

Fisheries Research and Development in the Mekong Region

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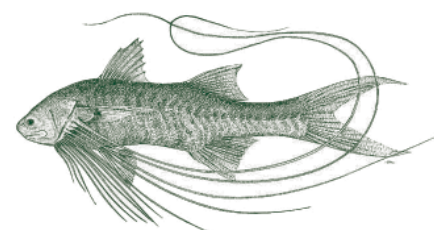
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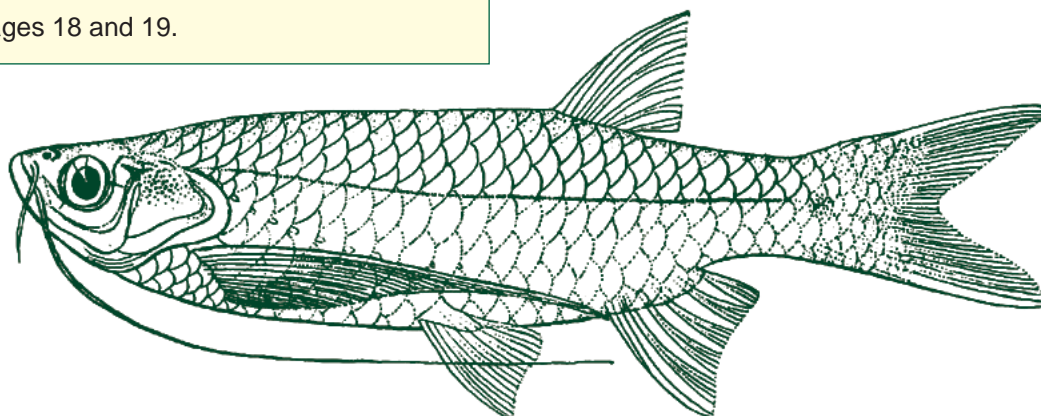
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Lao fisheries law promotes community management, protects resources

By Kaviphone Phouthavongs *

The director general of the Lao Department of Livestock and Fisheries recently urged authorities to publicise and enforce the country's new fisheries law adopted by the National Assembly in late 2009. A new MRC project supported by AusAid and the World Bank is expected to start raising awareness of the legislation during the first quarter of 2011.

Capture fisheries and aquaculture play very important roles in food security in Lao PDR and provide additional income for people, in particular for communities living close to water bodies. Over the past two decades, however, there has been no fisheries legislation, with all fisheries-related issues being referred to the Agriculture Law and the Forestry Law as well as the Wildlife and Aquatic Animals Law.

The need to develop a fisheries law became apparent with rapid changes in agriculture, intensified water resource development and increasing population growth. Other factors included the requirement for international and regional collaboration and cooperation as well as the need for a national legal framework for the ASEAN Free Trade Area. Such a framework would help to ensure that capture fisheries and aquaculture are managed effectively and are used in a sustainable manner to protect and conserve fisheries resources for future generations.

The Government of Lao PDR has recognised the importance of fisheries and aquaculture to food security and socio-economic development, and the need to have a fisheries law to serve development and collaboration with regional and international organisations. For these reasons, the government sought assistance from the Food and Agriculture Organisation of the United Nations (FAO) to develop such a law. The process started in September 2007 under an EC Facility Project (GCP/GLO/012/EC) and was continued under an FAO TCP Facility Project (TCP/LAO/32019).

With FAO assistance, the Department of Livestock and Fisheries of the Ministry of Agriculture and Forestry developed comprehensive legislation. As the law was being drafted, meetings were held to clarify the goals of the process, collect information and identify issues. In October 2008 the first draft was submitted for review to senior officers and then to the Legal Regulatory Office of the Ministry of Agriculture and Forestry, the Ministry of Justice, and the Prime Minister's Office. The new law was finally endorsed by National Assembly in July 2009.

With 10 chapters and 72 articles, the law defines the framework for implementing, managing, monitoring and inspecting capture fisheries and aquaculture. It aims to promote aquaculture, conserve and protect fisheries resources for sustainable development and ensure the availability of fish and other aquatic animals for food security, contributing to the socio-economic development of the nation.

The formulation of the new law took into account the experiences gained and lessons learned from the Fisheries Management and Governance Component of the MRC Fisheries Programme. Starting in 1997, the programme began working in reservoir fisheries co-management in Nam Ngum Reservoir in Vientiane province. The work was later expanded to four reservoirs in Vientiane and Bolikhamxay provinces, as well as deep pool fisheries management along the Mekong River at Khong Island in Champassak province. Community fisheries are covered in Articles 50 to 54 in Chapter VII of the new law, which includes fisheries management and control measures indicating the right of local communities to manage and utilise their resources. In addition, the law empowers communities to establish village or community fisheries management committees in specific water-bodies. The law also covers their organisational structure and roles and responsibilities in establishing fisheries protected areas (conservation zones) and community ponds, as well as the formulation of village fishing regulations.

Classifications of fish and other aquatic animals

Scientific name	English common name	Lao common name
I. Prohibition Category List		
<i>Orcaella brevirostris</i>	Irrawaddy dolphin	ປາຂ່າ
<i>Dasyatis laosensis</i>	Mekong stingray	ປາຝາໄລ
<i>Pangasianodon gigas</i>	Mekong giant catfish	ປາປຶກ
<i>Anguilla marmorata</i>	Giant mottled eel	ປາໂຫລໄຟຟ້າ
<i>Boesemania microlepis</i>	Boeseman croaker	ປາກວາງ
<i>Pangasius sanitwongsei</i>	Giant pangasius	ປາເລີມ
<i>Systemus partipentazona</i>	Indochinese tiger barb	ປາເສືອ
<i>Setipinna melanochir</i>	Dusky hairfin anchovy	ປາແມວ
<i>Paramesotriton laoensis</i>	Laos warty newt	ປາຕີນ
II. Management Category List		
<i>Hemibagrus wyckioides</i>	Red-tail catfish	ປາເຄິງ
<i>Pangasianodon hypophthalmus</i>	Sutchi river catfish	ປາຊວາຍແຂ້ວ
<i>Probarbus labeamajor</i>	Thick-lip barb	ປາເອີນຂາວ
<i>Wallago leerii</i> (now <i>W. micropogon</i>)	Giant sheatfish	ປາຄູນ
<i>Tor tambroides</i>	Thai mahseer	ປາແດງ
<i>Hemisilurus mekongensis</i>	Mekong sheatfish	ປານາງແດງ
<i>Luciosoma bleekeri</i>	Apollo shark minnow	ປາໝາກຫວາຍ
<i>Catlocarpio siamensis</i>	Giant carp	ປາກະໂທ
<i>Amyda</i> sp.	Soft shell turtle	ປາຝາອອງທຸກຊະນິດ
III. Common or General Category List		
<i>Bagarius yarrelli</i>	Giant goonch	ປາແຂ້
<i>Micronema bleekeri</i>	Silver sheatfish	ປານາງເງິນ
<i>Chitala blanci</i>	Indochina featherback	ປາຕອງກາຍ
<i>Notopterus notopterus</i>	Bronze featherback	ປາຕອງນາ
<i>Channa micropeltes</i>	Giant snakehead	ປາໂຕ
<i>Poropuntius</i> sp.	NA	ປາຈາດ
<i>Cyclocheilichthys enoplus</i>	Giant barb	ປາໂຈກ
<i>Barbonymus schwanenfeldii</i>	Tinfoil barb	ປາວູນໄຟ
<i>Hypsibarbus wetmorei</i>	Golden barb	ປາປາກຄຳ
<i>Gyrinocheilus pennocki</i>	Mekong honeysucker	ປາເກະ
<i>Hemibagrus wyckii</i>	Crystal-eyed catfish	ປາກິດໝີ່
<i>Pangasius larnaudii</i>	Black-ear catfish	ປາປຶ່ງ
<i>Oxyeleotris marmorata</i>	Marble goby	ປາບູ່
<i>Cirrhinus microlepis</i>	Small-scale river carp	ປາພອນ
<i>Cirrhinus molitorella</i>	Mud carp	ປາແກງ
Caridea	All shrimp species	ກຸ້ງ ທຸກຊະນິດ
<i>Perisesarma bidens</i>	Red-claw crab	ກະປູແດງ
Gastropoda	All snail species	ຫອຍທຸກຊະນິດ
<i>Kaloula mediolineata</i>	Microhylid frog species	ອີ່ງ
<i>Rana rugulosa</i> (now <i>Hoplobatrachus rugulosus</i>)	Bull frog	ກົບ-ຂຽດ
<i>Bufo melanostictus</i>	Asiatic toad	ຄັນຄາກ



MRC driver Bunphim Mayonta (top left) models the 'shrimpmobile' – a tuk tuk loaded with shrimp traps – at Ban Mak Hiao, which flows from That Luang near Vientiane east and south to the Mekong River. This area is heavily fished from September to November during the wet season. Nutrient-rich wastewaters from Vientiane are backed up by Mekong flood waters, promoting high aquatic productivity. Hundreds of people fish each day for shrimps, clams and many species of fish. The shrimp traps (top right) are constructed from used water bottles with the neck cut and inverted to form a funnel. The main net is made from heavy gauge nylon mosquito net. Plastics are replacing traditional materials in many kinds of gear in the Mekong basin. Each fisher may set several hundred traps, typically along a shoreline. The traps are baited (above) with small balls of a paste made from rice and padek (fermented fish) and may be cleared several times each day. Although each trap may only yield a handful of shrimps, the entire set may provide several kilograms, worth \$1-2 per kilogram.

PHOTOS: KENT G. HORTLE

Protection of aquatic resources and ecosystems is highlighted in Chapter II (Articles 9 to 12) and Chapter III (Articles 21 to 24). Under the Chapter II articles, fish and other aquatic animals are classified in three categories (see box). The Prohibition Category List contains species classified for protection and conservation which are not allowed to be used or traded. The Management Category List has species that can be used under close management and control of the local authorities. The Common or General Category List comprises species that can be used for environmentally-sound sustainable management. The Chapter III articles prohibit destructive fishing methods and protect breeding, nursing and feeding grounds as well as other ecosystems including deep pools, fish conservation zones, important wetlands and rapids.

Bounkhouang Khambounheung, director general of the Department of Livestock and Fisheries, urged the authorities concerned to publicise and enforce the new law during an annual meeting on fisheries management in Nam Ngum in October, "Boosting aquaculture and capture fisheries development through the sustainable utilisation of aquatic resources and the promotion of effective management will ensure food security, contributing to economic development and the conservation of natural resources," Dr Bounkhouang said. "It is not an easy task for us to eliminate and enforce against illegal fishing methods, since some traditional fishing activities will become illegal fishing methods as mentioned in the law. However, there are many opportunities and challenges to rectify the issues including awareness-raising in parallel with education campaigns as well as providing alternative livelihood activities to compensate the affected communities."

Communities where fishing methods are classified as illegal under the new law, such as the lee trap fishery in the Siphandone area in southern Champassak province, will need more assistance in environmental and social safeguards. There are many challenges and opportunities waiting. Publicising the new law and educating people about it will help to create local community awareness of the need to conserve and utilise aquatic resources in sustainable ways. In addition, alternative livelihoods are needed. To implement the law effectively, cooperation



Dr Bounkhouang Khambounheung

PHOTO: AKHANE PHOMSOUVANH

with various ministries and international organisations is also required. As part of these efforts, the Mekong Integrated Water Resource Management Project, an MRC project supported by AusAID and the World Bank, plans to help improve fish-breeding centres in Champassak province. It also plans to mainstream fisheries management into community development planning processes and provide fishing communities with alternative livelihood opportunities. The project, which includes activities to support increased awareness of the new law, is expected to start in the first quarter of 2011.

** Mr Kaviphone is a programme officer at the MRC Fisheries Programme in Phnom Penh*

Further reading:

Cacaud P & Latdavong P (2009) Fisheries and aquaculture in the Lao PDR- a legislative review. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand. RAP Publication 2009/05, 71 pp.

Cambodia celebrates ten years of community fisheries development

Hundreds gather in Phnom Penh for a national conference on community fisheries organised by the Fisheries Administration and the Fisheries Action Coalition Team, an alliance of non-governmental organisations.

Cambodia's Ministry of Agriculture, Forestry and Fisheries is now working with three other ministries to promote the development of community fisheries. Dr Nao Thuok, director general of the Fisheries Administration and Delegate of the Royal Government of Cambodia, said the Ministry of Industry, Mines and Energy was helping to dig ponds while the Ministry of Tourism had conducted a fish release ceremony in September. At the same time, the Ministry of Labour and Vocational Training is supporting technical training.

"The Fisheries Administration cannot work on this alone," he told a conference marking 10 years of achievements in community fisheries and management in Cambodia. "The management of fisheries is very complicated. We need to work with fishermen, businessmen, politicians, technical staff and monks as well as other agencies. We're currently working with three other ministries and this will expand to others."

While community fisheries have developed in other countries such as the Philippines, Thailand, Viet Nam and Bangladesh over the past two decades, Dr Nao Thuok noted that Cambodia's community fisheries are unique in being governed by a legal framework, put in place by a sub-decree signed by Prime Minister Hun Sen in 2005



Agriculture, Forestry and Fisheries Secretary of State, H.E. Por Try opens the conference as Dr Nao Thuok looks on

PHOTO: LEM CHAMNAP



Fishing gear on display at the conference

PHOTO: LEM CHAMNAP

(see *Catch and Culture*, Vol. 15, No 2). Moreover, the development of community fisheries is in line with the government's policy of decentralization and deconcentration, which is overseen by the Ministry of Interior. The country now has 469 community fisheries, of which 236 have been officially registered with the Ministry of Agriculture, Forestry and Fisheries. "We also have more than 300 conservation areas, something we should be proud of, especially in the northeast," Dr Nao Thuok said.

'We can provide seed, but we also need to make sure that people have technical expertise'

While acknowledging the need for external funding, the head of the Fisheries Administration stressed the need for community fisheries to be self-financing in the longer term. "We have been implementing our policies step by step," he said. "Progress and development have been at different speeds, depending on the availability of resources. But we now have 469 community fisheries, how can we help them all? We did try to help them all before but it was not sustainable. We can provide seed but we also need to make sure that people have technical expertise."



Opening ceremony

PHOTO: LEM CHAMNAP

In a presentation to the conference, Lieng Sopha, acting director of the administration's Department of Community Fisheries Development, said community fisheries should increase ownership and responsibility by creating jobs in areas such as processing and aquaculture while implementing co-management. "They should not totally rely on wild fish catches." And while support from non-governmental agencies and other development partners

Community fisheries on the Mekong near Phnom Penh

Among fishermen who spoke at the one-day conference was Chan Savon, who heads a group of 12 community fisheries with 1,971 members spread across four communes in Lvea Aem district in Kandal province. Established in 2001 and supported by the MRC Fisheries Programme, the network is now administered by 120 volunteers from 12 villages including 60 who serve as patrol officers and report fishing offences to local police. Located downstream from Phnom Penh on the east bank of the Mekong, the community fisheries cover 100 hectares of fishing grounds. To conserve wild fishery resources, Kdeitacho village in Sarikakeo commune has set aside 16 hectares as a fish sanctuary. Aquaculture has also been promoted in the area which now has 10 farms raising several species including the silver barb (*Barbonymus gonionotus*) and the Sutchi river catfish (*Pangasianodon hypophthalmus*), two of the species promoted by the Aquaculture of Indigenous Mekong Species (AIMS) component of the Fisheries Programme. Mr Chan Savon said red tilapia hybrids (*Oreochromis* spp.) were also popular.



Mr Chan Savon

PHOTO: LEM CHAMNAP

The community fisheries, whose members meet monthly, were recently officially registered with the Ministry of Agriculture, Forestry and Fisheries and are part of a wider coalition known as the Mekong Fishermen's Network which covers Kandal, Strung Treng, Kratie, Kompong Cham and Prey Veng provinces. Mr Chan Savon, who also serves as deputy chairman of the provincial network, told the conference that the Mekong's low water levels over the past year have been a particular challenge for poor fishermen. "With less fish, many have become indebted to financial institutions and businessmen while others have migrated to other provinces," he said. Mr Savon said other problems included illegal fishing, mainly by small groups of people in Kandal and Prey Veng provinces, and farmers who raise prohibited species.



Fish sanctuary in Kdeitacho village in Sarikakeo commune, Kandal province

PHOTOS: LEM CHAMNAP

is still needed, community fisheries should not have to rely on outsiders in the longer term, but instead work more closely with local authorities.

Most of the country's 469 community fisheries are located along inland waterways. The five provinces around the Tonle Sap Lake have 212 CFs, of which 173 have been officially registered. These tend to be larger, covering areas of between 150 and 20,000 hectares. The Mekong and Bassac rivers have another 222 community fisheries which are typically from 50 to 1,000 hectares. Mr Lieng Sopha said the Fisheries Administration had so far provided more than 600 training courses to fishermen and other stakeholders.



A theatrical performance on electro-fishing

PHOTO: LEM CHAMNAP



The Thmor Da–Teuk Cha Community Fisheries, spread across two lakes in Kompong Cham province, is one of the oldest and most successful among the hundreds of community fisheries established in Cambodia over the past decade. The woman (above left) shows fish that she caught using traps. Fishing regulations (above right) stipulate penalties for using illegal fishing gear including fines of KHR 200,000 (\$50) for fishermen found engaging in electro-fishing. The fine for using toxic materials such as calcium carbide stones is KHR 1,000,000 (\$250). When added to water, the stones produce acetylene gas which has an unpleasant smell that can be used to force fish in seasonal water bodies in a certain direction as the annual floods recede. Anecdotal evidence suggests that migrating fish will not return to seasonal ponds a year after the water is poisoned because of the lingering smell.

PHOTOS: KENT G. HORTLE AND LEM CHAMNAP

Do inland protected areas work?

By Vu Vi An, Doan Van Tien and Kent G. Hortle *

In three inland protected areas in the Mekong Delta of Viet Nam 124 fish species were identified and fish were more abundant and larger than outside the protected areas.

There are a total of 13 inland protected areas in the Mekong Delta (Buckton et al. 2000). Three typical inland protected areas of the Mekong delta were surveyed during 2009 and 2010 (see map). Tram Chim National Park, established in 1998, is in the Plain of Reeds in Dong Thap province. Tra Su protected landscape is in the Long Xuyen Quadrangle area in An Giang province and it was established in 2005. U Minh Ha National Park, established in 2006, is in the peat forest area of the Ca Mau Peninsula.

Fishing pressure is very high outside all the protected areas, with fishers using many kinds of gears throughout the year. The three sites were surveyed three times using standardized gears: gill nets, seine nets, cast nets, traps and electro-fishing, with samples taken inside and outside the protected areas.

In all, 124 fish species were recorded, including 24 black fishes¹ and 103 other species. There were 123 species in Tram Chim, 63 species in Tra Su and 14 species in U Minh Ha. Higher species diversity is associated with proximity to major rivers; Tram Chim and Tra Su are close

to major canals which connect to the Mekong and Bassac Rivers respectively, so riverine and estuarine species can swim into the protected areas during high water levels when sluice gates are opened. The low diversity in U Minh Ha national park, with virtually all the catch being black fishes or grey fishes², is a result of its distance from the main rivers and isolation by water gates and dikes, as well as its water quality (slightly brackish and acidic) with relatively low dissolved oxygen levels being unsuitable for most river fishes (Table 1).

Overall, black fish dominated the fauna and made up about 72%, 95% and 98% of the catches at Tram Chim, Tra Su and U Minh Ha respectively (Table 2). Some grey fish were also relatively abundant. White fish and other riverine species were relatively rare at all sites.

There were only two feral exotic species recorded (*Hypostomus plecostomus* – sucker catfish and *Oreochromis niloticus* - Nile tilapia) both in low (<1%) abundance. Comparison with earlier surveys shows that the number of species has been increasing in Tram Chim, with 55 species recorded in 1993 (prior to its protection) and 119 species in 2007 (eight years after it was protected). The protected areas serve as important refuges for indigenous fishes including significant species such as the endangered giant barb (*Catlocarpio siamensis*) which is found at both Tram Chim and Tra Su.

Table 1 Basic water quality in and near protected areas

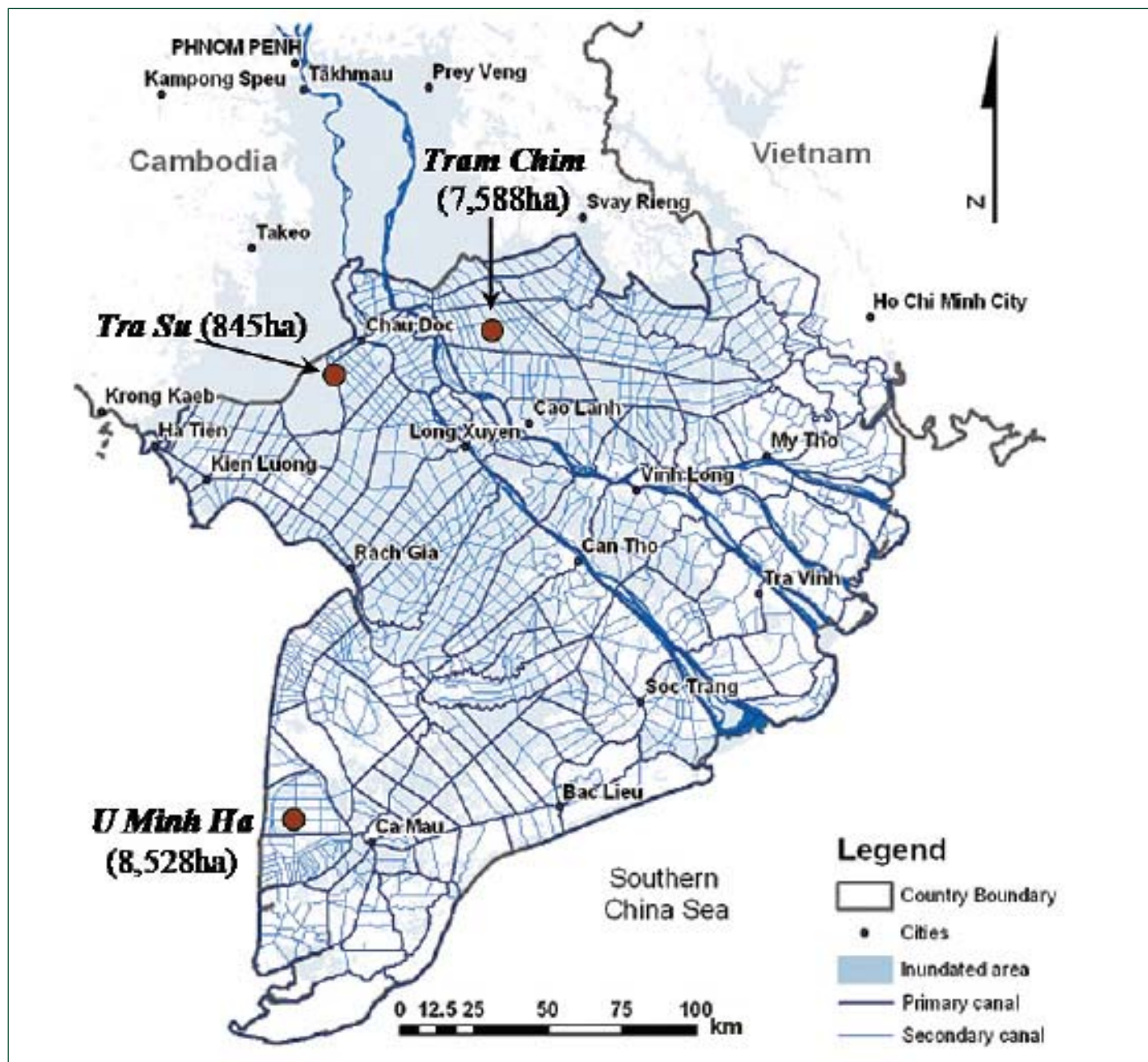
Water quality	Tram Chim		Tra Su		U Minh Ha	
	Inside	Outside	Inside	Outside	Inside	Outside
TDS (mg/L)	74	91	84	72	425	4,716
pH	6.65	6.76	5.92	6.92	5.84	5.92
Temperature (°C)	29.8	30.5	29.1	30.2	29.2	29.8
Transparency (cm)	37	23	33	31	16	18
Dissolved Oxygen (mg/L)	6.3	6.1	3.6	5.8	2.6	3.4

Notes: values are means of 3 sampling periods; each 5 samples inside & 5 samples outside the protected areas. Seawater has total dissolved solids of about 35,000 mg/ L.

¹ fishes that breathe air, are tolerant of anoxia and are locally resident

² species with some tolerance of anoxia that may undertake short migrations

Map of the Mekong delta, showing the three study sites, with the inundated area during a major (year 2000) flood highlighted



Apart from protection from fishing pressure, the increase in diversity can be partly attributed to improving water quality. Tram Chim formerly had more acidic water as a result of drainage from pyrite-rich soils which underlay much of the surrounding area. Canal building and maintenance in the protected areas and nearby has been effective in increasing the flow of riverine water to flush acidic water. In 1992 in October pH was 7.15 and in June (dry season) pH was 3.15. In 2004 pH was higher: 7.5 in October and 6.2 in June.

Larger fish sizes inside the protected areas

Local fishers claimed that fish are more abundant inside protected areas and that they reach much larger sizes than outside. To test these assertions, sampling was carried out using gill-nets 60 metres long and 1 metre deep with five mesh-sizes (1.2 cm, 2.5 cm, 4.3 cm, 6.8 cm and 19.8 cm) set inside and outside in ten typical sampling sites in each protected area. The catch rates (all species and sites combined) were much higher inside than the outside (Tram Chim: 2.1 times higher; Tra Su: 11.1 times

Table 2 Composition by percentage of the total weight caught at each site, showing the top ten species

Scientific name	Common Name	Classification	Tram Chim	Tra Su	U Minh Ha	Mean
<i>Channa striata</i>	Striped snakehead	Black	5.1	42.2	62.0	36.4
<i>Anabas testudineus</i>	Climbing perch	Black	1.2	23.4	16.6	13.7
<i>Trichogaster trichopterus</i>	Three-spot gourami	Black	33.0	3.7	5.2	14.0
<i>Trichogaster pectoralis</i>	Snakeskin gourami	Black	0.7	20.9	8.1	9.9
<i>Mystus mysticetus</i>	Striped catfish	Black	20.6	0.1	0.0	6.9
<i>Clarias macrocephalus</i>	Bighead walking catfish	Black	1.6	3.8	5.7	3.7
<i>Trichogaster microlepis</i>	Moonlight gourami	Black	6.2	0.5	0.0	2.2
Other Black Fish (17 spp.)		Black	3.9	0.3	0.3	1.5
Total Black Fish		Black	72.3	94.7	97.9	88.3
<i>Notopterus notopterus</i>	Bronze featherback	Grey	1.4	3.3	2.1	2.3
<i>Ompok bimaculatus</i>	Butter catfish	Grey	5.7	0.9	0.0	2.2
Other Grey Fish (24 spp.)		Grey	2.1	0.5	0.0	0.9
Total Grey Fish		Grey	9.2	4.7	2.1	5.3
<i>Parachela siamensis</i>	Siamese glass fish	White	5.9	0.1	0.0	2.0
Other fish including White Fish (70 spp.)		Other	12.7	0.4	0.0	4.4
Total Other Fish		Other	18.6	0.5	0.0	6.4
Total			100.0	100.0	100.0	100.0

higher; and U Minh Ha: 6.6 times higher). Most fish also reached larger maximum sizes inside the protected areas as shown in Tables 3 and 4 for two of the most common species. It is noteworthy that striped snakeheads were only caught inside the protected areas, where they were abundant, so it can be assumed that they are so heavily fished that few ever reach large sizes outside reserves. Similarly, outside two of the reserves no three-spot gouramies were caught, despite this being a common species (Table 3).

Further analyses are in progress, but the sampling does tend to confirm the observations of fishers regarding the value of protected areas in providing refuges where fish can survive and grow, and where they are presumably more likely to reproduce successfully, resulting in fry that provide fish for surrounding areas, where fish is an im-

portant food for local people. Other studies in the Mekong basin have also concluded that protected areas do provide general benefits for fisheries production in the surrounding area (e.g. Baird 2006).

Up to 70% of the people who live around the protected areas are poor, so not surprisingly many of them attempt to fish illegally in these reserves, which are easy to enter and where fish are relatively abundant and large. According to the managers of the protected areas, illegal fishing is common, especially during the dry season when fish are concentrated in low-lying water bodies and the canal system. For example, in 2009 there were 57 cases of illegal access recorded at Tram Chim and many electro-fishing gears were confiscated, while many other cases of illegal access to the protected areas were not recorded. Electro-fishing is probably the most common

Table 3 Catch rates and sizes inside and outside the protected areas of three-spot gourami (*Trichogaster trichopterus*), the second most abundant species by weight

Statistic	Tram Chim		Tra Su		U Minh Ha	
	Inside	Outside	Inside	Outside	Inside	Outside
Catch rate (fish/hr)	0.033	0.016	0.079	0	0.133	0
Catch rate (g/hr)	0.155	0.071	0.278	0	0.927	0
Average length (mm)	58	56	67	0	73	0
Max length (mm)	64	57	80	0	104	0

Table 4 Catch rates and sizes inside and outside the protected areas of climbing perch (*Anabas testudineus*), the third most abundant species by weight

Statistic	Tram Chim		Tra Su		U Minh Ha	
	Inside	Outside	Inside	Outside	Inside	Outside
Catch rate (fish/hr)	0.027	0.024	0.153	0.0044	0.030	0.0064
Catch rate (g/hr)	0.511	0.220	9.32	0.052	2.000	0.038
Average length (mm)	92	72	115	78	142	58
Max length (mm)	120	75	190	78	205	58



Fish sampling in the Tra Su protected landscape in An Giang province

PHOTO: VO VI AN

method used in protected areas, and is usually done at night, so it is extremely difficult to control.

Under pressure from surrounding villagers, the executive board of Tram Chim now allows some fishing in the protected area during the wet season (July – November) using some selective gears such as traps. Allowing some controlled access should have limited impact on fish populations and may help to decrease the pressure for illegal fishing in protected areas. As well as allowing some fishing, local authorities also attempt to help illegal fishers find alternative livelihoods, provide savings credits and help them find other ways to increase income so that they rely less on natural resources.

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* Mr An is the Vietnamese national director of the Fisheries Ecology, Valuation and Mitigation component of the MRC Fisheries Programme, Mr Tien is a fisheries biologist with the component and Mr Hortle is chief technical advisor to the programme

Using small indigenous fish species to address micro-nutrient deficiencies

Fish and other aquatic animals are no longer being overlooked as sources of essential micro-nutrients. Some small fishes labelled as “trash” or “low value” species are particularly nutritious.

Fish is frequently referred to as an important source of protein for people living in the Lower Mekong Basin. But when eaten whole with the head, bones and internal organs, many small fish species also provide essential micro-nutrients such as vitamin A, iron, zinc and calcium. Many governments and development agencies address micro-nutrient deficiencies by supplementing diets, with vitamin A capsules for example, or by fortifying foods, such as salt to which iodine is now commonly added. Other approaches to address micro-nutrient deficiencies typically focus on foods such as cheap leafy vegetables, moderately-priced fruits and more expensive foods like meat, milk and eggs.

But what about fish? According to Dr Thilsted, senior nutrition adviser to the World Fish Center, there has been little focus on fish and other aquatic animals such as crabs, snails, snakes, frogs and small shrimp. “I consider this a missed opportunity,” she told the annual meeting of the MRC Fisheries Programme in Can Tho City in November. “Small fishes have great potential to alleviate micro-nutrient deficiencies and, in comparison to supplementation and fortification, provide multiple micro-nutrients.”

The Danish nutritionist noted that small indigenous fish species are a particularly rich source of multiple micro-nutrients. For people in rural areas, they are often a common everyday food enjoyed by all family members including women and children. They also add diversity to diets based on a single staple food such as rice and can easily carry or absorb other foods like vegetables, oils and spices. Moreover, small indigenous fish species are a cheap way to address micro-nutrient deficiencies arising from soaring food prices. During the recent global food crisis, for example, many people responded to price

hikes by maintaining their energy intake and preventing hunger by continuing to eat as much rice as before while cutting back on more expensive foods like fish, vegetables, fruits and meat.

Dr Thilsted has been working with the Fisheries Administration in Cambodia, a country where micro-nutrient deficiencies are among the highest in the world. Only a third of Cambodian children were receiving vitamin A supplements in 2005. Moreover, only a similar proportion of Cambodian households use iodised salt, with provinces bordering Viet Nam preferring cheaper Vietnamese

Common micro-nutrient deficiencies

Among micronutrient deficiencies, vitamin A deficiency is the leading cause of preventable blindness in children and increases the risk of disease and death from severe infections. In pregnant women, it causes night blindness and may increase the risk of maternal mortality. Iron deficiency causes anaemia and is the most common and widespread nutritional disorder in the world. As well as affecting a large number of children and women in developing countries, it is the only nutrient deficiency which is also significantly prevalent in industrialised countries. Zinc deficiency is associated with growth retardation, delayed sexual and skeletal maturation, alteration in cell-mediated immunity and impaired resistance. Calcium deficiency leads to decrease in bone mineral content and mass that results in a weaker bone structure, leading to increased risk for bone fractures. Iodine deficiency disorders can start before birth, jeopardise children’s mental health and often their very survival. Serious iodine deficiency during pregnancy can result in stillbirth, spontaneous abortion, and congenital abnormalities such as cretinism, a grave, irreversible form of mental retardation.

Source: World Health Organization

salt which is not iodised. Such micro-nutrient deficiencies were found in a study in 66 households in 25 villages in Svay Rieng, one of the provinces bordering Viet Nam. Given that rice contains up to 14 percent protein, the study found that people were getting more than 100 percent of their daily requirements. But requirements for calcium, iron and vitamin A were far from being met.

**‘The Mekong flying barb ...
was found to be
particularly rich in iron’**

Working with the Fisheries Administration, Dr Thilsted has conducted nutrient analyses of 16 fishes commonly consumed in three Cambodian provinces. The Mekong flying barb (*Esomus longimanus*), a small fish that grows up to 10 cm, was found to be particularly rich in iron. This species, known as *trey changwa plieng* in Khmer, can supply 42 percent of the daily iron requirements of women and children when served as part of a simple meal of traditional sour soup and rice. The species, which is commonly mixed with other small fish in markets, also contained the most zinc among the 16 fishes analysed in Cambodia.

Among species analysed in Bangladesh, where Dr Thilsted is currently based, the yellowtail rasbora (*Rasbora tornieri*) was found to be particularly rich in vitamin A which is contained in the eyes and internal organs of fish. This species, pictured below, is also common in markets



Yellowtail rasbora (left) caught from the Mekong River in Kien Svay district of Cambodia's Kandal province in December. Removing the heads and internal organs before cooking (right) reduces the vitamin A content

PHOTOS: LEM CHAMNAP



Dr Thilsted at the annual meeting of the MRC Fisheries Programme in Can Tho in November

PHOTO: LEM CHAMNAP

in the Lower Mekong Basin. Even more rich in vitamin A is mola (*Amblypharyngodon mola*), a small species native to the Indian subcontinent and Myanmar. All small fish eaten with bones have a high calcium content and isotope-labelled test meals of mola with humans showed similar calcium absorption as from milk.

Since Cambodia is promoting rice fish culture, Dr Thilsted hopes to identify the most common small fishes and other aquatic animals in rice-fields, survey their consumption and then evaluate their nutrient contribution, especially to women and children. Depending on the season, other aquatic animals—an integral part of the Cambodian diet—may be even more important than fish for people living in some areas. Their nutrient contribution has not yet been analysed.



Vietnamese catfish farmers move towards better management practices

By Peter Starr *

As a three-year Australia-Vietnamese project draws to a close, the Ministry of Agriculture and Rural Development indicates it will consider supporting farmers to improve management practices to make catfish production in the Mekong Delta more sustainable.

Vietnamese catfish farmers and other stakeholders have adopted a set of better management practices to address various risks associated with the farming of Sutchi river catfish (*Pangasianodon hypophthalmus*) in what is now a billion-dollar export industry in the Mekong Delta. The adoption at a national stakeholder meeting in Long Xuyen in November came at the end of a three-year AusAID-funded project under the Collaboration for Agriculture and Rural Development project in Viet Nam (see *Catch and Culture*, Vol 15, No 3). With the overall goal of promoting sustainable aquaculture, the better management practices for grow-out farms, nurseries and hatcheries

go beyond simple extension activities which usually focus only on increasing the volume and quality of production. The document adopted in the An Giang provincial capital notes that catfish farming in the delta “has had its share of problems in recent years, particularly in respect of diseases and marketing, at various levels. Marketing problems are likely to intensify in the foreseeable future, and most of all the produce will have to meet increasingly stringent food quality and production, resulting indirectly from market globalisation and increasing demands of consumers.” Moreover, many producers, especially small-scale farmers, don’t yet have sufficient negotiating power to influence the market chain.

To achieve market-based food quality standards and maintain environmental integrity, catfish farming needs to adopt the better management practices “rather quickly,” the document says, arguing that working through farmer associations would be more effective than farmers work-



Mr Nang and Mme Thu on the second day of the workshop

PHOTO: LEM CHAMNAP

Catch and Culture

Historic Cambodian-Vietnamese fish release



On September 15, the Technical Advisory Body for Fisheries Management of the MRC Fisheries Programme held the first trans-boundary fish release ceremony along the border between Cambodia and Viet Nam. The event took place from a boat in Hong Ngu district in Viet Nam's Dong Thap province, located on the east bank of the Mekong River, a few kilometres from Prey Veng province in Cambodia.





Participants from Cambodia and Viet Nam, as well as Lao PDR and Thailand, released into the river 50,000 fingerlings of giant barb (*Catlocarpio siamensis*), a popular food fish whose population has been declining. The individual on the left, about 1.2 metres in length was photographed at an aquarium in Nong Khai in northeast Thailand. For the release in September, the fingerlings were bred in neighbouring Tien Giang province at the National Breeding Center for Southern Freshwater Aquaculture in Cai Be which is run by the Research Institute for Aquaculture No 2 (RIA2) in Ho Chi Minh City.

PHOTO: KENT G. HORTLE



PHOTOS: LEM CHAMNAP



Known as *trey kolreang* in Khmer and *ca ho* in Vietnamese, the giant barb is a herbivorous species native to the Mekong River Basin as well as the Mae Klong and Chao Praya basins in Thailand. It occurs in both mainstream and tributary habitats, with juveniles nursing in floodplains. The species can attain 2.5 metres in length, making it one of the largest in the Mekong.





The ceremony was attended by TAB members from the four countries and a delegation from the Cambodian Fisheries Administration which travelled to Dong Thap by road.

Officials from the Vietnam National Mekong Committee in Hanoi, the Dong Thap Dept of Agriculture and Rural Development and the MRC Secretariat offices in Vientiane and Phnom Penh also took part.

The Cambodian-Vietnamese release followed a similar TAB event on the Lao-Thai stretch of the river in 2009, in which endangered Jullien's golden barb (*Probarbus jullieni*) were released into the Mekong (see *Catch and Culture*, Vol 15, No 2).





Dr Nguyen Van Hao, director of the Research Institute for Aquaculture No 2 (left) and, Dr Nguyen Thanh Phuong, dean of the College of Aquaculture and Fisheries at Can Tho University (right)

PHOTO: LEM CHAMNAP

ing in isolation. The document says the catfish sector is currently undergoing “much financial stress” especially small household farmers who own, operate and manage their own farms. With sharply higher prices for inputs such as feeds, profit margins have fallen and, with current farm gate prices of between VND 16,000 and VND 17,000 (\$0.80 and \$0.85), catfish farming in the delta is often unprofitable. The adoption of better management practices supported by farmer organisations is seen as a way to reduce costs “and most likely provide a gateway to making the practices more economically and environmentally sustainable.” In addition, farmers who improve their management practices are seen as being more likely to be prepared to comply with more stringent certification standards (see next article).

Nguyen Thi Xuan Thu, vice minister at the Ministry of Agriculture and Rural Development, told the workshop that her ministry would consider funding support to help farmers adopt better practices, requesting local authorities and the Research Institute for Aquaculture No 2 (RIA2) in Ho Chi Minh City to make specific recommendations. “We totally support the development of better management practices,” she said. “Catfish is a valuable commodity and the Government of Viet Nam is committed to the sector’s sustainable development and achieving better seed quality.” Huynh The Nang, vice chairman of the An Giang People’s Committee, acknowledged that Vietnamese authorities had encountered “a lot of difficulties” in trying to organise catfish farmers into some sort of association. “We still don’t have an association

for fish farmers,” he said. “In my view, there should be an institution that could help farmers initiate and implement better management practices.” Mr Nang said he hoped the better management practices would help farmers comply more fully with government rules and regulations in areas such as water quality. “One characteristic of Vietnamese farmers is that if some farmers do something, everybody else follows. So catfish farming has attracted a lot of ministry rules and regulations for the farmers. Better management practices will help farmers gradually comply with these conditions.” Mr Nang also welcomed the provision in the document for monitoring and recording water quality and fish mortalities. “This addresses the weakness of Vietnamese farmers who don’t keep records.”

The three-year project was undertaken by RIA2 and the College of Aquaculture and Fisheries at Can Tho University in partnership with the Department of Primary Industries of the Australian state of Victoria and the Network of Aquaculture Centres of Asia-Pacific (NACA) in Bangkok. Sena De Silva, the NACA director general, told the Long Xuyen workshop that his agency was ready to kick-start the process of organising catfish farmers into associations to adopt the better management practices with funding from the European Community. To make sure the associations work and take the process forward, “we’d like to see the government come in as a major player.” Dr De Silva conceded that better management practices are “not a panacea for all the industry’s problems” and could not be effective in isolation from other strategic develop-

An easy way to cut production costs

Information gathered from farmer surveys during the project indicated that many farmers over-feed their fish, because they wrongly believe that this makes their stock grow better and faster. Catfish farmers in the Mekong Delta feed catfish up to 18 percent of their wet body weight each day with commercial feed, and up to 10 percent with farm-made feed. And while fish were found to be typically fed twice a day, some farms feed up to six times a day. The better management practices document recommends farmers feed their fish no more than five percent of the body weight each day during the grow-out stage after the fish reach 10 grams, with the amount of feed decreasing in proportion to body size. For fish weighing 200 grams, good quality feed equivalent to two to three percent of body weight a day is “more than adequate to obtain optimal fish growth and well being.” As for feeding more than three times a day, this is “unnecessary and costly, as it is a waste of feed and human resources and can lead to water quality deterioration.” As a result of excessive feeding, food conversion ratios are as high as 3.0 at some farms, indicating that the amount of feed used is three times the increase in wet biomass of the fish. “Proper feed management is probably the easiest way to reduce production cost and to enhance economic viability,” the document says.

The project found that mixed feeding schedules could be particularly effective. Nguyen Ngoc Hai, the “model farmer” in trials carried out by the project, alternated days of non-feeding with feeding at 107 to 110 percent of the normal feeding rate. Although this extended the harvest time by four weeks to 7.5 months, he saved 100 grams of feed per fish, reducing the food conversion ratio from 1.6 to 1.5 and saving VND 800 (\$0.04) for each kilogram of fish produced. Farmers who adopted mixed feeding schedules in the trials reported that disease occurrence fell from 6-7 times to 3-4 times per production cycle, resulting in overall mortalities being reduced by half. These farmers have stopped using chemicals, resulting in further savings of VND 400 (\$0.02) per kilogram of fish. Mixed feeding schedules are also perceived to improve the quality of the flesh by making it less fatty. To produce 1 kg of catfish fillet of export quality, only 2.8 kg of dry feed is now needed compared with 3 kg previously. Mr Hai, whose farm is located in Can Tho, has been able to reduce his average cost of production to VND 16,000 (\$0.75) per kilogram, which compares with an average farm gate price of VND 16,500 (\$0.80). In 2009, his farm enjoyed a net profit of VND 450 million (\$20,750). Contrary to the perception of farmers reluctant to adopt mixed feeding schedules, farmers who did so during the trials reported no change in feeding behaviour.



Model farmer

PHOTO: LEM CHAMNAP

ment actions. “No farming system can continue to grow without problems,” he said, noting that catfish production in the delta had expanded so rapidly that it was now equivalent to 70 percent of Europe’s entire production from aquaculture. While some problems are real, others are fictional, notably the inaccurate media reports about Vietnamese catfish production in recent years. “Global negative publicity is a very serious concern. No other product in the market has been targetted like catfish.” Dr De Silva said this was a trade issue that needed to be tackled by the Vietnamese government or agencies such as the Vietnam Association of Seafood Exporters and Producers (VASEP). “We can’t help — but we can help you make your production better.”

* Mr Starr is the editor of Catch and Culture



Mme Thu (left) with Dr Nguyen Thi Thu Thuy, a fish geneticist with the Victorian Department of Primary of Industries in Australia

PHOTO: LEM CHAMNAP

WWF publishes international catfish certification standards

By Peter Starr *

Stakeholders overcome last-minute hurdles over feed and farming in non-indigenous areas to reach final agreement.

After a three-year dialogue involving more than 600 stakeholders, the World Wildlife Fund (WWF) has published voluntary global certification standards for the production of two shark catfish species widely farmed in the Mekong Delta. Launched at the end of August together with separate standards for bivalve production, the new standards complement those for tilapia that were finalised in 2009 after a similar dialogue. The three dialogues, among eight coordinated by the WWF, aim to address negative impacts associated with the rapid growth of aquaculture such as water pollution, disease and unfair labour practices at farms. The two shark catfish species covered are Sutchi river catfish (*Pangasianodon hypophthalmus*) and Bocourt's catfish (*Pangasius bocourti*), two indigenous Mekong fishes that are now both exported as "pangasius" (and under a variety of other names) to more than 100 countries. Viet Nam is by far the world's largest producer followed by Bangladesh and India in distant second and third places. The certification process for the new standards will be overseen by the Aquaculture Stewardship Council (ASC), a new entity expected to be operating by mid-2011 (see *Catch and Culture* Vol 16, No 1).

Seven principles, more than 100 indicators

The pangasius standards completed in August are set against more than 100 indicators covering seven broad principles. These include locating and operating farms within established local and national legal frameworks (4 indicators) and minimising the negative impacts of pangasius farms on other users and the environment (11), water and land resources (15) and the genetic integrity of local pangasius populations (12). Other standards are applied to ensure that feed inputs are sustainable and minimised (10 including two interim options), to minimise ecosystem and human health impacts while maximising fish health and welfare and ensuring food safety (18)

and to develop farms in a socially responsible manner that contributes effectively to community development and poverty alleviation (34 indicators). Although not mentioned in the final document, it was clear throughout the three-year process that the standards were designed to be met by the top 20 to 25 percent of industry performers.

Feed ingredients had emerged as a major stumbling block at the fifth and final dialogue meeting in Can Tho City in March, with some stakeholders supporting the immediate inclusion of standards of the British-based International Social and Environmental Accreditation and Labelling (ISEAL) Alliance. Others argued that these were too rigorous and should be adopted in the longer term. Under a



Sutchi river catfish is also farmed in Cambodia, although production is less than five percent of Viet Nam's output. The albino individual pictured above was raised at the Cambodian Fisheries Administration's station at Bati in Prey Veng province.

PHOTO: LEM CHAMNAP

compromise since then, producers must start using fishmeal and fish oil products that comply with ISEAL certification requirements within three years of them becoming available in the region and within five years of the PAD standards being published, or 2015. In the interim, one option allows use of feed from fisheries which meet 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. A second interim option allows feed to be sourced from facilities that comply with the sourcing, traceability and manufacturing requirements of the International Fishmeal and Fish Oil Organisation (IFFO), which are already compliant with guidelines of the Food and Agriculture Organization of the United Nations (FAO).

Farming in non-indigenous areas

The document also finalises standards for pangasius farming outside the Mekong and Chao Phraya basins. To be certified, farms have to be located in a river basin where the farmed species is either indigenous or has a self-recruiting stock established by January 2005. This date was set based on two generations of about three years each to allow farmers in non-indigenous areas to show that the species is indeed established. Self-recruiting is defined as naturally reproducing based upon evidence from peer-reviewed papers, statements by competent authorities such as governments or other comparable references. The standards prohibit the use of wild-caught seed for grow out and require demonstration that seed has been generated by the pangasius populations naturally reproducing in the river basin. Giv-

en evidence of different genetically-distinct populations, this will require the development of a thorough map indicating species range and distinct stocks.

Among the hundreds of stakeholders who took part in the dialogue, farmers and academics were by far the most numerous, followed by government officials including the deputy director of the Research Institute for Aquaculture No 2 (RIA2) in Ho Chi Minh City, Nguyen Van Trong, who was one the 11 members of the process facilitation group (see box). The process also attracted suppliers of inputs such as seed, feed and chemicals, non-fish farmers such as employees and agricultural farmers, farmers-cum-processors, journalists, consultants, buyers, certifiers, processors and inter-governmental organizations including the MRC. The seven technical meetings included Nguyen Van Sang, another RIA2 deputy director who took part in the genetics working group, and Dinh Thi Thuy, a fish disease researcher at RIA2 who participated in the technical working group on health. So Nam, director of the Inland Fisheries Research and Development Institute (IFReDI) in Cambodia, was a member of the technical working group on genetics, feed and health.

David Graham, the process facilitation group member in charge of quality and regulatory affairs at Birds Eye Iglo Group, one of the largest frozen food businesses in Europe, said the new standards would “help enhance consumer confidence” in what are still “relatively unfamiliar fish species”, at least outside the Mekong region. “As a major European fish brand, it is important for our business to know that there are standards that were cre-

Process Facilitation Group Members

Name	Organisation	Stakeholder Group
Antoine Bui	Binca	Buyer/processor
Corey Peet	David Suzuki Foundation	NGO
David Graham	BirdsEye/Iglo	Buyer
Flavio Corsin	World Wildlife Fund	NGO
Jack Morales	Sustainable Fisheries Partnership	NGO
Nguyen Hoai Nam	Vietnam Ass'n of Seafood Exporters & Producers	Farmers/processors
Nguyen Van Trong	Research Institute for Aquaculture No.2	Government
Pham Quoc Lam	Butler's Choice	Buyer
Pham Thi Anh	Van Lang University	Academia
Thuy Nguyen	Network of Aquaculture Centres in Asia- Pacific	Regional government agency
Vo Thanh Khon	Binh An SeaFood Joint Stock Company	Farmer/processor

Source: WWF



Final meeting of the Pangasius Aquaculture Dialogue at Can Tho University in March

PHOTO: LEM CHAMNAP

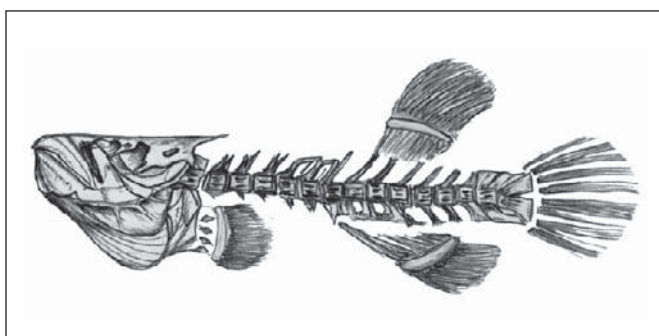
ated through a very credible process and will be independently audited," he said as the standards were being published in August. Mr Graham, who was involved in the dialogue for three years, reckons pangasius has the potential to become as popular as Atlantic cod (*Gadus* spp.) and Alaska pollock (*Theragra chalcogramma*), marine fishes that are widely consumed in Europe and North America. "Aquaculture," he argues, "can never be sustainable if it needs to plunder the oceans in order to feed the fish that it's trying to grow. The fact that pangasius has a much lower reliance on animal protein in its feed than other aquaculture species makes it particularly interesting." Mr Graham was previously part of the Fish

Sustainability Initiative of Dutch manufacturing giant Unilever, which sold Birds Eye Iglo to a British-based private equity firm for £1.9 billion in 2006. The frozen foods business operates under the Birds Eye brand in Britain and the Iglo brand in continental Europe, especially Germany and Austria.

Further reading:

<http://www.worldwildlife.org/what/globalmarkets/aquaculture/WWFBinaryitem17873.pdf>

* Mr Starr is the editor of *Catch and Culture*



Correction

On page 20 of the August issue of *Catch and Culture*, we published a photo of representatives of Bac Lieu Feedmill Joint Stock Company (Bafeco) visiting a distributor in Dong Thap province in July. The photo did not include Bafeco General Director Cao Van Quat as erroneously indicated in the caption. Our apologies.

Rights and conflicts in managing fisheries in northeast Thailand

By Malasri Khumsri, Kenneth Ruddle and Ganesh P. Shivakoti *

Managing inland fisheries in the Lower Songkhram River Basin (LSRB) of northeast Thailand is challenged by a complex, pre-existing local property rights system, characterised by overlap and conflict. A study funded by the MRC Fisheries Programme has analysed the components, conflicts and changes of the system in 14 communities, focusing on the auction system for barrages, an illegal and destructive, yet tolerated, fishery. These rights, adapted to gear type, seasonality, and habitat, are a critical social resource and proven management system that should be legitimised. Reprinted below are the study's conclusions which include recommendations for both improving general inland fisheries policy and reforming the barrage fishery. The main finding is that management measures for barrage use must be acceptable to both local communities and authorities, and must ensure the sustainable use of fisheries resources.

Fisheries resources in the LSRB are managed under a complex multiple-rights property regime, by which individual, common, and state property rights are defined and both combined and separated. This has resulted in overlap, conflict and complementarities, and in a varied performance. Changes in external economic and political contexts led to change in LSRB property rights, via a lengthy process characterized by struggle and negotiation, as both original individual rights holders and communities adjusted to the evolving new institutional arrangements. In many instances, however, problems within communities were resolved by coercion from external government. Further, as has been demonstrated by the example of the barrage fishery, changes in property rights regimes may be multi-directional, as when it changed from a common property right to either individual or collective rights, and then alternated between individual and community rights.

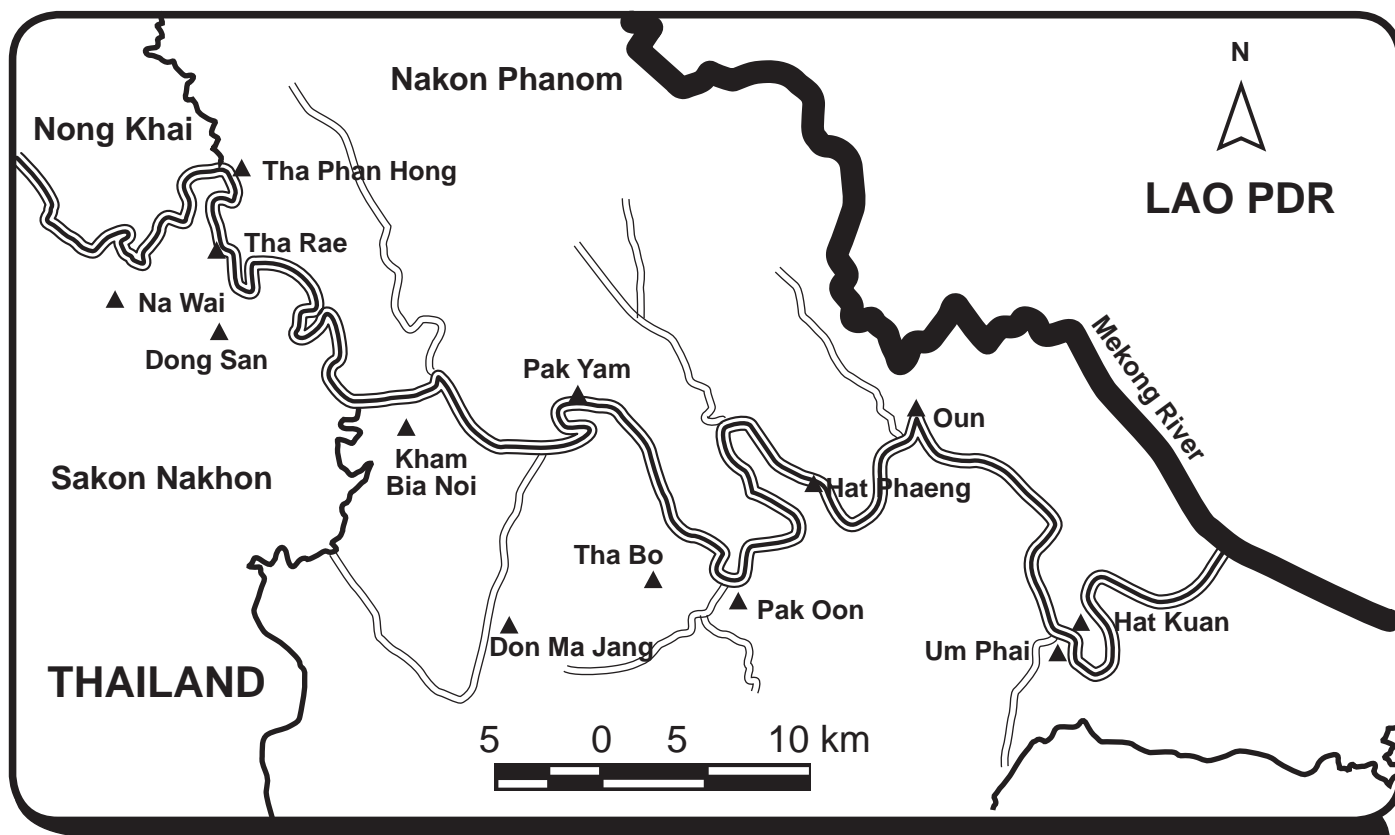


Bamboo fence with mosquito net installed to block a creek

PHOTO: MALASRI KHUMSRI

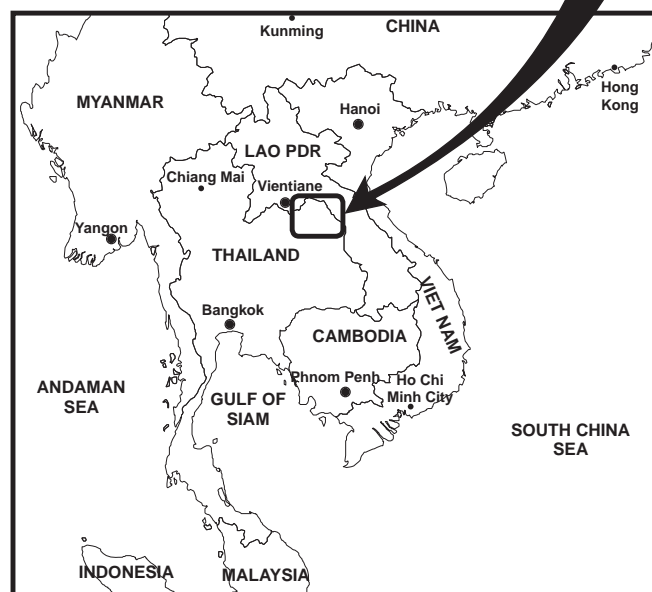
That institutional arrangements also change concurrently with property regimes, owing to structural changes in rights and duties that link people and resources systems, has been demonstrated when LSRB communities established new fisheries management institutions, by combining national institutions with village committees and district government offices. Moreover, communities also respect multiple types of property rights allocated locally to both individuals and communities. In other words, they neither rely on one particular kind of property rights regime nor clearly distinguish among the types of property right. This provides incentives to participate in fisheries management through collective action.

On the other hand, without specific rules, that situation does not guarantee sustainable fisheries management, as demonstrated by the barrage auction (see box), when the communities' desire to maximize income in turn drives winning bidders to seek maximum profit from the fishery during their very brief exclusive tenure. Without rules aimed specifically at sustainable use, over-exploitation and the eventual collapse of the fishery are inevitable.



Rights to manage fisheries have varied sources and are exercised differently. Although the Thai Constitution supports natural resources management by communities, there are neither guidelines for practical implementation nor clearly defined authority and roles. For example, national law may grant LSRB communities *de jure* rights of access and withdrawal, while reserving for government the formal rights of management, exclusion and alienation. Yet concurrently the communities hold *de facto* rights to manage fisheries within their boundaries. Thus there is duplication and mismatch between local and state institutional arrangements for fisheries management.

Fisheries management in the LSRB would be enhanced by a more effective property rights system. Although a tortuous and time-consuming process, as an essential first step local rights must be legitimized. And local authority, roles and management structures, together with strategies for allocation of fishing rights, should be specified clearly in policy guidelines. Regardless of the type of property rights regime adopted, it is vital to acknowledge



that the context within which the rights are exercised will vary according to location and habitat within the LSRB. This could be accomplished by the DoF acknowledging *de facto* rights within its legislation and policies. Manage-

ment could then become the joint responsibility of community members and DoF staff. Past DoF attempts to ban the barrage fishery failed, and now both fishers and communities have requested a review and amendment of legislation. From the research reported here it can be concluded that management of LSRB fisheries resources requires a multiplicity of rights that would restrict gear types and harvest sizes, times and locations. However, resources should still be owned in common rather than individually.

The study has also demonstrated some of the basic issues and general requirements for improving inland fisheries management throughout Thailand. These coalesce around community management of local resources. First, the complex nature of the fisheries examined in the LSRB demonstrates the inconsistencies inherent in trying to impose blanket legislation over diverse resources. Such a situation calls for the involvement of local communities in management. Second, the lack of pre-

cise physical boundaries to river basin fisheries makes it difficult to police access, even if unambiguous property rights have been clearly assigned. This reinforces the need for communities to be involved in the basic policing of resource use in their local areas. Third, management regimes without government involvement require a high level of community capacity, which, in turn, requires specific inputs to either create management skills from scratch or to enhance existing ones. On the other hand, full state control would require more financial resources and skills than are now available, is generally considered undemocratic, and has nowhere proven effective in fulfilling fisheries management objectives.

Four basic points emerge from this case study for the improvement of national policymaking for decentralized fisheries management. First is that a re-definition of the objective of fisheries management policy is required, since objectives differ between local communities and the state. The management objective of the state is to

Returning rights from private to common property in barrage fishing

The barrage fishery is the most lucrative commercial fishing gear used in the LSRB, with an annual income ranging from \$1,516 to \$31,513, and catch sizes between 50 and 100 kg/day, depending on barrage size and location (Ngoichansri and Thongpun 2003). Annual operating costs are in the range \$176–\$2,352, mostly for bamboo, ropes, nets and salt for processing fish, and the auction cost varies from \$88 to \$8,823. The barrage fishery yields an average rate of return of 150% on total investment costs (i.e., operating plus auction costs).

As a result of both administrative change and the evolution of the Thai rural economy since the 1950s, major changes have occurred in the barrage fishery in LSRB. Formerly, barrage fishing grounds were owned by individuals as a private property. But from 1986 this fishery was reclaimed by communities, and converted to a common property. The reclamation idea was agreed to in 1986 by the community leaders (villages heads [Phu Yai Ban] and sub-district heads [Kamnan]). They wanted the barrage fishery changed from an individually-owned, private property, to a common property managed by communities, because (1) income from barrages was required to supplement limited official budgets for community development, and (2) barrage fishing grounds are part of a community's territory, so the entire community should benefit from the income generated, and not just individual and mostly non-resident rights-holders.

However, full implementation of the leaders' decision required 12 years (1987–1999). First, cancellation of individual rights was agreed in 1986, and it was further agreed that from 1987–1995 operation of barrages would rotate alternately between original rights owners and communities, after which the right would be held by the communities alone. But implementation during 1987–1995 was difficult. Although the original right-holders lost their benefits as a result of the agreement, they continued to regard barrage fishing as their heritage. Consequently, conflicts and negotiations continued until 2000, when District Officers entered the negotiations, and arranged an agreement among community members and individual owners. Nowadays, most small and low-yielding barrages grounds are still held by individuals, who donate money to the communities. Large barrages are owned by communities, who manage them through an auction system.



Barrage size and configuration are adjusted to conditions in specific fishing territories

PHOTO: UBOLRATANA SUNTORNRATANA

maintain sustainable levels of resource use, whereas that of local communities is rational economic performance to serve their livelihood interests. Thus, both major stakeholders need to re-define a set of common objectives, and decide whether the management objective is to improve sustainability or to enhance rural livelihoods. The latter is more pertinent for small-scale fisheries, and should be reflected in policies and practices. Second is the need to formulate and implement fishery policy based on some form of co-management. Local communities play an important local management role, supported by both government and local organizations, while the DoF plays the dominant role at a higher level. Local authority, roles and management structures, together with strategies for allocation of fishing rights, should be specified clearly in policy guidelines. Third, a clear and appropriate legal framework is required, with mandates and responsibilities specified for the different fisheries management authorities at both central and local levels. Finally, decentralization of fisheries management must be implemented step-by-step, with the gradual transfer of selected responsibility and authority for management functions. Cooperation between the central and local institutions is fundamental, and must be ensured by the central government.

The illegal barrage fishery is of national importance, and efforts by the DoF to prohibit it have not succeeded anywhere in Thailand. Inland fisheries communities, realizing the harm that it does, have requested a review and revision of existing legislation. The findings of the LSRB

study suggest how the problem of the barrage fishery might be addressed. The main findings are that management measures for barrage use must be acceptable to both local communities and authorities, and must ensure sustainable fisheries resources use. Management should be based on scientific stock assessment and biological studies that also integrate complementary information from local fishers. Social and economic studies are also important, as well as research to determine rules to make barrage fisheries ecologically less detrimental and acceptable to both fishers and authorities. After that process is complete, management plans and detailed implementation measures are required for each geographic area to ensure effective management. Implementation should be a gradual and informal process, based on de facto rules, and begin with a closely monitored and co-managed pilot activity that would permit adjustment of management measures over the course of the fishing season (i.e. adaptive management).

References

Khumsri M, Ruddle K and Shivakoti GP (2009) Rights and conflicts in the management of fisheries in the lower songkhram river basin, northeast Thailand. *Thai Fisheries Gazette* 62(6): 495-510.

* Ms Malasri who works at the Ubon Ratchathani Inland Fisheries Research and Development Center, is the Thai national coordinator for the Fisheries Management and Governance Component of the MRC Fisheries Programme, Mr Ruddle is with the School of Policy Studies at Kwansai Gakuin University in Kobe and Mr Shivakoti is from the School of Environment, Resources, and Development at the Asian Institute of Technology in Bangkok.

Annual meeting in Can Tho City

The MRC Fisheries Programme held its annual meeting in Can Tho City on November 25-26 with representatives of Cambodia, Lao PDR, Thailand and Viet Nam adopting a statement on the conclusions. The following is the full text of the statement.

The Fisheries Programme Phase 2 (FP2) will end in 2010. The next phase (2011–2015) will build upon the achievements of 16 years of cooperation between the MRC and national fisheries agencies in research and development of fisheries of the Lower Mekong Basin. It will particularly seek to achieve a more balanced approach to management of fisheries and a better integration with other agencies and sectors to deal with the many challenges that are faced by the fisheries of the Basin.

The achievements of the MRC fisheries programme include raising the profile of Mekong fisheries so that they are now at the centre of the development agenda. The size and value of the resource and its importance to the Basin's countries and to the wellbeing of their people, are recognised widely. Fisheries play a key role in particular in supporting the poorer people – their food and livelihoods. Understanding the relationships between

habitats and fisheries production provides a scientific foundation on which to make judgements concerning the development of fisheries and other uses of water.

Co-management has become a key approach to fisheries management in the LMB, and improved production techniques are in place for the culture of indigenous fish species. The MRC has increased understanding of the role of women in fisheries. Information on Mekong fisheries is disseminated widely in a variety of media, and the capacity of riparian professionals has been developed through a broad spectrum of channels.

There are many threats to fisheries in the basin. The development of hydropower, particularly proposed dams on the mainstream, is very important, as it is well-known that large dams can cause negative impacts on river fisheries. Engagement between the fisheries and hydro-power sectors will continue to be a key part of the next phase of the programme.

There are many other threats as well as some major opportunities for fisheries in the basin. Inland capture fisheries are part of the landscape, which is primarily agricultural, so consideration of fisheries within agriculture



Opening session of the annual meeting. From left, Viet Nam National Mekong Committee Director-General Le Duc Trung, Can Tho City People's Committee Vice Chairman Nguyen Thanh Son, Vice Minister of Agriculture and Rural Development Luong Le Phuong and MRC Operations Division Director Tran Duc Cuong.

PHOTO: LEM CHAMNAP



Vietnamese Vice Minister of Agriculture and Rural Development Luong Le Phuong (centre) with MRC Fisheries Programme Coordinator Xaypladeth Choulamany (left) and Vietnamese Fisheries Administration Vice Director-General Pham Anh Tuan (right) as the annual meeting gets underway

PHOTO: LEM CHAMNAP

should be a key part of our thinking and an important factor shaping our future activities.

Within the MRC, the FP like other programmes will formulate activities taking into account many cross-cutting issues such as gender equity, climate change, maintenance of ecosystem services, and the need for basic access to services and markets.

The FP has a long history of cooperating with other regional agencies and this will continue and be built upon in the next phase. Our partners at this meeting have explained their regional fisheries activities, which are in many respects complementary of and supportive of MRC's basin-wide focus.

WorldFish Centre presented to the meeting on planned work on the aquatic agricultural systems in the Lower Mekong Basin for improved nutrition and health and on proposed research to understand and promote the production of nutrient-rich fisheries species in a predominantly agricultural landscape (see article on page 16). This work is strongly supportive of the MRC FP's need to take a balanced approach to management across all fisheries landscapes in the basin.

SEAFDEC has traditionally dealt with marine fisheries,

but increasingly recognises the importance of inland fisheries. The MRC FP will continue its history of cooperation with SEAFDEC.

NACA presented on the growing importance of aquaculture in the basin and its role in promoting best management practices, particularly in the large industry in the Mekong delta.

Concluding Remarks

Delegates expressed their gratitude to the People's Committee of Can Tho City, the Ministry of Agriculture and Rural Development, Viet Nam National Mekong Committee and RIA2 for hosting the meeting and for organising local logistics and support activities.

The generous financial support of Danida and Sida to the Programme was acknowledged.

The delegates from the four MRC member countries expressed their satisfaction with the information provided during the meeting and the progress made by the Programme. They looked forward to increased collaboration between the Programme, other MRC Programmes, NGOs, national line agencies, and other involved bodies. The 18th annual meeting will be held in Thailand during 2011 on a date and location to be announced later.

Strategic environmental assessment of mainstream dam development

In October, the MRC released the final report of a 14-month strategic environmental assessment of hydropower development along the Mekong mainstream. The independent report by the International Centre for Environmental Management from Australia deals with 11 proposed dams in the Lower Mekong Basin (LMB). The following is an extract from the report's summary, while the text in the box comes from the main body of the report.

In a river basin where 70% of communities are rural and where inland fisheries are the most intensive in the world, food security and livelihoods are still largely based on river-dependent natural resources. Risks and losses incurred by the Mekong terrestrial and aquatic ecosystems translate into threats to the livelihoods of millions of people – primarily through increasing food insecurity in the basin. If natural resources productivity is reduced, the country's most at risk are Cambodia and Lao PDR.

'The amount of protein at risk of being lost annually if 11 mainstream dams were built by 2030 represents 110% of the current total annual livestock production of Cambodia and Lao PDR'

The LMB mainstream projects enter the Basin at a time when tributary hydropower already threatens the diversity and size of the Mekong fishery. Fish yield in the Mekong is composed of at least 35% of long-distance migrant species whose migrations would be barred by dams. The mainstream projects would fundamentally undermine the abundance, productivity and diversity of the Mekong fish resources, affecting the millions of rural people who rely on it for nutrition and livelihoods.

In summary by 2030:

- With development basin-wide including a total of 77 dams on LMB tributaries and on the Lancang River mainstream, the loss of fish production compared to the 2000 baseline is expected to be 210,000 – 540,000 tonnes or 10-26% in the absence of mainstream dams.
- If 11 mainstream dams were in place, the total loss in fish resources would be 550,000 – 880,000 tonnes or 26-42% compared to the 2000 baseline – ~340,000 tonnes of that estimate directly due to mainstream dams. The amount of protein at risk of being lost annually if 11 mainstream dams were built by 2030 represents 110% of the current total annual livestock production of Cambodia and Lao PDR.
- If 9 mainstream dams were operating upstream of Khone Falls, the loss in fish resources would amount

Fish versus other animal protein

Freshwater fish supply is critical for food security in the basin, particularly in Cambodia. The four Mekong countries feature the highest consumption of freshwater fish in the world. Cambodia in particular holds the world record for consumption of freshwater fish. The share of protein coming from freshwater fish in people's diet represents between 2.2 and 8.6 times the world average, and alternatives to fish proteins are not always available. Thus, in the whole LMB there is much more freshwater fish harvested than cattle produced, and in Cambodia and Lao PDR, fish production amounts to twice the combined production of pork and chicken. Chicken and pork are alternatives to fish in three of the Lower Mekong countries, but not in Cambodia where fish is by far the dominant source of protein.

to 350,000 – 680,000 tonnes or 17 – 32% compared to the 2000 baseline, 140,000 tonnes of that estimate directly due to mainstream dams.

- If 6 dams were built upstream of Vientiane, a loss ranging between 270,000 and 600,000 tonnes or 13-29% is expected compared to the situation in 2000 - about 60,000 tonnes of that estimate due to mainstream dams or protein loss annually equivalent to 60% of the current livestock production of Lao PDR.

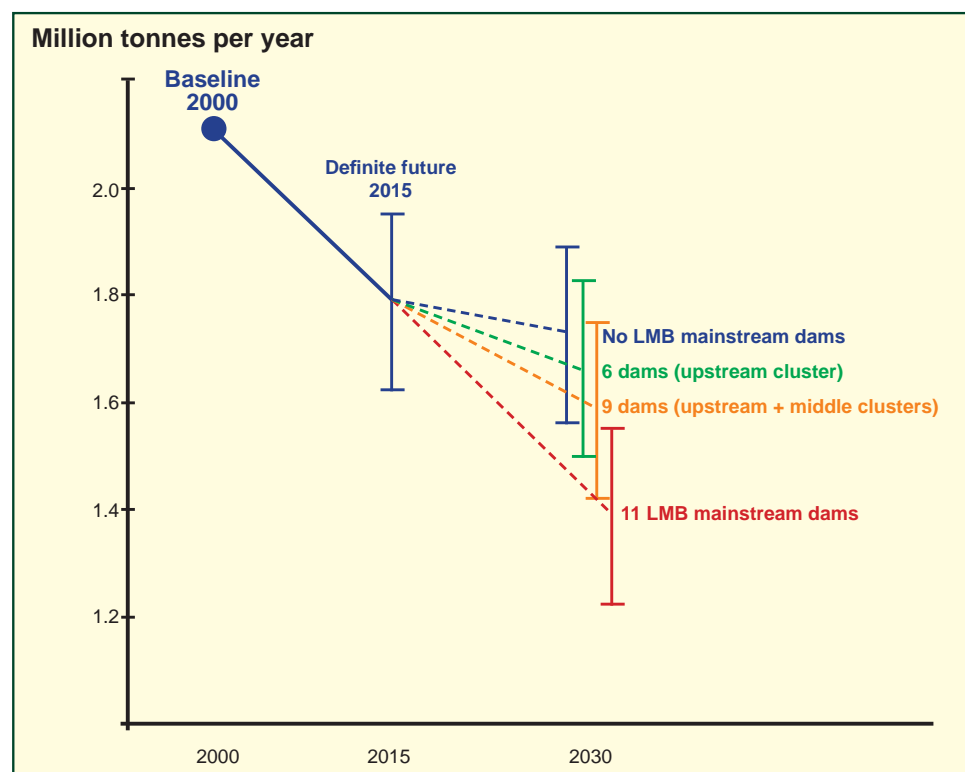
Reservoir fisheries cannot compensate for the loss in capture fisheries and at best would produce one tenth of the lost capture fisheries production. In the long term, the reduction in sediment and nutrient outflow predicted for 2030 of from 50% to 75% of the current average annual load would have a major impact on coastal fish production, and subsequently on the Vietnamese fishing sector and fish trade – a sector which has shown strong growth in the last 10 years and produces some 500,000 tonnes of fish annually.

‘Aquaculture can complement the Mekong capture fisheries sector but cannot replace it in terms of food security’

Aquaculture can complement the Mekong capture fisheries sector but cannot replace it in terms of food security. Aquaculture has shown rapid growth in all LMB countries (most developed in Viet Nam). Intensive aquaculture (e.g. Viet Nam) produces fish for export and in-

Capture fisheries production forecasts for the LMB

Potential incremental impact of LMB mainstream dams on fisheries production basin-wide



SOURCE: INTERNATIONAL CENTRE FOR ENVIRONMENTAL MANAGEMENT

come but is not accessible to the poor. Extensive aquaculture (e.g. Cambodia) feeds local people but is not very productive. This sector is dependent on: (i) investment, (ii) land/water management, and (iii) capture fisheries for feed (all countries) and juveniles (Cambodia in particular). With management for multiple uses, the LMB mainstream projects could provide the investment and water resources needed for continued growth in the aquaculture sector. The LMB mainstream projects would reduce the productivity of capture fisheries, diminishing the supply of feedstock to the aquaculture sector with limited capacity for replacement through reservoir fisheries.

Substantial losses in the fresh and marine capture fisheries and in Delta aquaculture would have basin-wide impacts on the fisheries sector, associated ancillary and processing industries, and fisheries associated livelihoods, and health and nutrition.



Open for business. Fisheries Programme staff pose with MRC Operations Director Tran Duc Cuong (top) on December 14 when the programme's new office opened at the recently-inaugurated office of the secretariat in Phnom Penh. The programme was previously based in Vientiane. From left, Junior Riparian Professional Nguon Vichet, Programme Secretary Pheng Sokunthea, Programme Officer Kaviphone Phouthavongs, Mr Cuong, Programme Officer Pham Mai Phuong and Programme Officer Buoy Roitana. Located on the Bassac River, the office of the secretariat in Phnom Penh opened in August. The interior of the programme office (bottom) with staff awaiting the arrival of office equipment and documents from Vientiane.

PHOTOS: LEM CHAMNAP

Suchart Ingthamjitr



Dr Suchart receiving a farewell gift from MRC Operations Division Director Tran Duc Cuong at the Fisheries Programme annual meeting in Can Tho in November

PHOTO: CHEA PHALLA

MRC Fisheries Programme officer Suchart Ingthamjitr has left the programme after 6 years to return to the Department of Fisheries in Bangkok. In his new position, Dr Suchart is now working as senior fisheries biologist with the Inland Fisheries Resources Research and Development Institute which is under the department's Inland Fisheries Research Bureau. During his time with the programme, the Thai fisheries biologist oversaw the Aquaculture of Indigenous Mekong Species (AIMS) component of the programme. Since 2009, he was closely involved in coordinating a regional ichthyoplankton survey to determine which fish spawning grounds on the Mekong mainstream are likely to be affected by mainstream dam development. Dr Suchart has been a regular contributor to *Catch and Culture* over the years and was responsible for coordinating the production of MRC Development Series No 5, "An Introduction to the Mekong Fisheries of Thailand." Xaypladeth Choulamany, coordinator of the Fisheries Programme, said: "We hope we will be able to continue working together implementing important studies with Dr Suchart, particularly at a time when so many rapid development changes are occurring in the Mekong."

Chea Vanny



Ms Vanny

PHOTO: LEM CHAMNAP

Chea Vanny has been appointed as administrative assistant to the MRC Fisheries Programme as part of its move to Phnom Penh in December. Ms Vanny previously worked as a programme and project assistant for the Poverty Reduction Cluster at the United Nations Development Program (UNDP) in Phnom Penh. Before that, she was an executive assistant to the United Nations Resident Coordinator in Cambodia. She previously worked as a patient coordinator for the Phnom Penh office of MOH Holdings Pte Ltd, the Singapore public health care group, and as executive secretary to the country director of World Vision Cambodia. A native of Phnom Penh, Ms Vanny holds a Bachelor of Accounting degree from Cambodia's National University of Management and a Bachelor of Education degree from the Institute of Foreign Languages at the Royal University of Phnom Penh.

Pheng Sokunthea



Ms Sokunthea

PHOTO: LEM CHAMNAP

Pheng Sokunthea has been appointed as secretary of the Fisheries Programme. Ms Sokunthea previously worked as assistant administrator at the administration office of the Cambodia-Japan Cooperation Center (CJCC) at the Royal University of Phnom Penh (RUPP). Before that, she was in Niigata for three years completing a Master of Arts degree in International Peace Studies at the International University of Japan. She previously also worked as secretary to both the CJCC director and the RUPP rector. In 2004, Ms Sokunthea took part in the first Cambodia-Viet Nam Dialogue in Viet Nam organised by Initiatives for Change, a non-governmental organisation based in Switzerland. A native of Kien Svay district in Kandal province, Ms Sokunthea graduated from the RUPP Institute of Foreign Languages with a Bachelor of Education degree in English in 2006.



Vu Vi An, the Vietnamese national director of the Fisheries Ecology, Valuation and Mitigation component of the MRC Fisheries Programme, surveying an inland protected area in the Mekong Delta

PHOTOS: DOAN VAN TIEN





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