



THE TECHNICAL ADVISORY BODY FOR FISHERIES MANAGEMENT (TAB)

Mekong giant fish species: on their management and biology

Mekong Fisheries Management Recommendation N° 2

August 2005



Working towards Effective, Sustainable and Regional Fisheries Management in the Lower Mekong Basin

BACKGROUND

Among the diverse fish fauna the Mekong supports, the giant species are ecological and environmental icons; they are symbolic of rich biodiversity of the river's ecosystems. While perhaps not vital elements in the overall balance and dynamics of the riverine ecology, these fish are indicators of the environmental health of the Mekong and its many habitats. As such, these prestigious fish are potential foci on which to draw regional and international attention to the threats that challenge the biodiversity of the Mekong and the future of the fisheries the river supports.

All the giant species, many of which are endemic to the Mekong, are under stresses that stem from the loss of natural habit and increasing fishing pressures arising from the needs of the basin's growing population. Concerns for the survival of these endangered fish have led to calls for action to ensure their conservation.¹ However, deciding what action to take is difficult because much of the expertise on these fish is spread across the four MRC member countries.

This note, therefore, presents a summary review of what we know about the biology and ecology of these species². It provides data on their habitats, migration, reproductive biology and life cycles and the results of experiments on artificial breeding. It also recommends a series of preliminary measures that will aid their preservation.

FACTORS CONTROLLING THE STATUS OF THE WILD STOCK

Status of the Mekong giant species

The IUCN Red List of threatened species³ includes two of the five giant Mekong species, *Pangasianodon gigas* (Mekong giant catfish) and *Probarbus jullieni* (Jullien's golden carp or seven-stripped barb), in the 'endangered' class. Two other listed species (*Probarbus labeamajor* and *Probarbus labeaminor*) are classified as 'data deficient'. Although it is not on the IUCN list, the other giant species, *Catlocarpio siamensis* (Siamese giant barb), is now found rarely in the Mekong.

While records of fisheries catches are incomplete, such information that we have shows the wild populations of all the giant fish are in decline. The number of giant catfish and Jullien's golden carp caught in spawning grounds fell sharply over the last decade⁴. The catch of Siamese giant barb in Cambodia dropped from 50 in 1980 to 10 in 2000.

The reasons for this decline are not fully understood as details of the biology and life cycle of the fish are poorly known. They are certainly under threat from over-fishing; large, valuable, fish are attractive targets for fishers (a 250 Kg giant catfish can fetch up to US\$2,500). In addition, the fragmentation of habitats and disruption of migration routes, caused by dams and weirs, is a particular hazard for giant species that have large geographical ranges. The species of *Probarbus* face an additional threat from fishers who target their spawning grounds.

Artificial breeding

Artificial breeding experiments and programmes have been relatively successful. Captive wild stock of the Siamese giant barb, Mekong giant catfish and Jullien's golden carp will spawn artificially if induced by hormone injections. The fecundity of all the species is high and survival rates are increasing as a result of improved techniques for nursing and culturing fry.

But, because all giant fish species take many years to reach maturity, the results of breeding in captivity may not become apparent for a number of years. For example, giant catfish reared from the juvenile stage at the Phayao Inland Fisheries Research Center, Thailand, reached maturity at the age of 18 years. They were successfully induced to spawn for the first time in 2001. Up to now, more than 300,000 fingerlings from 13 captive brood stock have been produced by four fisheries stations in Thailand. There are also reports that specimens of giant catfish released into reservoirs in Thailand have reached the adult sizes although none of the recaptured fish had mature gonads.

Because they take so long to reach sexual maturity, captive breeding of all the species relies on captured wild fish for spawning stock. Declining numbers of fish that are already rare makes the task of capturing adult mature specimens more difficult. For example no mature female giant catfish were caught in 1998 .

Stock enhancement

At present, enhancing the wild stock with fish bred in captivity is probably the best hope for the survival of the giant species, although schemes such as the 'buy and release' project introduced in Cambodia may relieve some pressure, at least in the short-term.

However, the very scarcity of the species and the reliance on a few individual wild fish as stock for artificial breeding brings the problem of a limited gene pool. All healthy wild populations of animals show broad genetic variation. A large gene pool allows species to adapt rapidly to changing environments and other external pressures.

The FAO issued guidelines aimed to protect the genetic variation of populations of wild fish that are maintained by the introduction of stock bred in captivity.⁵ These measures include:

- ✓ using as large a breeding population as possible (to increase the effective population size).
- ✓ avoiding inbreeding.
- ✓ avoiding hybridisation (unless sufficient brood stock of both sexes is not available).
- ✓ avoiding 'domestication selection'; that is, avoiding producing an organism that is adapted to the hatchery instead of nature.

DISCUSSION

Stock enhancement and other similar measures, however, will fail unless all concerned agencies take steps to address the root causes behind the decline of the Mekong's giant fish species. There is little point in introducing fish bred in captivity only for them to fall prey to the same threats that have decimated the wild population. These threats undoubtedly relate to broader issues including the degradation of ecosystems and habitats and the impacts of over fishing, poor fishing practices and larger development issues such as hydropower, irrigation and flood mitigation.

Protecting the giant fish species is inevitably a complex problem involving many other development sectors. It is also a trans-boundary issue requiring the support and cooperation of agencies and stakeholders from all four of the countries in the lower Mekong basin. This being the case, a initiative to preserve the giant species based on a MRC Basin Development Plan (BDP) may well be the best way forward.

RECOMMENDED ACTIONS

Further Research

Studies and workshops to identify the main cause(s) for rarity of the giant species should:

- ✓ Based on available data and knowledge, create one or more models to enable integration of available information and knowledge in a more easily understood form (these may range from simple, verbal models to complex, computerised models).
- ✓ Formulate hypotheses, eliminating those that are unlikely to have given rise to the observed data.
- ✓ Design and conduct experiments to test the hypotheses (the experiments may range from the small to large, ecosystem, scale). The time factor is an issue: large-scale ecosystem experiments may give better results but will take a long time, whereas small-scale experiments usually give quicker results.
- ✓ Analyse the results of the experiment(s) and identify the main reason(s) for rarity.
- ✓ Use the results of the experiments have to refine further the management system(s) to address the factors that cause rarity.

Monitoring

Put in place a basin-wide monitoring programme, covering ecology, genetics, and life history. Relevant data and meta-data should be available to fisheries scientists and in the public domain.

Breeding and stocking

- ✓ Ensure the brood stock, whether obtained from the wild or maintained in captivity, comprises a large number of individuals with appropriate genetic profiles.
- ✓ Put in place measures to ensure the diversity of the gene pool.

Aquaculture

Aquaculture can provide data on cultured populations that will increase our knowledge of the biology of wild populations, either through simple observation or through specifically designed experiments.

Participatory management

Set up participatory management of the breeding grounds, possibly involving providing fishers who have lost income with financial compensation

END NOTES

1. At its first meeting, in 2000, the Technical Advisory Body for Fisheries Management (TAB) commissioned a review of the status of the Mekong's giant fish. The review was undertaken by staff from the MRC Fisheries Programme and their findings published in 2002 (see end note below).
2. Mattson, N.S., Kongpheng Buakhamvongsa, Naruepon Sukumasavin, Nguyen Tuan and Ouk Vibol. (2002). Mekong giant fish species: on their management and biology. *MRC Technical Paper No. 2*, Mekong River Commission, Phnom Penh. 29 pp. This report contains a wealth of additional information on the life cycle, reproductive biology and artificial propagation and rearing of the giant catfish, Jullien's golden carp and the Siamese giant barb.
3. Not all of the Mekong's endangered fish are giant species, some, less charismatic species are also under threat.

Mekong fish listed in the 2000 IUCN Red List of threatened species (giant species in bold)

Species	Common name(s)	Red list classification	Size (cm)
<i>Aptosyax grypus</i>	-	DD	100
<i>Botia sidhimunki</i>	Dwarf Botia	CR	5.5
<i>Chela caeruleostigmata</i>	Leaping Barb	CR	7
<i>Chitala blanci</i>	Royal Featherback	LR	90
<i>Epalzeorhynchus bicolor</i>	-	EW	12
<i>Oreoglanis siamensis</i>	-	VU	14
<i>Pangasianodon gigas</i>	Giant Catfish	EN	300
<i>Pangasius sanitwongsei</i>	Pla	DD	250
<i>Probarbus jullieni</i>	Jullien's Golden Carp	EN	100
<i>Probarbus labeamajor</i>	Thicklip Barb	DD	150
<i>Probarbus labeaminor</i>	Thinlip Barb	DD	70
<i>Scleropages formosus</i>	Asian Bonytounge	EN	90
<i>Tenualosa thibaudeaui</i>	Laotian Shad	EN	30

Note: CR: Critically Endangered, DD: Data Deficient, EN: Endangered, LR: Lower Risk, VU: Vulnerable, EW: Extinct in the Wild

4. Pholprasith, S., M. Benjakarn and R. Ritthaporn (1992) Development of commercial culture of the Mekong giant catfish. *Technical Paper No. 14*, Inland Fisheries Division. Department of Fisheries, Ministry of Agriculture and Cooperatives, Bangkok. 51 pp.
5. FAO. 1997. FAO technical guidelines for responsible fisheries. *Aquaculture development*. No. 5, Rome. 40 pp.







Printed by the MRC Secretariat to promote and support the TAB - March 2005

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