

Now Available: New Antenna System to Detect Tagged Fish

New antenna system detects tagged fish in waterways while floating over them

Bottom Line

Passive Integrated Transponder (PIT) tags, along with a floating antenna system to read the information from the tagged fish, can track fish moving through rivers and streams.

Better, Faster, Cheaper

PIT tags allow researchers to track fish over time without harming them, and for lower costs. Remote antennas gather information 24/7 with little maintenance or upkeep.

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Collaborators

- Utah State University
- San Juan River Recovery Implementation Program

Future Plans

We plan to continue the development of floating PIT tag systems and are planning for several river-long trips to test the effectiveness over long distances. A manuscript is in preparation explaining the technique and its various applications.

Problem

Accurate fish counts are an important aspect of Reclamation's programs concerned with the recovery of endangered fish species. However, accurately detecting fish moving through rivers and streams is difficult and costly. Typically, fish are captured by electrofishing or trapping, which involves large amounts of personnel and equipment. Also, capturing can lead to mortality or changes in behavior and movements. The fish are captured and tagged with Passive Integrated Transponder (PIT) tags to allow researchers to track their movements and survival. PIT tags resemble a grain of rice and function similarly to barcodes used to scan goods in stores. Existing systems that detect PIT-tagged fish are only effective for species with predictable movement patterns that can be funneled past stationary antennae. System improvements are needed to detect other species without involving their capture to reduce costs and cause less disruption to the fish.

Solution

Reclamation and Utah State University researchers developed a system to detect fish as an antenna network floats over them. The researchers developed an innovative floating antenna system allowing remote detection of fish that have been PIT tagged but do not have predictable movement patterns, like salmon, that can be funneled through elaborate antenna systems and detected during their migration.

Unlike other PIT tag systems that require fish to travel through a detection device, this system floats on the river and does not disturb the fish. The system's antenna modules are 3 feet wide by 10 feet long, made of polyvinyl chloride (PVC) and foam with internal antennae, and float on the surface of the water.



Instream application of new floating antenna system on the Boise River, Idaho.

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The entire system consists of the floating antenna modules, a multiplexer to operate the antennas, battery power supply, an integrated Global Positioning Software (GPS), and data recorder to record tag number, date, time, and location of tag in the river. This floating antennae system can be mounted to a raft and floated down a river or mounted to stationary wires hung across a river.

Application

Reclamation programs, as well as other programs for detecting fish, can benefit from this technology. Better data on fish populations would assist numerous Reclamation programs in managing fish species and give Reclamation more information to manage its facilities in an efficient manner. For example, if the successful use of this system allowed better estimates of fish populations, progress toward recovery would be improved through better-informed stocking goals, flow recommendations, and management activities. PIT-tagged fish would not have to be individually captured and handled, thus reducing mortality and expense.

An early prototype of the system was constructed and tested in 2008 - 2012. The system's efficiency at detecting endangered fish that were free swimming in the San Juan River, New Mexico, was proven and documented. Antennas floated over a 19-mile reach of the river detected 76 tags, including 22 that were in a side channel inaccessible by electrofishing boats. An electrofishing effort that was running concurrently with the test detected approximately the same number of fish at a much higher cost. This test effectively demonstrated that fish can be detected with the floating antennae system, that it is less harmful to the fish, and much cheaper to operate.



Using PIT tags on floating antenna on the San Juan River, New Mexico.

Floating PIT tag antennas can also be deployed in a stationary configuration similar to antennas that are installed in the streambed. The floating antennas are deployed by hanging them from an overhead cable and allow debris to pass underneath them. Importantly, floating systems can be used in rivers and streams that have unstable substrates that are not suitable for antennas anchored to the streambed. In 2012 a stationary floating system installed on the Boise River, Idaho, also successfully detected tagged fish as they passed underneath.

BioMark, Inc., is now producing the floating PIT tag antennas and can custom-build a system for specific applications.

“This product exists because of the early stage funding provided by your projects as well as the hard work and creativity of the people involved. We have figured out how to manufacture the antenna efficiently and with robust quality. Now we need to thoroughly test the product in the river.”

Dean Park
President, Biomark, Inc.

“This provides another example of how we are able to achieve the transfer of Federally funded technologies into usable products without patents, licenses, or royalties.”

Chuck Hennig
Deputy Director, Research and Development Office, Reclamation

More Information

Science and Technology Program
Research Project:
www.usbr.gov/research/projects/detail.cfm?id=257

Contact Biomark, Inc., for specific applications and purchases:

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