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Description of the final stadium larvae of *Onychargia atrocyana* Selys, 1865 from Sarawak, identified using DNA barcoding (Odonata: Zygoptera: Platycnemididae), with an overview of larval characters in the Platycnemididae

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Abstract

The final stadium larva of *Onychargia atrocyana* Selys, 1865, is described and illustrated based on two female specimens collected at Gunung Mulu National Park, Sarawak, East Malaysia. The larvae were identified by matching the mitochondrial marker COI with that of known adult specimens from Gunung Mulu, Bintulu and Kuching in Sarawak and from Pahang state in West Malaysia. The specimens presented close matches with all adults in this gene. As *O. atrocyana* is a taxonomically isolated species with no close congeners in Borneo the determination is beyond doubt. *O. atrocyana* is the only member of the Onychargiinae for which the larva is known. It is compared with the known larvae of other platycnemidid subfamilies, and the possible significance of larval morphology in higher classification of the group is discussed.

Key words: Odonata, Zygoptera, *Onychargia atrocyana*, Platycnemididae, larval taxonomy, COI, DNA barcoding, Borneo, Sarawak

Introduction

The genus *Onychargia* Selys, 1865, presently includes two species occurring in tropical and subtropical Asia (Kosterin 2015). These are the widespread *O. atrocyana* Selys, 1865, and the closely related, sympatric *O. priydak* Kosterin, 2015, from eastern Cambodia. Previously the genus was believed by various authors to be related to the New World coenagrionid genus *Argia* Rambur, 1842, but recent molecular studies suggest it belongs in the Platycnemididae (Dijkstra *et al.* 2014). According to this view, together with the Madagascan endemic *Paracnemis alluaudi* Martin, 1902, it is placed in the subfamily Onychargiinae, which forms the sister group of all other Platycnemididae. Platycnemididae as recognized by Dijkstra *et al.* (2014) includes, as well as those groups traditionally placed there, also the former Old World representatives of the Protoneuridae (Disparoneurinae) as well as the Moluccan and New Guinean genus *Palaiargia* and its relatives, which are placed in the subfamily Idiocnemidinae.

Given its presently accepted phylogenetic position, it is of interest to know if *Onychargia* exhibits any unique morphological characters in the larva which support this placement, as has been demonstrated in certain platystictid subfamilies (Orr and Dow 2015), or if larval characters can otherwise shed light on its relationships. Furthermore, as *O. atrocyana* is a common insect and probably often retrieved in ecological samples, it is of practical importance that its larvae can be readily identified based on morphological inspection.

Onychargia atrocyana adults are found in a wide variety of shaded, swampy shallow, stagnant habitats from 0–1250 m throughout Southeast Asia (Lieftinck 1954). Where they occur, they are sometimes abundant, and it is perhaps surprising that the larva has hitherto gone unrecorded, but to date no larva of *Onychargia* species has been reared to adulthood. Therefore, the only realistic way to identify the larva is by using molecular methods. Such matching of larvae by DNA barcoding has previously been used to determine larvae of *Drepanosticta ?attala* Lieftinck, 1934 (Orr & Dow 2015).