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Description of two final stadium platystictid larvae from Borneo, including that of *Drepanosticta ?attala* Lieftinck, identified using DNA barcoding (Odonata: Zygoptera: Platystictidae)

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Abstract

The final stadium larva of *Drepanosticta ?attala* Lieftinck, is described and illustrated based on a single male specimen collected at Kuala Belalong Field Studies Centre, Brunei. The larva was identified by matching the mitochondrial marker COI with that of known adult specimens. The larva presented a good match with both *D. attala* and *D. barbatula* Lieftinck in this gene, but as adults of only the former species had been collected at the locality, it is presumed more likely to be that species. Another, unidentified platystictid larva, Platystictidae A, collected at the same general locality is also described. The two larvae show significant differences from each other and from *D. sundana* Krüger, the only other Oriental region member of the family for which larval morphology is known. The three species are also compared with the larvae of the Neotropical genus *Palaemnema*, which they closely resemble, despite being currently placed in different subfamilies. Based on this known material, Oriental and Neotropical forms differ significantly in details of mandibular morphology, especially the armature of the molar field.

Key words: Odonata, Zygoptera, *Drepanosticta attala*, *barbatula*, Platystictidae, larval taxonomy, COI, DNA barcoding, Borneo, Brunei

Introduction

The family Platystictidae includes more than 240 species of forest-dwelling damselflies occurring widely in the tropics of both Old and New Worlds (Schorr and Paulson 2015). They are absent from Africa, although an historical east African origin for the family has been hypothesized (van Tol *et al.* 2009). At present eight genera are recognized, grouped into four subfamilies (Dijkstra *et al.* 2014), namely Platystictinae from Ceylon and southern India, Sinostictinae from southern China, Palaemnematinae from Central and South America and Protostictinae from India to New Guinea. It has been noted that the ratio of species to genera within the family is very high (Dijkstra *et al.* 2014), due principally to the polytypy of the large Oriental genera *Protosticta* and *Drepanosticta* (van Tol *et al.* 2009), with the latter genus presently comprising 115 species found throughout the range of the subfamily. Members of the family show extraordinarily high levels of species-level endemism wherever they occur, presumably a result of low vagility and stenotopy associated with a requirement for persistent high humidity.

Platystictids are phylogenetically well removed from all other Zygoptera, forming the sister group to the entire suborder excluding the superfamily Lestoidea (Dijkstra *et al.* 2014), and this is reflected in their unique larva, characterized by having a squat, gomphid-like prementum (see e.g. Lieftinck 1934, Novelo-Gutiérrez and González-Soriano 1986). In the Oriental region particularly, larvae have proved very difficult to locate and to date only two have been discovered, both at Kuala Belalong in Brunei, despite an abundance of adults in lowland primary forest everywhere in Borneo. Lieftinck (1934) chanced upon a freshly emerged adult of *Drepanosticta sundana* (Krüger, 1898) in Java and was thus able to describe the identified exuvia, but it is certain that even if more larvae should be found they would be very difficult to breed in captivity. Therefore the only realistic way to identify larvae is by using molecular methods; indeed DNA barcoding (Ratnasingham & Hebert 2007) seems well suited to this task where good quality data is available for adults.