

Peter Edwards writes on

# Rural Aquaculture

## Cambodian Government ban on snakehead farming enforced

A large number of fish species are farmed using low value or 'trash' fish, either exclusively or in part, in cages or ponds in coastal and inland areas, although the main issue is with marine trash fish globally. Use of low value freshwater fish for feed in aquaculture is not common as their sale as human food is usually more profitable than as feed for carnivorous fish although several freshwater fish species are cultured using mainly trash fish. According to the recent APFIC Regional Workshop on Low Value and 'Trash Fish' in the Asia-Pacific Region, the direct use of low value or trash fish to feed carnivorous fish is unlikely to be sustainable in the long term. The challenges for aquaculture are to make better use of the existing low value fish and trash fish resources and to seek alternatives to direct feeding of trash fish in aquaculture. It was also pointed out that there is a need to recognize that change will have significant implications for the people involved, especially for the poor involved in harvest, and use of trash fish.

Farming giant snakehead (*Channa micropeltes*) in cages in Cambodia was a rather significant exception to the use of low value freshwater fish as feed but the practice has recently been banned by the Ministry of Agriculture, Forestry and Fisheries (MAF) of the Government on the recommendation of the Fisheries Administration. A visit to Cambodia in September last year provided an opportunity to see how effective the ban has been and how it has affected local aquaculture, and especially its impact on poor fishers. Poor fishers were observed raising snakehead in small-scale cages based on wild seed and feed they caught to supplement their income in 2001 during a consultancy I carried out for ACIAR to review feeds and feeding strategies in Mekong river countries. Earlier observations on cage farming in the Tonle Sap river and the Great lake of Cambodia 17 years ago during 1991 when working on the Review of the Fishery Sector in the Lower Mekong Basin provide further insight into this ongoing saga.



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### Cage culture in Cambodia

Cages are the most important culture system in Cambodia with over 80% of national production from aquaculture. Cage culture is dominated by and was probably also initially developed by ethnic Vietnamese fishers who started to migrate up the Mekong river into Cambodia decades and possibly over a century ago. However, cage culture in the country continues to evolve.



General view of Chnok Trou floating village on the Great Lake, 2006.





Constructing a cage for silver striped catfish at Chnok Trou on the Great Lake, 2006.

Cage culture is mostly located along the Tonle Sap river in Kompong Chhnang and in the Great Lake where there are large numbers of floating cages in village level concentrations. The traditional cages are made out of either split bamboo supported by a wooden frame or mainly of wood, supported by floating rafts made of bundles of bamboo tied to the long axis of the cage. Dwellings are constructed on top of the larger cages or are constructed on separate floats or in boats adjacent to smaller cages. Many of the cages for raising silver striped catfish are constructed in the form of a boat to eventually allow the fish to be towed in the cage by a motorised boat to market.

The two major species are silver striped catfish (*Pangasianodon hypophthalmus*) and until recently, giant snakehead (*Channa micropeltes*). Minor species include native carps such as *Leptobarbus hoeveni* and *Barbichthys altus* and *B. gonionotus* and walking catfish, *Clarias* spp. are grown mostly in polyculture at low density with silver striped catfish. Cage culture depends on capture fisheries for seed and a significant part of the feed although rice bran and water spinach are fed to silver striped catfish and to native carps. Rice bran is the most important feed for silver striped catfish which is cooked and either manually rolled into balls or minced before feeding to fish. Fresh chopped fish or small fish are fed when they are abundant during December



A small-scale fisher and his cage on the Tonle Sap river, Kandal province, 2001.



Cooking rice bran on top of a cage to feed silver striped catfish at Chnok Trou on the Great lake, 2006.



Mincing cooked rice bran on top of a cage to feed silver striped catfish on the Tonle Sap river at Kompong Chhnang, 2006.

to March but are unavailable at other times, especially from July to October, when rice bran is fed. The two feeds are mostly fed separately.

## Cage culture in 1991

In 1991 two thirds of total national production from cages was silver striped catfish, with giant snakehead comprising most of the other third. Although snakehead grows quickly, a major constraint is that it feeds only on fresh fish. It was raised in small 4.5-15 cubic meter cages in Kompong Chhnang stocked from July to December at densities of 50-100 per cubic meter and harvested from February to April at 0.8-1.0 kg. Farmers were reported to like to culture the species because seed was abundant and it was profitable but the provincial Fishery Department had recently prohibited its culture even then because it encouraged fish poaching for feed during the closed fishing season from May to September as well as the use of fine-meshed illegal fishing gear such as mosquito netting.

By 1991 there appeared to have been an increase in the scale of cage culture according to a comparison of statistics for 1969 and 1990. Cage culture in 1969 appeared to be generally a secondary



occupation for fishers, 95% of whom were small-scale but the practice came to be dominated by large-scale cage farmers rather than part-time fishers. Each small-scale fish farmer owned one cage which produced an average of 1.8 tonnes of fish based on a total of 3,034 fish farmers producing a total of 5,600 tonnes of fish. However, by 1990 only 736 farmers produced a similar total of 5,200 tonnes, with a marked increase in average farmer production of 7.1 tonnes which would preclude the participation of poor fishers because of the high capital and operating costs, particularly for the purchase of feed greater than they could catch themselves. Farmers interviewed in 1991 reported that the major constraint to cage farming was the availability of loans at suitable interest rates and the high rate of inflation.

## Cage culture in 2001

The two principle species were still silver striped catfish and giant snakehead but while the latter still had a high farm gate price of R 3,500-3,800/kg, the price of the former had fallen from R3,000-4,000/kg in 1998/99 to R1,700-2,000/kg in 1991 because Vietnam which used to import 500 tonnes annually had stopped buying because of a recent marked increase in local cage production. Many farmers had thus changed from culturing silver striped catfish to giant snakehead in response to market prices. According to the provincial fisheries officer in

Kompong Chhnang, the major cultured species had changed recently to giant snakehead at 77-83% followed by silver striped catfish at 15-20%, with 2-3% of local carps in polyculture. Snakehead cages were rectangular in shaped, ranging from 1-200 m<sup>3</sup> in volume, stocking densities were about 50 kg/m<sup>3</sup> with a net production of about 100 kg/m<sup>3</sup>.

A large giant snakehead farmer interviewed in 2001 had a 106 cubic meter cage stocked with 3.3 tonnes of fingerlings at an initial density of 31 kg/cubic meter. Fish were fed daily with fresh small fish purchased from fishers and in 12-13 months 12-13 tonnes were harvested. With an estimated FCR of 5 this would require 60-65 tonnes of small fish as feed, a huge amount used by just a single cage farmer.

However, several small to medium-scale fishers were interviewed in the Great Lake at Chhnok Tru as well as along the Tonle Sap river in Kompong Chhnang and Kandal provinces who were each raising giant snakehead in a small cage of 5-15 cubic meters. They caught fingerlings as well as small fish as feed and some fishers also had a small cage for nursing fingerlings. Cage culture of giant snakehead was clearly benefiting some small-scale fishers but constraints were also observed. One fisher reported catching varying amounts of small fish from 5-20kg/day so on occasion needed to purchase small fish for feed as, unlike silver striped catfish, giant snakehead needs to be fed every day.



*A small-scale fisher and his cage on the Tonle Sap river, Kandal province, 2001.*



*Conversion of a cage previously used to culture snakehead (right) to raise silver striped catfish. Traditional boat shaped cage for raising silver striped catfish (foreground), 2006.*

One small-scale fisher reported that he tried to feed his caged fish daily but only fed them every 2 days if he lacked money to feed fish. A fisher in Kompong Chhnang fed them with 60-80 kg of small fish which he was able to catch each day, sufficient to feed his caged giant snakehead but he paid a larger scale cage farmer to mince his fish to feed his fish because he was too poor to afford to buy a US\$60-80 mincer. One farmer in Prey Veng province reported that he sometimes fed chopped up rats to fish.



*Disused snakehead cages at Chhnok Tru on the Great Lake, 2006.*



A small-scale fisher and his cage on the Tonle Sap river, Kandal province, 2001.



A small-scale fisher feeding *Leptobarbus hoeveni* with water spinach, and his children on the Tonle Sap river at Kompong Chhnang province, 2006. Their dwelling is the small boat in the rear.

## Cage culture in 2006

A 2 day visit was made to the cage areas along the Tonle Sap river in Kompong Chhnang and at Chnok Trou in the Great Lake in September last year, kindly guided by Chhouk Borin of the Royal Agricultural University and Som Phirun, Vice Chief of Fisheries, Kompong Chhnang Provincial Fisheries Office. Six cage farmers were interviewed and the visit also indicated that the Government ban on snakehead farming was being effectively enforced. According to the provincial fishery officer there were 200 snakehead cage farmers in Kompong Chhnang, just before the ban was introduced.

The ban was announced by MAFF on 3 August, 2004. It was introduced, according to Nao Thouk, Director and Sam Nuov, Deputy Director of Fisheries Administration following complaints from some fishers about excessive harvesting of small fish which they perceived to be a cause of declining catches of larger fish. The major concern was that the small fish in the catch comprised important commercial species before they have had time to grow large, as well as the naturally small fish called 'trey riel' in Cambodian (*Cirrhinus lobatus* and *C. siamensis*) used to make fermented fish paste, a national dietary staple. According to these officials, the main concern of the Fisheries Administration is the preservation of the wild fisheries of the country as they provide about 90% of the total national fisheries production.

A translation of the ban is: "MAFF would like to announce to fish farmers that snakehead fish farming was very active recently, leading to illegal fishing of small wild fish to feed to snakehead, especially in the closed fishing season which severely affected natural aquatic resources. In order to eliminate this negative impact, all fish farmers must stop farming these species immediately, and temporarily to allow Government technical fisheries staff to study the negative impact on aquatic resources and to find alternative feeds for snakehead. MAFF would also like to recommend that farmers culture species other than snakehead to increase the fish supply, the second staple food after rice. MAFF strongly hopes that fish farmers, local authorities, and concerned officials at all levels will cooperate to prevent the farming of these species in an effective way and find alternative species for the long term conservation of aquatic resources".

Before implementing the ban, the reasons for doing so were explained to farmers who were also persuaded to grow non-carnivorous species of fish such as silver striped catfish and indigenous carps. The ban did not come into effect until 2005 as farmers were allowed to complete the snakehead culture cycle already underway at the time of the ban and market harvested fish. Several cage farmers were interviewed who had previously cultured snakehead as it was 30-40% more profitable than silver striped catfish. None of the cage farmers interviewed knew of any farmers raising snakehead in the neighbourhood but added that

it may still occur to a limited extent in remote areas deep inside the flooded forest as it is highly profitable.

By a stroke of good luck we were able to interview Sao Sambo, Deputy Inspector General of MAFF. As we were travelling by boat along the river, a large white launch came into view which jolted my mind into realizing how useful it would be to interview someone from the Fisheries Inspection Unit. As it turned out, the vessel did not belong to the Fisheries Inspection Unit at all but was a Great Lake research survey vessel provided by the Government of Japan but the Fisheries Office was next door. The Inspector explained the main justification for the ban on snakehead farming, explaining that the fish consumes a lot of small fish which fishers even use mosquito netting to catch. As the FCR is 4-6 and many young fish of large commercial species are caught along with adults of small fish species, imagine how many kg of large fish could have been produced from 1 kg of feed fish if they had been allowed to mature in nature he asked rhetorically. Inspections are carried out often and forty farmers were caught illegally farming snakehead in 2006 and ordered to market the fish, with 50% of the sale taken by the Government as a fine.

None of the interviewed farmers was raising snakehead although three farmers used to do so because it was more profitable was a farm gate price of R 12,000/kg. Fortunately for the cage farmers, the price of silver striped catfish had recently risen from lows of R 1,800-2,500 the previous month to



R4,000/kg as it was near the end of the closed fishing season but also because the Government had introduced a ban on import of all fish and livestock produce from Vietnam to protect local farmers. A large cage farmer was interviewed with one large boat shaped silver striped catfish cage 30m long x 6m wide and 3m deep, a total of 540 cubic meters. The farmer was in the process of converting an old snakehead cage of 5m x 10m x 3m dimensions which used to hold 15 tonnes of fish to a striped catfish cage for US\$3,000 compared to US\$10,000 for a new cage, which indicates the amount of capital required to be a large cage farmer. This farmer appreciated the

need for the ban on snakehead culture but reported that some fishers were now illegally catching large snakehead with electrofishing as they were not allowed to catch small fish to sell to snakehead farms. Previously rich cage farmers lent money to small fishers to buy fishing gear and contracted to buy back their catch but the situation was said to be worse with the number of wild fish continuing to decline as small-scale fishers were now fishing more intensively for the large fish and were catching them before they had time to breed.

One small-scale cage farmer/fisher reported that he never grew snakehead as he never had enough money; another similarly pointed out that only the rich could grow snakehead and not the poor. A third small-scale cage farmer/fisher who used to raise snakehead before the ban believed the introduction to be a good idea as he could never catch enough small fish to feed snakehead and did not have enough money to buy sufficient small fish to make up the feed deficit. As for the other small-scale operators, he reported that fishing was only for family subsistence as wild fish have declined over the last 20 years due to a marked increase in the number of fishers as well as poor water quality, especially in the hot season when the water in the Great Lake becomes shallow and static.



Detailed view of feeding *Leptobarbus hoeveni* with water spinach, 2006.

As well as increased profitability from farming silver striped catfish due to its recent increase in price, many farmers were stocking higher value native carps e.g. a small-scale farmer had stocked a monoculture of *Leptobarbus hoeveni* which is omnivorous and fetches a price of R7,000/kg. Another larger farmer was raising *Barbichthys altus* which had a farm gate price of R8,000 on commercial pellets and rice bran. A rather recent development in Cambodia is feeding marine trash fish, mainly to hybrid *Clarias* catfish in ponds, as the road from the coast is now good and ice is readily available.

## Postscript

Research is planned by the Fisheries Administration to assess the impacts of the ban on the livelihoods of fishers, fish farmers and poor people, as well as on aquatic biodiversity. From the brief visit reported here, it does not appear to have adversely affected poor fishers who struggled with the need to buy sufficient small fish to feed snakehead. Furthermore, they may be able to more readily farm high value omnivorous native carps. The Fisheries Administration would also like to carry out research on alternative diets for snakehead to fresh small fish so that the temporary nature of the ban may be lifted. Preliminary results of research in progress at the Asian Institute of Technology indicates that the key to developing an alternative diet to fresh fish for snakehead is to acclimatize the fry to dry feed. This has been achieved and the fish grown subsequently grow on commercial pelleted feed.



Marine trash fish for feeding hybrid catfish in Kandal province, 2006.