1st June 2015

Taxonomic and faunal notes on *Macromia* Rambur, 1842 from Cambodia (Odonata: Macromiidae)

Oleg E. Kosterin

Institute of Cytology & Genetics SB RAS, Acad. Lavrentyev ave. 10, Novosibirsk, 630090, Russia;
Novosibirsk State University, Pirogova str. 2, Novosibirsk, 630090, Russia;
<kosterin@bionet.nsc.ru>

Received 3rd August 2014; revised and accepted 10th March 2015

Abstract. Five species of *Macromia* were recently collected in Cambodia. For *Macromia aculeata*, this is the second finding of the species since its description in 1927. This species is very close to *Macromia arachnomima*, described from Borneo, but comparison of the respective holotypes proved them as different species. Records of *M. arachnomima* from Thailand, Laos, and the Malay Peninsula need to be reconsidered. The closely related species *Macromis cincta* and *Macromia cupricincta* have both been found in Cambodia; their diagnostic characters are discussed. *Macromia berlandi* is supposed to be a northern subspecies of *M. cupricincta*. Variation in *Macromia chaiyaphumensis* and *Macromia septima* is considered, and a female of the former is described. Controversies in grouping of Asian *Macromia* species are discussed. Notes on habitats and behaviour of the species considered are briefly provided.

Key words. Dragonfly, Anisoptera, synonymy, *Macromia aculeata, Macromia arachnomima, Macromia cincta*

Introduction

Cambodia still harbours some of the largest expanses of tropical forest in the Indo-Malayan Ecoregion, sometimes retaining the full sequence of forest types from mangroves and/or lowland evergreen forest to short upland forest. However, its Odonata fauna is still insufficiently studied (Kosterin et al. 2012a). Between 2010 and 2014, I made five 2–3-week trips to Cambodia with the goal to fill this gap in our knowledge (Kosterin 2010, 2011, 2012a, b, 2014a, b; Kosterin et al. 2012a, b). The trips of 2011, 2013, and 2014 were undertaken during the rainy season and yielded 12 specimens of five species of the genus *Macromia* Rambur, 1842, none of which had been

reported for Cambodia before. Most species of this genus are usually scarce and elusive, so this is rather a good result. Studying this collection involved problems as to diagnostic characters and taxonomical relationships of some species concerning much wider geographical scope beyond Cambodia, which are discussed in this paper.

Material and methods

Abbreviations: BMNH – Natural History Museum, London, United Kingdom; MNHN – Muséum national d'Histoire naturelle in Paris, France; MZH – Finnish Museum of Natural History, University of Helsinki, Helsinki, Finland; RMNH – Naturalis Biodiversity Center, Leiden, the Netherlands.

Observations were made during odonatological trips to Cambodia on 12–28-viii-2011, 22-v–07-vi-2013, and 01–18-vi-2014. Specimens were collected with a net and are kept partly in RMNH, partly with the author.

Specimens were photographed in colour in the field using an Olympus Camedia C8080 camera. Illustrations of morphological details of the Cambodian specimens were prepared from serial photographs obtained via a Zeiss Stemi 2000-C stereomicroscope with a Canon PowerShot A640 digital camera at the Institute of Cytology and Genetics of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk. Images with broad focus zones were obtained from serial photos with shifted focus using the program Helicon Focus 5.3 (http://www.photo-soft.ru/heliconfocus.html). Photographs of the holotypes of *Macromia aculeata* Fraser, 1927 and *Macromia cupricincta* Fraser, 1924 from BMNH were kindly provided by Benjamin Price, and photographs of the holotype of *M. arachnomima* Lieftinck, 1953 and of a male of an undescribed *Macromia* species from RMNH by Rory A. Dow.

Localities are mentioned in the text below by nicknames (underlined). For localities No. 1–3, 5, and 7 the local names (if any) were unavailable and they were conventionally named after dragonflies recorded at them for the

first time for Cambodia (Kosterin 2011, 2012a, 2014a). The explanations of the nicknames are as follows:

1. Macromia Rivulet: Koh Kong Province, 17 km ENE of Koh Kong, a forest rivulet with a half-open reach up to ca 1.5 m deep with sandy bottom (Kosterin 2012a: Fig. 59b). 11°40'17"N, 103°07'28-29"E, 294–296 m a.s.l.; 16-viii-2011; 23-v-2013.
2. Capricornis Rivulet: Koh Kong Province, 25.5 km ENE of Koh Kong. 11°42'31"N, 103°11'55"E, 306 m a.s.l.; 14-viii-2011.
3. Microgomphus River: Koh Kong Province, 6.5 km SW of Thma Bang, a medium-sized river flowing among forested hills and plantations, a slow and shallow reach with sandy bottom, at the bridge (Kosterin 2010: Fig. 23, left; Kosterin 2012a: Fig. 25). 11°38'44"N, 103°23'48"E, 340 m a.s.l.; 24-v-2013.
4. O'Sieng Lei: Ratanakiri Province, 19 km SE of Ban Lung, a slow reach of a medium-sized river upstream of the O'Sieng Lei (O'Seng Eall, O Sin Laer) Waterfalls, knee-, locally to waist-deep, with banks overgrown with bamboo. 13°35'38–40"N, 107°05'09–19"E, 181–185 m a.s.l.; 02-vi-2013.
5. Asahinai brook: Ratanakiri Province, near Lake Yak Lom, 3 km ENE of Ban Lung, downstream of the road: fast, with stony bed and some slower pools with growth of *Ludwigia* and *Marsilea*, partly shaded by trees, bordered by bush/herb thickets and small plantations. 13°44'17–20"N, 107°00'56"–01'01"E; 06-vi-2013.
6. O'Tamol Meik: Ratanakiri Province, lower reaches of the O'Tamol Meik rivulet, temporarily dried out to two separate pools in a clayey gully in the streambed. 14°09'46"N, 107°13'56"E, 124 m a.s.l.; 05-vi-2013.
7. Loringae brook: Mondulkiri Province, a brook downstream of Buu Sra Waterfall, being the left tributary of the main river, small shady forest brook with variable current downstream of a waterfall of its own. 12°34'01–19"N, 107°24'50"–25'03"E, 416–490 m a.s.l.; 12-vi-2014.

All specimens from Cambodia discussed in this study were collected by the author (OEK).

Macromia species recorded in Cambodia, with taxonomical remarks and notes on habitats

Macromia aculeata Fraser, 1927

(Figs 1a–d, 2a, b, 3a, b)

Selected references:
Macromia aculeata, sp. nov. – Fraser (1927): 68 f. (original description; holotype ♂ by monotypy, in BMNH; type locality: »Maymyo, Upper Burma«, presently Pyin Oo Lwin, Mandalay Region, Myanmar); *Macromia aculeata* Fraser - Fraser (1936): 163, 183 f., fig. 60d (key to species, redescription, drawing of male secondary genitalia); *Macromia aculeata* Fraser, 1927 – Kosterin (2014a): 1, 13, 23 (report for O'Sieng Lei River, Ratanakiri Province, Cambodia, without further remarks)

Material studied

Holotype ♂. »Maymyo, / Upper / Burma, / 25.V.25./ Coll. F. Wall«, BMNH (by photos) (Figs 1a–b); 1♂, Cambodia, O'Sieng Lei, 02-vi-2013 (Figs 1c–d).

Remarks

The Cambodian male (Figs 1c–d, 2b, 3b) was found to be very close to *M. aculeata* as described on the basis of one male from »Maymyo, Upper Burma« (presently Pyin Oo Lwin, Myanmar) (Fraser 1927) and to *M. arachnomima* Lieftinck, 1953 as also described on the basis of one male reared *ex larv*a from southern Borneo, Sampit District, Pemantang (Lieftinck 1953). It was compared to the original descriptions and photos of the holotype of *M. aculeata* in BMNH (Figs 1a–b, 2a, 3a) and those of *M. arachnomima* in RMNH (Figs 1e, 2c, 3c). The characters of the Cambodian male and of both above mentioned holotypes (and also of the related *M. katae* Wilson, 1993) are summarised in Table 1. While most of the characters of *M. aculeata* and *M. arachnomima* are in common, the most important differences are the outline of the hind margin of the genital lobe, which is angled in *aculeata* and smooth in *arachnomima* (Fig. 2), the relatively shorter cercus in *arachnomima* (Fig. 3), and the much more extensive abdominal yellow pattern in *aculeata* (Fig. 1). Based on these diagnostic characters, the Cambodian specimen (Figs 1c–d, 2b, 3b) was identified as *M. aculeata*.

Some notes as to the earlier published drawings and descriptions of the holotypes involved are necessary. Fraser's (1936: fig. 60d) outline of the secondary genitalia of the holotype of *M. aculeata* is somewhat inaccurate:

the posterior hamulus and genital lobe are shown in a more slanted position while they are actually more erect (Fig. 2a). Lieftinck (1953: 339, figs 4–5) described and illustrated a peculiar feature of the holotype of *M. arachnomima*: »The 9th segment exhibits a peculiar abnormality, where the upper part of the tergite is considerably shortened, the posterior border of its middle appearing crumpled up and folded over so much as to form a spinulose ruff that nearly meets the hind margin of the preceding segment. By this shortening of the dorsal portion, the whole 9th segment has become a seemingly distorted, wedge-shaped appearance when viewed laterally, the terminal segment with appendages forming accordingly an obtuse angle with the previous segment«. Lieftinck made no hints on any taxonomical value of this S9 feature; however Orr (2005) later claimed it to be diagnostic for the species. In fact, this should be considered an acquired individual deformity resulting from S9 being crumpled in the holotype, which was reared *ex larva* in captivity and probably had some problem during eclosion.

While no additional specimen of *M. aculeata* beyond the holotype has been reported so far, there are a number of reports of *M. arachnomima*: from peninsular Malaysia (Lieftinck 1971; Muraki 2010), peninsular Thailand, Trang Province (Kitagawa & Ichii 1999; Muraki 2007, 2010, 2014), western Thailand, Kanchanaburi Province (Hämäläinen 2002) and Laos (Yokoi 2003; Sasamoto at al. 2011; Muraki 2010). However, there are some doubts about whether all those specimens are actually conspecific with *M. arachnomima*, especially since *M. aculeata* was found in north-eastern Cambodia.

Until present, no other male specimens of *M. arachnomimia* have been reported from Borneo. Lieftinck (1971) reported the second male of "*M. arachnomima*" from the Plus River area, Sungai Choir, Central Perak, Peninsular Malaysia (Figs 2d, 3d). This specimen (in RMNH) has the characters of *M. arachnomima* (Tab. 1, Fig. 2d), but R.A. Dow (pers. comm.) pointed out its much shorter epiproct (about 110 % of the cerci length, see Fig. 3d) than in the holotype. This strong structural difference suggests that this specimen might represent an undescribed continental species closely allied to *M. arachnomima* and confined to Borneo. However, in a paper devoted to *Macromia* in Thailand, Muraki (2014) published photos of *M. arachnomima*, including a male with the appendages exactly as in the holotype of *M. arachnomima* (Muraki 2014: figs 65, 67–73). The prove-

nance of the specimens was not indicated in that paper but A. Muraki (pers. comm.) kindly informed me that these photos were made from specimens from Taiping, Perak, Malaysia (see Muraki 2010). He also informed me that the specimen of *M. arachnomima* from Trang Province in Thailand was nearly identical with only very slight differences in maculation. Hence, the true *M. arachnomima* does occur in the state of Perak and ranges throughout the Malay Peninsula (see Kitagawa & Ichii 1999; Muraki 2007). Apparently, Lieftinck's specimen from central Perak represents some aberration or extreme case of individual variation of the epiproct length.

In addition, Muraki (2007, 2010, 2014) reported another, unfortunately still undescribed species from his "*arachnomima*-group", allied but surely not conspecific with *M. aculeata* and *M. arachmomima*. It was variably referred to as "*Macromia* sp." in Muraki (2007) and "*Macromia* sp.2" in Muraki (2014). The morphological details of this species are depicted in Muraki (2007: figs 12–13, 2014: figs 74–82). Unlike in both *M. aculeata* and *M. arachmomima*, the posterior hamulus is thick, short, straight, and has no apical hook; the dorsal spine on S10 is thick and blunt; the cerci are almost as long as the epiproct; the posterior margin of the genital lobe is angled as in *M. aculeata*. This species is known by specimens collected at Chiang Dao, north Thailand, at a waterfall west of Vientiane, Laos, and at two other unspecified localities in Laos (Muraki 2007, 2010).

Since neither specimens nor illustrations of diagnostic features are available for other records from Thailand nor Laos, their true identity remain unclear.

The specimen from north-eastern Cambodia considered in this paper was obtained 1,400 km southeast of Maymyo, the type locality of *M. aculeata*. The Laotian records of an unidentified *Macromia* from Van Vieng (Yokoi & Mitamura 1995), referred to by the authors as "*Macromia* sp2" and not to be confused with sp.2 by Muraki 2014, and "*M. arachnomima*" (Yokoi 2003; Sasamoto et al. 2011) may also belong to *M. aculeata* since the Laotian localities are situated ca 400–900 km north-west of the collecting site in Cambodia and 700–1,000 km east to south-east of Maymyo.

The records of "*M. arachnomima*" from western Thailand (Lang Khnom Gnu and Nang Kroan, Kanchanaburi Province; Hämäläinen 2002) might actually refer to either *M. arachnomima* or *M. aculeata* since these sites are situated at the same distance of ca 800 km from both Trang and Maymyo.

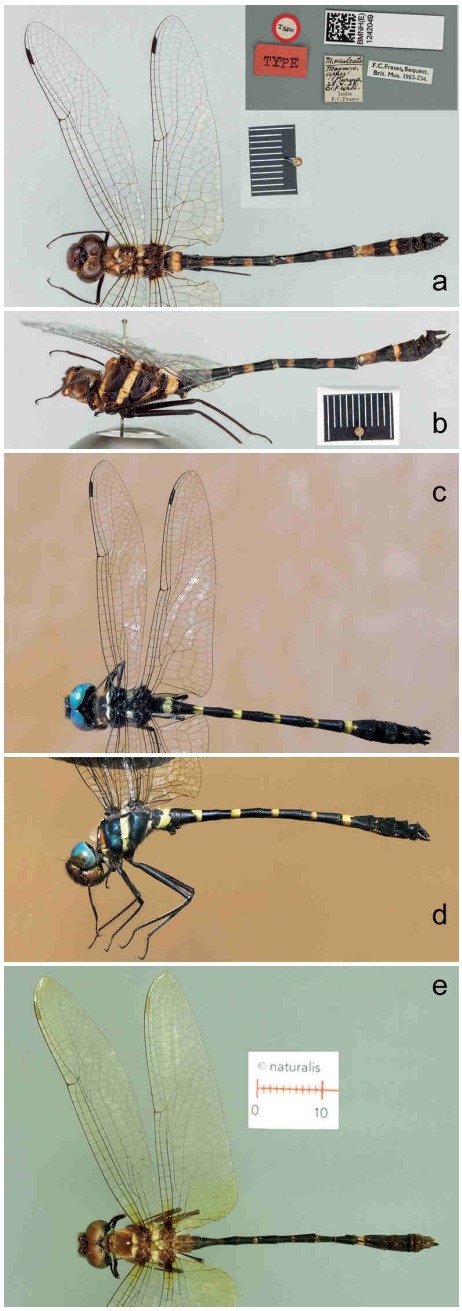

Figure 1. General habitus of males of *Macromia aculeata* (a–d) and *M. arachnomima* (e): a–b – holotype of *M. aculeata* from "Maymyo, Upper Burma", 25-v-1925 and its labels, BMNH (photo: B. Price); c–d – the male of *M. aculeata* from Cambodia, Ratanakiri Province, O'Sieng Lei River, 02-vi-2013, O. Kosterin leg. (photos: OEK); e – holotype of *M. arachnomima*, southern Borneo, Sampit District, Pemantang, emerged 02 to 03-ix-1953, RMNH (photo: Rory A. Dow); a, c, e – dorsal view; b, d – lateral view (not to precise scale).