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A Need for Clarification of the Concept of Nest Building Among Cyprinid Minnows

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The complex reproductive behavior of constructing well-defined pebble or rock nests (i.e. pit, pit/ridge and pit/mound) by the overt movement of substrate material with the use of the jaws of adult male chubs before and after the spawning act is considered an advanced evolutionary trait (reference to *Nocomis*, Lachner and Jenkins, 1971). It is limited to the species of four North American cyprinid genera (*Campostoma*, *Exoglossum*, *Nocomis*, and *Semotilus*). Excluded from this concept are the behaviors of minnows that form depressions with their fins during the act of spawning, e.g. that of *Rhinichthys atratulus*; or, as described by Raney (1940), that of minnows that may rarely pick up small stones in their mouths before spawning, e.g. *Notropis cornutus*.

Because of the uniqueness of pebble nestbuilding behavior and consequently its evolutionary significance in Cyprinidae, misunderstanding leading to misinterpretation may result if authors fail to clearly define their meaning when referring to nest-building minnows. For example, from a translation on life history aspects of some Asian minnows by Nakamura (1969), Gosline (1978) reports "*Opsariichthys* and *Zacco* are nest-building cyprinids and in this respect, differ from most or all members of the cultrine stock." A thorough and precise translation of Nakamura (1969) failed to identify these fishes as nest builders. Actually, the English equivalent of nest is used only once (p. 242), but it is in reference to ovaries of ripe females rather than to spawning nests. There is a statement that might be construed as a reference to a use of a nest where breeding pairs of *Zacco temminckii* go to a "spawning spot." Fur-

ther, Nakamura describes the migration of adult *Opsariichthys uncirostris* from Lake Biwa upstream into tributaries where they move into shallows to spawn over gravel or sand. He says that a cone-shaped concavity is made in the substrate as a result of the spawning activity of *O. uncirostris*. The elongated anal fin of the male makes "gravel into a scoop" that receives fertilized eggs. This type of nest is comparable to the depressions made by *R. atratulus* during the spawning act and is substantially different from the pebble nest of North American nest-building cyprinids.

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