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A NEW SPECIES OF *NABALUA* (HEMIPTERA: CICADIDAE) FROM MOUNT KINABALU, BORNEO

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Abstract – The cicada *Nabalua gogalai* sp. nov. (Hemiptera: Cicadidae) from Mount Kinabalu, Borneo, Malaysia, is described as new to science. Pictures of the male body in dorsal and ventral view are provided together with drawings of the male genitalia and the male opercula.

KEY WORDS: Cicadidae, *Nabalua gogalai*, new species, morphology, Borneo, Malaysia

Izvleček – NOVA VRSTA IZ RODU *NABALUA* (HEMIPTERA: CICADIDAE) Z GORE MOUNT KINABALU NA BORNEU

Opisana je nova vrsta škržada *Nabalua gogalai* sp. nov. (Hemiptera: Cicadidae) z gore Mount Kinabalu, Borneo, Malezija. Poleg fotografije holotipa samca podajava tudi risbe dorzalnega in ventralnega pogleda telesa samca ter samčevih genitalij in operkula.

KLJUČNE BESEDE: Cicadidae, *Nabalua gogalai*, nova vrsta, morfologija, Borneo, Malezija

Introduction

Since about 1995 scientists from Malaysia, Slovenia and the Netherlands, their students and some others are cooperating in the study of the singing cicadas (Hemiptera, Cicadidae) of Malaysia (Duffels & Zaidi 2000, Duffels & Trilar 2012, Gogala & Riede 1995, Gogala & Trilar 2007, Gogala et al. 2004, Kos & Gogala 2000, Prešern et al. 2004, Trilar 2006, Trilar & Gogala 2002, 2004). In the years 1996, 1999 and 2003 the first author investigated the cicadas of Mount Kinabalu by

hand collecting, collecting on light and bioacoustics. In 1996 and 1999 he collected a new species of the genus *Nabalua*, which is described here.

Material and methods

In the periods from June 26th to 29th and July 2nd, 1996, in April 9th to 14th and 17th to 19th, 1999, and in March 8th to 13th and April 2nd to 4th, 2003 the first author visited Kinabalu National Park. During the night we were checking the lights in the headquarter area. All the collected males of cicadas were put in a cage mounted on the branch of a leafy tree, hoping that the cicadas would start singing provoked by the cicadas singing in the neighbourhood forest.

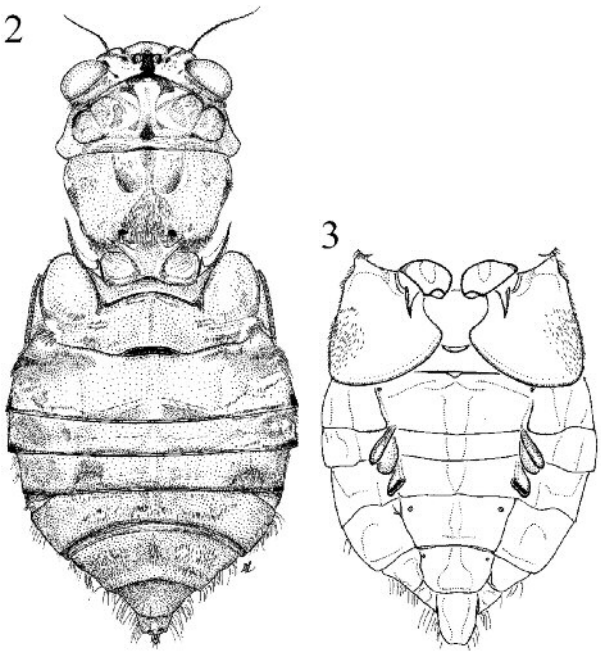
The most interesting specimens collected on light in the Kinabalu National Park Headquarters were three males of a new *Nabalua* collected on respectively 29.vi.1996, 11.iv.1999 and 14.iv.1999. Unfortunately these cicadas did not sing in the cage.

Taxonomy

In 1923, Moulton published an excellent overview of the cicadas of so-called Malaysia that comprised the Malay Peninsula, Java, Borneo and Sumatra. In this publication Moulton erected the new genus *Nabalua* for two species: *N. mascula* (Distant, 1889) and the new species *N. neglecta,* both from northern Borneo. In a more recent revision of *Nabalua* Duffels (2004) added four new species to the genus: *N. borneensis* and *N. maculata* from Borneo, *N. zaidii* from the Malayan Peninsula and *N. sumatrana* from Sumatra. A supposed apomorphy for these species of *Nabalua* is the presence of three (or four) pairs of tubercles on the ventral side of the male abdomen, viz., one pair of long and narrow tubercles on sternite 3 and two or three pairs of short and thick tubercles on sternites 4 and 5 (and 6) (Duffels, 2004). These characters are also found in the new species *N. gogalai*.

Initially we have hesitated in attributing this new species to *Nabalua* since the males of this species have some peculiar features that are not found in other *Nabalua* species, viz., a very broad male abdomen, a brownish, instead of black marking of

Fig. 1: *Nabalua gogalai,* male holotype.



Figs. 2-3: *Nabalua gogalai,* male holotype. – 2, body in dorsal view; 3, body in ventral view.

lines and spots on head, thorax and abdomen and a distinct marking on the basal veins of the 2nd, 3rd, 4th, 5th and 7th apical areas of the tegmina. Nevertheless, we think that the tubercles on the sternites of the abdominal segments 3-5 of *N. gogalai* provide a convincing apomorphy for the allocation of this species in *Nabalua*.

***Nabalua gogalai* Duffels & Trilar n. sp.**

Holotype male: 'Malaysia, Sabah'/ Kinabalu Nat. park / Park headquarters / 11.iv.1999, Trilar leg. **Paratypes:** same data as the holotype but with different date: 14.iv.1999, 1 male; Malaysia, Sabah: Kinabalu Nat. Park, Park Headquarters, 1500 m, 29.vi.1996, T. Trilar, K. Prosenc leg., 1 male.

Description of the male

Markings on head, pronotum and mesonotum light brown but some parts darker brown.

Head (Fig. 2). Vertex with trefoil shaped median marking enclosing the ocelli that is anteriorly broadly connected with the frontoclypeal suture. A pair of curved, dark brownish, semicircular fasciae reach from half-length of vertex to the vertex lobes. Inner margin of eye black with a recurved posterior end. Genae with black, transverse fascia reaching from postclypeus to half or two thirds of width of gena. Anterior and ventral parts of postclypeus with two series of 7-8 transverse brown streaks, medial ends of these streaks connected by a brown line.

Thorax (Fig. 2). Pronotum with very narrow to narrow central fasciae that widen strongly to the anterior margin of the pronotum. Posterior ends of central fasciae fused in a distinct darker brown spot in front of the pronotum collar. Pronotum collar light brown to black-brown, its posterior margin black. One paratype with very narrow dark brown streaks above anterior oblique fissures. Areas between ambient fissure and posterior oblique fissures and between posterior and anterior oblique fissures dark coloured.

Mesonotum (Fig. 2) light brown to brown with a narrow and vague median fascia, a pair of sharply delimited, slightly diverging, dark brown paramedian fasciae reaching to about half length of mesonotum, some yellowish colouring along outerside of paramedian fasciae and a pair of dark brown dots in front of anterior angles of cruciform elevation. Lateral fasciae indistinct.

Legs. Fore femur with an appressed spine at half length of underridge and a triangular spine close to the distal end. Outer side of fore femur with brown marking and with deep black spot distally of the triangular spine. Middle and hind femora with two long brownish lines. Apical part of tarsi of fore and middle legs dark brown.

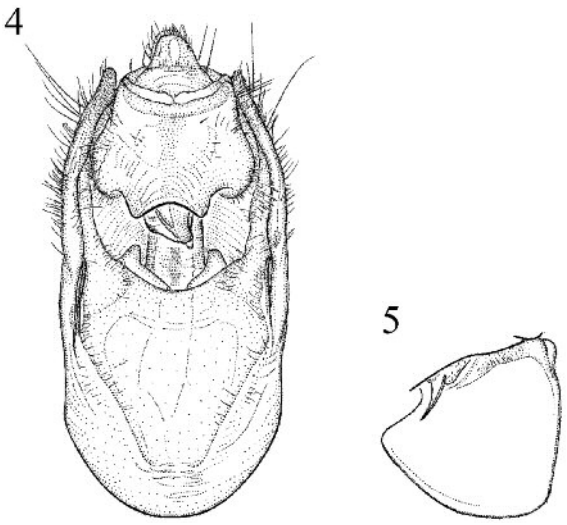
Operculum (Fig. 5) triangular with rounded right-angled laterodistal corner reaching to one third or one fourth of length of abdominal segment 3. Operculum 0.94–1.02 times as long as wide. Shortest distance between opercula 0.21–0.31 times as wide as operculum. Lateral margin very weakly undulate, distal margin fairly convex, medial margin rounded. Operculum without black-brown margin as found in other species of *Nabalua*.

Tegmina with brown spots on basal veins of 2nd, 3rd, 4th, 5th and 7th apical areas and with smaller, lighter brown spots at the apices of the longitudinal veins of all apical areas.

Abdomen (Fig. 3) very broad. The abdomen of the two paratypes are in natural position, with tergite 4 1.6 times as broad as width of head. The ventral side of the abdomen of the holotype is weakly incurved probably due to pressure from below on the abdomen during and after mounting. The abdomen of the holotype is therefore slightly more widened than the abdomen of the paratypes, with tergite 4 1.7 times as broad as width of head.

Tergites 2–7 shining brown, tergites 6–7 somewhat darker than other tergites. Timbal coverings ochraceous to light brownish with weakly convex or weakly undulate lateral margin, a weakly convex medial margin and a broadly rounded apical margin. Tergites 3–6 with a pair of sublateral brown patches enclosed by silvery or golden pilosity. Middle parts of posterior margins of all tergites with a narrow black-brown line. Sternites brown with exception of lateral parts of sternite 3 and medial parts of sternites 4 and 5. Sternites of abdominal segments 3, 4 and 5 with a pair of brown to dark brown tubercles. Tubercles on segment 3 long and narrow and attached to posterolateral corner of the sternite, those on segments 4 and 5 are short and thick and attached to two-thirds of lateral sternite margin.

Genitalia (Fig. 4). Lateral lobes of pygofer very slightly protruding, apical part of lobes black-brown. Uncus very broad, lateraly convex and subapically narrowing to the broad apex.



Figs. 4-5: *Nabalua gogalai,* male holotype. – 4, male genitalia in ventral view; 5, male opercula in ventral view.

Measurements in mm (n=3). Body length: 27.5–29.4; tegmen length: 38.2–40.7; head width: 8.0–8.6; pronotum width: 8.3–9.5; head width : pronotum width 0.90–0.96.

Ecology. All three specimens were collected in the Kinabalu Park Headquarter area. Two were collected on light, and the third one was sitting during the day on the leaf of a wild banana tree in the forest understorey and collected with an entomological net.

The Kinabalu Park Headquarter is located in the Lower Mountain Vegetation Zone which is covered with forest dominated by species of oaks (Fagaceae), conifers (especially *Dacrycarpus* and *Phyllocladus*) and the myrtle (Myrtaceae) and tea (Theaceae) families. These trees reach a height of 25-30 m. The temperature in this area is in average between 24°C to 18°C.

Etymology. This species is dedicated to our esteemed colleague and friend Matija Gogala at the occasion of his 80th birthday.

Bioacoustics. All three *N. gogalai* males collected were put in a cage mounted on a branch of a leafy tree, hoping that it will start singing provoked by the wild cicadas singing in the neighbourhood. We had success with some other species but not with *N. gogalai*, so we do not know how the species is singing.

Biogeography. The new species has been collected on Mount Kinabalu, like four other species of the genus that are all restricted to higher localities in northern Borneo like Mt Kinabalu and Mt Dullit. One species of *Nabalua* seems to be endemic to the Cameron Highlands in the Malayan Peninsula and one species is only known from one locality in North Sumatra.

The holotype is deposited in the Slovenian Museum of Natural History, Ljubljana, Slovenia; both paratypes are deposited in the Centre for Insect Systematics of the Universiti Kebangsaan Malaysia (UKM), Bangi, Malaysia.

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