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Hormonal induction of males as a method for studying tropical cladocerans: description of males of four chydorid species (Cladocera: Anomopoda: Chydoridae)

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Abstract

Methyl farnesoate, a crustacean juvenile hormone, successfully induced male development in several littoral cladocerans from Thailand in short-term multispecies cultures. Male morphology is fully described in four species of Chydoridae—*Oxyurella singalensis* Daday, 1898, *Leberis diaphanus* (King, 1853), *Leydigia* cf. *ciliata* Gauthier, 1939, *Disparalona* cf. *hamata* (Birge, 1910). Males of the latter two taxa from Thailand differ from these from the other localities, suggesting the presence of sibling-species in the Indochina region.

Key words: cladocera, methyl farnesoate, male induction, short-term cultures, Chydoridae, Thailand

Introduction

Cladoceran species with similar parthenogenetic females can often be separated by male morphology (Belyaeva & Taylor 2008; Frey 1985, 1993; Kubersky 1977; Kotov 2008; Sinev 2009). Male characters are especially important in the families Bosminidae, Chydoridae, Macrotricidae, and in such important genera as *Daphnia* and *Diaphanosoma*.

But so far, males (and gamogenetic females as well) are not known in many species, especially in tropical members of benthic families Chydoridae, Macrothricidae and Ilyocryptidae. According to Smirnov (1996), males are unknown for 32 of 102 species of Chydorinae, and male morphology is not fully studied in about 15 more. Cyclic parthenogens in stable environments, including tropical waters, generally show reduced or undetectable investment in males and sexual females (Brooks 1957). In tropical benthic cladocera, rarity of males is combined with low population density due to a high level of fish predation (Dumont & Negrea 2002), and obtaining males requires intensive efforts of collectors and/or a degree of luck. Benthic cladocerans usually are scarce in collections by standard plankton nets, and special approach for collecting from sediment and macrophytes is necessary. Sorting of such detritus-filled samples is time-consuming and unattractive activity. Alternatively, males can be obtained in long-term cultures started from animals hatched from resting eggs in dried sediments (for detailed description of the method see Van Damme & Dumont, 2010).

Methyl farnesoate (MF), a crustacean juvenile hormone, has been shown to induce male formation during oocyte maturation in several species of *Daphnia* and *Bosmina* (Olmstead & LeBlanc 2002; Tatarozako *et al.* 2003; Kim *et al.* 2006). MF treatment did not induce appearance of gamogenetic females. No attempts to induce males with MF have been conducted so far in other genera of Cladocera. The aim of the present study was to test the possibility of using MF for male induction in tropical littoral cladocerans under conditions of short-term cultures, and to describe males obtained by this method.

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