

RATE OF LOSS OF RING AND SPAGHETTI TAGS ON FLATHEAD CATFISH, *PYLODICTIS OLIVARIS* (RAFINESQUE)¹ 2

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ABSTRACT

During 1968-1971 a total of 494 flathead catfish were tagged with ring and/or spaghetti tags. Of 175 recaptures, 111 were by the authors and 64 were by fishermen. Application of ring tags to the pectoral spine and spaghetti (T-bar, 1-chor type) tags to the operculum is described. The anchor tags were applied to the operculum by piercing the bone with the needle of the tag applicator. Ring tags of monel metal were held totally by encirclement of the base of the pectoral spine. Rates of tag loss were measured from fish marked and recaptured March 1968 through October 1971. For both tag types, the rate of tag loss was linear the first year, but exponential the second year after tagging. A discontinuous linear regression, separating the first and second years was used to calculate tag loss. The rate of tag loss the first year was 0.0665%/day for ring tags and 0.0830%/day for spaghetti tags; the second year, the rates were 0.1230% and 0.0895%/day for ring and spaghetti tags respectively. Loss of ring tags was much higher the second year compared with the first year. Using both tags on each fish would give low probability for complete loss of identity ($P= .6\%$ in 100 days, $=2.0\%$ in one year). One fish, tagged with both tag types, was recaptured with both tags still firmly attached 1410 days (3.86 years) after tagging. Maximum tag retention times have been 1531 days (4.19 years) for a ring tag and 1448 days for a spaghetti tag.

INTRODUCTION

Commercial harvest of flathead catfish is permitted on a few Oklahoma reservoirs and the species is captured with "snaglines" (unbaited) and trotlines (baited) by sport fishermen on all public reservoirs. The commercial harvest of flathead catfish in Oklahoma averaged 69,263 pounds in the 13 years from 1957 through 1969 (Mensing, 1971). In 1968, when an in-depth survey was made, flathead catfish comprised 10.4% of a 1,126,537 pound harvest (Parrack, Brown and Mensinger, 1970) and 28% of the economic value of the total harvest (Mensing, 1971).

Because of its economic value and trophic importance as a large piscivorous species (Turner and Summerfelt, 1971b), basic life history and population studies have been the subject of intensive investigation in our reservoir research program since 1967 (Turner and Summerfelt, 1971a,c). During studies on population size, homing and home range of flathead catfish (Summerfelt, Hart, and Turner, 1972), the need arose to identify individual fish. A variety of tag

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types and marking methods were considered, such as those described by Rounsefell and Kask (1945) and Rounsefell and Everhart (1953).

Choice of tag type was restricted by several factors. Gill nets were the only feasible collection method, therefore, tags likely to be torn loose in netting were avoided. It was also necessary for the tag to have limited effect on the behavior and vulnerability (to gill nets) of the tagged fish. Ring tags appeared to have unique application to ictalurids because of their stout pectoral spines. Spaghetti tags appear to cause minimal injury to fish (Wegener, 1966) and they are easy to apply with an applicator gun (Dell, 1968). Moreover, both types are commercially available and applicable to a wide size range of fish. This report describes the use of ring and spaghetti tags on flathead catfish and a field study of their suitability.

METHODS

Study Site and Collecting Procedures

This study was conducted in Lake Carl Blackwell which is located in Payne County, in North Central Oklahoma, 12.8 km west of Stillwater. The main axis of the reservoir is 8.5 km long; during the study (March 1968 through October 1971), it had an average surface area of 850 ha, mean water depth of 4.0 m, and maximum water depth of 12.0 m. Maximum sechi disc transparency was 188 cm, but transparencies seldom exceeded 50 cm except for areas near the dam.

All flathead catfish were greater than 400-mm and were taken with gill nets. Several types of nets were used ranging from experimental nets with mesh sizes from 25 to 76 mm square mesh, to single mesh size nets, either 89, 101, or 157 mm square measure. In 1968 fish were collected in gill nets 45.7 m in length containing three sections each 15.2 m by 2.4 m tied down to 1.8 m. The sections were composed of 76, 89, or 101 mm square mesh. In 1969-1971, flathead catfish were collected with tied down experimental gill nets with square mesh sizes of 64, 76, 89, 101, 114, and 127 mm. Gill netting was a significant factor causing loss of tags on recaptured fish, rather than loss prior to recapture. In five cases either fresh wounds at the base of the left pectoral spine, or the presence of the anchoring T-bar indicated the tag was lost while the fish was in the net. It was not possible to be sure how recently the tag was lost in several other cases.

Description of Tags

The spaghetti (tube) tag,⁵ also called an internal T-bar anchor tag, was like that described by Dell (1968). Spaghetti tags consisted of a 50 mm piece of flexible polyvinyl chloride tubing, 1.7 mm outside diameter, attached to a nylon T-bar by a 25 mm shaft. The tubing on each tag contained the letters O.C.F.U.-O.S.U., representing Oklahoma Cooperative Fishery Unit Oklahoma State University, and a 5 digit number. Tag tubing was orange with black letters and numbers. Tags were applied to the operculum (Figure 1) by piercing the bone with the needle of the tag applicator. Piercing was accomplished by an alternating rotation of 180° while applying pressure against the operculum. The T-bar kept the tag from pulling out and the greater thickness of the tubing relative to the hole made by the applicator kept the tag from slipping on through.

Ring tags,⁶ also known as butt-end tags, or collar tags, of monel metal were the other tag type used. The definition of the collar tag (Rounsefell and Kask, 1945:323) aptly describes the ring tag: "A ring of any material (with or without an attached plate) that is held wholly by encirclement without piercing any tissues." Commonly used as bird bands (Addy, 1956; Taber and Cowan, 1969), their use on freshwater fish as an encirclement device for fish has been very

⁵Floy Tag Company, Seattle, Washington.

⁶National Band and Tag Co., Newport, Kentucky; also, available in colored aluminum.

limited as most fishes lack a suitable appendage; however, the manufacturer suggests their use as jaw tags for fish. Barkley and Freeman (1965) mentioned the possibility of using a cone of monel metal on the dorsal spine of catfish but discarded the idea because a method of securing the tag was not found. Rounsefell and Everhart (1953:275) reported an unsuccessful application of celluloid poultry leg bands around the caudal peduncle of mackerel. Tag return was poor and the band caused emaciation and chafing.

Two sizes of ring tags were used, size 7, 6.2 mm diameter, and size 10, 8.4 mm diameter. The smaller size was used most frequently. Tags were specially stamped with the initials O.S.U. and a four digit number. The tags were usually applied to the base of the left pectoral spine (Figure 1) with special tagging pliers but were also applied to the dorsal spine in 1971. Of ten recaptures of dorsally-tagged fish recorded during 1971, none had lost the dorsal tag after 1-6 months at large.



Figure 1. Flathead catfish with vinyl spaghetti tag (T-bar) anchored to operculum, and monel metal ring tag (arrow) around proximal portion of pectoral spine.

RESULTS

During 1968-1971 a total of 494 flathead catfish were tagged with ring and/or spaghetti tags. Of 173 recaptures, 111 were by the authors and 64 were by fishermen. The maximum retention period was 1448 days (3.97 years) for a spaghetti tag applied on 6/27/68 and recaptured on 6/13/72. Another fish, tagged 7/10/68 and recaptured on 5/21/72, retained both tag types for 1410 days (3.68 years). Another fish had retained a ring tag for 1405 days when recaptured. Aside from fish recaptured in 1972, retention intervals between tagging and recapture are given for 147 fish (Figure 2). Many fish were recaptured more than once indicating that the tag was not generally lost in recapture by gill netting.

The rate of loss of the spaghetti and ring tags was measured from fish marked and recaptured March 1968 through October 1971 (Figure 2). The rate of tag loss was linear in the first year but exponential in the second year after tagging (Figure 3). Therefore, a discontinuous linear regression, separating the first and second years, was used to calculate the tag loss. The slopes of the regressions indicate rates of tag loss in the first year were 0.0665%/day and 0.0830%/day for the ring and spaghetti tags, respectively; in the second year rates of loss⁶ were 0.1233%/day and 0.0896%/day for the ring and spaghetti tags, respectively.

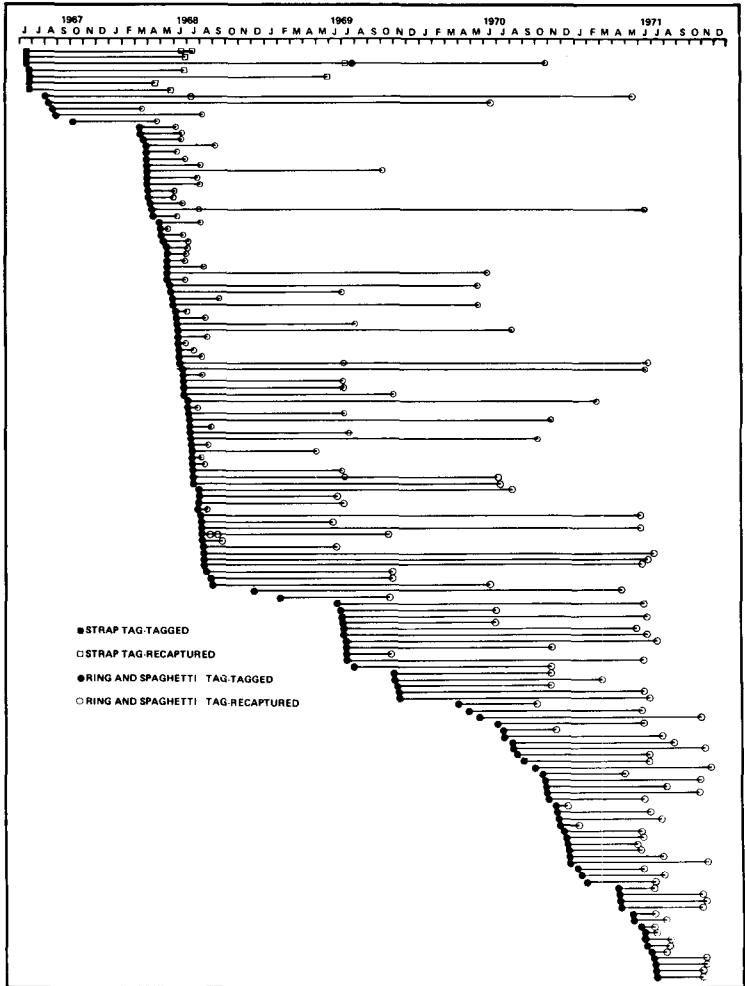


Figure 2. Temporal distribution of recaptures of flathead catfish tagged with strap, ring and spaghetti tags. The solid symbols represent dates of tagging and the open symbols the dates of recapture.

⁶The percent tag loss/day in the second year is the average loss/day since the actual loss was a negative exponential. The percentages given were derived from the difference in the antilog of percent tag loss at the beginning and end of the second year divided by 365.

Thus, ring tags were lost at a lower rate than spaghetti tags in the first year, but at a higher rate in the second year. The rate of loss of spaghetti tags was about the same in both the first and second years, 0.0830%/day and 0.0896%/day, respectively.

Assuming the loss of either the ring or spaghetti tag is independent of the loss of the other tag, then the probability of a fish losing both tags can be estimated from the product of the separate probabilities. These estimates indicate that for short term (<100 days) population estimates, the percentage loss of both tags of a double-tagged fish (both tag types) will be 0.6% of the number tagged. In the interval of 301-400 days the probability of fish losing both tags is about 2.0%, for two years, the probability of fish losing both tags range from 17 to 25%. Because of the difficulty in obtaining suitable numbers of recaptures of marked fish for population estimates in large reservoirs, application of both tag types may be desirable in light of the ease at which two tags may be applied. The tags may also be applicable to marking brood catfish in hatcheries for long term genetic studies. The ring tag would be less likely to slip off the pectoral spine of a channel catfish since it is strongly serrated in comparison with the pectoral spine of a flathead catfish.

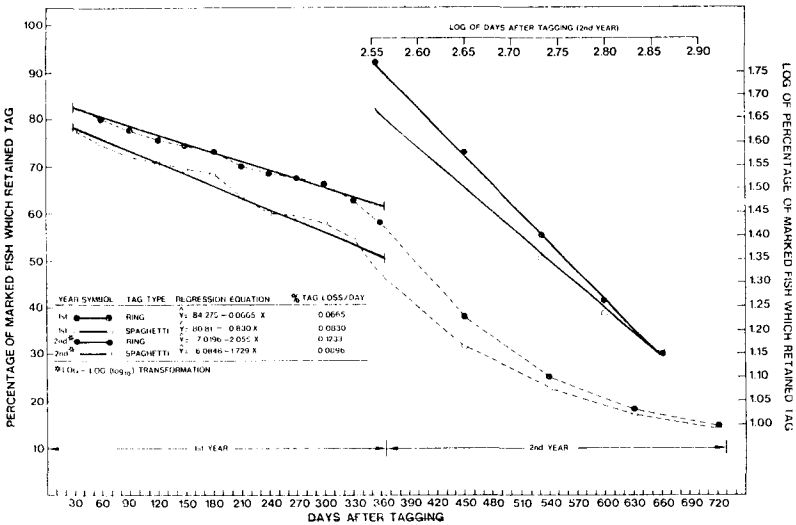


Figure 3. Percentage of flathead catfish retaining a spaghetti or ring tag at least 30 to 770 days. Regressions of tag retention on days after tagging was used to estimate percentage of tag loss per day in the first and second years.

DISCUSSION

A wide variety of tags have been used on ictalurids. In California a disk-dangler tag was returned six times better by fishermen than an opercular strap tag on white catfish, *Ictalurus catus* (Pelgen, 1954). No tag loss was observed for either tag type after holding tagged fish a year in a hatchery pond. After holding for 22 months, no disk-dangler tags were missing, but 24% of the strap tags were lost (Pelgen and McCammon, 1955). The same authors reported similar fishermen returns with the disk-dangler tag and a staple tag on white catfish, but did not evaluate tag loss in the field. When the Einer Lea hydrostatic tag was

compared with the disk-dangler tag, the hydrostatic tag was returned better because of more complete instructions (McCammon, 1956). However, a pond experiment indicated 15% of 20 hydrostatic tags were lost within one year. After the above comparisons, McCammon and LaFrance (1961) concluded the disk-dangler tag was the best tag available for catfish. When used on channel catfish, *Ictalurus punctatus*, the disk-dangler tag was retained up to four years.

Harrison (1953) inserted a bar type tag into the body cavity of channel catfish. Tag loss was about 10% with maximum known retention time of 1804 days. When using an internal strip tag, Welker (1967) found 14% of the recaptured channel catfish had lost the tag. Muncy (1957) used monel metal strap tags attached to the operculum and a streamer tag applied behind the dorsal spine on channel catfish and flathead catfish. Condition factor was similar for tagged and untagged flathead catfish, but growth was retarded. Peterson-type tags used on channel catfish resulted in 12.2% fishermen returns (Humpheries, 1965). Hubley (1963) attached aluminum strap tags to the mandible of channel catfish and obtained tag retention for as much as 11 years, although 95% of tag returns were within 5 years.

Several additional methods of tagging flathead catfish have been used recently. Biologists at the South Central Reservoir Investigations have used the spaghetti tag anchored in the musculature under the adipose fin of flathead catfish and channel catfish (personal communication, Thomas O. Duncan). Maximum tag retention has been 1160 days for a channel catfish. Voluntary fishermen tag returns for flathead catfish and channel catfish have accounted for 12 and 9%, respectively, of tagged fish. Texas biologists have discontinued the use of spaghetti tags in favor of a monel metal strap tag attached to the dorsal spine of flathead catfish (personal communication, R. J. Kemp). A plastic bandet tag⁷ attached to the dentary bone of flathead catfish has been used successfully in the Missouri River, Nebraska (personal communication, Larry Morris). Tag retention was reported to be high with recaptures up to 3 years after tagging. Inflammation at the tag site was reported to be minimal.

In this study the use of spaghetti and ring tags was considered quite successful. Both tag types had minimal physical effects on flathead catfish. Some redding occurred at sites where the spaghetti tag was applied. The ring tag caused minor bone erosion on the pectoral spine, but only after one or more years. The attachment of the ring tag to the dorsal spine, which grows very slowly in diameter, might allow greater tag retention. Growth of tagged fish was apparently unaffected as growth increments of tagged fish compared favorably with the back-calculated growth increments of fish collected in 1968. Expected growth increments of tagged fish were determined by using the back-calculated growth increments of fish of similar length to initial length of tagged fish. As fish were recaptured at intervals up to 4 years after tagging, it was possible to determine effects of tagging on growth. Fisherman recognition of the spaghetti tag appeared to be better than the ring tag. Both tag types may slightly increase the vulnerability to capture by gill nets.

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⁷Available from National Band and Tag Co.

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