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Discovery of the female of *Protohermes niger* Yang & Yang (Megaloptera: Corydalidae): Sexual dimorphism in coloration of a dobsonfly revealed by molecular evidence

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Abstract

In most species of Megaloptera, adult males and females have similar coloration. In this paper, we associate the adult female of a Chinese endemic dobsonfly species, *Protohermes niger* Yang & Yang, using molecular evidence from two mitochondrial genes (16S rRNA and COI). The body and wing coloration between the male and the female of *P. niger* exhibits distinct sexual dimorphism.

Key words: Sexual dimorphism, *Protohermes niger*, phylogenetic analysis, genetic distance

Introduction

The sexual dimorphism is present in many groups of animals, showing distinct variations in body size, shape, coloration, or certain non-genital structures between males and females of the same species. Recognizing sexual dimorphism is crucial for proper association of sexes. The order Megaloptera is a small group with ca. 380 known species in the world (Yang & Liu 2010). A number of megalopteran species exhibit remarkable sexual dimorphism including three genera of the subfamily Corydalinae (dobsonflies), i.e. *Acanthacorydalis* van der Weele, 1907, *Corydalus* Latreille, 1802, and *Platyneuromus* van der Weele, 1909. In *Acanthacorydalis* and *Corydalus* the male mandibles are enlarged and much longer than female mandibles (Contreras-Ramos 1998; Liu et al. 2005). In *Platyneuromus* the male head has a strongly expanded postocular region, which is much broader than that in female (Glorioso & Flint 1984). Also in the dobsonfly genus *Protohermes* van Weele, 1907, moderate sexual dimorphism has been reported in *P. latus* species group in which the male pronotum and forewing costa are larger than in the female (Liu et al. 2013). In the subfamily Chauliodinae (fishflies), sexual dimorphism is expressed in the antennal form of several genera from Asia and North America. In *Anachauliodes* Kimmins, 1954, *Neochauliodes* van der Weele, 1909, *Sinochauliodes* Liu & Yang, 2006, and *Nigronia fasciatus* (Walker, 1853), the male antennae are pectinate but subserrate in females (Yang & Liu 2010). In *Neohermes* Banks, 1908, males have antennae that are moniliform with long hairs but filiform and lacking long hairs in females (Flint 1965). Despite the above sexual dimorphism, the body and wing coloration are similar between males and females in almost all megalopteran species. Hitherto, only three species, i.e. *Protohermes spectabilis* Liu, Hayashi & Yang, 2008 from eastern Malaysia, *Protochauliodes kirramae* Theischinger, 1983 from Australia, and *Sialis versicoloris* Liu & Yang, 2006 (Sialidae) from China are known to be different in body or wing color between males and females (Liu et al. 2008; New & Theischinger 1993; Liu & Yang 2006).

Protohermes niger Yang & Yang, 1988 is a Chinese endemic dobsonfly species known only from southwestern Yunnan Province of China. This species belongs to the *P. costalis* species-group and can be distinguished from other group members by the dark pronotum and wings (Fig. 2) (Liu et al. 2007). Presently, this species is known only from the male adult and the female remains unassociated. Recently, males of *P. niger* were collected in

collection data labels suggest that adult activity of these sympatric *Protohermes* species overlap. It may be that to avoid interspecific hybridization, specific species-recognition signals such as chemical, sound, and coloration may be used. The darker wings of male *P. niger* may be one of these mechanisms to avoid hybridization among closely related *Protohermes* species of the region. To confirm this, species recognition mechanisms of these *Protohermes* species need to be examined in the future.

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