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SPRING MOVEMENTS OF SMALLMOUTH BASS IN THE WILSON DAM TAILWATER, ALABAMA

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ABSTRACT

Movements of seven adult smallmouth bass (*Micropterus dolomieui*) in the Wilson Dam tailwater were monitored using ultrasonic transmitters. Fish showed pronounced homing abilities and home range tendencies. Rock cover and current velocities influenced movement patterns of tagged specimens.

INTRODUCTION

The Tennessee River forms the southern periphery of the natural range of smallmouth bass in northern Alabama. Waters below Wilson Dam are renowned for consistent production of large smallmouth bass. A creel survey estimated more than 35,000 smallmouth bass harvested from within 20 km of the dam in a two-year period (8 April 1973 to 6 April 1975). Mean biomass of harvested smallmouth bass was 0.7 kg (Tennessee Valley Authority, Fisheries and Waterfowl Resources Branch, unpublished report). The creel survey showed that spring months were the most productive and that the 5 km segment immediately below Wilson Dam was the most productive tailwater segment.

Wilson Dam, located at Florence, Alabama, on Tennessee River Mile (TRM) 259.4, is the third dam in progression up the river. Wilson Dam discharges a mean volume of 1,000 m^3/s into the tailwater. From Wilson Dam downstream to TRM 247 (20 km distance), the Tennessee River flows within its original banks and is distinctly riverine. Below TRM 247, the influence of Pickwick Dam at TRM 206.7 is observed; the river spreads out to inundate the floodplain, and velocity of flow declines to form a more lentic environment.

The purpose of this study was to define movement patterns in relation to physical elements of adult smallmouth bass habitat in the tailwater of a Tennessee River impoundment.

MATERIALS AND METHODS

This study was conducted in 2 km of tailwater immediately below Wilson Dam. Current velocities in excess of 1 m/s occur daily as a result of hydroelectric generation. During periods of high runoff, floodgates are opened, and torrential flows are experienced over most of the tailwater. When floodgates are closed, a large region on the north side of the tailwater is relatively still; however, periodic discharge of the Wilson Dam lock creates strong currents for 15-30 minute intervals.

Cover in the form of rubble, boulders, and broken rock strata is scattered along the shoreline of the tailwater. A dense region of huge boulders and broken strata is found on the north side of the tailwater 150-250 m below the floodgates. This area is the remnant of an extensive rock shoal, Muscle Shoals, which extended from the study area upstream to approximately TRM 278 (30 km distance) prior to construction of Wilson and Wheeler dams.

Smallmouth bass greater than 350 mm total length (TL) were collected from the Wilson Dam tailwater by electrofishing. All fish were collected from the upstream side of the rock shoal area 150-250 m below the dam. Paraffin-coated ultrasonic transmitters were surgically implanted into the peritoneal cavity within 24 hr of capture. Fish were held 2-24 hr after surgery to assure recovery. Surgical procedures were those originally described by Hart and Summerfelt (1975).

Telemetry equipment was commercially available from Smith-Root, Inc., Vancouver, Washington. Receiving equipment included Model TA-60 ultrasonic receiver, Model PC-74 digital pulse counter, and Model SR-70-H submersible hydrophone. Ultrasonic transmitters, Model SR 69A, had a frequency of 75 kHZ, and pulse rates of 1.5-5.4/s were used to distinguish individual fish. Transmitters were inscribed with the message "CONTACT TVA FISHERIES" and with the pulse rate. Maximum transmitter dimensions, with a paraffin covering, were 21 mm cross-section diameter and 90 mm TL; each weighed 51 g in air.

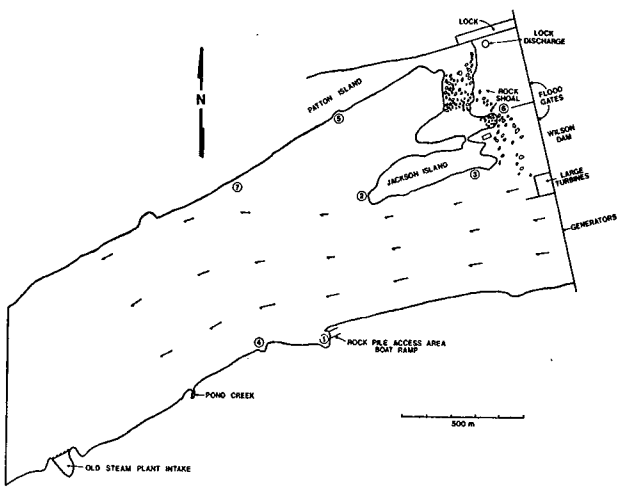

FIG. 1. *Map of the tailwater immediately downstream from Wilson Dam, Tennessee River. Circled numbers identify the release points of ultrasonic tagged smallmouth bass. Location 6 represents the site of original capture for all fish.*

Study fish were released at predetermined points within 1.5 km of Wilson Dam (Figure 1). All but one fish were displaced downstream from point of capture. A search was conducted daily for each fish. Upon location of a fish, the following parameters were recorded: time of fix, water depth at fix, current velocity at 30 cm depth, water temperature (1-m depth and bottom), and observable cover. When possible distance moved from the previous fix was measured in the field; otherwise, it was determined later from maps. Depth was determined with a Ray Jefferson Structure Recorder, Model 470; current velocity with a General Oceanic Flow Meter, Model 2050; and water temperature with a Hydrolab Marine Thermometer Model T4.

RESULTS

Seven study fish, six males and one female (350-490 mm TL), were released on 20 and 21 April 1978. Fish were tracked 28-47 days with a mean of 42 days. Locations were obtained on 35-68% of the tracking

days. Fixes were not obtained when water conditions prevented safe tracking or when fish could not be found. Water temperature increased from 17 to 24 C during the study with daily fluctuations up to 3 C.

Current velocities of 0-160 cm/s were measures at locations of smallmouth bass. The majority (73%) of observations showed current velocity less than 1 cm/s; 91.8% were between 0 and 36 cm/s.

Water depth where bass were located ranged from 0.8 to 6.0 m. Most observations (85.7%) showed water depths of 0.8-3.0 m; 67.8% were between 1.1 and 3.0 m. The maximum depth in the tailwater region is approximately 8.0 m.

More than 95% of the observations were made on fish associated with rock cover. In some instances, rock cover was accentuated by submerged or overhanging trees, but, generally, the cover was formed exclusively of rock.

Fish exhibited definite homing tendencies. Six fish were released 200-1,300 m downstream from the upper side of the rock shoal area where they were captured (see Figure 1). Four displaced fish (Study Fish 1, 2, 3 and 7) returned to their original capture area in 10-15 days. Two fish (Study Fish 4 and 5) moved upstream along the north side of the tailwater within 150 m of the capture site, but the rock shoal formed a physical barrier which prevented their return.

Heavy rains on 7 and 8 May 1978 necessitated opening floodgates causing extreme turbulence in the shoal area where all fish were residing. (Figure 1). Tracking was not possible until 11 May when floodgates were closed. Study fish were not located in the rock shoal area on that date. Six fish were located on 11 and 12 May, 400-1,000 m downstream of the rock shoal in eddies with rubble or boulder cover. Following closure of the floodgates, all fish were located in 4 to 11 days at their original home area on the upstream side of the rock shoal.

Except for movements associated with flooding, fish were highly sedentary. Of the observed movements, 55.2% were within 0-25 m of the prior location. Movements rarely exceeded 25 m while fish were in their home area.

Discussion

Availability of rock cover influenced movement patterns of smallmouth bass. Rock cover in the form of rubble, boulders, and broken strata was almost exclusively the cover type in the tailwater that could provide both protection from current and dark retreats for individual fish. Quiet water and darkness are the two primary characteristics of smallmouth bass cover according to Haines and Butler (1969).

Areas from which the smallmouth bass were collected and to which they showed a strong tendency to return were regions of dense cover composed of high boulders and broken strata adjacent to deep water. The cover extended vertically from a 3.0-8.0 m depth to the surface. These observations emphasize the association of adult smallmouth bass with rock shoals which has been described by other workers (Hubbs and Bailey 1938; Reynolds 1965; Munther 1970; Coble 1975; Paragamian 1976).

When displaced from their home area, study fish generally moved into areas near the shoreline where eddies created protection from the current and where rock cover was available. Fish wandered in large eddies or moved from one small eddy to another until they returned to the home area.

Adult smallmouth bass were observed to return to home areas following displacement by man as well as by flood conditions. The ability of smallmouth bass to return relatively short distances (up to 1.3 km) to a home area in the tailwater of a large mainstream dam was demonstrated in this study. None of the study fish were observed to move away from their home areas voluntarily. Homing behavior of smallmouth bass in small streams has been observed by others (Larimore 1952; Fajen 1962).

This study emphasized the association of adult smallmouth bass with rock shoals as well as the importance of rock cover and eddies as retreats during periods of flooding and high current velocities. The preserving of rock shoals and shoreline cover is important for existing tailwater fisheries and suggests a potential means for enhancement of smallmouth bass habitat.

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