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DIET OF JUVENILE BOWFIN, *AMIA CALVA* Linnaeus, IN THE SIPSEY RIVER, ALABAMA

by

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INTRODUCTION

The bowfin, *Amia calva* Linnaeus, is one of only a few living holostean fishes, and the only extant Amiiform fish (Nelson, 1984). It is widespread in the lowlands of eastern North America, from the St. Lawrence River and Great Lakes south to the Gulf of Mexico (Burgess and Gilbert, 1980). Adult bowfin are notorious predators, and feed on many vertebrate species, including salamanders, frogs, snakes, and lizards, but mostly other fishes. They also eat crayfishes, insects, and leeches (Lagler and Applegate, 1942; Berry, 1955; Diana, 1966). Adult bowfin are undoubtedly sight feeders that will eat anything appearing to be food, including artificial fishing worms (Diana, 1966).

Food habits of young bowfin are poorly known. Schneberger (1937) reported that bowfin between 45 and 70 mm total length (TL) feed on planktonic crustaceans and small insect larvae, but he did not quantify the food items. Pflieger (1975) noted that young bowfin, at approximately 100 mm TL, switched from a primarily invertebrate diet to eating vertebrates. Herein, we report on the gut contents of 50 juvenile bowfin from the Sipsey River, Alabama.

METHODS

Twenty five specimens in each of two size classes were examined. The smaller fish ranged from 21 to 23 mm TL ($\bar{x}$ =21.96); the larger fish varied from 39 to 59 mm TL ($\bar{x}$ =49.88). Fish to make up the two size groups were randomly selected from two collections made in a flooded area by the Sipsey River, Tuscaloosa County, Alabama [University of Alabama Ichthyological Collection 800.01 (284 specimens) and 4503.01 (76)]. Each fish's stomach was excised, flushed, and

its contents identified and counted. Food from each bowfin size class was pooled by taxon, dehydrated at 60°C for 48 hours and weighed.

RESULTS AND DISCUSSION

Gut contents of young bowfin were quite varied (Table 1, Figure 1). Fish in both size classes had eaten invertebrates almost exclusively. A single 46 mm specimen did contain one poeciliid fish, *Gambusia affinis*. Young bowfin most often eat cladocerans, copepods, isopods, amphipods, and dipterans. The relative abundance of each of these and other taxa differed, however, between size classes and depending on whether number or weight was considered. Cook (1959) stated that bowfin consumed vegetable matter, but we found none. The presence of some terrestrial arthropods, one aphid and one pseudoscorpion (Table 1), suggests that juvenile bowfin will eat almost any appropriate size arthropod they encounter.

Diet did not vary within a size class. This was also noted by Schneberger (1937), and is related to the compact schooling behavior of juvenile bowfin, which are herded into cohesive schools by the male parent until they reach 100 mm TL (Pflieger, 1975). Diet composition did differ appreciably between the two size classes (Table 1, Figure 1). The most conspicuous difference between the two was the infrequent number of insects in the smaller size class. Insects accounted for only 1.4% of the diet among smaller bowfins, but was nearly 23% of the diet for the larger size group. This difference may be size related, because larger insects, such as *Siphonurus*, Macromiidae, *Chauliodes*, and *Deronectes*, were present only in the stomach of the larger class. Perhaps members of these taxa are too large or evasive for the smaller bowfin. Alternatively, the discrepancy may be related to differences in

Table 1. Food items of juvenile bowfin by number and weight. Percentages by weight for taxa within Insecta are enclosed in parentheses.

Prey item	21-23 mm specimens			39-59 mm specimens		
	Number	%	% weight	Number	%	% weight
Crustacea						
Cladocera			50.3			43.3
Chydoridae	125	13.0		1098	12.8	
Daphnidae	437	45.3		3898	45.4	
Copepoda			8.7			10.0
Ameiridae				30	0.3	
Cyclopidae	224	25.3		1878	21.9	
Ostracoda			1.2			1.7
Cypridae	6	0.6		662	7.7	
Isopoda			35.7			15.0
Asellidae						
<i>Asellus</i>	134	13.9		115	1.3	
Amphipoda			2.7			6.1
Gammaridae						
<i>Gammarus</i>	17	1.8		306	3.6	
Insecta						
Ephemeroptera						22.6
Siphonuridae						
<i>Siphonurus</i>				2	0.02	(0.6)
Odonata						
Macromiidae				1	0.01	(0.1)
Homoptera						
Aphididae				1	0.01	(0.1)
Megaloptera						
Corydalidae						
<i>Chauliodes</i>				2	0.02	(0.5)
Coleoptera						
Dytiscidae						
<i>Deronectes</i>				101	1.2	(9.6)
Diptera						
Ceratopogonidae				1	0.01	(0.2)
Chaoboridae						
<i>Chaoborus</i>				120	1.4	(1.4)
Chironomidae	1	0.1	1.4	320	3.7	(8.7)
Culicidae				56	0.6	(1.4)
Arachnida						0.2
Pseudoscorpionida				1	0.01	
Teleostei						1.1
Poeciliidae						
<i>Gambusia</i>				1	0.01	
Total	964			8593		

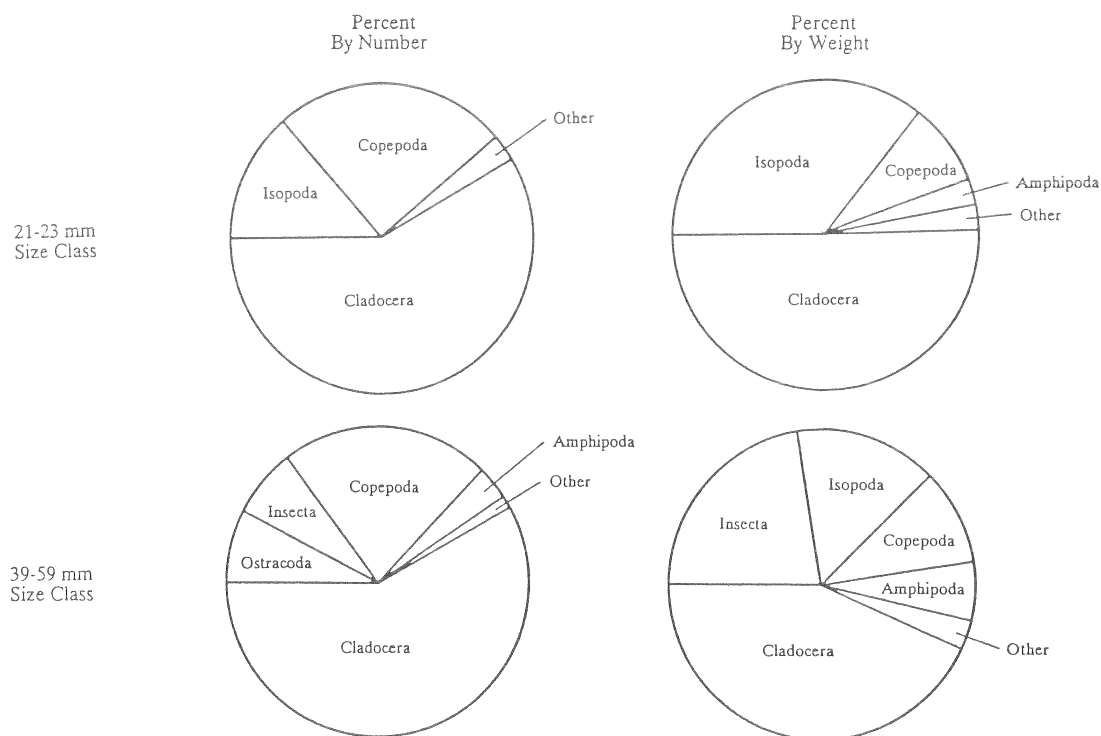


Figure 1: Stomach contents of two size classes of *Amia calva* expressed as percent by number and percent by weight.

foraging areas by the two size classes or sampling error. Smaller individuals had eaten many isopods, but larger specimens consumed slightly greater proportions of amphipods (Table 1, Figure 1).

Foraging locations of young bowfin are reflected in their diet composition. Planktonic taxa were well represented in the stomachs of both size classes (83.6% by number and 59.0% by weight in the small size class; 80.1% and 53.3% in the large size class), indicating that young bowfin feed frequently in the water column. Included in the zooplankton component of the diet are the cladocerans and cyclopoid copepods. *Chaoborus* also may be a planktonic component. Although chaoborids are a member of the benthic community during the day, they have crepuscular and nocturnal vertical migrations (Brigham et al., 1982).

Exclusive of the aphid and pseudoscorpion, all other invertebrates consumed (16.4% by number and 41.0% by weight; 19.9% by number and over 45.4% by weight by small and large class, respectively) inhabit varied benthic habitats. Other crustaceans (Ameiridae, Cypridae, *Asellus*, and *Gammarus*) and the Macromiidae inhabit benthic debris, often concealed beneath leaves or root masses. *Siphonurus* and *Deropectes* are commonly associated with submerged vegetation and sedimentary taxa include ceratopogonids and chironomids. Occurrence of these taxa suggests that young bowfin are also benthic foragers.

Young bowfin seem not to feed much near the surface. The culicids, or mosquitos, were the only surface dwelling insects consumed in any numbers by these bowfin. Culicids were not found in stomachs of the smaller bowfin and were infrequently observed in the larger bowfin. In total, mosquito larvae accounted for less than 1% by number and only 1.4% by weight of the total diet of the larger bowfin.

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