

Breeding the Southern Sheepshead Minnow, *Cyprinodon variegatus variegatus*

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The southern sheepshead minnow (*Cyprinodon variegatus variegatus*) is extremely numerous throughout its range, along the southern Atlantic Coast from Virginia, around the Florida peninsula, and along the Mexican Gulf coast to eastern México. Along with the mummichog (*Fundulus heteroclitus*) in the northern half of its range, and the Gulf killifish (*Fundulus grandis*) in the southern, it is one of the most common fishes the collector will find in estuaries of the east and Gulf coasts of the United States. *C. v. variegatus* is found in virtually every kind of shoreline habitat, in both brackish and full-strength sea water.

C. v. variegatus is a stocky fish which, for its body depth, is quite short, with a total length of 2.0-3.5 inches. When in breeding color, the male exhibits a silver body that reflects light blue or even green, appearing as a metallic sheen. A breeding male in good condition exhibits a sparkling slash of light blue on the upper body directly behind and below the nape. Breeding coloration also includes light to moderately bright orange on the lower jaw and the ventral fins. The dorsal fin has a dark spot posteriorly and is otherwise gray to bluish, as is the anal fin. The anal fin tends to be darker at the margins and is bordered by a yellow band. The caudal fin is whitish to light blue, with a black to dark gray border. The non-breeding male exhibits 6-10 irregular grayish to slate cross bars. These are generally not visible when the male is in breeding color. The unpaired fins of the females are without color but the dorsal fin has a black spot posteriorly. The body is silver with several greenish to brown cross bars and occasional spots on the flanks.

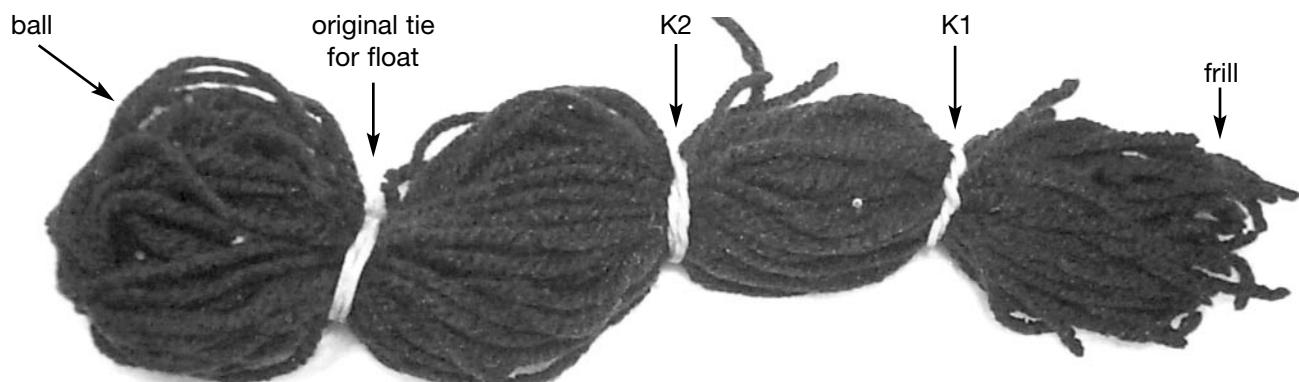
I've found that *C. v. variegatus* are easy to breed, both in sea and brackish water, and, after appropriate conditioning, in hard, alkaline fresh water. Although I prefer to keep *C. v.*

variegatus in brackish water, acclimation to fresh water is not difficult and can be accomplished over a period of 2-3 weeks. Simply replace small amounts of tank water every other day with hard, alkaline, aged water. The fish can be maintained at 7.5 to 8.0 pH and at least 150 ppm of carbonate hardness. A word of caution here: Once the acclimation process has begun, conversion back to sea water is not recommended because of the potential for ammonia spikes. Clear, clean well-aerated water and good filtration is needed to keep *C. v. variegatus* in peak condition.

The spawning group described in this article was part of a larger group seined in clear salt water, with a specific gravity of 1.016. The habitat contained isolated clumps of kelp and algae, but there was no significant plant matter at the shore. The substrate was a clean, light-colored sand. The location was a quiet lagoon near the mouth of Tampa Bay, where the bay empties into the Gulf of Mexico. The air temperature was in the mid-80s, the water temperature a few degrees cooler.

To prevent damage to females, a small breeding group of two males and three females were selected and housed in a 20-gallon long aquarium, acclimated to a specific gravity of 1.008 and a temperature of 76°F. The set-up was basic, consisting of only four small box filters set to a vigorous airflow. The sexes were isolated by a tank divider, and conditioned on live foods for a day prior to each spawning session. Although the wild fish voraciously attacked live foods, they readily took frozen and freeze-dried foods immediately after capture.

Sheepshead topminnow are known to spawn among aquatic plants. For this reason, I decided to try spawning them in yarn mops, trying different mop configurations to see which they liked best. The mops were made with dark green acrylic yarn, the most common material used for this purpose.



The yarn is wrapped 100 times or so around a 9 or 10 inch object (usually a book), then tied off on one end and the loops cut at the other. The tied end is draped over a small foam sphere and secured with a rubber band or a short length of yarn. The result is a yarn-covered float that makes the mop hang vertically from the surface, simulating strands of plant material. If the foam sphere is removed, the mop sinks to the bottom in a clump. The section from which the foam sphere is removed is now a loose ball of yarn with an empty center. One mop of each type was used in the initial spawning session.

The sexes were reunited and spawning displays and chases immediately began. The mops were removed after a day. No eggs were found in the floating mop, while 15 eggs were found in the sunken mop, all concentrated in the "ball" section, and jammed in the tight strands around the rubber band. Eggs deposited in this fashion are reminiscent of the behavior of crevice-spawning killifish species of the genus *Cubanichthys* and *Procatopus*, among others. Crevice spawning species characteristically place their eggs in the most inaccessible place they can find; if no suitable sites are available, they may refuse to spawn.

To test this observed preference, additional "sites" were provided by tying off the mop in sections along its length. The resulting mop had the original ball end, two tied off points along its length (designated K1 and K2 in the figure above), and a remaining section of free strands beyond the K1 tie that fanned out. This section is noted as "frill." After a day, the mop was picked and the following data was recorded:

location on mop	session 1	session 2
frill to K1	1	0
K1	16	18
between K1 and K2	6	8
K2	22	16
between K2 and ball	4	2
at or in ball	12	12
total eggs	61	56

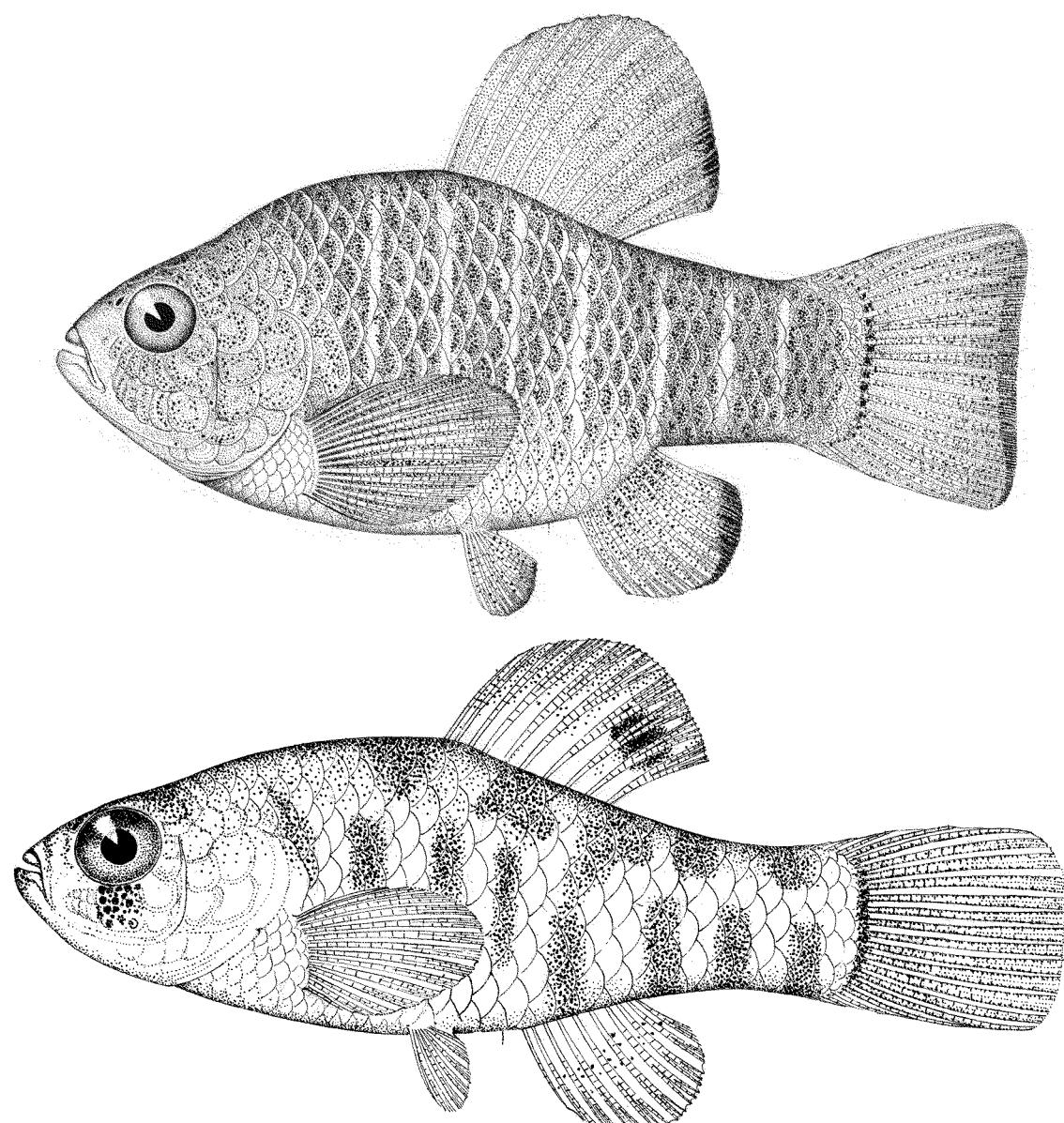
To confirm the initial results, the spawning session was repeated after the sexes were separated for a few days of rest and live food conditioning.

The data show a definite preference for depositing eggs in the tightest portions of the mop. It is inappropriate to read any significance into this observation other than an apparent preference under the artificial conditions of the aquarium. However, given artificial conditions, *C. v. variegatus* should provide a significantly greater number of eggs if such hiding sites are provided in the spawning media.

The eggs of the Tampa Bay population of *C. v. variegatus* are quite large, measuring about 1.5 mm. Although the surface of the eggs was somewhat opaque with scattered surface pigmentation, a beating heart and spine development was observed 72 hours after spawning, at a storage temperature of 78°F. At this temperature, all eggs hatched in 7-9 days. Typical of a plant-spawning killifish, an adhesive thread attached to the surface of the egg was also observed.

The eggs are firm and easily handled without damage. Incredibly, every one of the hundreds of eggs obtained from wild fish were fertile. Subsequent generations were nearly as fertile, with only the occasional egg being lost. Incubation can be as short as eight days or as many as 16 days, depending on the storage temperature. The fry are large and immediately take newly hatched brine shrimp. Within a week, most appropriately sized floating and sinking foods will be taken. Juveniles eat everything offered. Growth is fairly rapid, with sexual maturity at about six months.

Spawning through three generations did not appear to reduce fertility or brilliance of color, nor alter the behavior of this tough and beautiful killifish. Those who have access to wild *C. v. variegatus* are truly fortunate, but those who do not share in this bounty can nonetheless share in the experience of maintaining and propagating a true North American original, the sheepshead minnow. ➡



Two images of sheepshead minnow (*Cyprinodon variegatus*) from the files of the Smithsonian Institution, National Museum of Natural History, Division of Fishes. The top fish is an adult male, the bottom fish is a juvenile. Both illustrations are by A. H. Baldwin from specimens collected at St. George Island, Maryland. Thanks to Lisa Palmer for helping us get these images.