DIFFERENTIAL RETENTION OF FIVE FLOY® TAGS ON LARGEMOUTH BASS *(MICROPTERUS SALMOIDES)* IN HATCHERY PONDS[1]

Robert L. Wilbur
and
Richard M. Duchrow[2]
Eustis Fisheries Research Laboratory

ABSTRACT

Floy® dart tag (FD-67 international orange) loss of 78% was discovered among largemouth bass held in hatchery ponds for three months. Separation of the #20 tubing from its monofilament anchor accounted for 81% of the losses, while dislodgement of the anchor from fish occurred in only 19% of the losses. Since ponds were free of vegetation which could entangle the tag and contained only tagged bass and bait fish, tag loss was assumed to be the result of bass pulling tags from each others' backs. To test this theory and determine differential retention for other types of Floy® dart tags, further studies were conducted.

International orange, green, and brown FD-67 tags sustained 58%, 62%, and 63% retention, respectively, on largemouth bass held in a hatchery pond for 3 months. Differences in retention were nonsignificant in Chi-square testing.

In another pond, three international orange tag types were compared: (1) FD-67 (Standard), (2) FD-67C (#20 tubing only half as long), and (3) FD-68B (reinforced attachment of tag and anchor). Percent retention was 47%, 75%, and 88% for the short, standard, and reinforced tags, respectively. Chi-square tests indicated that retention was significantly lower for the short tag than for the reinforced and standard tags. Data indicated, however, that this difference was probably caused by manufacturer's quality control rather than difference in tag design. Reinforced and standard tag retention did not differ significantly.

Separation of the #20 tubing from its anchor accounted for 23% to 75% of the tag losses in the above experiments.

INTRODUCTION

Floy® dart tags and their quick-tagging applicator were introduced to fisheries workers by Dell (1968) who reported higher dart tag than Petersen disc returns in preliminary testing with rainbow trout, *Salmo gairdneri* Richardson. Later, Stobo (1972) found no evidence of Floy® dart tag loss among yellow perch, *Perca flavescens* (Mitchill), tagged and returned to the Ottawa River. High retention of similarly constructed dart and spaghetti tags has been reported by Kimsey (1956), Yamashita and Waldron (1958), Latapie (1967), and Pletcher (1968). Chew[3] indicated satisfactory return of Floy® dart tags among largemouth bass, *Micropterus salmoides* (Lacepede), returned to Florida lakes.

Therefore, Floy® dart tags were used to mark largemouth bass held in a hatchery pond for selective breeding purposes. Poor tag retention, however, resulted in considerable loss to this project. Since some modifications of the standard FD-67 tag appeared to have retention advantages, five different Floy® dart tags were subsequently tested for differential retention.

[1]Contribution from Federal Aid Restoration Funds under Dingell-Johnson F-26, State of Florida. Paper Number 8 of the Eustis Fisheries Research Laboratory, Florida Game and Fresh Water Fish Commission.

[2]Present Address: Department of Conservation, Fish and Game Research Center, 1110 College Avenue, Columbia, Missouri 65201.

[3]Chew, R.L. 1971. (Personal Communication) Eustis Fisheries Research Laboratory, Eustis, Florida 32726.

MATERIALS AND METHODS

As a result of tag loss incurred in Experiment I, Experiments II and III were initiated.

Experiment I

Fish were tagged and held for reasons other than conducting a tagging study in this initial experiment.

Each of 74 largemouth bass (1 to 2 lbs) were tagged with a single FD-67 (Figure 1) international orange Floy® dart tag prior to stocking in a 0.7-acre hatchery pond. Tags were embedded with the FD-67 tagging gun immediately below the dorsal fin in an attempt to lock the anchor behind the pterygiophores.

Bass were stocked between May 4 and September 15, 1971, generally nine at a time. The pond was drawn down on October 20, 1971. All bass were removed and records of tag loss prepared.

Experiment II

This experiment was designed to determine whether international orange, green, and brown FD-67 tags would display differences in retention.

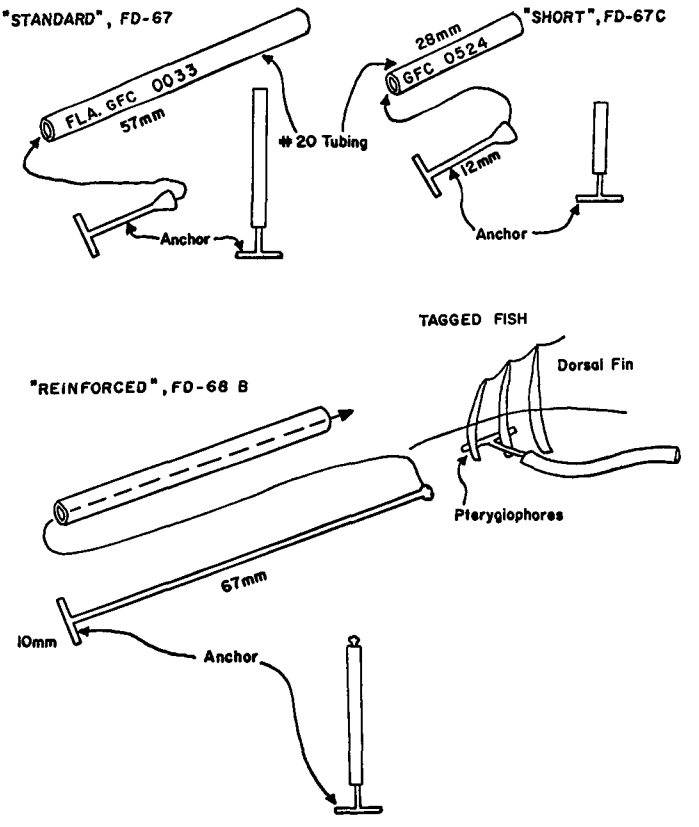

Figure 1. Three types of Floy tags® used, and anchored tag locked behind pterygiophores of fish.

One hundred, 1 to 2-lb largemouth bass were tagged and stocked in a 0.7-acre hatchery pond on February 17, 1972. Each fish received two tags, one on either side of the dorsal fin. All bass were tagged with one international orange tag, half being tagged on the right and the other half on the left side of the dorsal fin. On the side opposite the international orange, half the bass were given a green tag and the other half a brown tag. Four tag groups resulted:

(1) 25 bass - left side orange, right side brown,
(2) 25 bass - left side orange, right side green,
(3) 25 bass - right side orange, left side brown,
(4) 25 bass - right side orange, left side green.

To enable determination of tag colors lost, all bass carrying a brown tag had their left pelvic fin clipped, while the right pelvic fin was removed from bass with a green tag.

The pond was drawn down and all surviving bass removed on May 24, 1972. Bass were examined for tag losses and records were prepared.

Experiment III

This experiment was designed to determine whether the three international orange types shown in Figure 1 (FD-67, FD-67C, FD-68B) would display differential retention.

The only difference between this experiment and Experiment II was that a different hatchery pond was used to hold another group of 100 bass and different tags were used. Both experiments were simultaneously conducted. Four tag-groups were tested:

(1) 25 bass - right side standard tag, left side short tag,
(2) 25 bass - right side standard tag, left side reinforced tag,
(3) 25 bass - left side standard tag, right side short tag,
(4) 25 bass - left side standard tag, right side reinforced tag.

The left pelvic fin was clipped on the "reinforced" (FD-68B) tagged bass, while the right pelvic was cut on the "short" (FD-67C) tagged bass.

RESULTS

Two types of tag loss occurred in the three experiments: (1) "dislodgment" of the anchor from the fish, and (2) "separation" of the #20 tubing from its monofilament anchor.

Since ponds were free of vegetation which could entangle the tag and contained only the tagged bass and bait fish, tag loss seemed to be the result of bass pulling the tags from each others' backs.

Experiment I

Five of the 74 bass stocked were lost during the course of the experiment. Of the survivors, 22% (Table 1) retained their tags. Dislodgment losses accounted for 19% and separation losses 81% of the total losses.

Tag retention was inversely related to the length of time bass were held in the pond. Of the 29 bass stocked in May, only 3% retained their tags. The 20 bass stocked in August experienced 25% retention, while the 25 bass stocked in September had 36% retention.

Table 1. Floy® dart tag loss (ascending order) among largemouth bass held in hatchery ponds in three separate experiments.

Tag Type	No. Fish Surviving*	No. Tags Lost	Percent of Tag Losses: Dislodgment	+	Separation	=	Total	(x)
Reinforced-Orange-Exp. III	41	5	12	+	0	=	12	(12)
Standard-Orange-Exp. III	86	22	20	+	6	=	26	(21)
Standard-Brown-Exp. II	38	14	20	+	17	=	37	(24)
Standard-Green-Exp. II	42	16	21	+	17	=	38	(25)
Standard-Orange-Exp. II	80	34	21	+	22	=	43	(27)
Short-Orange-Exp. III	45	24	13	+	40	=	53	(22)
Standard-Orange-Exp. I	69	54	19	+	59	=	78	(40)

*The original number of fish tagged is of no particular value since fish were lost in each experiment.

(x) This figure denotes percent loss with all faulty tags (separation losses) deleted from the data entirely.

Experiment II

Eighty percent of the 100 originally stocked fish survived. Brown, green, and international orange tags sustained 63%, 62%, and 57% retention, respectively. Of the tags lost, about half resulted from dislodgment and half from separation losses (Table 1).

A 2x2 table with a continuity correction (Steel and Torrie, 1960) was employed in testing for significance between the above retentions. The adjusted Chi-squares for brown to green (X^2=0.019), green to orange (X^2=0.142), and brown to orange (X^2=0.326) were all nonsignificant at 0.05 level. Chi-square comparisons of right side tag loss to left side loss (X^2=0.783) were also nonsignificant at 0.05 level.

Experiment III

Eighty-six percent of the originally stocked fish survived. Reinforced tags, standard tags, and short tags sustained 88%, 74%, and 47% retention, respectively. No separation losses occurred among the reinforced tag losses, but 75% of the losses of the short tags were from separation (Table 1).

Comparisons of standard type to reinforced type (X^2=2.226) were nonsignificant at 0.05 level, but standard type to short type (X^2=8.814) and reinforced type to short type (X^2=14.456) were significant at 0.005 level. Right side tag losses were not significantly greater (X^2=0.563) than left side tag losses.

DISCUSSION

Mortality sustained in the three experiments may have been caused by otters and ospreys which frequented the hatchery rather than by tagging and handling. The ponds were examined several times each week during the study, and only one dead bass was discovered.

Since right and left side tag losses were not significantly different, the side on which the fish were tagged was ignored and right and left sides were lumped together.

Data presented in Table 1 indicate poor manufacturer's quality control in standard tags as indicated by the wide range of separation losses (6% to 59%). Dislodgment losses only varied from 12% to 21%. Table 1 also shows that separation losses and total losses were directly related, indicating that most of the retention differences between tag types were incurred as a result of poor quality control. This was further substantiated through observations made by the authors. It was noted that with some groups of tags the #20 tubing was quite easily separated from its monofilament anchor, whereas other groups were much more secure.

German and LaFrance (1965) reported attack by rainbow trout on each others' tags. If tag loss in these experiments did result from bass pulling tags off, it may be that this behavior was, at least partially, induced by experimental conditions. Bass density in the three hatchery ponds was greater than that normally expected in natural bass habitats. Food in the ponds was not abundant. Water clarity was very high and bass were often observed moving about the ponds in schools. It seems possible that under such conditions bass would be more prone to attack the colored trailing streamers, stimulated perhaps by the food-like appearance of the tag. This same behavior could account for tag loss in natural habitats, but probably would occur at a lower rate as influenced by reduced density, hunger, and water clarity.

Entanglement of the tag could be more of a problem in natural habitats due to the greater abundance of snags which could catch on the tag. Two of the three hatchery ponds were virtually free of vegetation (contained filamentous algae only) which could entangle the tag. The third pond (Experiment II) was full of *Chara* sp., but tag losses there were less than in the other ponds. It is difficult,

however, to conceive of the tags becoming entangled in anything. The tubing is short and relatively stiff. Other than the change of diameters between the anchor and the #20 tubing there is nothing on the tag which could catch vegetation or snags.

Tag loss through poor anchoring of the tag in the fish's body is also possible. This would have no effect, however, on separation losses. While some tag loss probably occurred from anchors "working loose," the high incidence of separation losses indicates that tag loss through aggressive fish behavior was probably the dominant cause.

Although statistical testing did not demonstrate statistically significant retention differences between reinforced and standard tags, the reinforced tag, by reason of its construction, must clearly have an advantage over the standard. Separation losses among the standard tags in Experiment III happened to be the lowest among the standard groups tested, indicating this group of tags was less prone to separate than the other standard tags tested. Had the separation losses been average, the reinforced tag retention would have been significantly greater than standard tag retention.

Results in Experiment III indicated that short tags were apparently no less likely to provoke tag attacks than were the longer standard and reinforced tags. It seems doubtful, however, that short tags were more likely to stimulate attack, as could be concluded from the significant Chi-square values obtained. High separation losses (40%) among the short tags and low separation losses (6%) among the standard tags caused the significant difference between these two tags. Therefore, the significance must be attributed to poor manufacturer's quality control rather than the difference in tag designs.

German and LaFrance (1965) reported that rainbow trout tagged with red tags harassed each other but did not when tagged with other colors. Retention results in Experiment II were very similar between green, brown, and orange standard tags. This information suggests that the colors tested were equally noticeable to the bass. However, green and brown tags did have a slight retention advantage over orange which may indicate a minor advantage in the darker colors.

Retention results in Table 1 which deleted from the data any tag losses due to separation provide an indication of what retention might have been had there been no faulty tags. These loss figures were relatively high in spite of the absence of separation losses.

CONCLUSIONS

1. Reinforced Floy® dart tags (FD-68B) are superior to the standard (FD-67) and short tags (FD-67C) as long as the attachment of tubing to anchor in the FD-67 tag can be broken.
2. Short Floy® dart tags probably have no retention advantage or disadvantage over the standard length tags.
3. Retention of green and brown dart tags (FD-67) may be superior to orange, but their possible advantage is minor.
4. The side on which dart tags are placed should not affect retention when inserted ventral to the dorsal fin. Superior tagging locations on fish could be sought.
5. Loss of dart tags in this study was thought to be the result of bass pulling the tags from each others' backs. Tag entaglement in vegetation and/or tags working their way out of the body remain as remote possibilities.
6. Tag retention is inversely related to length of time the tag is carried by the fish.
7. Loss of dart tags from fish placed in natural water bodies is expected to vary from the findings of this study. Retention should be generally higher in natural situations, through expected reduction of aggresive behavior from other fish.

ACKNOWLEDGEMENTS

Biologist, Freddy Langford, and fishery assistant, Joseph E. Crumpton, aided the authors in collection, marking, stocking, and drawdown phases of the studies.

Biologist, Edward Zagar, kept the hatchery ponds under close observation during the experiments in an effort to divert any problems which may have been encountered.

Secretaries, Betty Stewart and Paula Helms, were responsible for accurate clerical preparation of this report.

LITERATURE CITED

Dell, M. B. 1968. A new fish tag and rapid cartridge-fed applicator. Trans. Amer. Fish. Soc. 97(1):57-59.

German, E. R., and D. A. LaFrance. 1965. A comment on the use of red tags on fish. California Fish and Game 41(1):119-120.

Kimsey, J. B. 1956. Largemouth bass tagging. California Fish and Game 42(4):337-346.

Latapie, W. R., Jr. 1967. Evaluation of various tagging methods on several freshwater fishes and estuarine fishes of Louisiana. Proceedings of the 21st Annual Conference of Southeastern Game and Fish Commissioners 1967:505-509.

Pletcher, F. T. 1968. A subcutaneous dart tag for fish. Jour. Fish. Research Bd. Canada 25(10):2237-2240.

Steel, R. G. D., and J. G. Torrie. 1960. Principles and Procedures of Statistics. McGraw-Hill Book Company, Inc., New York, Toronto, London: 352-364.

Stobo, W. T. 1972. The effects of dart tags on yellow perch. Trans. Amer. Fish. Soc. 101(2):365-366.

Yamashita, D. T., and K. D. Waldron. 1958. An all-plastic dart-type fish tag. California Fish and Game 44(4):311-317.