GOLDEN SHINERS (*Notemigonus crysoleucas*) UTILIZING BOWFIN (*Amia calva*) NEST AS SPAWNING SITE

by Ray Katula, Cochrane, Wisconsin

Numerous fish species, primarily minnows, have been observed utilizing other species' prepared nests for depositing their own eggs. Nest-association spawning is the term generally applied to such behavior.

Redbelly daces (*Phoxinus*), Rosyface Shiners, Cardinal Shiners, Golden Shiners--these are but a few examples of "freeloaders." "Host" species include Hornyhead Chubs, sunfishes, lampreys, and other types of nest-building species.

To me, this fascinating social behavior takes the study of nature to a higher plane. More and more, we learn of causes and effects of species interaction in our streams--arguments for maintaining aquatic biodiversity.

The purpose of this article is to document an instance in which Golden Shiners deposited their eggs in a Bowfin nest. Golden Shiners have been observed laying their eggs in the nest of a Largemouth Bass (Kramer and Smith 1960). But, according to Lawrence M. Page, no documentation exists on any species of fish utilizing a Bowfin nest for spawning.

On May 11, 1994, I was walking down the shallow margins of a small, heavily vegetated pond. The unnamed pond was once normally a slough of the Upper Mississippi River, but railroad dikes were constructed many years ago severing most ties with the main river. (A river no longer flows through it.)

Amid muck and vegetation, I discerned some splashing noises that alerted me to the nest. I headed onto land and approached from there--my preferred method, to avoid scaring the adult Bowfin. When I could survey the shoreline nest, I noted that it was typically Bowfinlike, situated in a shallow, nearly circular depression 1' deep and 2½' feet in diameter. The flooded terrestrial grasses on the nest site had been shorn off, with only the tangled roots remaining. Untypical of many Bowfin nests, there were no overhanging bushes, trees, or vegetation above it. This slight aberration enhanced my vantage point considerably.

The activities I observed were relatively brief. The entire sequence lasted about 30 seconds. I saw approximately 25 to 30 Golden Shiners, mostly about 3" long, swimming around the inside of the Bowfin nest. Depending upon how the Bowfin body broke up the school, there would be two or three units of them. For the most part, the Golden Shiners swam one or two inches inside the perimeter of the nest and avoided the middle. Vegetation prevented them from swimming easily over

the sides of the nest, which was only open to deeper waters for a very short part of the perimeter.

Initially, the male Bowfin was facing toward the entry area of his nest, directly out towards deeper portions of the pond. I will designate this the 12:00 position. I was positioned to the right of the nest, about the 5:00 position. The Golden Shiners were swimming in tight schools and understandably avoiding the head regions of the male Bowfin.

As the Bowfin moved to various positions, the Golden Shiners remained clear of his head region, but they quickly filled any unoccupied areas and appeared to spawn quickly in those areas. From the 12:00 position, the Bowfin turned away from me to a 10:00 position, then to a 7:00 position. He then made a wide right turn all the way to about the 2:00 position, at which time he spotted me and swam off to deeper water, abandoning the nest. This move also scared away the Golden Shiners. Surprisingly, many of them had not been aware of my presence; they seemed preoccupied with spawning and avoiding becoming lunch at the same time. It did not seem to me as if the Bowfin was interested in consuming the shiners; his primary goal appeared to be protecting the nest.

After all this turmoil, curiosity replaced my astonishment. I knelt down for a closer look at the nest. Sure enough, there were two types of eggs in the nest. The much larger, black eggs I identified as Bowfin eggs, and outnumbering them were the apparent Golden Shiner eggs. While some readers might suggest that another species of minnow had laid them, it's unlikely that my identification would have been mistaken. This pond is well isolated from all sources of water. The last time an outside water source penetrated this pond was the horrendous flood of 1966. The flood wiped out the railroad dikes, and the long-excluded Mississippi poured in.

My parents' house, where I grew up, was immediately above, on the bluffs. I had sampled this pond extensively over the years. Of course there are no fish left, as regulatory agencies say we collectors can devastate and wipe out species by overcollecting. NOT! This pond is still full of all past species despite this writer's youthful and foolish overcollection. In any case, this pond had been sampled extensively by the author, and the only two other species of cyprinids ever turned up in my nets were Common Carp (*Cyprinus carpio*) and Fathead Minnows (*Pimephales promelas*). Carp spawn at a much larger size than these cyprinid spawners, and Fathead Minnows spawn in a completely different manner.

Before going home, I picked up four samples--two from the nest and two outside of it, the latter as controls. One 4"x4"

nest sample was taken to be preserved, another to hatch the cyprinid eggs. One control sample was taken 8" away from the nest, same depth, and another control sample was taken 3' away, at the same relative position from the shoreline and at the same depth. One nest sample and 8" control sample were preserved in alcohol. The 3' sample was frozen, and the other nest sample was used to obtain eggs. I collected 36 cyprinid eggs and 17 Bowfin eggs from an approximate 4"x4" sample of the nest.

I placed the Golden Shiner eggs into a hatching tray, added methylene blue, and aerated the mix. At 63°F, the eggs hatched on May 15th, 16th, and 17th. Of the 36 eggs taken, only 15 fry hatched. For several days post-hatching, the larval fry appeared to have some type of gluing glands attaching them to the bottom of the hatching tray. The fry were then placed into a ten-gallon aquarium for rearing after several fry were preserved.

Having reared tank-spawned Golden Shiners in aquaria previously, I knew that the fry would grow slowly. Indeed, these were no exception. In September, the fry appeared large enough to be identifiable. I sent them to the Illinois Natural History Survey for identification. No attempt was made to hatch the Bowfin eggs; there could be no confusion.

Five days after my original nest observations, I revisited the Bowfin nest. I wanted to find out several things. Since my captive eggs had hatched, would there be more, newly laid Golden Shiner eggs? Would the Bowfin eggs have hatched yet? I thought for sure that I would sight unhatched eggs of some kind, but I noted that the Bowfin eggs had hatched, and aside from fungused eggs, I did not observe any more Golden Shiner eggs. There were many very small, young fry swimming at the surface over the nest. These I presumed were the newly hatched Golden Shiner fry. If I lay still long enough observing the nest, I could discern the newly hatched Bowfin fry rising to the surface of the water obtaining their gulp of atmospheric air. These were easily differentiated from the presumed Golden Shiner fry. Were the Golden Shiner fry hanging around the nest benefiting from the protection of the Bowfin male? Or did they end up as food for the Bowfin fry? At this time, I took several photographs of the Bowfin nest. Interestingly, another Bowfin nest observed during this time did not contain Golden Shiner eggs (that I could discern).

Conclusions

Apparently Golden Shiners on occasion utilize the nests of Bowfins for depositing their eggs. Also, since it is not a common occurrence, one must wonder if there are a variety of

conditions or elements that entice the Golden Shiners to commence spawning. The day when I observed this occurrence was relatively warm for that time of year and sunny for the most part. Male Bowfins always appear emaciated while guarding their nest, and perhaps, like many other species of fish, refrain from eating during this period of time. After hatching, do the shiner fry benefit from the protection of the Bowfin male much as Orangethroat Darter fry hatched in a Smallmouth Bass's nest benefit from its protection? Perhaps further field research may find further answers. Whether or not my observations are new to science, it was a real joy to observe this nest-association behavior, and I can only hope that I will have further opportunities in the future.

References

Pflieger, William, 1966. Copeia, No. 1, Ichthyological Notes. Young of the Orangethroat Darter (*Etheostoma spectabile*) in nest of the Smallmouth Bass (*Micropterus dolomieui*).

Robison, Henry, and Buchanan, Thomas, 1987. Fishes of Arkansas. The University of Arkansas Press, Fayetteville, Arkansas 72701.

Page, Lawrence M., personal communication, May 16, 1994.

###