Research
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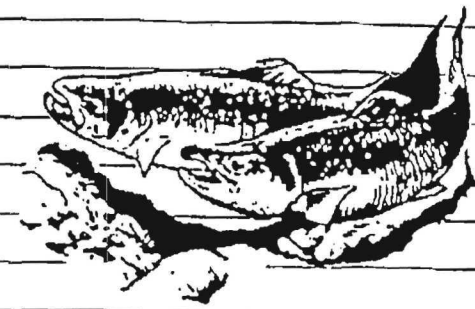

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Salinity Tolerance of Juvenile Gulf Sturgeon Identifies Habitat Limitations

The Southeastern Biological Science Center in Gainesville, Florida, is presently conducting a multiyear study of the life history, movement, food habits, and population structure of the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*) within the Suwannee River. Anadromous fishes have complex life histories. These fishes spend part of their lives in one osmotic medium and then shift to another medium as they grow or become reproductively active. The transition from one osmotic medium to another requires complex changes in a broad suite of physiological parameters, which are under endocrinal control. Although well studied in such groups as salmons and eels, little is known about the physiological mechanisms of transition in sturgeon.

Since the turn of the century, Gulf sturgeon have been present in reduced numbers within the Gulf Basin. This has been attributed primarily to overfishing and habitat degradation. The Suwannee River is presently considered to be the last stronghold of Gulf sturgeon in the Gulf of Mexico basin. All sturgeon spawn in freshwater rivers and, at some time, juveniles of most species migrate to the estuarine-marine system. It is unknown at what size or age sturgeon are first capable of making the transition from freshwater to seawater. The diversity of physiological responses to transition from freshwater to saltwater indicates the need for more research.

Acute Salinity Tolerance of Juvenile Sturgeon Tested

Juvenile sturgeon cultured in the laboratory were held in 132-L circular tanks with a flow-through freshwater system and fed a mixture of worms and commercially available food. Fish were measured to the nearest millimeter total length at the initiation of the experiment and every 10 days thereafter. Beginning at 5 days of age, single fish were placed in 0.5-L plastic containers at randomly assigned salinities. Sturgeon were tested every 10 days for 2 months. Total lengths varied from 8.9 mm at the beginning to 38.2 mm at the end of the study. Experimental treatments

were freshwater, 3 parts per thousand (ppt), 6 ppt, 9 ppt, 12 ppt, 18 ppt, 24 ppt, and 30 ppt, with 10 replicates per treatment. Survival was determined every 0.5 h for the first 6 h and every hour for the following 6 h; a final observation was made at 24 h. Deaths were recorded and surviving fish were placed in a separate tank. Each fish was used only once.

Salinity Tolerance Increases With Age of Fish

Five-day-old sturgeon tolerated salinities of 18 ppt for 1 h. Survival for 24 h in salinities as great as 9 ppt was 100%—no survival was observed from 12 ppt through 30 ppt. Sturgeon 55 days old were unable to tolerate salinities above 12 ppt for 24 h. Survival of sturgeon was 100% in salinities as great as 9 ppt, and 80% at a salinity of 12 ppt. Salinities in the Suwannee River estuary have varied from 0 to 30 ppt throughout the year. Few or no young sturgeon (less than 2 months old) would survive longer than 2 months if the estuarine portion of the river had salinities greater than 9 ppt.

Young sturgeon are initially observed in the estuary in fall. It is believed these fish may have been spawned the previous spring but are not exposed to varying osmotic conditions until they are older, larger, and better able to cope with changes in salinity. As we learn more about how gradual changes in salinity affect survival of young fish, as well as how acute changes affect larger fish, the closer we will be to fully understanding the marine segment of Gulf sturgeon life history.

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