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Larry G. Hart & Robert C. Summerfelt

Oklahoma Cooperative Fishery Research Unit, Oklahoma State University, Stillwater, Oklahoma, 74074, USA

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Surgical Procedures for Implanting Ultrasonic Transmitters into Flathead Catfish (Pylodictis olivaris)

LARRY G. HART AND ROBERT C. SUMMERFELT
Oklahoma Cooperative Fishery Research Unit
Oklahoma State University
Stillwater, Oklahoma 74074

ABSTRACT
Ultrasonic transmitters were surgically implanted into the peritoneal cavity of anesthetized flathead catfish through an incision made along the linea alba. The incision was closed with a single row of sutures through the peritoneum and dermis. Postoperative care included holding the fish in water with 50 mg/liter of oxytetracycline for 48-72 hours. After obtaining surgical experience, neither survival nor growth appeared to be affected by the surgery or by the presence of the transmitter. Flathead catfish with ultrasonic transmitters were tracked intermittently for as long as 40 days in Lake Carl Blackwell, Oklahoma. Behavior appeared to be normal after an initial adjustment period of about 36 hours, during which time movements seemed excessive. The same procedure was also used successfully on largemouth bass and striped bass.

Mark-and-recapture procedures generally provide only sketchy descriptions of the movements of a free-ranging fish. The development of transmitters applicable to placement in or on a fish provides an opportunity for continuous surveillance without the disturbance of recapture. The tracking of fish bearing an ultrasonic transmitter can make significant contributions to studies of homing, home range, activity levels, habitat preference, and correlations between movements and environmental variables. The use of ultrasonic transmitters to track fish movements expanded rapidly between 1960 and 1973 (Stasko 1971a, b and c).

Most telemetric tracking of free-ranging fish has been accomplished either by attaching the transmitters externally, or by placing them in the stomach of the fish. Except with pelagic species, however, external attachment is often not feasible because of drag, trauma, and the likelihood that the transmitter will become entangled.

Although stomach placement of a transmitter can be quickly accomplished through a tube inserted in the esophagus, the feeding frequency might thereby be altered because gastric evacuation is of major importance in controlling appetite and feeding periodicity (Windell 1971). Furthermore, some species have regurgitated transmitters placed in the stomach. Johnson (1971) reported regurgitation of transmitters by Pacific salmon (Onchorhynchus spp.) and, especially, by steelhead (Salmo gairdneri). Henderson, Hasler, and Chipman (1966) reported that one-third of 165 transmitters placed in stomachs of white bass (Morone chrysops) were shed before recapture. In our own experience, all of three largemouth bass (Micropterus salmoides) and all of five flathead catfish regurgitated transmitters within 24 hours.

With these problems in mind, we developed surgical procedures for implantation of transmitters into the peritoneal cavity of flathead catfish (Pylodictis olivaris). We have also applied the same techniques to implantation of transmitters in largemouth bass and striped bass (Morone saxatilis). Lorio, Warden, and Thornhill (1973) reported successful application of a similar methodology for implantation of transmitters in largemouth bass.

SURGICAL PROCEDURES
Prior to surgery, flathead catfish were anesthetized in 20 liters of water with 25 ppm quinaldine. The quinaldine was dissolved in about 5.0 ml of acetone, according to recommendations by Muench (1958). The fish remained in the water containing the 25 ppm quinaldine during surgery, although the water level was adjusted so that only the abdomen protruded above the surface. Intermittently during surgery, a current...
of water was manually forced over the gills. Before surgery we washed our hands with a tropical disinfectant containing 3% hexachlorophene and then wore surgical gloves. The transmitter (90 mm × 19 mm), a commercial type evaluated by Summerfelt and Hart (1972), was prepared for implantation by applying three coatings of a tissue em-
bedding media (Paraplast) of 56–57 C melting point. Complete with battery and coating, the transmitters weighed 29.5 g in water, and were 0.6% of the average weight (5.13 kg) of the fish. All surgical tools (Fig. 1a) and transmitters were disinfected with benzalkonium chloride (Zepharin chloride, diluted 1:128) and rinsed in sterile saline (0.7%) before use.

An incision was made with a scalpel in the midventral body wall through the linea alba and parietal peritoneum. Because preliminary observations indicated that the antiseptic (benzalkonium chloride) irritated the skin, the incision area was not given preoperative disinfection. The opening was lengthened by cutting with the scalpel between the arms of the forceps, which were used as spreaders and elevators of the body wall to prevent accidental injury to the viscera (Fig. 1b). The completed opening, usually 26–30 mm long (Fig. 1c), 38 to 76 mm anterior to the origin of the pelvic fins (Fig. 1d), was only as large as was required to admit the transmitter. When we closed the incision, sutures were made at 3–5 mm intervals with a curved, atraumatic needle, using a nylon suturing material (Vetafel, Haver-Lockhart, Oklahoma City, Oklahoma). Halver's surgical experience with salmonids indicates that one-fourth curve, cutting edge needles work better, and that chromic acid treated gut suture is quickly absorbed and produces no observable infection at the wound site (personal communication, John E. Halver, Western Fish Nutrition Laboratory, Cook, Washington). In our experiences, cutting needles were not strong enough to allow manipulation to penetrate the thick dermal layers of the flathead catfish. Gut suture was also tried but it disintegrated too rapidly to allow healing. Gut-tied incisions failed to heal. Sutures were tied with overhand knots (Fig. 1e and f). The nylon sutures remained tight on flathead catfish; with implantation of transmitters into striped bass, knots were more secure when tied with a double overhand knot of braided silk (0 gauge), rather than nylon.

A single row of stitches was made by passing the needle through both the peritoneum and integument. Initially, we sutured the peritoneum then the integument, but we found that closer annealing was obtained and postoperative survival was better when we used the single row of sutures to close the incision. Postoperative inflammation and erythema (Fig. 1g) resulted from rough manipulation of the integument with the forceps.

Antibiotics were not administered prior to, or during, surgery. Postoperative care included a 48–72 hour immersion in a static, aerated 610 liter tank containing 50 mg/liter of oxytetracycline for prophylactic chemotherapy (Snieszko and Bullock 1962). We have implanted transmitters in largemouth bass and striped bass in the field immediately after capture, and injected antibiotic through the incision into the peritoneal cavity at the rate of 55 mg per kg of body weight. Largemouth bass released immediately after surgery were tracked for as long as 2 months. The field procedure for surgical implantation is recommended because the trauma involved in transportation and holding feral fishes in the laboratory will generally exceed possible therapeutic benefits.

Examinations of six flathead catfish recaptured 5–24 months after surgery showed that the incisions had healed well, the suturing material had been expelled, and the scar was almost imperceptible (Fig. 1j). Length and weight data available for four fish recaptured after they had borne transmitters for 190–751 days indicated that growth rates of three fish were about average but one had grown more slowly. Prolonged postoperative observations were not made of the incision of largemouth and striped bass, but observations of their movement indicated that they were in good health.

In total, we implanted transmitters in 42 flathead catfish. The first 13 fish were sacrificed in developing techniques or died post-surgery, but 28 of the last 29 operations were successful, as measured by survival and activity of the fish. The time elapsed for surgery was reduced from 45 to 15 minutes with experience. In our flathead catfish studies, the time elapsed from capture to release was at least 50 hours, which included 48–72 hours of postoperative care. In the field, we performed the surgery and released large-
mouth bass and striped bass within 30 minutes after capture without postoperative care.

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LITERATURE CITED


