Bowfin (Amia calva)

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Abstract-
The Bowfin, *Amia calva*, is a primitive fish native to North America capable of breathing air. The Bowfin is a predacious fish, often caught by anglers fishing for something else. Bowfin are found in slow moving, vegetated areas where they build nests. Bowfin populations are stable.

Context and Content- Order Amiiformes, Family Amiidae, Genus Amia. *A. calva* is the only extant species in the order Amiiformes, which flourished in the mid-Mesozoic period (Wilson 1982).

General Characteristics- The Bowfin is a long, heavy bodied fish with a rounded, heterocercal caudal fin. They can easily be distinguished from all other North American native fish by the presence of a long dorsal fin separated from the caudle fin, a short anal fin, and a single gular plate. The bowfin has a large mouth with many sharp teeth. Bowfin are generally olive in color with some dark mottling in some individuals. The undersides are whitish or light in color. Males and juveniles have an ocellus (dark spot) on the caudal fin. This spot loses distinction in adult females. Bowfin have 10-13 brachiostegal rays and two barbels on the snout, as well as 65-70 lateral line scales, 45-48 dorsal rays, 9-10 anal rays, and 16-18 pectoral rays (Ross 2001).

Bowfin have been recorded at lengths of 1090 mm, but are more commonly found from 381-685 mm. The U.S. Angling record is 9.76 kg caught in South Carolina in 1980. Male bowfin are typically smaller than females (Ross 2001).

Distribution- Bowfin are widespread and found in most water systems and drainages in Mississippi, including, but not limited to, the Mississippi, Pascagoula, Pearl, and Tombigbee drainages. In the North America, Bowfin are found throughout the eastern portion of the United Sates and parts of Southern Canada. They can be found in the Mississippi, St. Lawrence-Lake Champlain, and Great Lakes basins (except Lake Superior). The Bowfin is also found in many Atlantic drainages from the Hudson, south into Florida and can be found throughout the Gulf of Mexico Coastal Plain from Florida west into Texas (Ross 2001).

Form and Function- The Bowfin’s distinguishing dorsal fin allows for slow moving both forward and backward by the use of wave-like undulations generated by the muscles attached to the dorsal rays. This is called ribbon-fin locomotion (Jagnandan 2012).

Bowfin posses the ability to breath air, that is, to acquire needed oxygen from the air. This is accomplished by the use of a highly vascularized swim bladder as a “lung” for gas exchange. Bowfin have a physostomous
swim bladder, meaning there is a connection from the swim bladder to the gut via the pneumatic duct. It is because of this connection that Bowfin can breathe air. Bowfin breathe by exhaling the old air in the swim bladder and quickly inhaling new air (Horn and Riggs 1973). An increase in air breathing occurs as water temperatures rise. At 10°C, Bowfin rely almost solely on their gills for respiration but at 30°C, Bowfin get most of their oxygen from the air. Interestingly though, even at high temperatures, the Bowfin uses its gills for around 60% of CO₂ elimination. (Johansen et al. 1970)

The gills of Bowfin are also unique among most fish. The gill lamellae are fused so that the tips are held apart from each other. This adaptation allows for gas exchange in air, while water is not holding the tips apart (Bevelander 1934).

Bowfin can survive out of water for hours, and even days at a time. Green (1966) reports of a Bowfin surviving 21 days buried in the mud of a dried up pond.

**Ontogeny and Reproduction—** Bowfin breed in the spring in Mississippi. Spawning activity begins as water temperatures reach 12°C and continues through 26°C, with peak spawning occurring at 18°C. Males construct a bowl shaped nest in shallow weedy areas of depths between 61-92 cm (Hildebrand and Towers 1928; Reighard 1903).

Courtship begins when a male approaches a female and holds her by the snout with his jaws. He then begins to swim circles around the nest. Next, the male moves to lie parallel to the female, with his snout just behind her pectoral fin. Spawning begins as the male starts vibrating his fins and the female sheds the eggs and they are fertilized. The courtship ritual may take over an hour and the pair may repeat it up to five times. Bowfin spawn both day and night, but show preference to the night (Reighard 1903). After spawning, the female leaves the nest but the male stays to vigorously guard the eggs (Kelly 1924).

Females may contain as many as 64,000 eggs. Mature eggs have a yellowish appearance and they are slightly elliptical (2.2 x 2.8 mm). The eggs are adhesive and stick to objects such as roots or vegetation. After fertilization, the eggs hatch in 180 hours (Ross 2001; Breder and Rosen 1966). At hatch, the fry measure 3-7 mm and are tadpole in shape. Each individual has a yolk sac until the fry reach 10-13 mm. The newly hatched fish have an adhesive organ which they use to attach to vegetation in the nest (Reighard 1934). The male guards the fry in the nest for about nine days. Then the fry leave the nest in a compact school, still vigorously guarded by the male. The fry stay in the school until about 102 mm, and then the solitary life of adults begins (Ross 2001).

Bowfin become sexually mature in two to three years and generally do not live more than ten years in the wild (Pflieger 1975). Growth can be rapid, with fish reaching 203 mm in the first year and 378-397 mm by their second (Becker 1983; Scott and Crossman 1973).
Ecology- Bowfin prefer habitats that include sluggish waters, vegetation, and annual flooding. Bowfin can commonly be found in oxbow lakes, slow rivers, and swamps. During high water stages, Bowfin move out into the flood plain. Because of this migration into the floodplain, Bowfin have developed a response to lowering water levels. As flood waters recede, Bowfin will actively swim with the currents back to the main river channel to avoid being trapped in drying pools (Greenbank 1956).

Bowfin are predators. Berry (1955) showed that, 97% of the stomach contents of adult Bowfin consisted of various fish species such as: Black Crappie, White Catfish, and Brown Bullheads. Other prey items include large crustaceans such as crayfish and grass shrimp (Stacy et al. 1970; Pflieger 1975). Juvenile Bowfin feed mainly on small crustaceans such as copepods and on insects such as dragon fly larvae. Fish smaller than 39 mm tend to feed more on small crustaceans and fish between 39-59 mm begin to feed more on aquatic insects and other appropriate sized foods. At around 102 mm, Bowfin begin to predate on small fish in addition to insects and crustaceans (Stacy et al. 1970; Pflieger 1975; Frazer et al. 1989).

Conservation- Bowfin populations are secure throughout their range. However, Bowfin are susceptible to habitat changes from slow, sluggish systems with lots of vegetation to systems with faster waters and little vegetation. In Mississippi, the Bowfin is regarded as a non-game fish and as such, has no regulation on harvest (MDWFP 2013).

Remarks- The Bowfin has many local names such as: Choupique (pronounced Shoe-pick), grinnel, grinner, dogfish, mudfish, spottail, and cypress trout. (Ross 2001)

Bowfin are known among fishermen for their fight on the line. Bowfin can be caught on most types of lures and baits from Texas Rigged soft lures to all styles of cut baits used to catch catfish and everything in between.

Bowfin do have commercial value, not necessarily for their meat, but for their eggs. Louisiana began marketing Bowfin roe as a less expensive caviar called “Choupiquet Royal” (Arceneaux 1992)

Literature Cited-


Mississippi Department of Wildlife, Fisheries, and Parks. 2013.


