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Aspects of the Life History of the Blue Shiner, *Notropis Caeruleus*, in the
Conasauga River, Georgia



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ASPECTS OF THE LIFE HISTORY OF THE BLUE SHINER, *NOTROPIS CAERULEUS*, IN THE CONASAUGA RIVER, GEORGIA

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The historical distribution of the blue shiner, *Notropis caeruleus* (Jordan), includes streams of the upper Cahaba and Coosa river systems of the Mobile Bay drainage in Alabama, Georgia, and Tennessee (Smith-Vaniz, 1968). The species has been extirpated from much of its former range and may no longer exist in the Cahaba river system (Ramsey, 1984). Within its present range, *N. caeruleus* occurs in medium to large streams with cool, clear water and substrates of sand, gravel, and cobble (Gilbert et al., 1980). No life history studies have previously been published for the species. This report provides data on the reproduction and age and growth of *N. caeruleus*.

MATERIALS AND METHODS

Monthly samples were taken in the Conasauga River at Highway 2, 10.1 air km northeast of Cisco, Murray County, Georgia, from October 1982 to September 1983 with a 3.7 m long, 3.2 - mm mesh nylon seine. Fishes were fixed in 15% formalin and stored in 43% isopropanol. All specimens were deposited in the Auburn University fish collection.

Examinations of ovaries, testes, and nuptial tubercles; determinations of gonosomatic indices (GSI); and measurements of oocyte diameters were used to determine the reproductive cycle of *Notropis caeruleus*. Ovaries were removed from ten adult females each month. The ovaries and specimens were blotted dry and weighed to the nearest 0.001 g using an electronic single-pan balance. The GSI was calculated giving ovarian weight as a percentage of somatic weight of each specimen. Ten oocytes were selected at random from both ovaries of each female, and the diameters were measured to the nearest 0.05 mm using an ocular micrometer in a dissection microscope. Measurements were corrected for nonsphericity by averaging the largest and smallest dimensions of each oocyte.

Age and growth were determined by measuring all specimens from each monthly sample to the nearest 0.1 mm SL. Length frequency histograms were prepared by plotting the percentage frequency for each 1-mm size group per sample. A two-way ANOVA was used to determine if any significant dif-

ferences in SL existed between adult males and females.

RESULTS AND DISCUSSION

Mature male *Notropis caeruleus* developed nuptial tubercles and a lemon yellow coloration in the fins during the reproductive season; the body developed a metallic blue sheen, as well. Enlarged, opaque testes were first observed in February; tubercles first appeared in April and spawning coloration in May. Tuberculate males with enlarged testes and nuptial coloration were collected in June and July. In August testes were smaller and translucent, spawning colors faded, and nuptial tubercles of most males had regressed.

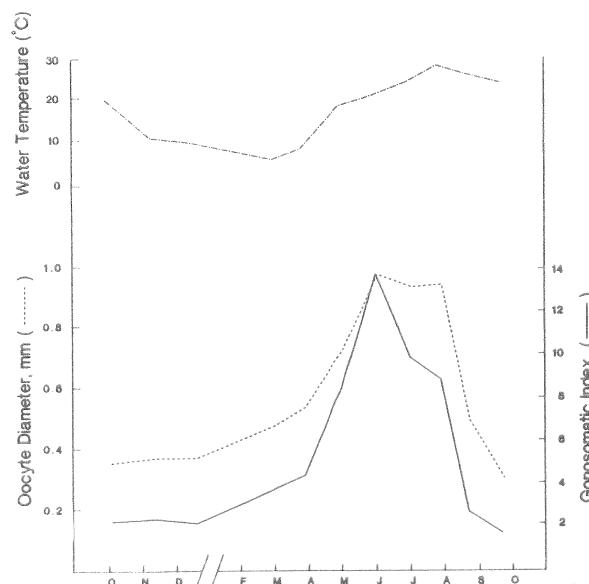


Figure 1. Mean diameters of largest oocytes and mean gonosomatic indices for *Notropis caeruleus* from the upper Conasauga River. River temperatures recorded with samples are also shown.

Tubercles and breeding colors were not observed in female *N. caeruleus*. Oocytes and ovaries exhibited marked changes in size throughout the study (Fig. 1). Both mean oocyte diameter and GSI values peaked in late May or early June, remained relatively high during June and July, and dropped in August, suggesting an early May – late August spawning period.

The occurrence of multiple clutches has been documented or may be assumed (as “fractional spawning”) for several members of the subgenus *Cyprinella* (Gale and Gale, 1977; Gale and Buynak, 1978; Wallace and Ramsey, 1981; Gale, 1986; Heins and Rabito, 1986) and is suspected to occur in at least one other (Cloutman and Harrell, 1987). This reproductive mode is a possibility for the blue shiner, based on a moderately extended spawning period and the occurrence of two distinct groups of developing eggs (larger, mature oocytes and smaller, developing oocytes) in the ovaries throughout this period (see Heins and Rabito, 1986).

Length-frequency analysis of *N. caeruleus* yielded well-defined size groups (Fig. 2). The lack of overlap between these size groups suggest that they represent distinct year classes. Growth was quite rapid during warmer months, espe-

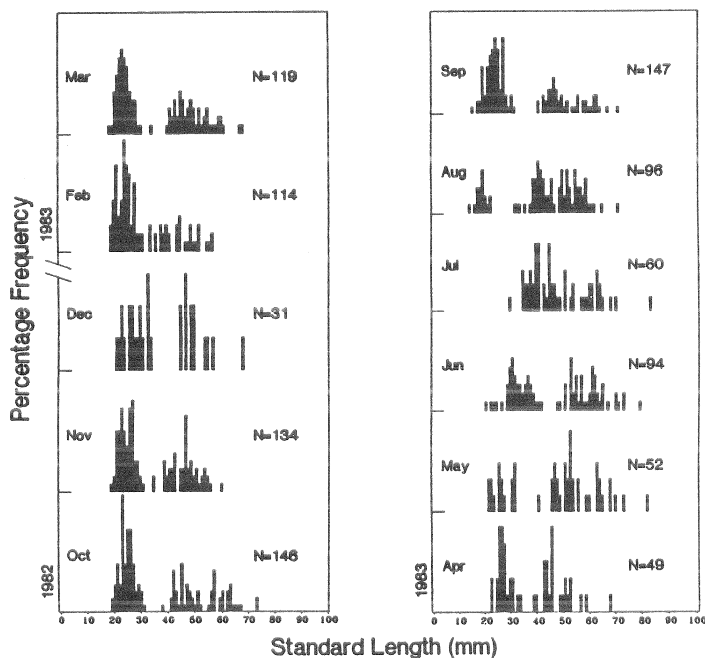


Figure 2. Length frequency distribution of *Notropis caeruleus* collected from the upper Conasauga River.

cially among young-of-year fish, but decreased markedly during the winter. Some age I individuals were large enough to reach sexual maturity and spawn (ca. 40–41 mm SL for males and females) before the end of the reproductive season, but most fish in spawning condition were age II and some might have been age III. There appeared to be considerable mortality among adults during August and September, possibly due to physiological exhaustion accompanying the spawning process. Similar “post-spawning” mortality has recently been observed in another southeastern cyprinid *N. lutipinnis* (Meffe et al., 1988).

With all data pooled, males were significantly larger than females ($F=21.51$, $P<0.001$). Maximum size among individuals collected during the study was 82.0 mm SL for males and 69.3 mm SL for females.

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