Effects of Micromagnetic Wire Tags on the Growth and Survival of Fingerling Largemouth Bass[1]

Joe E. Crumpton, *Florida Game and Fresh Water Fish Commission, P.O. Box 1903, Eustis, FL 32726*

Abstract: Six hundred sixty fingerling largemouth bass (*Micropterus salmoides*) were stocked into a 0.1 ha hatchery pond for 69 days to determine if micromagnetic wire tags or the tagging process affected survival and growth rates. Two hundred twenty fingerlings were tagged internally in the vomerine (nasal) cartilage and 220 in the forebrain area. These were co-stocked with 220 control fingerlings. At recovery, survival rates of vomerine and forebrain tagged bass were comparable (70.5% and 75.9%), but were less than the rate for control fish (93.6%). Tag retention rates for vomerine and forebrain tagged fish (25.0% and 10.0%) were far less than desirable. Both vomerine and forebrain tagged fish (those retaining tags for 69 days) exhibited slower growth rates than controls, but only the forebrain-tagged fish grew significantly slower ($P < 0.005$). Fingerlings tagged in vomerine and forebrain areas but which failed to retain tags for the full 69 days grew significantly slower than controls ($P < 0.005$).

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 37:391–394

Biologists have been searching for the perfect means of identifying individual fish or groups of fish in field studies for many years. Since the late 1800s, when Atlantic salmon (*Salmo salar*) were first tagged in Maine (Everhart et al. 1975), many marking techniques and devices have been used with varying degrees of success. Detrimental effects such as mortality resulting from fungal infection, bacterial infection, open wounds, and effects of growth retardation have been documented for many marking and tagging techniques (Carline and Brynildson 19792, Eschmeyer 1959, Gunn et al. 1979, Moyer et al. 1974, and Rawstron 1967).

From 1975 to 1978, the Florida Game and Fresh Water Fish Commission conducted a study evaluating the feasibility of stocking hatchery reared fingerling largemouth bass into an established fish population (Crumpton et

[1] Contribution from Federal Aid in Restoration Funds under Dingell-Johnson Project F-24, State of Florida.

al. 1979). A relatively new technique of implanting color-coded, magnetized wire tags into the head of individual fish was utilized to distinguish between stocked and naturally spawned fish. The technique was first used by the National Marine Fisheries Service to tag salmonids (O. Alspaugh, pers. comm.). Short-term tag retention rates in National Marine Fisheries studies exceeded 90%. The following study was conducted to determine if the wire tags or tagging process had any detrimental effects on the survival and growth of stocked fingerlings.

Methods

Study fish were randomly selected from a group of fingerling largemouth bass, ranging from 50 to 71 mm total length ($x = 60.6$ mm), reared at the Richloam Fish Hatchery, Sumter County, Florida. Fingerlings were tagged internally with a micromagnetic tagging device, developed by Technical Research Company.[2] Prior to tagging, latex head molds were constructed for fish 50 to 55 mm, 56 to 65 mm, and 66 to 71 mm total length. Randomly selected fingerlings were separated into size groups and tagged utilizing the appropriate head mold. The tags, color-coded stainless steel wire (1 mm long/.25 mm diameter), were hypodermically injected into the vomerine (nasal) cartilage or into a gelatinous filled cavity directly between the eyes and in front of the brain. Prior to tagging, fingerlings were tranquilized in an aerated holding pan with 0.6 cc/l Quinaldine[3] (a higher than normal rate of Quinaldine was required to tranquilize fish due to the super-aerated condition of the water in the holding pan) and fin clipped. Fin clips were used to distinguish between vomerine-and forebrain-tagged bass because earlier studies by Ricker (1949) on largemouth bass, Shetter (1952) on lake trout, Churchill (1963) on walleye, Brynildson and Brynildson (1967) on brown trout, and Horack (1969) on rainbow trout indicated fin clipping techniques did not affect survival or growth rates of experimental fish. A right pectoral clip was used on vomerine-tagged bass, and a left pectoral clip on forebrain-tagged bass. Fingerlings used as controls were not fin clipped, but were tranquilized and passed through the tagging console. All fingerlings were treated with 1.5 g/liter Baitsaver[4] following tagging and held in a raceway for 24 hours to monitor initial mortality and tag loss.

Of the 660 fingerlings utilized in the pond study, 220 were tagged in the vomerine cartilage, 220 in the forebrain area. Two hundred twenty untagged fingerlings were used as controls. All fingerlings were co-stocked into a 0.1 ha hatchery pond.

Survival, growth, and tag retention rates were determined after 69 days.

[2] Technical Research Company, Seattle, Washington 98178.
[3] Sigma Chemical Company, St. Louis, Missouri 63178.
[4] Jungle Laboratories, Sanford, Florida 32771.

Wire tags were detected by a Technical Research battery-powered field detector. A Student's *t*-test and one-way analysis of variance was used to test for differences in sizes between vomerine and forebrain bass (tagged and untagged) and controls.

Results and Discussion

The survival rate of vomerine-tagged fish was 70.5%, markedly lower than the 99.5% rate indicated in an earlier hatchery study by Crumpton and Smith (1976). The survival rate of forebrain-tagged fish, 75.9% was lower than that of forebrain-tagged fish, but comparable (83.7%) to a hatchery study by Crumpton and Jenkins (1978). The survival rate of the control fish was 93.6%. Overall survival rates (80%) were also lower than 1978 rates (91%).

The wire tag retention rate in this study for vomerine-tagged bass was 25%, similar to the retention rate (22%) in a study of comparable duration by Crumpton and Smith (1976), but the retention rate for forebrain-tagged bass, 10%, was markedly lower than that (69%) reported by Crumpton and Jenkins (1978).

Average total lengths for control bass were 113.9 mm, an average growth rate of 0.77 mm per day. Vomerine-tagged bass lengths averaged 11.9 mm, an average growth rate of 0.74 mm per day. Forebrain-tagged bass lengths averaged 105.9 mm, an average growth rate of 0.66 mm per day.

Total lengths of largemouth bass retaining wire tags in the vomerine cartilage were not significantly different ($P > 0.05$) from those of control fish. However, total lengths of forebrain-tagged bass were significantly less ($P < 0.005$) than those for both control and vomerine-tagged fish.

Comparison of wire-tagged largemouth bass that did not retain tags for 69 days with control bass indicated that both vomerine- and forebrain-tagged fish were significantly smaller ($P < 0.005$) in size than control fish. Forebrain-tagged fish also were significantly smaller ($P < 0.005$) than fish tagged in the vomerine cartilage.

Conclusions

Survival rates of micromagnetically tagged largemouth bass fingerlings (70.5% for vomerine and 75.9% for forebrain fish) were within acceptable ranges. Wire tag retention rates (25% for vomerine and 10% for forebrain fish) were far less than desirable. Statistical comparisons indicated that wire tags may have affected the growth of forebrain-tagged largemouth bass. Comparisons also indicated that the initial tagging trauma (hypodermic injection of the tag) may have contributed to slower growth rates of fish tagged in either the vomerine or forebrain areas.

Literature Cited

Brynildson, O. M. and C. L. Brynildson. 1967. The effect of pectoral and ventral fin removal on survival and growth of wild brown trout in a Wisconsin stream. Trans. Am. Fish. Soc. 96(3):353–355.

Carline, R. F. and O. M. Brynildson. 1972. Effects of the Floy anchor tag on the growth and survival of brook trout, *Salvelinus fontinalis*. J. Fish. Res. Board Can. 29:458–460.

Churchill, W. S. 1963. The effect of fin removal on survival, growth, and vulnerability to capture of stocked walleye fingerlings. Trans. Am. Fish. Soc. 92:298–300.

Crumpton, J. E. and S. L. Smith. 1976. Largemouth Bass Investigations. Fla. Game and Fresh Water Fish Comm., Annu. Prog. Rep., Tallahassee.

——— and L. J. Jenkins. 1978. Largemouth Bass Investigations. Annu. Prog. Rep., Fla. Game and Fresh Water Fish Comm., Tallahassee.

———, C. Mesing, and M. Wicker. 1979. Investigations of Methods for Increasing Largemouth Bass Populations. Completion Rep., Fla. Game and Fresh Water Fish Comm., Tallahassee.

Eschmeyer, P. H. 1959. Survival and retention of tags and growth of tagged lake trout in a rearing pond. Prog. Fish-Cult. 21:17–21.

Everhart, W. H., A. W. Eipper, and W. D. Youngs. 1975. Principles of fishery science. Cornell Univ. Press Ltd., London, Engl.

Gunn, J. M., J. M. Ridgeway, P. J. Rubec, and S. U. Qadri. 1979. Growth curtailment of brown bullheads tagged during the spring spawning period. Prog. Fish-Cult. 41:216–217.

Horack, D. L. 1969. The effect of fin removal on stamina of hatchery-reared rainbow trout. Prog. Fish-Cult. 31(4):217–220.

Moyer, E. J., S. L. Smith, and J. E. Crumpton. 1974. Comparison of Floy fingerling tags and latex injection for marking sub-adult largemouth bass. Fla. Game and Fresh Water Fish Comm., Eustis.

Rawstron, R. R. 1967. Harvest, mortality, and movement of selected warmwater fishes in Folsom Lake, California. Calif. Fish and Game. 53:40–48.

Ricker, W. C. 1949. Effects of removal of fins upon the growth and survival of spiny-rayed fishes. J. Wildl. Manage. 13(1):29–40.

Shetter, D. S. 1952. The mortality and growth of marked and unmarked lake trout fingerlings in the presence of predators. Trans. Am. Fish. Soc. 81:17–34.