 2003-4 catch is the lowest ever recorded, and far lower than might be predicted based on flood-levels alone.

Timing and duration of flooding are also important factors affecting catches. Were recent floods earlier or later than usual? The flood peaks in the Tonle Sap occur over a very narrow time slot each year. Between 1995 and 2003, the earliest peak was on 18 September (in 1995), and the latest on 4 October (in 1999) so the flood is predictable to within about two weeks. As well as the relatively consistent timing of the flood, annual variations in flood height are very small compared to some other large tropical rivers (MRC, 2003).

Can differences in flood duration or shape explain low catches? Figure 2 shows that in 2003 there was a very

Figure 2 **Daily water levels of the Tonle Sap, 1995-2003**

Data from Phnom Penh Port, which are well correlated with water levels in the Tonle Sap and the Great Lake.



narrow flood peak, indicating a short duration flood. This would have contributed to the low dai catch in 2003-04. But there is no overall pattern, such as a series of low or short floods, which would explain the declining catches over the last few years.

Fishing pressure is continually increasing along the Tonle Sap and in the Great Lake. Each year there are more fishers and gears, both legal and illegal. Small-scale fishers - now numbering in the tens of thousands during the peak season - mainly use small-mesh nylon gillnets. Any fish not caught by the bagnets is highly likely to be caught by a gillnet, as observed earlier this year when many fish tagged and released from the most downstream bagnets were immediately caught by gillnets.

Other features of catches which are consistent with overfishing are continuing declines in both the number of larger species and the average size of the dominant small fishes.

So the low dai catches in recent years can be at least partly explained by high fishing pressure. Either some of the fish normally caught by bagnets are being caught by others - including those competing with different types of fishing gear - or total catches are falling. A fall in total catches is of great concern as it signifies overfishing, generally defined as catches falling below optimum levels. Scientists are traditionally reluctant to confirm any phenomenon without proof. But in fisheries

science, as in environmental science generally (see Downes *et al.*, 2002), absence of proof is not proof of absence. We should not wait until the fishery collapses to bring in effective management measures.

## Acknowledgments

The dai data result from the efforts of many field data collectors, Dr Nik van Zalinge and former DOF counterparts of the MRC Fisheries Programme, including Deap Loueng, Yim Chea, Heng Kong, Chhoun Chamnan and Souen Sothia. Hydrology data were kindly provided by Dr Chayanis Manusthirapom, Hydrologist, of the MRCS.

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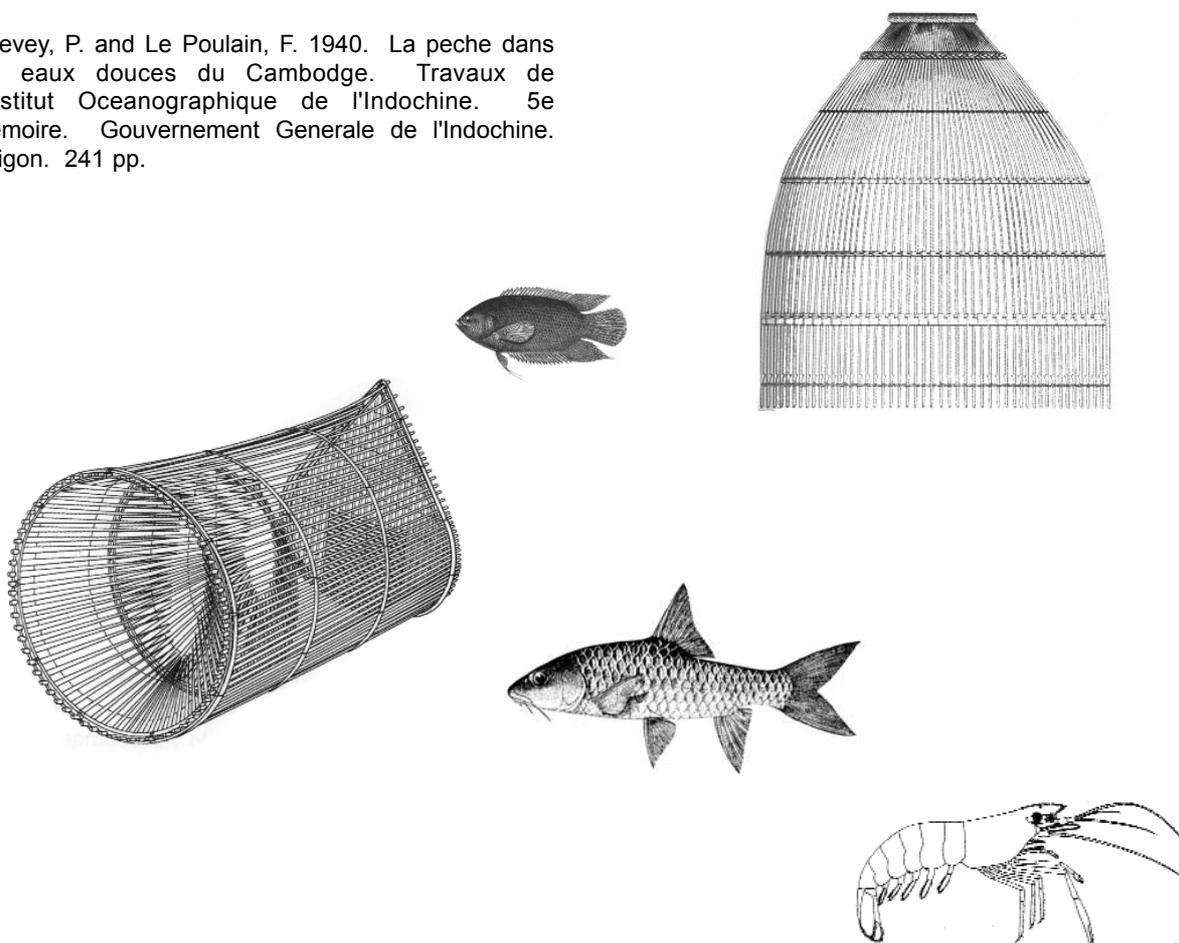
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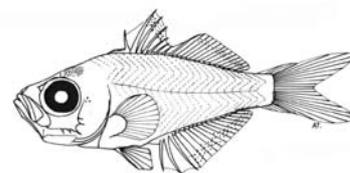
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# Sabre rattling and drum beats from another desperate industry



By Peter Starr

***Washington is preparing to rule on dumping allegations brought by shrimp industry lobbyists representing 2,124 workers in the United States. In Viet Nam and Thailand, the livelihoods of more than a million farmers are at stake.***

The scenario is unfortunately common. An ailing industry in a rich country is losing money, unable to compete in the global marketplace. Instead of making the difficult economic choices needed to tackle the problem head on, it takes the easier option - accusing foreigners of "dumping" products onto its market at prices that are either below cost or below those in the exporting country. Under domestic political pressure, the government agrees and applies punitive tariffs on the offending imports, supporting a dying industry and severely distorting international trade.

Europe has been abusing anti-dumping provisions in its trade laws for years, mainly to protect its subsidised farmers. But as Japanese steelmakers, African cotton growers and Australian sugarcane farmers know only too well, the United States likes to protect certain industries as well. Vietnamese catfish farmers learnt this last year when they were hit with anti-dumping duties, causing prices to collapse as exporters scrambled for new markets.

Now the much bigger shrimp industry is at stake, not just in Viet Nam but also in Brazil, China, Ecuador, India and Thailand. On February 17, the United States

International Trade Commission unanimously ruled that there was a "reasonable indication" that America's shrimp industry might be injured by imports from the six countries. Amid allegations that import prices are "less than fair value", investigations are continuing with a preliminary anti-dumping ruling expected on June 8. The investigation covers frozen and canned imports of any species of warm-water shrimp or prawns (generally classified in the Penaeidae family).

Vietnam's official reaction was typical of the outrage felt among the six countries which together exported almost 300,000 tonnes of shrimp worth \$2.4 billion to the United States in 2003. "While preaching trade liberalisation, US authorities adopt protectionist measures including quota and high tax impositions rather than encourage competition," the Vietnam News Agency commented in January. Interestingly, many Americans agree.

The American Chamber of Commerce in Viet Nam has voiced concern about "protectionist pressures" in the United States and says the anti-dumping suit is a "serious threat to restrain trade" between the two nations. In a statement released in February, the chamber said any imposition of anti-dumping duties would be "difficult to square with economic reality" given Viet Nam's natural competitive advantage. Moreover, such a "tax increase" on American consumers will do "nothing to address the underlying problems facing the US domestic harvesting and processing industries."

In the United States, seafood industry sources say the wild shrimp industry along the Gulf of Mexico and the Atlantic Ocean has failed to change with the times. Critics charge that it has long been plagued by quality

and marketing problems as well as limited seasonality which makes harvests unpredictable. Other problems reportedly include poor infrastructure, habitat destruction, pressures from recreational interests and the rising costs of fuel, gear and labour. In short, the industry is "archaic and inefficient," the monthly magazine *Seafood Business* says.

Wally Stevens, president of the American Shrimp Distributors Association, complained last year that offers to help shrimpers develop better handling and processing methods had fallen on deaf ears. "Instead, we are hearing the rattling of sabres and the steady drumbeat from a desperate industry that believes proper recourse consists of slamming our borders shut on imports." Stevens warned that efforts to impose trade barriers would be exhausting, divisive, expensive and ineffective.

Rather than taking the short-term approach of seeking punitive tariffs, he said shrimpers would be "better off investing time, effort and finances behind a long-term niche marketing strategy." But that suggestion also appears to have fallen on deaf ears, with the Southern Shrimp Alliance - representing shrimpers in Alabama, North Carolina, South Carolina, Florida, Georgia, Louisiana, Mississippi and Texas - filing their suit on December 31.

In a preliminary hearing three weeks later, Global Aquaculture Alliance president George Chamberlain reportedly told the International Trade Commission that shrimp farms produced 1.6 million tonnes of shrimp last year, or about 35 percent of all shrimp worldwide. "If this dumping case somehow leads to a decline in shrimp supply from certain countries, it will quickly be replaced by farm product from emerging exporters like Mexico, Indonesia, Malaysia, Bangladesh and others," he was quoted as saying.

If Washington rules against the exporters, shrimp farmers in Asia and Latin America will be the first to suffer, notably those in Viet Nam and Thailand where the industry is said to employ more than a million people. But the biggest losers will be the tens of millions of American consumers facing higher prices. Some industry experts such as Stevens reckon shrimp will go back to being a luxury item if duties are imposed.

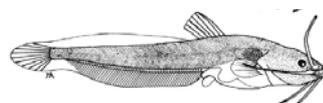
Who then will benefit, apart from competing exporters? *Seafood Business* warned as early as March last year that some of Washington's biggest trade lawyers had

been signing up to represent the shrimpers. "Once again, the Washington lawyers will make another killing and the seafood industry will foot the bill," it concluded. "If you want to buy and sell fish these days, you have to keep one eye on Washington. Even though Republicans are calling the shots, the trade environment for the seafood business has never been more anti-business." The *New York Times* has since accused Commerce Department officials of being "highly solicitous of domestic lobbies", urging shrimpers to rethink their pursuit of such a "groundless" case.

To wage its battle, the shrimp alliance is fighting fire with fire. One of its big gripes is that alleged "financial incentives" from foreign governments and unidentified international institutions have over-stimulated output in many countries. But to help pay its legal bills, the alliance is reportedly now getting its own incentives - up to 600,000 dollars in state funds from Louisiana and a local tax on fuel raising up to 260,000 dollars from Alabama.

The Mexican shrimp industry is also suspected of providing "incentives" in exchange for not being named in the suit. On December 18, the Southern Shrimp Alliance announced that it had held two days of talks with Mexico's National Chamber of Fishing and Aquaculture Industries and that the two groups had decided to "cooperate to the best of their abilities to jointly oppose unfair trade in shrimp." Until then, Mexico had frequently been named as one of the countries dumping shrimp on to the American market.

Unlike the catfish battle, Viet Nam is not alone in the shrimp-dumping dispute. China, India and Brazil are among the world's biggest economies and have considerable clout with the ultimate judge, the World Trade Organisation (WTO), to which Viet Nam does still not belong. The six countries also have powerful allies in the American consumers themselves, including distributors and restaurants. The real question is how far the Bush administration is willing to go in alienating millions of shrimp-eating American voters in an election year, and whether 2,124 "outsourced" shrimpers and their friends are worth the trouble. If they are, the focus will hopefully shift from Washington to the WTO headquarters in Geneva.



# Sampling fish larvae

By Kent G. Hortle

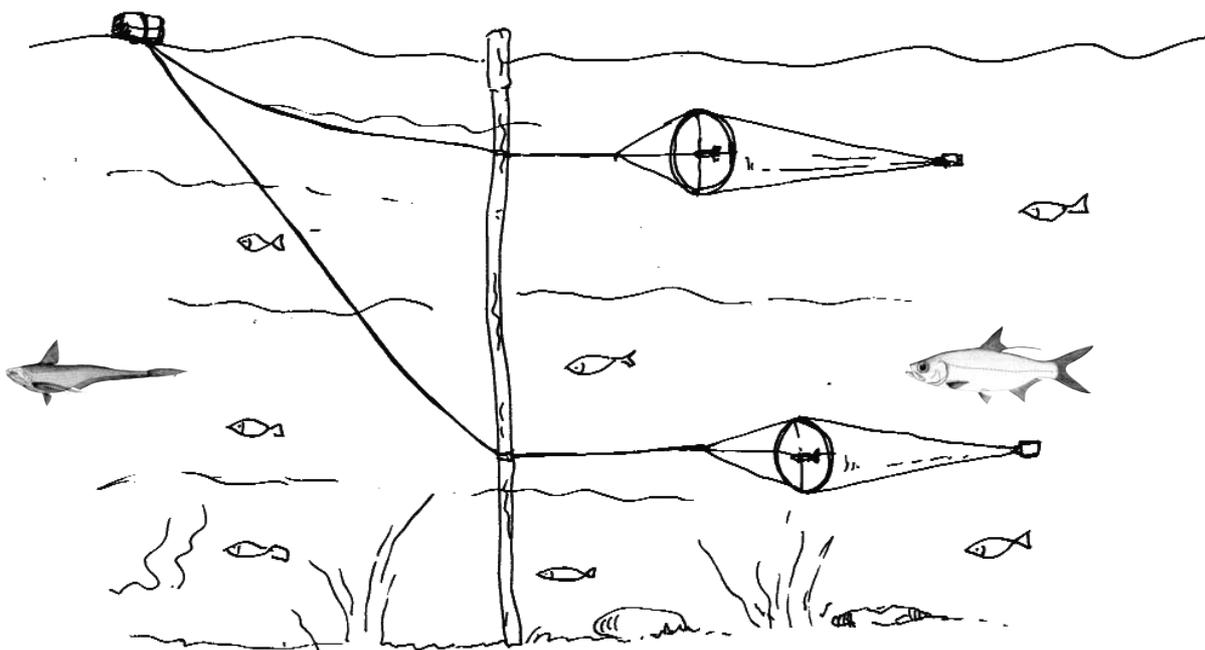
**Many biologists are familiar with sampling adult fish and larger juveniles. But it is only recently that attempts have been made to sample larvae and young juveniles in large tropical rivers. Using standardised nets, the MRC is now aiming to expand larval sampling across the basin.**

In tropical rivers, many species spawn upstream of the main floodplain as water levels rise. Eggs, larvae and juveniles drift downstream and rising waters carry them to favourable rearing areas. In the Mekong system, such flood-spawners include many of the important catfishes (pangasiids) and river carps (cyprinids). Nets can be used to catch the larvae and juveniles of these fishes, along with other drifting organisms such as aquatic insects - including predators on larvae - and shrimps.

The abundance of larval fish makes them easier and cheaper to catch than older fish. Sampling can indicate the composition and diversity of species as well as breeding times and spawning habitats. It can also indicate the availability of fish for trial grow-out in aquaculture. And as young fish are generally more sensitive to toxicants, sampling can provide important information about the quality of water and habitat. The presence of larvae shows that the habitat is supporting all stages up to breeding adults.

Larval fish can be sampled using many kinds of equipment including electrofishers, light traps, drift nets, pump samplers, seine nets, buoyant nets, dip nets, tow nets, push nets, ring nets, and toxins. The method used depends on study objectives, target species, stage of development and habitat type.

In many studies, bongo nets are used. Usually employed for sampling plankton, these nets are typically 30 centimetres to a metre in diameter with mesh apertures of between half a millimetre and a millimetre. The Assessment of Mekong Capture





Larval fish sampling nets being retrieved from the Mekong river near Phnom Penh. Note the use of twin nets, one set near the surface and the other near the bottom of the river.

Fisheries (AMCF) component of the MRC's Fisheries Programme aims to expand basin-wide larval sampling. This will be based on standardised nets with a diameter of 40 centimetres or one metre and a mesh aperture of one millimetre. Nets this size are cheap, easy to transport and simple to set in the field. Based on existing data on larval density, they filter enough water to let large numbers of larvae be obtained during spawning periods. A mesh aperture of one millimetre is large enough to let most suspended detritus pass through without clogging the net. It's also fine enough to catch the larvae of most species. Early catfish and river carp larvae, for example, typically absorb their yolk sacs and begin feeding when between four and eight millimetres long. Before that, many species cannot be identified.

Apart from large seasonal variations, the density of fish larvae varies over the course of the day and larvae are more concentrated in certain parts of the river cross-section such as the surface or bed, or

the mainstream or edges. These patterns must be studied and methods standardised before any large-scale sampling is implemented so that differences found between sites or times are not simply artefacts of sampling.

Sampling by the AMCF focuses on species whose larvae drift in the river. But the larvae of some river-spawning species may not be obtained by drift-net sampling, as they remain associated with bankside vegetation and snags or the substrate. Other methods are required for floodplain spawners and those fishes in which parents brood or protect the young. The AMCF has recently prepared a detailed review of methods for sampling larval fish. Further information can be obtained from the author.

***Kent Hortle is a fisheries biologist working for the MRC's Fisheries Programme. He can be contacted at [hortle@mrcmekong.org](mailto:hortle@mrcmekong.org)***

# Fins make the fish

By John Valbo-Jorgensen and Kent G. Hortle

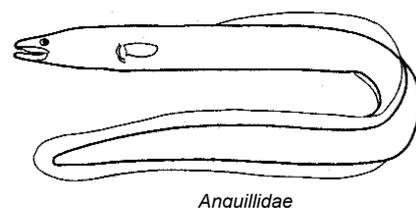
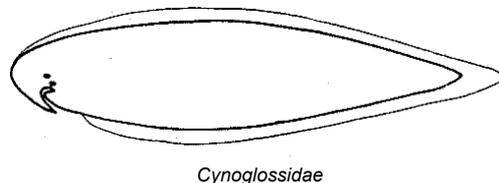
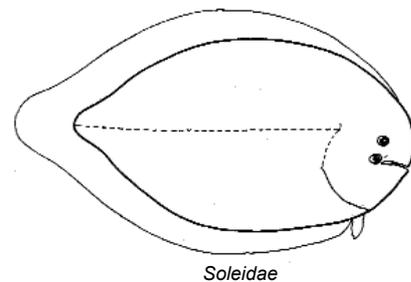
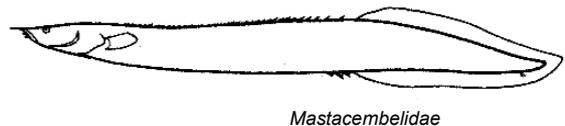
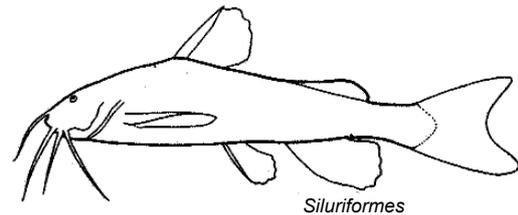
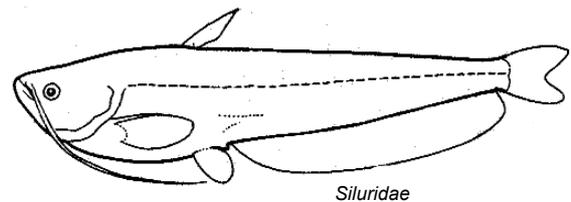
***Fins are mainly used for swimming. But they can also be used for defence purposes, territorial and mating displays, clinging to rocks and even flying.***

Fins characterise fish, perhaps more than any other external features. They vary greatly in shape between species, but have a common basic structure. Paired pectoral and pelvic fins in fish correspond to the arms and legs of land vertebrates. Fish also have single anal, caudal (tail) and dorsal fins.

Fins of bony fishes are generally flexible, and consist of a series of bones or rays covered by soft tissue and skin. Specialised muscles are used to erect or collapse fins, and the shape of pectoral fins may be adjusted to control movements. Fin rays are either soft or spiny. Soft rays may be branched at their ends. Fish spines may be located in any fin except the caudal fin. Most commonly, however, fishes have spines in their dorsal fin. If a species has two dorsal fins, it is often only the anterior fin which has spines.

The fins of sharks are supported by stiff, unbranched and unsegmented cartilaginous rays. Some sharks have a spine in connection with the first dorsal fin, but no Mekong sharks have spinous fins.

The dorsal fin may be greatly reduced or completely missing, such as in some sheatfishes (Siluridae). In other species, the dorsal fin is divided into two or even three fins. Some fishes, such as catfishes (Siluriformes) have an adipose fin, which is a small fleshy fin-like appendage without rays found between the dorsal and caudal fins. Its role is not well understood, but it may simply act to reduce friction while the fish is swimming. The caudal fin may be joined with either the dorsal or anal fin, or with both - as in the spiny eels (Mastacembelidae), soles (Soleidae) and tonguefishes (Cynoglossidae).



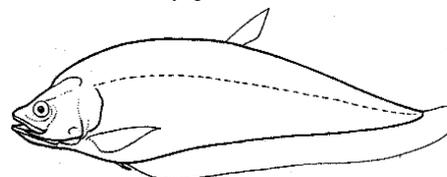
Fish use fins mainly to provide power and stability for swimming, and for manoeuvring. A fish moves forward by contracting the muscles along its backbone to generate a wave from its head to its tail, and by oscillating its caudal fin. The fastest species, such as tunas, devote most or all of their energy to muscles which rapidly oscillate very large sickle-shaped tail fins. At the other extreme, the slowest fishes use only bodily contractions for thrust. They have very small or absent tail fins, the most extreme case being eels (Anguillidae). Other fishes fall between these extremes. Fish use their other fins mainly to orient or steer, and to maintain their position in the water column. However, pipefishes (Syngnathidae) and featherbacks (Notopteridae) swim by using the dorsal and anal fin respectively. And frogfishes (Batrachoididae) walk along the bottom on their fins.

Fins have several other functions. They are used in the territorial or mating displays of many species. For example, male fighting fish (*Betta splendens*) use their large and brightly-coloured dorsal, caudal and anal fins to warn other males to stay away from their territory. Fin spines are a key element in most fish defence systems. The dorsal, anal and pectoral spines of many species are stiff and sharp to deter predators. When locked in place, the spines increase the effective size of the fish, making it difficult to swallow. Moreover, the spines of some species carry toxins, notably some catfishes (Ariidae). Threadfins (Polynemidae) use the touch-sensitive and greatly-extended filaments of their pectoral fins to locate invertebrates buried in muddy bottoms. Most gobies (Gobiidae) have fused pelvic fins which form a sucker pad, enabling them to cling to stones in fast currents. Marine perhaps most specialised are the pectoral fins of the flying fishes (Exocoetidae), which are greatly enlarged to allow them to glide through the air over large distances.

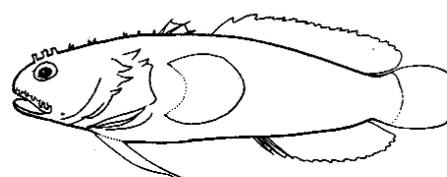
Having many functions and being highly variable between species, fins are among the most important features used for identifying fishes. Key characters include their number and position in relation to each other, the number of fin rays, the presence or absence of spines, and whether the spines are smooth or serrated.



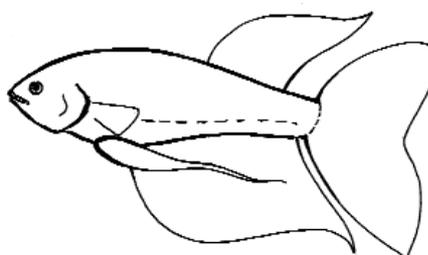
Syngnathidae



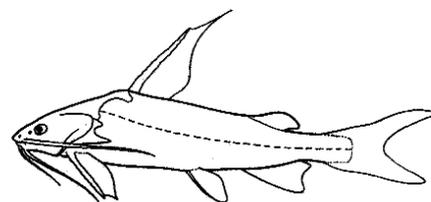
Notopteridae



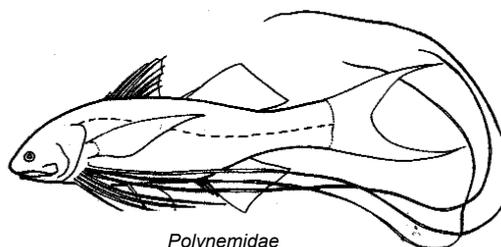
Batrachoididae



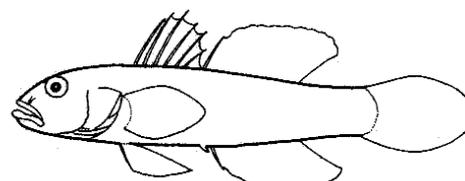
Betta splendens



Ariidae



Polynemidae



Gobiidae

# Technical Advisory Body for Fisheries Management

By Wolf Hartmann

The Technical Advisory Body for Fisheries Management is being increasingly recognized as a central plank in regional efforts to bring about effective and sustainable fisheries governance in the LMB. In recognition of this, the Swedish government has allocated funds over a three year period (Jan 2004 - Dec 2006) for the TAB to embark on a series of activities aimed at strengthening fisheries management in the Mekong. The funding is in addition to that provided by Danida to the MRC Fisheries Programme to support the TAB.

Members met in Hanoi in March to review the achievements of the TAB and to develop a work plan for the next three years. It was generally felt that the TAB had increased regional coordination on fisheries development and helped to build a common understanding of the constraints and opportunities for fisheries development shared by all four countries.

Discussions also led to the formulation of a mission statement for the TAB, to serve as an overall guide for future areas of involvement.

In the next stage of the Hanoi meeting, the TAB members went on to consider the main activities in a three-year work programme. An initial list of activities was developed, all of which fall under the agreed outputs of:

- Management capacity strengthening
- Knowledge creation through research
- Assisting the flow of information to relevant institutions.

Since the Hanoi meeting some details have been added to these draft activities by the newly formed TAB Support Group (an action agreed during the meeting). In the next TAB meeting scheduled for mid-May 2004, the TAB members will discuss the details of the draft activities further and finalize its first three-year

workplan. The workplan will be flexible, however, so that the TAB can respond to new priorities as they arise.

The expanding role for the TAB comes at a time of obvious increasing need for real and effective fisheries management in the Mekong Basin. Along with national fisheries agencies and other partners involved in fisheries management, we wish it every success in its critical role in ensuring the sustainability of the fisheries of the Mekong River Basin.

***Wolf Hartmann is fisheries manager working with the MRC Fisheries Programme.  
He can be contacted at [merops@jaopdr.com](mailto:merops@jaopdr.com)***

## TAB Mission Statement

The TAB is a regional body which gives advice, enables and facilitates the exchange and uptake of information on fisheries management and development into government policies and action plans for the sustainable improvement of rural livelihoods in the LMB. This is achieved by strengthening management capacity, creating knowledge through commissioned research and assisting the flow of information to relevant line agencies, NMC's, MRCS, fishery groups and donors. In implementing its activities the TAB highlights the cross-cutting issues of gender equity, food security, poverty alleviation and full participation. It is member of the MRC Fisheries Programme Steering Committee and regularly reports to the JC on regional fisheries status, opportunities and constraints.

# Fish or naga?

By Kent G. Hortle



Photograph of *Regalecus glesne* or oarfish labelled "Payanak" and "Queen of Nagas."

On the last day of Buddhist Lent - the first full moon of the eleventh lunar month - people gather along the Mekong in the evening to watch hundreds of red, pink and orange fireballs burst from the river and soar into the sky.

Despite reports of people firing rockets and guns to simulate the fireballs, the phenomenon has been so widely observed and reported for decades that there is no doubt that it is a genuine natural event.

The fireballs, each the size of a tennis ball, are known as bang fai payanak. Some claim they only occur in a very limited area near Nongkhai in Thailand and the Lao village of Ban Hat Sai Khao, about 60 kilometres downstream from Vientiane. But similar fireballs have been observed in several other rivers and swamps in the region. Ngor Pen Bun, a biologist at the Cambodian Fisheries Department, says they have

also been seen on the Mekong in northern Cambodia.

Local people believe the fireballs are released by the King of the Nagas (payanak), a revered giant serpent that lives in caves beneath the bed of the river. The naga has a long history with Hindu or Buddhist origins and the naga belief still has a great influence over everyday life in the region.

Some monks believe the fireball phenomenon began long ago when villagers were floating fireboats on the river in an annual mark of respect to the Lord Buddha. When some villagers started firing small rockets into the sky, the naga decided to participate and began shooting fireballs from beneath the river.

The event is now a major boost to local economies, drawing huge crowds each year including about 400,000 people on the Thai side alone in 2002. The

event is expected around October 29 this year.

Thai scientists investigating the phenomenon suggest that the fireballs may result from the release of methane or phosphine gases, formed by anaerobic decay of vegetation.

But the naga belief system would be reinforced by a picture that has been widely distributed throughout the Mekong region. The picture shows US marines who appear to have killed a baby naga. The caption reads "Queen of the Nagas" and claims that it is from the Mekong River in Lao PDR. The distinctive fish is, in fact, a specimen of the world's longest fish *Regalecus glesne*, also known as the "King of the Herrings" (Regalecidae, Lampridiformes). The bright silver and red fish is a widespread species, predominantly deep-sea and entirely marine. The specimen in the photo was washed onto a beach near a US military base in southern California in 1996. The photo was taken by Leo Smith of the Scripps Institution of Oceanography

where the fish's head and tail are now preserved. At 7.3 metres and about 120 kilograms, it is apparently the largest preserved specimen of this species which grows to perhaps 15 metres in length.

Who added the false text to this famous photo and why? We many never know, but we do know it is not a naga, and it does not live in the Mekong.

## References

Roberts T.R. (2002) Payanak as a mythical animal and as the living species *Regalecus glesne* (Oarfish, Regalecidae, Lampridiformes). *Natural History Bulletin of the Siam Society*. 50: 211-224.

Numerous websites can be accessed; use naga fireballs isan, and *Regalecus glesne* for images and information.

## Events

# Calendar of Fisheries Events

**Fourth World Fisheries Congress Reconciling Fisheries with Conservation: The Challenge of Managing Aquatic Ecosystems; 2-6 May 2004; Vancouver, British Columbia, Canada**

**Eleventh International Symposium on Nutrition and Feeding in Fish; 3-7 May 2004; Phuket, Thailand**

**Eleventh Annual Meeting of MRC Fisheries Programme; 12-13 May 2004; Luang Prabang, Lao PDR**

**Training course in Management of Sustainable Aquafarming Systems; 7 May - 5 June 2004; SEAFDEC, Iloilo, Phillipines**

**Philippines International Symposium on Transboundary Water and Ecological Cooperation; 18-25 July 2004; Kunming and Lhasa, China**

**Ninth International Symposium on River Sedimentation; 18-21 October 2004; Yichang, China [www.irtces.org/issahu/9ISRS.htm](http://www.irtces.org/issahu/9ISRS.htm)**

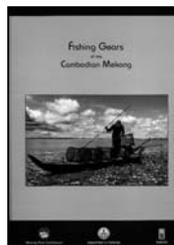
**Global Symposium on Gender and Fisheries 2004; 28-29 November 2004; Penang, Malaysia**

**Seventh Asian Fisheries Forum: *New Dimensions and Challenges in Fisheries in the 21st Century*; 29 November - 3 December 2004; Hotel Equatorial, Penang, Malaysia**

# New information products

## Fishing gears of the Cambodian Mekong

Fishing gears are the link between the fishers and the fish. They reflect many aspects of the behaviour of the target species, the habitats they occupy, and their movements across space and time. Fishers exercise their knowledge, accumulated over generations, in the selection and use of gears. The gears themselves display local technologies and show the decision-making processes of the fishers, including beliefs and taboos. It is important to understand these, when it comes to measures for resource conservation.



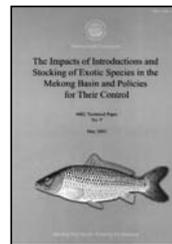
This catalogue is an essential aid for managing and studying inland fisheries. It will assist those involved in assessing or monitoring fisheries, by providing accurate specifications of gear size and characteristics, allowing calculation of catch per unit effort, for example.

Fine technical drawings accompanied by photos and concise descriptions make this fishing gears catalogue an outstanding production. It describes around 150 gear types grouped into 16 major categories, based on their principle of capture. The names of the gears are given in Khmer and English, accompanied by a short technical description, drawings and photographs. A chart shows usage of the gear in four fishery regions: the Great Lake, the Tonle Sap, the Mekong and Bassac floodplains south and east of Phnom Penh, and the upper Mekong River. There is also information about seasonal uses, gender aspects, cost and legal status.

Apart from the usefulness of this manual for the management and study of fisheries, the gears that are depicted reflect the living culture of the Cambodian people, whose lives have for centuries been based on harvesting the Mekong's riches.

*Jointly published by the Mekong River Commission, the Department of Fisheries in Cambodia, and Danida in 2003. Hardback, 268 pages. US\$25.*

## The Impacts of Introductions and Stocking of Exotic Species in the Mekong Basin and Policies for their Control

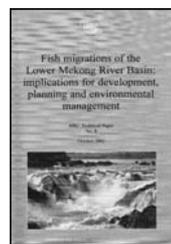


Exotic fish species have been introduced into the Mekong River Basin for aquaculture, stocking of lakes and reservoirs, mosquito control and the aquarium fish trade. The authors call for a code of conduct to be established for future introductions, arguing that while the impacts of exotic species so far appear relatively minor, their uncontrolled movement is a threat to native fish species that may decline through competition, predation or genetic interference, and the possible spread of disease.

The report describes the exotic species, their known impacts, and policy suggestions.

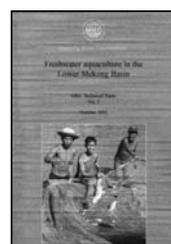
*MRC Technical Paper No. 9, May 2003. US\$5.*

## More reports



**Fish migrations of the Lower Mekong Basin: Implications for development, planning and environmental management**

*MRC Technical Paper No. 8  
October 2002. 62 pages. US\$5.*

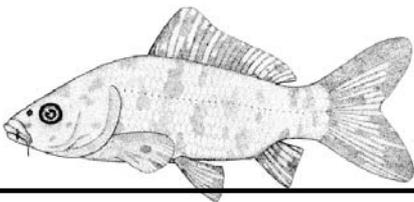
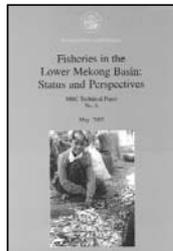


**Freshwater aquaculture in the Lower Mekong Basin**

*MRC Technical Paper No. 7  
October 2002. 62 pages. US\$5.*

### Fisheries in the Lower Mekong Basin: Status and perspectives

MRC Technical Paper No. 6  
May 2002. 95 pages. US\$5.



### Maps and data products

Maps showing sub-catchments, watershed classification, river networks and the flood depth, duration and extent in the Lower Mekong Basin are available at scales of 1:800,000 to 1:2,000,000. For details, check the Mekong River Commission website at [www.mrcmekong.org](http://www.mrcmekong.org)

### More CD products

#### Where there is water, there is fish

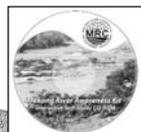
The seasonal swelling and shrinking of the Tonle Sap Great Lake in the central floodplains of Cambodia has been likened to a beating heart – the heart of the Mekong River system, where vast numbers of fish act out their perpetual cycles of migrations. The film tells the story of the great fisheries that have evolved here over the centuries. Today, the food security of Cambodia's population of 12 million still rests on fish and rice. The film stresses the importance of regional cooperation to protect these inland fisheries that are among the richest and most biologically diverse in the world.



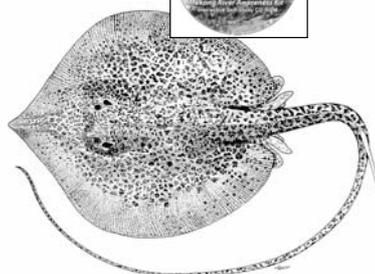
2002. US\$ 5.00  
In English and Khmer.

#### River Awareness Kit

Designed for self-study, this interactive CD-ROM provides an introduction to basic scientific facts and concepts to do with river ecology.



January 2003. US\$ 10.00



### How to buy products

Items may be ordered by email and paid for by telegraphic transfer. For such transactions, normal bank charges and postage costs apply. You can also use a credit card to purchase information products on-line. If you are in Cambodia, you can purchase items directly from the Documentation Centre at the MRC Secretariat building in Phnom Penh during business hours, **up until 17 May 2004.**

The MRC Secretariat will move to Vientiane, Lao PDR, in June 2004. Purchases can once again be made direct from the Documentation Centre from 1 July 2004 at the new premises.

Government agencies in MRC's four member countries wishing to receive reference copies of any items are welcome to contact the Secretariat.

### Contact details

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# Mekong Fisheries Index



**Giant catfish critically endangered, group says.** National Geographic News on [www.national-geographic.com](http://www.national-geographic.com), 18 November 2003. The World Conservation Union (IUCN) has put the Mekong River's giant catfish on its Red List as a critically endangered species.

**Mekong River countries agree on water use.** Vietnam News Agency website, 3 December 2003. Cambodia, Lao PDR, Thailand and Viet Nam have agreed on Procedures for Notification, Prior Consultation and Agreement, and Procedures on Water Use Monitoring. The procedures pave the way for the countries to agree over the next two years on rules for the maintenance of flow on the mainstream, and on water quality guidelines, under a process supported by the Global Environmental Facility through the World Bank.

**Tapping the mighty Mekong.** Opinion piece by Joern Kristensen in the South China Morning Post, 16 December 2003.

There is enormous trade potential on the Mekong as an international waterway, but a strong framework for cooperation needs to be put in place, with the relevant safety standards. For example, the continued transport of fuel in single-hull tankers on the Mekong could be a disaster waiting to happen.

**Statkraft Groner to carry out environmental study in Cambodia,** Development Today, 17 December 2003.

Sida and NORAD are funding a major study of potential dams in Viet Nam, carried out by the consultancy SWECO. But there is concern about possible cross-border impacts of Vietnamese dam building on two rivers that flow into Cambodia. On Sida's insistence, four additional studies will be carried out in Cambodia to predict the extent of these impacts.





**The sweet serpent of Southeast Asia.** Special feature in The Economist, 30 December 2003.

How much longer will the Mekong remain the world's last great unspoilt river? Few rivers can top the Mekong for sheer peculiarity, with its two-way flow and unusual fauna. Now reef-blasting and dams may threaten the river basin's most valuable resource: its fisheries.

**Farms, fishermen suffer as waters dry up,** Bangkok Post, 11 March 2004.

The dry spell has made it possible to walk from Thailand to Lao PDR on sandbars across the Mekong.

**Mekong lower, fears higher,** Inter Press Service report on Asia Times website, 16 March 2004.

The annual dry spell affecting the Mekong River basin this year has brought into relief the vulnerability of millions of rural people who depend on the river for their livelihood when the waters dip to unexpected lows. The Challenge Programme on Water and Food is funding projects focusing on agriculture productivity and the efficiency of water use in the Mekong region.

**Managing the Mekong's future cooperatively.** Opinion piece by Kim Geheb in The Nation, 9 March 2004.

Irrigated agriculture is bound to increase over the next two decades, but changes in the flow patterns will affect the rich Mekong fishery. Understanding is needed of the interconnection between the river basin's societies, economies and ecology.

**Lao, Thai villagers urged to seek compensation.** Radio Free Asia Lao service, 19 March 2004.

NGOs are urging villagers along the Mekong River in Thailand and Lao PDR to seek Chinese compensation for damage to the environment caused by blasting of reefs in the Mekong.

**Drought, not Chinese dams, blamed for lower flows in the Mekong.** Associated Press report on asia.news.yahoo.com, 27 March 2004.

If low flows in the lower Mekong were caused by the retention of water in dams in China, we would expect that the dry conditions would be more extreme at the upstream sites near China, but this is not the case, according to the Mekong River Commission. Conditions are dryer at Pakse in southern Lao PDR.

**Regional drought to see Mekong River at lowest in Cambodia in a decade.** Agence France Presse report on TerraDaily website, 29 March 2004.

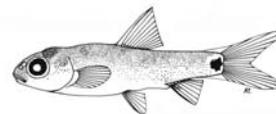
The Mekong River Commission comments on the low flows in the river basin, citing little rainfall as the main reason.

**Two giant fishes caught in Mekong River.** Vietnam News Agency, HCM City, 6 April 2004.

Two giant fish, classified as *Catlocaropio siamensis* of the Cyprinidae family, were caught alive in the Mekong River on Monday by fishermen of the Long Xuyen Quadrangle. One of them weighed 80 kilos and the other, 110 kilos.

**Three Giant Catfish caught.** Bangkok Post, 3 May 2004.

Fishermen of Ban Hat Sai in Chiang Khong district are celebrating the rare catch of three giant catfish weighing more than 200 kilogrammes each from the Mekong river.



**Published by the Mekong River Commission Secretariat**

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Sikhottabong District, Vientiane 01000 Lao PDR

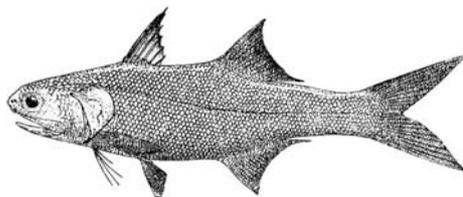
**Phone:** 856-21-263 263 **Fax:** 856-21-263 264

**Website:** [www.mrcmekong.org](http://www.mrcmekong.org)

# Fisheries Research and Development in the Mekong region

There are no differences between males and females that can be seen without opening the fish, and in several species all individuals are born male and change sex as they grow larger (Feltes 1997) (species with such a life strategy are called protandrous hermaphrodites).

Threadfins live in muddy waters normally near the bottom. Some species form loose schools, although larger individuals more often are observed individually or in pairs. They are most commonly found over sand and mud substrates, where they search for their prey by probing the bottom with their pectoral fin filaments (Moyle and Cech 1988). The filaments are provided with sense organs that respond to the slightest touch by a prey organism. Threadfins have a preference for crustaceans especially shrimps, but also feeds on worms. The composition of the diet may change over

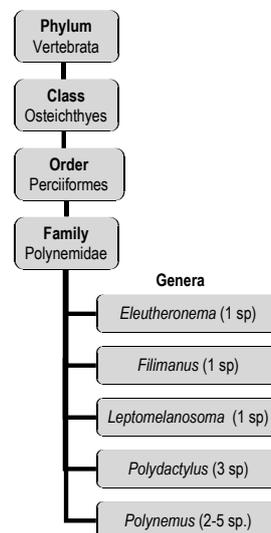


The estuarine four finger threadfin (*Eleutheronema tetradactylus*) is the largest of the threadfins that occur in the Mekong.

the year and when they grow larger some species switch to a diet comprised predominantly of fish.

Threadfins are marketed fresh or salted and dried (Rainboth 1996). They are excellent food fish (Smith 1945), although in Viet Nam, at least, they are of low economic value (Nguyen Tanh Tung, pers. comm.). Threadfins can be caught with various nets or by hook and line. In former times there was an intensive fishery for them in the Chao Phrya, where they were sometimes so abundant that they were used as duck feed and fertiliser (Smith 1945). Although several species occur in Cambodia they are not commonly seen in the Dai fisheries (Lieng *et al.* 1995), but some species are still common in the fishing lots where they may constitute up to about 5% of annual catches in some localities (Deap *et al.* 1998).

There are, unfortunately, no fisheries data available from Viet Nam where several of the species are more common.



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# Threadfins - Polynemidae

By John Valbo-Jorgensen

The threadfins are a family of mainly marine and brackish water fishes. In the Mekong, there are 5 genera and up to 11 species. Six species belonging to four genera (*Eleutheronema*, *Filimanus*, *Leptomelanosoma*, and *Polydactylus*) are considered sporadic visitors in the estuary and the lowermost part of the Mekong and Bassac Rivers (Mekong Fish Database, MFD 2003).

A few species of the genus *Polynemus* are entirely riverine (Roberts 1989). The Mekong Fish Database mentions five species of that genus as indigenous to the Mekong Basin (MFD 2003). However recent research by Dr Hiroyuki Motomura (pers. comm.) indicates that there are only two *Polynemus* species in the Mekong, *P. melanochir* and *P. aquilonaris*. The latter species occurs as far upstream as the Khone Falls (Motomura 2003).

Because of their many conspicuous external characters, threadfins are usually easy to distinguish from other fishes. The most striking character is the

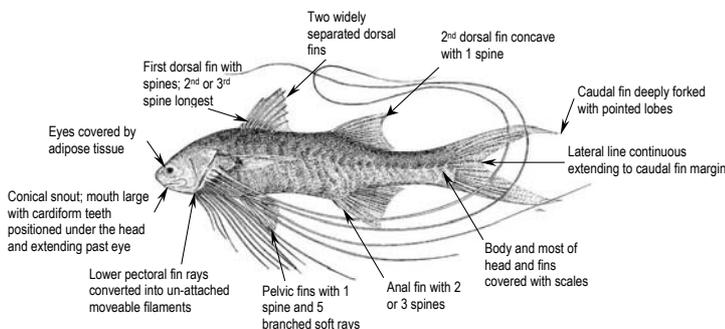
division of the pectoral fins into an upper "normal" part with regular fin rays, and a lower part with 3-16 long, unattached rays which can be spread apart like an umbrella (Roberts 1989). The length of the filaments depend on the species. In *P. aquilonaris*, for example, the filaments may be up to four times as long as the standard length of the fish (Motomura 2003).

On the back are two widely separated dorsal fins. The first one is provided with seven or eight spines of which either the second or third is the longest; the second dorsal fin has only one spine and a series of soft rays. The pelvic fins are positioned just behind the base of the pectoral fins, each of them having one spine and five branched rays. The anal fin has two or three spines. The caudal fin is deeply forked with pointed lobes.

The body is compact with silvery, golden or light brown colours, while the fins are tinted in shades of yellow, orange or brown. The body, most of the head and much of the fins are covered with scales. An uninterrupted lateral line extends from the head to the edge of the caudal fin.

The snout is conical and overhangs the mouth, which is large and positioned under the head. The opening of the mouth extends beyond the eye, and is equipped with numerous small, sharp, and slender teeth that are arranged in comb like series. The eyes are protected by a cover consisting of an immovable transparent tissue.

Most threadfin species are medium sized, but the four finger threadfin (*Eleutheronema tetradactylus*), which occasionally visits the Mekong, may grow to a length of about 2 m.



The fringed threadfin (*Polynemus multifilis*) has been recorded from the estuary and the lower reaches of the Mekong (Rainboth 1996, MFD 2003), although Dr. Hiroyuki Motomura (pers. comm.) disputes these records.