**Showcasing the DNR: Tracking fish movements with acoustic telemetry**

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If you’ve ever been fishing, you know fish can be hard to locate. Many anglers have marked a high-quality fishing spot with a GPS coordinate, only to return the next day to find that all the fish have left. Fish movements can be influenced by many factors, including location of desirable habitat, water temperature and the seasons.

In addition to helping anglers target their catch, understanding fish movement can help develop more effective strategies for managing fish populations. The Michigan Department of Natural Resources employs a multitude of tools to study these movements.

One method involves marking fish by clipping off a portion of one fin on fish reared in DNR hatcheries, like salmon or trout. This fin clip indicates that an internal coded-wire tag has been inserted into the fish’s head. This tag is microscopic and contains information that DNR staff can read with a microscope.

When anglers catch a marked fish, they are encouraged to [report information about the catch online](https://www2.dnr.state.mi.us/ORS/Survey/26) or in person at DNR customer service centers. In some cases the DNR will [reward anglers for submitting information about the catch](https://www.michigan.gov/dnr/0,4570,7-350-79137_79770_79780-530529--,00.html).

This mark-and-recapture method helps generate data based on how far the fish moved from where it was last observed. The drawbacks to this method are that researchers don’t know how or when the fish traveled between two points and it is dependent on catching the fish multiple times – a challenging task in a body of water the size of the Great Lakes.

To gain greater insight into fish movement, researchers have been turning to acoustic telemetry.

Acoustic telemetry is the process of using sound and distance to determine approximate movements of animals. It has two main components: a transmitter and a receiver. Each transmitter emits a unique series of sound pulses that can be detected on a stationary receiver. The receiver decodes this unique sound and logs the transmitter number, date and time of the detection.

Researchers can surgically implant a transmitter in the fish’s body cavity and release the fish into a body of water where receivers have been deployed. As the fish swims, movements can be tracked from receiver to receiver, showing the amount of time a fish spends in one area. Some tags also have environmental sensors that provide clues on the fish’s depth, swim speed and water temperature.

Researchers at the Lake St. Clair Fisheries Research Station use acoustic telemetry to study muskellunge movements in the St. Clair-Detroit River system to better understand spawning areas for habitat restoration and conservation.

“The ability of acoustic telemetry to provide fine-scale data across all seasons and across huge areas is a game changer, especially for species like muskellunge that are commonly low density,” Dr. Jan-Michael Hessenauer, a DNR fisheries research biologist, said.

Since 2016, more than 130 muskellunge have been tagged with transmitters.

One unique aspect of this project is involving muskellunge angling groups in the tagging process.

“Members of these groups have participated in special fishing events where they have collected fish for tagging and contributed funds to purchase tags and other equipment needed to sustain the project,” Hessenauer said.

Acoustic telemetry can yield surprising results. According to Hessenauer, one male muskellunge “has made two separate trips to the Buffalo area on the east side of Lake Erie, each time returning to the Detroit River where he was initially tagged … But it is important to stress that he’s the only fish that has moved at that scale.”

The Detroit River to the Buffalo area is roughly 500 miles roundtrip, so a muskellunge making this trip twice would have to swim about 1,000 miles.

Acoustic telemetry can have different applications for DNR staff involved in native and invasive species management. Staffers at the DNR’s Waterford Fish Station in Oakland County collaborate with researchers at Michigan State University to track movements of grass carp in Lake Erie. Grass carp are an invasive species the DNR and regional partners are working to eradicate from the Great Lakes. The primary goal of their field work is to remove as many grass carp as possible.

Tagging a small number of fish with acoustic transmitters and releasing them back into Lake Erie has helped locate grass carp across the vast expanse of the lake and its tributaries.

“Having seasonal movement information for these fish helps response crews better target high-use areas for control efforts,” said John Buszkiewicz, a grass carp biologist at the Waterford Fish Station.

One noteworthy application of this technology is the “real-time rapid response” project. When a tagged grass carp comes into a specific area, a real-time receiver sends out an email alerting the response crews. A team can mobilize quickly by deploying gear to capture any other grass carp in the area. This technology has revealed specific timing of spawning activity and shown seasonality of grass carp movements, which has helped improve capture rates. Telemetry continues to be a major component of grass carp eradication efforts in Lake Erie.

One special aspect of acoustic telemetry research in the Great Lakes region is that data downloaded from receivers is published on GLATOS – the Great Lakes Acoustic Telemetry Observation System. It’s a great example of researchers working together to share equipment and information to advance knowledge of fish movement patterns.

“GLATOS provides fishery managers with information concerning fish movement and behavior that traditional fishery assessments were unable to,” said Dr. Chris Vandergoot, GLATOS director.

Information observed for individual fish is used to better understand how populations interact with the environment over both the short and long term.

“Data sharing is imperative … because without it, individual projects wouldn’t be successful,” Vandergoot said. “Since fish don’t recognize state or international boundaries, individual researchers are able to follow their fish even if they leave their study area.”

The next time you plan a fishing trip on the Great Lakes, consider exploring information on fish movement through [GLATOS](https://glatos.glos.us/) or at [Michigan.gov/TaggedFish](https://www.michigan.gov/dnr/0,4570,7-350-79119_79146_82441_82708---,00.html). It may make you a wiser, less frustrated angler.

If you believe you have caught a tagged fish, consider taking the time to report it to the DNR. Visible tags can be reported online through the [DNR’s Eyes in the Field](https://www2.dnr.state.mi.us/ORS/Survey/26) reporting system. For adipose fin-clipped fish with coded-wire tags, heads can be submitted at a [local drop-off station](https://www.michigan.gov/documents/dnr/CodedWireTagDropSites_320620_7.pdf).

Collaborative science makes Michigan’s world-class fisheries even more exceptional.

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