JOURNAL OF THE TENNESSEE ACADEMY OF SCIENCE

VOLUME 55, NUMBER 2, APRIL, 1980

COMPARATIVE LIFE HISTORY FEATURES OF YOUNG-OF-YEAR SMALLMOUTH AND LARGEMOUTH BASS IN PICKWICK RESERVOIR

ROBERT L. WARDEN, JR. AND WAYNE A. HUBERT

Tennessee Valley Authority
Muscle Shoals, Alabama 35660

ABSTRACT

Life history features were compared for young-of-year smallmouth and largemouth bass in Pickwick Reservoir, Alabama. Length-weight relations, condition factors, and lengths at collection were similar for both species during their first summer. Smallmouth bass from 20 to 99 mm (TL) depended heavily on Tendipedidae and Ephemeroptera for food; while largemouth bass in the same size category shifted with growth from crustaceans, to aquatic insects, to insects and fish. Both bass species were collected throughout the reservoir, and differential habitat preference were observed.

INTRODUCTION

Pickwick Reservoir is inhabited by smallmouth bass, *Micropterus dolomieui,* and largemouth bass, *Micropterus salmoides.* The smallmouth bass fishery in the headwaters of Pickwick Reservoir is nationally renowned. Age and growth studies (Hubert 1975) have shown smallmouth bass growth to be exceptional in Pickwick Reservoir, whereas largemouth bass growth is slow relative to other southeastern impoundments. To achieve a better understanding of the relationships between the coexisting bass species, a study was initiated to compare the life histories of young-of-year fish.

STUDY AREA

Pickwick Dam, Tennessee River Mile (TRM) 206.7, is the second in a series of mainstream dams on the Tennessee River and impounds 17,400 ha of water at full pool. The upstream boundary of Pickwick Reservoir, Wilson Dam (TRM 259.4), discharges a mean annual volume of 1,000 m^3/s into Pickwick Reservoir. From Wilson Dam downstream 20 km (TRM 247), the river flows within its original banks and is distinctly riverine in nature. Below 20 km, the river spreads out to inundate the floodplain and form a more reservoir-like habitat. Pickwick Reservoir is a relatively old impoundment; the dam was closed in 1938.

MATERIALS AND METHODS

Young-of-year smallmouth and largemouth bass were collected by shoreline seining and in cove rotenone samples from June 6 to August 14, 1975. A 15 x 2 m and 5 x 2 m nylon bag seine with 3.1 mm bar mesh was used to collect young-of-year bass at 2-14 day intervals during daylight hours at TRM 213, 230, 239, and 249. All bass were preserved in the field with 10 percent formalin and returned to the laboratory for examination.

In the laboratory, bass were separated by species and total lengths (mm) and wet weights (gm) were recorded. For food habitat analysis, the stomachs from the shoreline seine samples were examined. Bass were placed in 20 mm length groups and stomach contents for each group were identified and enumerated. Percent occurrence and percent total number of the specified food taxa were calculated for each 20 mm length group.

Length-weight relationships were computed by the formula:

$$\log W = b + \log L$$

where L = total length in millimeters (mm) and W = weight in milligrams (mg). Condition factors were determined using the formula:

$$K = \frac{W \times 10^5}{L^3}$$

where K = coefficient of condition, W = weight in g, and L = total length in mm. Bass of each species were placed in 10 mm length groups and the mean and standard deviation for each K were calculated.

RESULTS AND DISCUSSION

Length-weight relationship derived for 101 young-of-year smallmouth bass and 193 young-of-year largemouth bass were: Smallmouth bass = $\log W = 1.88 + 2.95 \log L$ ($r^2 = 0.99$); Largemouth bass = $\log W = 1.77 + 2.88 \log L$ ($r^2 = 0.98$).

Only slight differences exist in the length-weight relationships of young-of-year smallmouth and largemouth bass in Pickwick Reservoir. Studies by Beckman (1948, 1949) indicate similar first year length-weight relations. Hubert (1975) found that Pickwick Reservoir adult smallmouth bass exceeded adult largemouth bass in weight up to a length of 375 mm, after which the reverse was true.

TABLE I: *Condition factors of young-of-year smallmouth and largemouth bass from Pickwick Reservoir.*

Length	Mean K	Standard Deviation	Sample Size
Smallmouth bass			
20-29 mm	1.18	0.07	8
30-39 mm	1.05	0.05	24
40-49 mm	1.13	0.04	2
50-59 mm	1.07	0.07	31
60-69 mm	1.05	0.08	25
70-79 mm	1.10	0.09	9
80-89 mm	0.99	0.04	2
Largemouth bass			
20-29 mm	1.11	0.07	2
30-39 mm	1.11	0.16	52
40-49 mm	1.06	0.15	25
50-59 mm	1.05	0.13	33
60-69 mm	1.06	0.18	27
70-79 mm	1.00	0.18	23
80-89 mm	0.97	0.09	9
90-99 mm	0.95	0.03	10
100-109 mm	1.01	0.07	2

Comparison of condition factors for young-of-year smallmouth and largemouth bass in Pickwick Reservoir reveals slight differences (Table I). Calculated condition factors for the two bass species in Pickwick Reservoir are lower than values determined by Swingle (1965) for basses of comparable length in Alabama.

Ranges and median lengths for each species on individual collection days are presented in Figures 1 and 2.

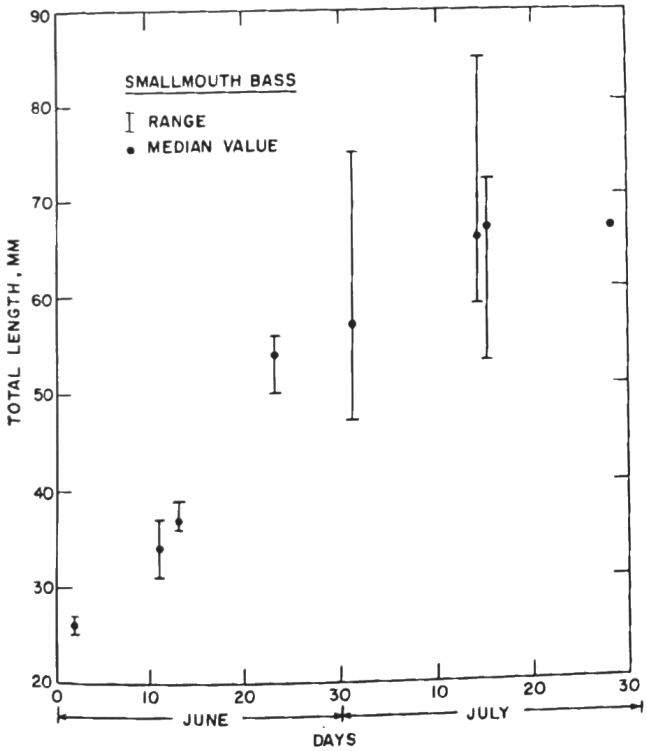

FIG. 1. *Range of lengths and median length for young-of-year SMB on each collection day.*

Median lengths were similar on the same dates, and both species averaged 50 mm by June 23, 1975. The range in lengths was consistently greater for largemouth than smallmouth bass and would imply a more extended spawning period for the former.

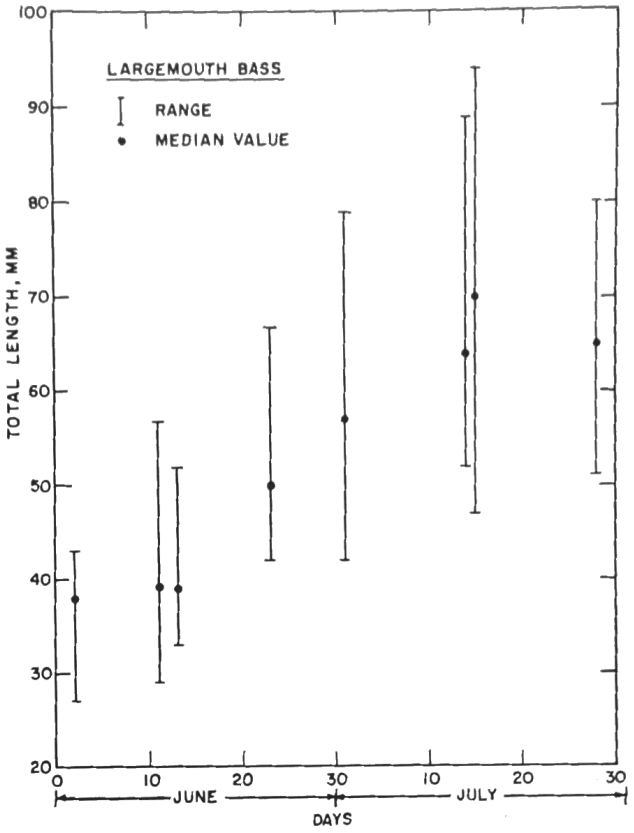

FIG. 2. *Range of lengths and median length for young-of-year LMB on each collection day.*

The diets of young-of-year smallmouth and largemouth bass are summarized in Table II. Tendipedidae were the most important food items in smallmouth bass 20-39 mm long, while largemouth bass of this size fed on Crustacea and Tendipedidae. Ephemeropterans were the dominant food item in smallmouth bass 40-59 mm. Crustaceans comprised the highest percentage of food items in largemouth bass 40-59 mm, but Tendipedidae, Ephemeroptera, and fish had the highest percentage of occurrence. Ephemeropterans were the most important food item for smallmouth bass 60-99 mm. In the diet of largemouth bass 80-99 mm, Zygoptera and Notonectidae comprised 50.0 percent of food items, but fish was the most important item.

Young-of-year smallmouth bass 20-99 mm long in Pickwick Reservoir are heavily dependent upon insects as a food source. Tendipedidae larvae are important to smallmouth bass of 20-39 mm, and Ephemeroptera larvae, (mostly *Hexagenia*) comprise the bulk of the diet of smallmouth bass 40-99 mm in length. Wickliff (1920) found smallmouth bass less than 35 mm long to depend heavily upon copepods with a gradual shift to midge larvae at increasing lengths. He also found mayfly nymphs to be the least important food item.

TABLE II. *Percentage of total number and percent occurrence of foods eaten by young-of-year smallmouth (SMB) and largemouth (LMB) bass collected from Pickwick Reservoir, June 2-July 28, 1975.*

				Percent of total number (1) and percent occurrence (2)									
				Crustacea		Tendipedidae		Ephemeroptera		Other Insects		Fish	
Species	Size (mm)	Number Examined	Number with Food	1	2	1	2	1	2	1	2	1	2
SMB	20-39	32	31	1.4	16.1	97.1	94.0	0.3	6.5	0.6	12.9	0.6	6.4
LMB	20-39	40	36	79.4	36.1	20.3	70.0	—	—	—	—	0.3	8.3
SMB	40-59	14	13	—	—	6.3	50.0	93.7	100.0	—	—	—	—
LMB	40-59	40	32	65.9	31.2	22.9	37.5	7.8	28.1	1.0	15.6	2.4	25.0
SMB	60-79	25	25	0.3	8.0	3.7	44.0	95.7	84.0	—	—	0.3	8.0
LMB	60-79	40	33	1.9	3.0	36.7	9.0	27.5	30.3	9.8	9.0	24.5	60.6
SMB	80-99	2	2	—	—	3.6	50.0	96.4	100.0	—	—	—	—
LMB	80-99	6	6	—	—	—	—	—	—	50.0	33.3	50.0	66.6

Lachner (1950), in studying smallmouth bass in trout waters of western New York, found mayflies to be the most common food item in fish of 32-78 mm in Arkansas reservoirs; Applegate et al. (1966) found fish, aquatic insects, and entomostracans to be of primary importance to 50-99 mm smallmouth bass, with fish comprising the bulk of the diet in smallmouth bass longer than 100 mm. Lachner (1950) and Wickliff (1920) also found fish to be a common item in the diet of young smallmouth bass. The high occurrence of Tendipedidae and Ephemeroptera in the diet may be related to the availability of drifting or suspended invertebrates to young smallmouth bass. Habitats frequented by young-of-year smallmouth bass in Pickwick Reservoir are generally associated with flowing or wave-swept water where suspended or drifting invertebrates, especially Tendipedidae and Ephemeroptera, would be present.

The diet of young-of-year largemouth bass in Pickwick Reservoir shifted from Crustacea to Tendipedidae and Ephemeroptera larvae to other insects and fish as the bass increased in total length. Studies in Arkansas reservoirs (Applegate et al. 1966, Applegate and Mullan 1967, and Hodson Strawn 1969) revealed a similar change in the diet with increasing length. McCammon et al. (1964) also observed this change in diet for fingerling largemouth bass in Clear Lake, California.

Both species of bass were collected throughout the reservoir, but habitat preferences were noted. Smallmouth bass preferred gravel bottoms associated with points of islands. Largemouth bass were common at all collecting sites but were most numerous in coves. The largemouth bass appeared to be less selective in its habitat preferences than the smallmouth bass; largemouth were common at collection sites where smallmouth bass were most numerous, but the reverse was not true. Available literature on smallmouth bass habitat preferences (e.g., Munther 1970, Carlander 1975, and Coble 1975) substantiates the attraction to rock substrates exhibited by the Pickwick Reservoir smallmouth bass.

LITERATURE CITED

Applegate, R. L., and J. W. Mullan. 1967. Food of young largemouth bass, *Micropterus salmoides*, in a new and old reservoir. Trans. Amer. Fish. Soc., 96(1):74-77.

Applegate, R. L., J. W. Mullan, and D. I. Morais. 1966. Food and growth of six centrarchids from shoreline areas of Bull Shoals Reservoir. Proc. Southeastern Assoc. Game and Fish Comm., 20:469-482.

Beckman, William C. 1948. The length-weight relations, factors for conversion between standard and total lengths, and coefficients of condition for seven Michigan fishes. Trans. Amer. Fish. Soc., 75:237-256.

————. 1949. The rate of growth and sex ratios for seven Michigan fishes. Trans. Amer. Fish. Soc., 50:63-81.

Carlander, K. D. 1975. Community relations of bass—large natural lakes. Pages 125-130 in Clepper, H. (Ed.). Black Bass Biology as Management. Sport Fishing Institute, Washington, DC.

Coble, D. W. 1975. Smallmouth bass. Pages 21-23 in Clepper, H. (Ed.). Black Bass Biology and Management. Sport Fishing Institute, Washington, DC.

Hodson, R. G., and K. Strawn. 1969. Food of young-of-year largemouth and spotted bass during the filling of Beaver Reservoir, Arkansas. Proc. S.E. Assoc. Game and Fish Comm. 22(1968):510-516.

Hubert, W. A. 1975. Age and growth of three black bass species in Pickwick Reservoir. Presented at 29th Ann. Conf., S.E. Assoc. Game and Fish Comm., St. Louis, Missouri. October 1975. 8 pp.

Lachner, E. A. 1950. Food, growth, and habits of fingerling northern smallmouth bass, *Micropterus dolomieui dolomieui* Lacepede, in trout waters of western New York. Jour. Wildl. Mgmt. 14(1):50-55.

McCammon, G. W., D. LaFuance, and C. M. Seeley. 1964. Observations on the food of fingerling largemouth bass in Clear Lake, Lake County, California. Calif. Fish and Game. 50(3): 132-140.

Munther, Gregory L 1970. Movement and distribution of smallmouth bass in the Middle Snake River. Trans. Amer. Fish. Soc., 1970, No 1

Swingle, W. E. 1965. Length-weight relationships of Alabama fishes. Agr. Exp. Sta. Auburn Univ. Zool.—Entomol. Dept. Series Fisheries No. 3. 87 pp.

Wickliff, E. L. 1920. Food of young smallmouth black bass in Lake Erie. Trans. Amer. Fish. Soc. 50:364-371.