NEST-BUILDING MINNOWS

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Adapted from "Male Minnows Build Spawning Nests, " The Illinois Natural History Survey Reports, November 1989, No. 291. Thanks to Clifford Zoller for sending it to AC.

With over 2,070 species, the minnow family (Cyprinidae) is the largest family of fishes in the world. The more than 220 species that occur in North America are often the most abundant fishes in streams and lakes. Very little is known about this group of ecologically important freshwater fishes.

A group of eastern North American minnows once called Awadosi, or stone-carriers, by the Indians of the Hudson Bay region is particularly interesting. These fishes, which are known as chubs today, are unique among North American minnows in that they build spawning nests in the gravel substrate of streams. The nest of the Fallfish (Semotilus corporalis), the largest species of nest-builder, can be six feet in diameter and three feet high, and contain several thousand stones. Nests are usually built by one male, who uses his mouth to carry stones to the nest, or excavate them from a pit.

Only about 8% of North American minnows build nests for spawning. Species of nest-builders are found in genera Luxilus, Campostoma, Semotilus, Nocomis, and Exoglossum.

With the exception of Exoglossum, nest-building minnows exhibit strong sexual dimorphism. Males are larger and more brightly colored than females and develop keratinized structures called breeding tubercles on the head, body, and fins. The largest breeding tubercles are found on the head and are extremely large in some species. Functions of breeding tubercles on the head are thought to include display, defense, and stimulation of females. Tubercles on the body and fins are thought to assist in holding, or maintaining contact with, females during spawning.

Three types of nest-building behavior have evolved in several groups of North American minnows: pit-building, pit-ridge-building, and mound-building. Striped Shiners (Luxilus chrysocephalus) [NOTE: traditionally known as Notropis chrysocephalus.--AC/Ed.] and Stonerollers (Campostoma anomalum), both common in Illinois, are examples of fishes that build simple pits in gravel areas for spawning. Small circular depressions are formed by males who dig into the substrate and push material aside with their snouts, and, in Stonerollers, remove small stones with their mouths. Males are aggressive and defend positions over pits. Females congregate nearby and enter the pits individually. Spawning occurs as one or more males converge

on a female in a pit. These species may spawn in association with each other or over the nests of other species of minnows.

The Creek Chub (Semotilus atromaculatus), one of the most common fish species in Illinois, spawns in pit-ridge nests constructed by males. Males excavate pits in gravel runs by removing stones with their mouths and piling them immediately upstream. Spawning occurs when a female enters the pit, and eggs are covered with substrate by the male, who then extends the pit downstream. Eventually the nest becomes a long ridge of gravel. Single male Creek Chubs build nests and guard them from intruders, especially conspecific males.

Such territoriality and the apparent shortage of suitable nest sites result in a complex social system and aggression among breeding males Challenges by similarly sized males result in complex displays called parallel swims. Smaller males that attempt to take over nests are driven away, often by a display of head tubercles by the resident male. Many males do not build their own nests, but instead act as satellites, waiting for opportunities to temporarily occupy the nests of territorial males and spawn.

Gravel mound nests are constructed by two groups of minnows: cutlips minnows* (Exoglossum) and chubs (Nocomis). Male chubs begin nest-construction by excavating a pit in gravel substrate of a stream. The pit is then covered with stones the male carries to the site in his mouth, and a large mound is constructed. Spawning occurs in small pits dug on top of the mound by the male. Nest-construction in cutlips minnows is similar except the nest is not started as a pit, and spawning occurs on the upstream slope of the mound rather than in pits dug by the male. Although males of all other nest-building minnows develop conspicuous breeding tubercles, male Exoglossum do not.

Little is known about the breeding behavior and social systems of nest-building minnows. Observations on several species of nest-builders are being made by the author in order to gain an understanding of various aspects of the behavior of these species. Special attention to the behavior of males is being made so that a comparative study of the social systems of nest-building species can be made.

Often the nests of minnows are used for spawning by other species of minnows. This habit, termed nest association, is especially common over the gravel-mound nests of Nocomis and Exoglossum. Research is underway to determine the nature of this relationship. Are nest associates parasites, or does the host derive some benefit from nest association. How did this behavior evolve? Through field observations and experimentation, a better understanding of nest-building, nest-association, and the interrelationships of the species involved will be gained. In addition, life-history information is being gathered on species

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of minnows whose habits are virtually unknown. Such information aids in the preservation of the biodiversity of natural systems.

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*Usual AC style is to capitalize species names. Exoglossum maxillingua is the Cutlips Minnow. In this case, however, the author appears to use the term to refer to the two species in the genus--E. maxillingua and E. laurae (Tonguetied Minnow). Therefore no capitals.