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Limits and phylogenetic relationships of East Asian fishes in the subfamily Oxygastrinae (Teleostei: Cypriniformes: Cyprinidae)

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Abstract

The cyprinid subfamily Oxygastrinae is composed of a diverse group of fishes that has been taxonomically and phylogenetically problematic. Their great variation in appearance, life histories, and trophic diversity resulted in uncertainty regarding their relationships, which led to their historical classification across many disparate subfamilies. The phylogenetic relationships of Oxygastrinae are resolved based on sequence data from four loci: cytochrome *b*, cytochrome *c* oxidase I, opsin, and recombination activating gene 1. A combined data matrix consisting of 4114 bp for 144 taxa was compiled and analyzed using maximum likelihood and parsimony optimality criteria. The subfamily Oxygastrinae is recovered as a monophyletic group that includes *Ancherythroculter*, *Aphyocypris*, *Candidia*, *Chanodichthys*, *Ctenopharyngodon*, *Culter*, *Distoechoodon*, *Elopichthys*, *Hainania*, *Hemiculter*, *Hemiculterella*, *Hemigrammocypripis*, *Hypophthalmichthys*, *Ischikauia*, *Macrochirichthys*, *Megalobrama*, *Metzia*, *Mylopharyngodon*, *Nicholsicypris*, *Nipponocypris*, *Ochetobius*, *Opsariichthys*, *Oxygaster*, *Parabramis*, *Parachela*, *Paralaubuca*, *Pararasbora*, *Parazacco*, *Plagiognathops*, *Pseudobrama*, *Pseudohe-miculter*, *Pseudolaubuca*, *Sinibrama*, *Squaliobarbus*, *Toxabramis*, *Xenocyprionoides*, *Xenocypris*, *Yaoshanicus*, and *Zacco*. Of these genera, the following were found to be monophyletic: *Aphyocypris*, *Distoechoodon*, *Hypophthalmichthys*, *Nipponocypris*, *Opsariichthys*, *Parachela*, *Paralaubuca*, *Plagiognathops*, *Xenocyprionoides*, and *Xenocypris*. The following genera were not monophyletic: *Metzia*, *Hemiculter*, *Toxabramis*, *Ancherythroculter*, *Chanodichthys*, *Culter*, *Megalobrama*. The remainder are either monotypic or were represented by only a single species. Four genera not examined in this study are provisionally classified in Oxygastrinae: *Anabarilius*, *Longiculter*, *Pogobrama*, and *Rasborichthys*.

Key words: Cypriniformes, Cyprinidae, Oxygastrinae, phylogeny, systematics, taxonomy