Tagging Fish

Monitoring native species

By Susan McGinley

Native fish populations in Arizona's rivers and streams have declined over the past several decades. Water diversion, changes in permanence of flow and competition from non-native fish lead the list of causes for their decline. To conserve the populations of native fish that remain, wildlife managers need to know more about how native and non-native species are distributed in streams, and how they react to changes in water flow, especially during monsoons.

"One theory is that native fishes are more capable of withstanding flood flows in Arizona streams than non-native fish, which are supposedly 'blown out' by the flood flows," says Gene Maughan, a professor of wildlife and fisheries science in the School of Renewable Natural Resources. "Our purpose has been to test this hypothesis."

Andrew Shultz, a master's candidate in wildlife and fisheries science, joined Maughan in tagging and monitoring fish in three sections of Sonoita Creek, near Patagonia in southeastern Arizona. With the help of several undergraduate student volunteers, the researchers caught native and non-native fish at three locations and injected small glass cylinders about 1/2 inch long and 1/8 inch in diameter into their abdominal cavities. Native species tagged included Sonoran sucker and desert sucker; exotic species included large-mouth bass and catfish.

Each tag contained an identification number which was logged into a computer database along with information about that particular fish. On periodic trips out to the three study sections on Sonoita Creek, the team captured fish and scanned them electronically before releasing them back into the stream. They noted the number of each species present in each location, and entered the information into the database.

The group wanted to sample the entire stream but didn't have permission to enter the areas that were private property. Sonoita Creek passes through a combination of Nature Conservancy, state and private land.

After repeated visits, they were able to "query" each fish by typing the tag number into the database and retrieving the history of captures. Using this electronic census over a two-year period from 1998-1999, the team was able to determine the movement of the fish, and their habitat preferences. The results of the sample were representative of the fish populations in the creek.

The researchers took monthly samples, but additional samples were taken after heavy rains during the monsoon season. "If there was a big flood flow we'd go out to the creek," Maughan says.

"In general, our data have shown that non-native fishes stay in the same general area of stream where they are marked, independent of flow," he notes. "There is no evidence that non-native fish are displaced to any greater extent than native fish.

"The data tell us that at least in Sonoita Creek, you can't depend on flood flows to displace exotic fishes from native fish habitats. If non-native fish are a problem in Sonoita Creek, we've got to find another way of managing them than relying on flood flows to remove them."

Why the need to manage the exotic species? Native fish species in Arizona are nearly all threatened and endangered, according to Maughan. Exotic fish introduced from other areas over the years may compete with native fish by preying on them directly, or consuming the same food source. Separating exotic and native fish might help increase native fish populations by removing competition. If the data from this study can be generalized to other streams, the hypothesis that flood flows remove exotic fish from native fish habitat may be too simple.

Along with fish monitoring, the team also measured habitat changes, but Maughan says they had no pre-impact baseline data to work from.

"Many of the original habitats these fish occupied have become unsuitable for occupation by the native species," he explains. "There have been a lot of changes in watercourses, including increased agricultural irrigation and municipal water use. There is also some evidence of a major climate shift beginning in the late 1800s. These things all suggest that habitat conditions have changed for native fish, and many of the changes are human-induced. Water diversion has left some streams completely without water."

The team chose this particular stream because it had a persistent balance between native and non-native species, although the numbers of desert sucker and Sonoran sucker varied in different sections of the creek. Shultz and Maughan found that exotic fish tended to congregate near a reservoir.

"There were more exotics closer to the reservoir, and more natives farther away from it," Maughan says. "That suggests reservoirs serve as a source for introductions of exotic fish. Non-native species enter the downstream sections of the stream by passing over the spillway during periods of high flow." There are some streams in Arizona where native fish predominate; Maughan believes that native fish may outcompete non-native fish when they are in optimal habitat. However, more data are needed to confirm this hypothesis and to determine whether the data collected on the responses of fish to flow in Sonoita Creek are typical of fish in other Arizona streams. ❖

"One theory is that native fishes are more capable of withstanding flood flows in Arizona streams than non-native fish, which are supposedly 'blown out' by the flood flows."

AZCFWRU

Fish not native to Arizona: Large-mouth bass

Student Research on the Reservation

AZCFWRU

Fish native to Arizona: Apache trout

Reduced populations of the native Apache trout in streams prompted David Chris Kitcheyan (White Mountain Apache) to conduct his recently completed graduate study regarding fish habitat and survival. He focused on the recovery of a threatened species on the reservation and began to develop techniques that would allow it to be reintroduced into areas from which it's been eliminated.

In 1995, Kitcheyan, a graduate student in wildlife and fisheries science in the College of Agriculture's Cooperative Fish and Wildlife Research Unit, renovated Squaw and Flash Creeks on the Fort Apache Indian Reservation to remove non-native fish that had been stocked there, then introduced Apache trout from Flash Creek into Squaw Creek.

"Two years later, we found various size classes of Apache trout," Kitcheyan says.

Apache trout above a natural barrier on Flash Creek were allowed to repopulate the renovated section, and three years later, 45 Apache trout were found below the natural barrier. Kitcheyan tagged juvenile and adult fish to track their preferences for different stream habitats.

"I tried to identify exactly what types of areas they occupied in the stream, and to get an idea of habitat preferences between juveniles and adults," he says. "This was the historic habitat for the Apache trout. By reintroducing it, we're making an attempt to recover the species and hopefully one day take it off the endangered species list."

The results show that it is feasible to reintroduce these fish into areas from which past trout have been eliminated, but that some techniques result in lower survival rates than others. Still, Kitcheyan notes that the Apache trout population has risen to 30 self-sustaining populations, a dramatic increase.

For future restocking, it's best to use fish from the area.

"Last I heard, the plan was to monitor the fish in Squaw Creek, and use the fish in Flash Creek as source stock," Kitcheyan says.

The project was supported by the White Mountain Apache Game and Fish Department, and the Arizona Fisheries Resource Office.

Kitcheyan was recently hired as a fisheries biologist with the Fisheries Resource Office in Vernal, Utah. He's working with other fish right now– razorback sucker, Colorado pikeminnow, humpback chub, bonytail, and possibly cutthroat trout. He hopes to return one day to the reservation, to give back some of what he learned from eight years of university work.

"I'd like to work on Apache trout again, to work for Game and Fish on the reservation," he says. "I owe it to my people to go back home and help out any way I can to manage their natural resources."

In Memoriam: O. Eugene Maughan

It is with deep regret that we inform you of the death of Dr. O. Eugene Maughan on April 12, 2000. Dr. Maughan was an outstanding leader, scientist and mentor, and he is sorely missed by his many friends and colleagues.

The Minority Training Program in the School of Renewable Natural Resources

D. Bounds

For the last decade the USGS Cooperative Fish and Wildlife Unit in the School of Renewable Natural Resources has supported a natural resource training program for American Indians and other minority undergraduate and graduate students who are recommended by tribal councils, individual tribal members, or cooperating agencies.

Fourteen students have received bachelor of science degrees through the program, six have completed or are enrolled in master's programs and one has completed a doctorate.

In 1999 two members of the White Mountain Apache Tribe graduated with bachelor of science degrees in Wildlife and Fisheries Resources. Both began careers with the White Mountain Apache Game and Fish Department.

Another member of the White Mountain Apache Tribe completed a master's degree in Fisheries. The student has been supported under a Cooperative Education Agreement by the U.S. Fish and Wildlife Service during both his undergraduate and graduate training. He has accepted employment with a Fisheries Resources Office of the U.S. Fish and Wildlife Service.

Department of the Interior, which recently renewed its support for another five years.

For more information on the Minority Training Program:
William Shaw, (520) 621-7265
wshaw@ag.arizona.edu