

**Mactaquac Aquatic Ecosystem Study  
Report Series 2015-021**



**METHODS REPORT:  
Fish Tagging**

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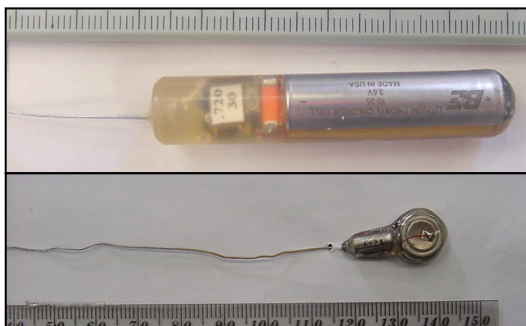
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**DISCLAIMER**

Intended use and technical limitations of the report, “Methods Paper: Fish Tagging”. This report describes the methods for fish tagging employed by the CRI in the MAES. The CRI doesn’t assume liability for any use of the included information outside the stated scope.

## Introduction

Tagging of fish is a common tool in fisheries science. It is commonly used for identifying individuals or groups of fish, which is useful for growth, movement, and population studies (Guy et al. 1996). There are two basic groups, internal and external. Internal tags are surgically implanted or injected into the body of the fish, i.e., acoustic and radio tags. Radio tags (Figure 1) transmit a signal through an antenna at a preset frequency and have a unique identification code. Radio tags are detected and decoded through water and air using a radio receiver and antenna. These tags are reliable for tracking fish in fresh water only, as the signal will not penetrate salt water (Thorstad et al. 2013). Acoustic tags (Figure 2) are designed for use in both fresh and marine environments. These tags, like radio tags, have a unique identification code and transmit at a preset frequency. The acoustic signal, or ping, emitted can be intercepted and decoded by an underwater hydrophone.



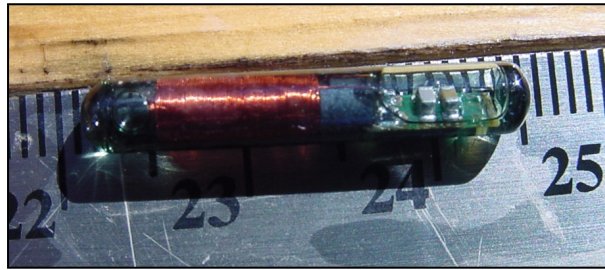
**Figure 1:** Radio tags



**Figure 2:** Acoustic tag

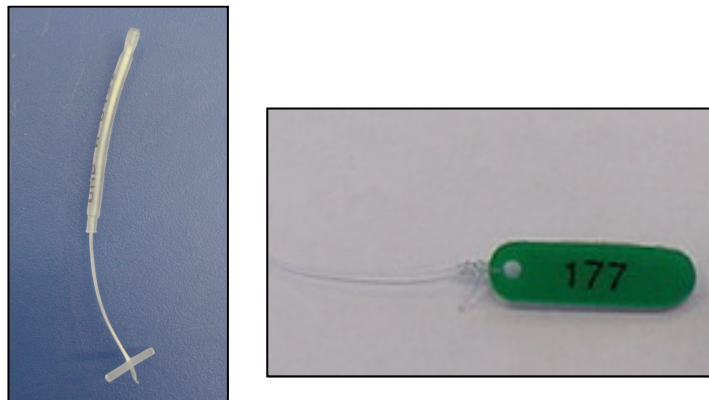
Passive integrated transponder tags, or PIT tags, are small glass encapsulated electronic tags. The tag does not have a battery; therefore, has an infinite life, and rely on an external source for power (i.e., antenna or hand held reader). Once energized, the tag emits a unique identification code for the duration the tag is in the range of the antenna or detection device. External tags are

attached to fish and are visible on surface of the fish. These tags are relatively low cost and can have unique identification numbers and contact information printed on them.



**Figure 3:** Passive integrated transponder tag

Common external tags include t-anchor, dart, and Carlin tags. Dart and T-anchor (Figure 4) tags are long and thin plastic tags that have a tee or hook shape on the end. These tags are designed to be inserted into the white muscle and become hooked behind the ptergiophores of the fish. Carlin tags (Figure 4) are small plastic disc tags that are generally attached to a fish using monofilament or wire. These external tags can be stamped with information, i.e., identification number and contact information (Guy et al. 1996).



**Figure 4:** Typical T-anchor tag (left) and a Carlin tag (right).

## Methods

### Equipment

- Surgical equipment – scalpel and blades, scissors, needles, hemostats, probe, tweezers, sutures.
- Disinfectant – Betadine (10% povidone-iodine).
- Coolers for anesthetic bath and recovery.
- Water squeeze bottle.
- Aerators and thermometer.
- Internal tags (acoustic, radio, or PIT).
- External tag (Carlin, T-anchor, or dart) and applicator.
- Measuring board, balance/scales, and cradle.

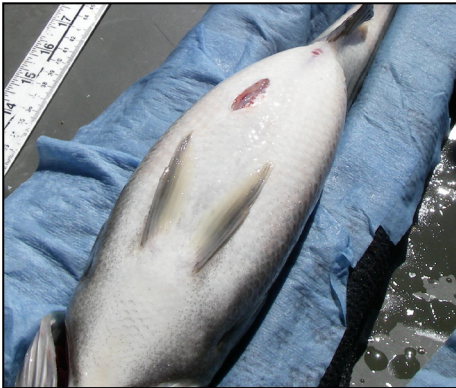
Fish selected are held in an aerated live-well until the tagging procedure. The water temperature in the live-well is monitored closely, and refreshed as necessary. The tagging station is set up and all equipment disinfected using the Betadine solution. An anesthetic bath, 40 mg/L clove oil (Eugenol) solution, was used for anesthetizing the fish. Ethanol (95%) is used to dissolve the clove oil, 10:1 ratio, and prior to being added to the water. A volume of 0.4 ml of clove oil is dissolved in 4 ml ethanol for every 10 liters of water. The fish is kept in the anesthetic bath until it reaches Stage 3 of anesthesia, surgical anesthesia, which is; the total loss of equilibrium, and muscle tone, gill movement almost ceases, and there is no tactile response (Ross and Ross, 2008). The fish is then measured for length and weight.

### Internal Tags

Acoustic and radio tags are surgically implanted using methods similar to those described by Brown and Mackay (1995) and Lower et al. (2005). The anesthetized fish is placed on its back exposing the ventral surface. Several scales are removed in the area off the midline and ahead of the pelvic girdle (or behind if pelvic fins are thoracic), and then disinfected with Betadine. For

acoustic tags, a small incision, approximately 2 cm, is made in the abdomen of the fish where the scales were removed (Figure 5).

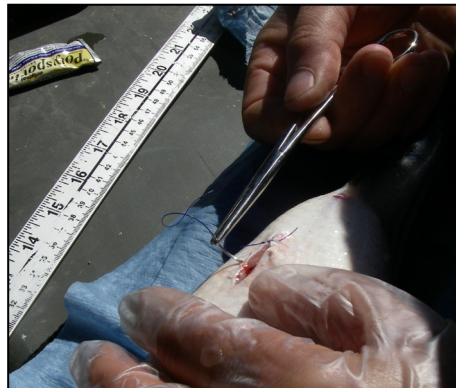
The acoustic tag is carefully inserted through the incision (Figure 7). The incision is closed using a Monosof or Ethicon monofilament, reverse cutting suture (2-0, 4-0, 6-0 size, depending on the fish species and size), using two or three stitches, held by square or surgeons knots (Figure 8).



**Figure 6:** Incision location on a Striped Bass for implanting acoustic



**Figure 7:** Acoustic tag insertion into a Striped Bass.



**Figure 8:** Suturing the incision after tag implantation into a

For radio tags, a small incision, approximately 2 cm, is made in the abdomen of the fish anterior to the pelvic girdle (or behind if pelvic fins are thoracic). A 16 gage hypodermic needle is inserted approximately 1 cm posterior to the incision and angled through the incision. The radio

tag antenna is threaded into the needle and carefully pulled through. The needle is then removed and the tag inserted into the body cavity, with the antenna hanging out the needle hole, posterior to the incision. The incision is closed using a Monosof or Ethicon monofilament, reverse cutting sutures (2-0, 4-0, 6-0 size, depending on the fish species and size) and two or three stitches, held by square or surgeons knots (Figure 9). During the surgery, the fish's gill and body are irrigated using the squeeze bottle using half anesthetic and half fresh water.



**Figure 9:** Muskellunge implanted with a radio tag, showing the sutures and exposed antenna.

Passive Integrated Transponder (PIT) Tags are implanted by making a 2 – 4 mm incision the abdomen of the fish anterior to the pelvic girdle. The tag is then carefully inserted into the body cavity (Figure 10) and, if necessary, a suture applied (Roussel et al., 2000). Tagged fish are then placed into an aerated live-well of fresh water for recovery. The water temperature is monitored often and refreshed as needed. After recovery, the fish are released back to water.



**Figure 10:** Passive integrated transponder tag, 23mm, implanted into a brook trout.

### External Tags

Carlin or Floy tags are secured to a length of monofilament. A hypodermic needle is inserted through the fish below the dorsal fin (Figure 11). The loose end of the monofilament is passed through the needle and the needle is removed. The ends of the monofilament are then tied (Figure 12), securing the tag to the fish (Figure 13).



**Figure 11:** Insertion of needle and monofilament for Carlin tagging.



**Figure 12:** Tying off the monofilament.



**Figure 13:** Carlin tag attached to a Striped Bass.

Dart and T-anchor tags are inserted into the white muscle below the dorsal fin. To insert these tags, an applicator, needle or tagging gun is required. A couple scales are removed at the tagging area prior to tagging. The tag is loaded into the applicator (Figure 14), which is then inserted into the fish at a fairly sharp angle. The applicator is then rotated about 90 degrees to free the tag and removed from the fish. It is important for tag retention, that the anchor point of the tag be situated behind the ptergiophores of the fish. The tag should be snug when lightly tugged, loose tags will likely be lost (Guy et al. 1996). The tags and equipment are sanitized using Betadine prior to tag insertion.



**Figure 14:** T-Bar tag attached to a Striped Bass.

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