First-Year Growth and Survival of Largemouth Bass Fingerlings Stocked into Western South Dakota Ponds

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Jesse W. West Fisheries Research Endowment Completion Report No. 1
South Dakota State University
August 2009

Introduction

Largemouth bass *Micropterus salmoides* are commonly introduced into Midwestern ponds at stocking densities of 125-250 largemouth bass fingerlings (4-8 cm) per hectare (50-100 per acre). Due to the slow growth of largemouth bass at northern latitudes, largemouth bass stocked into South Dakota waters may not reproduce until age 2 (Stone 1981; Willis et al. 1990). Over the past decade, private pond managers in the southern U.S. began experimenting with innovative stocking rates for new ponds, including a lower rate for largemouth bass fingerlings (60-125 per hectare [25-50/acre]) that is intended to increase growth rates (Willis et al. *in press*).

The original intention of this study was to assess the potential for stocking South Dakota ponds with a lower density of largemouth bass fingerlings so that the bass might reproduce at age 1. However, the largemouth bass fingerlings used for this study were stocked into the study ponds in September of 2008 at a mean length of 89 mm. Thus, no matter the stocking density, they would not attain total lengths of 280-300 mm by late May that would be needed for them to mature at age 1. Therefore, we modified the objective of the study to document first-year growth and survival of the largemouth bass fingerlings in relation to pond characteristics.

Study Site

All seven study ponds were located on the Buffalo Gap National Grasslands, managed by the U.S. Forest Service. All ponds were located south and east of Wall, South Dakota, in Pennington and Jackson counties. Physical and chemical characteristics for each pond are summarized in Table 1. Despite the colloidal clays in the soils of this geographic location, only one pond had low transparency. The other six ponds had Secchi transparencies of 1.1-2.2 m, which allowed substantial growth of submergent aquatic plants.

Methods

An initial trip was made to the study ponds on August 4-6, 2009. At that time, a 16-m bag seine with 6-mm bar mesh was used to sample all seven ponds. Three quarter-arc seine hauls were completed at each pond except Wheeler 1, where four hauls were conducted. We also determined physical and chemical characteristics of the ponds at this time. Water chemistry information was determined for water samples collected within the top 0.3 m of the water column. The percent of the total pond surface area covered by submergent aquatic vegetation was visually estimated for each pond after viewing from a boat. Maximum depth was determined using an electronic fish locator. Pond surface area was provided by the South Dakota Department of Game, Fish and Parks biologists who stocked the ponds in 2008.

A second sampling trip was conducted on August 19-20, 2009. At this time, age-1 and older largemouth bass were collected by angling. We purposely varied lure size, and recorded total fishing effort for each pond. All collected fish were measured for total length, weighed (nearest gram), and scales were removed for subsequent age analysis. We calculated relative weight for age-1 and older largemouth bass; this index of relative plumpness is obtained by dividing the actual weight of a collected fish by the standard weight for a fish of that length and multiplying by 100 (Anderson and Neumann 1996).

Results and Discussion

Age-0 largemouth bass were collected only at Wheeler 1, where we collected an average of 60.8 bass per seine haul (Table 2). No age-0 largemouth bass were collected in any other pond. We did not expect that the largemouth bass fingerlings stocked in September of 2008 would be mature for spring 2009 reproduction; thus, were not surprised when we caught adult (mature) largemouth by angling. The three adult largemouth bass sampled from Wheeler 1 were 308 mm (Wr = 101), 319 mm (Wr = 95), and 340 mm (Wr = 89) in length. Scales were aged by three readers, and all three fish were age 3 (i.e., 2006 year class). Thus, they likely were either holdovers from a time period prior to the drought, or someone moved some adult fish into this particular pond.

No age-1 largemouth bass were collected in the bag seine at any of the seven study ponds. However, age-1 largemouth bass were collected by angling from three of the seven ponds, including Wheeler 1 (Table 2). We cannot be certain if the age-1 largemouth bass from Wheeler 1 resulted from natural recruitment, the 2008 fingerling stocking, or both. No age-1 largemouth bass thus were collected from four of the ponds, despite the fact that a minimum of 3 total angler hours was expended on each of those four ponds. In addition, we were able to visually observe the largemouth bass in the three ponds from which we caught them by angling, while no bass were observed at the other four ponds. Therefore, we suspect that no largemouth bass survived the introductory stockings in four ponds, but of course cannot be certain. It is possible that we simply did not collect them with our sampling methods (i.e., seining and angling).

Mean length of age-1 largemouth bass ranged from 189 to 218 mm in the three populations (Table 2). The largest individuals collected were 235 mm at Maco Sica, 237 mm at Kerpan, and 204 mm at Wheeler 1. The age-1 largemouth bass at Wheeler 1 had the lowest maximum size, the smallest mean length, and the lowest mean Wr values of the three ponds that contained age-1 bass. Potential competition with the adult largemouth bass in that pond may have reduced their growth rate. Given that the largemouth bass likely have 6 more weeks of growing season after our sampling date, we expect that at least some of the bass will reach maturity and spawn in Maco Sica and Kerpan during the late spring of 2010.

In summary, we found survival of age-1 largemouth bass in only three of the seven study ponds (43%). This is lower than we expected, especially as all ponds except Wheeler 2, where

the Secchi transparency was only 0.2 m, appeared to be appropriate largemouth bass habitat. Big Foot Pass had the shallowest maximum depth, and thus may be most vulnerable to potential winterkill. Stone (1981) reported that first-year survival for largemouth bass fingerlings stocked into 16 eastern South Dakota ponds ranged from 0 to 100%, with a mean of 50.2%. Growth data are more complex to interpret. However, Stone (1981) did collect fall age-1 largemouth bass, introduced the previous year (1979) as fingerlings, in September of 1980, and the mean length across eight southeastern South Dakota ponds was 276 mm. His study design was quite different from ours, though, as his initial stockings involved fingerlings with a mean length of 36.7 mm that were stocked in early to mid-July of 1979.

Acknowledgements

We thank Gene Galinat and Matt Ward from the South Dakota Department of Game, Fish and Parks, and Randy Griebel of the U.S. Forest Service for their assistance with this project. Largemouth bass fingerlings were provided by the South Dakota Department of Game, Fish and Parks. Funding for the field data collection was provided by the Jesse W. West Research Endowment at South Dakota State University.

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Table 1. Physical and chemical characteristics of seven study ponds on the Buffalo Gap National Grasslands in Jackson and Pennington counties, South Dakota.

	Wheeler 1	Wheeler 2	Haynes	Kerpan	Maco Sica	Church	Big Foot Pass
Surface area (ha)	2.1	2.1	6.3	2.1	2.5	6.3	5.8
Maximum depth (m)	3.1	3.1	3.7	6.7	3.7	3.1	2.4
Secchi (m)	2.2	0.2	1.8	1.3	1.8	1.9	1.1
Temperature (C)	22.8	23.3	25.4	22.5	20.4	21.2	20.3
Conductivity (mS/cm)	0.265	0.291	0.384	0.683	0.284	0.192	0.306
pH	10.6	9.3	10.3	9.9	10.2	10.0	10.5
Dissolved oxygen (mg/L)	13.3	10.5	11.1	10.1	9.4	8.7	9.3
Submergent vegetation coverage (%)	90	8	75	50	75	20	90

Table 2. Stocking records and fish sampling data for seven ponds on the Buffalo Gap National Grasslands in Jackson and Pennington counties, South Dakota, August 2009. LMB = largemouth bass; FHM = fathead minnow; GOS = golden shiner; Wr = relative weight; SE = standard error of the mean.

	Wheeler 1	Wheeler 2	Haynes	Kerpan	Maco Sica	Church	Big Foot Pass
LMB stocked (number)	125	125	375	125	150	375	350
FHM stocked (kg)	1.4	1.4	1.8	1.8	1.6	3.2	0.0
Mean age-0 LMB/seine (SE)	60.8 (52.6)	0.0	0.0	0.0	0.0	0.0	0
Mean length (mm) age-0 LMB (SE)	46.9 (1.0)						
FHM collected?	No	Yes	Yes	Yes	Yes	Yes	Yes (1)
GOS collected?	No	Yes	No	No	Yes	No	No
Number of age-1 LMB collected	19	0	0	14	18	0	0
Age-1 LMB/angler hour	6.3	0.0	0.0	9.3	6.5	0.0	0.0
Mean length (mm) age-1 LMB (SE)	189 (3.2)			218 (3.8)	208 (3.6)		
Mean Wr age-1 LMB (SE)	96 (2.2)			115 (1.5)	106 (1.3)		

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About the Jesse W. West Research Endowment: This endowment is intimately tied to the *Pond Boss* magazine and forum. It honors the life of Jesse W. West, a Mississippian and professor of Geology. While teaching Geology "Summer Camp" in the West, including Colorado, California and the Black Hills (one of his favorite geologic places), he developed a love of the area and its people which he shared with his family. His interest in lands and waters and all they provided led to many trips with his family to study and behold the Earth's majesty through fishing and hunting. His strong belief in helping others along their journey in applied science is the cornerstone of this Endowment. The Endowment was initiated by a donation from son Eric West. Since that time, *Pond Boss* members have donated individually and through the proceeds from the silent auction at the annual conference. The interest on the Endowment is used to fund worthy projects.