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Sexual dimorphism in species of *Schistura* (Teleostei: Nemacheilidae) from the Mae Khlong basin and peninsular Thailand

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Abstract

Sexually dimorphic characteristics are described for four species of *Schistura* from the Mae Khlong basin and peninsular Thailand. Males of *S. mahnerti* have a suborbital flap and rows of unculi on the upper surfaces of the pectoral-fin rays. Females of *S. mahnerti* have a suborbital groove. None of the morphological measurements differ significantly between males and females of *S. mahnerti*. In the other three species, *S. aurantiaca*, *S. cf. aurantiaca*, and *S. sexcauda*, all individuals lack the flap or groove, but most males have a conspicuous black blotch on the procurent rays of the upper lobe of the caudal fin, a feature absent in most females. Some morphometric characteristics vary between sexes of these species. Sexually dimorphic traits presumably have a function related to reproduction; however, little is known about reproduction in *Schistura*, and variation in morphology in relation to habitat or other environmental factors has not been studied.

Key words: loaches, suborbital flap, suborbital groove

Introduction

Sexually dimorphic characters are common in many animals including fishes. Ornamentations such as bright colors and tubercles develop on males of many species during the breeding season and are associated with reproductive behavior. Dimorphic traits can be affected by both sexual and natural selection (Lande 1980). Many experimental and theoretical studies on sexual selection have sought to understand the origin of male traits and the basis of their attraction to females during reproduction (Wiens 2001; Kitano *et al.* 2007; Aguirre & Akinpelu 2010). Sexual selection can lead to the evolution of ornamentations perceived as indicators of fitness to potential mates and competitors, but they may be reduced or lost through natural selection when associated costs significantly outweigh advantages (Casselman & Schulte-Hostedde 2004).

Schistura is a diverse genus of about 180 nemacheilid loach species broadly distributed in low-order streams in Southern and Southeastern Asia (Eschmeyer 2012). Sexually dimorphic traits have been reported for some species (e.g., Kottelat 1990; Freyhof & Serov 2001); however, many species lack obvious dimorphism, and interspecific variation in these traits has been used for taxonomic recognition of species that are, or almost are, otherwise morphologically indistinguishable (Kottelat 1990). This study reports new information on traits that vary between sexes in four species of *Schistura* indigenous to the Mae Khlong basin and peninsular Thailand, including one trait that is previously unreported as sexually dimorphic for any species of *Schistura* and which provides an easy and nonlethal method to discriminate sex in field studies.

Materials and methods

Schistura aurantiaca, *S. mahnerti*, and *S. sexcauda* were collected in first- to third-order tributaries in the Mae Khlong basin. *Schistura cf. aurantiaca* and *S. mahnerti* were collected in first- to third-order tributaries in the