Catchability and Spawning Behavior of Largemouth Bass Tagged with Dummy Transmitters

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Abstract: Catchability and spawning behavior of largemouth bass (*Micropterus salmoides*) with surgically implanted dummy transmitters and bass without transmitters were compared during 1992–1994 in a 0.20-ha pond. There was no significant difference between catchability of transmitter and control bass ($P < 0.05$) and spawning behavior of male transmitter and control bass ($P < 0.05$). Female transmitter and control bass were observed being courted by male bass on nests.

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A crucial assumption of any tagging study is that the tag does not alter the normal behavior of the subject. In upper Chesapeake Bay during 1992, anglers caught 6 of 11 largemouth bass with implanted transmitters (Richardson 1992). Similarly, Seibold (1991) found anglers in the Potomac River caught 7 of 12 largemouth bass fitted with transmitters and Heidinger and Tetzlaff (1991) reported 8 of 26 Ohio River largemouth bass with internal transmitters were captured by anglers. These relatively high capture rates suggested largemouth bass with transmitters may be more susceptible to angling than bass without transmitters.

We reviewed 24 radio telemetry studies of largemouth bass and found only 1 (Crumpton 1982) where the effects of implanted transmitters on catchability and behavior of bass had been specifically examined. Crumpton (1982) placed largemouth bass fitted with dummy radio transmitters and bass without transmitters (controls) in separate ponds, angled for them, and found no significant difference in catchability between the 2 groups. However, 2 factors that may have influenced his results were the low number of test animals (10 bass with dummy transmitters, 10 controls) and the use of separate ponds for transmitter and control bass.

Our study compared the catchability of largemouth bass implanted with dummy transmitters (transmitter bass) and those without transmitters (controls) released into the same pond. We also observed the spawning of both groups to determine if there were differences in behavior between transmitter and control bass.

Methods

Twenty largemouth bass (570–2,494 g) were collected each April, 1992–1994, from 2 Chesapeake Bay tidal rivers by electrofishing. Dummy transmitters (18–22 g) similar to Advanced Telemetry Systems Model 5 and Model 6 transmitters were surgically implanted in 11 bass during 1992 and 10 bass each in 1993 and 1994. Control bass were exposed to the same handling and anesthetization procedures as bass receiving transmitters, however, no incision was made in controls.

Bass were weighed (g), measured (mm), and anesthetized individually in a 189-liter plastic tub containing a solution of oxygenated water and 50 mg/liter tricaine methanesulfonate (Finquel-MS 222). The pH was maintained at a level similar to that of the water from which the bass were collected. The sex of each bass was determined using methods described by Benz and Jacobs (1986). Transmitter implantation was done on a specially built surgery table that provided a steady flow of oxygenated water over the gills during the 5-minute surgery. A prophylactic which encourages mucous replacement was added to the water during the procedure and any exposed areas of the bass were covered with a damp towel.

Scales were removed from bass just ventral to the right pectoral fin and a 2–3-cm, dorsal-to-ventral incision was made through the skin using a curved scalpel. A dummy radio transmitter weighing <2% of the fish body weight was passed through the incision into the body cavity and a hollow 12-gauge surgical needle was used to guide the teflon-coated antenna through the body wall and skin near the ventral midline at a point anterior to the anus and posterior to the incision. Incisions were closed with 3 or 4 non-absorbable sutures, depending on bass size, and fish were monitored for 1 hour in a recovery tank. A numbered Hallprint T-bar internal anchor tag was attached between the third and sixth pterygiophores of transmitter bass and control bass to allow individual identification. Tags for transmitter bass were painted with fluorescent paint in unique color combinations to facilitate identification of individual bass by shore observers.

Transmitter and control bass were held in a 0.20-ha pond at Maryland's

Unicorn Lake Fish Hatchery 74 days in 1992, 104 days in 1993, and 73 days in 1994 from late April through early July. Between 3.5 and 5.5 kg of golden shiners (*Notemigonus crysoleucas*), spottail shiners (*Notropis hudsonius*), and bluegill (*Lepomis macrochirus*) were stocked in the pond each year as forage.

Catch data of bass was collected by slightly different methods than used by Crumpton and Smith (1975) and Crumpton (1982). One-hour angling events were scheduled twice each week (Monday through Sunday) in 1992 (22 hours), and modified to 3 each week in 1993 (42 hours) and 1994 (34 hours) to increase angling effort. Increased study length in 1993 was due to pond availability. Angling days were randomly selected for each week. During the 3 weeks of peak spawning activity, angling was reduced to one sample per week in 1992, and 2 samples per week in 1993 and 1994 to reduce interference with spawning behavior. Angling began 24 hours after the bass were released into the pond.

Anglers used a spinning rod and reel and were provided with single-hook artificial lures (7-g single blade yellow spinnerbait, 15-cm purple rubber worm, 7-g leadhead jig with black plastic body). A single angler made a complete circuit around the pond, moving to a new casting location every 5–10 minutes to insure all of the pond was angled. All bass landed were weighed, measured, visually examined and then immediately released back into the pond. Chi-square analysis was used to test the null hypothesis that there is no difference between catchability of largemouth bass with implanted transmitters and controls. Both the number of bass caught (recaptures not counted) and the total number of captures (includes recaptures) of bass for individual and combined years were examined since there is a possibility some animals become capture-shy or capture-addicted (Davis and Winstead 1980). Statistical significance for all tests was established at $P < 0.05$.

Observations of bass spawning behavior were recorded as an observer slowly walked the pond perimeter. Male bass were considered having engaged in spawning behavior if observed performing any of these activities: nest building, nest guarding, courting, guarding fry, and actual spawning. Female bass were considered engaged in spawning behavior if observed being courted at an established nest site or actually spawning. Chi-square analysis was used to test the null hypothesis that there is no difference between the number of male transmitter and control bass observed engaging in spawning activities and likewise for the females. At the end of each study, bass were removed from the pond, weighed, measured, and the external condition of incisions were recorded.

Results

Catchability

There was a total of 98 hours of angling effort during the 3-year study (Table 1). The null hypothesis of equal catchability between transmitter and control bass was not disproved for the number of bass caught in 1992, 1993, 1994, and all years combined and for the total number of captures in 1993, 1994, and all years combined (Table 1). There was a significant difference between

Table 1. Numbers of transmitter and control largemouth bass caught (recaptures not counted) and captured (recaptures counted) in a 0.20-ha hatchery pond. Numbers followed by different letters are significantly different ($P < 0.05$).

Angling parameters	1992	1993	1994	Combined years
N angling hours	22	42	34	98
N bass caught				
Transmitter bass	5	9	6	20
Control bass	25	8	9	19
N bass captured				
Transmitter bass	10A	22	7	39
Control bass	2B	15	13	30

1992, *N* = 11 transmitter bass, 9 control bass.
1993, *N* = 10 transmitter bass, 10 control bass.
1994, *N* = 10 transmitter bass, 10 control bass.

the number of captures of transmitter bass (10) and control bass (2) in 1992 (Table 1).

Spawning Behavior

Male transmitter and control bass were observed performing various spawning activities including guarding of fry. The null hypothesis of equal numbers of male transmitter and control bass engaging in spawning activities was not disproved for 1992, 1993, 1994, and all years combined (Table 2). Female transmitter bass (3 of 7 in 1992, 2 of 5 in 1993, 3 of 4 in 1994) and female control bass were observed being courted by males on nests all 3 years. We were not able to quantify the number of female control bass engaged in spawning activities.

Mortality

Four bass (3 transmitter, 1 control) died in 1992, no bass died in 1993, and 1 bass (transmitter) died and 4 others (2 transmitter, 2 control) were unaccounted for in 1994. River otter (*Lutra canadensis*) predation was confirmed as a cause of mortality for 1 transmitter bass in 1992 and was the suspected cause for the missing bass in 1994. There was no significant difference between the number of transmitter and control bass that died each year or for all years combined. By the end of each year implant incisions had completely healed and only a slight white scar was apparent where the incision had been made on transmitter bass.

Discussion

There was no significant difference between the catchability of transmitter and control bass. Transmitter bass were captured more than control bass in 1992, however this was attributed to reduced angling effort (Table 1). Our results agree with Crumpton's (1982) conclusion that largemouth bass with surgically-

Table 2. Number of transmitter and control male largemouth bass observed engaging in spawning activity in a 0.20-ha hatchery pond.

Year	Fish type	*N* males in pond	*N* males observed spawning
1992	Transmitter	4	3
	Control	4	2
1993	Transmitter	5	4
	Control	4	3
1994	Transmitter	6	4
	Control	6	3
Combined	Transmitter	15	11
	Control	14	8

inserted radio transmitters are just as likely to be caught as largemouth bass without transmitters.

Spawning behaviors observed for male transmitter bass were consistent with normal bass spawning behavior (Heidinger 1975). There was no significant difference between the number of control and transmitter bass observed performing spawning activities. Individual identification of male transmitter (painted tags) and control bass (unpainted tags) was successful due to the high visibility of painted tags and because males tended to spend more time in shallow water during the spawning period allowing the observer ample time for identification.

Female transmitter and control bass were observed courting with males on nests in all years but egg deposition could not be confirmed. Individual identification of female transmitter bass was successful; however, identification of female control bass having the unpainted anchor tags was not considered reliable due to poor visibility of the unpainted tags during the low light periods when spawning typically occurs (Heidinger 1975). Statistical analysis and testing of the null hypothesis could not be done.

Surgical implantation of radio transmitters did not cause higher mortality of transmitter bass; for the 2 years where mortality occurred, there was no significant difference between the number of transmitter and control bass that died.

In conclusion this study demonstrated, in terms of angling vulnerability and spawning behavior, largemouth bass having implanted transmitters can be expected to behave similar to any other largemouth bass. The relatively high catch rates by anglers of radiotagged largemouth bass discussed earlier in this paper may be due to intense angling pressure on the bass fishery as a whole and not an effect of implanted radio transmitters.

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