

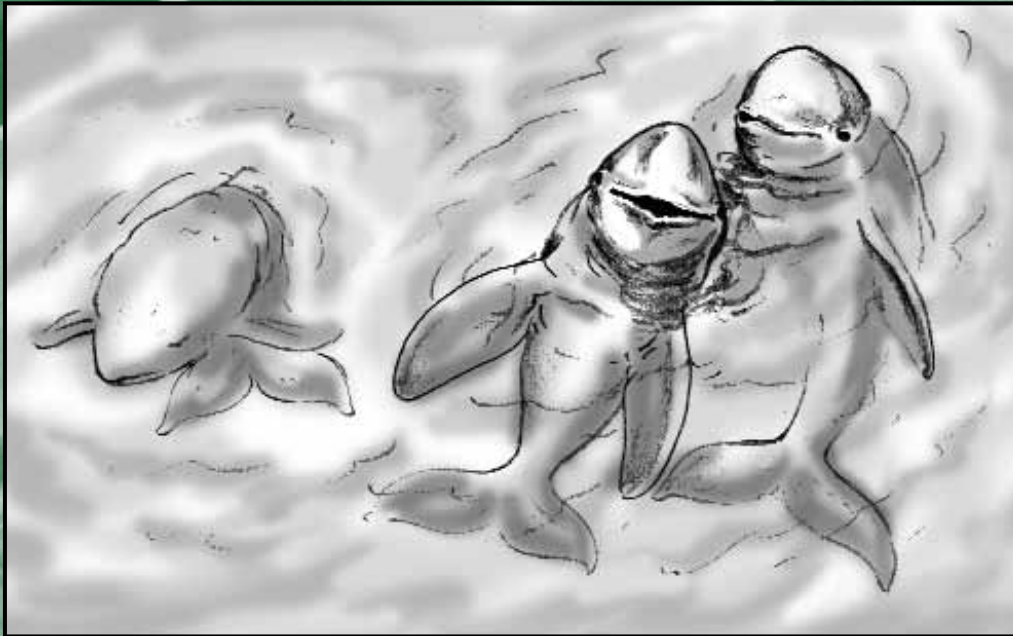


Catch and Culture

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Editorial



The Mekong Dolphin is an icon of the region, symbolising the vitality and spirit of the Mekong River, but unfortunately it is now only found in a few areas of the river and is considered an endangered species. Therefore it is good news that the Cambodian government is taking some firm action on protecting these important cetaceans by introducing a river guard system, training local people to become guardians of the dolphins living in their stretch of the river. This system which has the backing of the many Cambodian government ministries and the provincial governors is a world first and should be applauded in its foresight. The dolphins are most at risk from entanglement in fishing gear and since the new policing measures have been introduced, and fishing sites have been restricted, the dolphin population is on the upswing.

Still in Cambodia, in this issue of *Catch and Culture* we are honoured to feature an article by H.E. Dr Chan Sarun, the Cambodian Minister for Agriculture, Forestry and Fisheries who discusses his country's new fisheries law which highlights management and conservation.

In Viet Nam farmers are taking a new look at one of their most financially valuable aquaculture industries – shrimp farming. Farmers are finding that this type of aquaculture is not as lucrative as it used to be. In Soc Trang province in the Mekong Delta farmers are being encouraged to return to rotating their shrimp farming with rice cultivation. Working with the MRC Fisheries Programme, farmers and local authorities are now trying to improve environmentally friendly farming systems which will be both sustainable and bring in suitable economic returns.

Aquaculture issues are also being addressed in Lao PDR where research institutes are experimenting with domesticating the indigenous species *Pangasius krempfi*. This is both an issue for conservation of this migratory species and for the development of aquaculture. The team has succeeded in spawning the species using wild broodstock and is now looking forward to the 2007 breeding season. Meanwhile Vietnamese scientists have succeeded in inducing spawning of *Pangasius krempfi* females raised in captivity.

In other news we look at research into the management of two species of carp and the documentation of deep pools around the Great Lake in Cambodia.

All of us at the Fisheries Programme hope you have enjoyed reading our newsletter during 2006 and we look forward to bringing you the most interesting fisheries news in the region again in 2007.

The Editors

Cambodian river guards monitor six dolphin-conservation zones

Locally-manned river guard service is a world first

Cambodia is providing military training to dozens of river guards to monitor six dolphin-conservation zones established along a 200 km stretch of the Mekong between Kratie and the Lao border. The training is being carried out under the Commission for Mekong River Dolphin Conservation and Eco-tourism Development set up by the Council of Ministers in early 2006. A Korean Navy Seal diver and a Cambodian Navy trainer conducted an initial 20-day lifesaving course for the guards in April and May. A second is scheduled for early 2007.

Dr Touch Seang Tana, the deputy president of the National Tourism Authority who chairs the commission, said authorities were taking a co-management approach to dolphin conservation. Half of the 72 river guards recruited in 2006 are local villagers from Kratie and Stung Treng provinces. The rest are policemen, soldiers, military policemen and fisheries officers stationed in the area. "It's the first river guard service anywhere in the world," Dr Tana said.

The establishment of the high-level commission follows growing tourist interest in the area and a recent series of Irrawaddy dolphin (*Orcaella brevirostris*) deaths, especially among young calves and particularly between December 2005 and February 2006.

Dr Tana said the commission had evidence that the dolphins were drowning after entangling themselves in a new type of gill net set by local fishermen. He also asserted that the public had been "misled" by claims that distant gold-mining operations on the Kampi River in Mondulakiri province were responsible. The Kampi River flows into the main area for dolphin-viewing in Kratie, located about half an hour north of the provincial capital.

In Cambodia, permanent habitats of the Irrawaddy dolphin are now limited to six areas along the Mekong. In Kampi alone, Dr Tana said a survey in October 2006 indicated a population of 25 dolphins, up from only 17 individuals in 1997. The Kampi population is divided into three groups that feed

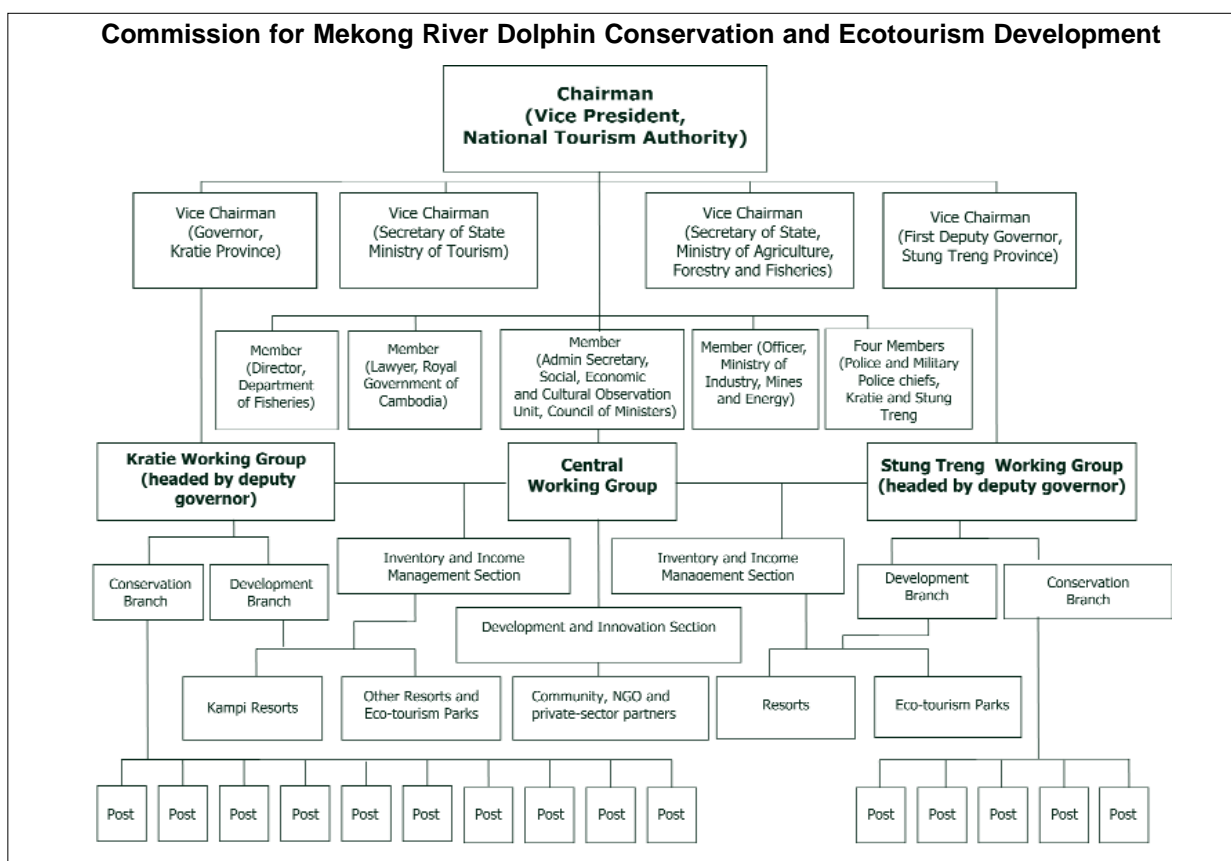


The dolphin population in the Kampi River is increasing.

separately. Overall, about 130 dolphins are believed to inhabit Kampi, another two areas in Kratie and three areas further upstream in Stung Treng.

In addition to the Mekong, the dolphins are also found in the Makaham River in the Indonesian province of Eastern Kalimantan, the Ayeyawady River in Myanmar and shallow coastal waters between Australia, India and the Philippines. In 2004, the World Wide Fund for Nature (WWF) estimated the Asian population at less than 1,000 individuals.

In Cambodia, up to seven river guards are stationed at 15 conservation posts along the Mekong. Each of the 12 main posts has a 4 m high platform and two boats with engines – a patrol boat and a high-speed pursuit vessel. For night work, the main posts are equipped with infra-red binoculars and floodlights. Each also has a 30 m telecommunications antenna which allows guards to communicate with each other all the way up to the Lao border. "The fishermen are really scared," Dr Tana said, adding that three had been jailed in September for electro-fishing.



Fishing restrictions

The commission has delineated six dolphin-conservation zones where gillnet fishing is prohibited. Around each of these zones is a restricted-fishing zone where local villagers are allowed to use nets, traps and long lines with hooks. Gill-net fishing in the restricted-fishing zones is currently allowed but is expected to be banned by the end of 2007. The restricted-fishing zones also allow recreational fishing with rods and licensed cage culture as well as water sports like rafting. Resort development is limited to a third zone outside the restricted-fishing zone. Agriculture and aquaculture are limited to a fourth zone outside the resort zone.

Kampi village itself has three conservation posts. Further upstream but still in Kratie province, the villages of Koh Sam, Koh Phdao and Ksach Manak share five posts and Koh Dambang village has two. In Stung Treng province, Thbong Khla commune has two posts, Siem Bork district has two and Chheu Teal village near the Lao border has one. The guards are paid \$20-40 a month.

The commission is governed by a five-member board comprising the chairman, the Kratie provincial governor, the first deputy governor of Stung Treng and secretaries of state from the Ministry of Agriculture,

Forestry and Fisheries and the Ministry of Tourism. Other members of the commission include the police and military police chiefs of the two provinces and a government lawyer along with representatives of the Department of Fisheries, the Ministry of Industry, Mines and Energy and the Social, Economic and Cultural Observation Unit of the Council of Ministers.

At the provincial level, working groups headed by deputy provincial governors oversee separate conservation and development branches in each province. The conservation branches are in charge of the 15 conservation posts and the development branches oversee tourism development. The commission is currently considering plans to build a port and expand the airport runway from 1,800 m to 2,300 m to accommodate larger aircraft from Siem Reap.

Wind and micro-hydro power are also being considered, along with aquaculture. In addition to indigenous species, Dr Tana wants to promote farming of red tilapia, a fast-growing hybrid species, to feed the expanding numbers of tourists. The number of visitors to Kampi alone jumped from 25,244 in 2004 to 37,533 the following year and to 36,736 in the first five months of 2006. At that rate, the number of tourists visiting Kampi in 2006 will be equivalent to

about half the entire population of 150,000 living along the river between Kratie and the Lao border, a remote area with limited access to health and education.

As alternatives to gill-net fishing, the commission is promoting the production of environmentally-friendly insecticides from wood vinegar and the farming of jatropha (*Jatropha curcas*), a plant whose seeds can be used to make biodiesel. It is also promoting the production of local handicrafts, and solar energy as an alternative to fuel wood

Dr Tana hopes the activities of the commission will be spelt out in 2007 in a royal decree that recognises the

dolphins under Cambodian law as part of the country's natural heritage. In the meantime, the guards are protecting humans as well as dolphins. Guards at one post recently rescued 12 people from a sinking vessel including a couple of pregnant women and four children. Indeed, with characteristics like commitment, devotion, perseverance and courage as part of their job description, the commission's criteria for hiring guards reads more like a lifesaver's manual. In the longer term, Dr Tana is hoping the guards can provide regular ambulance services. "I want all the posts to be training centres," the chairman said.

Irrawaddy dolphins

Irrawaddy dolphins (*Orcaella brevirostris*) take at least seven years to reach maturity by which stage they are almost two metres long and weigh more than 100 kg. In Cambodia, mating has been observed between January and February as well as between June and July. With a gestation period of 10 months, calves born during the early part of the commercial fishing season in late November and early December are particularly vulnerable to getting tangled in gill nets.

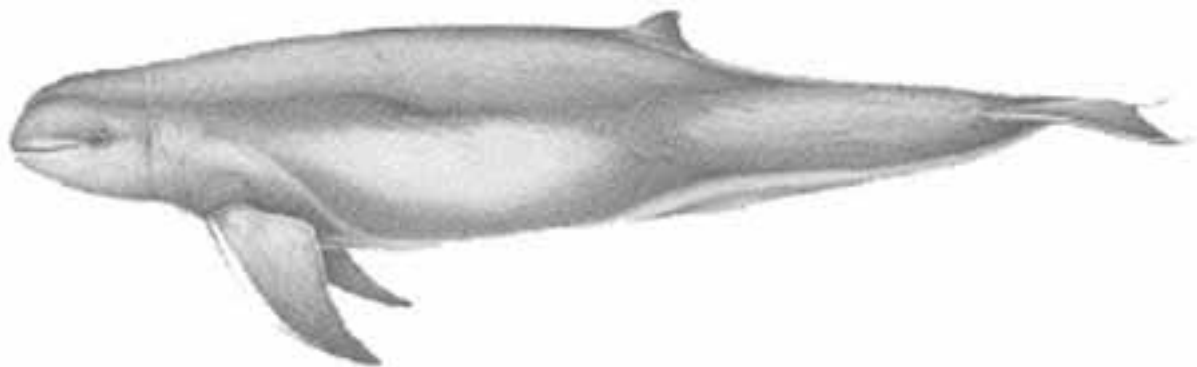
Newly-born offspring have been found to vary in size from five to 15 kg, depending on the size of the mother. During the first four months of its life, an infant calf relies entirely on its mother's milk. The mother suckles her young with the assistance of another adult female. During this period, the mother

swims with the calf on her back as she hunts for fish. Rearing the offspring takes between 15 and 18 months.

Source: Commission for Mekong River Dolphin Conservation and Eco-tourism Development

Orcaella brevirostris

Family:	Delphinidae (dolphins)
English:	<i>Irrawaddy dolphin</i>
Khmer:	<i>Trey psaut</i>
Lao:	<i>Pa ka</i>
Thai:	<i>Pla loma</i>
Vietnamese:	<i>Ca heo</i>
Size:	Almost two metres
Status:	Data deficient



Rice returns as delta farmers reconsider stampede into shrimp



A public billboard at a ferry crossing in My Xuyen district in Soc Trang province spells out rules for rotating rice and shrimp crops.

Photo: Pham Thanh Lam

After rushing into the lucrative but high-risk business of intensive shrimp farming in recent years, some Vietnamese farmers are having second thoughts. In My Xuyen district in Soc Trang province, farmers, local authorities and the MRC Fisheries Programme are working together to improve environmentally-friendly farming systems that rotate rice and shrimp culture.

Three years ago, Phuc Chang Lao took a big gamble. For more than 10 years, the Vietnamese rice farmer had been supplementing his modest income from a wet-season rice crop by raising tiger shrimp (*Penaeus monodon*) in the dry season that starts towards the end of each year. Over the previous decade, rotating

rice-shrimp culture had become common in Soc Trang and other coastal provinces of the Mekong Delta, traditional rice-growing areas where seasonal intrusions of brackish water make shrimp culture relatively easy.

Between 1992 and 2002, Mr Lao had been earning up to eight million dong (\$500) a year by converting his paddy fields into shrimp ponds after the annual rice harvest. The rice was partly used for household consumption with the rest being sold. While rice was not particularly profitable, the returns from shrimp farming were increasingly lucrative. Moreover, raising shrimp was relatively easy compared with the labour-intensive work of growing rice.

So like thousands of other farmers in the Mekong Delta, Mr Lao decided in 2003 to abandon rice and go for intensive farming of shrimp instead, investing 20

million dong in the new venture. The first year was a huge success, with a profit of 120 million dong from a bumper harvest of two crops which fetched more than 200 million dong. But outbreaks of disease led to crop failure in 2004. Mr Lao lost almost four million dong that year and had no rice crop to fall back on. In 2005, he barely managed to break even.

"I decided to switch back to rice-shrimp culture this year," Mr Lao said after a recent training course on income-management for farmers in Hoa Trung hamlet. Located in Hoa Tu Mot commune in My Xuyen district of Soc Trang province, the hamlet has its own farmers cooperative, one of six taking part in the second phase of a water-management project under the Research Institute for Aquaculture No. 2 (RIA2) in Ho Chi Minh City. My Xuyen district has been the focus of the MRC-funded project which started in 2003. Under the second phase from 2006 to 2008, commune and district officials are working with shrimp farmers in six cooperatives and five smaller clubs to manage water resources and diversify rural livelihoods. In addition to improving household productivity and the local economy, the project aims to make shrimp farming more environmentally sustainable in the district which is close to the estuary where the Bassac River flows into the South China Sea.

In some ways, Mr Lao and other Soc Trang farmers who recklessly plunged into intensive shrimp farming are lucky – they at least have the option of going back to the less lucrative but more sustainable system of rotating rice and shrimp crops. In neighbouring Bac Lieu province, some farmers were so seduced by the allure of windfall earnings from shrimp a few years ago that they tore down dykes that protected rice-growing areas from excessive intrusions of seawater. The shrimp industry boomed. But the soil in such intensive shrimp-farming areas is now so salty that it is no longer suitable for growing rice. If shrimp crops fail or prices collapse, adopting the My Xuyen model of crop rotation is not even an option.

Environmental management and technical training

Educating farmers is considered crucial in developing a sustainable model for shrimp farming in the Mekong Delta. Officials from Vietnam's Ministry of Fisheries say that farmers are often lured into the business by the typically high returns in the first year. As the waste products (faeces and uneaten feed) from shrimp-culture residue accumulate over the years, subsequent crops tend to yield less. The temptation to stock ponds with large numbers of shrimp to get higher returns may increase their susceptibility to disease as well as increase the amount of waste



Rice farming in Hoa Loi cooperative in Ngoc Dong commune.
Photo: Pham Thanh Lam

generated which further shortens the life of the pond.

Aware of such problems in Taiwan and Thailand, ministry officials said they warned farmers several years ago about the potential pitfalls of intensive farming. "They wanted to make easy money from shrimp," recalled Pham Ba Vu Tung, an officer with the socio-economic and management division of RIA2. "We told them about the high risks but they didn't believe us."

Ministry guidelines for the Mekong Delta these days recommend stocking no more than three shrimp for each square metre of the pond's surface area. The guidelines say that ponds using this "improved extensive" system may last as long as 30 years. For semi-intensive farming, the ministry recommends no more than seven individuals a square metre which is considered less sustainable, allowing ponds to be used for up to 20 years. Intensive farming with up to 15 shrimp per square metre may be good for as little as five years and is therefore not considered sustainable. In neighbouring Bac Lieu province, some

farmers are said to be pushing the limits of intensive shrimp culture by cramming their ponds with as many as 30 individuals per square metre.

Regardless of the environmental costs, the economic benefits of intensive farming start to fade if crop yields fail to match the increase in number of shrimp stocked. Moreover, to keep the water circulating in highly-stocked ponds, farmers in the delta have to invest in costly water-wheel systems. These may be one-off investments but entail additional recurring costs as they are powered by diesel engines.

In preparing for the second phase of the project, the Fisheries Management and Governance component of the MRC Fisheries Programme acknowledged that coordinating water supplies posed challenges. For example, farmers who want to start stocking their ponds early in the season can damage the remaining rice crops if they bring brackish water into an area too soon. Others who pump mud from their ponds or drain them when disease breaks out risk polluting the water supply and spreading diseases at the expense of other shrimp farmers.

As part of the project, the cooperatives and farmers clubs taking part have received equipment to monitor local water quality. Farmers can now check the depth, transparency and temperature of the water as well as other variables like acidity, alkalinity, ammonia and oxygen levels. In addition to environmental training, the farmers are also offered classes to improve their management and technical skills.

Such training is in strong demand at the Farmers Cooperative in Binh Hoa hamlet in Gia Hoa commune, which started working with the project earlier this year. After three successive crop failures resulting from low-quality seed and disease outbreaks between 1998 and 2000, local farmers set up an informal support group in 2001. At the urging of the commune people's committee, 18 households set up the cooperative in 2003.

The group now comprises 21 households with 22.4 hectares of land devoted to rice and limited farming of shrimp. The cooperative is divided into two smaller groups which each has its own set of water-monitoring equipment. One member operates a small hatchery, buying seed from neighbouring Bac Lieu province and central Viet Nam. Monthly membership fees of 20,000 dong have enabled the cooperative to accumulate 12 million dong which, if necessary, can be used to cushion losses arising from crop failures.

Nguyen Van Hai, the 31-year-old head of the cooperative, says only a few crops have failed so far. He remains committed to rotating between rice and the improved extensive model of shrimp farming. When he's not farming shrimp, Mr Hai raises freshwater fish like tilapia and carp with his annual rice crop. Rice yields 6.5 tonnes a hectare, of which about 30 percent is kept for household consumption.

Unlike many farmers, Mr Hai remains unimpressed by the quick returns from intensive and even semi-intensive farming. "When I was younger, I often went to look at models of intensive and semi-intensive shrimp farming in other districts," Mr Hai said. "But we cannot apply those models here as we're too poor. We don't have the money to make such high-risk investments." Fisheries ministry officials are similarly cautious. "We don't want to apply intensive culture here," one official said. "If we did, maybe we'd destroy the water environment."

A tale of two provinces

For Luong Minh Quyet, deputy chairman of the My Xuyen District People's Committee, the past 15 years have provided some important lessons for local farmers who traditionally grew two crops of rice every year. They also raised fish and shrimp with the dry-season crop and grew cash crops like peanuts and ginger. The establishment of a local shrimp hatchery in 1990 made seed more widely available, encouraging farmers to switch one of the rice crops to shrimp every year. Over the years, shrimp farming became more intensive.

"Three or four years ago, the farmers in Bac Lieu province started raising a lot of shrimp and making lots of money. They didn't care about rice any more. But their shrimp crops sometimes failed so we decided to promote rotating rice-shrimp culture here," Mr Quyet said. "Some farmers in Soc Trang still raise two crops of shrimp every year but not as many as in Bac Lieu. Farmers in Soc Trang are now increasing rice production as they think their farms will fail if they try to raise two shrimp crops every year."

Estimates compiled by Pham Thanh Lam, head of the planning and research division at RIA2, indicate that the surface area of fisheries is about 50,000 ha in Soc Trang, barely 40 percent of the area in Bac Lieu. Of the total, an estimated 26,000 ha is devoted to limited shrimp farming using the improved-extensive model. Semi-intensive farming accounts for an estimated 13,000 ha and intensive farming for about 4,600 has. In Bac Lieu, the estimates indicate about 28,000 ha for improved-extensive culture and about 11,000 ha

for intensive culture (estimates for semi-intensive culture weren't available at the time of writing).

Mr Quyet, the deputy chairman of the people's committee, attributed the different paths for agricultural development in the two provinces to different regulatory approaches to shrimp farming. "The Soc Trang Province People's Committee passed regulations more than 10 years ago. Bac Lieu province is more affected by brackish water so their rules were optional," he said. "Bac Lieu farmers didn't follow the rules. Soc Trang farmers did."

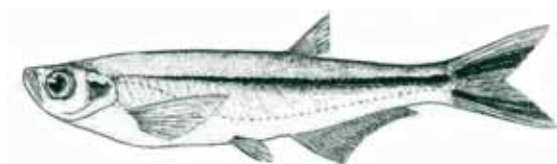
To sustain the new model of rotating rice-shrimp culture in My Xuyen district, public billboards exhort local farmers to follow a few more rules like adhering to the correct stocking time in the shrimp season

which starts in January. If farmers want to raise fish instead of growing rice after the shrimp harvest, they are discouraged from using feed. Ponds should be at least 60 centimetres deep and stocking density should be limited to no more than five shrimp for each square metre. Farmers are also urged to avoid buying shrimp unless they've been tested for disease by recognised experimental stations. And to ensure food safety and security, shrimp must not be treated with veterinary pharmaceuticals that have been outlawed in Viet Nam.

Shrimp stocking rate guidelines

Type of culture	Number	Size at harvest	Expected life of pond
Improved extensive	1 - 3/m ²	40 - 70 g (15 - 25 shrimp/kg)	20 - 30 years
Semi-intensive	3 - 7/m ²	30 - 50 g 20 - 35 shrimp/kg	10 - 20 years
Intensive	7 - 15/m ²	25 - 40 g 25 - 40 shrimp/kg	5 - 10 years

Source: Research Institute for Aquaculture No. 2, Ho Chi Minh City



New Cambodian fisheries law highlights management and conservation

By Chan Sarun *

Cambodia's Minister for Agriculture, Forestry and Fisheries assesses the historical context of the country's new fisheries legislation

Before the French colonial period, Cambodia's fishing grounds were freehold land that was publicly held. There was no fisheries administration. Nor were there any rules, regulations or laws governing management. During the colonial period many regulations were promulgated, starting with a royal regulation in 1872 that allowed fishing barrages across water channels (see box on page 13).

Subsequent regulations included the classification of fishing lots for public auction and definitions of sizes for fishing gear. After the French colonial period, Cambodia established a code in 1956 for managing freshwater fisheries with 11 chapters and 134 articles. Another code for managing marine fisheries was formulated in 1958. These two codes remained in effect until the 1970s and were completely discarded after the genocidal Pol Pot regime seized power in 1975.

After liberation in 1979, the fisheries sector was rehabilitated by the Department of Fisheries which was re-established under the Ministry of Commerce and transferred to the Ministry of Agriculture in 1980. The Council of the People's Revolutionary Party of Kampuchea decided the same year to maintain all fishing lots based on past locations. The Council also adopted a temporary policy in 1980 to allow fishery solidarity groups to borrow funds from the national bank to invest in large-scale fisheries.

The Department of Fisheries of the People's Republic of Kampuchea recognised that previous regulations had little impact on sustainable resource management. In early 1981, it began studying the formulation of a new fisheries law with many hard-

working experts from the former government who had patiently remained behind.

In 1982, the Council of Ministers adopted a circular dealing with the revenues of state-owned fishing lots. The Ministry of Agriculture and the Ministry of Finance issued guidelines for implementing the circular the same month. In early 1984, the politburo decided that the exploitation of fishery resources by military fishing units should be avoided starting with the 1984-85 season. In August the same year, the Council of Ministers decided to suspend such activities which included fishing lots. A month later, the Council of Ministers adopted a circular on the collection and distribution of fishery products. Under a subsequent letter from the cabinet of the Council of Ministers in 1986, state-owned enterprises in the fisheries sector had to be self-financing.



H.E. Dr Chan Sarun addresses the crowd at the National Fish Day ceremony in Sihanoukville on 1 July 2006. Photo: Mak Remissa

President Heng Samrin signed the new Law on Fisheries with six chapters and 44 articles on March 9, 1987. The signing came two months after the Ministry of Agriculture adopted a decision defining the role, duty and organisation of the Department of Fisheries.

Over the next 12 years, the fisheries sector developed rapidly and Cambodia became part of the regional and international community. To keep pace with these changes, the Department of Fisheries set up a working group to reformulate the law. The World Bank provided legal experts to help with the original draft which had 15 chapters and 169 articles by 1999.

In early 2000, the department set up an internal legal group in consultation with experts to check the draft with the earlier fisheries codes and the 1987 law. The draft was examined four times in a process that was completed in March 2001, at which point the draft was sent for public consultations at five workshops.

In the intervening period, the Royal Government of Cambodia under the leadership of Prime Minister Samdech Hun Sen initiated fishery reforms in 2000. A sub-decree reduced the area of fishing lots by 56.46 percent, making available 538,522 ha for family-scale fisheries.

By early 2003, a revised draft of the new law was completed and sent to the Ministry of Agriculture, Forestry and Fisheries. Improved in line with a new forestry law, the revised draft had 17 chapters with 125 articles. Following more improvements to fulfill entry requirements for the World Trade Organization (WTO), the ministry submitted the draft to the Council of Ministers. Following examinations by the Social, Economic, and Cultural Observation Unit, the Ministry of Justice and various inter-ministerial meetings, the Council of Ministers adopted a newly-revised draft with 17 chapters and 109 articles in January 2004.

In principle, the fisheries law aims to ensure long-term conservation and sustainable management of fishery resources taking into account social, economic and environmental factors. All major activities having a serious impact on fisheries have to be assessed for their environmental and social impacts in consultation with the public.

To strengthen management, the new fisheries law provides for a central administration that oversees

fisheries inspection and a decentralised structure used by the former Sangkum Reastr Niyum regime (1953 to 1970) as well as other countries in the region.

Regarding the classification of fishing grounds and development of the sector, the law encourages the creation and proper maintenance of conservation zones and strongly promotes the development of aquaculture by all means including the annual National Fish Day. All of these are key to ensuring the development of the fisheries sector.

The law ensures local community rights to use fishery resources for traditional, religious and livelihood purposes through the establishment of community fisheries. Management, development and user rights ensure the sustainability of the resources which are provided by the state. The law also encourages utmost efforts for the widespread promotion of aquaculture development with simple procedures.

To stop illegal fishing, the law has strong provisions with serious penalties against those who break the law including fisheries and other government officers. To investigate, prevent and counteract illegal activities and compile documents for submission to courts, the officers of the fisheries administration are considered as judicial fisheries police.

The law is also designed to be comprehensive and includes a glossary of terms explaining the meanings of important words.

To reach the goal of sustainable social and economic development, the nation needs a fisheries law covering all legal aspects. The law needs to serve the nation, especially people in local communities, reduce poverty and ensure sustainable development and good governance under the government's rectangular strategy and Cambodia's entry into the WTO. The new fisheries law is an effective tool for taking action to manage and conserve fishery resources in a sustainable manner for the next generation.

** H.E. Dr Chan Sarun is Cambodia's Minister for Agriculture, Forestry and Fisheries. The article is based on his address to the National Assembly on 15 March, 2006. The assembly adopted the legislation on 30 March and His Majesty King Norodom Sihamoni signed the new law on 21 May. The Department of Fisheries published the original Khmer-language address in June.*

From colonial rule to early independence

1872

A royal regulation allows fishing barrages to partly cross water channels. To let boats pass, the barrages may cross no more than one third of the channel.

1874

A royal regulation prohibits the use fishing gear with mesh sizes smaller than 2.5 centimetres.

1899

A decision by the general treasurer of French Indochina defines procedures related to selling of marine fishing grounds in Koh Kong province. The procedures apply for three seasons.

1908

A circular on the census and classification of fishing grounds includes three royal regulations. The first regulation defines two types of fishing grounds – those with exclusive fishing rights granted by the state to the highest bidder and the grounds freely accessed by those who pay a fee to the state. The second and third regulations deals with taxes on fishing gear, ovens and fish-drying grounds.

1909

A royal regulation amends one of the previous year's regulations to define taxes on seine nets used to catch shark catfishes (Pangasiidae) on the Tonle Sap Lake.

1920-21

A royal regulation on state-owned property management in 1920 leads to the establishment of fishing lots in 1921.

1923

A royal regulation prohibits the collection, sale, and consumption of marine turtle eggs.

1924

The royal regulation of 1921 comes into force.

1925

A royal regulation prohibits the capture of marine turtles inhabiting islands in the Gulf of Thailand for a five-month period ending in April 1926.

1929

Fishing lots are reorganised with proper mapping. Seven percent of the fishing-lot areas are reserved for family fishing.

1939

A French presidential decree defines maritime territory for fishing grounds as extending 20 kilometres from the

coast at low tide and prohibits the entry of foreign fishing vessels with engines.

1940

A royal decree on freshwater fisheries management defines the boundaries of flooded forests and prohibits forest clearance around the Tonle Sap Lake.

1944

A decision by the general treasurer of French Indochina regulates the use of fence traps in Cambodian maritime territory. The decision amends an earlier decision in 1942.

1946-50

A royal *kram* on fishing gear rights is passed in 1946. A royal decree in 1946, an amendment in 1949 and two more decrees in 1950 provide for regulations on the transport and export of fish from Cambodia. During this period, a group of national fisheries experts is established as part of a national group of experts in water resources, forestry and wildlife.

1952

A declaration by the Ministry of the National Economy classifies various types of processed fish products and prohibits the export of salted and fermented fish during the annual spawning season between August 1 and September 30. A second declaration by the ministry requires permits for transporting fishery resources.

1956

Following independence in 1953, a royal *kram* adopts the Fisheries Code for the Management of Freshwater Fisheries with 11 chapters divided into 134 articles.

1957

A royal decree defines Cambodia's maritime territory and continental shelf.

1958

A royal *kram* adopts the Fisheries Code for the Management of Marine Fisheries with six chapters divided into 48 articles.

1960

A royal *kram* spins off the national group of fisheries experts to establish the Department of Fisheries. Under a separate royal decree, the Department is responsible for managing both freshwater and marine fisheries.

The summary is based on H.E. Dr Chan Sarun's address to the National Assembly on 15 March, 2006.

The current status of flagship species

By Naruepon Sukumasavin *



The Mekong giant catfish (*Pangasianodon gigas*) is one of the three “flagship” species identified by the Technical Advisory Body’s working group.

Many agencies have contributed to efforts to conserve giant fish species over the past six years. What happens next is up to the four countries in the Lower Mekong Basin.

In 2000, the inaugural meeting of the MRC’s Technical Advisory Body for Fisheries Management (TAB) agreed that action should be taken to conserve giant fish species. But at the time, existing studies on which a conservation strategy for the giant species could be based were not available. So the MRC set up a working group to report to the TAB about the important habitats, migration, biology and life cycles of the giant species, as well as the success or otherwise of releasing artificially-bred fingerlings into the wild.

Based on the recommendations of the working group, the TAB identified three “flagship” species – the Mekong giant catfish (*Pangasianodon gigas*), the giant barb (*Catlocarpio siamensis*) and Jullien’s barb (*Probarbus jullieni*). These species are indeed giant fishes. The Mekong giant catfish can grow to 3 m metres and 300 kg; the giant barb to 3 m and 120 kg; and Jullien’s barb to 150 cm and 70 kg.

The designation of flagship species sought to raise awareness and educate people about the importance of maintaining the biodiversity of the fish fauna in the Mekong.

In addition to identifying possible reasons for the growing rarity of the three species, the working group highlighted the need to cooperate with other sectors to develop an adaptive or experimental system of

management. Such a system would entail creating models, formulating and screening hypotheses, designing and carrying out experiments, and analysing the results to identify why these species are becoming increasingly rare. The process would involve refining management so that gaps in data and knowledge are identified in all stages of the management process.

The working group concluded that the Mekong giant catfish seemed threatened by human activities. Conserving self-sustaining populations was therefore likely to be part of the broader management of the aquatic resources of the Lower Mekong Basin. If an ecosystem approach was taken, efforts to sustain wild populations of giant species would probably succeed – provided they were in collaboration with other sectors using the river. If such an approach failed, one further option may be to breed giant species in captivity for possible future re-introduction into the wild (although this would address the symptoms but not the causes of the problem).

Of the three species, only the Mekong giant catfish is listed as “critically endangered” by the World Conservation Union (IUCN). Breeding grounds for the species are not well known, although one location is north of Chiang Khong in northern Thailand. Hatchery production from wild and captive broodstock has allowed stocking in Thai reservoirs as well as in the Mekong mainstream.

The giant barb, although not listed by the IUCN, is extremely rare above Khone Falls. It is more common in Cambodia and Viet Nam, although large fish are now rarely caught. Spawning grounds for the giant barb are not known but they may be in the deep pools in northern Cambodia.

Jullien's barb is listed as endangered on the IUCN List of Endangered Animals. This species has several known spawning grounds. A recent publication by Ian Baird highlights the dramatic decline in the populations of this species and the closely-related *Probarbus labeamajor*.

In Thailand, the Department of Fisheries has been producing fingerlings from wild broodstock of the Mekong giant catfish since 1983 and from captive broodstock since 2000 (see *Catch and Culture*, Volume 12, No. 1). Production of captive fingerlings in 2006 is expected to reach about 400,000, twice the number produced a year earlier and a new record. Genetic studies are being carried out with Thai Department of Fisheries and Tohoku University in Japan, as well as through the Network of Aquaculture Centres in the Asia Pacific (NACA) and the Darwin Initiative.

Among other initiatives, the Cambodian Department of Fisheries has been carrying out a buy-and-release program for the Mekong giant catfish with the MRC and the World Wild Fund for Nature (WWF) since



Although the giant barb is not listed as “critically endangered” it is now extremely rare above Khone Falls.

2001. Thailand has also been working with the MRC, Kyoto University and the Mekong Wetlands Biodiversity Program (MWBPD) on a tracking program for captive fish and a larval study to determine spawning grounds. A programme to buy-out fishing gear used to catch the giant species in northern Thailand was also launched in 2006 (see *Catch and Culture*, Volume 12, No. 1).

At the same time, the Mekong Giant Catfish Conservation Working Group set up in 2005 seeks to bring relevant organisations together and exchange information. The group is working towards a joint conservation strategy that includes national governments, regional agencies such as the MRC and NACA and international organisations like IUCN, WWF and FAO, academic institutions like Imperial College of London and Kasetsart University, as well as the Darwin Initiative.

Population modelling for the Mekong giant catfish in Thailand indicates that fishing for large specimens is less of a threat than previously thought. A moderate level of traditional fishing could be allowed – and might also be beneficial for long-term monitoring and maintaining public interest in the species. The impact of catching young specimens of less than one metre is not clear. But significant catches of juvenile fish could have a big impact on the abundance of the species. Such fishing would be incidental and very difficult to address.

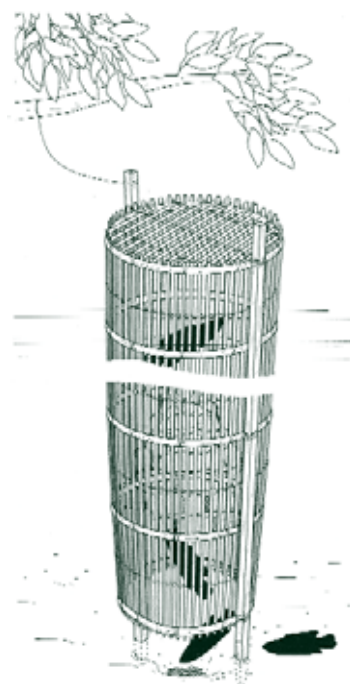
The model also shows that the degradation of habitats probably didn't play a major role in past

changes in giant catfish population, but it may do so in the future as human populations grow, economies develop and natural resources are used. The biggest threats are thought likely to come from navigational improvements and hydrological changes at spawning grounds as well as dams in tributaries blocking access to juvenile habitats. The modification of spawning grounds may be the most acute threat but cannot be detected in adult populations for about 20 years.

As for the other two flagship species, Thailand has carried out a genetic inventory for both the wild and hatchery populations of Jullien's barb in addition to developing a broodstock management plan for the fish. For the giant barb, the Department of Fisheries produces and releases about 200,000 fingerlings a year.

Protecting the giant fish species of the Mekong is a complex problem involving many sectors. As a trans-boundary issue, it also requires the support and cooperation of agencies and stakeholders throughout the region. Initiatives to conserve these giant species are already underway. What happens next is up to the four countries of the Lower Mekong Basin.

** Dr. Naruepon is the MRC Fisheries Programme's national coordinator in Thailand and also a member of the Technical Support Group for the Technical Advisory Body for Fisheries Management (TAB). This article is based on the presentation he made to the Eighth Technical Symposium on Mekong Fisheries in Ho Chi Minh City on 3 November.*



Opportunities for management and conservation over the next four years

A workshop at the Mekong Fisheries Technical Symposium, November 2006, raised several ideas for management of giant fish species in the Mekong

The Eighth Technical Symposium on Mekong Fisheries called for the development of a regional research network to share data and knowledge about giant species. During a half-day workshop on managing such species, delegates also called for countries to cooperate on issues such as breeding and hatchery technologies. The need for a research network and technological cooperation were among several ideas identified during the workshop in Ho Chi Minh City on 3 November.

In a statement issued after the workshop, the MRC Fisheries Programme strongly recommended that the Technical Advisory Body on Fisheries Management (TAB) take up such themes in its work plan for 2007 to 2010. "The management of giant species is complex," the statement said, noting that

much was still to be learnt about their biology and that more data was needed. "Their management is also a trans-boundary issue, requiring cooperation among the four riparian countries. It will also need the involvement and support of local fishing communities."

Opened by TAB chairman Sam Nouv, deputy director of Cambodia's Fisheries Administration, the workshop featured a presentation on the current status of giant species including the results of actions taken since 2002. It also included a panel discussion between TAB members which highlighted the importance of managing and conserving giant fish given their role as "flagship species" symbolising the ecological health of the Mekong. The discussion noted that giant species acted as an umbrella for other fish and that protecting them helps to protect many other fish species. TAB members also noted that managing giant fish could help safeguard the food security of rural communities and alleviate poverty as well.

Pangasianodon gigas

Family: Pangasiidae (shark catfishes)
English: Mekong giant catfish
Khmer: *Trey reach*
Lao: *Pa beuk*
Thai: *Pla beuk*
Vietnamese: *Ca tra dau*
Size: Up to 300 cm
Status: Critically endangered (IUCN Red List), Appendix 1 (CITES)

Probarbus jullieni

Family: Cyprinidae (minnows & carps)
English: Jullien's barb
Khmer: *Trawsak*
Lao: *Pa ern ta deng*
Thai: *Pla yee sok thong*
Vietnamese: *Ca tra so truong*
Size: Up to 165 cm
Status: Endangered (IUCN Red List), Appendix 1 (CITES)

Catlocarpio siamensis

Family: Cyprinidae (minnows & carps)
English: Giant barb
Khmer: *Kahao, kolreang*
Lao: *Pa ka ho, pa ka man*
Thai: *Pla ka ho, pla ka man*
Vietnamese: *Ca ho*
Size: Up to 300 cm
Status: Unlisted (IUCN Red List), extremely rare above Khone Falls and larger fish also now rare in Cambodia and Viet Nam



Lao, Vietnamese breakthroughs in domesticating *Krempf's catfish*

Occurring throughout the Lower Mekong Basin as well as the rivers and coastal waters of southern and eastern Viet Nam, Krempf's catfish (Pangasius krempfi) is a valuable species in fisheries between the Lao-Cambodian border and the Mekong Delta. Being one of the few freshwater fishes of the lower basin that lives part of its life in the South China Sea, it has been compared to species of the salmon family. But unlike most salmonids, it is not known where the fish spawns or what sort of habitat it requires.

Under the Aquaculture of Indigenous Mekong Fish Species (AIMS) component of the MRC Fisheries Program, efforts have been underway to domesticate P. krempfi since 2004. These efforts finally paid off in mid-2006 with Lao researchers getting mature wild breeders to reproduce for the first time (see below). The Lao trials also succeeded with another valuable species known as the sharp-nosed catfish (Pangasius concophilus). In a separate breakthrough in October, Vietnamese researchers successfully induced spawning of Krempf's catfish raised in captivity (see page 20).

Artificial reproduction succeeds in Lao trial ...

*By Somphanh Phanousith, Philippe Cacot, Chaloun Souliyavong, Ti and Len Bun Long **

In the Khone Falls area in southern Lao PDR, about 600 fence traps are used to catch Krempf's catfish (*Pangasius krempfi*), known as *pa suey hang leuang* in Lao, as they migrate upstream in the rising waters of June and July. Thousands of fish are caught every year as strong waters flush fish into the traps as they look for one of the few channels allowing them to swim past the falls. With support from the Living Aquatic Resource Research Centre (LARReC) in Vientiane, researchers conducted initial trials for artificial reproduction in the area in 2004, using breeders caught at Nokassoum Island. Although the trials failed, the experience was useful as it showed that getting breeders to reproduce artificially posed two challenges.

The first was collecting the breeders and keeping them alive. The fish had to be removed quickly from the traps and transferred to special tanks, either a

large-ring shaped tank or a small tank with a strong water flow. If the fish were tethered in the river – a traditional practice for other species – they died within a few hours. Stocking the fish in cages also ended in fatalities. After transfer to the large tank, limited and careful handling using anaesthetics resulted in high survival rates after three weeks.

The second challenge was to induce ovulation. In the first trial, the team applied six different types of standard hormone treatments to 12 females. Two treatments showed promising results in three individuals but none of the fish ovulated, probably because they were not sufficiently mature. The females may also have been under stress.

In 2006, a second series of trials took place with hormonal implants injected into six females before a single standard injection. The implants were pure



A Lao fisherman with Krempf's catfish in the Khone Falls area.

cholesterol or 85 percent cholesterol and 15 percent cellulose. It was found that they increased the size of the oocytes, the cells in the ovary that divide to form eggs, and probably raised the sensitivity to the subsequent treatment. The only female which ovulated received an implant of pure cholesterol followed by the injection of LHRHA (Suprefact) and domperidone. Ovulation took place 12 hours after the last injection. Following the removal of about 40,000 eggs, fertilisation took place with diluted sperm. Incubation lasted about 30 hours and about half of the eggs hatched on July 15. A similar method was used for the artificial reproduction of three sharp-nosed catfish (*Pangasius conchophilus*), another valuable species of shark catfish. For this species, the implant was replaced by 3 or 6 injections of human chorionic gonadotropin at a low dose (500 IU/kg of body weight per day).

One observation from the second trial was that only about a fifth of the females were in an advanced stage of sexual maturity. On the other hand, all the males were fully mature. The testes were not very big, but they were developed and produced sperm that could easily be collected.

Having succeeded with the first reproduction of Krempf's catfish, the team is now looking forward to the next breeding season in 2007. The season in 2006 was a bit short – about three weeks instead of five to six weeks because of the seasonally late rise in the water level. Treatments need to be optimised with more efficient implants and improved stocking and handling during the resolving treatment. We need also to be prepared to manage a large amount of fish breeders coming within a short period.

There is, however, a need for a permanent presence on Nokassoum Island with tanks, a small laboratory and simple accommodation for a few technicians and scientists. The project would be pleased to collaborate with investors for mass production of seed and further collection of wild breeders to set up new broodstock in captivity. At the same time, there is an urgent need to conserve the site and regulate fishing at the Khone Falls and even all along the migration routes of this important species.

The domestication of *P. krempfi* is an issue for both the conservation of this migratory species and for the development of aquaculture. *P. krempfi* is euryhaline, capable of living in water with variable salinity. Therefore it could be suitable for aquaculture in either fresh or brackish water, similar to the commonly-cultured Asian sea bass (*Lates calcarifer*).

* Mr Phanousith is Head of the Aquaculture Unit at the Living Aquatic Resources Research Center (LARReC) in Vientiane while Dr Cacot is a scientist with the Lao program of CIRAD, the French Centre for International Cooperation in Agricultural Research for Development.

Mr Charoune is an officer of the Provincial Agriculture and Fisheries Office of Champassak province, Muang Khong District. Mr Ti is a fisherman and staff member of the Department of Fisheries in Cambodia. Mr Len Bun Long is an MSc student from Can Tho University, Viet Nam. This article is based on their presentation to the Eighth Technical Symposium on Mekong Fisheries in Ho Chi Minh City in November.



... as Vietnamese induce spawning of females raised in captivity

Krempf's catfish (*Pangasius krempfi*) is one of the most highly-prized species in the Mekong Delta. Reaching up to 80 centimetres, market prices for what's locally known as *ca bong lau* can be up to three times the price for *ca tra*, another species of shark catfish that is widely farmed and exported from the delta. In 2005, scientists of the Research Institute for Aquaculture No. 2 working under the Aquaculture of Indigenous Mekong Fish Species (AIMS) component, succeeded for the first time in keeping wild specimens alive in a cage (see *Catch and Culture*, Volume 12, No. 1). By mid-2006, about 50 females larger than 2.5 kg were maturing.

"At that time, we working in the dark," recalled Trinh Quoc Trong, the national director for AIMS in Viet Nam. The team planned to inject the same hormone used to induce spawning in other shark catfishes farmed in the delta – human chorionic gonadotropin, a hormone produced by the placenta during pregnancy. "But we didn't know what hormone dosage to use or how many injections to give or at what intervals," he added.

The first attempt to induce spawning involved three hormone injections over a two-day period – the same dose given to *ca tra*. The experiment took place in a village in Dong Thap province where the candidate fish were being kept in a two-cubic-metre *hapa*, a net enclosure suspended inside a cage in the river. "That was a mistake," Trong said. The fish were weak and could not swim freely in such a small area which, the team believed, made it difficult for the hormone to take effect. Moreover, it was found that the first spine of the pectoral fin of this species could easily get entangled in the net, increasing the chances of death.

For the second attempt a few weeks later, about 10 fish were transferred from the cage to a couple of tanks at the new National Breeding Centre for Southern Fresh Water Aquaculture in the nearby



Scientists sampled for eggs when they injected the fishes.

province of Tien Giang. The fish were very healthy and received the same dose of hormones. "But we made a handling mistake," Trong said. "Every time we injected a fish, we were also sampling for eggs. That was too stressful for the fish." Sampling the eggs required extra handling, which damaged the skin on the caudal peduncle, and the resultant loss of the mucous layer made the fish prone to infection. By the end of the third week, all four injected females were dead.

In the third attempt, the team decided to forget about egg sampling and release the fish immediately after injecting the hormone. Trong chose his most skilful worker, telling him to be gentle with the fish and not grab the area around the tail too hard. He also decided to change the dose to a series of injections over a week, the same technique used to induce spawning in Bocourt's catfish (*Pangasius bocourti*), the other widely-farmed catfish in Viet Nam known as *ca basa*. On the seventh day, Trong administered the primary dose which was followed by a final injection in



the evening.

On the eighth day, 5 October, the fish was “stripped” – a technique that involves manually pressing the belly of the fish to force the eggs to be discharged from the ovaries. “But initially we could not strip any eggs,” Trong said. “We left the fish for a few hours and observed that the eggs were getting bigger. We gave one more injection, the same as the final dose the day before. Eight hours later, she ovulated. That was a success because it was the first time we could make a female ovulate. So by then, we knew that several injections over a week really did work.”

Fertilising the eggs was the next obstacle. The testes of the wild males caught in 2005 had barely developed and efforts to obtain sperm were unsuccessful. “I sacrificed four males but did not get a drop of sperm,” Trong said. Consequently, he opted for frozen sperm from the *tra* species instead. “The eggs started developing, but stopped after 10 hours.

The cryo-preserved sperm was inappropriate.”

In the fourth experiment a week later, the female received the same dose as the third. But this time, Trong decided to use fresh sperm from a live *tra* catfish. It worked. The team stripped the fish twice in 45-minute intervals, gathering thousands of eggs which were placed in incubators. Fertilisation rate for the stripped eggs was about 25 percent, considered very successful. “We incubated the fertilised eggs until they successfully hatched to prove that they were viable. Thereafter, because of strict Government of Viet Nam and international protocols against producing hybrid fish species, I personally supervised the destruction of all the hatchlings. I was saddened by having to do this but I know that next season by giving equal care when maturing the male *P. krempfi*, we will be the first to successfully produce *P. krempfi* seed through induced breeding”, Trong said.

AIMS staff in Cai Be



Trinh Quoc Trong
Photo: Joe Garrison



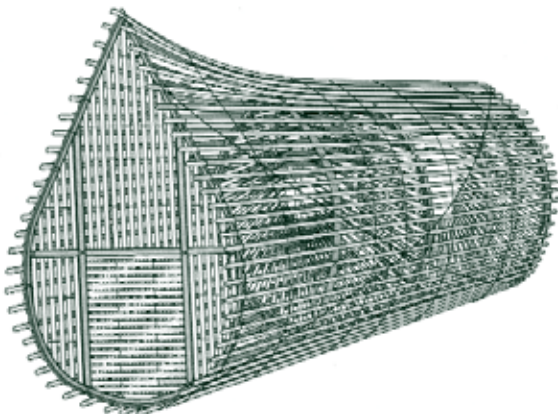
Dang Van Truong
Photo: Joe Garrison



Thi Thanh Vinh
Photo: Joe Garrison



Le Trung Dinh
Photo: Trinh Quoc Trong



Fish-processing industry in Mekong Delta more than doubles output in four years

The first comprehensive snapshot of fisheries in the Mekong Delta in Viet Nam confirms the importance of fisheries for food security, employment and foreign exchange.

The Mekong Delta's fish-processing industry more than doubled its output between 2000 and 2004 as a result of the growth of aquaculture and rising marine catches. A study of the delta by the Research Institute for Aquaculture No. 2 (RIA2) also found that capture fisheries alone averaged 800,000 tonnes worth about \$700 million a year and that fisheries overall employed about 1.4 million people, mostly in the aquaculture sector.

A presentation* to the Eighth Technical Symposium on Mekong Fisheries in Ho Chi Minh City in November 2006 showed that production by Delta processing companies hit almost 506,000 tonnes in 2004, up from less than 236,000 tonnes in 2000. Frozen-fish processing by 43 companies accounted for about four-fifths of total production in the latest year. The rest came from the processing of fish meal and other products like fish sauce.

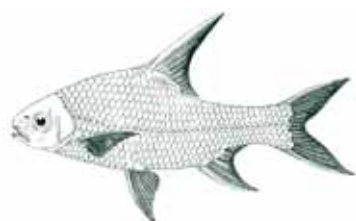
In freshwater aquaculture, annual catfish (primarily *Pangasianodon hypophthalmus*) production in five provinces jumped from 106,000 tonnes to an estimated 287,000 over the four-year period. An Giang province accounted for 61 percent of total production followed by Can Tho and Dong Thap with 15 percent each. Cage culture amounting to 1.1 million cu m accounted for 40 percent of production in 2004. Small-scale ponds covering 34,000 ha

accounted for another 40 percent while the remaining 20 percent came from ponds devoted to intensive culture which had a combined area of about 1,000 ha. Intensive ponds yielded an average of 170 tonnes/ha/year.

Shrimp production (primarily *Penaeus monodon*) in farms in another eight provinces with brackish water soared from 73,000 tonnes to an estimated 236,000 tonnes over the four years. Ca Mau province accounted for 37 percent of shrimp production followed by Bac Lieu with 25 percent and Soc Trang with 13 percent. The proportion of farms using more intensive production techniques has grown from two percent in 2000 to seven percent in 2004. Of the more than 520,000 ha devoted to shrimp farming in 2004, 93 percent was devoted to extensive production (less than 500 kg/ha/year); semi-intensive farms (500-3000 kg/ha/crop) accounted for four percent, and intensive farms (greater than 3000 kg/ha/crop) accounted for three percent.

In capture fisheries, the marine catch rose from about 600,000 tonnes in 2000 to more than 726,000 tonnes in 2004. The figures for the inland catch showed a decline, but these figures include only commercial fishing, and not the very large family and subsistence level catches. The importance of family level fishing is reflected in the number of fishing vessels operating in inland waters, which increased from 70,000 boats in 2000 to more than 90,000 in 2004. The sharp increase reflected growing numbers of boats without engines.

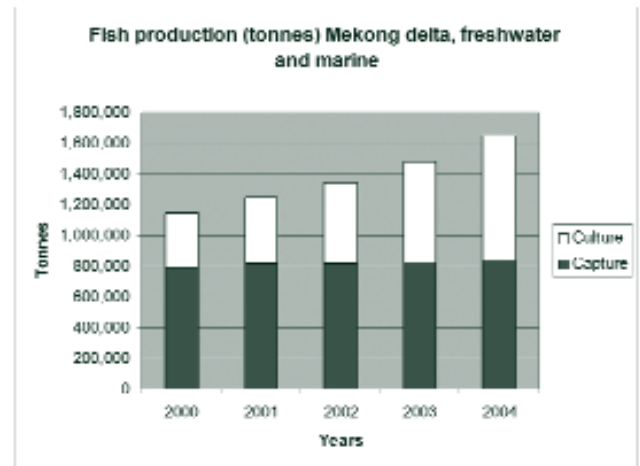
In terms of value, shrimp accounted for between 36 and 43 percent of the marine catch which ranged from



\$398 million in 2000 to \$526 million in 2004. Freshwater prawns accounted for between 11 and 19 percent of the inland catch which peaked at \$70 million in 2001.

The researchers found that aquaculture employed almost 1.1 million people in the Delta. Capture fisheries employed a further 300,000, mostly unskilled labourers although some people in the marine fisheries sector had been trained. By 2004, the Vietnamese government had close to 800 officers working in Delta fisheries. Aquaculture had 315 officers, up from 277 four years earlier, while capture fisheries had 470, up from 356.

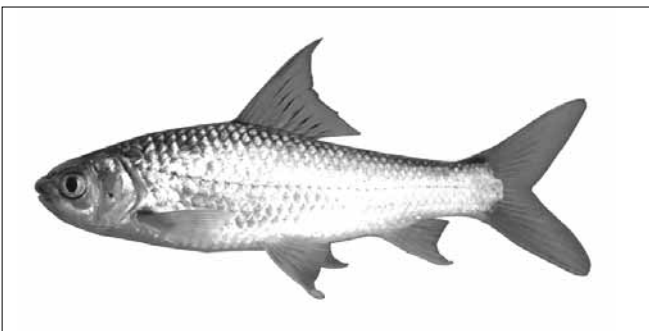
** Based on research by Nguyen Thanh Tung, Pham Mai Phuong, Thieu Lu, Nguyen Minh Nien, Truong Thanh Tuan, Do Quang Tien Vuong and Nguyen Van Hao of the Research Institute for Aquaculture No. 2.*



Same same but different: *Henicorhynchus lobatus* and *Henicorhynchus siamensis*

Research into genetic variation shows that two similar species of carp need separate management strategies

Among the hundreds of fish species that occur in the Lower Mekong Basin, few generate as much confusion as a couple of small carps that may account for 30-50% of the region's annual catch. The Siamese mud carp, *Henicorhynchus siamensis*, reaches a



H. siamensis

maximum length of 20 centimetres and is a major source of protein in the basin, notably in Cambodia where it is used to make fermented fish paste. This species is almost identical to another small carp, *Henicorhynchus lobatus*, a similarly-important protein source that reaches 15 centimetres. Both species can be considered "ecological keystone species" whose continued well being is vital to the whole ecosystem.

Scientists agree that both species belong to the cyprinid family of minnows and carps. The confusion arises over their classification in the *Henicorhynchus* genus, which has been treated as a "junior synonym" of the *Cirrhinus* genus since a revision* in 1997. That suggests that the two species are closely related to species like the small-scale river carp, *Cirrhinus microlepis*. But are they? And are they even closely related to each other, as the Khmer, Lao, Thai and Vietnamese common names suggest (see page 26).

In a presentation to the Eighth Technical Symposium

on Mekong Fisheries in Ho Chi Minh City in November, 2006, Australian geneticist David Hurwood asserted that the two species displayed a "high degree of divergence" not usually expected among species within a genus. Whether the two species belong together in the *Cirrhinus* genus is difficult to determine as the genetic analysis indicated that *Cirrhinus* is a polyphyletic group, the biological term for groupings of organisms derived from more than one common ancestor. By definition, a genus is monophyletic – species within it are believed to have a common ancestor and be more closely related to each other than to species in other genera. So from an evolutionary point of view, the classification of the two species under the same genus may be historically inaccurate which is why future taxonomic revisions are expected.

In the meantime, Dr Hurwood and colleagues from Queensland University of Technology in Australia have used a molecular approach to document the wild stock structure of the two species. Funded by the Australian Centre for International Agricultural Research (ACIAR), the study is considered important for regional food security, especially among the rural poor. The study is also globally significant as the two species may account for one-half to one percent of the world's combined marine and freshwater catch every year.

Sampling to determine the geographic distribution and patterns of genetic diversity within each species



H. lobatus

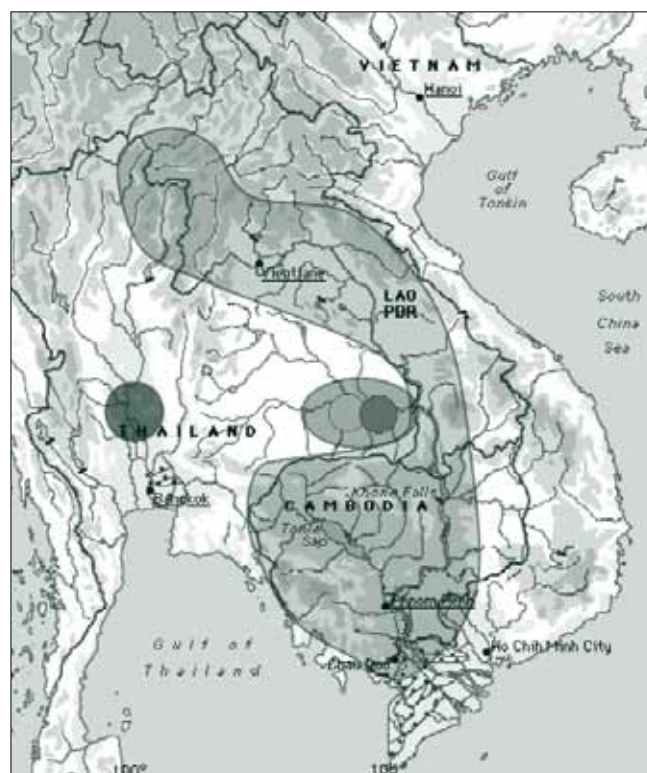
started in early 2004. The researchers used a technique known as mitochondrial DNA analysis (mitochondria are the structures in cells responsible for the biochemical processes of respiration and energy production). Dr Hurwood acknowledged that even field biologists sometimes had trouble distinguishing the two species – some samples identified as one species turned out to be the other and other samples were from neither species.

Based on spatial analysis of molecular variation, the researchers found at least five independent stocks of *H. siamensis* including four in the Lower Mekong Basin (see map below). One covered an area above the Khone Falls including the Mun and Songkhram Rivers. Two similar groups were found further upstream around Nong Kai and Chiang Saen and a separate stock was found in the Mae Klong basin. Below the Khone Falls in Cambodia and Viet Nam, the study indicated at least one and possibly two independent stocks.



Studies located at least five independent stocks of *H. siamensis*

For the smaller species (*H. lobatus*), the researchers found three stocks – one along the entire stretch of the Mekong from Viet Nam to northern Thailand, another in the Mun River and a third group in the Chao Phraya basin (see map above right). Researchers also found one specimen from the main Mekong stock in the Chi River, the longest river in Thailand which flows into the Mun. If the main Mekong stock is found to be more widespread in the



Researchers also found three stocks of *H. lobatus*

Mun River, Dr Hurwood said the researchers would like to find out if the two stocks interbreed.

Since the two species are so genetically and ecologically different, the study concludes that separate management strategies would be needed for ongoing sustainable exploitation of the stocks. Further research is expected to focus on verifying whether or not two independent stocks of *H. siamensis* exist below the Khone Falls and investigating the possibility of an “evolutionary significant unit” of *H. lobatus* in the Mun River. And to avoid any more confusion out in the field, the researchers also hope to develop a genetically-based identification system for distinguishing cyprinid species.

* The most recent publication on fishes of the Mekong by a recognised taxonomist is “Fishes of Laos” by Maurice Kottelat in 2001. He refers to both species as *Henicorhynchus*. A taxonomic revision by Tyson Roberts in 1997 placed both species in the genus *Cirrhinus*. The MRC has previously referred to both species as *Cirrhinus* while the FishBase website lists them as *Henicorhynchus siamensis* and *Cirrhinus lobatus*.

A Czech connection

What does the Czech language have in common with Khmer, Lao, Thai and Vietnamese?

While biologists are still arguing about what to call the two small carps that dominate the annual catch in the Lower Mekong Basin, ordinary people in Cambodia, Lao PDR, Thailand and Viet Nam know what they're talking about.

The two species are collectively known as *trey riel* in Khmer, *pa soi* in Lao, *pla soi* in Thai and *ca linh* in Vietnamese. To distinguish between the two species, all four languages add modifiers to the "core" common names. So the Siamese mud carp (*Henicorhynchus siamensis*) is known *trey riel tob* in Khmer, *pa soi hua po* in Lao, *pla soi hua klom* in Thai and *ca linh ong* in Vietnamese. *H. lobatus* is *trey riel ongkarm* in Khmer, *pa soi hua lam* in Lao, *pla soi lord* in Thai and *ca linh thuy* in Vietnamese.

H. lobatus has no common name in any European

language except Czech where it is called *ostroretka mekongska* ("Mekong carp"). That's consistent with *ostroretka siamska* ("Siamese carp") for *H. siamensis*. According to the FishBase website, the Czechs - who have been raising carp in ponds for centuries - have common names for no fewer than 48 cyprinid species. Most cover the *Chondrostoma* genus of carps found in Europe.

But the Czechs also have names for 11 species of *Cirrhinus* and three *Henicorhynchus* species as well as the reba carp (*Labeo ariza*) from India and an obscure species (*Gymnostomus horai*) from Myanmar. Known as *ostroretka salvinska* ("Salween carp") in Czech, this small carp is thought to occur only in Inle Lake in the Salween River Basin. Like many other cyprinids, it has no common name in English or any other European language apart from Czech. Given their contribution to the global fish catch, maybe the Siamese and Mekong carps deserve better recognition.



Lake Inle – home of the Czech-named *storoetka salvinska* ("Salween carp"), as seen by members of the MRC's Technical Advisory Body for Fisheries Management team during a visit to Myanmar in November 2006.

Photo: Wolf Hartmann

Documenting deep pools around the Great Lake in Cambodia

Cambodian researchers have documented the location of deep pools in the streams in the catchment of the Great Lake in Cambodia. The surveys were conducted by Chan Sokheng, Putrea Solyda and Lieng Sopha of the Inland Fisheries Research and Development Institute (IFReDI). Based on interviews with people in 64 villages, they documented 123 deep pools in the Tonle Sap and its tributaries. Most of the pools have depths of between one and 7 m during the dry season although four are more than 15 m deep. The biggest pool was reported to cover an area of almost 15 ha.

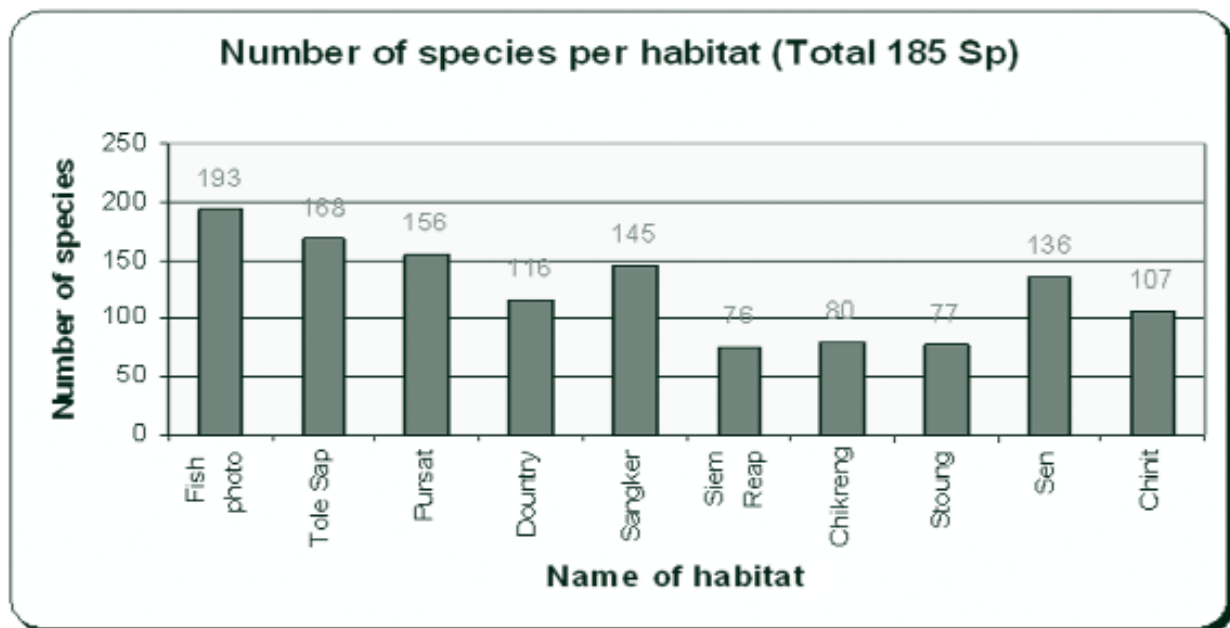
Using photographs of nearly 200 fish species commonly found in Cambodia, villagers identified 185 species from the deep pools around the Tonle Sap, including 156 in the Pursat River, 145 in the Sangker River and 136 in the Sen River. Fewer species inhabited deep pools in five other tributaries. One hundred and sixty-eight species were recognised as living in the deep pools in the lake itself. Most species spawned between May and August, although some spawned between January and April.

Among the nets used in deep-pool fisheries, villagers

identified both stationary and drifting gill nets as well as cast and scoop nets. Other types of gear include horizontal cylinder traps and long-handled scoop baskets as well as hooks and lines.

Villagers identified fishing pressure and hydrological changes as the two major threats to deep pools and their associated fish stocks in the Tonle Sap and its tributaries. Fishing pressure is the result of both overfishing and use of illegal gears. They also said deep pools are threatened by hydrological changes caused by dams and irrigation systems, as well as collapsing riverbanks and increasing silt loads. Representatives of the communities considered they did not have sufficient knowledge and resources to adequately manage the pools.

The identification of the pools – considered important dry-season habitats for many fish species in the Lower Mekong Basin – is part of a broader MRC project to produce an atlas of deep pools in the region. The project, coordinated by Wisa Wisesjindawat from the MRC's Information and Knowledge Management Programme, is expected to be completed in 2007.



Source: Chan Sokheng, Putra Solyda and Lieng Sopha

Mekong Fisheries Index

Thais help protect Cambodian fishery

Bangkok Post, October 16, 2006

Thai villagers in Nakhon Phanom have lent their local wisdom to Cambodian villagers in Stung Treng, helping them learn about and protect their local fishery which has seen a drastic decline in fish species in recent years. The villagers met residents of four villages in Stung Treng, sharing their methodologies for conducting their own Thai Baan research and exchanging conservation lessons. Research and conservation efforts in Thailand helped to raise Thai villagers' awareness of environmental and forest protection. The management of resources in the Songkhram River is a successful project of the Mekong Wetlands Biodiversity and Sustainable Use Programme (MWBP). It is a joint programme of development agencies including the United Nations Development Programme, the Mekong River Commission and the World Conservation Union. Its research on identifying the number of fish in the Songkhram River was published last November. According to the findings, there are 120 fish species in the site. Five of them are classified as abundant, 32 as rare, 80 as medium and two as endangered. The villagers believe excessive and illegal fishing to accommodate commercial needs in other big cities such as Phnom Penh had resulted in the decline in fish numbers.

Viet Nam fisheries to focus more on quality over quantity

Viet Nam News Service, 27 September 2006

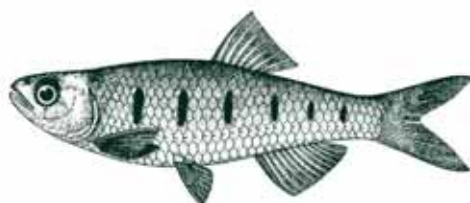
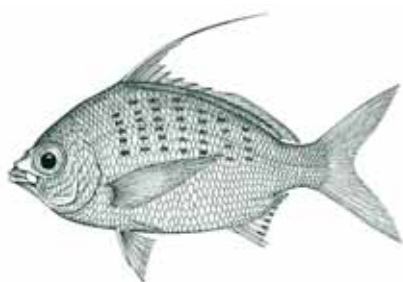
The fisheries sector will prioritise quality over quantity in its 2010 to 2020 plan, according to Mr Nguyen Chu

Hoi, director of the Fisheries Planning and Economic Institute. "In developing fisheries we aim to meet domestic as well as export demand, while firmly upholding export turnover," he said. "It is important to pay attention to science technology applications, especially biological technology. Continuing to change the business structure, balancing exploiting and breeding, linking producing and processing, consumption and environment protection are other priorities. The targets by 2010 include: fisheries output to increase an average of 3.8 per cent per year, export turnover at 10 per cent per year, and labour resource at three per cent annually. In the early fisheries development planning, we didn't pay much attention to inter-industries, while the resources of each region such as the Mekong or Red River Deltas are often shared with other economic industries. Therefore, in the future, the relevant agencies should co-operate to allow an agreement which will not cause conflict among concerned industries."

At least 10 rare Irrawaddy dolphins born in Cambodia, official reports

Agence France-Presse, 5 October 2006

At least 10 young Irrawaddy dolphins have been discovered in Cambodia, according to a government official, raising hopes the rare animal was being pulled back from the brink of extinction. The calves, observed by fisheries officials, were most likely born between May and July in the Mekong River not far from the Lao border, said Touch Seang Tana, who chairs a government commission established to protect the dolphins. The commission was set up earlier this year after at least 12 dolphins died in January and February, raising extinction fears.



Conservationists estimate that fewer than 100 Irrawaddy dolphins exist in the wild. But the official said this number could be around 130 and that he hoped there would be as many as 170 within the next five years. He said since the beginning of the year, 66 guards had been posted along the river to protect the dolphins. Only two dolphins had been found dead since the commission was established. Starting next year, all fishing nets, which are the primary cause of dolphin deaths, will be banned along the stretch of Mekong from the central town of Kratie to the Lao Cambodian border.

Rare fish found

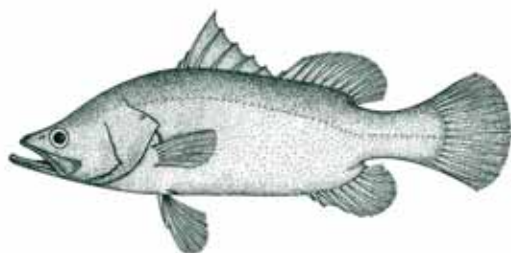
Viet Nam Bridge, 21 November 2006

Biologists have recently found an *Anh Vu* fish, one of the rarest and most precious river fishes in Viet Nam, in the Xuan Son National Park in the northern midland province of Phu Tho. The *Anh Vu* fish, known under the scientific name of *Semilabeo obscurus*, often lives in the bottom of the river and eats moss.

Seafood exports up 25% on last year

Viet Nam News Agency, 24 November 2006

Seafood exports so far this year hit US\$3.08 billion, an increase of 25 per cent over the same period in 2005, according to the Ministry of Fisheries. The November figure is above the Government's \$3 billion annual target. The ministry attributes the stronger-than-expected growth in exports to high prices for seafood in the world market. Shrimp prices are expected to continue rising due to recovering exports to the US and Japan, and to surging demand in the domestic market during the wedding season from September to December and the Lunar New Year in February. The ministry has also voiced concern about shrimp export restrictions. The Japanese authorities have proposed an investigation into shrimp and cuttle fish imports from Viet Nam, while Russian officials have decided to first test and then allow imports into their market starting in early January. As a result, the Ministry of Fisheries is co-operating with the People's Committees in the Cuu Long (Mekong) River Delta



provinces to create and implement programmes to improve industry safety and product quality.

Fish migrations show oceans warming up

The Nation, September 2006

A warm water Atlantic triple fin fish has, for the first time, been caught off the coast of Britain in another sign of species migrating north as global temperatures rise, experts said. The triple fin fish is usually found off the coasts of Africa, South America and the Mediterranean but was caught in the Bristol Channel. In August, a fisherman on the northeast coast of England caught a large swordfish far away from its natural habitat in the Mediterranean and in July scientists reported a shoal of sunfish had been spotted in the waters off Cornwall (in the south west of the country) despite normally being found thousands of kilometres away.

Giant catfish dies after getting caught in net

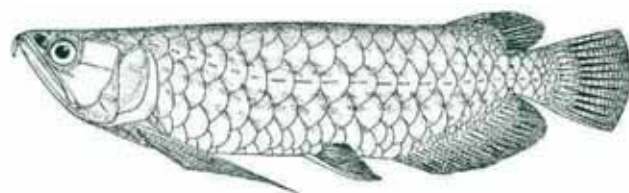
Cambodia Daily, 30 November 2006

A critically endangered Mekong giant catfish caught in Phnom Penh died after getting accidentally tangled in a research facility net, officials at the Ministry of Agriculture's Fisheries Administration said. The 2.4 m long, 184 kg fish was caught in a bagnet on the Tonle Sap river about 2 km upstream of the Japanese Friendship Bridge, said Fisheries Administration Director Mr Nao Thuok. It was the fifth giant catfish caught by the administration this month and the second to die. Mr Nao Thuok added that the specimen caught would be stuffed to it could be displayed on July 1 – National Fish Day.

Ministers back plan to tackle drought in Mekong Basin

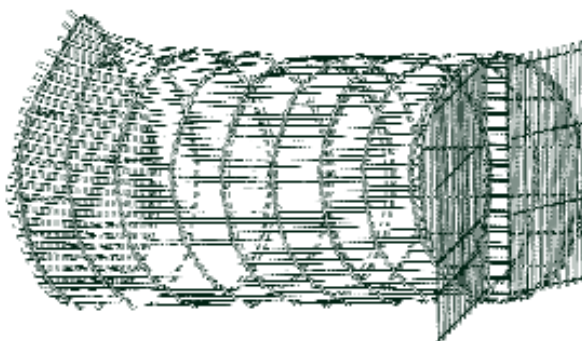
MRC Press Release, 12 December 2006

Senior Government Ministers representing the four Mekong River Commission (MRC) member countries met in Ho Chi Minh City, Viet Nam for the 13th Meeting of the MRC Council and discussed the launch of a new Drought Management Programme to be



implemented by the MRC in 2007. In addition to the flood issues that are being addressed by the MRC's Flood Management and Mitigation Programme, MRC Council members from Cambodia, Lao PDR, Thailand and Viet Nam said that it was time the MRC took a leading role in drought management at a regional scale as this would involve issues of transboundary water management. Other business included the launch of Phase 2 of the Basin Development Plan (BDP2) and an extension to the Water Utilisation Programme. BDP2 will see the preparation of a rolling Integrated Water Resources Management-based Basin Development Plan, the identification and short listing of a portfolio of programmes and projects, better assessment tools, an improved knowledge base and enhanced capacity for planning and mediation. The WUP extension is primarily intended to build national capacity in the implementation of the Decision Support Framework (DSF) modelling software and the technical guidelines for the Procedures for Maintenance of Flows on the Mainstream and the Procedures for Water Quality as well as continuing discussions on these guidelines and maintaining the DSF applications. Apart from the Drought Management Programme the MRC is also undertaking formulation of a Hydropower Programme

and an Information Knowledge Management Programme.



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