Catch and Culture

Fisheries Research and Development in the Mekong Region

Volume 13, No. 2 ISSN 0859-290X September 2007

INSIDE

Catch and Culture is published three times a year by the Mekong River Commission Secretariat in Vientaine, Lao PDR and distributed to over 650 subscribers around the world. Free email subscriptions to *Catch and Culture* are available through the MRC website, www.mrcmekong.org For information on the cost of hard-copy subscriptions, contact the MRC's Documentation Centre by email to doc.centre@mrcmekong.org

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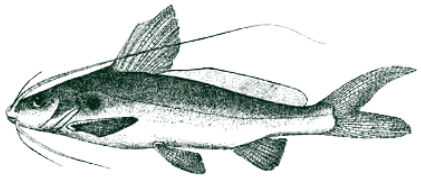
Editorial



For several years, Catch & Culture has wanted to review the booming catfish industry in the Mekong Delta. For various reasons, it never happened. Earlier this year, however, it all fell into place thanks to several important developments including the first international catfish conference, held in Ho Chi Minh City in June. The conference was timely - catfish production in the delta doubled last year and is expected to surpass a million tones this year. In terms of volumes, Vietnamese catfish production is now starting to rival the global salmon industry.

The lead story in this issue focuses on a selective breeding programme for one of the most commonly-farmed catfish in the delta. Dating back to 2000, the program aims to accelerate growth and increase fillet yield for farmers. The initial results have been very encouraging, prompting the Research Institute for Aquaculture No. 2 (RIA2) in Ho Chi Minh City to register its own brand name for the increasing amount of fry that are now being distributed to farmers in the delta.

Our profile of the catfish processing industry includes material from various presentations at the conference in June as well as an article on the development of certification standards, which were to be discussed at a separate meeting in Ho Chi Minh City in late September. We also have a special colour insert that covers the various stages of catfish processing from the unloading of live fish from the farms to the packaging of frozen fillets for export.

Moving away from aquaculture, we also look at what's happening with catfish in the wild. One article looks at the significant genetic variation among three populations of the most widely-farmed species. Another looks the importance of channels around the Khone Falls for various catfishes and other species migrating upstream from Cambodia. A third article examines the most compelling evidence to date that a unique species of catfish believed to spawn along Lao and Thai stretches of the Mekong River actually spends most of its adult life in the South China.Sea.

This issue also features several other fascinating stories, notably the first of three articles on the hydrology of the Mekong River Basin and how it compares to the other great river basins of the world. The first article looks at the annual meteorological floods that occur in the Mekong and how they are affected by the Southwest Monsoon.

We hope you enjoy the current issue, which attempts to cover as many aspects of Mekong catfish research and development as possible.

The Editors

Selective breeding of *Pangasianodon hypophthalmus* yields **promising results**

A selective breeding programme to accelerate growth and increase fillet yield is delivering promising results in Viet Nam. Farmers in two Mekong Delta provinces are already getting access to better quality seed.

In an ideal world, farmers would get their animals to grow faster without making additional investments on things like feed and hormones. The animals would be more healthy and fewer would die. And without paying more money each time they went shopping, consumers would get more meat – and less bones and fat – at their tables. The Research Institute for Aquaculture No. 2 (RIA2) in Ho Chi Minh City may not be that ambitious. But recent successes with a seven-year breeding program for sutchi river catfish (*Pangasianodon hypophthalmus*), a widely-farmed species from the shark catfish family, have prompted RIA2 to register its own brand name. The genetically-improved fish from this particular genus will be marketed as "PanGI", considered acceptable both for Viet Nam, where the species is known as *ca tra*, and foreign markets where it is most often referred to as "pangasius" after the genus of another species in the same family (Bocourt's catfish or *Pangasius bocourti*). Other trade names range from "panga" to "hypobasa" and even "dory" in some Southeast Asian markets.

Collecting the eggs

PHOTO: JOE GARRISON

Under the “Selective Breeding Programme to Improve Growth Rate and Fillet Yield by Family Section”, farmers in the Mekong Delta started receiving fry last year. At the peak of the spawning season between May and September, deputy programme manager Dinh Hung said prices were little as one or two dong each, equivalent to between 8,000 and 16,000 fry for a dollar. Outside the season, the fry fetch up to 10 dong, or about 1,600 for a dollar. As of May this year, Hung said more than 100 million fry had been sold to farmers in An Giang and Dong Thap, two of the delta provinces bordering Cambodia. Sales are expected to reach 200 million fry by October and may be extended to farmers in Tien Giang province and Can Tho municipality this year. For the time being, however, RIA2 is still waiting for the green light from trademark authorities to start using the new brand name.

The programme dates back to a selective-breeding initiative in 2000 by the Support for Aquaculture (SUFA) project of the Ministry of Fisheries and the Danish aid agency Danida. “The aim was to establish broodstock over a long period of selection,” Hung said. “The base population had to have big variations so we collected broodstock from the wild and three big hatcheries in the Mekong Delta.” The original three-year program from 2000 to 2002 cost US$28,000 and was extended in 2003 with an allocation of US$3,000. Following the initial successes, the Ministry of Fisheries allocated a further US$1.4 million from 2006 to 2008.

Researchers at the National Breeding Centre for Southern Fresh Water Aquaculture in Cai Be in Tien Giang province are now working with three base populations descended from fingerlings caught in the wild. The first group comprises individuals selected for body weight in 2001. The first generation produced in 2005 now comprises 75 families. After estimating heritability of body weight and fillet yield in 2006, researchers selected 500 individuals from 45 families as broodstock and a second generation is now expected in 2008. The second base population dates back to 2002, a year after the first. Individuals were also selected for body weight and the first generation was produced in 2006. This group now comprises 79 families and further selection based on genetic parameters is taking place this year. The second generation of this population is expected in 2009.

Unlike the first two groups of individuals selected for a single trait in 2001 and 2002, the third base population of 2003 comprises both individuals and families selected for fillet yield as well as body weight. The first generation from this group of 101 families is

due this year. After establishing the genetic parameters next year and making further selections, a second generation is scheduled to be produced in 2010.

After one generation, the research team lead by programme manager Nguyen Van Sang has found that the selected stocks are growing about 13 percent faster in their first year. Fillet yield is estimated to be as much as three percentage points higher at between 34 and 35 percent of body weight, up from 32 to 33 percent for regular stocks.

Such excellent results are good news for the rapidly expanding catfish industry in the Mekong Delta. During an international catfish conference in Ho Chi Minh City in June, RIA2 director Nguyen Van Hao noted that the “uncontrolled quality of broodstock and fingerlings” was one of the problems facing the industry. Although production started in the seventies, Dr Hao noted that artificial catfish seed had only been widely used since the nineties and that Viet Nam now had a large network of hatcheries producing four to five billion fry a year. But the quality of seed is hard to monitor.

Production of catfish has meanwhile skyrocketed this decade, from less than 100,000 tonnes in 2000 to 400,000 tonnes in 2005 and 800,000 tonnes in 2006. Production is expected to reach 1,000,000 tonnes this year, mostly for export to the European Union and the United States. Dr Hao described recent developments in catfish farming as “too hot” and called for a strategic plan that balanced increased production with environmental protection and social stability. He also recommended a system of certified standards for

hatcheries, grow-out farms and feed manufacturers.

A recent paper by the Vietnamese team highlights the importance the programme. With an ability to produce as many as 300,000 eggs per kilogramme of body weight, the fecundity of this species is very high. So a comparatively small number of broodstock can provide enough seed for a large grow-out industry. If hatchery managers select fish from farms as broodstock, the risk of increased inbreeding is significant. A breeding program based on a maximum number of families with different populations greatly reduces such risks, and provides superior stock for grow-out. Given that frozen catfish fillets are the main product exported, fillet yield and growth rates are the most desirable traits to maximise the cost benefits of catfish farming.

The paper concludes that the program will acquire a "medium to high" response for growth but a "rather low" genetic response for fillet yield. To satisfy the demands of farmers for better quality seed, the authors strongly recommended the continuation of the selective breeding programme along with an expansion in multipliers and dissemination networks to spread the improved stock throughout the industry.

To accelerate dissemination of selectively-bred seed, the program is not only providing fry but also fingerlings and broodstock to hatcheries as well as rearing and grow-out farms in the delta. The program may not help with the zoning and planning at different levels which is needed to ensure the sustainability of the industry. But it goes a long way towards improving quality of the product and profitability of the industry.

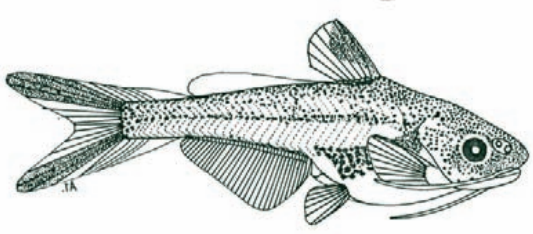
Further reading:

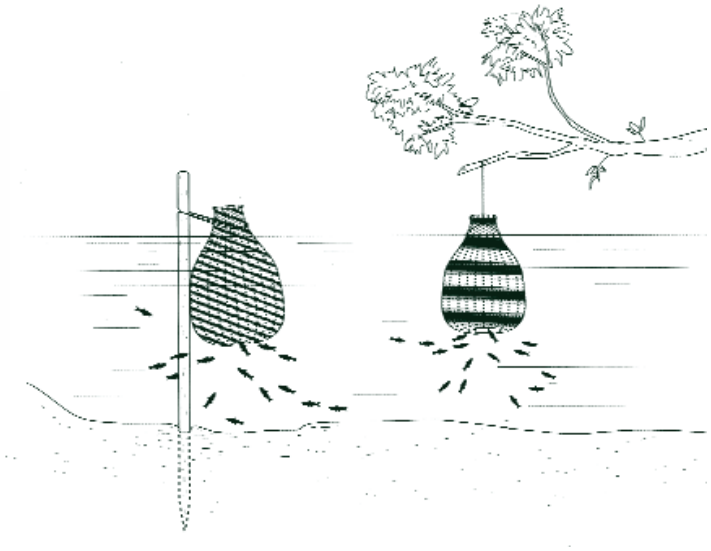
Nguyen Van Sang, Nguyen Van Hao, Dinh Hung, Pham Din Khoi, Bui Thi Lien Ha, Vu Hai Dinh and Nguyen Dien. Selective breeding for growth and fillet yield of river catfish *(Pangasianodon hypophthalmus)* in the Mekong Delta, Vietnam". Aquaculture Asia Magazine, April-June, 2007, pp 26-27.

Ten years and still growing

	1997	2006
Catfish production:	22,500 tonnes	825,000 tonnes
Volume of exports*:	7,000 tonnes	286,000 tonnes
Value of exports:	$20 million	$737 million

Source: Vietnam Association of Seafood Exporters and Producers





Significant genetic **variation** in catfish **eggs** drifting downstream

Larval sampling in Cambodia and Viet Nam shows that three spawning populations are predominant in a commercially-important species from the shark catfish family

In nature, the sutchi river catfish *(Pangasianodon hypophthalmus)* spawns upstream between the Cambodian town of Kratie and the Khone Falls area across the Lao border. MRC Technical Paper No.1 published in 2002 indicated that the three main spawning habitats were around Kampi Creek and the Sambor Rapids in Kratie province and Siembok district in Stung Treng province, also in Cambodia. The spawning grounds of this species consist of rapids and sandbanks as well as deep rocky channels and pools.

In recent decades, commercial catches of this species, known as *trey pra* in Khmer and *ca tra* in Vietnamese, have plunged in the Lower Mekong Basin. At the same time, harvests from sutchi river catfish reared in ponds and cages have grown rapidly in Vietnam (see special insert and separate article on the aquaculture industry on page 16).

This species commences spawning at the onset of the rainy season. The bulk of the egg and larval drift downstream towards the Mekong Delta occurs in June and July, although some eggs and larvae can still be caught in August. Up to three peaks occur in the larval drift, which is influenced by water temperature and rainfall as well as water level and flow. So Nam, deputy director at the Inland Fisheries Research and Development Institute (IFREDI) in Phnom Penh, reckons each peak lasts for a few days and varies in size. The peaks also vary from year to year.

A study by Dr So and two researchers at the Laboratory of Aquatic Ecology in Belgium found that the species spawns in temporally discrete groups separated by several days to weeks. The team found low but significant genetic variation among larvae drifting downstream. The findings are based on larvae collected from Prey Veng in Cambodia and Ving Xuong in Viet Nam during the first, second and third peaks in larval drift between June and August in 2003. Since water can drift from Kratie to the Mekong Delta (a distance of more than 350 km) in four days at that time of year, the larvae were no more than a week old.

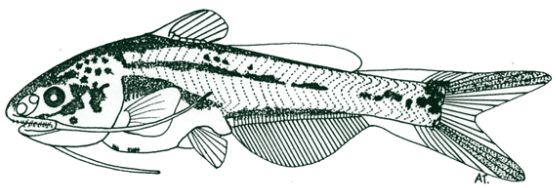
Larval sampling over eight weeks indicated that the larvae mostly came from a large number of families found in three main populations. The study also indicated that population distribution varied with each larval peak, possibly due to variations in cohort structure among sub-adult fish on the feeding grounds. Given that the level, flow and temperature of the water are all ecological triggers for catfish to spawn, changes in population distribution may reflect fluctuations in the natural physical environment. Alternatively, the authors suggested, the changes may be caused by the availability of food—phytoplantkon and zooplankton—that affects larval survival.

The authors concluded that analysing spatial and temporal patterns of various life stages of known age should be a priority for genetic research in the Mekong. In particular, they argued, insights are required into the dynamics of adaptation as well as the interaction between genetic structure and life history in areas such as age, sex, size, growth and survival of the species.

Further Reading:

So Nam, Gregory Maes and Filip Volckaert. 2006. Inter-annual genetic variation in the downstream larval drift of sutchi catfish *(Pangasianodon hypophthalmus)* in the Mekong River. *Biological Journal of the Linnean Society*. **89**: 719-728.

So Nam, Gregory Maes and Filip Volckaert. 2006. High genetic diversity in cryptic populations of the migratory sutchi catfish *Pangasianodon hypophthalmus* in the Mekong River. *Heredity*. **96**: 166-174.



Floods and the **Mekong River system**

By Tim Burnhill and Peter Adamson*

This is the first article in a series of three in which we look a the character of the Mekong's annual flood, particularly the factors that define the 'natural envelope' or variability of the system. In this first article we examine the flood in a global and historical context. The other two articles will describe the specific characteristics of the flood, the shape of the annual hydrograph, the criteria that define the dry and wet seasons, and what are the extremes of the system's natural envelope and their causes. The aim is to present our understanding of the system today with an eye to how it many change in the future, and what these changes may bring to the people of the basin.

The annual flood impacts everybody who lives near the Mekong or one of its tributaries. For some it may only bring minor inconvenience, such as a difficult journey to work or a short power cut; for others it may cause the destruction of a livelihood or lead to major loss of property or life. Over the millennia since humans first colonised the Mekong Basin, people have built their ways of life around the yearly cycle of flood and recession none more so than the fishers of the basin. Nevertheless, extremes of flood and drought can still cause severe hardship, even for those inhabitants whose families have lived in basin for many generations.

Great historical floods

On 3rd September 1938 the gauge station at Kratie in Cambodia recorded a flow of 66,700 cubic metres a second (cumecs). This is the highest flow measured on any stretch of the Mekong in the 80 years since reliable measurements were first taken[1]. Impressive as this figure may appear (being 22 percent above the average annual peak flow at Kratie of 52,000 cumecs) it pales by comparison to the 110,000 cumecs measured in the Yangtze in 1870 (which is the highest flow measured in East Asia) or the astounding 370,000 cumecs recorded in the Amazon at Obidos, Brazil, in 1953, which is the highest flood resulting purely from rainfall recorded in the world (Table 1).

However, excessive rainfall is not the only, or even the principal cause, of the world's largest recorded floods. These result from the failure or breach of natural dams and the release of impounded waters, and they account for seven of the eleven recorded floods greater than 100,000 cumecs. The most catastrophic flood on record occurred in 1841 when a temporary natural dam formed by a rockslide across the Indus River failed, releasing a flow in excess of 540,000 cumecs. Going back into recent geological history, the floods associated with glacial retreat at the end of the last ice-age (over 10,000 years ago) were even larger. The largest of these, caused by the failure of an ice-dam that blocked the Kuray River at Altai, Russia, is estimated to have been in the order of 18 million cumecs — 270 times the record flow at Kratie.

Meteorological floods

Returning to extreme floods caused by excessive rainfall (or more correctly meteorological floods), the 1938 flood places the Mekong Basin eighth in a global ranking of basins in terms of the largest recorded floods (Table 1).

Surprisingly, however, the Mekong Basin ranks only twenty-third in a global listing based on catchment area[2]. (There are many basins with a larger catchment than the Mekong but which have a smaller flood — the Indus, from the tropics, and the Volga, from temperate latitudes, are two well known

[1] It is quite probable that this figure was exceeded in 1978, the year that the largest flow at Pakse (nearly 400 kms upstream in Lao PDR) was recorded but unfortunately only the height of river and not its velocity were measured that year at Kratie.

examples.) However, generally speaking there is a linear relationship between catchment area and the magnitude of the largest flood — it is just that the Mekong and a few other rivers buck this trend.

To understand why the Mekong is different we have to examine the "unit runoff" (cubic metres per second per square kilometre) of the world's major river basins at the time of the extreme floods. The average unit runoff for basins with a catchment area exceeding 500,000 km^2 is 0.042 cumecs/km^2. However, the unit runoff of the Mekong (0.103 cumecs/km^2) during the 1938 flood is more than twice the average for these basins, and is greater than both the Amazon and Ganges; being exceeded only by the Yangtze, Orinoco and Brahmaputra (Figure 1).

Figure 2 plots of the unit runoff of the major basins against geographical latitude. From the plot we can see that the river basins with the largest rainfall-related floods, particularly those with the largest unit runoff, occur in basins that lie in a belt extending from just south of the equator to the latitude 40°N. It is therefore tempting to equate extreme rainfall-related floods with humid tropical climates. However, other

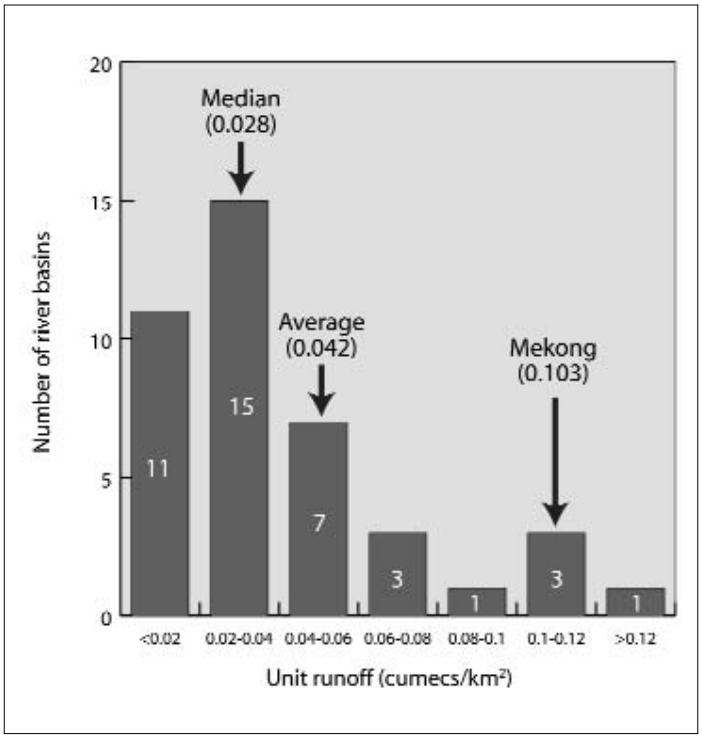


Figure 1. Frequency distribution of unit runoff in river basins with a catchment area greater than 500,000 km^2.

Table 1. Top-ten river basins in world in terms of maximum recorded rainfall-related flow.

River basin	Country of ultimate discharge	Date	Basin area (10^3 km^2)	Station area (10^3 km^2)	Peak discharge (m^3/s)	Unit runoff (cumecs/km^2)
Amazon	Brazil	Jun 1953	5854	4640	370,000	0.080
Yangtze	China	July 1870	1794	1010	110,000	0.109
Orinoco	Venezuela	March 1905	1039	836	98,120	0.117
Brahmaputra	Bangladesh	August 1974	650	636	81,000	0.127
Congo	Zaire	December 1961	3699	3475	76,900	0.022
Ganges	Bangladesh	August 1973	976	950	74,060	0.078
Mississippi	USA	May 1927	3203	2928	70,000	0.024
Mekong	Viet Nam	September 1939	774	646	66,700	0.103
Yenisey	Russia	May 1937	2582	1400	57,400	0.041
Parana	Argentina	June 1905	2661	1950	43,070	0.043

Note: Data from O'Connor and Costa (2004)

[2] To ensure equitable comparison, the ranking is based on the catchment area that contributed to the flow at the measuring stations, not the catchment of the whole basin.

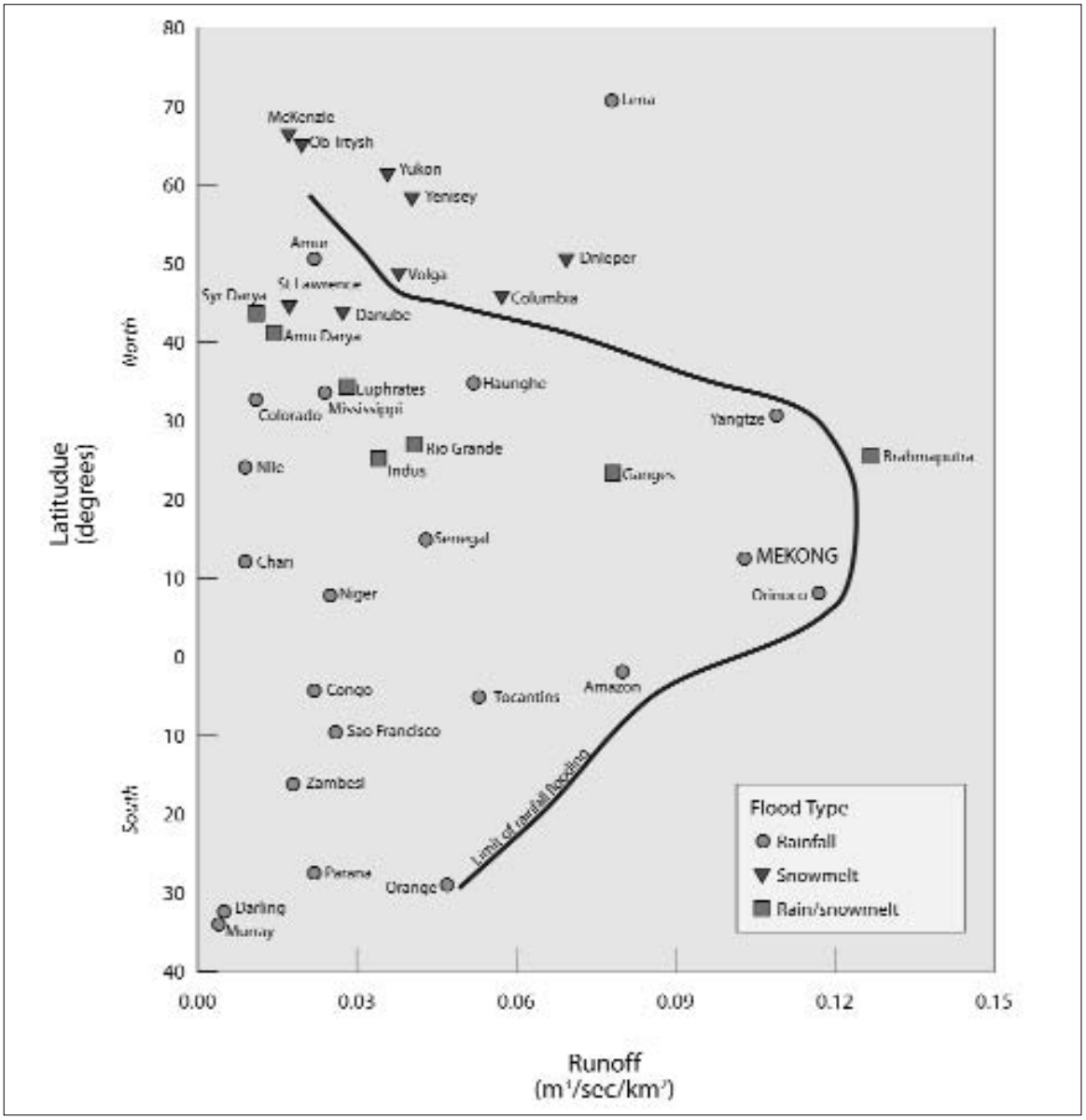


Figure 2. Unit runoff of the world's major river basin and their geographical latitude at the station where the record flood was measured (after O'Connor and Costa, 2004).

factors, such as seasonality and orography (the influence of mountain ranges), come into play. The flow in many river-basins in humid tropical regions shows little annual variation. These basins, such as the Congo, suffer extreme floods because they drain vast catchments that are subject to heavy rainfall (>1,800 mm/yr,) despite having below average unit runoff (0.022 cumecs/km^2 in the case of the Congo).

The flow in the Mekong basin, by contrast, shows great seasonal variation (the flow in the wet season may be 12 times greater than during the dry season) and most of the annual rainfall (which is comparable to the Congo's) occurs within a few months. This compensates for the Mekong's relatively small catchment and accounts for the basin's above average unit runoff during times of extreme flooding. In the case of the Mekong, most rain falls on the high mountains of northern Lao PDR and the Annamite Ranges of Lao PDR and Viet Nam, and this exacerbates the effects of large amounts of rain falling in a limited area over a short period of time.

The Southwest Monsoon

The pattern observed in the Mekong is typical of basins, such as the Ganges and the Oronoco (both of which have well above average unit runoff), where rainfall patterns are dominated by a single monsoonal weather system. For the Mekong the Southwest Monsoon is, of course, the dominant climatic influence, and therefore understanding this monsoon, particularly its causes and variability, is the foundation

for understanding the causes and variability of floods in the Lower Mekong Basin.

This weather system is a direct consequence of the present distribution of oceans and continents[3] and is probably as least as old as continental Asia itself[4]. However, the system is not static and it changes in response to a variety of cyclical global-scale climatic phenomena, such as the El Nino Southern Oscillation, or the ENSO (Wang *et al.*, 2005). Palaeo-climatic data, particularly ancient vegetation patterns indicated by fossil plant spores and pollen, suggest that today's strongly seasonal monsoon is as little as 5,000 years old, before which time the SW monsoon was possibly stronger and the flood more perennial and less seasonally extreme (Penny, 2004).

There are a number of reasons why understanding these seemingly far-distant climatic events are relevant to the challenges that today face the sustainable development of the Mekong's water resources. Firstly, many of the large-scale environmental issues that will impact the basin in the future, such as climate change and rising sea level, mirror historical geological and palaeo-climatological processes. If these climate changes mean more intense floods, then we surely need to know about it.

Perhaps of more immediate importance, the aquatic habitats and ecosystems of the Mekong today developed as a consequence of the changing character of the river and the monsoonal climate and its associated floods. The river's prolific plant and animal life evolved in-step with these changes and are well adapted to the monsoon's strong seasonality.

However, we do not know how this biota, and the countless livelihoods that depend on it, will adapt to changes to the flood regime brought about by human activitiesthat will happen in decades rather than millennia.

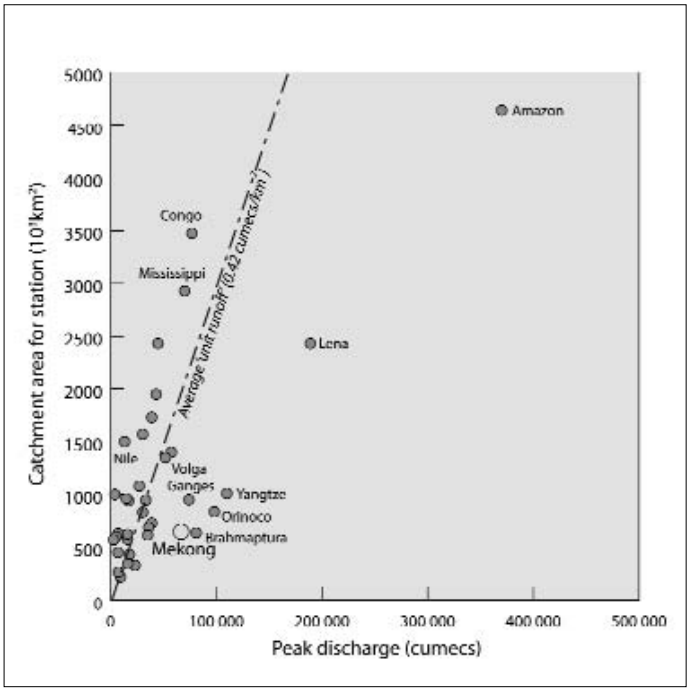


Figure 3: Peak discharge for the world's major river basins. (Data from O'Connor and Costa, 2004)

Further reading:
Penny (2006) The Holocene history and development of the Tonle Sap, Cambodia. Quaternary Science Reviews 25: 310-322.

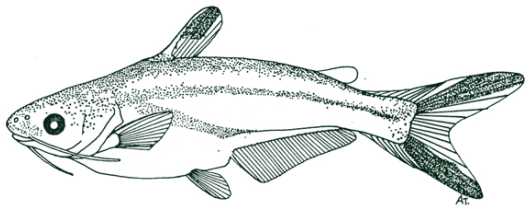
MRC (2007) Annual Mekong Flood Report 2006, Mekong River Commission, Vientiane, 76pp.

Wang *et al.*, (2005) Evolution and variability of the Asian monsoon system: state of the art and outstanding issues. Quaternary Science Reviews 24: 595-629.

O'Connor, J.E. and J.E. Costa (2004) The world's largest floods, past and present-their causes and magnitudes. US Geological Survey Circular 1254. 13pp.

Latrubesse, M.E., Stevaux, J.C. and R. Sinha (2005) Tropical Rivers. Geomorphology 70: 187-206.

* *Dr Burnhill is a science editor and Dr Adamson is a hydrologist providing consulting services to the MRC.*



[3] The major portion of the Asian continent lays in the northern hemisphere. The southern hemisphere is by and large covered in ocean. The SW monsoon develops from major low-pressure cells over mainland Asia during the summer months of the northern hemisphere. These low-pressure systems draw hot moist air from over the southern oceans across Southeast Asia.

[4] Current palaeo-climatic thinking places the age of the monsoon system at about 15 million years and is coincident with the elevation of the Himalayan-Tibetan Plateau. The plateau itself was formed during the collision between the Indian and Asian tectonic plates, which was the last of a series of collisions that shaped the current configuration of the continental landmass of Asia (Wang *et al.*, 2005).

ADB retires **fisheries** policy

An internal evaluation study finds the Asian Development Bank's fisheries policy to be redundant, largely irrelevant and probably unsustainable. Released earlier this year, it recommends retiring the policy within 12 months and reclassifying aid to aquaculture as part of agricultural development.

A few months after holding its 30th birthday bash in the Japanese city of Fukuoka in 1997, the Asian Development Bank (ADB) adopted an ambitious policy for the fisheries sector. For regional policy developers and strategic planners, the mid-nineties had been an exciting time to work for the bank as Asia's "miracle" economies boomed. The ADB had adopted a population policy in 1994 and a policy on research into agriculture and natural resources in 1995. During this period, it also revised its policy for the energy sector and adopted several new "cross-cutting" policies for regional cooperation, governance and involuntary settlement.

Between 1969 and 1979, most ADB assistance to the fisheries sector had focused on large-scale fisheries. In the nineties, however, the approach to fisheries started taking environmental and social concerns into account. The policy adopted at the height of the Asian financial crisis in October 1997 expressed concern about widespread poverty among small-scale fishers and overfishing. One of its five guiding principles dealt with sustainability, equity in balancing the interests of competing resource users and efficiency in developing and managing aquatic resources. Other principles were a greater role for the private sector in fish marketing and processing, government responsibility for regulating the sector, rigorous application of ADB environmental guidelines and a participatory approach to fisheries projects.

Review of the Policy

Ten years on, the policy is in tatters. According to Bruce Murray, the ADB Director-General in charge of evaluating operations, "the overall rating of the fisheries policy is unsuccessful" as far as relevance, effectiveness, efficiency and sustainability are concerned. Murray, who authored a special 176-page evaluation study released early in 2007, said the policy "did not make a significant difference" in guiding ADB operations in the fisheries sector. Moreover, it was only "partly relevant" to designing projects and carrying them out. "With the evolution of global and regional policy initiatives, emerging issues, and contemporary challenges, the fisheries policy has become redundant," he concluded. "The policy has been largely irrelevant in terms of influencing national fisheries policy development, has been less effective and efficient in terms of ADB's fisheries operations, and its implementation is unlikely to be sustainable in the future."

What went wrong? One explanation is that its approach to managing capture fisheries had simply become outdated. As a result, it lacked the terminology to deal with new concepts like co-management and community fisheries. According to Murray, another deficiency was that it took a "conservative" approach to aquaculture, combining it with capture fisheries rather than recognising fish farming as a form of agriculture. So it was poorly placed to recognize the recent shift to more responsible environmentally-friendly systems of fish farming. Perhaps the biggest criticism, however, was that the policy lacked guidelines for applying, implementing and enforcing policies and also had no monitoring framework for policy implementation.

In short, the policy was little more than a "combination

ADB operations in fisheries 1968-2005 ($m)

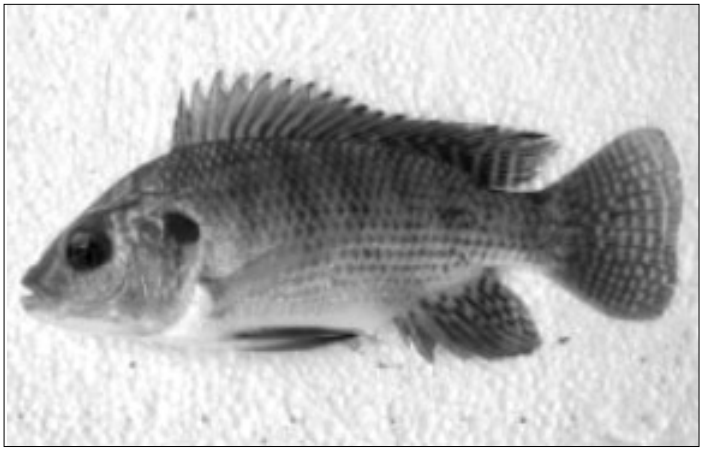
Year	Loans	Regional Grants	Country Grants
1968-69	17.0	0.2	0.0
1970-79	247.7	2.1	0.1
1980-89	575.8	10.1	3.8
1990-99	385.0	20.6	16.6
2000-05	174.9	17.1	4.3
Total:	1,400.4	50.1	24.8

Source: Asian Development Bank

of directives, safeguards, and approaches provided in a context that makes identifying one from the other difficult," Murray wrote. "The lack of mutual acknowledgment among existing ADB policies and guidelines is also a source of confusion." As an example, he cited environmental assessment guidelines adopted by the bank in 2003. These include a checklist for fisheries that fails to even acknowledge the fisheries policy. "Despite the policy statement that ADB fisheries specialists will be asked to review projects with potential impacts on fisheries, interviews with ADB staff confirmed that in-house fisheries specialists have not reviewed any such projects," Murray said. Had the policy not been in place, "most ADB staff confirmed that fisheries projects and TAs would have been designed in the same manner."

The study also found that the bank's fisheries portfolio had "poor results" when compared with other sub-sectors in the agriculture and natural resources sector. Of 29 post-evaluated fisheries projects, a third were rated "unsuccessful" by the end of 2005. Another third were "partly successful" (including two in Thailand and one in Viet Nam). The remaining 31 percent of the projects were either "generally successful" or "successful" (including two in Cambodia and one in Thailand). Problems included poor design, inadequate stock assessments during project preparation, low use of infrastructure and support facilities, and a lack of beneficiary participation.

The 29 projects were among 68 fisheries-related projects worth $1.4 billion approved between 1968 and 2005. Only 14 were approved after the fisheries policy was adopted. With a cumulative loan value of $305 million, these projects represented only 22 percent of the fisheries loan portfolio. As the report noted, "the sector remained a minor part of ADB's lending operations after adoption of the fisheries policy." Overall, the bulk of ADB's fisheries activities were concentrated in three countries - Indonesia, Philippines and Sri Lanka, which together accounted for 61percent of fisheries loans.



Genetically-Improved Farmed Tilapia (GIFT), also known as Super Tilapia, was developed with funding from the ADB as well as UNDP. PHOTO: WORLDFISH CENTER

As for technical assistance, the ADB provided $50 million in grants to the fisheries sector between 1968 and 2005. Half of this went to research, studies, training and conferences. Cambodia received 7.0 percent of overall technical assistance, making it the fourth-biggest recipient among ADB members (behind, Indonesia, Sri Lanka and the Philippines). Viet Nam was the eight-largest recipient, accounting for 4.1 percent.

Some successes

Despite the generally poor assessment, some projects were rated "highly successful" (see table on page 15). The executive summary of the study highlighted two. One succeeded in developing and disseminating genetically-improved tilapia (the GIFT project) in collaboration with the Consultative Group on International Agricultural Research (CGIAR). The ADB investment was relatively small at $2.2 million. The other involved the Inland Fisheries Research and Development Institute (IFREDI) in Cambodia, which was built with Danida funds provided through the MRC Fisheries Programme. An initial $900,000 in technical assistance "helped IFREDI develop its scientific and administrative expertise and boosted Cambodia's capacity building effort for inland fisheries," the study found.

The study noted that the ADB medium-term strategy for 2006 to 2008 had categorized fisheries as a sector with "limited demand" for ADB services and in which the bank's performance had not been strong. In addition to retiring the policy within 12 months and developing a plan for existing fisheries activities, the ADB study recommended reclassifying aid to aquaculture as aid to agricultural development instead. At the same time, it said, the ADB should adhere in principle to the Code of Conduct for Responsible Fisheries of the Food and Agriculture Organisation (FAO) while referring to the policy instruments of regional organisations including ASEAN and the MRC. It should also integrate fisheries into broader approaches to rural development. Acknowledging its "lack of fishery sector expertise", the study called for strategic ADB partnerships with international institutions working in fisheries.

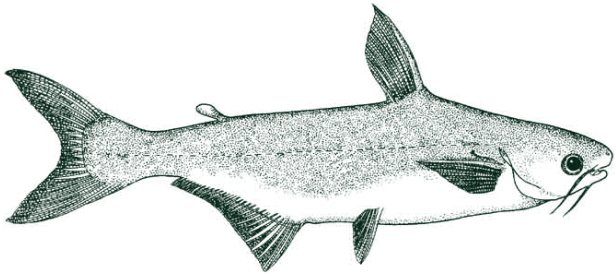
Management responds

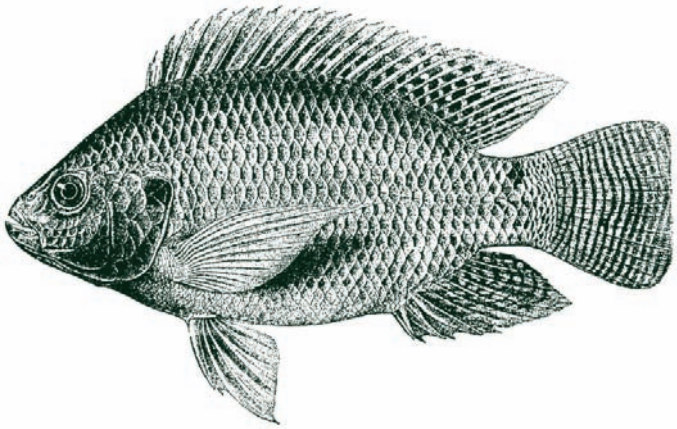
In its general comments on the study, ADB management agreed that the fisheries policy was now "less useful" than it was 10 to 15 years ago. "Redirecting investment away from supporting conventional fisheries-resource management and fishing-industry capacity development will probably protect fisheries and biodiversity better from over-exploitation and further destruction," it said. Integrating fisheries into broader development initiatives "may provide an exit strategy from over-exploitation of fishery resources." It could also "prove more useful in simultaneously addressing poverty-reduction and environmental-sustainability questions than interventions through stand-alone fisheries-sector activities."

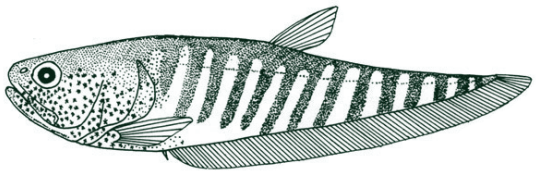
The study also recommended an ADB assessment of its own in-house capacity to administer and service current assistance to the sector. If the bank does not have the ability to network and acquire complementary expertise, "a significant risk is that its current portfolio of fisheries operations will not lead to the anticipated development results," it warned. In addressing this issue, management responded that assessing in-house skills was an "urgent" priority and emphasised the need for people with backgrounds in agriculture, natural resource economics and management. "Staff capacity in fishery and aquaculture biological fields may not after all be as crucial in administering most ongoing and committed projects," management said.

In response to specific recommendations, however, management was cautious about linking fisheries more closely to rural development and reclassifying aquaculture as part of agriculture. Reference to the broad field of rural development "should not become a platform for ADB to continue its engagement in fisheries beyond the transition phase," it said. But "an integrated approach to link fishery, forestry, agriculture and tourism alongside the development of infrastructure and building of human capacities is desirable." At the same time, any reclassification of aquaculture needs to be "carefully nuanced," management said. "It is important not to overlook the dynamic links between aquaculture and wild fish resources. These links are extensive and critical to maintain the environmental and ecological integrity of aquaculture development. There is a danger of falling into the trap of developing techno-centric production systems that will undermine the role of aquatic biodiversity and genetic resources necessary for the long-term sustainability of aquaculture."

Further reading:
The full report titled "Special evaluation Study on ADB's Fisheries Policy" can be accessed at
http://www.adb.org/Documents/SES/REG/sst-reg-2006-07/ses-fisheries.asp







ADB grants and loans to fisheries sector in Lower Mekong Basin

Project Area	Approved	Amount	Rating
Cambodia			
Technical Assistance			
Regulatory and Management Framework	2002	0.54	HS
Research and Development Capacity Building	2003	0.90	HS
Research and Development Capacity Building (II)	2005	0.30	--
Poor Floating Communities on the Tonle Sap [1]	2005	1.00	--
Influence of Built Structures on the Tonle Sap [2]	2005	0.77	--
		3.51	
Loan			
Tonle Sap Environmental Management	2002	***10.9***	Ongoing
Thailand			
Technical Assistance			
Inland Fisheries Development [3]	1977	0.15	--
Aquaculture Development	1978	0.11	--
Fisheries Sector Study	1983	0.15	--
Advisory Services to Cold Storage Organisation	1984	0.07	--
		0.48	
Loans			
Fisheries Development	1975	20.00	PS
Aquaculture Development	1978	14.00	PS
Brackishwater Shrimp Culture Development	1986	11.00	GS
		45.00	
Viet Nam			
Technical Assistance			
Fisheries Development	1970	0.68	--
Coastal Aquaculture Development Study	1995	6.00	PS
Capacity Building at Ministry of Fisheries	1995	10.00	--
Training in Fishing Port Management	2001	1.40	--
Coastal Management Institutions [4]	2002	2.50	--
		20.58	
Loans			
Fisheries Development	1970	2.50	None
Second Fisheries Developm ent	1974	6.00	Cancelled
Fisheries Infrastructure Improvement	1995	57.00	None
		65.50	
Regional			
Technical Assistance			
Critical Wetlands in Lower Mekong Basin	1998	***2.07***	PS

GS = generally successful, HS = highly successful, PS = partly succe ssful
Source: Asian Development Bank

[1] Japan
[2] Finland
[3] European Economic Community
[4] Sweden

Catfish **processing** takes off in **delta** as global **demand soars**

The booming catfish industry in the Mekong Delta is one of the fastest growing types of aquaculture in the world and is now starting to rival the global salmon industry in volume terms

The catfish industry in the Mekong Delta has not only expanded dramatically over the past decade but has also evolved in terms of farming techniques. At the same time, export markets have become remarkably diversified following a controversial anti-dumping ruling by the United States in 2003 which imposed punitive tariffs on Vietnamese catfish (see *Catch & Culture* Vol. 9, No. 2).

Catfish production doubled from approximately 400,000 tonnes in 2005 to reach a record 825,000 tonnes in 2006, and is forecast to surpass one million tonnes in 2007. According to the FAO, global production of salmon was 1.2 million tonnes in 2005.

A decade ago, ponds and cages were used to raise catfish in similar proportions. By 2005, however, ponds accounted for about two thirds of production.

Net pens and cages accounted for the rest, with cages being the least popular type of farming. The Research Institute for Aquaculture No. 2 (RIA2) in Ho Chi Minh City distinguishes between smaller “field ponds” which stock less than 20 catfish per cubic metre of water and larger “island ponds” closer to rivers which stock between 20 and 40 individuals per cubic metre. In field ponds, which are less than 5,000 square metres in area, water is not frequently changed and is not more than two metres deep. In these ponds, the catfish take six to eight months to mature. Island ponds are usually more than 5,000 square metres in area and are up to four metres deep. The water in these ponds is frequently changed and the grow-out period is shorter at five to six months.

Net pens are part of the river and adjoining bank enclosed with a net or bamboo fence, and are usually more than 5,000 square metres. Water exchange is through the natural flow of the river. Net-pen enclosures are generally stocked at 30 to 50 individuals per cubic metre of water. The grow-out period is five to six months.

Quality control at the Anvifish processing plant near Long Xuyen PHOTO: JOE GARRISON

During an international catfish conference in Ho Chi Minh City in June, RIA2 Director Nguyen Van Hao noted that field ponds, islands ponds and net pens covered an area of about 5,000 hectares in 2006. Dr Hao said that field-pond farming had not been growing in recent times while cage farming had been on the decline. In 2004, cages covered about 1,143,000 square metres. Cages are between 50 and 200 square metres and can stock 100 to 250 fish per cubic meter of water.

Bamboo fencing around net pens in the Mekong River in Viet Nam

In terms of operational costs, Dr Hao noted that island ponds and cages required an outlay of about 11,000 dong (68 cents) to produce a kilogram of catfish with a high ratio of white meat which is preferred by most consumers in export markets. Yields are about 1,000 tonnes per hectare for net pens and between 100 and 300 kilograms per cubic metre of water in cages. Island ponds require a smaller investment of 10,000 dong per kilogram but the flesh is less white and the yields are lower at between 100 and 300 tonnes per hectare. Field ponds require only 9,000 dong to produce a kilogram of fish but the flesh is yellow or pinkish. Yields are even lower at 50 to 80 tonnes per hectare.

Recent quality assurance efforts have included standards developed by An Giang provincial authorities and the Viet Nam Association of Seafood Exporters (VASEP) in collaboration with Geneva-based Société Générale de Surveillance. An Giang Fisheries Import Export Joint Stock Company (Agifish) has meanwhile set up the Agifish Pure Pangasius Union (APPU) which provides products and services in accordance with international quality standards. It includes breeding centres and farms as well as producers of feed and veterinary drugs. Other companies such as Vinh Hoan Co Ltd, a processor based in Cao Lanh in Dong Thap province, have been developing traceability programs and producing "organic" catfish for selected European markets.

During the conference in June, VASEP Secretary General Nguyen Huu Dung noted that it takes only six months to build a plant that can process 300 tonnes a day (the same capacity as the Agifish factory featured in the special insert of this edition). According to Dr Dung, the Mekong Delta is now home to 70 catfish processing plants with a daily production capacity of 3,300 tonnes.

Following the anti-dumping ruling in 2003, exporters diversified away from the United States which was overtaken by the European Union as the biggest single market for Vietnamese catfish in 2004. By 2006, catfish exports had soared to $740 million a year, up from less than $400 million in 2005. VASEP says the EU accounted for more almost 50 percent of exports last year. The biggest single market was Russia with 15 percent followed by Poland and Spain with about 9 percent each. Other big markets were the United States and the Netherlands (about 8 percent each), China and Germany (about 6 percent each), and Singapore, Belgium and Australia (about 4 percent each).

In the EU alone, VASEP estimates that Viet Nam's share of the combined market for frozen freshwater fillets in all 27 member countries is more than 40 percent. VASEP reckons Viet Nam is also the top supplier of frozen catfish fillets to the United States, well ahead of its nearest rivals China, Thailand and Malaysia.

With Viet Nam expected to meet its catfish annual production target of one million tonnes three years ahead of schedule in 2007, the current focus is on developing good aquaculture practices in the delta. Dr Hao said the plan was to address issues such as disease, intensive farming and environmental protection as well as monitoring and traceability—the ability to record every step in the production process. Partners include the Network of Aquaculture Centers in the Asia Pacific (NACA) and the Australia Centre for International Agricultural Research (ACIAR). According to Dr Dung, such practices will be voluntary and equivalent to European standards as well as best practices adopted by the Aquaculture Certification Council of the United States.

Dialogue on catfish **industry** aims for **sustainability** through **consensus** and certification

By Flavio Corsin*

The rapid growth in catfish farming is prompting the development of certification standards to ensure confidence in the industry as an exporter of quality fish produced in an environmentally sustainable manner

The farming of shark catfishes (Pangasiidae) is one of the fastest growing types of aquaculture in the world. It mainly involves sutchi river catfish (*Pangasianodon hypophthalmus* or *ca tra* in Vietnamese) and Bocourt's catfish (*Pangasius bocourti* or *ca basa*). According to the FAO, global production rose from just 10,000 tonnes in 1995 to 440,000 tonnes in 2005. In Viet Nam, where about 90 percent of pangasius farming occurs, 1,000,000 tonnes of pangasius are expected to be produced in 2007-a goal the country had set for 2010. This rapid growth has raised concerns among many stakeholders and has prompted the World Wildlife Fund (WWF) to establish a Pangasius Aquaculture Dialogue (PAD) to address the sustainability of farming by developing certification standards.

WWF, the largest multinational conservation organisation in the world counting about five million members, has been engaged in sustainable aquaculture for more than a decade. Several aquaculture dialogues have been established to develop certification standards for key aquaculture commodities traded globally including shrimp, tilapia, salmon and bivalves. Thanks to a generous grant from the David and Lucile Packard Foundation, the speed at which dialogue standards are unfolding has increased greatly over the past few months. For some commodities—such as tilapia—standards are nearing completion.

The pangasius dialogue is a new initiative for WWF. Like with other aquaculture dialogues, WWF will harness the commitment of the many stakeholders within and outside the supply chain to develop credible certification standards. PAD standards will be developed through multi-stakeholder consultations aimed at achieving consensus on the process as well as on the major impacts of the sector and ways to reduce those impacts in a measurable way. The identification of the major impacts will rely on stakeholders' experience and on detailed surveys, which will allow also the identification of achievable performance thresholds to be reached by the sector.

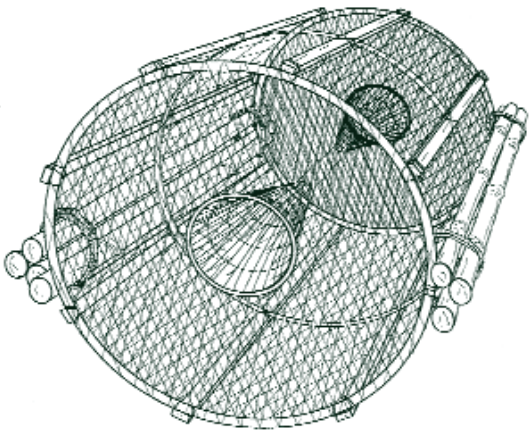
Since they will be based on performance and not be yet another "recipe" for sustainability, it is envisioned that small-scale producers will be able to achieve the PAD standards. Like some large-scale producers, however, some small-scale producers will be required to make improvements to comply. The dialogue will also become a multi-stakeholder forum to develop Better Management Practices (BMP) to comply with the PAD standards. Other standards organisations and governmental agencies have expressed interest in incorporating the dialogue standards within their frameworks.

Dialogue partners

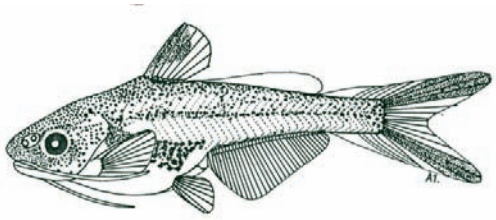
- Small and large-scale farmers
- Processors and exporters
- Vietnam Association of Seafood Exporters and Producers (VASEP)
- Traders and distributors
- Hatchery managers and owners
- Feed manufacturers
- Chemical and drug manufacturers
- Retailers and food industry (European and American)
- Government agencies (Vietnamese and foreign)
- Universities (Vietnamese and foreign)
- Non-profit organisations
- Inter-governmental organisations
- Donors
- Certifiers (observers)

Feeding time at an An Giang province catfish farm belonging to the Agifish Pure Pangasius Union (APPU)
PHOTO: JOE GARRISON

An inaugural PAD meeting, scheduled to be held in Ho Chi Minh City on September 26 and 27, is expected to agree on the PAD process including clear milestones for developing the standards and major impacts that need to be addressed. These will be the first set of standards for sustainable pangasius aquaculture to be developed in compliance with the Code of Good Practice of the International Social and Environmental Accreditation and Labelling (ISEAL) Alliance. Standards will also be developed in compliance with FAO guidelines on aquaculture certification currently under development. Although WWF is playing a key role in the establishment of the PAD, it will be only one of the stakeholders involved in the process as the PAD standards are aimed at being an expression of all the stakeholders



Further reading:
http://www.worldwildlife.org/cci/dialogues/pangasius.cfm



** Dr Corsin is Senior Aquaculture Advisor with the World Wildlife Fund in Hanoi*

Trapping migrating **catfish** in **channels** at the Khone Falls

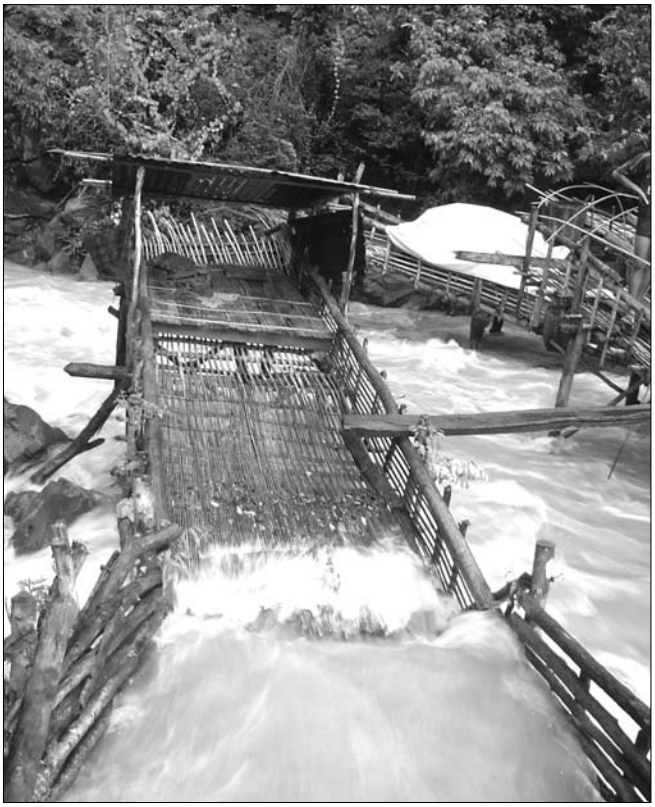
By Kaviphone Phouthavongs and Vannaxay Soukhaseum*

As part of an occasional series, we look at the Lao fishery around the Khone Falls area, one of the most important in the Lower Mekong Basin

With about four-fifths of the country covered by mountains, most Lao people live close to riverbanks. For centuries, rivers have been a vital source of food as they still are today. Fish and other aquatic animals are the most important source of animal protein and barely a meal goes by without some type of fish product being put on the table. The rivers from which these fish come are nearly all within the catchment of the Mekong River, which winds its way 1,800 km through the country before flowing into Cambodia just below the Khone Falls in Champasack province.

The Khong district around the falls is characterised by rocks and deep pools which provide habitats for many fish species. Roberts and Baird (1995) documented the many channels at the Khone Falls and their use by fish attempting to migrate through the falls. The great majority of fishes which successfully migrate through the Khone Falls fault line move up two channels— the Hoo Sadam and the Hoo Sahong (*hoo* meaning channel in Lao language). Only these two channels do not have waterfalls at their upstream end.

Local fishermen are particularly knowledgeable about fisheries resources in Champasack province, where they catch fish for both subsistence and trade. For example, the giant carp known as Jullien's barb (*Probarbus jullieni or pa eua* in Lao) can be found in a deep pool located in Don Hii and Don Tholathi villages in Khong district as well as in Don Koo village in Pakse district further north. The well-known habitat for the small-scale croaker *(Boesemania microlepis)* is in Don Lekfai and Don Tholati villages. The most important habitat for the small-scale river carp (*Cirrhinus microlepis* or *pa phone*) is in Don Deng village in Pathumphone district.



Fishermen often sleep overnight in shelters attached to *li* traps . PHOTO: VANNAXAY SOUKHASEUM

Elsewhere in Khong district, another commercially-valuable species, a bagrid catfish known as pa keung *(Hemibargus wyckioides*), inhabits the deep pool of Hat and Hang Sadam villages. Various studies over the past decade have indicated that this species as well as Krempf's catfish (*Pangasius krempfi)*, the black spotted catfish (*P. larnaudii),* the sharp-nosed catfish *(P. conchophilus)* and the sutchi river catfish *(Pangasianodon hypophthalmus)* can all be targeted in the Hoo Som Yai and Hoo Sahong channels and nearby Don Nokkasum village.

Many different types of fishing gear are used around the Khone Falls, some of them unique to the area. Fishermen use gill and cast nets to catch fish in the

dry season from January to March. During the wet season from May to July, they use specially-built *tone* and *li* traps to target fish migrating upstream, especially species from the shark catfish family.

Khong Island has about 600 *li* traps including 19 in Hoo Som Yai in 2006. The traps are mostly made from local trees or bamboo. With construction starting towards the end of the dry season, they are normally deployed between late May and late August. Their size varies depending on water levels and location. In Hoo Som Yai, they are usually about 1.5m wide and up to 10m long. Smaller traps are used in narrower or shallower channels.

The traps work by catching fish migrating upstream that grow tired swimming into the strong current and are subsequently swept back downstream. The *li* traps have wing fences to guide fish onto chutes which effectively filter the fish from the flowing water. In the fast flowing rapids and waterfalls of the area, building and operating the traps can be dangerous work.

Most fishermen stay overnight near their traps or even on on them (see photo). Fish are collected in the early morning and then transported to the village market. Prices range from 5,000 kip ($0.50) to 20,000 kip ($2.00) a kilogramme, depending of species and size. In Hoo Som Yai, bigger catches are associated with rising water levels. When migration peaks, the daily catch of sharp-nosed catfish from a single *li* trap can be as much as 150 kg with the fish ranging from 20 cm to 30 cm in size. Taxes levied by the local district office are based on the size of the trap and range from 50,000 kip ($5) to 200,000 kip ($20) a season.

Recent studies highlight that fisheries in Siphandone are still in good shape and face no major environmental threats. However, there are concerns about declining numbers of large fish and species that are very difficult to catch. Causes are unclear. Some blame overfishing (particularly the use of monofilament gill nets, introduced in the 1970s) but others point to environmental changes caused by human development.

A local authority acknowledges these changes and is seeking to sustain the use of fisheries by empowering the local community in planning and implementation. Champasack province and neighbouring Stung Treng province in Cambodia have meanwhile taken steps to cooperate in transboundary management. In April 2007, the proposed Mekong Transboundary Champasack and Stung Treng Project supported by the World Bank undertook a mission to the two provinces. Fisheries management emerged as the top priority followed by tourism and solid-waste management. The World Bank is expected to provide a $4 million grant for the five-year project starting in 2008.

Further reading:

Baran, E., Baird, I., Cans, G. 2005. Fisheries bioecology at the Khone Falls (Mekong River, Southern Laos). WorldFish Center. 84 pp.

Cacot, P., Phanousith, S., Immalavong, S., Vonghachak K., Souliyavong, C. 2006. Domestication of the indigenous Mekong catfish *Pangasius krempfi* : overview of the fishery in Cambodia and Laos and preliminary study of the artificial reproduction above the Khone waterfalls. LARReC Technical Report No. 019 , Living Aquatic Resource Research Center, Vientiane, Lao PDR. 45 pp.

Claridge, G. F., Sorangkhoun T., Baird I.G. 1997. Community fisheries in Lao PDR: A Survey of Techniques and Issues. IUCN-The World Conservation Union, Vientiane.

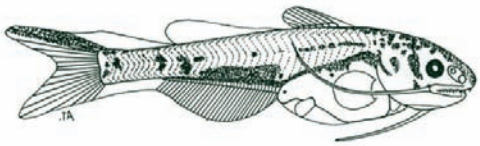
Singhanouvong, D, C. Soulignavong, K. Vonghachak, B. Saadsy and T.J. Warren. 1996. The main wet-season migration through Hoo Som Yai, a steep-gradient channel at the great fault line on the Mekong River, Champassack Province, Southern Lao PDR, Indigenous Fisheries Development Project, Fisheries Ecology Technical Report, Vientiane, 4: 1-115.

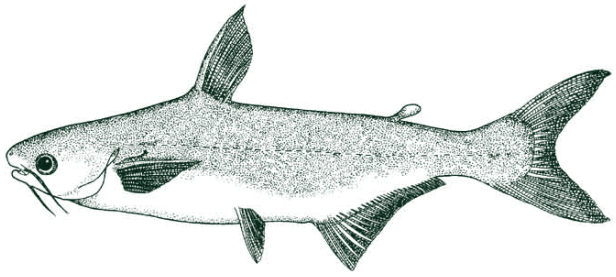
Phouthavongs, K. 2006. Employing Geographical Information Systems in Fisheries Management in the Mekong River: a case study of Lao PDR. Master of Sciences thesis. Faculty of Science, School of Geosciences, University of Sydney, Australia. 177 pp.

Roberts, T.R. 1993. Artisanal fisheries and fish ecology below the great waterfalls of the Mekong River in southern Laos. *Natural History Bulletin of the Siam Society.* **42**: 67-77.

Roberts, T.R. and I.G. Baird. 1995. Traditional fisheries and fish ecology on the Mekong River at Khone Waterfalls in Southern Laos. *Natural History Bulletin of the Siam Society.* **43**: 219-262.

* *Mr Kaviphone is a programme officer with the MRC Fisheries Programme and Mr Vannaxay is a fisheries biologist at the Living Aquatic Resources Research Center (LARReC) in Vientiane.*





Long distance migration of ***Pangasius krempfi*** in the **Mekong River**

A new study looks at the otoliths and muscle tissue of Krempf's catfish caught migrating upstream along Lao stretches of the Mekong. The research offers the most compelling evidence to date that it's an anadromous species, spending most of its adult life in the South China Sea and then migrating more than 700 km up the Mekong to spawn.

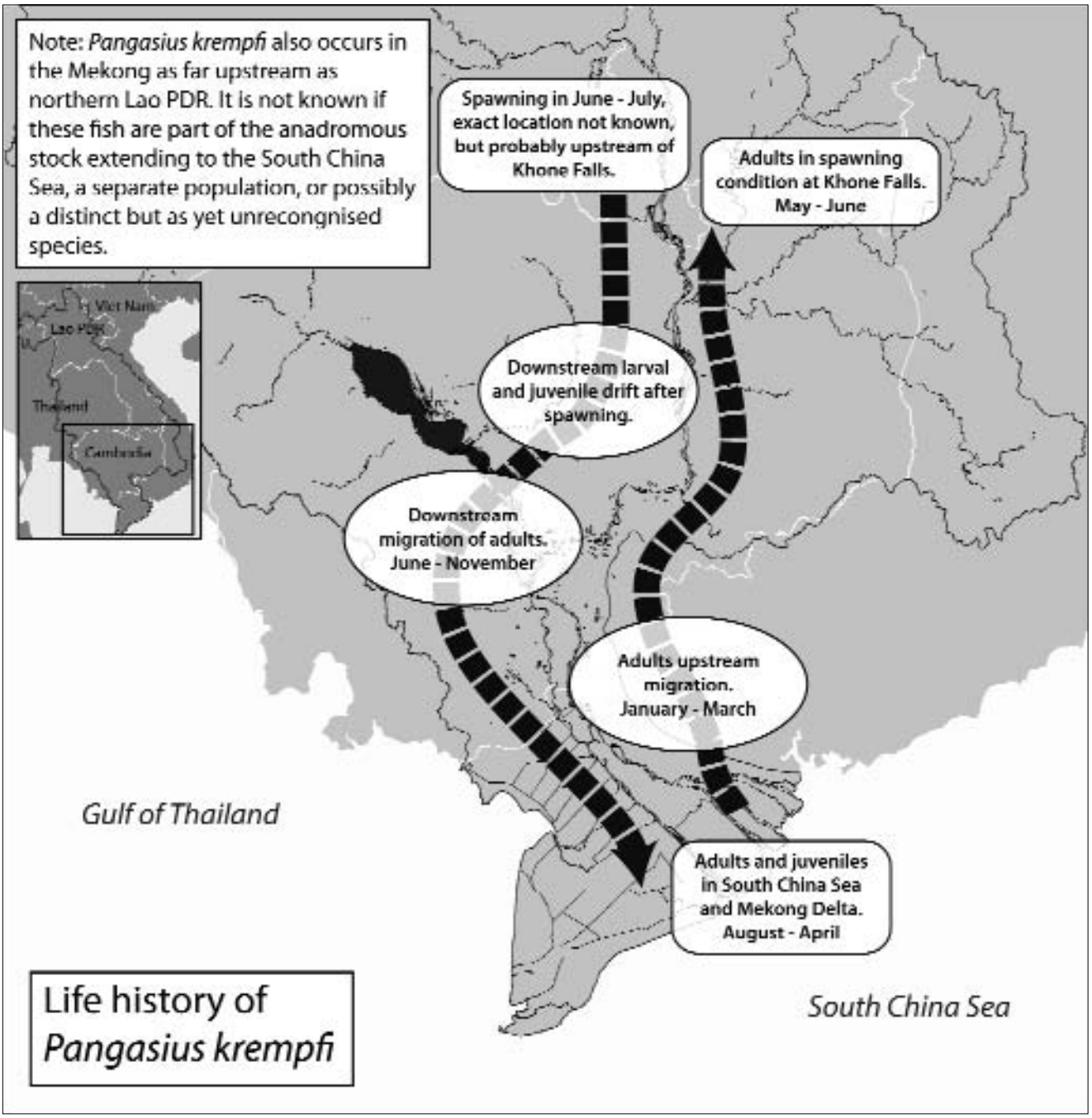
Scientists have known for two decades that Krempf's catfish *(Pangasius krempfi)* spends at least part of its life in the South China Sea. What they haven't been able to prove is that it's anadromous fish, a migratory species that lives most of its adult life in the sea but must enter freshwater to spawn. Anadromy is unusual in catfishes, and Krempf's catfish is unique among members of the shark catfish family (Pangasiidae) which has many species that occur in the Lower Mekong Basin and other basins in Southeast Asia.

Roberts and Baird (1995) noted that this commercially-important species was reported in Vietnamese coastal waters between January and April. They noted records of two 4 kg specimens caught 10 km off Vung Tau in January and suggested that the species starts migrating upstream in February and March. After swimming more than 700 km, it reaches the Khone Falls in May and probably swims further upstream to spawn in June and July. After spawning, the authors suggested that adults probably migrate back to the estuary and the sea while the young drift or swim down to the Mekong Delta.

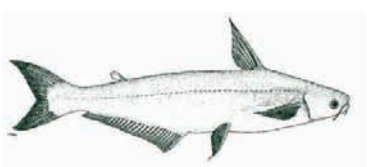
A new study by a team led by Zeb Hogan of the University of Wisconsin-Madison uses chemical techniques as well as catch data to test the hypothesis that the fish is anadromous. One of these techniques involved examining otoliths, the ear stones found in the inner ears of fishes (see *Catch and Culture* Vol 9, No 1). Otoliths comprise successive layers of calcium carbonate and are often used to age fish. Since deposits of other elements like strontium and barium can also record physical and chemical events that occur while a fish matures, otoliths can also be used to determine whether a fish has been living in a saltwater or freshwater habitat. Armed with this knowledge, the scientists collected otolith samples from 33 individuals. For comparison, they also took another seven samples from sharp-nosed catfish (*P. conchophilus*), long-barbel catfish (*P. macronema*), black-spotted catfish (*P. larnaudii*), red-finned catfish (*P. pleurotaenia*) and another catfish species from the same family but a different genus (*Helicophagus waandersii)*. These are all potamodromous species that live their entire lives in rivers but undertake long migrations to spawn, feed or seek refuge.

The researchers found that strontium levels in the otoliths of Krempf's catfish were significantly higher than the concentrations of strontium found in the other five species. This was consistent with the hypothesis that this species spends part of its life in marine waters. But the analysis also found high variability in the ratio between calcium and strontium in the otoliths of Krempf's catfish including multiple increases and decreases. This indicated that the species may move regularly between marine and brackish waters, contradicting an earlier study that suspected non-migrating individuals reside exclusively in marine waters.

Further evidence of anadromy came from samples of dorsal muscle tissue taken from each of the six species of catfish and a small cyprinid species from the *Henicorhynchus* genus. Analysis of the Krempf's catfish tissue showed elevated levels of stable carbon and nitrogen isotopes that were not observed in the other species. This was "highly suggestive of marine habitation" and probably indicated feeding before migration. When examined in the light of catch data and other information available, the authors conclude that the isotope results "provide a compelling argument that the species is anadromous".



Migration of *Pangasius krempfi* in the Mekong River system. Genetic studies are currently being conducted to determine the taxonomic status of populations of this species in the Mekong River Basin. The studies are based at the Research Institute for Aquaculture No. 2 (RIA2) in Ho Chi Minh City and are being funded under the Aquaculture of Indigenous Mekong Fish Species (AIMS) component of the MRC Fisheries Programme.



While the study doesn't provide conclusive evidence that the species moves downstream to the Mekong Delta after spawning, the authors argue that a "considerable amount of information points to such a conclusion." The otolith analysis indicates that the fish inhabits saltwater repeatedly from a very early age. Moreover, Lao fishermen don't report seeing juveniles but Vietnamese fishermen in the Mekong Delta do report seeing small individuals. So it seems that the larvae and juveniles move downstream quickly after spawning and arrive in the delta before significant growth occurs. They note that after spawning, the adult fish probably migrate downstream, swimming through Lao, Cambodian and Vietnamese waters to the estuary and the South China Sea. None of these fish, however, have been reported or observed being caught when moving downriver. This may be because high discharge rates during the wet season preclude effective fishing in the main channel of the river.

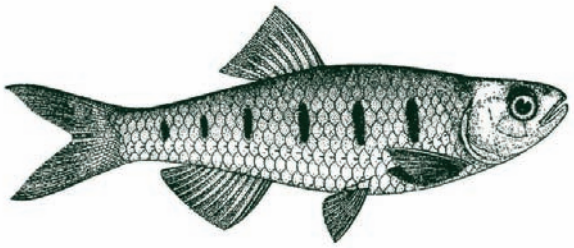
The authors note that habitat alteration and degradation are already a "significant threat" to Krempf's catfish and other species. They also argue that this migrating species is likely to be "greatly impacted" if any dams are built on the lower or middle stretches of the river. "The species might even disappear from the Mekong River," the paper warns. As an anadromous fish that migrates though Viet Nam, Cambodia, Lao PDR and Thailand, the authors highlight the "immediate need for trans-boundary cooperation" between countries of the Mekong River Basin. The study notes the existence of several regional agreements for managing and conserving straddling stocks of species as well as international conventions on migratory species and biodiversity. It concludes that these, along with fisheries laws and local management agreements, can serve as a framework for the regional management of aquatic biodiversity in the Mekong River Basin.

Further reading:

Hogan, Z., I.G. Baird, R. Radtke, and M.J. Vander Zanden. 2007. Long distance migration and marine habitation in the tropical Asian catfish, *Pangasius krempfi*, *Journal of Fish Biology*. **71**: 818–832.

Poulsen, A.F., K. Hortle, J. Valbo-Jorgensen, S. Chan, C.K. Chhuon, S. Viravong, K. Bouakhamvongsa, U. Suntornratana, N. Yoorong, T.T. Nguyen & B.Q. Tran. 2004. Distribution and ecology of some important riverine fish species of the Mekong River basin. MRC Technical Paper No. 10, Mekong River Commission, Phnom Penh. 116 pp.

Roberts, T.R. and I.G. Baird. 1995. Traditional fisheries and fish ecology on the Mekong River at Khone Waterfalls in Southern Laos. *Natural History Bulletin of the Siam Society.* **43**: 219-262.



Raising **Lao** fisheries **awareness**

By Kaviphone Phouthavongs*

Releasing fish into Beung Va Reservoir in Savannakhet province

Lao people rely heavily on natural resources. In rural areas, fish, wild animals and non-timber forest products are the main sources of food. Over the past decade, the Lao government has formulated policies for sustainable development and conservation including the Environmental Protection Law of 1999 and the Forestry Law of 2001. Many regulations and executive orders on fisheries also exist. Regulations to manage and protect aquatic animals and other wildlife are included in the Forestry Law.

Article 46 of this law identifies July 13 as a national day for protecting wildlife and releasing fish. This year, Prime Minister Bouasone Bouphavanh and Vientiane Mayor Dr Sinlavong Khoutphaythoune took part in a fish-release ceremony in Sikhottabong district of the capital. Together with government officials and villagers, they released more than 100,000 fish and other aquatic animals including frogs and eels. Vientiane also held a fish-release ceremony at the Nam Houm reservoir in Naxaithong district.

In Savannakhet province about 430 km south of Vientiane, Vice Governor Dr Souphan Keomixay attended a separate ceremony at Beung Va reservoir with Kaisonphomvihan District Governor Lahoun Maphangvong. "We have to develop and manage our resources in sustainable ways," Mr Lahoun said. The district governor called for the establishment of fish conservation areas and the farming of indigenous

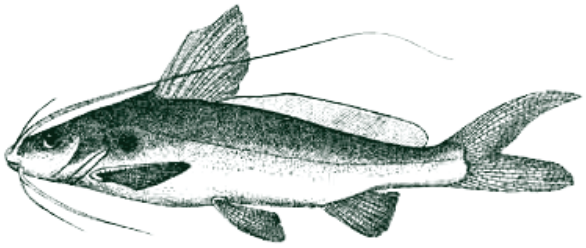
species for subsistence and trade. "The main goals of fish-release day are to create awareness of the importance of fishery resources to people's livelihoods and food security as well as to educate people about the sustainable exploitation of wildlife and aquatic animals, to enhance fish production and to protect natural resources," he said. "If we can achieve this, fishery resources will be sustained and continue to contribute to the food security of communities and help alleviate poverty."

The ceremony was also attended by Livestock and Fisheries Department Director-General Dr Bounkhouang Khambounheuang and Thai Fisheries Department Deputy Director-General Mr Niwat Suteemeechaikul along with Southeast Asia Fisheries Development Center (SEAFDEC) Secretary-General Dr Siri Ekamaharaj. Thailand and SEAFDEC donated 500,000 fingerlings for the ceremony. About 300,000 were released in Beung Va reservoir and the rest were given to other districts. More than 600,000 fish are estimated to have been released in Savannakhet this year.

** Mr Kaviphone is a programme officer with the MRC Fisheries Programme.*

Lao proverbs

ໃນນ້ຳມີປາ (NAI NAM MEE PA)
The fish are abundant
ໃນນາມີເຂົ້າ (NAI NA MEE KHAO)
The rice harvest is plentiful
ໃນດົງມີໄມ້ລຳໃຫຍ່ (NAI DONG MEE MAI LAM YAI)
The forest has a lot of big green trees



Lao and Thai government officials attend this year's National Fish Day ceremony in Savannakhet province.

Hun Sen calls for **fisheries** to be included in **school curricula**

Prime Minister Samdech Hun Sen bestows the Sowathara Thanka Sena medal on Mr Sam Nuov, Deputy Director-General of the Cambodian Fisheries Administration and former chairman of the MRC's Technical Advisory Body on Fisheries Management (TAB)
PHOTO: JOE GARRISON

Educating children about the importance of fisheries becomes a new priority in Cambodia, along with aquaculture

Cambodia's Prime Minister Samdech Hun Sen has called on the Ministry of Education, Youth and Sports to include fisheries in the country's school curricula. Speaking at the Fifth National Fish Day ceremony in Takeo province on July 1, the prime minister stressed the need to raise awareness of the "importance of fisheries in relation to livelihoods" in Cambodia.

"We have done some good TV spots and I know that more are on the way," he said. "I want the Ministry of Education, Youth and Sports to include these awareness activities in their curriculum so as to raise our children's awareness in relation to this matter."

The prime minister bemoaned the "limited understanding of the general public about the importance of natural resources, environment, regulation and the concept of sustainable development." Additional challenges included increased numbers of people fishing and the limited ability to educate them about modern fishery techniques. Such factors have had a "destructive effect" on fishery resources and are "still the main constraints to achieving the policy of sustainable use and development."

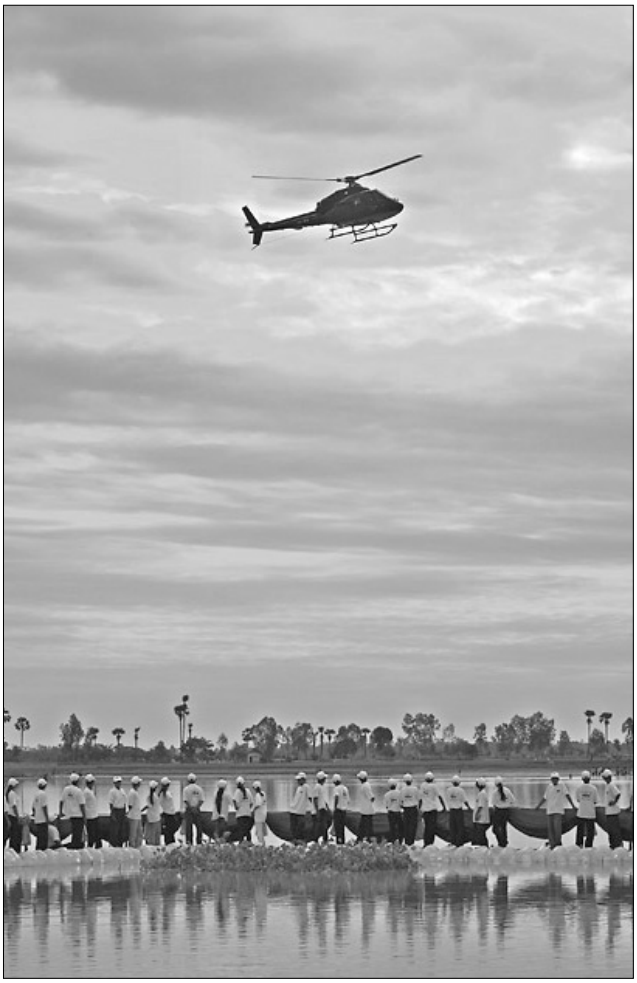
In addition to protecting dry-season habitats and

spawning areas, Samdech Hun Sen called for a strategy that encouraged the widespread release of fish in villages, communes, communities, schools, pagodas, hospitals and fishing lots. "At the same time, we must try to establish more community fish ponds and conservation areas," he said.

Samdech Hun Sen also called for greater emphasis on aquaculture to reduce Cambodia's traditional reliance on the natural fish catch. "Culturing fish should be upgraded to a national movement in both advanced and traditional methods. We should seek to encourage private investment in this sector," he said, stressing the need for Cambodia to catch up with neighboring countries and the rest of the world. He also highlighted the need for Cambodia to set up an institute for aquaculture research for both freshwater and marine species. "Take Vietnam and Thailand," he said. "They have respective populations of 80 million and 60 million but they have been able to provide them with sufficient fish and also for export."

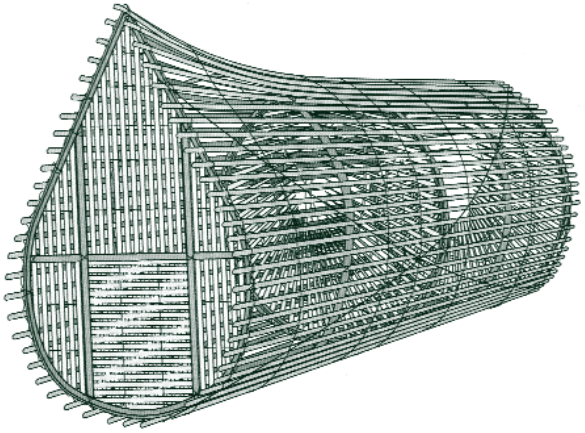
Regarding the environmental degradation of fish habitats, Samdech Hun Sen ordered municipal and provincial governors to take action to prevent the "anarchic looting" of flooded forests and mangroves. "All concerned authorities must cooperate with one another with high responsibility and determination to confiscate those areas and return them back to the state because they are the life and blood of the fishery sector," he said.

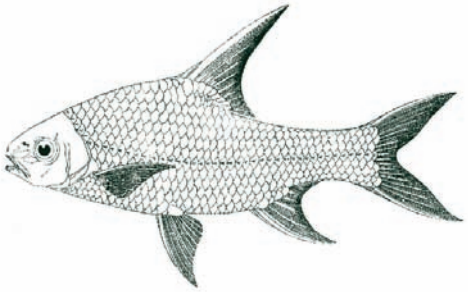
Organisers said this year's ceremony and fish release at Othom Lake near the Bassac River in southeast Cambodia attracted more than 10,000 people. Previous ceremonies were held in Kompong Speu province in 2003, Kandal province in 2004, Prey Veng province in 2005 and Sihanoukville in 2006.



Top left: Samdech Hun Sen and First Lady Lok Chumteav Bun Rany Hun Sen releasing fish into Othom Lake near the Bassac River during this year's National Fish Day ceremony **Bottom left:** Agriculture, Forestry and Fisheries Minister Chan Sarun (centre) with Fisheries Administration Director General Nao Thouk (left) and Deputy Director General Sam Nouv (right) **Right:** Fisheries Administration officers look on as the helicopter departs. PHOTOS: JOE GARRISON

Cambodia raises community awareness of fisheries.
The scene depicted above is from a new flipchart developed for the Cambodian Fisheries Administration to educate communities about the importance of fisheries. Live & Learn Environmental Education, a Cambodian non-governmental organisation affiliated with a Fiji-based group specialising in environmental eduction in Pacific island countries, designed the flipchart on behalf of the Food and Agricultural Organisation of the United Nations (FAO). During this year's National Fish Day ceremony in Takeo province, Prime Minister Samdech Hun Sen bemoaned the "limited" public understanding of environmental issues and called for education authorities to include fisheries awareness in school curricula (see previous two pages).





Mekong **Fisheries Index**

Seafood goes overboard in Mekong Delta
Viet Nam News, 6 September 2007

Provinces in the Cuu Long Delta have devised an ambitious plan to build an additional 32 seafood processing plants between now and 2010 in an effort to keep pace with the region's burgeoning seafood export industry. The addition of the new plants will bring the total number of seafood processing plants in the region to 68, capable of churning out 534,000 tonnes of seafood per year. The figure is expected to increase to 130 by 2020 with a total annual capacity of more than 1 million tonnes. Based on the projection, the volume of *tra* and *basa* catfish products exported to Asia, the European Union, and North America will surge to 230,000 tonnes by 2010, fetching close to US$600 million. The figure is expected to double again by 2020. Meanwhile, local processors project 38,000 tonnes of seafood for domestic consumption by 2010, and 16,600 ha and 1.9 million tonnes by 2020. By 2010, the Cuu Long (Mekong Delta) will establish more than 2,100 small fry nursing centres, which will increase to 3,000 by 2020. These facilities are expected to yield 2.7 billion and 6.7 billion fry by 2010 and 2020, respectively.

Mekong Delta to have more aquaculture
Viet Nam News, 1 August 2007

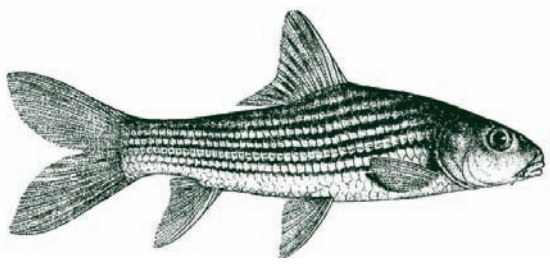
The Ministry of Fisheries will establish an aquaculture technology centre in Soc Trang Province to serve aquaculture breeding in the Cuu Long (Mekong) region. The centre, which costs VND 35.5 billion (US$2.2 million), will teach advanced farming techniques and provide high-quality strains for the region's provinces and city. The ministry plans to build seven aquaculture breeding centres in Can Tho City and the provinces of Ca Mau, Bac Lieu, Kien Giang, An Giang, Dong Tha and Tien Giang

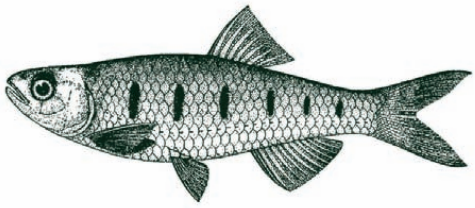
Northern fish production boosted
Vientiane Times, 27 July 2007

Technicians from the Livestock and Fisheries Department in Lao PDR are teaching new breeding techniques to fish farmers around the country, to raise larger numbers of fish. The department will focus on the northern provinces, where many farmers in the region lack experience with fish breeding, but still have suitable natural areas for fish production. This year the department will encourage farmers to increase production. Officials expect about 130,000 tonnes of fish to be consumed, including those sourced naturally from rivers, according to the Ministry of Agriculture and Forestry. Last year consumption was around 108,000 tonnes. Fish consumption has been rising at an average rate of 5 percent per year. Five years ago, 7-8kg were consumed on average per person, while this year the figure has risen to 11-12 kg per person. It has been difficult to increase fish production because of the low number of offspring produced, the lack of effective management of fish production and the impact of environmental fluctuations.

UN project to save the rare Mekong dolphins
AsiaNews.it website, 19 July 2007

A United Nations project intends to convert 200km stretch of the Mekong River into a leading eco-tourism destination and turn it into the Mekong Discovery Trail. According to the WWF, between 80





and 100 of the dolphins are managing to survive in nine deep pools between the scenic town of Kratie and Cambodia's border with Laos. The UN's World Tourism Organisation will pinpoint areas for infrastructure development and identify activities that will provide new sources of income for fishing villages. These villages have seen their incomes plunge even further as patrols of river guards, set up to protect the dolphins, began cracking down on gill-net fishing, strictly enforcing fishing zones and targeting illegal methods such as dynamite, cyanide and electric-shock fishing, which risk compromising the river's delicate ecosystem. The project, which is being funded by the Cambodian government, the UN and the Dutch development agency SNV, has two phases: The first is an urban renewal plan for the provincial capital, Kratie, that aims to turn the riverside town into a gateway to the country's spectacular but rarely visited northeast. Once the Kratie facelift is finalised, the Mekong Discovery Trail will be charted. This will include cycling paths and other eco-friendly activities that planners say will primarily benefit local communities and small-scale businesses, as well as the dolphins.

***Tra* and *basa* output alarmingly high**
VN Economy website, 10/07/2007

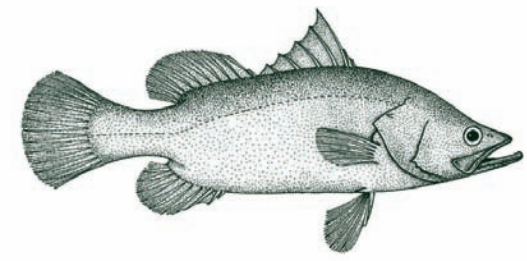
According to the Ministry of Fisheries, the output of farmed *tra* and *basa* increased sharply in the first six months of the year, estimated at 400,000 tonnes, an increase of 100% over the same period of 2006. An alarm has been rung over the overly high productivity of *tra* and *basa*, which is believed to be causing problems for the environment. Especially as *tra* and *basa* are now being bred not only in the traditional southern provinces, but in the centre and the north as well. The high price of *tra* and *basa* has prompted people to farm fish on a large scale. The flip side of the overly 'hot' development of *tra* and *basa* farming is that it has caused a serious lack of breed fish, increased prices of food for fish and chemicals. According to the Ministry of Fisheries, *tra* and *basa* farming has developed to an uncontrollable rate with the farming density of 300-500 tonnes per hectare, which, as experts have warned, will have bad impacts on the environment.

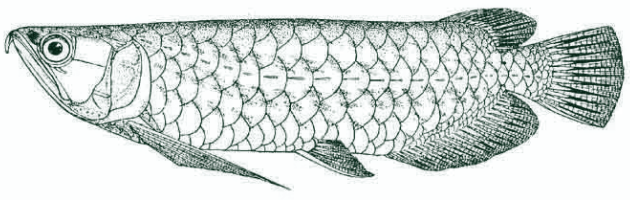
Rich gourmands devour endangered fish
Viet Nam News, 30 June 2007

A rare fish in danger of extinction will probably not survive due to its popularity among the *noveaux riche.* The *anh vu* (*Semilabeo obscurus*) of the Red River is being exterminated to satisfy the tastes of gourmets. Clients have to order the fish at least one month in advance and one restaurant owner said he had not been able to buy *anh vu* fish for about a decade. A veteran fisherman said the fish had been seen as a specialty exclusively served for kings, lords and powerful people since his father's time. It is only caught in October to March when clear water runs fast and the weather is cold, tempting the fish to come out of their caves to look for food. Only experienced fishermen used to be able to catch the fish, diving into the deep water and using special tools. Later explosives and electricity were used. While it has nearly reached extinction, demand is surging, one restaurant order in Hanoi was willing to pay VND4 million (around U$250) per kilogramme, while a Ho Chi Minh customer was ready to pay VND20 million for a 3kg fish. The *anh vu* is said to be tastiest when steamed with no spices added. Its lip cartilage is brittle and fragrant and said to help cure various types of diseases.

Government to issue decree on fishing rights
Vientiane Times, 27 June 2007

Residents of villages near the Nam Theun 2 hydropower project in Khammuan province are providing information to the government to help formulate a new decree to manage fishing in the Nakai reservoir at the dam. The government is expected to issue the decree in the middle of next year. It is presently collecting information drawn from the various experience of relevant officials and power project staff concerning other reservoirs and will present this informatinto the Government.. A meeting to discuss fishing rights in the reservoir heard the





opinions and ideas of representatives of the Living Aquatic Resources Research Centre, the Lao National Mekong Committee, the Nam Theun 2 Hydropower Project, and several agricultural sections. The decree would help the ministry implement regulations relating to the administration of fishing and management of fish stocks. According to the Nam Theun 2 Power Company fishing rights in the reservoir would be determined under the concession contract between the government and the company, which had already been approved by the National Assembly. The contract states that people who had been resettled as a result of the project would be allowed to fish in the reservoir for 10 years after the power plant starts to generate electricity in 2009.

Rare giant turtle found in Mekong
BBC, 16 May 2007

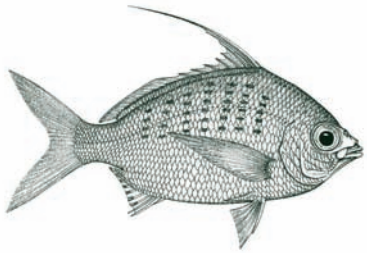
One of the world's largest turtles, said to be on the brink of extinction, has been found in abundance in a former Khmer Rouge stronghold in Cambodia. Conservationists discovered an 11kg female Cantor's giant soft-shell turtle and a nesting ground during a survey of the Mekong River. The species, which can grow two metres long and weigh 50kg, was last spotted in Cambodia in 2003. Scientists say the find could help save it from disappearing off the planet. Experts from Conservation International and WWF, along with Cambodian wildlife officials, stumbled across the animal and the nesting ground when conducting a survey in March. Eggs that were found have since hatched. The baby turtles were released into the wild earlier this month, along with another adult turtle. The region where the species were found had been closed to scientific exploration for many years because it was one of the last places under the control of the Khmer Rouge.

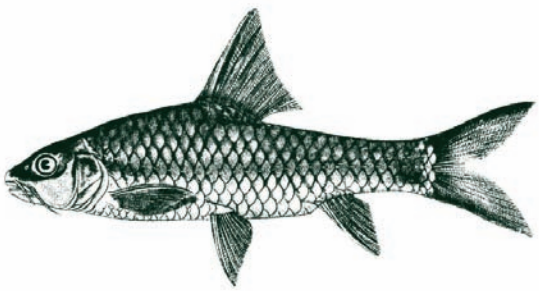
Sanctuary to restore fish population
Vientiane Times, 21 May 2007

A fish sanctuary has been declared in an area where the Mekong River links three villages in Khong district, Champassak province. The sanctuary, called Vangkhaidiew Huahinlerk, is designed to protect a depleted population of indigenous fish and the health of the Mekong, according to an official. Local authorities, interested people and monks took part in the ceremony; monks sprinkled holy water and released more than 20,000 fish into the river. An organiser explained that while many local people were reliant on fishing, many fish habitats had been disturbed by fishermen, and the fish had moved away. In the past, there were more than 100 indigenous fish species in this area, but now only 60 varieties remain. The number of indigenous fish and other aquatic animals is continually decreasing, which is why it had been declared as a sanctuary. The area is known by locals to contain deep pools at the bottom of the river, where schools of fish are known to reside.

Rare Mekong Fish out of danger for now
Viet Nam News/ANN, 10 May 2007

Viet Nam Scientist Huynh Huu Ngai has helped a species of rare fish survive and boosted its population in the Mekong River. He has spent more than two years artificially breeding and raising *ca ho*, the giant barb (*Catlocarpio siamensis*). He's also sent thousands of fingerlings and juvenile fish to farms in Mekong Delta provinces to rejuvenate the species' development, in addition to keeping several groups of juvenile and adult fish for further experimentation at the Research Institute for Aquaculture No 2 in Tien Giang Province. The giant barb was identified as one of three "flagship" species by the MRC Fisheries Programme at the Mekong Fisheries Technical Symposium, a workshop that raised ideas regarding the management of giant fish species in the Mekong. Ngai works at the Centre for Aquaculture of Southern Freshwater Species which has been working to protect the genes of some 20 precious fish species identified as having high cash values or facing extinction. Since the early 1990s, these species have been protected both through frozen eggs and sperm to preserve their DNA and through national parks, ponds and fishing farms, as part of national preservation programmes. A project of domesticating and artificially breeding selected freshwater fish





species is also aiming to provide juvenile fish to farmers, both to develop the species and support the farmers. Programmes and projects carried out at the centre are receiving support and cooperation from international institutions and organisations including the Mekong River Commission and Danida.

Illegal Fishing Methods Threaten Mekong, Tonle Sap Spawning Grounds
The Cambodia Daily, 26 April 2007

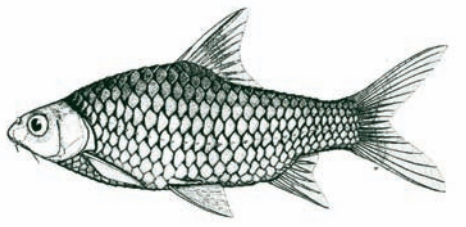
Illegal fishing in Stung Treng province poses a serious threat to spawning grounds for barb fish in the Mekong River and Tonle Sap, as well as the endangered Mekong gouramy. Fishermen are employing illegal fishing techniques within the Ramsar region of the Mekong River in Stung Treng, a spawning and breeding region for many kinds of barbs, according to government officials. The Ramsar region is also a popular migratory region for the Irrawaddy dolphin and is currently under control of the Ministry of Environment. Poor fishermen are known to use illegal fishing methods in the area, such as grenades and electric shocks. Officials note that if swift action is not taken soon to halt the illegal fishing, the catch of the Mekong barb –-locally known as *trey pasey* – would decline significantly next year. About 10 tonnes of *trey pasey* are said to be harvested in Stung Trey each year, out of a total of 50 to 100 tonnes of fish. *Trey pasey*, which is only found in Stung Trey province, spawns in the Ramsar region every February and is a popular delicacy in expensive restaurants in Phnom Penh.

Swedish Government gives US$6.4 million support for environment, fisheries and planning in Mekong River Basin
MRC press release, 24 April 2007

The Swedish Government has signed a US$ 6.4 million (45 million Swedish kronor) agreement over the three-year period 2007-2009 to support the work of the Mekong River Commission (MRC).The agreement was signed in Hanoi, Viet Nam by HE Mrs Gunilla Carlsson, Minister for International Development Cooperation, on behalf of the Government of Sweden and Dr Olivier Cogels, Chief Executive Officer of the Mekong River Commission Secretariat. Sweden has supported the MRC for many years, focusing in particular on the Environment Programme, the Basin Development Plan, the Fisheries Programme and on Institutional Support. The renewed support will continue to be used on these four areas. Within the Fisheries Programme the support will be used to fund an economic valuation of fisheries in the Lower Mekong Basin and to provide support to the Technical Advisory Body for Fisheries Management, a regional fisheries management body.

Tonle Sap fishermen wrestle with shrinking fish stocks
Phnom Penh Post, 20 April 2007

Khmer fishermen in Chong Kneas community of Siem Reap province say they are concerned for their livelihoods in the face of illegal fishing and increased competition from ethnic Vietnamese fishermen. One Chong Kneas fisherman who has lived on the Tonle Sap for many years, said Cambodian fishermen could not catch as many fish as their Vietnamese counterparts, who use superior fishing gear and techniques. “We have the market, but do not have fish to sell,” he said. “The number of fish we catch has gone down over the last five years.” Minh Bunly, coordinator of the Fisheries Action Coalition Team based in Siem Reap, said as the number of fish decreases, the livelihoods of villagers in the area will be adversely affected as well. Some locals say the use of electric shocks to kill large schools of fish continues – despite official crackdowns and the destruction of illegal equipment. The water has also become polluted with the increase of people migrating to the area. Around 70 percent of villagers are fishermen and among those 747 families are Cambodians and 356 are Vietnamese. All the villagers were suffering because of a decrease in their catch.and children and villagers in the community were facing health problems such as diarrhoea and skin diseases because they lived on polluted water. Fishermen catch about 1.5 to 2 tonnes of fish per day,



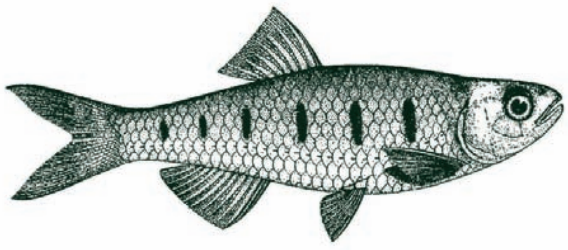
but, because this is distributed to about 1,000 families, the haul is only just enough to support a day-to-day existence.

Firm plans to export $100 m in catfish
Viet Nam News, 9 April 2007

Nam Viet Seafood Import Export JSC expects to export US$ 100 million worth of *tra* and *basa* catfish under a memorandum of understanding (MoU) recently signed with Russian representatives. The MoU was reached during a mid-March visit by Russia's General Consul Nikolai Demitrievich Ubushiev and former Deputy Fisheries Minister Sotnikov Fedor Ivanovik. The Russian representatives also visited Nam Viet's factory which processes about 700 tonnes of *tra* and *basa* a day. Last year, Nam Viet exported $170 million worth of *tra* and *basa*, 70 percent of which went to Russia and the European Union.

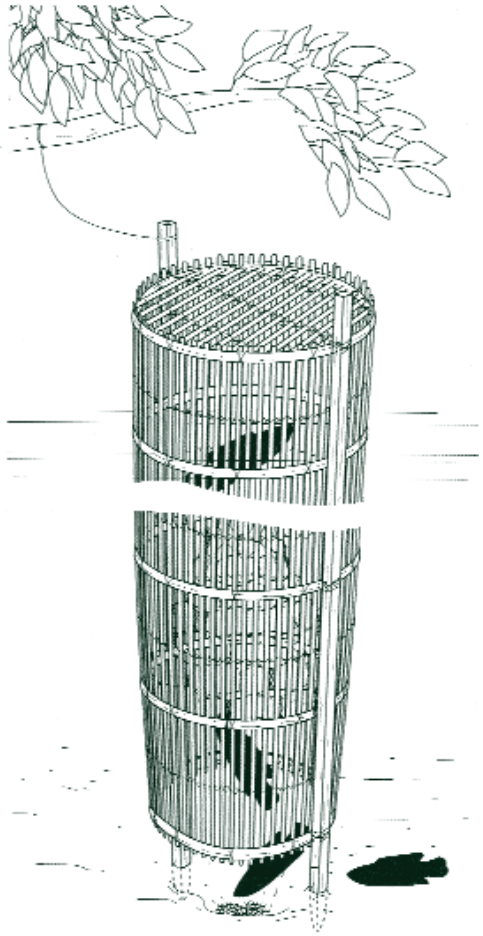
Mekong province suspends new catfish farms
Viet Nam News, 6 April 2007

The An Giang Province People's Committee has called a halt to digging new ponds to breed catfish since a rapid increase in catfish farms negatively impacted local water resources. More and more local farmers have begun to farm catfish after its prices surged recently. Of the 208 ha of new catfish farms in the Cuu Long (Mekong) Delta province this year, only 55 ha are in zoned areas.



Two new Mekong fish species discovered
Practical Fishkeeping, April 2007

A review of the glyptosternine catfish genus *Pareuchiloglanis* from the upper Mekong River has resulted in the description of two new species. Xu Li, Wei Zhou, Alfred Thomson, Qing Zhang and Ying Yang studied all of the *Pareuchiloglanis* catfishes found in the Lancanjiang, or upper Mekong, in Yunnan, and recognised five species, two of which are new to science. The new fish can be distinguished from others by their fins, restricted gill openings, and number of anal fin rays. Unlike some other members of the subfamily, *Pareuchiloglanis* lacks adhesive apparatus on the thorax, instead having plaited adhesive organs on their paired fins.



Published by the Mekong River Commission Secretariat

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Packaging for export

The snap-frozen fillets emerge at the end of the line in a cold room that is sealed off from the earlier stages of production. For Agifish, major export markets are Europe, the United States, Australia and Asia including Hong Kong, Singapore, Malaysia, China and Taiwan. New markets include Mexico, South Africa and the Middle East. Unlike the slaughter, filleting and trimming teams, staff in the packaging rooms work two shifts a day.

MEKONG RIVER COMMISSION
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Catch and Culture

Special insert

Catfish Processing in Viet Nam

Unloading the harvest

An Giang province is the "catfish capital" of the Mekong Delta and the riverside city of Long Xuyen is home to many processing plants. Live fish harvested from ponds, net-pen enclosures and river cages are often transported to factories by boat. At this Agifish facility in Long Xuyen, the fish are transferred from the dock in a 20 cm suction hose. A new hose being installed this year has the capacity to pump 25 tonnes of fish an hour.

PHOTOS: JOE GARRISON

Slaughter and filleting

Agifish opened Frozen Factory No. 9 at the end of 2006. Company officials said daily production capacity was scheduled to rise from the current level of 300 tonnes of raw product a day to 450 tonnes by September 2007. The morning shift starts at 6 a.m. Live catfish coming into the factory are slaughtered by hand and immediately transferred to pools of water where the blood is washed from them. The people who fillet the fish are highly skilled, having undergone three months of training prior to joining the filleting line.

Trimming and freezing

By the time the fillets are ready for trimming, the skins have been removed by hand for most export markets with the notable exception of Hong Kong. Trimming involves removing the red meat and fat. This is done for most markets except Russia. The fillets are then graded according to flesh colour. White is premium quality followed by pink and yellow. The catfish are then arranged on conveyor belts leading to the Individual Quick Freezing machines.