



# Catch and Culture

## Fisheries Research and Development in the Mekong Region

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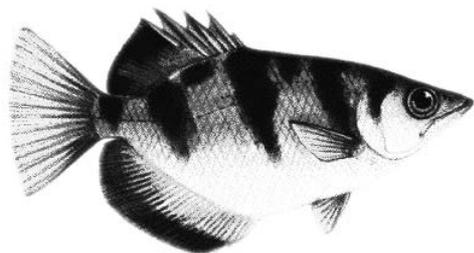


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### **Editorial panel**

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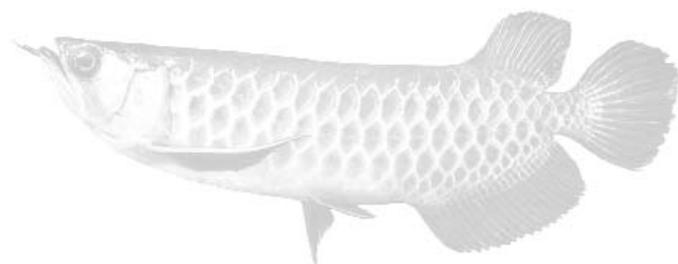
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# Editorial

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It's been a dry year on the Mekong, with water levels similar to 1992, a hydrological drought year. Around this time of year, the Tonle Sap starts to flow back into the Mekong - the famous heartbeat of the Mekong in action.

The Mekong River Commission's new *State of the Basin Report 2003* suggests that this heartbeat may be weakening. The analysis of river flows over an extended period shows that dry-season flows are increasing, and wet-season flows decreasing - a possible result of over 20,000 small dams built in the river basin over the last few decades. These have been left out of big-picture concerns, which have focused rather on the possible impacts of a few large dams.

If the Mekong's ancient flood pulse changes, there would almost certainly be impacts on migration and spawning cycles, linked as they are with the rise and fall of the river. Two *Catch and Culture* stories this time discuss the importance of the flood cycle to fisheries and make policy recommendations.

For Vietnamese catfish farmers in the Mekong Delta, it's been a long dry season in a different sense. High US tariffs on Vietnamese catfish imports this year have caused prices to plunge, and many small farmers have gone bust. In this issue, we take a look at how the aquaculture industry in the Delta is coping.

Fisheries and other river management bodies should maintain a watching brief on these important issues, that are key to both the "catch" and "culture" aspects of Mekong fisheries.

Finally, as part of our efforts to broaden the readership of *Catch and Culture*, we are pleased to announce that selected articles 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).

**The Editors**

# Catfish farmers struggle to adapt to punitive tariffs

(Vietnamese translation at [www.mrcmekong.org](http://www.mrcmekong.org))

By Peter Starr

***For the New York Times, it was "yet another case study in the way the US, Europe and Japan are rigging the global trade rules so they remain the only winners." For American consumers, it meant higher prices for frozen fish fillets on the supermarket shelf. And the hundreds of thousands of Vietnamese affected? Widespread bankruptcies, millions of dollars in losses and the overnight collapse of a promising new market.***

Pham Thi Truc Giang was listening to BBC radio on a Thursday morning when she first heard the news. It was around dawn on July 24 and the United States International Trade Commission had just given its final verdict in a bilateral trade dispute with Viet Nam. Following allegations of dumping, the Commerce Department had recently slapped tariffs of 37 percent to 64 percent on Vietnamese catfish. Despite questionable evidence, the commission found that catfish farmers in the Mississippi Delta had indeed been hurt by "unfair competition" from Viet Nam. The ruling made the punitive tariffs permanent.

For Giang's family - and tens of thousands of other catfish farmers along the Mekong Delta - the news came as a crippling blow. Over the past five years, the family had invested five billion dong (US\$320,000) on developing a commercial catfish farm near Long Xuyen on the Hau Giang branch of the Mekong, known

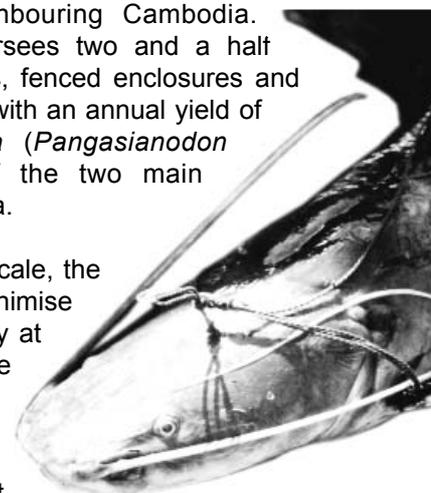
as the Bassac in neighbouring Cambodia. Giang's brother, 29, oversees two and a half hectares of floating cages, fenced enclosures and traditional earthen ponds with an annual yield of 1,000 tonnes of *ca tra* (*Pangasianodon hypophthalmus*), one of the two main species farmed in the delta.

With such economies of scale, the family has been able to minimise costs by raising its own fry at less than half the wholesale price and producing its own feed pellets from rice bran, broken rice and fish meal. As a result, production costs are lower than average at about 9,000 dong (58 cents) a kilogram for fish reared in cages. With fish processors paying as much as 12,000 dong (77 cents) a kilo to farmers in recent years, a single cage could generate annual earnings of up to 360 million dong (\$23,000) based on an average harvest of 60 tonnes every six months.

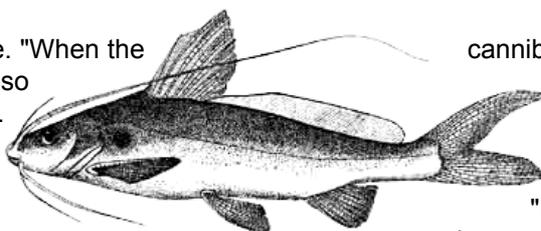
Following the ruling in Washington, such returns evaporated with prices plunging from 10,000 dong (65 cents) a kilo to a low of 7,000 dong (45 cents) in August. By late September, prices had improved to 8,500 dong (55 cents) at which point the family decided to off-load 140 tonnes to help make ends meet, even though the fish were only about 80 percent of the regular harvest size of one kilo.

"We had to sell early as we needed the money to cover our daily costs," Giang said, noting that the cost of running the farm was about 20 million dong (1,300 dollars) a day. As it turned out, the family managed to break even with the early harvest. Had they waited a few days, however, they would have made a small profit - by the first week of October, fish processors were paying as much as 9,200 dong (59 cents) a kilo.

With such thin margins and continued price uncertainty,



the family is cautious about the future. "When the market peaked about a year ago, so many people invested," Giang said. "We're well established but the smaller farms have gone bust."



cannibalism and bacterial infection, new feeding and stocking techniques allowed survival rates to climb to 70 percent.

## Bankruptcies

According to Giang's father Phan Van Danh, about a third of the region's catfish farms went bankrupt between late July and early October. As vice-chairman of the An Giang Fisheries Association, he helps oversee 40,000 people directly involved in catfish farming including 13,000 owners. Initial estimates indicate losses of about 100 billion dong (\$6.4 million) in An Giang province alone during the first two months after the ruling. But Danh noted that international agencies had since estimated losses for the entire Mekong Delta at \$70 million a year with An Giang province accounting for 60 percent of the total. "It seems our original estimates were too conservative," he said.

Tran Anh Dung, deputy director of Fisheries Resources Conservation in An Giang province, said the US ruling had "very big consequences" not only for farmers but also for those involved in related industries such as food, medicine and transport. Moreover, many of the estimated 4,000 cages in An Giang province were used as collateral for loans. Since they had to meet interest payments, many farmers simply stopped raising catfish altogether and sold their cages to raise cash. Others opted to leave their cages empty, and some started raising tilapia instead.

"The Ministry of Fisheries is promoting tilapia but farmers are concerned about a repeat of what happened with catfish," Dung said. Moreover, processed products are not as diversified for tilapia as they are for catfish where frozen heads, stomachs, skins, fillets and steaks supply different parts of the export market.

## Competitive advantage

Tilapia is a challenge for other reasons as well. Dr Nguyen Van Hao points out that other countries have been raising tilapia for years, whereas Vietnam has the competitive advantage of 25 years of research into artificial propagation of catfish. Dr Hao is director of Viet Nam's Research Institute for Aquaculture Number 2 (RIA2) based in Ho Chi Minh City. Together with Can Tho University, RIA2 has been conducting induced spawning of catfish since 1981. Despite initial high mortality rates caused by

"Five years ago, our techniques for spawning succeeded. We transferred these techniques to the farmers, and many created hatcheries themselves," Dr Hao said. Before long, millions of fry were being produced in commercial hatcheries, resulting in prices plunging by more than 90 percent. From An Giang, catfish farming soon spread to six other provinces. "The seed was available, the technique was excellent and the market was good. If we had no problems with the United States, it would be a very good industry," Dr. Hao said, noting that *ca tra* could yield 400 tonnes a hectare over six months. "No fish can compete," he said. "We've been working with these fish for 30 to 40 years. And only Viet Nam can produce them. Our only question now is where can we sell our products?"

The answer, of course, is virtually everywhere else but America, which is why processing companies have been diversifying into new markets and expanding their sales into other less-established markets. For Doan Toi, the president of NamViet Fish Co. Ltd. (Navifishco), the Washington ruling has been a blessing in disguise. "Last year, 70 percent of our exports went to the United States. But other markets are expanding this year," he said. Among the promising markets in Europe, Toi mentioned Austria, Belgium, Britain, Denmark, Germany, Italy, the Netherlands, Portugal and Spain. Egypt is another new market. In Asia, the main export markets are China, Hong Kong, Japan, Korea, Malaysia, Singapore and Taiwan. Sales are also growing in Australia. "Thanks to the free publicity surrounding this catfish war between Viet Nam and the United States, our products are now known worldwide," Toi said.



Located on the outskirts of Long Xuyen, Navifishco is one of the four main processors in An Giang province. Established by Toi's wife, the private company employs some 2,000 workers and processes about a third of Vietnam's catfish production, making it the country's biggest single processor. Focusing almost exclusively on the upmarket *ca basa* species, the company has 60 of its own cages supplying 5,000 tonnes of fish a year as well as its own network of suppliers providing a further 30,000 tonnes. Its three-year-old facility produces 14,000 tonnes of frozen fillets and 7,000 tonnes of feed a year. Nothing goes to waste - fats are processed into cooking oil for the domestic market and skins are exported to Spain for handicrafts.

Toi is no stranger to the US Commerce Department. In March, three officials visited Navifishco and spent a week going through the company's financial reports and production figures in an apparent attempt to get evidence of dumping. "The Americans didn't accept our figures," he said. "The reason? There was no reason."

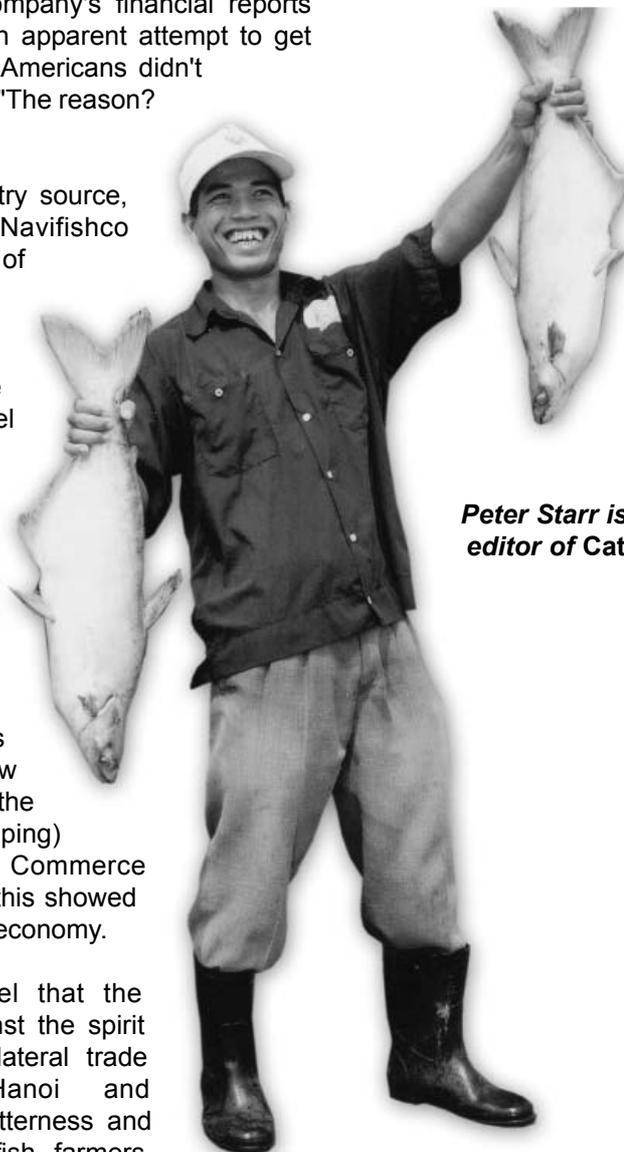
But according to one industry source, it was processors like Navifishco that provided the evidence of anti-competitive practices. Over the past decade, the source said, the fixed prices paid to catfish farmers were maintained at the same level whereas the increased demand from processing companies should have resulted in higher prices as production took off. Apart from depriving farmers of the benefits of increased economies of scale, such price fixing meant that processing costs were being kept artificially low - not below cost (one of the traditional definitions of dumping) but low enough for the Commerce Department to declare that this showed evidence of a "non-market" economy.

Many Vietnamese still feel that the ruling was unfair and against the spirit of a recently-concluded bilateral trade agreement between Hanoi and Washington. Despite the bitterness and anger felt among the catfish farmers,

Danh, the vice-chairman of the An Giang Fisheries Association, believes it's time to move on. The association is now focusing efforts on expanding domestic sales, especially in the central highlands and northern Viet Nam where catfish is generally unknown despite its popularity as a food in the Mekong Delta for hundreds of years.

Apart from diversifying markets both at home and abroad, the industry is diversifying into new products as well. A factory in Chau Doc, located upstream on the border with Cambodia, is reportedly buying 20,000 tonnes of waste to produce three tonnes of dried catfish air-bladder every month. Fetching up to 100,000 dong (\$6.45) a kilo, the dried air-bladder is apparently being sold in Cambodia, Thailand and China.

"We have to forget about the past and look to the future," Danh said, adding that his main fear was the dispute could damage the goodwill towards Americans that has been built up in recent years. "Future generations may think about the ruling and react," he said. "But it's already happened - that's the reality and we just have to accept it. Besides, the farmers are still surviving and the economy in general is still expanding."



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

# What's in a name?

## *How science gives way to politics in trade disputes*



The people of the Mekong Delta have been raising catfish in ponds for hundred of years. Cage culture, begun almost a century ago in Cambodia, was introduced in the 1960s and has since been concentrated along the border in An Giang and Dong Thap provinces.

After reunification in 1975, Viet Nam designated *ca basa* and *ca tra* catfish as the top priority for freshwater fisheries development, followed by giant prawns. Vietnamese hatcheries mastered spawning in the early 1980s and nursing about a decade later, triggering a surge in cultured production. As the production capacity of *ca basa* was initially dwarfed by capacity to raise *ca tra*, the two species tended to get mixed together.

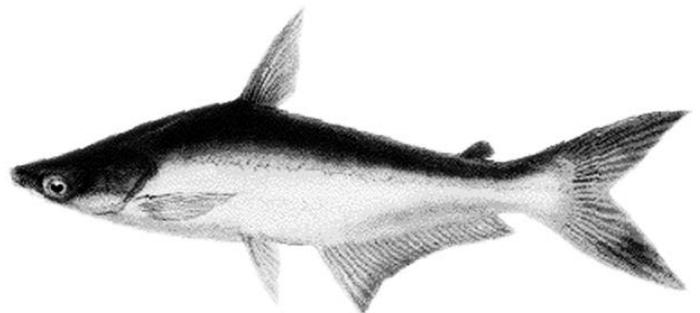
Although the taste and muscle structure of the two species differed, importers in the United States accepted both as the frozen fillets looked the same. But "some years later, the US asked us to identify whether they were *ca basa* or *ca tra*," said Nguyen Van Hao, director of the Research Institute for Aquaculture Number Two (RIA2). Thus the "Mekong catfish" was born.

Faced with growing competition from Viet Nam and the erosion of their market share, catfish farmers in the Mississippi Delta cried foul. As the *New York Times* noted in an editorial in July, these farmers were not huge agri-businesses and many struggled to make ends meet. "But that does still not explain how the United States, the international champion of free market competition, could decide to rig the catfish game to cut out the very Vietnamese farmers whose enterprise it had originally encouraged."

Following intense lobbying, the United States Congress passed an amendment declaring that only the American family known as Ictaluridae could be called "catfish" and that thousands of other types were impostors. As a result, Vietnamese exporters had to label their fish as *ca basa* or *ca tra* and avoid any references to the "c" word. For the convenience of the subsequent anti-dumping case, however, it was decided that they were catfish after all.

Such abuse of trade laws by developed countries was highlighted by the World Bank in a report released in September. The report, *Global Economic Prospects 2004*, reproduced the *New York Times* editorial that was highly critical of America's handling of the dispute with Viet Nam (see Mekong Fisheries Index, page 16).

**PS**



# Floods are vital for fisheries

(Khmer, Lao, Thai and Vietnamese translations at [www.mrcmekong.org](http://www.mrcmekong.org))

By Anders Poulsen

## ***The flood pulse is now widely accepted by scientists as a conceptual model for floodplain river systems.***

From the banks of the Mekong, the water flowing downstream provides a mundane view. The picture changes a bit with rising and falling water levels caused by monsoon rains. It may be therapeutic for some, but watching rivers from the ground is about as tedious as it gets. View the Mekong from space over several years, however, and a fascinating snapshot emerges. Computer-animated hydrological models of floods around the Tonle Sap show a seasonal swelling and shrinking of the Great Lake. The rhythms resemble heartbeats, adding substance to the expression that the lake is "the heart of the Mekong", in which case the tributaries must be arteries.

Known as the flood pulse, this cyclical change between high and low water levels is a key factor for the Mekong River ecosystem. Monsoon floodwaters inundate large areas of floodplains next to river channels every year. Mekong fishes are highly adapted to this seasonal variability. Most species have evolved complex life cycles to take full advantage of the flood pulse, including elaborate migration patterns, high fecundity and strong dispersal ability.

Developed in the late eighties, the flood pulse concept is recognised as a key determining factor for the ecology of tropical rivers with large flood plains. It was initially presented to the first Large Rivers Symposium in Canada in 1986. At the time, it was a new way of conceptually describing river ecology. Since then, it has gained wide acceptance among river fisheries scientists. At the second Large Rivers Symposium held in Phnom Penh earlier this year, it was endorsed as a robust conceptual model for large rivers (see [www.lars2.org](http://www.lars2.org)).

One conclusion is that most animal biomass in the river is derived either directly or indirectly from the floodplain. The main channel is mostly used as a route to access floodplain habitats - adult feeding areas, nurseries and spawning grounds - or as a refuge during the dry season. Most of the lower basin's estimated catch of about two million tonnes a year is produced in the large floodplain areas around the Tonle Sap River and the Great Lake as well as in the Mekong Delta and most of the large tributaries. The annual reversal of the Tonle Sap current - a direct result of the flood pulse - is particularly important.

To take maximum advantage of the flood pulse, the life cycles of fishes and other aquatic animals are intimately in tune with the annual flood. Major migrations occur both at the beginning and the end of the monsoon to access floodplain habitats as they emerge and, in turn, escape before they dry out. The flood pulse starts with sudden increases in water discharge, causing fish to migrate towards spawning grounds or to freshly inundated feeding grounds on the floodplains. Falling water levels at the end of the monsoon cause fish to abandon the plains, with the biggest generally leaving first followed by smaller species. Fishers of the Mekong often have detailed knowledge about the timing and sequence of species migrating as the water rises and falls, allowing them to use the most appropriate fishing gear at any time. Their lives - and the livelihoods of fishing communities - are also in tune with the flood pulse.



## Spawning is synchronized with the flood pulse

Most fish species spawn at the beginning of the flood season, ensuring that young fish can access the rich nursing grounds emerging on the floodplain as the monsoon progresses and the pulse reaches its peak. Some spawn on the floodplain. Their offspring are within close range of their nursing habitat as soon as they hatch. Others spawn far away. Their offspring rely on currents to get to their destination.

Fish behaviour is synchronised to the flood pulse. Many spawn in the mainstream Mekong in northern Cambodia or the southern part of the Lao PDR, relying on the current to bring larvae more than 500 kilometres to the floodplains of southern Cambodia and Viet Nam. If they spawn a few weeks too early, they may miss the reversal of the Tonle Sap and not get access to the river and the Great Lake system.

Since the pulse determines their behaviour, fish cope with natural variability. Variations in the timing of the start of the floods, for example, are fine - as long as the floods come and as long as they are of a certain magnitude and duration.

The flood pulse is one of the most important ecological "drivers" of the Mekong ecosystem. It is also the feature that humans seek to conquer for development including agriculture, electricity production and flood protection. One of the main functions of the Mekong River Commission is to find a sustainable compromise between the need for development and the need for maintaining a healthy and productive natural resource base in the basin for the benefit of both present and future generations. To reach such a sustainable compromise, we should ensure that:

- Basin-wide development planning takes into account socio-economic and environmental factors that depend on the flood pulse, including fisheries. The MRC's Basin Development Plan is an obvious vehicle for such process.
- Rules for allocating water, spelt out under the MRC's Water Utilisation Programme, take into account ecological needs including the water required to sustain fisheries productivity.

- Facilities like big dams are managed to maintain ecological processes, including fisheries. Water-release protocols must sustain the river's productivity and avoid, for example, flash floods caused by the large release of water from reservoirs during the dry season.
- Managers and researchers put priority on quantifying the flood pulse's importance for fisheries, making it easier for other sectors and development planners to take it into account.

The flood pulse is what keeps the heart beating. If the heart stops, the system dies.

***Anders Poulsen is a fisheries biologist who formerly worked for the MRC Fisheries Programme.***

### **"Sufficiently refined to permit broad management decisions"**

Held in Phnom Penh in February 2003, the Second International Symposium on the Management of Large Rivers for Fisheries found that the river pulse and other concepts had proven "extremely robust" since they emerged at the first symposium in 1986. "The general understanding of how river fish communities function is now sufficiently refined to permit broad management decisions concerning the river environment for fish and fisheries," a statement from the symposium said. Attended by more than 220 experts representing 96 rivers worldwide, the meeting called for national and regional mechanisms to be set up to address the needs of communities dependent on living aquatic resources. It also called for ecological flow requirements of river-floodplain systems to be included in development plans and impact assessments taking into account seasonality as well as fish migration and reproduction needs.

# Migrating masses

(Khmer, Lao, Thai and Vietnamese translations at [www.mrcmekong.org](http://www.mrcmekong.org))



***Migratory fishes maintain the productivity of Lower Mekong fisheries. Their protection and management requires joint efforts from riparian countries.***

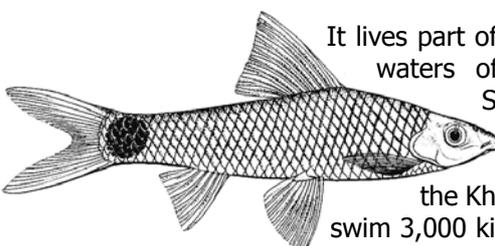
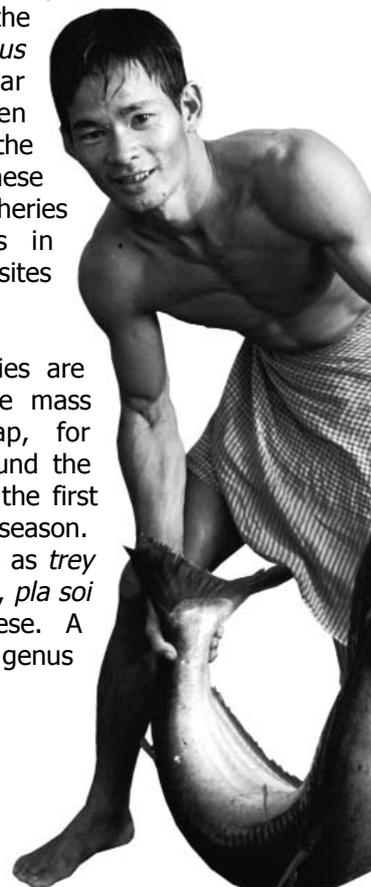
on the inundated floodplains, the falling waters at the end of the monsoon signal that it is time to move back to safety before the floodplain dries out.

In this way, migratory fishes move on a seasonal basis back and forth between floodplain and refuge habitats. In the lower basin, the distance is often measured in hundreds of kilometres - from floodplains around the Tonle Sap and the Great Lake system to deep pools in northern Cambodia and southern Lao PDR.

People along the rivers have attuned their lives to the coming and going of migratory fishes. They know when certain species are expected to arrive and apply a range of fishing methods. Some even follow important migratory stocks, a testament to their importance to the lives and culture of the people of the Mekong basin.

With a large number of migratory species, each with its own peculiarities, the reality is more complex. And although the flood pulse is the driving force, some species have particular migration patterns which don't seem to be directly triggered by water levels. For instance, the highly-esteemed *Probarbus jullieni* undertakes spectacular spawning migrations between December and February in the middle of the dry season. These form the basis of important fisheries just above the Khone Falls in southern Lao PDR and other sites along the Mekong.

The migrations of many species are tuned to the lunar cycle. The mass exodus from the Tonle Sap, for example, occurs in waves around the full moon every month during the first four to five months of the dry season. The dominant species is known as *trey riel* in Cambodian, *pa soi* in Lao, *pla soi* in Thai and *ca linh* in Vietnamese. A small cyprinid species of the genus



It lives part of its life in the warm waters of the South China Sea. And it's been caught in the cool fresh waters above the Khone Falls. It may not swim 3,000 kilometres like certain

catfish along the Amazon, but the *Pangasius krempfi* may be the species with the longest migration along the Mekong. Recent isotope studies confirm that those caught in Lao waters had migrated all the way up through Cambodia from the estuary in Viet Nam. Given that it's also common further upstream, it may also be unique in crossing all four national boundaries of the Lower Mekong Basin.

Such long journeys through the basin may be rivalled only by the migration of the famous giant catfish. The *Pangasianodon gigas* is now extremely rare. In recent years, a few have been caught at two sites in the Lower Mekong - on the Tonle Sap in Cambodia and on the Mekong mainstream in the Lao-Thai border area of Chiang Khong and Huai Xay. It is not clear whether fish from the two sites are of the same stock. If they are, the giant catfish migration would easily exceed 1,000 kilometres.

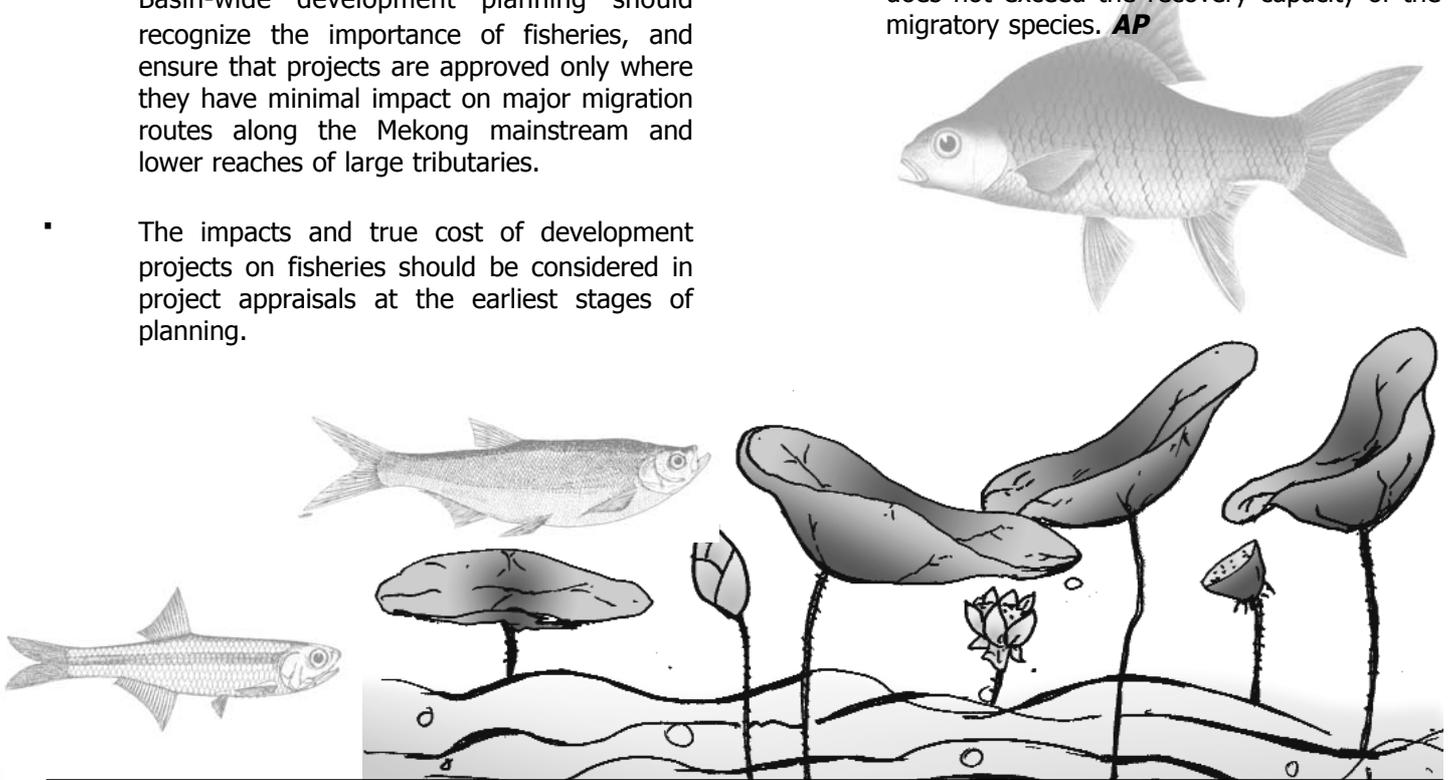
Why do fish migrate? Usually, it's because habitats essential for survival are separated by time and space. Migrations are guided by seasonal changes in the environment and the availability of habitats. Migratory fishes of the Mekong generally spend the dry season in refuges within river channels. The rising of the waters at the beginning of the monsoon is a signal for them to start migrating towards spawning grounds or emerging feeding habitats on the floodplains. After many months

*Henicorhynchus*, it is caught in large amounts throughout the Mekong basin. It migrates from the delta in Viet Nam and the floodplains of southern Cambodia to northern Cambodia, southern Lao PDR and possibly northeast Thailand as well, although different stocks may be involved in the upper reaches of the Mekong. Managing the species will require cooperation between all four Lower Mekong countries.

To protect and manage migratory fishes, the following requirements should be met:

- Basin-wide development planning should recognize the importance of fisheries, and ensure that projects are approved only where they have minimal impact on major migration routes along the Mekong mainstream and lower reaches of large tributaries.
- The impacts and true cost of development projects on fisheries should be considered in project appraisals at the earliest stages of planning.

- Existing water-management schemes should take measures to lessen harmful impacts on fisheries as much as possible in collaboration with fisheries and environmental experts, and future projects must incorporate such measures in project design and management procedures.
- Fisheries management agencies should cooperate to share information on fish catches, to ensure that the rate of fisheries exploitation does not exceed the recovery capacity of the migratory species. **AP**



## Calendar

<b>28-29 October</b>	2nd Annual Mekong Flood Forum, Phnom Penh, Cambodia
<b>17-21 November</b>	Southeast Asia Water Forum, Chiang Mai, Thailand
<b>26-27 November</b>	MRC Technical Symposium on Mekong fisheries, Pakse, Lao PDR
<b>8-12 December</b>	East Asian Seas Congress, Kuala Lumpur, Malaysia

# Fish and ships

By Peter-John Meynell



**How will the removal of rapids on the upper stretches of the Mekong affect the ecology of the river? A field trip finds it's difficult to assess the biological impact.**

Apart from birds, little is known about biodiversity along the Mekong between the Lao-Chinese border and Thailand. Recent efforts to improve navigation along this stretch of the river have, however, raised concerns. Under an agreement between China, Myanmar, Lao PDR and Thailand, the work has included removing rapids and dredging shoals at 21 sites. The aim is to improve dry-season navigation for larger vessels.

To identify diversity issues for inclusion in an upgraded environmental impact assessment, the World Conservation Union (IUCN) and the Mekong Wetlands Biodiversity Programme organised a brief scoping survey of the region earlier this year. The survey covered the stretch of river from the Tang Salum rapids, about 10 kilometres north of the Xieng Kok in Lao territory, to the Lao-Thai towns of Huai Xay and Chiang Khong.

The team of nine specialists - two fish biologists, two freshwater biodiversity specialists, three Lao officials and representatives from two Thai environmental groups - traveled down the river by boat over a four-day period in late February. It stopped off at key points on the river to talk with villagers and fishermen, and to observe such flora and fauna as could be found during a rapid survey. The team also set larval traps overnight around Mouang Mom, and visited local markets to see what fish were being sold.

Although fishery activities seemed limited, species diversity was high. Some parts of the river and surrounding area, which act as biological refuges, would be especially valuable to protect. All of these areas are considered important for fish life cycles and fisheries.

The team identified more than 80 species of fishes including larval samples of *Opsarius* and *Garra* sp. A specimen of the freshwater stingray, *Dasyatis laeensis*, was seen at Chiang Khong market. About 75 centimetres in diameter, it was reportedly caught upstream. The Giant Catfish Fishermens Association said no *Pangasianodon gigas* had been caught for two years in Chiang Khong, the center of the giant catfish industry in Thailand. Fishermen said other catfish, such as *Pangasius sanitwongsei*, were still being caught but were smaller than they used to be.

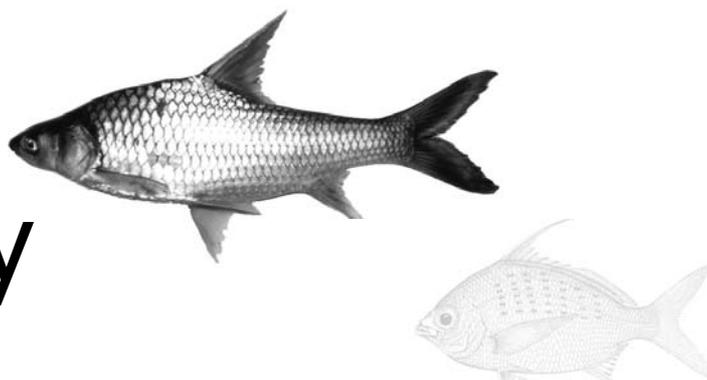
The impact of navigation works - for which four Chinese contract vessels were observed - is difficult to predict. The works are located at discrete sites, and won't markedly change the overall character of the river due to the extensive nature of the rock formations and shoals over much of the stretch surveyed. But the absence of a comprehensive and effective environmental impact assessment or baseline survey means that it will also be very difficult to say how the modifications have affected the river and its biodiversity.

Team members were more concerned about the long-term impact of increased traffic and bigger cargo vessels - amid fears of getting swamped, some fishermen said they now tended to fish at night rather than during the day.

The rapids at Khon Pi Louang, just north of Chiang Khong, have not been modified yet amid Thai concerns about the impact on the Thai-Lao border and, more recently, the local environment and livelihoods. The area is considered important for biodiversity, including giant catfish breeding. More studies are envisaged in this area. Thailand's Southeast Asia Rivers Network, together with local community groups, has already started research into the fishery and the surrounding ecosystem.

**Peter-John Meynell is team leader of IUCN's Mekong Wetlands Biodiversity Program.**

# In search of the ideal body



By John Valbo-Jorgensen

**Body shape determines how fast fish can swim. Some of the slowest have fused fins to get that extra push forward. Some of the fastest resemble torpedoes.**

Fish are almost weightless in water. In terms of energy consumption, that means weight is less of a problem than when moving around on land. But the high density of water makes it difficult to move - when fish move forward, eddies create a drag which counteracts the movement and costs energy. Body shape is therefore crucial for saving energy and moving faster. As its early designers must have known, the torpedo's ability to minimise turbulence is perfect for moving through water. Such ideal bodies can be found in fast-swimming species *Aptosyax grypus* and the Chinese seerfish (*Scomberomorus sinensis*).

Most fish swim by making lateral body movements resulting from powerful alternating contractions of the muscles along their two sides. The backbone makes the body bend instead of shorten every time the muscles on one side contract. These undulating flexures result in powerful sweeps with the tail and caudal fin, propelling the fish forward.

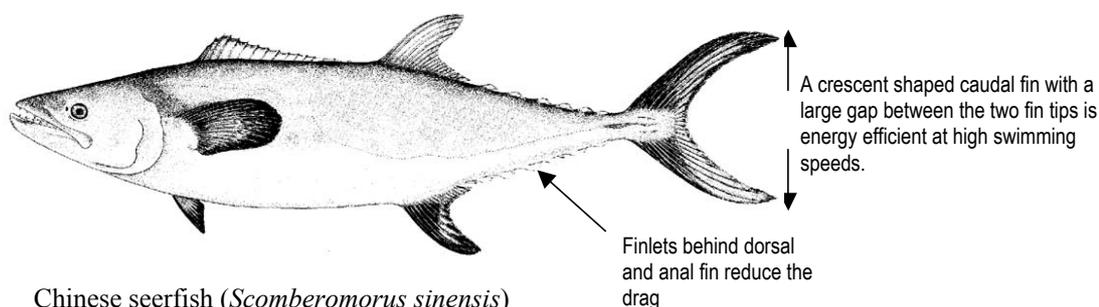
Although energy-efficient swimming has played an important role in fish evolution, it's not the only requirement. Some species, for example, have to move around in complex habitats with great precision. Others need to accelerate rapidly. Body shape varies considerably between the 91 families of fishes in the Mekong.

Some fish swim by undulating their entire bodies, known as "anguilliform" swimming after the true eels (Anguillidae). This style of swimming is also employed by other fish with elongated bodies such as spiny eels (Mastacembelidae) and air-breathing catfishes (Clariidae). The dorsal and anal fins are long and often fused with the caudal fins to increase the area of the tail. This gives them an extra push forward when they swim. But it also creates a lot of turbulence, and these fish are all slow swimmers.

Other fish, like snakeheads (Channidae), are lurking predators which try to catch their prey with a surprise attack. To ensure high acceleration, they have a large caudal fin supported by a powerful caudal peduncle, which is the area of the fish joining the body and the tail. Such a fin is uneconomical and is not very good for sustained swimming because of friction with the water. Fast long-distance swimmers have a narrow caudal peduncle with a large forked caudal fin. When swimming, the last third of the body oscillates rapidly.

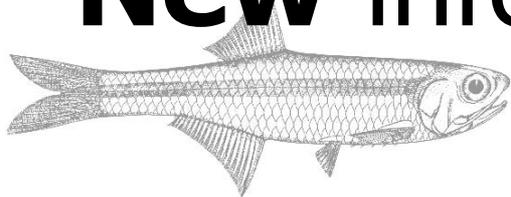
In the fastest swimmers, the caudal fin is shaped like a crescent (see diagram). This maximises the propulsive force and minimises the energy wasted. A bigger gap between the two tail tips may reduce turbulence, as may small finlets behind the dorsal and anal fins or the presence of an adipose fin.

Most fish swim in a style somewhere in between these extremes. But there are variations. Slow-swimming puffers (Tetraodontidae), for example, move only the tail. Pipefishes (Syngnathidae) have abandoned horizontal swimming to drive themselves forward with the dorsal fin. And featherbacks (Notopteridae) move by undulating their long anal fin, which has joined with the caudal fin.



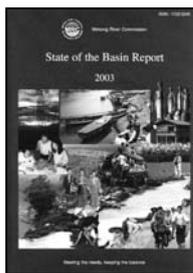
Chinese seerfish (*Scomberomorus sinensis*)

# New information products



## State of the Basin Report 2003

This valuable reference document is the first report in six years to review all the main water-related sectors of fisheries, agriculture, forestry, hydropower, trade and transport, domestic water, sanitation and flooding in the Mekong river basin area of Cambodia, Lao PDR, Thailand and Viet Nam.



August 2003. 300 pages.

Main report comes with separate Executive Summary and CD-ROM. US\$30.

Summary report only, US\$5. CD-ROM only, US\$15.

## New approaches for the improvement of inland capture fishery statistics in the Mekong Basin

Official national estimates of fisheries yield and consumption have consistently been lower than estimates derived from more focused local surveys. This collection of papers from an expert consultation meeting in Udon Thani, Thailand, from 2-5 September 2002, provides an in-depth discussion of how to improve inland capture fishery statistics in the Mekong Basin.



Published jointly by the UN Food and Agriculture Organisation and the Mekong River Commission, 2003. 148 pages. US\$5.

## People and the Environment Atlas of the Lower Mekong Basin



This atlas, published on CD-ROM, presents interactive data on the environment and socio-economic conditions in the four Lower Basin countries of Cambodia, Lao PDR, Thailand and Viet Nam. The maps are suitable for use at regional scales of 1:250,000 to 1:1 million. Easy-to-use map viewing software is provided, as well as the full datasets for users with access to GIS software.

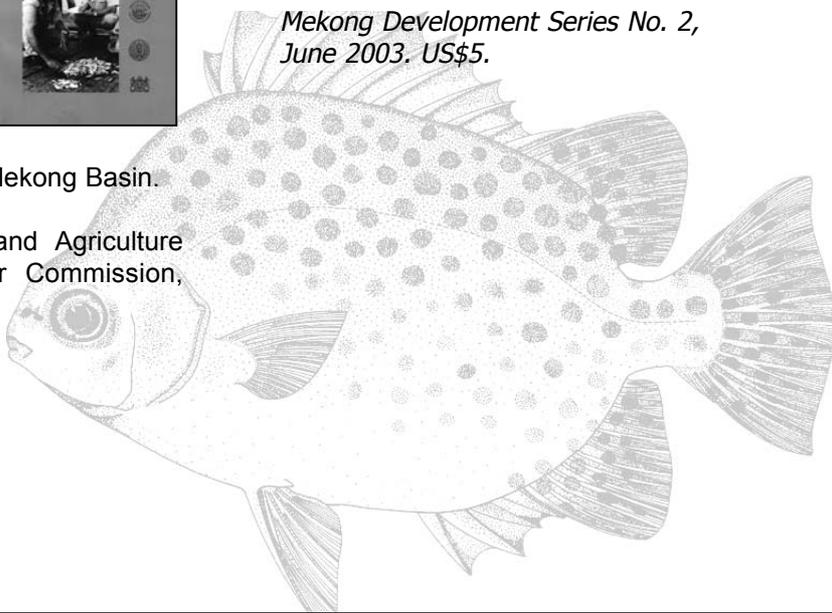
August 2003. CD-ROM. US\$5.

## Biodiversity and Fisheries in the Mekong River Basin



This new publication in MRC's Mekong Development Series argues persuasively for the elimination of boundaries between fisheries management and biodiversity conservation, showing that when biodiversity is well managed, fisheries production goes up.

Mekong Development Series No. 2, June 2003. US\$5.



## Social Atlas of the Lower Mekong Basin

The 51 maps in this atlas provide rare insights into social issues at province level within the Lower Mekong Basin countries of Cambodia, Lao PDR, Thailand and Viet Nam. The maps show indicators for population, labour force, living standards, health and education across the river basin, enabling useful comparisons to be made.



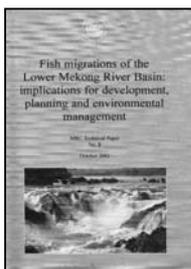
March 2003. 154 pages. US\$25.

CD-ROM version with datasets and interactive map viewer, US\$10.

## More reports

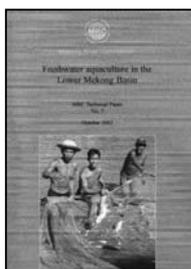
### Fish migrations of the Lower Mekong Basin: Implications for development, planning and environmental management

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



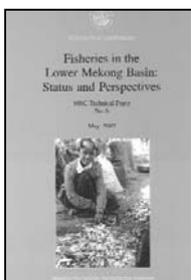
### Freshwater aquaculture in the Lower Mekong Basin

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.



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**Where there is water, there is fish**  
2002. VCD. US\$5.



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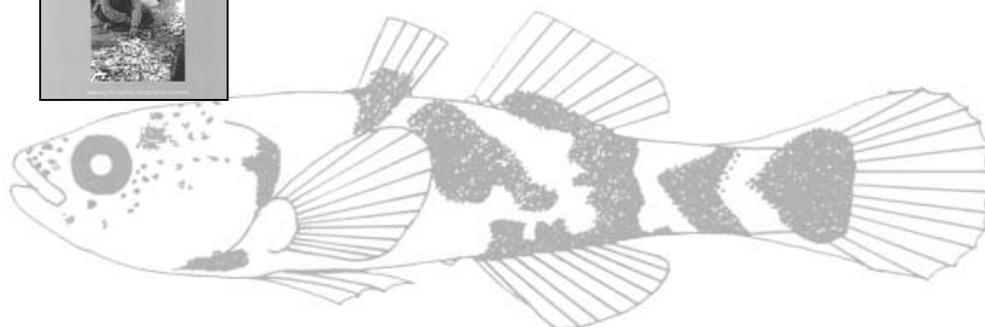
Maps showing sub-catchments, watershed classification, river networks and the flood depth, duration and extent in the Lower Mekong Basin are available at scales of 1:800,000 to 1:2,000,000. For details, check the Mekong River Commission website at [www.mrcmekong.org](http://www.mrcmekong.org)

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# Mekong Fisheries Index



**Swimming upstream: The case of the Vietnamese catfish.** Global Economic Prospects 2004, published by the World Bank.

Reprint of New York Times editorial illustrating the vicissitudes of exporters in anti-dumping waters.

**For lake's ecology, a murky future.** International Herald Tribune, April 29, 2003.

The rise and fall of Cambodia's Great Lake sustains a delicate ecology of fish migration, bird life and human livelihoods. They are threatened by upstream developments on the Mekong.

**Big trouble for Asia's giant catfish.** National Geographic News, May 15, 2003.

No giant catfish have been captured in Thailand since 2001. The Mekong Fish Conservation Project is raising awareness that it is in danger of disappearing completely.

**Four way stretch.** New Civil Engineer, June 5, 2003.

Officials planning the future of the Mekong basin will have comprehensive information to support their decisions when a new computer simulation package, the Mekong River Commission's Decision Support Framework, is completed.

**Mekong River plans set to take off.** Straits Times, June 14, 2003.

With peace in Cambodia and Laos, opportunities for improving the lives of people near the Mekong River look possible, but checks and balances are needed to prevent the Mekong from being destroyed. These were discussed at a business conference in Bangkok, "The Mekong region comes of age".

**NGO sponsors trip to expand fish exports.** Cambodia Daily, July 23, 2003.

The organisation Small and Medium Enterprise Cambodia is sponsoring 10 Cambodia fish traders to visit the Thai Frozen Food Association in Bangkok, so that they can understand the quality and packaging standards required to compete internationally.

**Blue Revolution - the Promise of Fish Farming.** The Economist, August 9 to 15, 2003. It is controversial, especially for environmental reasons. Yet fish farming is a young industry and has huge potential to help feed the world as well as preserving wild fish stocks. Leader and three-page cover story.

**US shrimp dumping suit looms large for local farmers.** Vietnam Investment Review, August 25-3, 2003. Shrimp importers from 15 countries may be sued by US shrimp producers. Among those in danger of being sued are Brazil, China, Ecuador, Indonesia, India and Thailand.

**'Pristine' Mekong sets no alarm bells ringing.** Phnom Penh Post, August 29 - September 11.

The Mekong River shows surprising signs of health but a lack of available data means trouble could be lurking below the surface.

**Changing water flows in Mekong River Basin.** Vientiane Times, September 12-15, 2003.

Water flows in the Mekong River Basin have changed significantly, but the impacts are different from those earlier predicted, according to the Mekong River Commission's State of the Basin Report 2003.

**New Chiang Saen port opens for trial run.** Bangkok Post, September 18

The newly-built Chiang Saen port by the Mekong River in Chiang Rai, Thailand, has opened for a trial run and is expected to facilitate trade.

**La baisse de ressources halieutiques inquiete les professionnels,** Cambodge Soir, September 23, 2003.

Holders of large fishing concessions on the Tonle Sap are concerned about a sharp decline in fisheries resources including highly-prized fish species which have almost completely disappeared.

**Published by the Mekong River Commission Secretariat**

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# Freshwater anchovies - Engraulididae

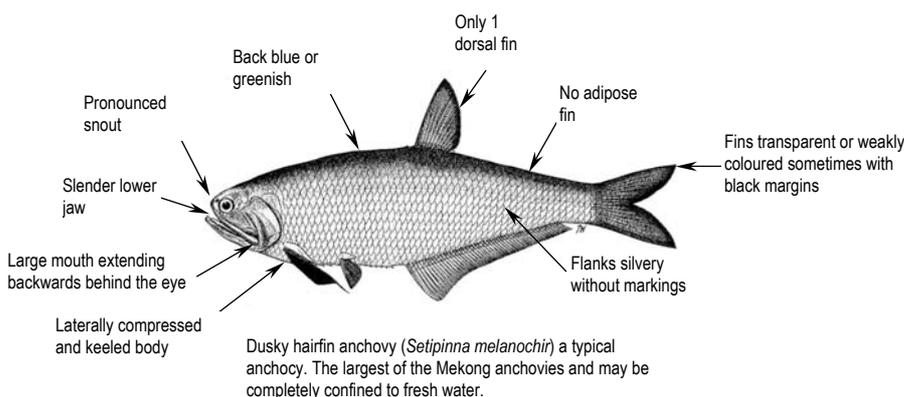
By John Valbo-Jorgensen

With 139 species listed worldwide by Whitehead *et al.* (1988), anchovies constitute a fairly large family of fishes. The family was previously called Engraulidae (Rainboth 1996, MFD 2003), but the correct spelling is Engraulididae (Whitehead *et al.* 1988, Kottelat 2001).

Anchovies have a sharply-edged belly, a lateral line system on the head but not extending to the body, and a swim bladder connected to the inner ear (see *Catch and Culture's* Supplement No. 8). They are easily

mouth and gill cavity. Fin tips or margins are sometimes black. There may be a blotch just behind the gill opening. But there are never any markings elsewhere on the sides.

The family comprises small to medium-sized fishes. The smallest, from the genus *Stolephorus*, grow to between seven and 15 centimetres. The largest Mekong species is the dusky hairfin, *Setipinna melanochir*. It can reach 33 centimetres.

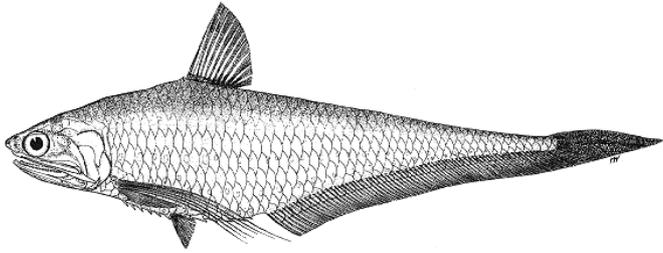


distinguished from the herrings (Clupeidae) by the huge mouth, extending backwards to behind the eye, and their pronounced snout projecting beyond the tip of the slender lower jaw. Their jaws are fringed with small or large teeth. They are mostly schooling pelagic fishes with blue-green backs and silvery flanks. Fins are transparent or pale yellow, chrome or orange, like the

Most peculiar are the grenadier anchovies. They come from the *Coilia* genus and are represented by four species in the Mekong. Highly specialised, they deviate considerably in appearance from other anchovies. Their body tapers towards the tail, and the caudal fin has become pointed and connected to the anal fin. The resemblance to a trimmed fighting cock has given them the common name "chicken tail fish" in Cambodia and Thailand (Smith 1945). The most common species is Lindman's grenadier

anchovy (*C. lindmani*), which occurs as far upstream as Stung Treng. Another *Coilia* species, the golden spotted grenadier anchovy (*C. dussumieri*), has rows of light organs (photophores) along the flanks, belly and lower jaw that are also scattered on the cheeks and gill covers (Whitehead *et al.* 1988). Nothing has been published on the light organs of this species since the

# Fisheries Research and Development in the Mekong region



Golden spotted grenadier anchovy (*Coilia dussumieri*).  
The only anchovy with light organs.

original description by Haneda (1961). It's not known exactly how they work and what their purpose might be in a muddy estuary. But it's possible that they spend part of their life cycle in clearer water.

Anchovies are usually coastal marine or estuarine species. A few South American ones are completely restricted to freshwater. The same may be true for some Mekong species - the dusky hairfin anchovy, for example, is probably confined to lakes and rivers. It is one of the 16 species from five genera (*Coilia*, *Lycotrissa*, *Setipinna*, *Stolephorus* and *Thryssa*) found in the Mekong (MFD 2003).

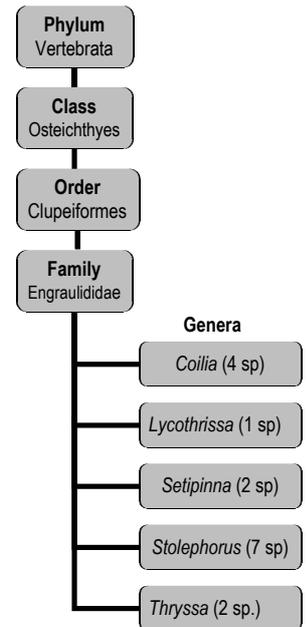
Being mainly marine or estuarine, anchovy species are most commonly seen in the Mekong Delta, although several have been recorded in the Tonle Sap. The dusky hairfin and the sabertooth thryssa (*Lycotrissa crocodilus*) are said to occur above the Khone Falls (pers. comm. Dr. Tyson Roberts). But this is contested by Kottelat (2001) and Terry Warren (pers. comm.). Rainboth (1996) speculates that the sabertooth thryssa is non-migratory because it's equally abundant in the Tonle Sap throughout the fishing season. Poulsen and Valbo-Jorgensen (2000) disagree. They reported that it migrates upstream from the delta during the dry season from October to March, and then moves downstream from May to July. The sabertooth thryssa is also reported to inhabit deep pools in the Mekong mainstream (Poulsen *et al.* 2002).

Most anchovies feed on small invertebrates such as plankton, worms and insect larvae. Some species are very efficient filter feeders, swimming through the water with their mouths wide open, and using the numerous gill rakers on the first gill arch to filter plankton from the water. Others grasp individual prey with their teeth. The large teeth that characterise the sabertooth thryssa suggest that this species at least occasionally attacks larger and more vigorous prey such as shrimps and small fishes.

Anchovies generally lay large numbers of eggs from which small planktonic larvae quickly hatch. Spawning grounds in the Mekong haven't been identified yet and it's not known whether reproduction - if it takes place in fresh water - follows the same pattern as in the marine environment.

Along with their relatives, the herrings, anchovies are among the world's most economically important fishes. One species off the coast of Peru used to yield up to 10 million tonnes per year at the peak of the fishery in 1960-70s. In the Mekong, there are no specific fisheries for anchovies, although some species are regularly seen in mixed catches in Cambodia and Viet Nam where they are used to make fish paste.

Anchovies are delicate, like herrings, and readily shed scales when handled or caught in fishing gear. This usually results in death.



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