

Reprinted from "Copeia" Volume 1959, number 4, 1959, pp. 343-344, Nichols: Extreme loss in body weight of an American shad (*Alosa sapidissima*). With permission from the American Society of Ichthyologists and Herpetologists.

EXTREME LOSS IN BODY WEIGHT OF AN AMERICAN SHAD (*ALOSA SAPIDISSIMA*).— American shad (*Alosa sapidissima*) native to streams north of Cape Hatteras, North Carolina, do not normally die after spawning; and, if they survive natural and fishing mortality, return to their native stream to spawn in subsequent years (Talbot and Sykes, *U. S. Fish and Wildlife Service Fishery Bull.* 58(142), 1958). Since they take little or no food from the time they enter the river, spawn, and return to the sea, they must subsist on the reserve energy accumulated in the form of fat and proteins.

Each spring shad enter the Connecticut River about the first week in April, and the run continues until mid-June. A dam at Holyoke, Massachusetts, 84 miles above the mouth, prevents migrating fish from passing this point. A mechanical fish-lift installed in 1955 passes several thousand shad each spring. Shad which spawn above this dam leave the spawning grounds by mid-July. The young hatched above the dam grow to four or five inches while in the river, then in fall, migrate to sea. Both adult and young on their downstream migration bypass the dam

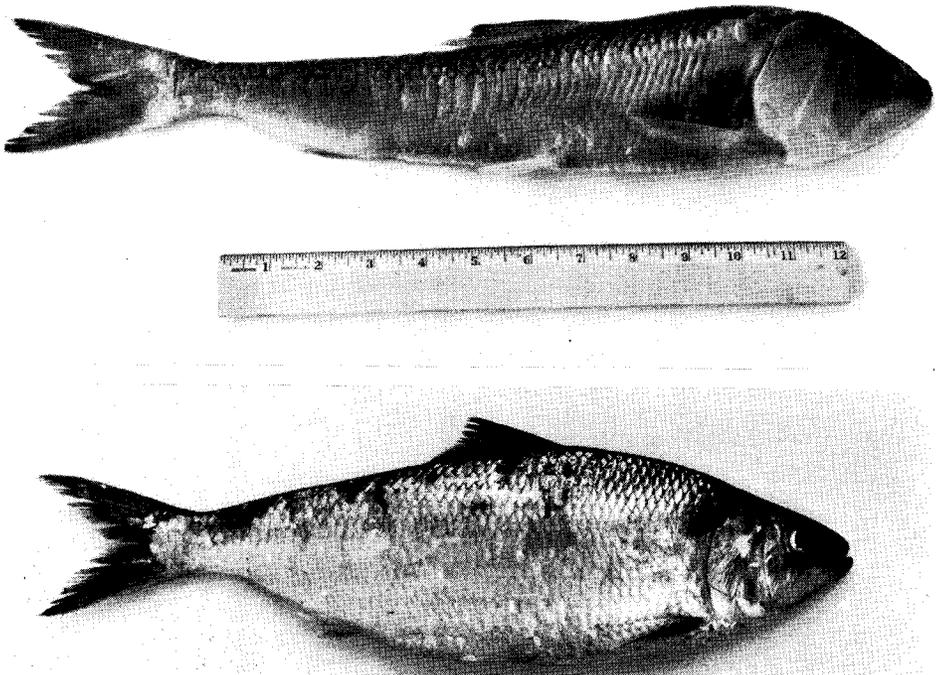


Fig. 1.—[upper] Preserved specimen of a four-year-old male American shad (*Alosa sapidissima*) from Connecticut River illustrating extreme loss in body weight after spawning and living a minimum of 120 days in fresh water; and [lower] Fresh specimen of a typical four-year-old male American shad (*Alosa sapidissima*) illustrating shad in pre-spawning condition.

through a canal system operated in conjunction with the dam.

In October, 1958, two adult shad were observed with the young in the canal system. Why or how these two adults were delayed in their downstream migration is unknown. One of these fish was captured during a mortality study conducted on downstream migrant juvenile shad. This adult fish was a four-year-old male which had spawned for the first time the previous spring (Fig. 1, upper). It weighed 1.0 pound and was 17.2 inches fork length. In contrast, the lower specimen is representative of a four-year-old male on its first spawning run. During the 1958 shad-fishing season the average weight and length of this age group in the Connecticut River was 3.2 pounds and 17.1 inches fork length, respectively.

It has been calculated that Atlantic salmon lose in body substance and in sex products discharged between 40 and 45 percent of their weight from the time they enter fresh water until they spawn. Death by starvation is known to occur in many animals when the loss in body

weight exceeds 40 percent (Curtis, *Life Story of the Fish*, 1949; Krivobock, *International Council for Exploration of the Sea*, No. 63, 1958) reported that three-year-old spring-spawning salaka's (Baltic herring) total loss of fat during the maturation of the sexual glands and the spawning amounted to 65.0 percent in 1956 and 52.4 percent in 1957.

The spawned-out adult male shad captured after spending a minimum of 120 days in fresh water had lost approximately 69 percent in body weight. Examination of the liver showed that it had atrophied to less than 20 percent normal size and was faded yellow in color. The stomach had shrunk to less than 5 percent normal size and was very hard. The gonads were very dark in color and hard-leathery in texture. Because of these morphological changes and loss in body weight, it is doubtful that this fish could have survived had it returned to the sea.—PAUL R. NICHOLS, *Bureau of Commercial Fisheries, U. S. Fish and Wildlife Service, Beaufort, North Carolina*.