



Catch and Culture

Fisheries Research and Development in the Mekong Region

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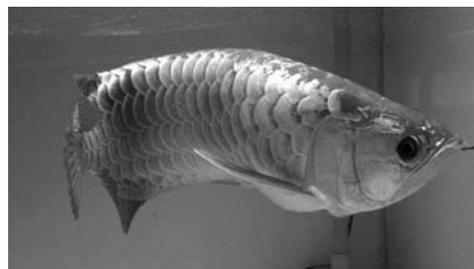
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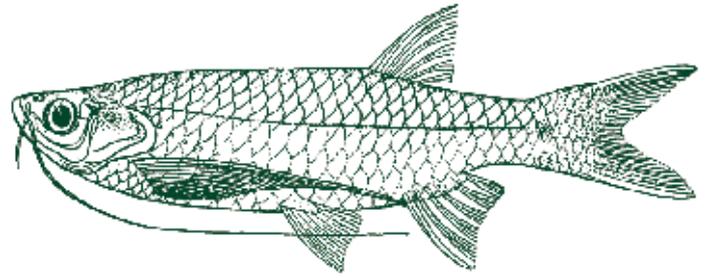
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Editorial



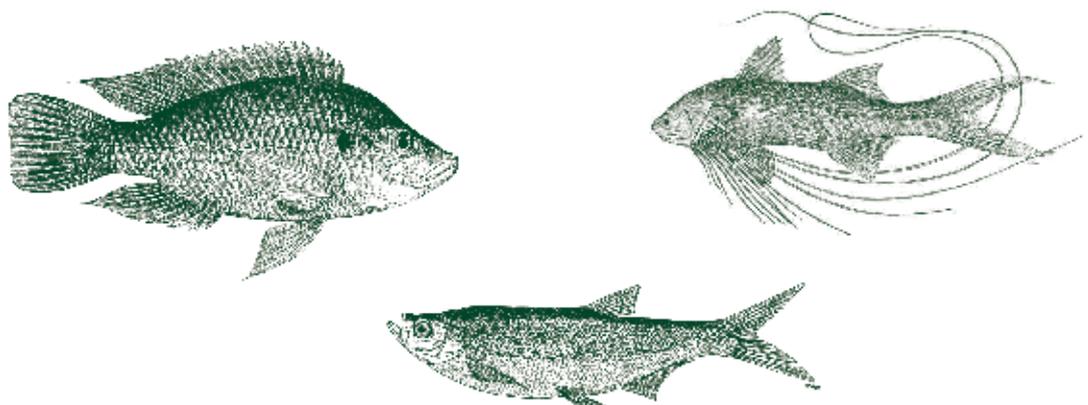
In this edition of *Catch and Culture*, our first for 2010, we highlight fisheries issues raised at the Mekong River Commission Summit in April, the first since the MRC was set up in 1995. At the historic gathering in Thailand, the four prime ministers committed their countries to better fisheries management, describing it as one of the “critical emerging challenges” over the next ten years.

We also report on the outlook for Vietnamese aquaculture following the first year-on-year decline in catfish exports and recent consolidation in an industry that supports more than 200,000 people in the Mekong Delta. As a sign of the sector’s growing economic significance, Can Tho City recently hosted the first Viet Nam Fisheries Festival, a four-day event which drew more than 600,000 people and is featured in our special insert for this issue.

Elsewhere in this edition, we meet the first Cambodian farmer to succeed in artificial propagation of Sutchi river catfish (*Pangasianodon hypophthalmus*) along with the owners of three Vietnamese companies which occupy different segments of the country’s aquarium fish market. Other articles highlight recently-published research on the impact of stocking Lao water bodies with alien species and the benefits of farmer-managed aquatic systems in Cambodia, Thailand and Viet Nam. We also report on the final phase in the development of certification standards for the global catfish trade, a process that has taken almost three years. In addition, we highlight a conservative estimate contained in the MRC’s newly-published *State of the Basin Report* showing that the basin’s inland fisheries are worth up to \$7 billion a year.

Our lead article is devoted to how the Third Phase of the MRC Fisheries Programme is taking shape after consultations with more than 350 stakeholders. Operating from 2011 to 2015, it’s now envisaged that the next phase will have one component for programme management and communication and another focussing on fisheries management and development.

Finally, congratulations to Dr Pham Van Khanh, Dr Ly Thi Thanh Loan and Mr Nguyen Van Sang of the Research Institute for Aquaculture No 2 in Ho Chi Minh City who were among 12 scientists awarded in April for their outstanding contributions to Viet Nam’s aquaculture development. We also congratulate the research institute for setting a record for the biggest giant barb (*Catlocarpio siamensis*) cultured in Viet Nam.



Mekong leaders commit lower basin countries to better fisheries management



PHOTO: CHAI PORNCHEI

Food security emerges as a key issue at the inaugural MRC Summit

The prime ministers of Cambodia, Lao PDR, Thailand and Viet Nam have agreed that better fisheries management in the Mekong Basin is one of the “critical emerging challenges” facing the Mekong River Commission over the next decade. In a declaration adopted at the First MRC Summit in Hua Hin in April, leaders recognised that enhanced understanding of the Basin’s aquatic diversity and fisheries was among the “significant achievements” over the past 15 years.

“Mekong partners and stakeholders now know and understand more about this complex and productive river system,” the declaration said. In committing to cooperate further to tackle critical emerging challenges, the leaders highlighted the need for “better

managing the Basin’s unique natural fisheries.” Other challenges include minimising any deterioration of water quality and better integrating “sustainability considerations” into hydropower development.

Future MRC priorities outlined in the declaration include sustaining aquatic diversity and “identifying and advising on the opportunities and challenges of hydropower and other infrastructure development in the Basin, especially risks as they pertain to food security and livelihoods.”

In a separate statement adopted at the summit, development partners* noted that Mekong waters were an “irreplaceable input” to regional food security. “The Mekong Basin is probably the most productive inland fishery on Earth: it provides about 2 percent of the world’s entire fish catch. Fish represent the bulk

of protein consumed by people in the basin. Fish and other aquatic resources are therefore critical to the food and nutrition security of people in all Mekong Basin countries,” the statement said.

“Given their importance, consideration of potential impacts on fisheries must be fully integrated into decisions about the construction and operation of infrastructure, and particularly hydropower, in the basin.” The statement noted that the Mekong Delta was “particularly vulnerable” to the cumulative effects of large-scale water projects, and that Vietnamese aquaculture and agriculture were both potentially threatened.

The summit on April 4 and 5 was preceded by a two-day international conference on trans-boundary water resource management. According to a conference summary endorsed by the leaders, the overall message was that prosperity depends on how the benefits of common water resources are protected

and shared through cooperative mechanisms such as the MRC. “Water is life, and our increasing demands for food and energy (depend) on our ability to work together and manage this precious resource,” the summary said.

In a presentation to the conference, World Fish Center Deputy Director-General Patrick Dugan said it was not possible to maintain livelihoods and fisheries at present levels while food and energy production is increased. In balancing the trade-offs, Dr Dugan highlighted the need to integrate water-resource developments with a diverse range of stakeholders while understanding the resource value, building adaptive capacity and learning from others.

* Asian Development Bank, Australia, Belgium, Denmark, Finland, Food and Agriculture Organisation, France, Germany, International Union for the Conservation of Nature and Natural Resources, International Water Management Institute, Japan, the Netherlands, New Zealand, Sweden, United States, United Nations Development Program, World Bank and Worldwide Fund for Nature

Lao fish markets continue to expand

These fish sellers at Thongkhankham Market in Vientiane offer both river and reservoir fish. Taken in April, 2010, the photo shows Mekong silver barb (*Barbonymus gonionotus*, bottom left) in top condition, with many full of eggs prior to the annual flood. The large Chevron snakeheads (*Channa striata*), were caught in Nam Theun 2, a large and newly-filled reservoir in Lao PDR. As has been observed in other reservoirs shortly after filling, snakehead populations rapidly expand to exploit the newly-created habitat. Usually a more expensive fish, the snakeheads were selling at this time for about LAK 16,000 (\$2) per kg. Their low price is perhaps related to the increased supply. The barbs, often a cheaper fish, were fetching LAK 20,000 (\$2.50) per kg, probably reflecting their good condition and a preference for river fish.



PHOTO: KENT HORTLE

Third Phase of Mekong River Commission Fisheries Programme **takes shape**

By Xaypladeth Choulamany and Wolf Hartmann *

The next phase of the MRC Fisheries Programme from 2011 to 2015 has been designed with two components. One covers programme management and communications. The second focuses on fisheries management and development in specific areas. The new phase is expected to start after programme staff move from Vientiane to Phnom Penh in December.

Fisheries in the Mekong River system are of immense importance to the people of the Lower Mekong Basin (LMB). They provide food, employment and income to millions of people. These factors in the early 1990s led to a programme to heighten awareness of fisheries and their role in poverty alleviation, providing a basis for managing the resources and their environment to maintain productivity for future generations. The MRC Fisheries Programme started in the mid-1990s, and continues to the present day.

Mekong fisheries are under pressure from a wide array of impacts from development. Such impacts, most of them negative, stem from construction of hydropower dams, expansion of irrigated agriculture, and infrastructure development. In 2008, Danish International Development Assistance (Danida) and the Swedish International Development Cooperation Agency (Sida) conducted a mid-term review of the Second Phase of the Fisheries Programme from 2006 to 2010, recommending a Third Phase from 2011 to 2015.

Main focus

The main focus of the next phase is to consolidate and institutionalise the information, lessons learned and processes initiated. It is expected that the Third Phase will clearly be seen as the final transition to a more streamlined and regionally focussed—but nationally rooted—fisheries component of the MRC. Main tasks are systematic anchoring and strengthening of tools and processes, ensuring a progressive convergence

towards sustainable regional fisheries development, and anchoring information developed during the first two phases, based on an audience-oriented consolidation and ‘distillation’ of scientific data, lessons learned and outcomes.

Collaboration with other MRC programmes

The MRC’s Draft Strategic Plan for 2011–2015 concentrates on a number of strategic issues that also important for the Third Phase of the Fisheries Programme. These are strategic goals, shifting from a developing function to a monitoring and regional facilitation function, full riparianisation, long and medium-term financing needs of MRC in relation to its core functions, national execution of MRC projects and activities, cross-programme coordination within the MRC Secretariat, strategic partnerships and coordination with other regional initiatives. The Third Phase is therefore expected to collaborate with a number of MRC programmes:

- *Basin Development Plan* (the Fisheries Programme is collaborating closely and contributing key information to the Basin Development Plan and this will continue in the Third Phase);
- *Environment Programme and Climate Change and Adaptation Initiative* (as climate change will impact LMB fisheries significantly, the Third Phase will actively support the initiative, which was launched in 2008 and is headed by the Environment Programme);
- *Integrated Knowledge Management Programme* (the Third Phase will provide the programme with all data and other information accumulated and stored during the first and second phases, and further combine its expertise with the programme’s modelling component);

How the new phase was formulated

In preparing the Third Phase of the Fisheries Programme from 2011 to 2015, the MRC consulted more than 350 stakeholders over almost one year. In April, 2009, representatives of the National Mekong Committees and fisheries agencies from the four countries met in Vientiane to discuss recommendations from the Mid-term Review of the second phase of the programme to the 12-member Technical Advisory Body on Fisheries Management (TAB). The meeting, which was also attended by the Regional Network on Gender and Fisheries (NGF), agreed on the process to be taken to prepare for the next phase of the programme. At the programme's 16th annual meeting in Siem Reap in June, recommendations from the Mid-Term Review and preliminary ideas on the next phases were shared with a wider audience. This included representatives of fishing communities and user organisations as well as agencies such as the United Nations Food and Agriculture Organisation (FAO), the Wetlands Alliance, the World Fish Center and the World Wide Fund for Nature (WWF).

Detailed discussions followed at the 17th TAB meeting in Bangkok in September, where members strongly recommended that the process involve ample consultations with national and regional stakeholders. Further ideas were gathered at the Tenth Technical Symposium on Mekong Fisheries in Pakse in November. A consultant from the Institute of Fisheries Management of Denmark's Aalborg University then met with senior MRC secretariat and programme management as well as representatives of fisheries agencies from the four countries. In late November, a brainstorming workshop in Phnom Penh produced a comprehensive list of actions and activities to implement the recommendations and ensure the continued relevance of the Fisheries Programme to stakeholders. In January, the consultant presented preliminary findings to the Viet Nam National Mekong Committee in Hanoi, which recommended that the Fisheries Programme maintain two components. The committee also suggested a focus on MRC core functions and links between the Fisheries Programme and other MRC programmes, all within a basin-wide framework for integrated water resource management.

At a presentation in Vientiane in February, about 30 stakeholders accepted in principle a draft concept note prepared by the consultant but sought elaboration in areas such as emphasising more recent changes in fisheries and the basin. The stakeholders—including the MRC chief executive officer, representatives of the National Mekong Committees, senior staff of fisheries agencies and members of other MRC programmes—requested details on how the next phase would be implemented. A subsequent meeting of programme staff and national coordinators in Vientiane decided to reformulate the logical framework for the next phase for further discussion at a meeting in Ho Chi Minh City in late February. That meeting succeeded in defining details or activities under each component and focus areas of the Third Phase of the Fisheries Programme and agreed on how they would be implemented. Following further reviews by the TAB and stakeholders, the Draft Programme Document is scheduled to be submitted to the MRC Joint Council meeting in Phnom Penh in third quarter of 2010.

- *Integrated Capacity Building Programme* (this programme will develop implementation arrangements to work closely with the Third Phase, whose programme and counterpart staff will be trained in areas related to the policies, strategies and functioning of the MRC, and will advise the Fisheries Programme on the planning of technical capacity-building activities);
- *Initiative on Sustainable Hydropower* (the Fisheries Programme has established close links

with the initiative and has already provided a modelling tool for assessing cumulative effects of mainstream hydropower dams on migratory fish populations. The Third Phase will strengthen these links by supplying more tools and data).

Collaboration with other partners

The Third Phase is also expected to continue collaborating with regional partners and their initiatives. Among them are the Southeast Asian Fisheries Development Center (SEAFDEC), the ASEAN

Regional Fisheries Management Mechanism (FMM), the Network of Aquaculture Centres in Asia-Pacific (NACA), World Fish Center, Wetlands Alliance, World Wide Fund for Nature (WWF) and the International Union for Conservation of Nature (IUCN) as well as the Asian Institute of Technology (AIT), Kasetsart University, Royal University of Phnom Penh, Can Tho University and National University of Laos.

Guiding principles for designing the Third Phase have included adopting the MRC's Results-Based Monitoring and Evaluation System for defining goals, objectives, outcomes and outputs. Other principles included delivering MRC core functions, flexible in priority setting and riparianisation.

The two components of the Third Phase are 'Programme Management and Communication' and 'Fisheries Management and Development.' The latter may establish 'focus areas' which set major themes for programme activity such as capture fisheries, fisheries socio-economics, fisheries governance and aquaculture of indigenous species. The Third Phase is expected to integrate programme activities as much as possible. To ensure the programme is flexible and able to respond to new challenges, focus areas may change during the course of the next phase as

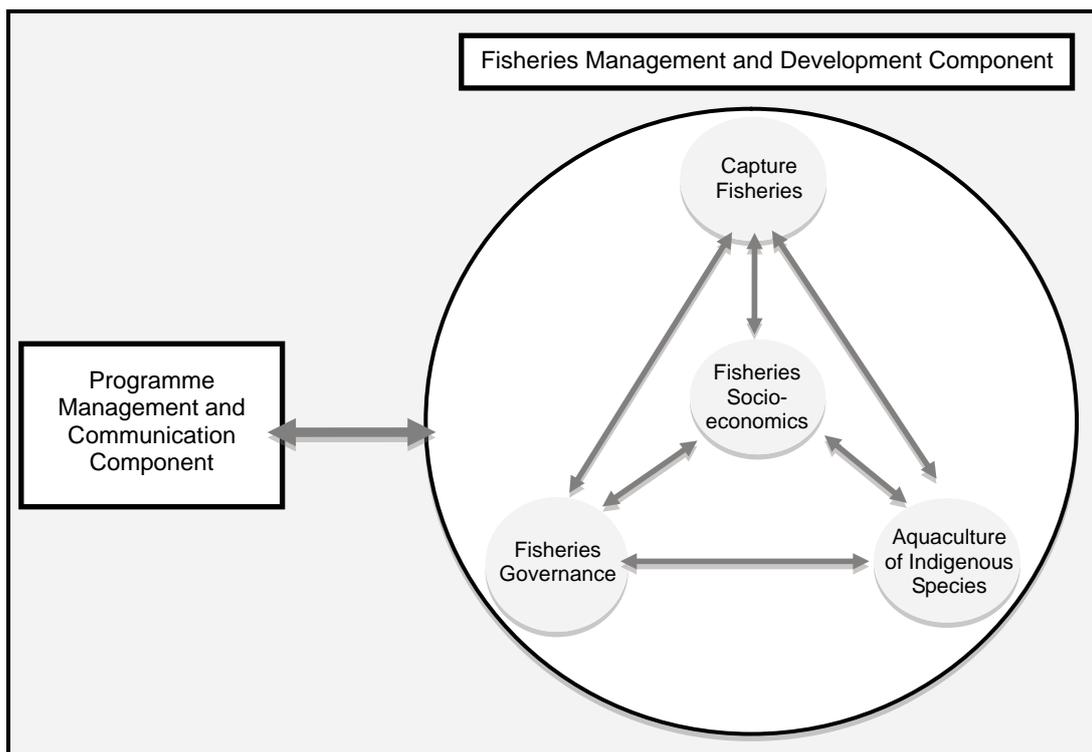
determined by needs and circumstances.

Intermediate outcomes

The objective of the Third Phase is that 'regional and national fisheries organisations implement measures for sustainable fisheries development and improved rural livelihoods.' The four intermediate outcomes contributing to the objective are that:

- riparian organisations have a good, science-based understanding of the situation of fisheries in the region;
- key stakeholders maintain a high level of regional and national dialogue, as well as dialogues between sectors and programmes relevant to fisheries within a basinwide integrated water resource management framework, and guide the implementation of suitable measures to maintain fisheries sustainability;
- riparian organisations monitor, provide and promote the use of information on status and trends in fisheries and aquaculture management and development; and
- national and local agencies and fishing communities have the capacity necessary

Proposed Structure of the Third Phase



for improving fisheries management and development.

To achieve the intermediate outcomes, the Third Phase is expected to have 13 outputs with several activities contributing to each. Four risks that could affect programme implementation have been identified and relevant strategies for mitigation developed.

The Fisheries Programme is under the Operations Division of the MRC. Its governance and administrative structure consist of a steering committee and a management team. The team is responsible for coordination, monitoring and timely implementation of all activities in workplans. Its functions are to guide the development and implementation, monitor progress and impacts, advise in problem situations, provide links to political and strategic decision-making levels and facilitate information exchange between the Fisheries Programme, the National Mekong Committees and development partners. Core staff are a programme coordinator, a chief technical adviser, four programme officers, three technical experts and two secretaries/administrative assistants.

Institutional arrangements

Institutional arrangements through the MRC and national fisheries agencies are expected to continue in the Third Phase. The management team has permanent working links with each of the MRC programmes and senior management of the MRC Secretariat. An important institutional linkage and 'policy mechanism' is the Technical Advisory Body for Fisheries Management (TAB), which provides an efficient conduit between the programme and the National Mekong Committees as well as fisheries agencies and the Regional Gender and Fisheries Network (NGF). Activities are implemented through national fisheries agencies, also termed 'counterpart agencies'. In the four LMB countries, eight counterpart agencies and more than 250 counterpart staff are expected to collaborate directly on the Third Phase.

The programme's stakeholder engagement mechanisms operate both formally and informally. In addition to the TAB, formal mechanisms involve programme coordination and yearly events to exchange information and engage in fisheries and aquatic resource management and development. On

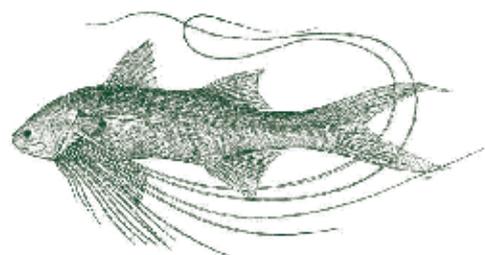
To our readers

With the MRC's adoption of the Results-Based Monitoring and Evaluation System, the Fisheries Programme plans to undertake numerous surveys in the coming years. These surveys will mostly be carried out by email, although hard-copy versions will also be distributed where appropriate. Hard copies of our first survey were enclosed in the previous issue of *Catch and Culture* and are aimed at subscribers for whom we have no email addresses. An electronic version of the same survey was sent to other subscribers in June.

a more informal level, there is frequent cooperation with more than 250 community organisations, some at district and provincial levels. With more than 9,000 members, these organisations have been supported by the Fisheries Programme since the early 2000s.

Danida has pledged \$5 million towards the Third Phase of the programme. In the focus areas, a 'rolling programme approach' is envisaged for planning and implementation. The idea is to maintain a flexible, adaptable programme that can be modified based on experience and respond quickly to developments within the MRC and changes in the external environment. Programme planning is expected to be undertaken annually within the MRC strategic planning framework and under the supervision of the Programme Steering Committee, headed by the TAB chair. It is envisaged that monitoring and evaluation of the Third Phase will follow the newly-adopted MRC Results-Based Monitoring and Evaluation System.

** Mr Xaypladeth is the coordinator of the MRC Fisheries Programme and Mr Hartmann is a Vientiane-based consultant who coordinated the fisheries management components under the first and second phases of the programme.*



With fewer fry from upstream, Tonle Sap dai fishery catch declines in latest season

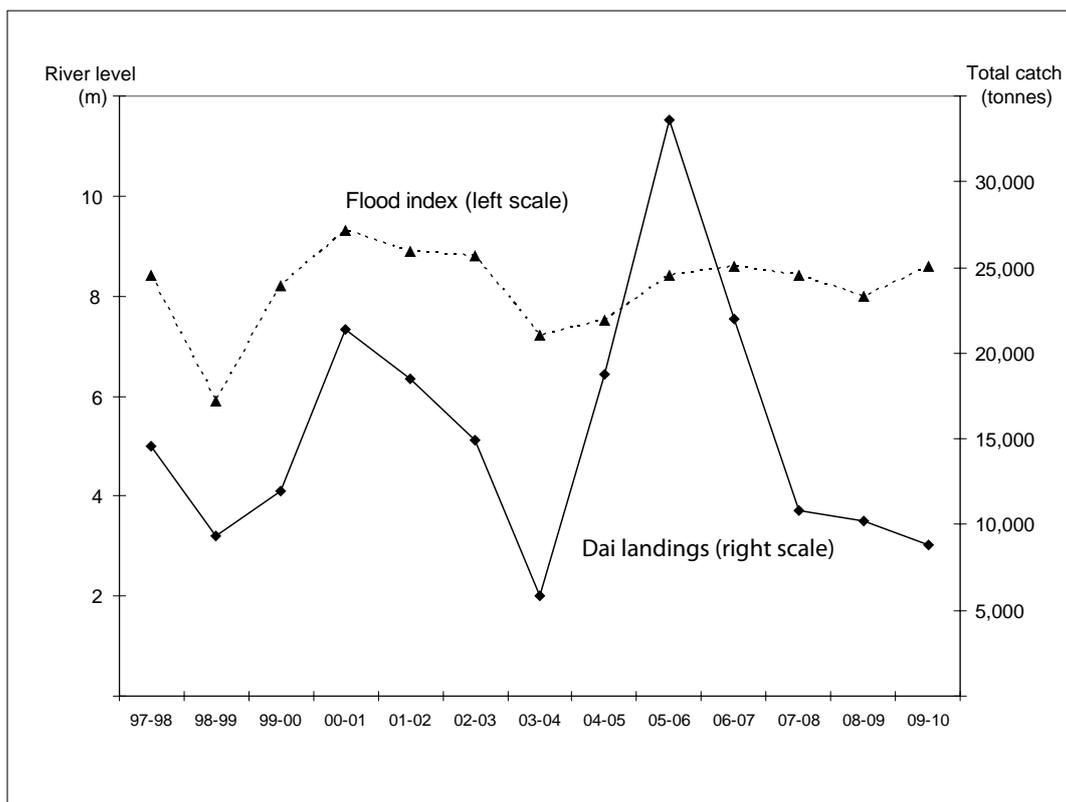
By Lieng Sopha, Ngor Pengby, So Nam and Kent G Hortle *

Concern about possible effects of fishing pressure lead to conservation measures for deep pools

The Tonle Sap dai (stationary trawl) fishery in the Tonle Sap River has been intensively monitored since 1997-98 by the Cambodian Fisheries Administration, sponsored by MRC. Trends in catches have been discussed in several *Catch and Culture* articles (e.g. Halls et al. 2008, So et al. 2007). In the 2009-10 season (October-March), the total catch from the Tonle Sap dai fishery fell 14 percent from the last season to 8,811 tonnes. Catches were the lowest since a severe drought during the 2003-04 season, when dai landings dropped to 5,869 tonnes. The average price

of Siamese mud carp (*Cirrhinus siamensis*) and lesser silver mud carp (*C. lobatus*)—the two main species targeted by the dai fishery—rose to a record KHR 1,095 (\$0.26) per kilogram, up 1 percent from a year earlier. That compares with KHR 628 (\$0.15) in 2003-04. During the latest season, the average 31-day flood index was 8.58 metres, up from 7.98 metres a year earlier and 7.20 metres in the 2003-04 season.

Catches from the dai fishery before the 2003-4 season were well-correlated with flood height ($r^2 = 0.67$), as is clear from the chart below. Flood height itself is correlated with a flood index based on area and duration (km² days). Larger, longer floods can lead to increased survival and growth of fish, by providing more habitat and feeding opportunities, which can





Stationary trawl harvest north of Phnom Penh

PHOTO: KENT HORTLE

ultimately lead to higher catches. In 2003-4 and in later seasons, the flood-catch relationship broke down, so that over the entire 13-year data-set there is very little correlation between flood height and catches ($r^2=0.18$).

Another important variable which affects fish production is the number of fry available to colonise floodplains. Since 2004, the Fisheries Administration has been monitoring the drift of fry in the Mekong and Tonle Sap River. Results are yet to be finalised, but preliminary figures suggest a very strong relationship between fry density and subsequent catches in the dai fishery. Very high fry densities in 2004 probably led to higher production and catches in 2004-5, and later the declining dai catches closely track a decline in fry drift densities.

Many factors could cause declining fry densities, including the possible effects of construction of dams on several tributaries and overfishing of brood

stock in deep pools in upper Cambodia in the dry season, perhaps exacerbated by unusually low river levels. Concern about the possible effects of fishing pressure has led Fisheries Administration Director-General HE Nao Thuok to order the Department of Fisheries Conservation to consider measures for fisheries conservation in deep pools. Results from MRC-sponsored research continue to be a key input to support fisheries development and management in Cambodia.

** Mr Sopha is acting director of the Department of Community Fisheries at the Cambodian Fisheries Administration, Mr Pengby is the MRC Fisheries Programme's database manager, Dr So Nam is director of the Inland Fisheries Research and Development Institute in Phnom Penh and Mr Hortle is the chief technical advisor to the Fisheries Programme.*

Further reading

Halls A, Lieng S, Ngor P, Tun P (2008) New research reveals ecological insights into dai fishery. *Catch and Culture* 14 (1): 8-12.

So Nam, Leng Sy Vann & Kura Yumiko (2007) *Catch and Market Chain of Low Value Fish along Tonle Sap River, Cambodia - Implications for Management of Their Fisheries*. Inland Fisheries Research and Development Institute and WorldFish Center, Phnom Penh, Cambodia. 55 pages.



Monitoring fry in Cambodia

PHOTO: KENT HORTLE

Exotic carps and tilapia found to have mild impact on native Mekong species

Lao wetlands study shows how stocking water bodies with alien species can boost overall fish abundance

As part of an adaptive learning community-based fisheries management initiative, MRAG scientist Robert Arthur and colleagues from the Lao Department of Livestock and Fisheries and Imperial College London assessed the impact of village-led stocking of 28 wetlands in lowland areas of the southern Lao provinces of Khammouane and Savannakhet. In a two-year experiment, the wetlands were stocked with combinations of Nile tilapia (*Oreochromis niloticus*), the Indian major carps mrigal (*Cirrhinus cirrhosus*) and rohu (*Labeo rohita*), and the Chinese bighead carp (*Aristichthys nobilis*). A further 14 wetlands, which were free of the alien species, served as the control group. Villages stocked the first group of wetlands with carps and tilapia in 2000 and 2001 and did test fishing with multi-panel gill nets on four occasions over this period.

The results of the experiment, published in the journal *Aquaculture** in November, showed that these alien species added almost 50 percent to total fish community biomass without affecting abundance of native species. At the same time, the study detected no significant impacts on native fish species richness, diversity indicators, species composition or feeding guild composition. By the time the experiment ended in 2002, alien species already accounted for a third of total biomass in the wetlands where they had been introduced but had not measurably affected the abundance or diversity of the native fish community.

While the impacts of species introductions may take years and possibly decades to become fully apparent, the authors noted that any impacts on the early life stages of native species in the experiment were likely to be rapid since most were small and short-lived. On the other hand, they conceded that subtle or long-term impacts could emerge. Indeed, an observational study of 23 pairs of wetlands conducted before the experiment showed significant declines in Simpson

diversity and equitability indices, two measures of species diversity and evenness. This suggested that the alien species had only a mild to moderate impact on the native species even where they accounted for a large or dominant share of total biomass.

Low niche overlap

The limited impact of the alien species on native fishes may reflect a “low niche overlap” between the two. Nile tilapia, for example, feed on phytoplankton and blue-green algae that is under-utilised by native species in the region. By removing individuals, fishing may have also made more resources available. The authors noted that a wetlands study had found no evidence of alien species replacing native ones under different levels of exploitation. But some studies have found that Mozambique tilapia (*Oreochromis mossambicus*) may affect regional biodiversity as they tend to prey more upon small fish and larvae than the Nile tilapia used in this study. Other studies have also found no evidence of negative impacts on biodiversity from stocking the carp species in small water body or floodplain fisheries at similar densities to the Lao experiment.

Since the study was specific to the species released, the wetlands and the native fish communities, the authors warned that the same species could interact significantly with native species if released in different biogeographic regions. In addition to assessing risk from alien species, they stressed the importance of carefully considering the benefits of stocking and the risk of alternatives, particularly the development of native species. This partly reflected a perception that stocking native species would cause less harm to native animal and plant life than alien species, and perhaps also a view that this was more “natural.” However, “the release of partially-domesticated native fish brings with it new, different and, as yet, poorly quantified ecological and genetic risks.”

* Arthur RI, Lorenzen K, Homekingkeo P, Sidavong K, Sengvilaikham B, Garaway CJ (2010) Assessing impacts of introduced aquaculture species on native fish communities: Nile tilapia and major carps in SE Asian freshwaters. *Aquaculture* 299: 81-88.

Catfish exports suffer first decline ever but performance still better than expected

Drops in shipments to Russia, Ukraine and European Union in 2009 are cushioned by increased exports to America, other ASEAN markets and Mexico

Viet Nam's catfish exports suffered their first decline ever in 2009, depressed by lower sales in the European Union (EU) and a sharp downturn in shipments to Russia and Ukraine, according to the Vietnam Association of Seafood Exporters (VASEP). The export value of processed Sutchi river catfish (*Pangasianodon hypophthalmus*) and Bocourt's catfish (*Pangasius bocourti*) fell 7.6 percent from a year earlier to \$1.3 billion in 2009. Export volumes were also down, dropping 5.2 percent to less than 608 million tonnes during the same period. By value, exports to the EU fell 7.3 percent to \$539 million with slightly weaker sales to Spain and Germany exacerbated by much steeper declines in exports to the Netherlands and Poland. Exports to Russia, where the market was closed in early 2009 due to food safety concerns, plunged 65.8 percent to \$64 million while those to Ukraine were down 54.7 percent at \$62 million. Exports to the United States, however, leapt 70.6 percent from a year earlier to \$134 million, and exports to other ASEAN countries advanced 17.3 percent to almost \$89 million, led by increased sales to Singapore, Malaysia and Thailand. Exports to Mexico were also higher, climbing 20.7 percent to \$72 million.

Pham Luu Hung, fisheries sector research analyst at Saigon Securities Inc (SSI) in Hanoi, said performance in 2009 was "better than expected" but that the outlook for 2010 was mixed. Writing in the March edition of the SSI newsletter *Sector Watch*, Mr Hung said that exports to Russia may recover further following the reopening of the market in the second half of 2009. New markets such as Brazil, Ecuador and possibly even Japan may emerge. But "competition is still fierce," he said, pointing to the small enterprises that produce low-quality catfish for sale at big discounts. "This might damage the Vietnamese pangasius image in the world market and is the main obstacle



Catfish processing plant in the Mekong Delta

PHOTO: LEM CHAMNAP

to expansion as well as the improvement in terms of price." The SSI analyst also noted that processing capacity remained high and that further expansion was not expected in 2010. "Rather, enterprises prefer to have a closer integrated production chain by adding by-product processing factories," he said. Also looming on the horizon was the continued threat that the United States may reclassify the Pangasiid species as catfish, reversing its earlier decision that the two fishes did not fit the American government's definition which covers a different family.

Ngo Thi Minh Huyen, senior equity analyst at Sacombank Securities Co, noted that the average export price for catfish dropped five percent to \$2.23 a kilogram in 2009 but forecast a recovery to about \$2.40 in 2010. With lower material costs, prices rose steadily in the seven months to March (see chart next page). For the whole of 2010, however, Ms Huyen said material prices were likely to increase over 2009 levels due to surging food and transport costs. She agreed that Latin America was a potential new market for Vietnamese fisheries exports, adding that Africa was also expected to enjoy good growth this year, especially with South Africa hosting the World Cup.

Hung Vuong becomes top catfish exporter

Among other developments, Hung Vuong Corp of Tien Giang province became the world's largest exporter of catfish last year, displacing Vinh Hoan Corp of Dong Thap province. According to VASEP, Hung Vuong's

exports came to \$122 million last year, accounting for 9.1 percent of total catfish exports. That compared with \$110 million at Vinh Hoan. Nam Viet Corp (Navico) of An Giang province trailed in third place with exports of almost \$85 million followed by Anvifish Joint Stock Co, another An Giang company, with \$57 million. An Giang Fisheries Import Export Joint Stock Co (Agifish) ranked fifth with \$55 million. Mr Hung, the SSI analyst, attributed Hung Vuong's emergence as the top exporter to its "aggressive strategy of maintaining revenue growth." The company's sales grew three

percent from a year earlier to VND 3.1 trillion (\$155 million) in 2009. Net income more than doubled to VND 363 billion (\$18.2 million). Listed on the Ho Chi Minh City Stock Exchange in November last year, Hung Vuong launched a public offer in February to acquire an additional 29.2 percent of Agifish, boosting its stake to 51.1 percent of the company. According to Mr Hung, the planned acquisition would allow the company to resume exports to the United States since the anti-dumping rate applied to Agifish is virtually zero compared with the rate of 58 percent applied to Hung

Earnings Outlook for Major Mekong Delta Processors in 2010

Company name Abbreviated name (stock code) Main products (main markets)	Capital (VND bln)	Daily capacity (tonnes)	Net profit 2009 (VND bln)	Net profit 2010 (F) (VND bln)
Minh Phu Seafood Corp Minh Phu (MPC) Shrimp (US, Canada, Japan)	700	* 19,500	237	300
Nam Viet Corp Navico (ANV) Catfish (Russia, EU, Asia)	660	500	(176)	NA
Hung Vuong Corp HV Corp (HVG) Catfish (EU, East Europe)	600	800	363	410
Vinh Hoan Corp Vinh Hoan (VHC) Catfish (EU, US)	353	500	209	243
Ben Tre Forestry and Aquaprodukt Import-Export JSC Faquimex (FBT) Shrimp, catfish (NA)	150	130	(87)	NA
Investment Commerce Fisheries Corp Incomfish (ICF) Shrimp, catfish (EU, US, Japan)	128	* 20,500	29	26
An Giang Fisheries Import Export JSC Agifish (AGF) Catfish (East Europe, Russia, West Europe, Asia)	128	150	14	68
Bentre Aquaprodukt Import and Export JSC Aquatex Bentre (ABT) Catfish, clams (EU, US, Japan)	113	40 (clams) 30 (fish)	91	90
Mekong Fisheries JSC Mekong Fish (AAM) Catfish, octopus (EU)	113	120	53	65
CLFish Co Cuu Long Fish (ACL) Shrimp, catfish (EU)	90	100	50	55
Sao Ta Foods JSC Fimex (FMC) Shrimp (Japan, US)	80	50	15	18

F = forecast * Annual capacity
Source: Sacombank Securities

Vong. In addition, he said it would allow the company to expand catfish production by increasing the low capacity utilisation rates at Agifish plants.

Bright outlook for clam and shrimp exporters

Elsewhere in the market, Mr Hung noted that net earnings at Bentre Aquaproduct Import and Export Joint Stock Co more than tripled last year, reflecting its stable core business as the largest exporter of Ben Tre clams (*Meretrix lyrata*) and an attractive portfolio of financial investments. For 2010, he said, the outlook is brighter following the recent decision to award the Ben Tre clam fishery with Marine Stewardship Council (MSC) certification (see *Catch and Culture*, Vol 15, No 3). As for Minh Phu Seafood Corp, the country's top shrimp exporter, its net income of about VND 240 billion (\$12 million) in 2009 was better than expected. With shrimp exports of \$160 million outpacing its nearest rival with exports of only \$83 million last year, Mr Hung said the company's leading position remains solid. Partly controlled by Singapore's Temasek Holdings, Minh Phu exports black tiger shrimp (*Penaeus monodon*) and white shrimp (*Litopenaeus vannamei*) farmed in the Mekong Delta provinces of Ca Mau and Kien Giang. While the company risked a shortage of raw material during the first quarter of this year, "current performance is decent and overall we believe the fundamentals are still good in 2010," Mr Hung said. Moreover, if the supply of raw materials expands and the demand for processed shrimp grows, the expected doubling of Minh Phu's capacity in 2010 will fuel strong growth.

Ms Huyen, the Sacombank Securities analyst, reckons Minh Phu and other largely-capitalised companies such as Hung Vuong and Vinh Hoan have the most sustainable businesses. Not only do they have stable export markets and well-organised farms, they also have strong financial positions and well-known brand names to help them penetrate new markets faster. Medium-capitalised companies like Aquatex Bentre, Mekong Fish and Cuu Long Fish also have bright prospects with exports focussed on the EU. Ms Huyen said that companies such as Navico, Agifish and Faquimex—which suffered losses or low earnings last year—were expected to see big improvements in revenue in 2010. But she noted that these companies still faced long-term risks given their dependence on unstable markets and weak material supplies.

Small indigenous freshwater fish species

A recent workshop in India has highlighted the importance of small indigenous freshwater fish species as a source of micronutrient, vitamins and fatty acids. Organised by the International Collective in Support of Fishworkers (ICSF) Trust, the workshop in Kolkata in February focussed on the roles such species play in poverty reduction, food security and conservation biodiversity. The workshop heard that small species offer a better source of calcium "bioavailability" than milk and could thus be a good dietary supplement for expectant and lactating mothers. Even minimal annual production of 10 kg of small species like the mola carplet (*Amblypharyngodon mola*), similar to many small cyprinids found in the Mekong Basin, can make a large difference to the nutritional needs of the rural poor. Of India's 450 small indigenous freshwater fish species, 62 are highly important as food species and another 42 as food and ornamental fish. Despite this diversity, such species are invisible in official statistics, hence the need to develop a legislative framework and criteria to conserve them, keeping in mind the need to ensure local food security.

Further reading

<http://www.icsf.net/SU/Sam/En/55>

[http://www.esiap.cipotato.org/upward/Publications/Agrobiodiversity/pages%20439-447%20\(Paper%2055\).pdf](http://www.esiap.cipotato.org/upward/Publications/Agrobiodiversity/pages%20439-447%20(Paper%2055).pdf)

<http://fish-and-nutrition.net>

<http://www.fao.org/fileadmin/templates/biodiversity/pdf/Halwart.pdf>

Ornamental fish farms flourish in Viet Nam with both exotic and native species

By Nguyen Nguyen Du and Peter Starr *

In this article, we meet the owners of three ornamental fish farms in Ho Chi Minh City that cater to very different segments of the market. We also visit the owner of a licensed retail outlet specialising in Asian arowanas.

Vo Van Sanh isn't sure when his grandfather started the family ornamental fish business in Saigon except that it was some time during World War II, a few years before he was born. Mr Sanh himself became involved in the business as a boy in 1968. "My father used to export fish to America and South America via Hong Kong. At the time, we were selling a lot of indigenous fishes from the Mekong and Saigon rivers," he recalls, adding that archerfishes and loaches were particularly popular. "My father also used to import fishes, especially from France." Although imports from France were interrupted after Saigon's liberation in 1975, the country's reunification had a positive impact on the business as it then had direct access to Chinese species that had been introduced into the Red River in northern Viet Nam many years earlier.

"From 1975 to 1986, we cultured local species only," Mr Sanh says. Following the launch of economic reforms in 1986, however, the business was able to resume imports of South American species via Thailand. Other species were imported from Singapore, Malaysia, Indonesia and ultimately Japan in 1990 when the business started importing koi, the domesticated ornamental varieties of common carp (*Cyprinus carpio*) introduced from China several centuries ago. Mr Sanh said the initial consignment of several hundred individuals of 10 cm - 15 cm soon allowed him to start breeding the Japanese varieties himself. Exports of "Vietnamese koi" began two years later to markets such as the United States and Europe, notably the Czech Republic.

Today, sales of koi account for about 90 percent of turnover at the Ba Sanh Ornamental Fish Farm in



Mr Sanh: third-generation aquarium fish farmer

PHOTO: LEM CHAMNAP

Common carp

The common carp (*Cyprinus carpio*) was introduced into Thailand from 1913, into Viet Nam from 1969 and into Lao PDR from 1977. According to MRC Technical Paper No 9, the species is now "widely established in the wild and in many areas is now regarded as a permanent element of the fauna." Despite disfavour towards the species in many areas, "it is not perceived as an immediate problem in the Mekong." Since it eats the eggs of other fish, however, southern Lao fishermen have blamed it for declines in local fish species. The paper noted that common carps are "notorious" for the way their populations rapidly increase following the construction of dams. Moreover, their habit of digging around the bottom and muddying the water can "seriously alter the environment to the detriment of other species." But "given that the species is firmly established, there seems little that can be done to eradicate this potentially troublesome fish."

Binh Tanh district on the outskirts of Ho Chi Minh City. Situated on four hectares of land, the farm employs 10 people. Monthly operating costs are about VND 80 million (\$4,000) of which about 20 percent goes towards feed. The farm has three sources of water—underground water for the hatcheries, water from the Saigon River for grow-out and city water to keep fish that are on display and ready to be sold. Overall, Mr Sanh says, the business currently deals in about 30 species. Apart from koi and several other alien species from Asia and South America, the 10 main species include three Mekong fishes—the clown featherback (*Chitala ornata*), the Siamese algae eater (*Gyrinocheilus aymonieri*) and the giant gourami (*Osphronemus goramy*). Less frequently-traded Mekong species include the three-spot gourami (*Trichogaster trichopterus*) and the moonlight gourami (*Trichogaster microlepis*). Mr Sanh says his family has been breeding the giant gourami for 45 years. Clown featherback breeding goes back 20 years and now includes a greenish-yellowish variety with two rows of spots rather than one. The breeding of Siamese algae eaters started about three years ago.

At its height, the koi export business was air freighting minimum consignments of 500 kg to the United States, equivalent to almost 4,000 individuals of 10-12 cm. Although koi exports were suspended in 2006 amid concerns about Koi Herpes Virus (KHV), Mr Sanh hopes they will resume later this year when Vietnamese government testing shows that his fish are free of the disease. Until that happens, he's relying on the domestic market. "Our customers are mainly collectors who live in tall buildings," he says. Others include operators of recreational areas from across Vietnam and aquarium fish retailers from Ho Chi Minh City as well as Phnom Penh, the Cambodian capital. According to Mr Sanh, prices for koi can range from as little as VND 10,000 (\$0.50) for 5 cm individuals to as much as VND 10 million (\$500) for a particularly attractive fish of 50 cm. That compares with VND 15,000 (\$0.75) for a 20 cm clown featherback or VND 5,000 (\$0.25) for a 5 cm gourami.

* * *

Founded in 1999 by Vietnamese and Czech interests, Saigon Aquarium Corporation started out on a one-hectare site in Cu Chi District on the outskirts of Ho Chi Minh City. In 2004, the joint stock company established

a second farm of eight hectares. Today, the company has 80 employees and claims to be the biggest breeder and exporter of tropical freshwater aquarium fish in Viet Nam. Exotic species from 20 families are mainly bred at the larger farm while native species are mostly stocked at the smaller facility. Le Huu Thien, the company's director, says Saigon Aquarium currently stocks about two dozen species from the Mekong ranging from gouramies and eels to pufferfishes and rasboras (see table next page). His uncle Nguyen Van Duc, who founded the company, is based in the Czech Republic where he oversees imports into Europe.

Nguyen Ngoc Que, the company's Czech-trained chief technician, says Saigon Aquarium stopped importing exotic species about seven years ago. Asian species were previously imported from Thailand, Singapore and China while imports of South American species were arranged by the company's Czech partners. In addition to breeding its own fishes, the company has agreements with small breeders and fishermen who collect native species from the wild. "We used to



Mr Que: Czech-trained technician
 PHOTO: LEM CHAMNAP

Native Ornamental Fishes

Indigenous Mekong species stocked by Saigon Aquarium Corp

Scientific name	Common name
<i>Balantiocheilos melanopterus</i>	Tricolour shark minnow
<i>Batrachomoeus trispinosus</i>	Three-spined frogfish
<i>Cyclocheilichthys apogon</i>	Beardless barb
<i>Datniodes undecimradiatus</i>	Mekong tiger perch
<i>Gyrinocheilus aymonieri</i>	Siamese algae eater
<i>Hampala macrolepidota</i>	Hampala barb
<i>Macrogathus siamensis</i>	Peacock eel
<i>Mastacembulus armatus</i>	Zig zag eel
<i>Monotretus turgidus</i>	Stiff puffer
<i>Mystus atrifasciatus</i>	Striped catfish
<i>Osphronemus goramy</i>	Giant gourami
<i>Parambassis apogonioides</i>	Iridescent glassy perchlet
<i>Pisodonophis cancrivorus</i>	Long fin snake eel
<i>Puntius partipentazona</i>	Red cheek barb
<i>Rasbora borapetensis</i>	Black line rasbora
<i>Rasbora trilineata</i>	Three-lined rasbora
<i>Scatophagus argus</i>	Spotted scat
<i>Tetraodon biocellatus</i>	Eyespot pufferfish
<i>Tetraodon nigroviridis</i>	Spotted green pufferfish
<i>Toxotes jaculatrix</i>	Banded archerfish
<i>Trichogaster pectoralis</i>	Snakeskin gourami
<i>Trichogaster trichopterus</i>	Three spot gourami
<i>Trichopsis schallieri</i>	Three stripe gourami

have a lot of Mekong species but now they are less common,” Mr Que says.

Most species are sold for less than \$1 each. In addition to Europe, which accounts for more than half the company’s overseas sales, Saigon Aquarium exports to the United States and other Asian countries. The company’s packaging staff, who are also Czech-trained, prepare shipments in 15 kg boxes containing four bags of fish. Minimum exports are about 20 boxes. Mr Que says the number of fish in each shipment depends on the species, the size of the fish and the distance travelled. For example, a shipment of 3 cm swordtails, a species native to Central America, might have 2,400 individuals per box if being flown to Singapore but only 800 if travelling to Frankfurt, the company’s European hub. Mr Que says Saigon Aquarium also ships fish to domestic destinations such as Ho Chi Minh City, Hanoi, Haiphong and Danang.

* * *

Established in 1993, Hai Thanh Aquarium Co Ltd started out by importing tropical freshwater fishes from Singapore, Malaysia and Indonesia for breeding in Viet Nam. In 2006, the company began importing koi from the Okayama Momotaro Koi Farm in western Japan. At the time, recalled company chairman Le Huu Dung, the koi being supplied by Saigon Aquarium and Ba Sanh Ornamental Fish Farm were of poor quality in terms of breeding traits such as tail size, colour, body width and head shape. To meet the demands of Vietnamese collectors, Mr Dung imported more than 1,000 broodstock from Momotaro, paying at least \$1,000 each for individuals ranging in size from 30 cm to 60 cm. Since the quality of the offspring was poor, he imported a second batch of smaller individuals, paying between \$300 and \$500 for each fish. The offspring from the second batch were of better quality and had grown to 2 kg - 3 kg within 18 months.

Today, the Hai Thanh Koi Farm has about 50,000 individuals of various sizes ranging from 10 cm to 90

Continued on page 20



Mr Dung: meeting the demands of local collectors

PHOTO: LEM CHAMNAP



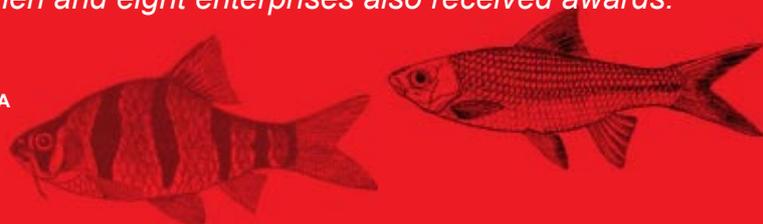
Catch and Culture



Viet Nam Fisheries Festival



Referring to Viet Nam's rich aquatic resources, Ho Chi Minh once said: **“Our silver sea belongs to the people.”** In April, more than **600,000 people** took part in the first Viet Nam Fisheries Festival hosted by **Can Tho City**, at the heart of the dynamic **Mekong Delta**. The four-day event coincided with the inauguration of Can Tho Bridge over the **Hau Giang** branch of the Mekong (also known as the **Bassac River**). The bridge has the longest main span in Southeast Asia. At the opening on April 24, **Prime Minister Nguyen Tan Dung** praised the industry's contributions to the economy, noting that key export species like catfish and shrimp help to promote Viet Nam as an important aquaculture exporter to the rest of the world. Among those awarded for their **outstanding contributions to Vietnamese aquaculture development** were 12 scientists including **Dr Pham Van Khanh, Dr Ly Thi Thanh Loan and Mr Nguyen Van Sang** from the **Research Institute for Aquaculture No. 2 (RIA2)**. To various extents, their work has been related to **MRC Fisheries Programme** activities. Eleven farmers and fishermen and eight enterprises also received awards.





The festival was a **major socio-economic event** which, together with cultural activities, demonstrated the **strength and potential of Vietnamese aquaculture** in creating an **internationally-recognised trademark**. It was also a major attraction for tourists to Can Tho and the whole Mekong Delta, said **To Minh Gioi**, vice-chairman of Can Tho City People's Committee and organiser of the event. The festival featured more than **470 booths** arranged by more than **160 participants** from **30 provinces**. Displays included live and processed aquaculture products, research work of several institutions such as **RIA2**, new technologies for feed and feed additives, water treatment and processing methods and equipment, new aquaculture technologies, new probiotic products, chemicals and aquaculture services, and new aquaculture standards.





Vietnamese exports of aquaculture products are expected to exceed \$4.5 billion in 2010, up from \$4.3 billion in 2009. The sector is one of Viet Nam's most promising and productive, with farms currently covering 1.1 million hectares. According to the Ministry of Agriculture and Rural Development, aquaculture products are one of the country's key agricultural products besides rice and vegetables. Forum topics at the festival ranged from improving product quality to policy making for aquaculture development. A common issue was that the country's aquaculture sector still faces the challenge of increased international competition as a result of its global integration, said Luong Le Phuong, deputy minister at the Ministry of Agriculture and Rural Development. "The festival's forums provided fruitful solutions to increase the competitiveness of Vietnamese aqua products," Mr Phuong said.



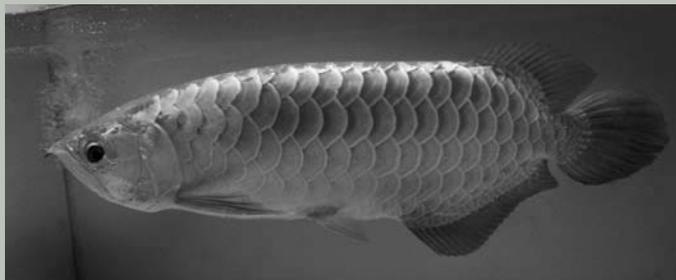


After four hectic days, the closing ceremony on April 27 featured national awards for records set in five categories including one for the **largest collection of fishing gear and boat models**. Other records were set for the **biggest cultured Bocourt's catfish** (*Pangasius bocourti*), **Sutchi river catfish** (*Pangasianodon hypophthalmus*) and **black tiger shrimp** (*Penaeus monodon*). The fifth award, for the **largest cultured giant barb** (*Catlocarpio siamensis*), went to **RIA2**. The fish weighed **32 kg**.



TEXT AND PHOTOS: TRINH QUOC TRONG AND PHAM DANG KHOA

Dragon fishes



Until recently, the endangered Asian arowana (*Scleropages formosus*), known as dragon fish in the aquarium trade, was thought to be the only arowana species indigenous to Asia. According to the International Union for the Conservation of Nature (IUCN), the species is native to Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, Thailand, Viet Nam and possibly Myanmar. However, Pouyaud et al. (2003) described three new species within *Scleropages formosus*: *Scleropages legendrei*, *Scleropages aureus* and *Scleropages macrocephalus*, all from Indonesia, and considered *Scleropages formosus* to apply only to the more common green arowana. The three new species

correspond to what were considered colour varieties within the species, although other scientists (Kottelat and Widjanarti, 2005) have contested the evidence presented by Pouyaud et al. for splitting these from *S. formosus*.

Since imports and exports of the Asian bonytongue are restricted under CITES, captive breeding programmes in Singapore, Malaysia and Indonesia now meet the demands of the aquarium trade. Super reds command premium prices. Hoang Manh Long, the owner of Hong Anh Aquarium in Ho Chi Minh City, says a 20 cm individual can fetch up to US\$1,250, almost six times the average retail price for a slightly smaller red-tailed arowana (see table above). Hybrids formed by crossing super red and green arowanas retail for about \$100 for a 16 cm individual, twice as much as the pure green species. Although he doesn't sell silver Asian arowanas, Mr Long says they're widely available in Ho Chi Minh City for about \$10 each. The cross-backed golden arowana, a variety that occurs only in Bukit Merah in the Malaysian state of Perak, commands prices similar to those for the super red species.

Among CITES-registered Singapore breeders supplying tagged arowanas to Viet Nam are Imperial Arowana Breeding Farm Pte Ltd and Fu Long Holdings Pte Ltd, formed by the merger of Sing Arowanas Pte Ltd and Pang Long Pte Ltd in 2007. Mr Long says Singapore farms have successfully bred all Asian arowanas except the super reds which are farmed only in Indonesia or Malaysia. On the other hand, the cross-backed golden variety is farmed only in Singapore and Malaysia. Mr Long himself says he became interested in arowanas while studying graphic design in Singapore. Today, his arowana shop is a sideline to his main business of exporting ceramics.

Further reading

Kottelat M, Widjanarti E (2005) The fishes of Danau Sentarum National Park and the Kapuas Lake Area, Kalimantan Barat, Indonesia. *Raffles Bulletin of Zoology Supplement* 13: 139-173.

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Asian arowana retail prices in Ho Chi Minh City

Common name	Scientific name	cm	US\$
Cross-backed golden arowana	<i>Scleropages</i> sp. cf. <i>formosus</i>	20	750-1250
Super red arowana	<i>Scleropages legendrei</i>	20	550-1250
Red-tailed golden arowana	<i>Scleropages aureus</i>	16	220
Banja red arowana	<i>S. legendrei</i> x <i>S. formosus</i>	16	100
Green arowana	<i>Scleropages formosus</i>	16	50
Silver Asian arowana	<i>Scleropages macrocephalus</i>	16	10

Sources: Hong Anh Aquarium, FishBase

Continued from page 18

cm. Located next to the Saigon River in the Cu Chi District of Ho Chi Minh City, the 23 hectare facility is the largest ornamental fish farm in Viet Nam with 70 employees including eight security guards. So far, Mr Dung says he has invested VND 107 billion (\$5.4 million) on developing his koi breeding facility. Most of his customers are serious collectors. "Restaurants and hotels are only interested in cheap prices. A collector might pay \$6,000 for one fish whereas restaurants and hotels might pay only VND 600,000 (\$60) for a fish the same size," Mr Dung says. Indeed, on the day *Catch and Culture* visited the farm, one customer shelled out \$6,000 for a large individual and \$800 each for four smaller individuals. "We have the best quality koi so there's no competition," Mr Dung says. "Most of our customers are collectors from northern Vietnam. Sometimes we also get customers driving here from Laos." Other foreign customers include Singaporeans, Malaysians, Japanese and Indonesians, although a resumption of exports to these countries depends on the results of KHV tests expected in June.

As far as the domestic market is concerned, Mr Dung says koi breeding seems to be a recession-proof industry. During the recent economic downturn, "collectors actually came to buy more fish since they had no work and wanted to relax." So far, the most expensive fish sold has been for \$15,000 while the most expensive individual on offer in early April was for \$18,000. Although collectors from northern Viet Nam can sometimes spend as much as VND 4 billion (\$200,000) in a single month, Mr Dung says sales are generally slow and not enough to cover the farm's monthly operating costs of VND 1.5 billion (\$75,000), of which about 40 percent goes towards feed. On the other hand, the chairman notes that the company is still in its investment phase and sales should improve in the longer term. Although Hai Thanh has a showroom in downtown Ho Chi Minh City, "we're not advertising yet," Mr Dung says. "We plan to but at this stage we don't have enough fish to sell." As for the sprawling farm site, the chairman hopes to develop a koi hotel for collectors to visit their fish on weekends, a concept that is popular at koi and arowana farms in Singapore. Since koi need five years to reach full maturity, the hotel will also offer collectors the opportunity to track the growth of juveniles before they develop their final colour and shape.

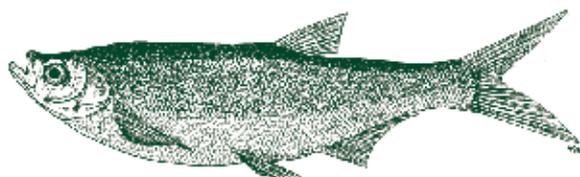


Handle with care: a worker at the Hai Thanh Koi Farm

PHOTO: LEM CHAMNAP

Away from the koi farm, Mr Dung has been involved in various public aquarium projects over the years including a freshwater and marine aquarium that was scheduled to open in Hanoi during the second quarter of 2010. One of his biggest regrets is not succeeding in an earlier plan to build a public aquarium devoted to Mekong species. "I know that fishes from the Mekong are very difficult to keep in aquariums as I've experimented with many different species," he says. "Many years ago, I wanted to establish an aquarium specialising in Mekong fishes. But my business partner wanted to develop an amusement park instead. It was a big mistake."

** Mr Du is a biologist with the Fisheries Ecology, Valuation and Mitigation Component of the MRC Fisheries Programme and Mr Starr is editor of Catch and Culture*



Rich diversity of self-recruiting aquatic animals awaits Mekong rice farmers

Aquatic habits managed by Cambodian and Thai farmers in or near the Mekong River Basin yield a large variety of self-recruiting species ranging from fish to amphibians, crustaceans, molluscs and insects. Yields in the Red River Basin in northern Viet Nam are less diverse.

Having evolved over 6,000 years, rice-farming systems and their aquatic habitats are among the oldest cultural landscapes on the planet. In the first in a series of two articles* published last year, a group of scientists from Imperial College London, University of Stirling and the Asian Institute of Technology introduced the concept of “farmer-managed aquatic systems” in Cambodia, Thailand and Viet Nam. To characterise these systems, the team conducted a two-year study of 500 farming households in 16 villages in both upland and lowland areas between 2001 and 2003. The authors identified five systems—rice fields, household ponds, ponds in rice fields, ponds in lakes and “bid-rent ponds”, the latter being large ponds on public land that can be rented by farmers for aquaculture. In Svay Rieng and Takeo provinces in southern Cambodia and Yasothon, Roi Et and Sisaket provinces in northeast

Table 1 Species Recorded in Survey

Taxon	Cambodia	Thailand	Viet Nam
Teleost fishes ¹	20	53	13
Insects	0	5	0
Crustaceans	2	2	2
Molluscs	1	3	2
Amphibians ²	1	3	0
Total species	24	66	17

¹ all ray-finned fishes except primitive bichirs, sturgeons, paddlefishes, freshwater garfishes and bowfins
² excluding amphibious fishes

Thailand, farmer-managed systems primarily yielded self-recruiting species of fish and other aquatic animals rather than cultured species. Farmers managed the systems accordingly, either by allowing such species or attracting them. In the northern Vietnamese villages, located in Hanoi and the Red River Delta district of Phu Xuyen in Ha Tay province, farmers managed the systems more intensively, mostly to produce fish reared in hatcheries. For households in Vietnam, the market value of self-recruiting species was only about 3 percent of the rice crop compared with about 10 percent in Cambodia and Thailand.

Diversity

In the second article, the authors looked at the diversity of aquatic resources and management impacts on catch rates. During a 13-month monitoring survey, aquatic animals harvested included amphibians, crustaceans, molluscs and insects as well as fish. The number of locally-recognised species varied from 66 in Thailand to 24 in Cambodia and 17 in Viet Nam (see Table 1). Among the self-recruiting species, fishes accounted for most of the catch in all three countries. Other aquatic animals accounted for as little as 16 percent in Thailand to as much as 46 percent in one Cambodian province (see Table 2 next page). By weight, the most important self-recruiting fish species harvested in all three countries were chevron snakehead (*Channa striata*) followed by climbing perch (*Anabas testudineus*) and species



Frogs accounted for 18 percent of the catch in one Cambodian province

PHOTO: JOE GARRISON

from the *Clarias* genus of walking catfishes. Next came a group of small fishes comprising flying barb (*Esomus metallicus*) and species from the *Rasbora* genus of carps, important only in Cambodia and Thailand, followed by gold fish (*Carassius auratus*) which were limited to Viet Nam. Among other self-recruiting species, the most important were frogs (*Rana* spp.), pulmonate apple snails (*Pomacea* spp.), prosobranch pond snails (*Sinotaia* spp.), rice field crabs (*Somanniathelpusa* spp.), freshwater prawns and shrimps (including *Macrobrachium* spp.) and various insects. Amphibious fish and other aquatic animals accounted for most of the catch of self-recruiting species in all three countries. Cultured species were all fishes. The dominant ones in Cambodia were Nile tilapia (*Oreochromis niloticus*) and species from the *Pangasius* genus of shark catfishes. Elsewhere, the dominant species were common carp (*Cyprinus carpio*) and silver barb (*Barbonymus gonionotus*) in Thailand and mud carp (*Cirrhinus*



A 'trap-pond', a typical element of farmer-managed aquatic systems in northeast Thailand
 PHOTO: KENT HORTLE

Table 2 Self-Recruiting Species

Composition of catch (%) for all fish species and other groups contributing at least 5% to the total

Type	Cambodia		Thailand	Viet Nam
	Svay Rieng	Takeo		
Fishes	75	54	84	58
Frogs	18	13	10	0
Snails	0	0	2	31
Rice field crabs	2	26	1	1
Prawns & shrimps	5	7	2	10
Insects	0	0	1	0
Total	100	100	100	100
Contribution ¹	82	72	98	20
Amphibious species ²	74	79	70	62

¹ as percentage of overall catch including cultured species
² as percentage of self-recruiting species only

molitorella) and silver carp (*Hypophthalmichthys molitrix*) in Viet Nam.

Management

Twelve management activities were commonly practised and at least half of all farmers carried out at least one activity. In Cambodia, there was a significant difference between the upland area in Takeo province, where farmers practised an average of almost three activities, and the lowland area in Svay Rieng province, where the average number of activities was closer to one. In Takeo, the most common activities were drying and deepening ponds, building brush parks, stocking, feeding and water management. In Svay Rieng, feeding and stocking were most common. In Thailand, farmers practised fewer activities on average, the most common being the construction of brush parks, stocking and feeding. In Viet Nam, farmers with ponds followed significantly more management activities than those in Cambodia and Thailand with feeding, stocking and pond preparation practised by more than half the households monitored. In the countries with systems dominated by self-recruiting species, only brush parks in Cambodia and only fertilisation in Thailand had positive effects on catch rates. In Viet Nam, where ponds were managed comprehensively as carp polyculture systems, positive impacts were seen from several activities ranging from owning a pond and feeding to pond preparation and stocking.

The authors noted the predominance of amphibious



Rain-fed rice-fields are the most extensive aquatic habitats in the LMB, as shown here in Xieng Khouang province, Lao PDR.

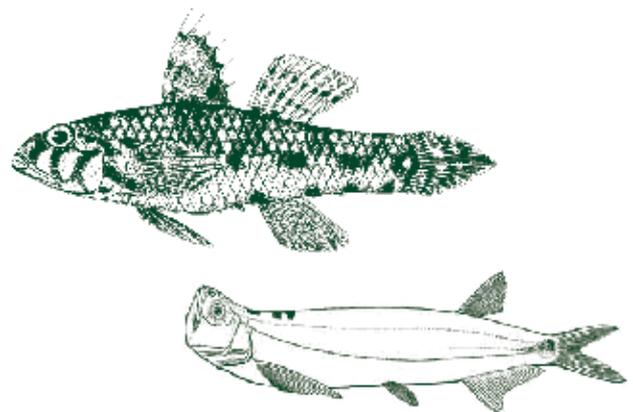
Photo KENT HORTLE

species including fishes such as Chevron snakehead, climbing perch and various walking catfishes which can breathe air, move over moist ground and survive buried in mud for long periods. Such adaptations allow amphibious fishes as well as frogs, snails, crabs and aquatic insects to colonise rice farming areas where aquatic habitats are extensive but seasonally or intermittently dry and also fragmented by dikes. The ability of these species to move across land barriers implies that the connectivity of aquatic habitats is unlikely to be a major limitation to the production of self-recruiting species in farm-managed aquatic systems. However, primarily aquatic organisms such as fish need truly aquatic habitats of sufficient depth to sustain production—which explains why fish contributed more to self-recruiting species in deep-water, rain-fed and flood-prone rice growing areas of Cambodia and Thailand compared with the shallow irrigated areas of Viet Nam. The difference in landscapes probably also accounted for the higher diversity of self-recruiting species in Cambodia and Thailand. In addition to the nutritional benefits of aquatic animals and the likely contribution of self-recruiting species to pest control, the authors noted that the latter were more diverse and abundant in farmer-managed aquatic systems than open waters. By increasing the overall aquatic habitat area and promoting the movement of aquatic animals

between natural open water bodies, such systems may therefore help to conserve aquatic biodiversity. As such, they concluded, the systems deserve more attention in agricultural and ecological research and extension.

* Amilhat E, Lorenzen K, Morales EJ, Yakupitiyage A, Little DC (2009a) Fisheries production in Southeast Asian farmer managed aquatic systems (FMAS). I. Characterisation of systems. *Aquaculture* 296: 219-226.

Amilhat E, Lorenzen K, Morales EJ, Yakupitiyage A, Little DC (2009b) Fisheries production in Southeast Asian farmer managed aquatic systems (FMAS). II. Diversity of aquatic resources and management impacts on catch rates. *Aquaculture* 298: 57-63.



Cambodian farmer succeeds with artificial propagation of native catfish

By Chea Phala and Peter Starr *

Although the initial survival rate has been low, the seed quality is said to be better than what's available from Viet Nam

While farmers in the Mekong Delta have been raising Sutchi river catfish (*Pangasianodon hypophthalmus*) for centuries, the species has been domesticated only in recent decades. Artificial propagation was first achieved in 1959 in Thailand, where the catfish is native to both the Mekong and Chao Phraya River Basins, and over the next 20 years in Indonesia, Malaysia and Vietnam. By 2000, when overfishing prompted Viet Nam to follow Cambodia in banning the collection of wild-caught fry drifting downstream from spawning habitats, the Vietnamese private sector was playing an important role in local seed production (see MRC Technical Paper No 2).

Not so in Cambodia, where the species has been artificially propagated at the Freshwater Aquaculture Research and Development Centre (FARDEC) in Prey Veng province since 2003 as part of joint research efforts by the Cambodian Fisheries Administration and the MRC Fisheries Programme. Until recently, Cambodian farmers seeking to raise this locally-popular species had to rely either on government hatcheries or seed from Viet Nam which, if available, was often expensive and subject to high rates of mortality due to poor roads (see *Catch and Culture*, Vol 15, No 3). Artificial breeding of the species by the private sector remained an elusive goal.

In 2009, however, Pheng Vy, a hatchery operator in Svay Onto district in Prey Veng province, became the first local farmer to induce artificial spawning of Sutchi river catfish in Cambodia. A former rice farmer, he began raising fish in grow-out ponds in 1994 while still in his mid-twenties. He initially focussed on the native silver barb (*Barbonymus gonionotus*) and several domesticated alien species such as Nile tilapia (*Oreochromis niloticus*), common carp (*Cyprinus carpio*) and the Indian major carps mrigal (*Cirrhinus cirrhosus*) and catla (*Gilbelion catla*).



Mr Pheng Vy at his farm in Prey Veng province

PHOTO: LEM CHAMNAP

Since starting his hatchery in 2001, Mr Pheng Vy has produced these and other species such as the native mad barb (*Leptobarbus hoeveni*) and bighead walking catfish (*Clarius macrocephalus*) as well as alien species such as the North African catfish (*Clarius gariepinus*), silver carp (*Ctenopharyngodon idella*) and grass carp (*Hypophthalmichthys molitrix*) from China and rohu (*Labeo rohita*), another major Indian carp. The most successful species, he says, have been silver barb and two of the Indian species, mrigal and rohu. In a typical year, input costs have been about KHR 6 million (\$1,500) and revenues about KHR 20 million (\$5,000), leaving net income of about KHR 14 million (\$3,500). Given its location on a 0.6 hectare site

Pheng Vy's Hatchery Production in 2009

Scientific name	English	Khmer	Fingerlings	Price
<i>Barbonymus gonionotus</i>	Silver barb	Trey chhpin	150,000	KHR 60 (USD 0.015)
<i>Ctenopharyngodon idella</i>	Silver carp	Trey carp sor	20,000	KHR 60 (USD 0.015)
<i>Oreochromis niloticus</i>	Nile tilapia	Trey tilapia	20,000	KHR 60 (USD 0.015)
<i>Cyprinus carpio</i>	Common carp	Trey carp samanh	15,000	KHR 60 (USD 0.015)
<i>Pangasianodon hypophthalmus</i>	Sutchi river catfish	Trey prah	12,000	KHR 80 (USD 0.020)
<i>Hypophthalmichthys molitrix</i>	Grass carp	Trey carp si smao	10,000	KHR 60 (USD 0.015)
<i>Cirrhinus cirrhosus</i>	Indian major carp mrigal	Trey carp india	10,000	KHR 60 (USD 0.015)

with 10 small nursing ponds, the hatchery's return on investment of almost 150 percent is considerable.

Third time lucky

Pheng Vy began induced spawning trials of Sutchi river catfish in 2007 with 32 broodstock. But he failed that year and again in 2008, losing money as a result. With another 42 broodstock acquired from Bati Station, he tried again in 2009. The broodstock were fed with a home-made mixture containing fishmeal (40 percent) and pellets from Viet Nam with 40 percent protein content (20 percent). The other ingredients were rice bran (28 percent), broken rice (10 percent) and Vitamin E (2 percent) containing 35 percent protein. After selecting three females to practice, he achieved his first success on August 3 last year after injecting one individual with three doses of the hormone Suprefact over a 19-hour period (3 micrograms per kilogram for the first dose, 20 for the second and 10 for the third). The stripping of the eggs took place 27 hours after administering the first dose.

After fertilisation, 255,000 fry were produced. Of these, however, only 12,060 survived, similar to the low nursery survival rates of less than 5 percent in Viet Nam in the 1980s. On the other hand, Mr Pheng Vy says the seed quality is high. "I cultured some in my own ponds and confirmed that the seed is better than what we get from Viet Nam," he says, echoing the results of tests carried out by the Fisheries Administration on fry produced at FARDEC. In the meantime, Mr Pheng Vy has managed to cushion his losses by selling Sutchi river catfish fingerlings to grow-out farmers in a neighbouring district about 20 kilometres away. Since the price is one third higher than for fingerlings of other species, he plans to undertake more induced spawning trials in May and June this year with the aim of improving survival rates.

For the time being, however, his hatchery and nursing ponds are mostly producing silver barb fingerlings.

** Dr Phala is Cambodian National Director of the Aquaculture of Indigenous Mekong Fish Species (AIMS) Component of the MRC Fisheries Programme and Mr Starr is editor of Catch and Culture*

Further reading

Trong TQ, Nguyen VH, Griffiths D (2002) Status of Pangasiid aquaculture in Viet Nam. *MRC Technical Paper 2*: 1- 16.

Regional ichthyoplankton survey

The MRC Fisheries Programme has completed a regional survey of fish larvae at 11 sites along the Mekong mainstream. The 12-month regional ichthyoplankton survey aims to identify significant spawning grounds that may be affected by the development of mainstream dams (see *Catch and Culture*, Vol 15, No 1). In addition to separate country reports on the larval sampling, a regional analysis of the data collected is being carried out by Dr Wongpathom Kamonrat, fisheries expert on aquatic biodiversity at the Thai Department of Fisheries. Although such sampling has been carried out in Cambodia and Viet Nam to assess fish abundance, the survey to identify spawning areas is the first of its type in the Lower Mekong Basin.

Global catfish standards imminent as Pangasius Aquaculture Dialogue winds up

By Peter Starr *

Issues related to feed and genetics emerge as last-minute hurdles to a global industry agreement

After two and a half years of discussion, the Pangasius Aquaculture Dialogue held its fifth and final round of talks in Can Tho City in the Mekong Delta in March, leaving technical working groups to finalise global standards for two species of shark catfish by June. The standards are aimed at the top 20 percent of producers of Sutchi river catfish (*Pangasianodon hypophthalmus*) and Bocourt's catfish (*Pangasius bocourti*), two indigenous Mekong species that are now exported to more than 100 countries, primarily in Europe. According to WWF estimates, global production of these two species grew from about 200,000 tonnes in 2004 to about 1.8 million tonnes in 2009. Viet Nam alone accounted for 1.1 million tonnes in 2009 followed by Bangladesh with about 0.3 million tonnes and India with about 0.2 million tonnes.

Launched in Ho Chi Minh City in September, 2007, the pangasius dialogue has overlapped with seven other WWF-coordinated aquaculture dialogues. Tilapia standards were finalised in December last year (see box on page 29) and standards for the two catfish species and bivalves (clams, scallops, mussels and oysters) are expected to be completed during the second quarter of this year. Other standards for abalone, salmon, seriola/cobia, shrimp and trout are scheduled to be finalised by the end of this year. Like the tilapia standards, the catfish standards will be overseen by a new Aquaculture Stewardship Council (ASC) which is expected to be set up by WWF and the Dutch Sustainable Trading Initiative in 2011 to complement the existing Marine Stewardship Council which focuses on capture fisheries (see *Catch and Culture*, Vol 15, No 1.). According to Flavio Corsin, the WWF's senior aquaculture advisor in Hanoi, "the ASC will work with independent and accredited certification bodies who will contract auditors to certify farms



Nguyen Van Sang, deputy director of the Research Institute for Aquaculture No 2, at the final meeting in Can Tho

PHOTO: LEM CHAMNAP

that adopt the dialogue standards." The standards being developed for catfish are applicable to all three production systems used in the Mekong Delta—ponds, pens and cages—and may later be extended to other species from the shark catfish family, known as Pangasiidae.

Feed management

While social and health issues were the main hurdles to overcome at the fourth Pangasius Aquaculture Dialogue meeting in Ho Chi Minh City in August last year, feed management emerged as a major stumbling block at the two-day meeting in Can Tho in March. To ensure that feed ingredients are sustainable, participants agreed that uncooked or unprocessed fish and fish products should not be used for the

Which standards?

When it comes to international standards, Vietnamese catfish producers will have no shortage of certification bodies from which to choose. According to Xavier Bocquillet, general manager of Quali Service, a consulting firm in Ho Chi Minh City, the traditional “customer value triangle” of quality, price and service has broken down. Today, consumers are increasingly taking health and safety considerations into account along with environmental concerns and social issues such as labour conditions. As the Pangasius Aquaculture Dialogue standards and other schemes are finalised, Vietnamese producers will soon have at least four sets of indicators to certify to wholesalers, retailers and consumers that their catfish is environmentally and socially acceptable. Existing international standards for aquaculture include the Global Partnership for Good Agricultural Practice (GlobalGAP) based in Germany, AquaGAP developed by the Institute for Marketecology (IMO) in Switzerland and the Best Aquaculture Practices (BAP) certificate of the Aquaculture Certification Council (ACC) in the United States.

GLOBALG.A.P.

GlobalGAP traces its roots to the Euro-Retailer Produce Working Group (EUREP) founded by British retailers and continental European supermarkets in 1997 amid growing consumer concerns about product safety, environmental and labour standards. The group developed harmonised standards and procedures for good agricultural practices which came to be known as EUREPGAP. As it began to take on a more global significance, EUREPGAP was rebranded as GlobalGAP in 2007. While it has strong market recognition for certifying fruit in Europe, Bocquillet says GlobalGAP has faced a “hard beginning” in aquaculture. At shrimp farms in Thailand, for example, only 50 percent complied with GlobalGAP shrimp standards. Moreover, on-site technical support was necessary and premium prices for certified shrimp were not guaranteed. GlobalGAP released its draft standards for tilapia and pangasius in Brussels in April last year. Trial audits were conducted in five countries including Viet Nam. The pangasius standards were developed in Viet Nam with assistance from German Technical Cooperation (GTZ) and have been subject to several revisions, the most recent being in November last year.

AquaGap was launched in early 2009 by IMO, a Swiss certification body specialising in organic foods which was founded in 1990 and now has offices in more than 90 countries. Two Vietnamese farming and processing companies already have AquaGAP certification including leading producer Vinh Hoan Corp in Dong Thap province.

Developed in response to importer demands rather than a multi-stakeholder process, the standards are available for multiple species in multiple areas and are owned by Swiss Bio-Foundation, a non-profit group.



ACC, based in Miami, has already certified dozens of shrimp farms and processing plants in Viet Nam. While it has standards for pond culture of channel catfish (*Ictalurus punctatus*), blue catfish (*I. furcatus*) and hybrids thereof, its BAP certification scheme for pangasius is still being developed. Established in 2003, the ACC is largely oriented towards American wholesalers although its board includes representatives of producers, processors, buyers, non-governmental organisations and universities in the Americas, Asia and Europe.

two species of catfish. They also agreed to prohibit feed made from pangasius by-products as well as species that are either designated as threatened by the International Union for the Conservation of Nature (IUCN) or protected under the Convention on International Trade in Endangered Species (CITES).

But the Can Tho meeting failed to resolve the key question of whether or not to include standards of the International Fishmeal and Fish Oil Organisation (IFFO) as an indicator of sustainable fish sourcing. Based in Britain, the IFFO has recently developed a Global Standard for Responsible Supply with certification requirements for sourcing, traceability and manufacturing practices. In February, a Peruvian anchovy fishmeal plant operated by Tecnologica de Alimentos SA (TASA), the world's largest fishmeal producer, became the first feed company to be certified under the new IFFO standard. While the dialogue meeting in Ho Chi Minh City in August last year agreed to incorporate the IFFO standard with two other feed standards, public comments received since then had questioned the new standard.

Even though it complies with FAO guidelines, critics argued that the IFFO standard was not sufficiently rigorous. Catfish producers, they said, should instead focus on ensuring that fish feed is sourced from fisheries that comply with the standards of certified members of the International Social and Environmental Accreditation and Labelling (ISEAL) Alliance. Set up in 2002, the ISEAL Alliance is based in Britain and includes the Marine Stewardship Council among its founding members. Some argued that ISEAL compliance was a long-term goal that could only be achieved within five years.

In the interim, one option is for catfish producers to focus on feed from fisheries meeting minimum standards under the FishSource scheme operated by Sustainable Fisheries Partnership based in Jakarta and San Francisco. But minimum scores would have to be accompanied by a stock assessment. Others noted that the FishSource option was impractical for catfish producers as it would limit their sources of fishmeal and fish oil to Norwegian, Icelandic and North Sea herring fisheries and by-products from processing non-catfish species which are not widely available, at least in Viet Nam. As a compromise, it was suggested that the requirement for stock assessments for



Ngo Tan Quynh Chuyen, the local business development manager of Norwegian aquaculture technology company Akva Group ASA

PHOTO: LEM CHAMNAP

fisheries source for feed could be dropped in exchange for a higher FishSource score. After failing to reach a consensus, the Can Tho meeting agreed to let the technical working group on feed management resolve the issue, described by some participants as a potential deal breaker.

Genetics

Genetics emerged as the second contentious issue in Can Tho. Participants agreed that catfish farms should be located in areas where the farmed species is indigenous or has a self-recruiting stock established. But the meeting failed to agree on how to define the establishment of self-recruiting stocks, a key issue for producers in Bangladesh and India where the two species have been introduced. Under the International Standards for Responsible Tilapia Aquaculture completed in December, producers must show that the tilapia species is naturally reproducing in the receiving waters of the operation on or before January 1, 2008. In Africa, producers have to do likewise for both the species and the strain of tilapia farmed.

International Standards for Responsible Tilapia Aquaculture

The World Wildlife Fund (WWF) released the International Standards for Responsible Tilapia Aquaculture in December after almost five years of discussion between more than 200 people. Intended for internationally-traded tilapia, mainly from Latin America and Asia, the standards aim to address the most significant environmental and social impacts of tilapia farming. These primarily originate from production systems and immediate inputs such as feed, seed, chemicals and water. The 30 standards cover legal compliance (1), farm management (6), water conservation (2), conservation of species diversity and wild populations (4), responsible resource use (3), health and welfare management (4) and social responsibility (10). The 38-page document also contains five appendices for calculating water quality, economic feed conversion ratios and feed fish equivalency ratios for both fishmeal and fish oil. The steering committee of the Tilapia Aquaculture Dialogue, which held a series of meetings in the United States and Malaysia as part of the process, included three producers. These were Aquamar of Ecuador and two Miami-based companies—Rain Forest Aquaculture, with operations in Costa Rica, and Regal Springs Tilapia, which produces tilapia in Honduras, Indonesia and Mexico. Apart from WWF, other steering committee members were the Boston-based New England Aquarium and the Sustainable Fisheries Partnership operated from Jakarta and San Francisco.

Aaron McNevin, the WWF officer who coordinated the dialogue, noted that almost 75 percent of the world's tilapia came from farms. "There are other tilapia standards on the market but these standards have staying power because they were developed by a broad and diverse group of experts through a very transparent process," Dr McNevin said. "The standards also will have a long shelf life because they are metrics-based, which is the only way to really know if the tilapia industry is reducing its environmental footprint." According to WWF, certification costs will be low compared to most certification programs because the standards focus on reducing a set number of key impacts instead of a long list of issues. The relatively low cost will make it easier for small- and large-scale producers to adopt the standards. The Aquaculture Stewardship Council (ASC), a new body expected to start operating in 2011, will be responsible for working with independent, third-party entities to certify farms that comply with all of the standards. In the meantime, WWF says this role will be filled by GlobalGAP, a private-sector body that sets voluntary standards. GlobalGAP is expected to certify tilapia producers by supplementing its existing food safety, environmental and social requirements with the new standards.

Further reading

<http://www.worldwildlife.org/what/globalmarkets/aquaculture/sustainability-standards-tilapia.html>

The tilapia standards consider alien species to be established if they have a reproducing population inferred from "multiple discoveries of adult and juvenile life stages over at least two consecutive years." Given that successful establishment may require multiple introductions, species are excluded if records of their discoveries are based on "one or only a few non-reproducing individuals whose occurrence may merely reflect transient species or unsuccessful invasions." For producers in Bangladesh and India, the definition of established self-recruiting stocks will determine

whether they can meet the standards. According to Dr Corsin, who has been coordinating the dialogue since 2007, outreach activities in Bangladesh had not found any scientific documentation of local introductions of either species.

Among other genetic issues, the Can Tho meeting agreed that the standards would prohibit the use of wild-caught seed as well as genetically-engineered and hybrid seed. It also agreed on a series of indicators to prevent farmed catfish from escaping

into the wild. In addition, producers will have to show that catfish seed is sourced from populations already established and naturally reproducing in the receiving waters. But if either catfish species is established, in Bangladesh and India, for example, should seed be sourced from that population only? Or should this be the case only where the species is indigenous? The meeting failed to resolve this question, as well as an additional question of whether seed from one indigenous population could be sourced by producers in an area with a separate indigenous population (see box below). The technical working group on genetics is supposed to resolve the issue before the standards are finalised.

How many populations in the Mekong?

According to MRC Technical Paper No 10, the natural distribution of Sutchi river catfish (*Pangasianodon hypophthalmus*) and Bocourt's catfish (*Pangasius bocourti*) is limited to the Mekong and Chao Phraya Basins. The Mekong has at least two populations of Sutchi river catfish. The larger one is a lower population that extends from the Mekong Delta in Viet Nam to the Tonle Sap Lake and as far upstream as the Khone Falls on the Cambodia-Lao border. An upper population extends upstream from central Lao PDR and northeast Thailand to Myanmar and possibly China as well. There may, however, also be a middle population extending upstream from the Khone Falls to northeast Thailand and central Lao PDR which may overlap genetically with the lower population. And there may also be a fourth population in the Sesan tributary system that extends from northeast Cambodia to the central highlands of Viet Nam, in the case of the Sesan and Srepok rivers, and to southern Lao PDR and central Vietnam in the case of the Sekong. As for Bocourt's catfish, the Mekong probably has two distinct populations. One, extending from the delta in Viet Nam to central Lao PDR and northeast Thailand, may comprise two sub-populations with a degree of genetic overlap. The other extends from the area around Vientiane and Nongkhai to northern parts of Lao PDR and Thailand.

According to WWF, more than 600 people have been involved in the dialogue including hundreds of small-scale farmers in Viet Nam and Bangladesh.



Pham Quoc Lam, chief representative of Danish catfish importer Butler's Choice in Viet Nam

PHOTO: LEM CHAMNAP

Farmers and academics have been the key players. Other stakeholders have included processors, input suppliers, foreign buyers, government agencies and non-governmental organisations. During two public comment periods between April last year and January this year, the dialogue received feedback from more than 300 people. According to a revised timetable adopted at the end of the Can Tho meeting, the standards were scheduled to be finalised by May 25 and released publicly on June 1. The effort to establish global catfish standards coincides with a separate Vietnamese project to develop better management practices for farms in the Mekong Delta (see *Catch and Culture*, Vol 15, No 3). The better management practices are expected to be finalised in August and are seen as a first step for producers seeking certification for complying with global standards.

Further reading

<http://www.worldwildlife.org/what/globalmarkets/aquaculture/dialogues-pangasius.html>

* Mr Starr is editor of *Catch and Culture*

Phousavanh Fongkhamdeng

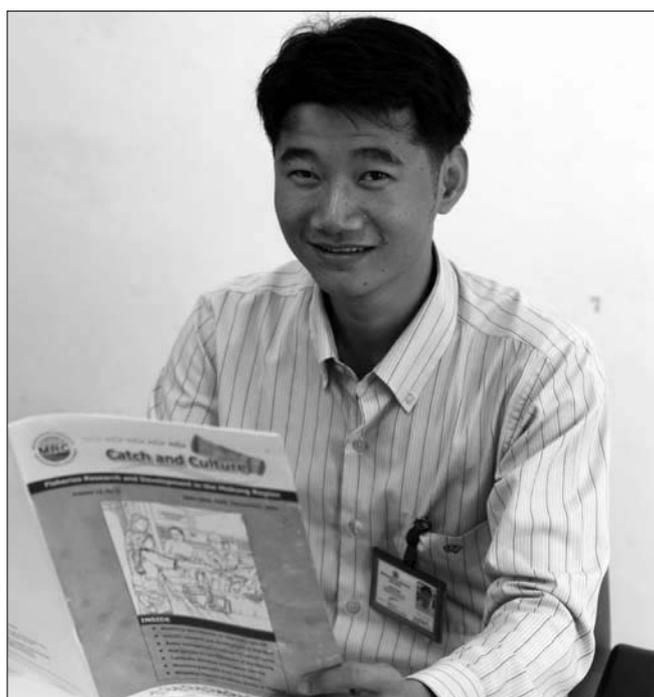
Phousavanh Fongkhamdeng has returned to the Department of Water Resources at the Water Resources and Environment Administration (WREA) of the Lao Prime Minister's Office after a year's on-the-job training with the MRC Fisheries Programme. Mr Phousavanh joined the programme in June, 2009, as a junior riparian professional under the MRC's Integrated Capacity Building Programme. During his time with the Fisheries Programme, he worked for the Ecology, Valuation and Mitigation Component to review the status of fisheries in Khong district in Champassak province under the supervision of programme officer Dr Suchart Ingthamjitr. He also took part in catch and hydro-acoustic surveys in Champassak province and worked with the Living Aquatic Resources Research Centre (LARReC) to monitor catches in Luang Prabang and Bolikhamxay provinces. Mr Phousavanh graduated from the National University of Laos in 2008 with a Bachelor of Environmental Science degree after completing a thesis on the status of wetlands and fisheries in Phon Ngam village, Pakkading district, Bolikhamxay province.



PHOTO: SINTHAVONG VIRAVONG

Nguon Vichet

Nguon Vichet has been appointed to the MRC Fisheries Programme as a junior riparian professional under the commission's Integrated Capacity Building Programme. He joins the Fisheries Programme from the Natural Resources Protection and Conservation Office of the Cambodian Ministry of Environment where he has been working since 2004. Mr Vichet graduated from the Royal University of Agriculture in 2007 with a Bachelor of Fisheries Science degree. He also has an associate degree in English.



Vichet studying during his 'reading week' at the MRC

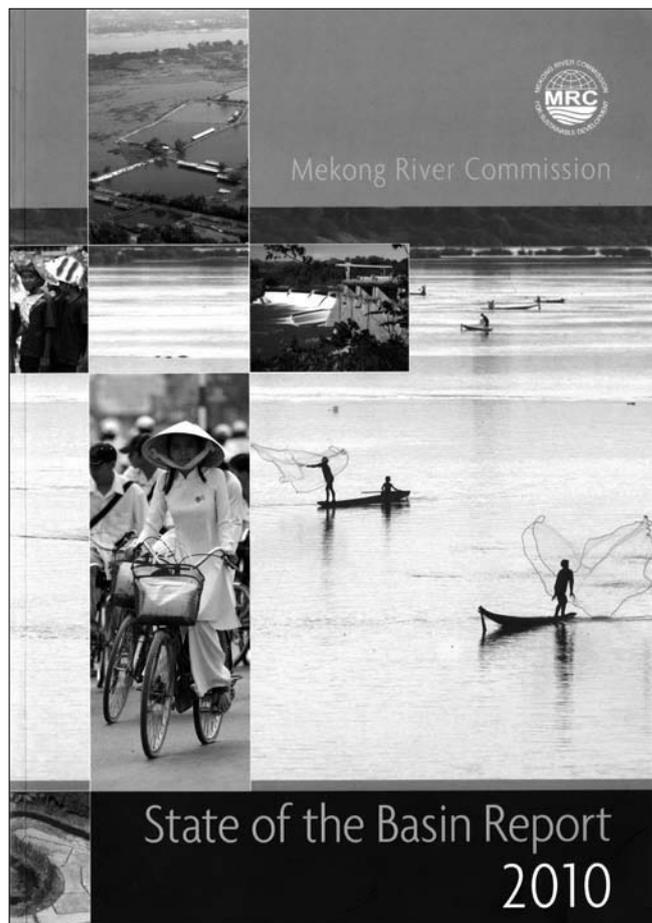
PHOTO: KENT HORTLE

Conservative estimate shows Lower Mekong Basin's inland fisheries worth up to \$7 billion a year

Annual consumption of freshwater fish and other aquatic animals in the basin is estimated at almost 4 million tonnes

How valuable is the inland fisheries yield of the Lower Mekong Basin? The latest *State of the Basin Report* from the MRC tries to answer this question by adjusting consumption data for 2000 to take into account the basin's growing population. Assuming per capita consumption is constant, the 60 million people of the basin consumed almost 2.8 million tonnes of freshwater fish and other aquatic animals in 2008, up from about 2.6 million tonnes in 2000. Viet Nam and Thailand each consumed more than 0.9 million tonnes each while Cambodia consumed close to 0.7 million tonnes and Lao PDR consumed more than 0.2 million tonnes. In addition to consumption, the basin exported an estimated 1.1 million tonnes of aquaculture products in 2008 so the total yield of freshwater fish and other aquatic animals in the lower basin was about 3.9 million tonnes.

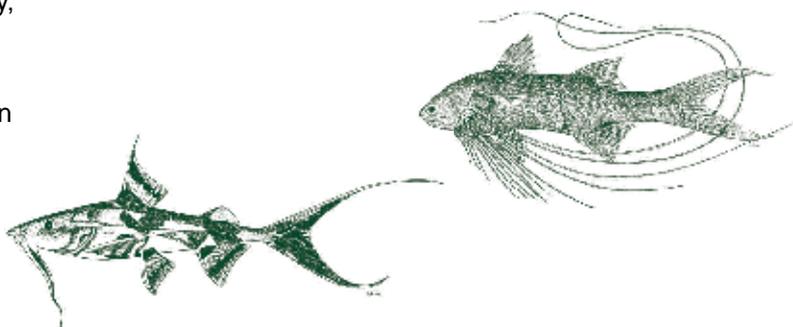
The report notes that this is a conservative estimate as it doesn't take into account wastage or use in fish and animal feed. At current first-sale prices of between \$1.00 and \$1.80 a kilogram, this conservative estimate of the annual inland fisheries yield is worth between \$3.9 billion and \$7.0 billion. In addition to inland fisheries, the report notes that nutrients and organic material in the Mekong's plume support a significant coastal fishery. Besides fisheries, the *State of the Basin Report*, a much-anticipated MRC publication first issued in 2003, describes the status of forestry, agriculture, hydropower, water quality, wetlands, navigation and trade, climate change and flood management in the basin and interactions between them.



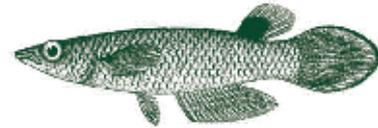
Further reading

MRC (2010) *State of the Basin Report: 2010*, Mekong River Commission, Vientiane, Lao PDR

<http://www.mrcmekong.org/state-of-the-basin-report.htm>



How healthy is the Mekong?



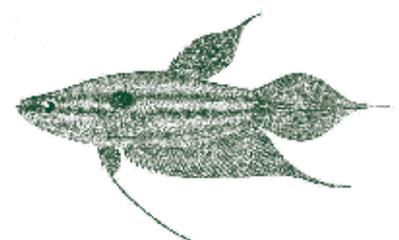
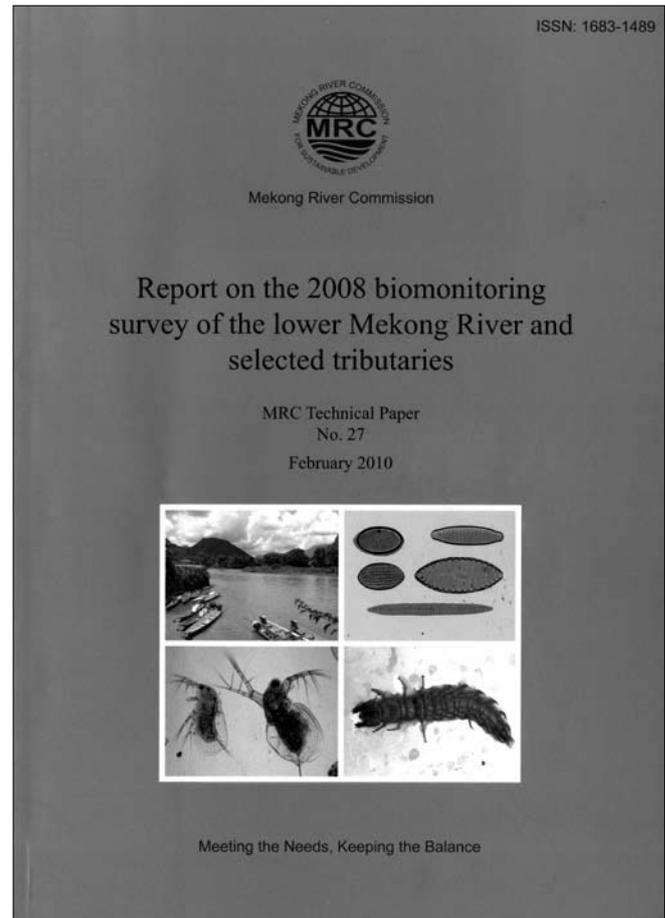
Two thirds of 32 sites along the Mekong and selected tributaries are found to be in excellent or good ecological health. The rest are in moderate or poor health.

The Mekong River Commission carried out biological monitoring of the Lower Mekong River and selected tributaries at 51 sites between 2004 and 2007 (see *Catch and Culture*, Vol 15, No 1). The MRC has since transferred these monitoring activities to the four member countries. In 2008, each country examined eight sites including four new sites in Thailand and five in Viet Nam. Of the 32 sites where samples were collected, 9 were found to be in excellent ecological health, 12 were in good health and 10 in moderate health. One site was in poor ecological health. Compared with previous years, classifications at more than half the sites were stable. At some sites, the classifications improved, particularly in the Mekong Delta. MRC Technical Paper No 27 concludes that these are “positive signs for the health of the Mekong River.” According to the paper, the declining health of some other sites probably reflects bank erosion during the rainy season. Other sites have changed since 2005 in terms of water flows, water levels and the amounts of sand and clay accumulated, which could have affected local organisms. The paper concludes that degradation trends in isolated locations “give a warning of increasing environmental impacts caused by human activities, and degradation of habitats in some parts of the Mekong.” To identify remedial actions and possible restoration efforts, further investigations are needed.

Further reading

Dao, H. G. et al (2010) *Report on the 2008 biomonitoring survey of the lower Mekong River and selected tributaries*, MRC Technical Paper No. 27, Mekong River Commission, Vientiane, Lao PDR

http://www.mrcmekong.org/download/free_download/Technical_paper27.pdf



Fish foot fad spreads to Lao capital



Foot spa in a Moroccan setting

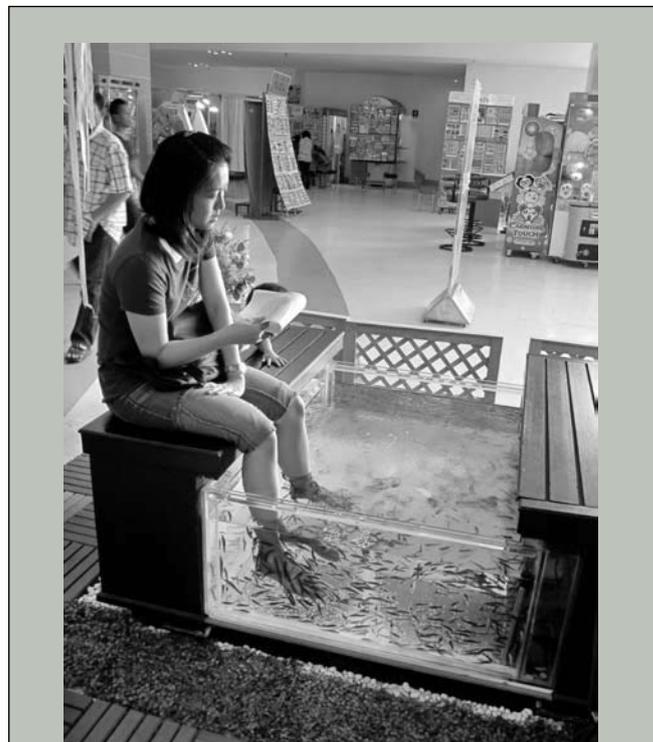
PHOTO: PHOUSAVANH FONGKHAMDENG

Vientiane now has its own fish pedicure service. Located within L'Orientale, a Moroccan restaurant and internet cafe in the central quarter of Ban Haisok, the Fish & Feet Spa opened in April 2010 with three tanks containing hundreds of 'doctor fish', *Garra rufa* that feed on dead skin. The species is native to the Middle East and has been exported to many countries. It is widely used to treat skin conditions such as psoriasis and eczema. In Vientiane, a 20-minute treatment costs LAK 39,000 (\$4.75) for adults, LAK 19,000 (\$2.30) for students and LAK 10,000 (\$1.20) for children under ten.



Garra rufa

PHOTO: PHOUSAVANH FONGKHAMDENG



A happy customer at the Va San Va Fish Foot Spa in Udon Thani, northeast Thailand. Her feet are being gently cleaned by the Siamese algae eater (*Gyrinocheilus aymonieri*), which is also a frequently-cultured aquarium fish. A 20-minute treatment costs THB120 (\$4). Foot spas are increasingly popular in cities of the Lower Mekong Basin.

PHOTO: KENT HORTLE



Gyrinocheilus aymonieri await their next meal

PHOTO: KENT HORTLE



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