



Naturalis Repository

Identification and distribution of *Indaeschna baluga* (Odonata: Aeshnidae)

Quinn R. Adamson, Kennedy A. Ginn, Olivea N. Fisher, Karin Verspui & Vincent J. Kalkman

Downloaded from

<https://doi.org/10.60024/odon.v54i1-2.a5>

Article 25fa Dutch Copyright Act (DCA) - End User Rights

This publication is distributed under the terms of Article 25fa of the Dutch Copyright Act (Auteurswet) with consent from the author. Dutch law entitles the maker of a short scientific work funded either wholly or partially by Dutch public funds to make that work publicly available following a reasonable period after the work was first published, provided that reference is made to the source of the first publication of the work.

This publication is distributed under the Naturalis Biodiversity Center 'Taverne implementation' programme. In this programme, research output of Naturalis researchers and collection managers that complies with the legal requirements of Article 25fa of the Dutch Copyright Act is distributed online and free of barriers in the Naturalis institutional repository. Research output is distributed six months after its first online publication in the original published version and with proper attribution to the source of the original publication.

You are permitted to download and use the publication for personal purposes. All rights remain with the author(s) and copyrights owner(s) of this work. Any use of the publication other than authorized under this license or copyright law is prohibited.

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the department of Collection Information know, stating your reasons. In case of a legitimate complaint, Collection Information will make the material inaccessible. Please contact us through email: collectie.informatie@naturalis.nl. We will contact you as soon as possible.

Identification and distribution of *Indaeschna baluga* (Odonata: Aeshnidae)

Quinn R. Adamson¹, Kennedy A. Ginn¹, Olivea N. Fisher¹,
Karin Verspui² & Vincent J. Kalkman²

¹Department of Biology, Brigham Young University, Provo, UT, 84602, USA;
quinnadamson05@gmail.com, kennedyginn6@gmail.com,
oliveafisher29@gmail.com

²Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands;
karin.verspui@gmail.com, vincent.kalkman@naturalis.nl

Received 22nd October 2024; revised and accepted 19th March 2025

Abstract. *Indaeschna baluga* was described by NEEDHAM & GYGER (1937) based on a male specimen collected from Mount Banahaw, Luzon, the Philippines. We show that the characters mentioned in the original description of *I. baluga* do not allow separation from the widespread *Indaeschna grubaueri*. However, the male superior appendages of the two species are morphologically distinct. Material of male *I. grubaueri* from Negros and Samar, Philippines, is found to belong to *I. baluga*. For Mindanao only females are available, which can at present not be identified to species level. Based on this, *I. baluga* is considered the only species of *Indaeschna* occurring in the Philippines (Luzon, Negros, and Samar), while its close relative *I. grubaueri* is restricted to Sundaland, distributed as far north as the Kra Isthmus.

Further key words. Dragonfly, Anisoptera, Philippines, Southeast Asia

Introduction

The genus *Indaeschna* Fraser, 1926, contains five species all restricted to the Indo-Malayan region, of which three: *Indaeschna erythromelas* (McLachlan, 1896), *Indaeschna melanictera* (Selys, 1883), *Indaeschna ornithocephala* (McLachlan, 1896), became recently included when the genus *Polycanthagyna* (Fraser, 1933) was synonymized with *Indaeschna* (SCHNEIDER *et al.* 2023). The members of the genus are large, even by the standards of Aeshnidae, and can easily be recognized by having two broad yellow stripes on the side of the thorax, two broad yellow ante-humeral stripes, and the dorsum of the frons dark black. *Indaeschna baluga* was described by NEEDHAM & GYGER (1937) based on a single male from Mount Banahaw Luzon, Phil-

ippines, which has the tips of the superior appendages broken (Fig. 1; cf. NEEDHAM & GYGER 1937: plate 2, fig. 32). NEEDHAM & GYGER (1937) noted that *I. baluga* is closely allied to *Indaeschna grubaueri* (Förster, 1904) (Fig. 2), but they did not have access to a specimen of the latter species. Hence, they based their comparison on the original description of *I. grubaueri*. To our knowledge, nobody has studied the holotype of *I. baluga* since its description and at present this species is considered to be endemic to Luzon, with specimens of the genus *Indaeschna* from Negros and Mindanao assigned to *I. grubaueri* (HÄMÄLÄINEN & MÜLLER 1997).

NEEDHAM & GYGER (1937) mention the following five characters to distinguish the male *I. baluga* from *I. grubaueri*:

- (i) Brownish color along vein M_1 lacking (also known as RP1 vein; GARRISON *et al.* 2006);
- (ii) metepimeron more extensively pale;



Figure 1. *Indaeschna baluga* holotype male in lateral view, S10 in dorsal and lateral view, and labels. Photos: Jacki Whisenant. Original photos resized, cropped, and arranged into a plate. Made available by Cornell University Insect Collection (CUIC).

- (iii) semicircular mid-dorsal prominence on S1 of the abdomen present;
- (iv) dorsal tooth on S10 smaller and more remote from the base;
- (v) principal dilation of the superior appendages narrower.

Objective of this study was to determine if these characters by NEEDHAM & GYGER (1937) allow the separation of these two taxa, to verify other characters for identification, and to determine the distribution of the two.

Material and methods

We studied the original description of *Indaeschna baluga* by NEEDHAM & GYGER (1937), and images of the holotype kept in the Cornell University Insect Collection, Ithaca, NY, USA (CUIC) (Fig. 1). Furthermore, we studied four male and four female specimens of *Indaeschna* from the Philippines as listed below. This material was compared to 25 males and



Figure 2. *Indaeschna grubaueri* male in life. Hulu Langat District, Selangor, Malaysia. Photo (viii.2013): E. Refling Nielsen

14 females of *I. grubaueri* from Peninsular Malaysia, eastern Malaysia, and the Indonesian islands of Sumatra and Java. The specimens studied are all housed at Naturalis Biodiversity Center Leiden, The Netherlands (RMNH).

Studied material of *Indaeschna* from the Philippines

- 1♂, Luzon, Quirino, Maddela, Sulong River (500–650 m a.s.l.), 26.–27. iv.1991, Th. Borromeo, Sr. leg.; 1♂, Camarines Sur, Pili Bungcao Curry, Mt Isarog, Caririca River (200–400 m a.s.l.), 04.–15.viii.1997, C.M. Nazareno leg.; coll. RMNH
- 1♂, Negros, Amlan (500 m a.s.l.), vi.1985, C.G. Treadway leg.; coll. RMNH
- 1♂, Samar, Hinubangan, Arizona (100–280 m a.s.l.), 29.iii.–06.iv.1997, R.A. Müller leg.; coll. RMNH
- 1♀, Mindanao, Bukidnon, Lapatan, Mt Apolang (1300 m a.s.l.), 24.–29. viii.1989, Th. Borromeo, Jr. leg.; 3♀, Mindanao, Davao Oriental, Boston Mt Agtuaganon, Camp 55 (1020 m a.s.l.), 29.v.–07.vi.1996, R.A. Müller leg.; coll. RMNH

Results

We investigated the five characters in NEEDHAM & GYGER (1937) with the material available to us and found the following:

- (i) The presence of a brownish color along the M_1 vein was found to be variable within *I. grubaueri* and seems to depend on the age of the specimen as already mentioned by ORR (2003); therefore, it is of no value for distinguishing between the two species.
- (ii) The pale pattern on the metepimeron of *I. grubaueri* varies among specimens, with the largest patch matching the pale metepimeron visible in the *I. baluga* specimen from Luzon.
- (iii) The semicircular mid-dorsal prominence is described by NEEDHAM & GYGER (1937: 44) as »...a median carina on segment 1 is raised on the posterior half in a semicircular ridge that is densely hairy«. NEEDHAM & GYGER (1937) assumed this prominence to be absent in *I. grubaueri* as it is not mentioned in the description provided by FÖRSTER (1904). However, a study of the material from Malaysia and Indonesia revealed that this character is present in *I. grubaueri* as well.

- (iv) The dorsal tooth at S10 of *I. baluga* is described as a »...middorsal ridge that is elevated in a tooth at one-third of its length that, viewed from the side, is a nearly equilateral triangle« (NEEDHAM & GYGER 1937: 44). The shape and size of this tooth vary within *I. grubaueri* as well as within *I. baluga*, making it of little use for identification.
- (v) The principal dilation of the superior appendages is very similar in both *I. baluga* and *I. grubaueri* and does not allow these species to be separated (Fig. 3).

We also studied the secondary genitalia and found no differences. Although the characters mentioned in the original description were found to be of lit-



Figure 3. Male superior appendages in dorsal view. Left – *Indaeschna baluga*, Luzon, Quirino, Maddela, Sulong River, 500–650 m a.s.l., 26.–27.iv.1991, Th. Borromeo, Sr. leg.; right – *I. grubaueri*, Malaysia, Selangor, Ulu Bernam, 23.iii.1961, O. Milton leg.

tle use for identification, we did notice a clear difference in the shape of the tip of the superior appendages (Fig. 3). In *I. grubaueri*, the apical margin of the superior appendages is set more at an angle, and the bent tip protrudes from the outer edge of the superior appendage, while the superior appendages of *I. baluga* has a more rounded apical margin and a short tip that protrudes from the center of the superior appendages. This character was not previously mentioned because the tips of the superior appendages of the holotype were already broken when it was described (Fig. 1; cf. NEEDHAM & GYGER 1937: pl. 2, fig. 32).

The tips of the superior appendages of the two males from Negros and Samar are clearly distinct from those of *I. grubaueri* and match those of *I. baluga* from Luzon. The specimens from Negros and Mindanao were listed as *I. grubaueri* by HÄMÄLÄINEN & MÜLLER (1997) because *I. baluga* was presumed endemic for Luzon and no other proper information on identification was available (M. Hämäläinen pers. comm.).

We found no morphological characters to separate the females of both species and the four examined specimens from Mindanao cannot be identified with certainty.

Discussion

The characteristics given by NEEDHAM & GYGER (1937) do not allow for distinguishing between *Indaeschna baluga* and *I. grubaueri*. However, the clear morphological differences in the shape of the tip of the male superior appendages shows that *I. baluga* is distinct from *I. grubaueri*. Because the specimens examined from Negros and Samar belong to *I. baluga* and not to *I. grubaueri* and the females from Mindanao cannot be identified to species level, the latter species needs to be deleted from the list of Odonata species of the Philippines. As a result, the range of *I. grubaueri* (Fig. 4) becomes restricted to the Malay Peninsula (southern Thailand and Peninsular Malaysia) north to its narrowest part, the Kra Isthmus, Borneo (Sarawak, Sabah, Brunei, and Kalimantan), Sumatra, and Java (Dow *et al.* 2024). *Indaeschna baluga* is currently known from four records of males from Luzon, Samar, and Negros. For Mindanao, only four females of *Indaeschna* were examined, which we cannot identify with certainty but tentatively assume to belong to *I. baluga*. Although probably widespread in the Philippines, only a handful

of records are known for *I. baluga*, and available records seem to suggest that it is rarer within its range than its sibling, *I. grubaueri*. Dow (2020) states that »Nothing has been recorded on the habitats and ecology of this species, however it is very likely to be forest-dependent. The only other species known from the genus, *I. grubaueri*, breeds in forest pools and at least occasionally in phytotelmata«. The species is currently listed as ‘Vulnerable’



Figure 4. Map of Southeast Asia showing records of *Indaeschna grubaueri* (●) and *I. baluga* (●). The records of female *Indaeschna* on Mindanao (●) are tentatively considered belonging to *I. baluga*. Records of *I. grubaueri* are taken from LAIDLAW (1923), ASAHINA (1986), KALKMAN & DOW (2022), and DOW *et al.* (2024) and include all published records known from the region. The relative scarcity of records from Sumatra, Java, and Kalimantan reflects the lack of recent fieldwork in these regions.

on the IUCN red list (Dow 2020), based on the very small number of locations and a plausible serious threat – mainly logging. However, with the species now being known from an additional two islands (Negros, Samar) and possibly Mindanao, a reassessment of the red list status is advised.

Acknowledgments

We want to thank Jacki Whisenant, Insect Technician at the Cornell University Insect Collection (CUIC), for making the images of the holotype of *I. baluga*. Erland Refling Nielsen kindly gave permission to use his field image of *I. grubaueri*.

References

- ASAHINA S. 1986. A list of the Odonata recorded from Thailand. Part XV. Aeschnidae. *Tombo – Acta odonatologica* 29: 71-106
- DOW R.A. 2020. *Indaeschna baluga*. The IUCN Red List of Threatened Species 2020: e.T139069705A139118453. <https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T139069705A139118453.en>
- DOW R.A., CHOONG C.Y., GRINANG J., LUPIYANINGDYAH P., NGIAM R.W.J. & KALKMAN V.J. 2024. Checklist of the Odonata (Insecta) of Sundaland and Wallacea (Malaysia, Singapore, Brunei, Indonesia and Timor Leste). *Zootaxa* 5460: 1-122
- FÖRSTER F. 1904. Odonaten von Hoch-Malacka und Sikkim. *Insekten-Börse* 21: 355-356, 362-363
- GARRISON R.W., VON ELLENRIEDER N. & LOULTON J.A. 2006. Dragonfly genera of the New World. An illustrated and annotated key to the Anisoptera. The Johns Hopkins University Press, Baltimore
- HÄMÄLÄINEN M. & MÜLLER R.A. 1997. Synopsis of the Philippine Odonata, with lists of species recorded from forty islands. *Odonatologica* 26: 249-315
- KALKMAN V.J. & DOW R.A. 2022. Odonata observations from SE Asia. Version 1.3. Naturalis Biodiversity Center. Occurrence dataset. URL (19.iii.2025): <https://doi.org/10.15468/tc5n4y>
- LAIDLAW F.F. 1923. The dragonflies (Odonata) of Burma and Lower Siam. III. Subfamily Aeschninae. *Proceedings of the United States National Museum* 62 (21): 1-29, pl. 1
- NEEDHAM J.G. & GYGER M.K. 1937. The Odonata of the Philippines. *Philippine Journal of Science* 63 (1): 21-101, pls 1-10
- ORR A.G. 2003. A guide to the dragonflies of Borneo: their identification and biology. Natural History Publications (Borneo), Kota Kinabalu
- SCHNEIDER T., VIERSTRAETE A., KOSTERIN O.E., IKEMEYER D., HU F-S., SNEGOVAYA N. & DUMONT H.J. 2023. Molecular phylogeny of Holarctic Aeshnidae with a focus on the West Palaearctic and some remarks on its genera worldwide (Aeshnidae, Odonata). *Diversity* 15 (9): 950. <https://doi.org/10.3390/d15090950>