

Research Informs Policy to Lift Cambodian Snakehead Farming Ban

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Introduction

AquaFish takes a holistic approach to exploring sustainable solutions in aquaculture and fisheries that improve food security and health, build wealth, conserve natural environments for future generations, and strengthen poorer countries' ability to self-govern. In Cambodia, AquaFish focuses on developing and improving aquaculture of native species, such as snakehead, that are adapted to cope with the predicted impacts of climate change; investigating new feed technologies to decrease negative environmental impacts; and using such innovations and science-based evidence for decision makers to use when developing aquaculture policies that involve vulnerable populations.



The Ban on Snakehead

Fisheries of the Lower Mekong Basin provide food security and nutrition for 60 million people in Cambodia and Vietnam. From capture to culture, many residents rely on fish, including snakehead (*Channa striata*), as a source of income. While aquaculture of snakehead in Vietnam gained popularity because of its high market value, snakehead farming was banned in neighboring Cambodia in 2004 in an effort to:

- Curtail unsustainable wild seed collection practices; and
- Alleviate pressure on wild populations of small, low-value, freshwater fish that were harvested for snakehead feed.

In order for the ban to be lifted, the Cambodian government mandated that successful technologies of domesticated breeding, weaning, and rearing of snakehead using formulated diets needed to be developed and to be apt for farms in Cambodia.



After the Ban was Put in Place

- Snakehead were illegally imported from neighboring countries because snakehead generate 10 times more profit than other fish species in Cambodia.
- Fishermen continued to illegally harvest and export small-sized fish for snakehead feeds in neighboring countries.
- Fishing pressure, particularly illegal and destructive methods such as electro-shockers, increased on wild snakehead populations.

AquaFish Efforts

AquaFish Innovation Lab partners — at the Inland Fisheries Research and Development Institute (IFReDI) in Cambodia; Can Tho University in Vietnam; and the University of Connecticut – Avery Point, the University of Rhode Island, and Oregon State University in the USA — have been working in the region since the ban to develop technologies and strategies to create a sustainable snakehead aquaculture program, including the formulation of commercial feeds that reduce the reliance on small-sized fish without decreasing growth performance and marketability of snakehead.



Feed represents more than 70% of the total operational costs and the primary ingredient (60% -100%) in feed for wild snakehead culture is small-sized fish. To reduce the need for small-sized fish, AquaFish researchers in Vietnam first developed a pelleted snakehead feed that contained plant protein, a far more sustainable ingredient than that of typical fishmeal. They found that snakehead feed could contain up to 40% soy protein without affecting fish growth of domesticated strains of snakehead or economic efficiency.

Once the feed was successfully implemented in Vietnam, AquaFish researchers compared the weaning and grow-out performance of wild, indigenous snakehead in Cambodia to that of domesticated snakehead from Vietnamese hatcheries on formulated and pelleted diets. In grow-out experiments, both strains of snakehead accepted formulated or pelleted feed, and the feeds did not significantly affect fillet quality. Vietnamese hatchery fish, however, showed a higher growth rate than that of wild Cambodian snakehead and produced higher profits.



As pellet diet usage in Vietnam became widespread, some farmers reported abnormalities, particularly lordosis and scoliosis of the vertebral column, in the snakehead that they were producing. Such abnormalities are widely known in aquaculture and are caused by inadequate levels of vitamin C. In Vietnam, scientists investigated vitamin C requirements of snakehead. A hatchery phase and a grow-out phase were conducted. In the hatchery phase, maximal growth was observed at 500 mg/kg vitamin C in the diet, although differences were not significant at 250, 500, 1000 and 2000 mg/kg. In the bacterial challenge following the feeding trial, mortality was significantly reduced from about 60% (0 mg/kg and 2000 mg/kg) to about 20% (500 mg/kg and 1000 mg/kg). Farm trials confirmed that lab results also apply to on-farm conditions, where soy-based pelleted diets containing vitamin C resulted in significantly lower rates of spinal abnormalities, and greater growth rates and protein efficiency ratios, when compared to fish fed commercial feed.



Lifting the Ban

Cambodia's Fisheries Administration sought information from AquaFish partners regarding their research on snakehead domestication and breeding, weaning, and grow-out. AquaFish-supported research played a substantial role in lifting Cambodia's ban on snakehead farming in 2016 by informing the design and implementation of a successful and sustainable snakehead aquaculture program. A key tipping point in lifting the ban, besides the need to increase income opportunities for farmers, was the development of processed fish feeds, which AquaFish researchers helped create.



Future Work

To enable fish farmers' success, AquaFish researchers hold demonstrations and trainings on their on-going research, specifically their improved domestication breeding, weaning, and grow-out technologies, and feed formulation technologies. To increase the longevity and sustainability of snakehead farming in Cambodia, researchers from Can Tho University also trained IFReDI researchers to further disseminate the results.

Lifting the ban has opened the door for improved economic opportunities and increased food security for Cambodians, while beginning to alleviate the environmental impacts of overfishing. To quantify these effects, AquaFish researchers are conducting a survey throughout the nation on food security and household nutrition, with a particular focus on women and children.



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