FOOD OF YOUNG-OF-THE-YEAR LARGEMOUTH AND SPOTTED BASS DURING THE FILLING OF BEAVER RESERVOIR, ARKANSAS

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ABSTRACT

Young-of-the-year largemouth, *Micropterus salmoides* (Lacepede), and spotted bass, *M. punctulatus* (Rafinesque), were collected periodically from Beaver Reservoir during the growing seasons of 1964 and 1965. Scales were read to insure that all bass included in the study were young-of-the-year. Counts were made of the number of bass that had eaten a particular class of food rather than either how many or the volume of items eaten. Qualitative analysis of stomach contents indicated that entomostracans were eaten by a high percentage of small bass and were not eaten by the larger young-of-the-year bass. More bass of all sizes contained insects than entomostracans (excluding 10 to 19 mm largemouth bass). More largemouth and spotted bass contained insects than fishes except more of the larger young-of-the-year largemouth bass had eaten fishes than insects. Within the 50 to 69 mm size range, diet throughout the growing season appeared to be influenced by food availability, and largemouth and spotted bass were similar in the food they ate, except more largemouth ate fishes than did spotted bass.

INTRODUCTION

In recent years multiple-purpose reservoirs have been constructed in almost every state. Beaver Reservoir is the third such reservoir to be constructed on the mainstem of the White River. It is to be used for generating electricity, flood control, city water supply, and recreation. Fishery biologists, fishermen, and other people associated with these new lakes are interested in finding the reasons for excellent fishing in a new reservoir and for the decline of sport fishing which usually takes place after the first several years (Bennett, 1937; Jenkins, 1961). Our study was designed to provide data on the food habits of young-of-the-year largemouth, *Micropterus salmoides* (Lacepede) and spotted bass, *M. punctulatus* (Rafinesque) in a new reservoir for future comparison with data on the food habits of the young of these species after the reservoir had aged and fishing success had declined.

Food studies of young-of-the-year largemouth bass have been conducted by Turner and Kraatz (1920), Murphy (1949), Kramer and Smith (1962), McCammon, LaFaunce, and Seeley (1964), Applegate, Mullan, and Morais (1966), and others, but extensive food studies of young-of-the-year spotted bass have been lacking.

Study Area

Beaver Reservoir lies immediately upstream from Table Rock Reservoir on the White River in northwestern Arkansas (Benton, Carroll, Madison, and Washington Counties). It began filling in December, 1963, and, at power pool elevation of 1,120 ft. msl., contains 28,220 surface acres stretched over 73 river miles. At power pool level, Beaver Reservoir has a maximum depth of 216 ft. per mile. In general, the impounded basin is narrow and steep-sided.

During the summer of 1964, Beaver Reservoir was maintained at about 6,390 surface acres and had maximum and average depths of 116 and 35.5 ft. In the early spring of 1965, the water level rose 50 ft. This created a pool of 16,210 acres with average and maximum depths of 48 and 166 ft.

Description of stations and a map showing their locations can be found in Hodson (1967). Samples were collected from Prairie Creek and Van Hollow areas in 1964 and from Prairie Creek, Rocky Branch, and War Eagle areas in 1965.

Research was conducted under contract arrangement between South Central Reservoir Investigations, Bureau of Sport Fisheries and Wildlife, and the University of Arkansas.

METHODS AND MATERIALS

Field work was conducted from May 29 to November 10, 1964, and from June 2 to October 1, 1965. Bass were seined at weekly intervals through the first week of August; thereafter they were collected at two-week intervals. A bag seine 30 ft. long, 6 ft. deep with ¼-inch square mesh and a 6-ft. cubical bag in the center was used during most of the summer to collect fingerling largemouth and spotted bass. Ten-and 20-ft. straight seines were used early in the season when the bass were relatively small and easy to catch. The 10-ft. seine was 6 ft. deep with 1/8-inch square mesh. Late in the summer and in the fall, as the bass became larger, electro-fishing and hook and line fishing were also employed as a means of collecting fish.

Bass, to prevent them from regurgitating, were chilled in ice or allowed to suffocate before they were preserved in 10% formalin. In the laboratory, the contents of each stomach were examined with a binocular dissecting microscope and/or a monocular microscope.

The stomachs of 332 largemouth and 301 spotted bass were examined from the 1964 samples, of which 229 and 219, respectively, contained food. In 1965, 216 out of 281 largemouth bass stomachs and 178 out of 205 spotted bass stomachs contained food. Some of these came from tributaries and are not included in the figures.

Percentage occurrence was used as a measurement of the importance of specific types of food (oligochaetes, entomostracans, malacostracans, insects, and fishes). To get percentage occurrence, bass containing a specific food were divided by the total number of bass containing food. This was done by size class of bass. Standard lengths were used in this study.

RESULTS

Over a third of the largemouth bass belonging to size classes up through 60 to 69 mm in 1964 and 40 to 49 mm in 1965 had eaten entomostracans. Entomostracans were the food eaten by the highest percentage of largemouth bass 10 to 19 mm long. They were not eaten by largemouth 80 mm or larger in 1964 and by largemouth over 69 mm in 1965 (Fig. 1). Forty-one percent or more of the largemouth bass is each size class contained insects in 1964 and, except for six largemouth of the size class of 100 to 109 mm, which had not eaten insects, insects occurred in 16 to 92% of the largemouth comprising the various size classes in 1965. In 1964, insects were the food eaten by the most largemouth in each size class below 90 to 99 mm in standard length. In 1965, insects occurred in the stomachs of more largemouth belonging to the size classes larger than 10 to 19 mm and below 60 to 69 mm than any other item of food (Fig. 1). Fishes were utilized by largemouth 50 mm and longer in 1964 and 20 mm and longer in 1965. However, the lack of fishes in the diet of largemouth less than 50 mm in 1964 could be the result of small sample size (6 bass). There was a trend toward increasing utilization of fishes as food as the largemouth increased in size. More largemouth in size classes over 90 to 99 mm in 1964 and over 50 to 59 mm in 1965 contained fishes than any other food item (Fig. 1). Malacostracans and oligochaetes were of minor or no importance to all size groups of largemouth.

Entomostracans were eaten by 21% of more of the spotted bass belonging to size classes below 70 to 79 mm during both years. Entomostracans were not eaten by spotted bass over 79 mm in standard length in 1964 and over 69 mm in 1965 (Fig. 2). Based on percentage of occurrence, insects were the most important food item eaten both years by all size classes of spotted bass. Fishes were not common in the diet of spotted bass in 1964 (5% or less per size class). In 1965, fishes were of greater importance than in 1964 in the diet of spotted bass 69 mm and less in standard length (4 to 36% occurrence). Malacostracans and oligochaetes were not important components of the diet of young-of-the-year spotted bass in 1964 and 1965 (Fig. 2).

Largemouth and spotted bass changed their food habits and ceased to eat entomostracans as they increased in size (Figs. 1 and 2). However, the seasons were progressing as the bass increased in size, so the change in food habits could have been related to the time of year rather than size. Bass 50 to 69 mm from different collecting periods were compared to test for seasonal effects (Fig. 3).

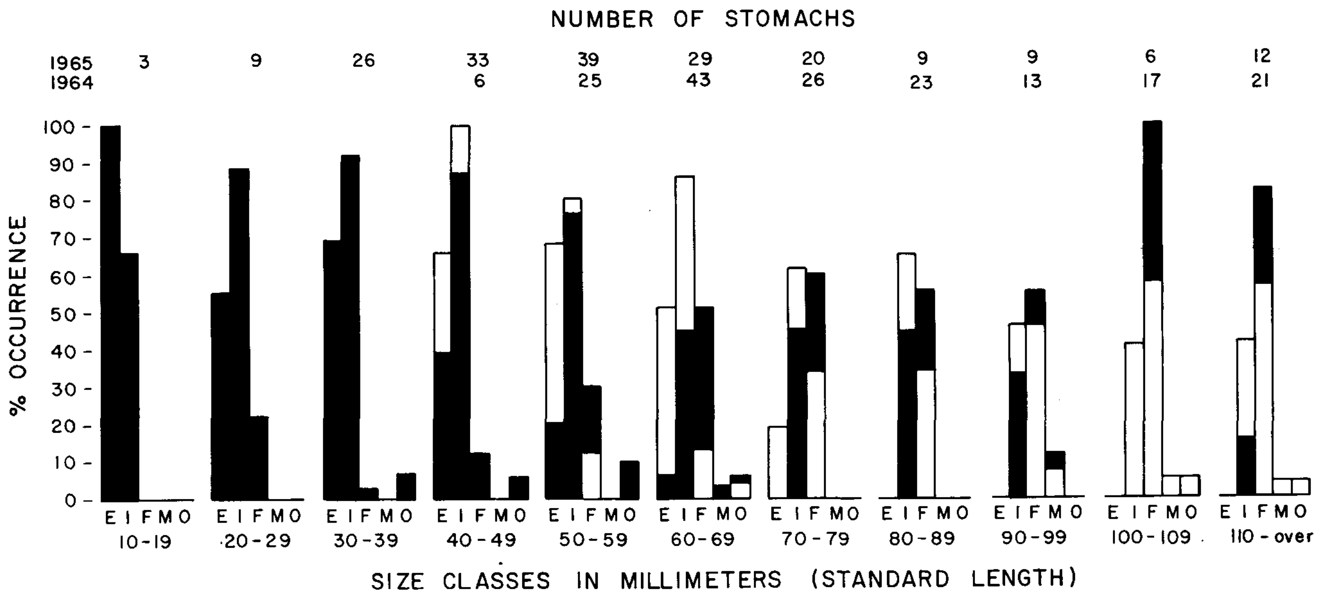

Figure 1. Histogram showing the percent occurrence by size class of bass of entomostracans (E), insects (I), fish (F), malacostracans (M), and oligochaetes (O) in the stomachs of young-of-the-year largemouth bass with food. Open bar represents 1964, solid bar represents 1965, and striped bar represents both years equal.

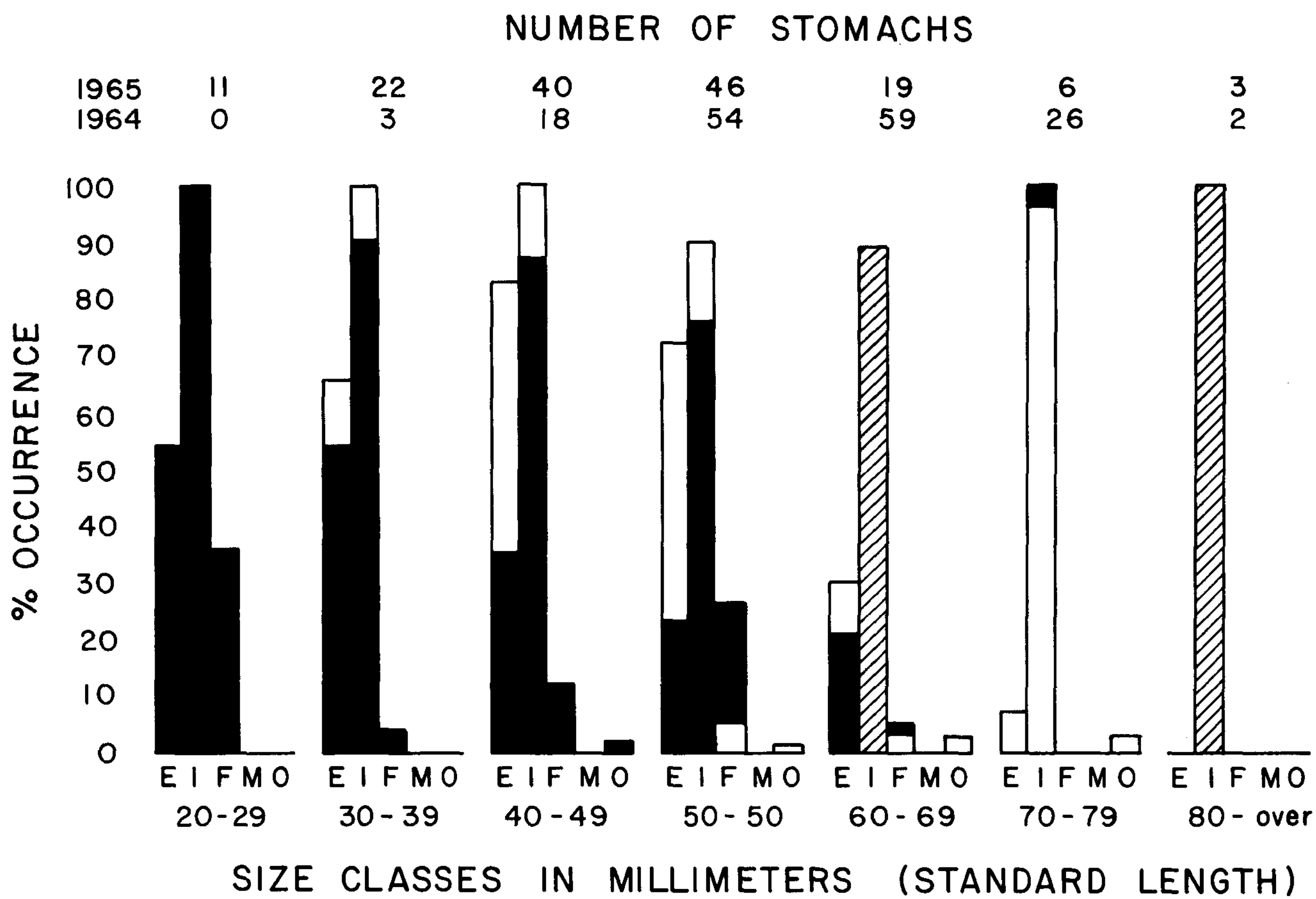

Figure 2. Histogram showing the percent occurrence by size class of bass of entomostracans (E), insects (I), fish (F), malacostracans (M), and oligochaetes (O), in the stomachs of young-of-the-year spotted bass with food. Open bar represents 1964, solid bar represents 1965, and striped bar *represents both years equal.*

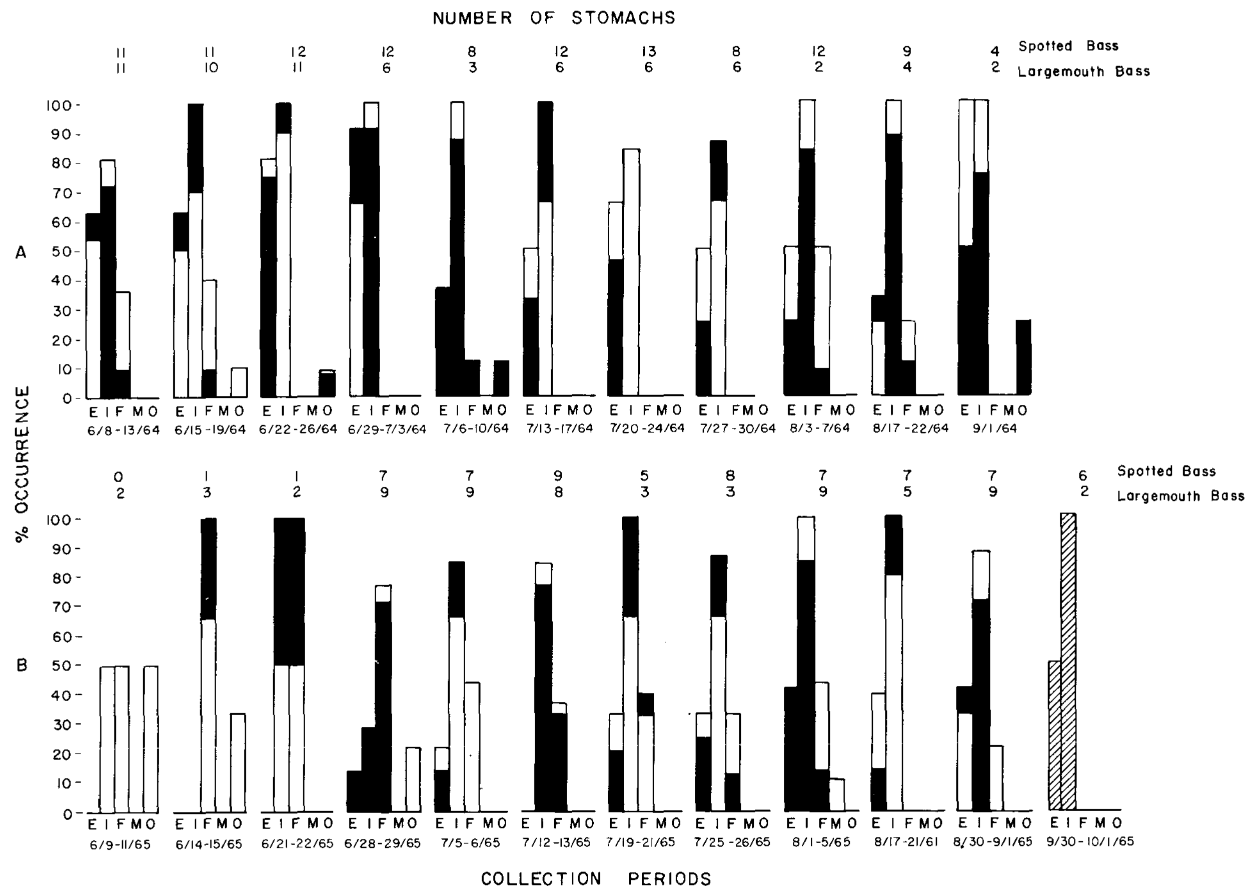

Figure 3. Histogram showing the percent occurrence of entomostracans (E), insects (I), fish (F), malacostracans (M), and oligochaetes (O), in young-of-the-year spotted and largemouth bass from the 50 to 69 mm size class in 1964 (A) and in 1965 (B). Open bar represents largemouth bass, solid bar represents spotted bass, and striped bar represents both species equal.

A smaller percentage of both largemouth and spotted bass 50 to 69 mm in standard length ate entomostracans in 1965 than in 1964. In 1965, fewer bass of both species ate entomostracans through mid-July than after mid-July. The number of bass of both species eating insects was similar both years except there was some indication that fewer bass ate insects early in 1965 than at other times (Fig. 3). Largemouth tended to eat more fishes than spotted bass. More bass of both species ate fishes in 1965 than in 1964 and fewer bass of both species ate fishes after mid-August in 1965.

DISCUSSION

Entomostracans, insects, and fishes were the three main foods eaten by largemouth and spotted bass fingerlings in Beaver Lake. As the bass became larger, the general trend was from smaller to larger food or from entomostracans, to insects, to fishes (Figs. 1 and 2). Applegate, Mullan, and Morais (1967) found a similar pattern in Bull Shoals Reservoir, a reservoir downstream from Beaver Reservoir. These changes indicate a direct relationship between bass length and size of preferred food. Turner and Kraatz (1920) found insects and fishes to be the principal food of largemouth bass over 55 mm long (total length) in Ohio, and Murphy (1949) found fishes to be almost the exclusive food of largemouth bass over 71 mm (total length) in Clear Lake, California.

Fingerling bass appear to eat food organisms in relation to their abundance. Kramer and Smith (1962) suggest that this is true of all food organisms of a size small enough to be eaten but large enough to attract attention. In a study performed at Lake George, Minnesota, they attributed the small use of fishes by largemouth fingerlings to the low abundance of forage fishes of suitable size. They found that largemouth bass fingerlings utilize cladacerans in direct relation to the abundance of cladacerans. McCammon *et al.* (1964), working on Clear Lake, California, found that young largemouth bass will switch to a fish diet at a length of less than 3 inches (75 mm) if forage fishes of appropriate size are available.

In Beaver Lake, largemouth and spotted bass 50 to 69 mm in length tended to parallel each other in the type of food eaten during the growing seasons of 1964 and 1965. For example, when few largemouth bass contained either entomostracans, insects, or fishes, few spotted bass contained the food item that was rare in the largemouth (Fig. 3).

A scarcity of forage fishes of a suitable size limited the consumption of fishes by fingerling bass in Beaver Lake during 1964 and 1965 and resulted in largemouth fingerlings being in poor condition during late summer and early fall. The spotted bass grew more slowly than the largemouth and were in good condition during the late summer and fall when largemouth were in poor condition. Either their small size enabled them to utilize food items too small to appeal to largemouth or they were more efficient foragers of the foods available. Insects were eaten by all size classes of young-of-the-year bass and an abundance of insects throughout the growing season may be important in the survival of young-of-the-year bass, especially when forage fishes of a suitable size are scarce.

Malacostracans were of minor importance in the diet of fingerling largemouth (found in about 1% of the stomachs) and were absent from the observed diet of the spotted bass from Beaver Reservoir. Crayfish were rarely taken while seining in the reservoir and were probably not readily available as food. The few crayfish collected in the reservoir were large adults and were too big for small bass to eat. Crayfish of all sizes were abundant in tributary streams. In 1964, counting only bass that had food in their stomachs and that were stream inhabitants, crayfish occurred in 10 of 46 largemouth and 18 of 47 spotted bass. It may be that crayfish will increase in importance in the diet of the bass when species of crayfish adapted to life in the reservoir become abundant — especially in the diet of spotted bass which are considered to be avid eaters of crayfish. Terrestrial oligochaetes were of minor importance in the diet of largemouth and spotted bass fingerlings (Figs. 1 and 2). Their occurrence as food items may have been correlated with rises in the water level of the reservoir.

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ACTIVITIES OF THE WATER USE COMMITTEE SOUTHEAST SECTION, WILDLIFE SOCIETY

The Southeastern Water Use Committee has been concerned with pertinent water use problems affecting fish, wildlife, and related resources since its inception. Annually, since its initiation, it has prepared or sponsored the preparation of special reports on various water problems of particular concern. These have included evaluations of watershed development problems, stream preservation, water use studies, water policy legislation, watershed in relation to wildlife, with special reports from the Watershed Study Sub-committee in 1965 and a report on Stream Banks Wildlife Habitat in 1966. In 1967, a general report and recommendations were prepared for the meeting held at New Orleans. The Committee has been responsible for the production of nineteen special and published reports since it was first organized.

In 1967 a special spring meeting was held at Reelfoot Lake, Tennessee, and among plans made at that time was a special study and workshop concerning watershed developments. Mr. Floyd Fessler of the Soil Conservation Service planned the organization of such a workshop in the 1968 fiscal year, but his subsequent illness prevented completion of this objective. Among other proposals and plans was a study of methods for implementing plans for stream preservation, and studies of bottomland hardwood drainage and encouragement of research on matters affecting fish and wildlife at the Water Research Centers.

The Committee met again at New Orleans during the annual 1967 Southeastern meeting, and primary objectives and purposes of the Committee were revuewed. A summer meeting was planned, but various commitments and problems besetting Committee members delayed this session. Committee personnel problems, including the change in job status of the Chairman during the past annum, brought about deferral of actions which had been comtemplated. Hopefully, we believe the Committee can improve its operational program in the 1969 year. We believe problems in water management, which include drainage, loss of timberlands, inundation of streams by impoundments, pollution, and many other affects of management and the results of technology are among the most significant habitat problems facing fish and wildlife biologists and those concerned with preservation of a diverse and ecologically balanced environment for people.