# Status of the Mekong Giant Catfish, *Pangasianodon gigas* Chevey, 1930 Stock Enhancement Program in Thailand

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## Introduction

The Mekong giant catfish (*Pangasianodon gigas* Chevey, 1930) is one of the largest freshwater fish in the world, measuring up to 3 m in length and weighing in excess of 300 kg. It is endemic to the Mekong River Basin area. It is found in Tonle Sap Lake, Tonle Sap River, and the Mekong River. It is not known to occur in the upper 2,000 km of the Mekong River. The current extent of occurrence is estimated at around 4,150 km.

Historical reports indicate that the species was abundant in the early 1900s with 40-50 fish caught yearly in Nong Khai Province, north-east Thailand. However, since that time the number of fish caught has declined. In 1967, fishermen captured 11 *P. gigas* in the area (Pookaswan 1969) and by 1970, this fish was caught only as by-catch of beach seine fisheries (Pholprasith and Tavarutmaneegul 1997). From 1980 to the present, it has been found in Chiang Khong District, Chiangrai Province, Northern Thailand. The number of fish caught in Chiang Khong is shown in Fig. 1. The catch has declined from 69 fish in 1990 to just 7 fish in 1997. In 1999, 20 fish were captured in Chiang Khong, but no fish were caught in the area during 2001-2003 which may be due to the blasting of rapids in Chiang Saen District, north of Chiang Khong. Since 1999, the giant catfish has also been reported in the Tonle Sap River, Cambodia.

### Rarity and size

The Mekong giant catfish has been listed on CITES Appendix I since 1975 and classified as “Endangered” on the IUCN Red List in 1996. It has been classified as “Critically Endangered” on the IUCN Red List since 2003 after the fish disappeared from Chiang Khong in 2001-2003.

It can be assumed that the Mekong giant catfish is threatened due to human activities, such as overfishing or alterations to the environment (increasing disruption of migration corridors, from construction of dams and weirs means fragmentation of existing habitats etc.). Furthermore, it may be rare because it is evolving or is a relic species of an old group.

Its large body size may also be a reason for its rarity. Data from FAO FishBase showed that the proportion of threatened fishes increases substantially for maximum sizes exceeding 100 cm length, and that most fish species that grow to this size are threatened. In general, large bodied fish tend to be more susceptible to fishing, partly because of their relative mobility, which increases the likelihood of encountering fishing gears. Further, the preference of most fishers for large, valuable fish, and the fishery itself appears as a likely cause of the decline of *P. gigas*. The situation for the Mekong giant catfish is further aggravated because fishers target them in the spawning grounds.

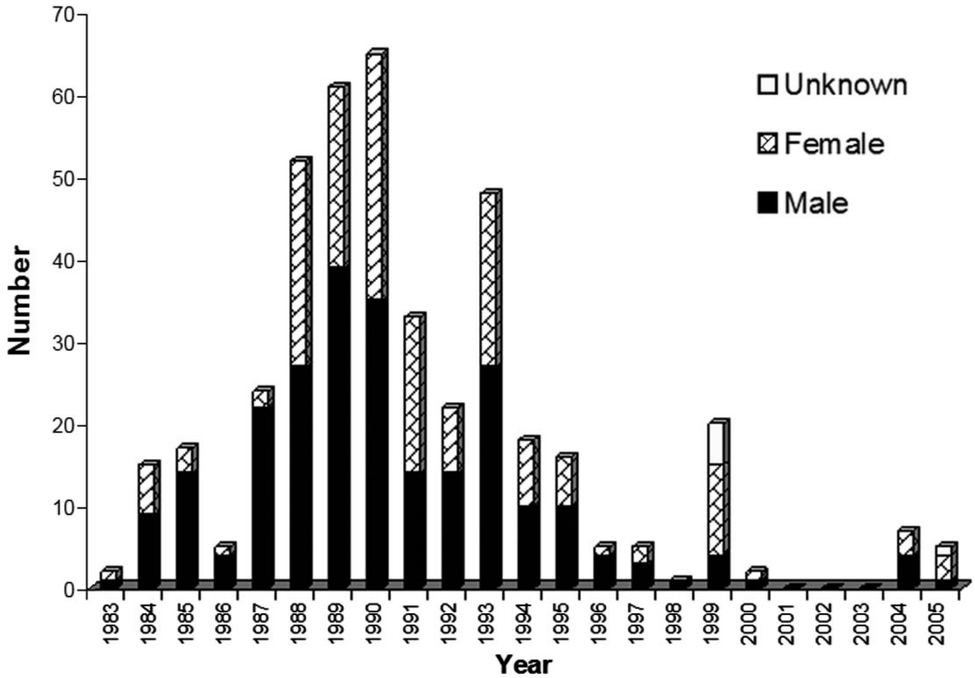


Fig. 1. Number of giant catfish *Pangasianodon gigas* caught in Chiang Khong District, Chiang Rai Province, Thailand, from 1983 to present.

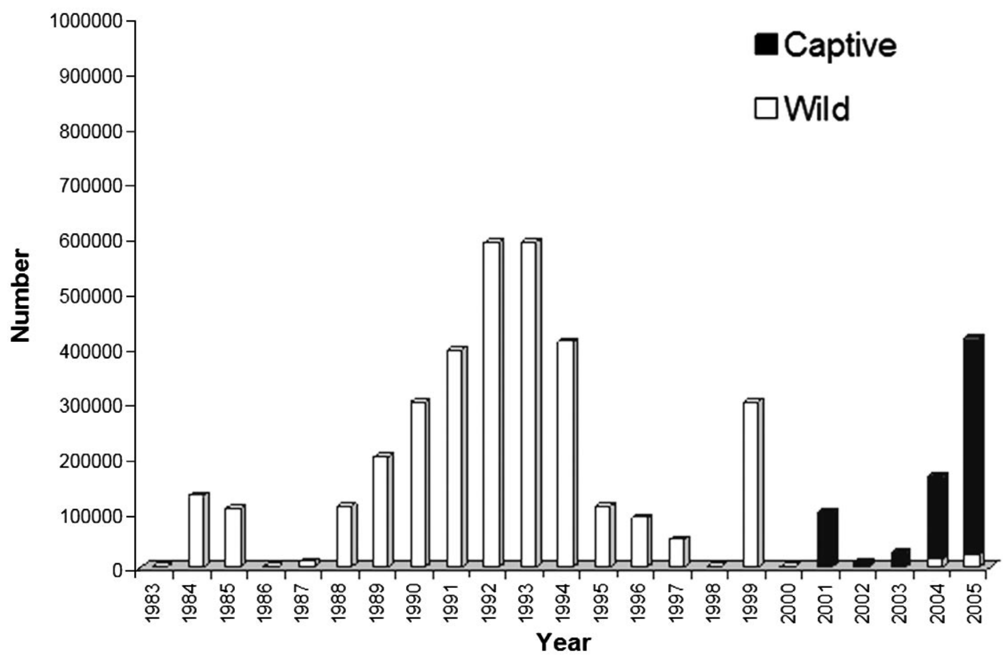


Fig. 2. Number of Mekong giant catfish fingerlings produced from wild sourced and captive broodstock from 1983 to 2005. Since the 2005 spawning season of the captive broodstock has just started, the number of fingerlings reported reflects the partial total production for 2005.

### Natural food

After the yolk sac has been absorbed, giant catfish hatchlings are fed zooplankton (*Moina* sp.) for two weeks. The fry are cannibalistic (Pholprasith 1983). When the fish are one year old, they become herbivorous (Pookaswan 1969). Adults feed on filamentous algae, but probably also ingest insect larvae and periphyton. The lack of dentition on the jaws and vomer area has led fishery biologists to believe that the fish feeds on algae growing on submerged rocky substrates (Pholprasith 1983).

### Natural spawning season and spawning grounds

The natural spawning season of the Mekong giant catfish is from late April to mid-May but the location of the spawning grounds is poorly known. One well-known spawning site is in the mainstream of the Mekong River northward from Chiang Khong in northern Thailand (Pholprasith and Tavarutmaneegul 1997) where mature fish have been caught annually during the spawning season. Thongsaga and Pholprasith (1991) reported that local fishermen observed mating behavior of *P. gigas* in the Mekong River about 30 km upstream of Chiang Khong.

### Age and size at first maturity

There is no report on the age at first maturity in nature. The spawners that were caught in Chiang Khong in 1984-1990 were estimated to be 6-12 years old with body weight of 150-250 kg (Pholprasith and Tavarutmaneegul 1997). Mature females are larger than the males. Captive spawners were 14-18 years old with a body weight of 40-60 kg.

## Breeding Program

The Thai Department of Fisheries (DOF) launched a breeding program for wild Mekong giant catfish in 1980 after obtaining fish with mature gonads in Chiang Khong. Present fishing activities in Chiang Khlong cannot be stopped since it is "the way of life" of people as it generates income. The Thai DOF then uses a short period of 2-3 days before the fish are killed, to induce the fish to spawn.

The first successful artificial breeding of wild spawners caught in the Mekong River was reported in 1983. Since then, successful breeding has been achieved every year, except in 1986 and 1998 (Fig. 2). Initially, the hypophysation technique was used. Since 1992, gonadotropin hormone-releasing hormone analogue and dopamine antagonist have been used successfully in induced spawning (Leelapatra et al 2000).

The offspring of the wild-caught parental stock which were reared continuously in captivity for about 17 years were successfully bred for the first time in 2000. Since 2004, broodstock that were reared in closed recirculating cement tank systems have been induced to spawn successfully. It can now be concluded that the life cycle of the captive *P. gigas* stock has been completed by the Thai DOF.

### Cryopreservation of sperm

Using cryopreservation, spermatozoa of male Mekong giant catfish were successfully preserved in liquid nitrogen, retaining its fertilizing capacity for up to 3-4 months, and a fertilization rate of around 65% (controls 73%). After 18 months, the fertilization rate was 67.7±7.1% while controls were 79.0± 1.4% (Pholprasith 1992).

## Stock Enhancement

The Thai DOF has started the stock enhancement program of *P. gigas* since 1983. The objective of the stock enhancement program is mainly to conserve, retain or replenish stocks of *P. gigas* which are endangered. Furthermore, stock enhancement of *P. gigas* aims to maintain fisheries productivity of a water body (especially in the reservoir) at the highest possible level.

At present, the stocking strategy is not based on any scientific principle. The stocking size is from 3 to 20 inches in total length. In the Mekong River, only offspring from wild broodstock were stocked. In the years when more than one pair of broodstock were induced to spawn, fingerlings from all broodstock were mixed and released. However, if only one pair of broodstock were spawned, the offspring were mixed with those produced in the previous years to ensure that the genetic diversity of the wild fish would not decrease. Also, fingerlings stocked into the Mekong River have been limited to the lowest possible number until the population structure has been determined. At present, around 60,000 fingerlings have been stocked in the Mekong River. The stocking sites were not confined only to its spawning ground in Chiang Khong, but every province along the Mekong River was included (Fig. 3).

In inland water bodies like reservoirs, fingerlings will be tagged before stocking to identify their origin. Stocking will be conducted only in large water bodies with established conservation programs. The stocking density is one fish per 30 rai (5 ha). Catches are monitored annually. From 1984 to 2004, more than 100,000 Mekong giant catfish fingerlings have been released into reservoirs throughout Thailand.

### Tagging

Various types of tagging techniques have been applied to the Mekong giant catfish in order to study its behavior and migration route. Fin clipping, hot branding and Spaghetti tags are found to be useful only for short-term studies since these marks or tags change or are removed accidentally as the fish grows fast. Preliminary studies using ultrasonic biotelemetry technique (by implanting with coded ultrasonic transmitter tags and monitoring tags by means of ultrasonic receivers) seem to be very promising. However, long-term monitoring using this technique is very costly and requires cooperation from the riparian countries along the Mekong River.

### Production from reservoirs

Recently, the Thai DOF has started to monitor catches of *P. gigas* in reservoirs. The results from a study in 2004 showed that only 2% (1,500 of 64,000) of stocked fish were recaptured in 10 reservoirs throughout the country. The total weight of fish was 64.2 tonnes with a value of 4.79 million Baht (0.12 million USD) (Fig. 4).

## Population Genetics Studies

Reduced genetic variation causes a decrease in the ability of a population to adapt to and withstand normal environmental challenges. Therefore, for a population to avoid extinction in the longer term, it is essential that appropriate and sufficient genetic variation be maintained. This becomes an issue particularly when breeding fish for release into the wild. Since 2000, genetics of *P. gigas* has been studied to determine the genetic structure of the wild fish and develop a broodstock management plan for both restocking programs and aquaculture. Microsatellite DNA (msDNA) and mitochondrial DNA (mtDNA) markers have been developed. Genetic variability of wild and captive stocks was estimated using both markers. Stock inventory for hatchery fish is being conducted to develop a broodstock management plan and reconstruct the genotype of the wild stock using the genetic structure of the founder populations in the hatchery.

## Conclusion

There has been very little evaluation of the recapture data and no demonstration

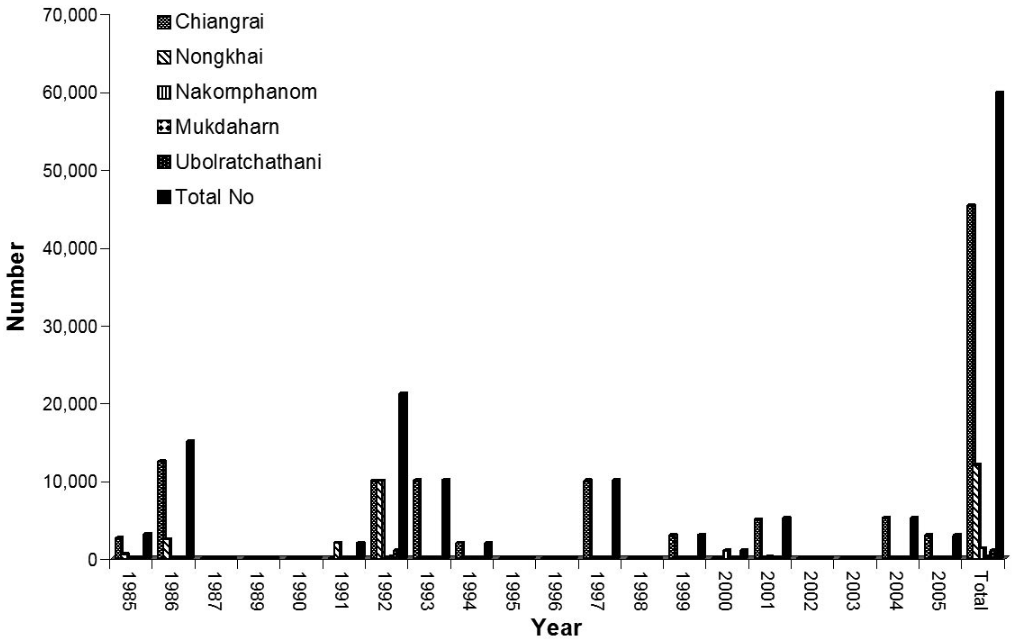


Fig. 3. Number of Mekong giant catfish fingerlings released into the Mekong River at Chiangrai, Nongkhai, Nakornphanom, Mukdaharn and Ubolratchathani, 1985-2004.

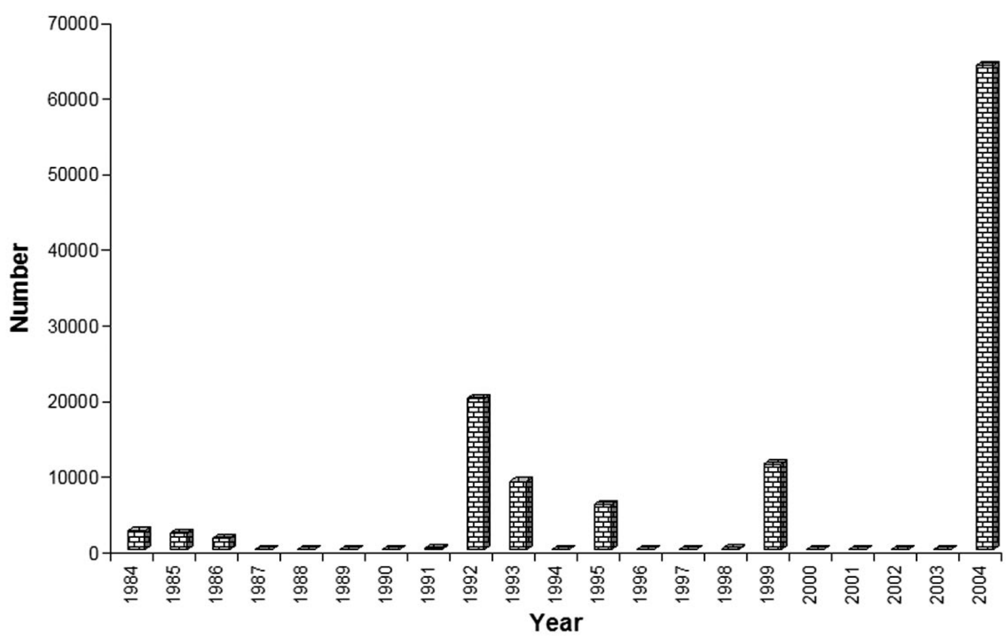


Fig. 4. Number of Mekong giant catfish fingerlings released into reservoirs throughout Thailand, 1984-2004.

of the economic viability of stock enhancement of Mekong giant catfish in inland water bodies. Inspite of these, stock enhancement of the Mekong giant catfish in inland water bodies seems to be very successful. However, for conservation purposes, more genetic studies are needed to support a suitable restocking program that will not affect natural stocks of *P. gigas* in the Mekong River. Furthermore, it is suggested that any management aimed at improving the situation of threatened species or reintroduction of extinct species must start by the identification of the possible reasons for rarity (Mattson et al 2002). If these prove to be unsuccessful, efforts aimed at improving or re-establishing populations are likely to fail as well. Notably, this implies that stocking aimed at re-inforcement/supplementation or re-introduction of a threatened or extinct species should only be considered after the factors that cause rarity have been identified and resolved.

## References

Leelapatra W, Srisakultiew P and Sukumasavin N. 2000. Biology and breeding of indigenous Mekong fish species in Thailand. Management of reservoir fisheries in the Mekong Basin II. MRC. Component Report No. 2: 83-86

Mattson N, Buakhamvongsa K, Sukumasavin N, Nguyen T and Ouk V. 2002. Management and Preservation of Mekong Giant Fish Species. MRC Technical Paper No. 2. 16 p.

Mongkonpunya K, Chairak T, Pupipat T and Tiersch TR. 1995. Cryopreservation of Mekong Giant Catfish Sperm. Asian Fish. Sci. 8: 211-221

Pholprasith S. 1983. Induced spawning of the Mekong giant catfish. Thailand Fish. Gaz. 36(4): 347-360

Pholprasith S. 1992. Biology and economical studies on the Mekong giant catfish *Pangasianodon gigas* (Chevey, 1930). Department of Fisheries, Bangkok, Thailand. 27 p.

Pookaswan T. 1969. *Pangasianodon gigas* Chevey. Inland Fisheries Division, Department of Fisheries, Thailand 7: 12 p.

Pholprasith S and Tavarutmaneegul P. 1997. Biology and culture of Mekong giant catfish *Pangasianodon gigas* (Chevey 1930). Extension Paper No. 31. National Inland Fisheries Institute, Bangkok. 79 p.

Thongsaga S and Pholprasith S. 1991. Some aspects on the biology of the Mekong giant catfish *Pangasianodon gigas* (Chevey) pp. 499-511. In : Proceedings of the 29th Kasetsart University Annual Conference (Fisheries), Kasetsart University, Bangkok, Thailand