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The Fish That Did Not Get Away

by Craig Harris

Although the Yangtze River in China, the Fraser River in Canada, and the Orinoco River in Venezuela are on separate continents thousands of miles apart, they all share a disturbing trait. Vital indigenous fish stocks in all three rivers are threatened by overfishing and habitat destruction. The massive Three Gorges dam on the Yangtze River will affect the prized Yangtze carp fish stocks. Experts say it is impossible to accurately predict what the dam might do to the river's ecosystem. In Canada, hydro-electric projects such as the Kemano II dam on a tributary of the Fraser pose major risks to salmon stocks. In Venezuela, industrial activity and hydro-electric projects on the Orinoco River also threaten the region's most popular fish species, cachama. On all three river systems the increasing demands of commercial fisheries, indigenous and smaller fishing communities and sport fishers have only exacerbated environmental problems.

"There's ample evidence that major river systems with significant fish stocks are being severely depressed by overfishing, dams and alteration of habitat," says Brian Harvey, a Canadian fisheries specialist. "There are common threads in rivers around the world."

Researchers fear that the genetic strains and variability of wild fish stocks are being depleted, or at least seriously diminished, at a rapid pace. Some species of fish are near the point of extinction. Harvey points to a study of fish stocks in the Columbia River in the northwestern United States that revealed that 106 stocks of fish are extinct and another 200 are threatened. "No similar study results are available to date on fish species in Colombia, Venezuela, China or Canada," he says. "We can only imagine the results."

PRESERVING GENETIC MATERIAL

To combat this serious threat to biodiversity, biologists and aquaculture specialists are trying to preserve the genetic material of various species through fish gene banks. The establishment of the International Fish Gene Bank (IFGB) in the wake of the UN Conference on Environment and Development in 1992 was a major step toward this goal. The aims of the bank are to preserve genetic material from endangered fish through frozen sperm and to offer genetic variability to fish hatcheries around the world.

In January 1994, IFGB became a joint venture conservation program of the Vancouver Aquarium. Harvey, the founding director of the gene bank, says collecting and freezing fish sperm in gene banks is crucial for the protection of threatened species. "It is an important kind of insurance policy," he says. "In gene banks, there can be genetic complements for species on the verge of extinction."

Since 1981, Harvey has streamlined techniques for the collection and storage of aquatic genetic material. With IDRC funding he has transformed a cumbersome, time-consuming process into a straightforward, portable technique. Pioneered in Canada, this new method allows biologists to go to remote field locations, collect and freeze material on site, and transport it to permanent gene banks. The gene banking equipment consists of portable freezing and storage containers the size of a small suitcase.

The loss of genetic material in fish species has a particularly harsh effect on fish farms and hatcheries. Already, many hatcheries often rely on too few breeders to reproduce, resulting in lower production, susceptibility to diseases and poor survival rates in the wild. As wild fish stocks disappear, it becomes even

more difficult for hatcheries to find new breeders.

AGRICULTURAL PARALLELS

Ironically, current trends in fish gene banking mirror reactions to the loss of genetic diversity in field crops and livestock. Perhaps the closest parallel to fish gene banks is that of preserving the genetic material of animals through frozen sperm, Harvey says. "Basically, we're doing the same thing with fish," he says. "Cryopreservation is a fancy term for freezing and preserving the sperm of specific fish stocks."

It is precisely this message of simplicity and awareness that Harvey and IFGB are promoting in Southern countries such as Colombia and Venezuela. The IFGB has focused specifically on the use of the popular cachama fish species along the Orinoco River, which runs through Venezuela and Colombia. Many of the smaller fish farms and hatcheries attempting to breed this fish are constrained by a lack of genetic diversity in the breeders and limited access to wild genetic material. The frequent results from small fish samples, says Harvey, are inbreeding and "genetic drift" -- a term used to describe deficiencies in the genetic makeup of certain fish species through narrow breeding techniques.

BUILDING ON INDIGENOUS KNOWLEDGE

Fish gene banks offer vast potential benefits to the hatcheries in South America. Fish farmers have access to better quality fish seed and a greater diversity of wild genetic material. Banked sperm is easier to transport than live fish and avoids transmitting disease. It can also be used immediately or kept indefinitely in liquid nitrogen. "We would like to build on the indigenous knowledge of the people living on the Orinoco and add fish gene banking as an option," Harvey says. "The benefits are there for the smaller hatcheries and fish farmers."

Some key challenges for the IFGB in the two countries include raising farmer awareness of gene banking and demonstrating gene banking technology to potential users. To meet these challenges, researchers have established a training program for farmers in techniques for collecting and freezing sperm.

The international gene bank has also collaborated with the Instituto Limnologico in Caicara, Venezuela and with the national fisheries arm of the Colombian government to transfer knowledge and equipment. The IFGB also works with the indigenous people of the Shuswap Nation in western Canada on fish gene banks for salmon stocks. The potential for loss of unique fish stocks has become an acute problem for many native Indian communities. "The Shuswap Nation has taken on a leading role in conserving the genetic resources of salmon fish stocks," Harvey says. "They want to use gene banking as a resource tool to ensure the future availability of fish stocks." As in the South American project, local aboriginal fisheries workers will be trained in gene banking procedures, while at the same time accumulating genetic material for targeted fish stocks.

A coordinated network of regional gene banks is planned worldwide. Harvey hopes to see such gene banks in Venezuela, western Canada and China. "This is obviously more than a regional issue," Harvey says. "In rivers around the world -- not just Canada, China, Colombia and Venezuela -- there exist sharp declines in the genetic resources of major fish stocks."

For Harvey, there is a distinct urgency in the need for fish gene banking. The protection of natural habitat for fish species and the regulation of fishing activity are necessary developments, he says. But he thinks conserving genetic resources has to be the immediate goal. "We have to protect fish habitats, but, more importantly, we need to get samples of genetic material before certain species become extinct," he says. "We can't wait years to clean up the environment and then realize that dozens of fish stocks are gone. By then it's too late."

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