

IDF



Faunistic Studies
in South-east Asian
and Pacific Island Odonata

A Journal of the International Dragonfly Fund

1-17

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published 13.04.2022

No. 39

ISSN 2195-4534

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Internet: <http://www.dragonflyfund.org/>

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Editorial Work:	Martin Schorr, Milen Marinov and Rory Dow
Layout:	Martin Schorr
IDF-home page:	Holger Hunger
Printing:	Colour Connection GmbH, Frankfurt
Impressum:	Publisher: International Dragonfly Fund e.V., Schulstr. 7B, 54314 Zerf, Germany. E-mail: oesstlap@online.de
Responsible editor:	Martin Schorr
Cover picture:	<i>Mortonagrion alcyone</i>
Photographer:	Rory A. Dow

Odonata from the Loa Buluh Field Station area in East Kalimantan, Indonesia

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Abstract

The results of a survey of the Odonata in the Loa Buluh Field Station area in Kutai Kartanegara Regency, East Kalimantan, Indonesia, conducted in 2009, are reported. The history of odonatological activity in East Kalimantan is briefly summarised and the primary types of Odonata that originate from the province are listed. Details of the locations at which the 2009 survey took place are given. Sixty-six species were recorded during the survey but because it was not possible to export specimens, so that identifications were made with a hand lens in the field, there is uncertainty over the identity of some of the taxa concerned. Nevertheless, as far as we are aware there are no previously published records of six of the species recorded during the survey (*Elattona aurantiaca* (Selys, 1886), *Prodasineura dorsalis* (Selys, 1860), *Prodasineura verticalis* (Selys, 1860), *Archibasis incisura* Lieftinck, 1949, *Mortonagrion* sp. cf. *aborensis* (Laidlaw, 1914) and *Macrogomphus decemlineatus* Selys, 1878) from East Kalimantan before. The need for further work on the Odonata of East Kalimantan to be conducted sooner rather than later, especially given the large changes that will occur in the province due to the planned construction of the new Indonesian capital there, is discussed briefly. Previously undocumented variation in *Prodasineura tenebricosa* Lieftinck, 1937 is discussed in the context of one of the species of uncertain identity found during the 2009 survey.

Key words: Odonata, Indonesia, East Kalimantan, Kutai Kartanegara, REA KON, conservation, Oil Palm

Introduction

In 2009 the first author made a visit to the Loa Buluh Field Station (Hulu Belayan, Kembangjanggut District, Kutai Kartanegara Regency, East Kalimantan, Indonesia) managed by the REA Kaltim Conservation Department (REA KON) for the Ironwood Foundation (Yayasan Ulin) and made a short survey of the Odonata there. He was assisted by the second author, who worked for REA KON at the time, as well as other members of the REA KON staff. The Loa Buluh Field Station is situated in an area of Oil Palm plantations with forested conservation areas and also riparian buffer zones around many of the

streams. It was not possible to export specimens from this trip and the identifications were made with the aid of a hand lens examination in the field, hence there is a far greater degree of uncertainty about some of them than is desirable. Nevertheless, since data on Odonata from Kalimantan is generally scarce and some of the definite records are new for East Kalimantan, it seems worthwhile to publish them.

There are records of Odonata from East Kalimantan in Asahina (1986), Bárta & Dolný (2013), Cleary (2016), Cleary et al. (2004), Dolný et al. (2011), Dow (2010a, 2010b), Dow, Choong & Orr (2007), Dow, Hämäläinen & Stokvis (2015), Dow & Orr (2012), Dow & Price (2020), Dow, Stokvis & Ngiam (2017), Dow et al. (2019), Fraser (1932), Hämäläinen, Dow & Stokvis (2015), Kalkman & Villanueva (2011), Karsch (1903), Lieftinck (1939a, 1939b, 1940a, 1940b, 1948, 1949, 1950, 1953a, 1953b, 1954, 1960, 1964a, 1964b, 1965a, 1965b, 1968, 1971), Orr (2002), Ris (1919), van Tol (2006), van Tol & Norma-Rashid (1995). It should be noted that even for publications from the present century, only the records in Cleary 2016, Cleary et al. 2004, Dolný et al. 2011 (and Bárta & Dolný (2013)) and van Tol 2006 (with a few specimens covered in the last also used in one or two taxonomic publications involving the first author of this paper) are based on fieldwork done in the same century, the others are based on museum specimens mostly collected during the colonial era, with a few small collections made in the latter half of the 20th century.

The primary types of a number of species of Odonata originate from East Kalimantan, these are listed in Table 1. Additionally, parts of the type series of *Devadatta aran* Dow, Hämäläinen & Stokvis, 2015, *Vestalis amaryllis* Lieftinck, 1965, *Archibasis tenella* Lieftinck, 1949, *Acrogomphus jubilaris* Lieftinck, 1964 (allotype female), *Heliogomphus borneensis* Lieftinck, 1964 and *Leptogomphus williamsoni* Laidlaw, 1912, are from locations in East Kalimantan. It is interesting to note that of the 14 primary types listed in Table 1, eight were collected by (or for) M.E. Walsh (mostly in 1937) and five by A.M.R. Wegner (in 1950 and 1956). The only exception is that the holotype of *Oligoaeschna mutata* was collected by a "native collector" according to the original description (Lieftinck (1940b: 381)), although

Table 1: Primary types of species of Odonata from East Kalimantan.

Species	Status
<i>Lestes praeivus</i> Lieftinck, 1940	Holotype
<i>Drepanosticta barbatula</i> Lieftinck, 1940	Holotype
<i>Drepanosticta monoceros</i> Lieftinck, 1965	Holotype
<i>Coelliccia arcuata</i> Lieftinck, 1940	Holotype
<i>Coelliccia resecta</i> Lieftinck, 1953	Holotype
<i>Prodasineura flammula</i> Lieftinck, 1948	Holotype
<i>Amphicnemis amabilis</i> Lieftinck, 1940	Holotype
<i>Amphicnemis mariae</i> Lieftinck, 1940	Holotype
<i>Oligoaeschna mutata</i> Lieftinck, 1940	Holotype
<i>Oligoaeschna platyura</i> Lieftinck, 1940	Holotype
<i>Oligoaeschna venusta</i> Lieftinck, 1968	Holotype
<i>Burmogomphus arthuri</i> Lieftinck, 1953	Holotype
<i>Leptogomphus mariae</i> Lieftinck, 1948	Holotype. Currently considered to be a junior synonym of <i>L. coomansi</i>
<i>Onychothemis coccinea</i> Lieftinck, 1953	Holotype

Lieftinck (1968) lists Walsh as the collector. Wegner made some large collections in East Kalimantan, these are now in the Naturalis Biodiversity Centre, Leiden and have still not been completely worked.

Locations

All of the locations listed here are in Kutai Kartanegara Regency. Fig. 1 shows the location of the study area with Borneo (unfortunately only international boundaries are visible in the figure). Fig. 2 gives an overview of the locations,



Figure 1: Google Earth image of Borneo, showing the location of the study area.

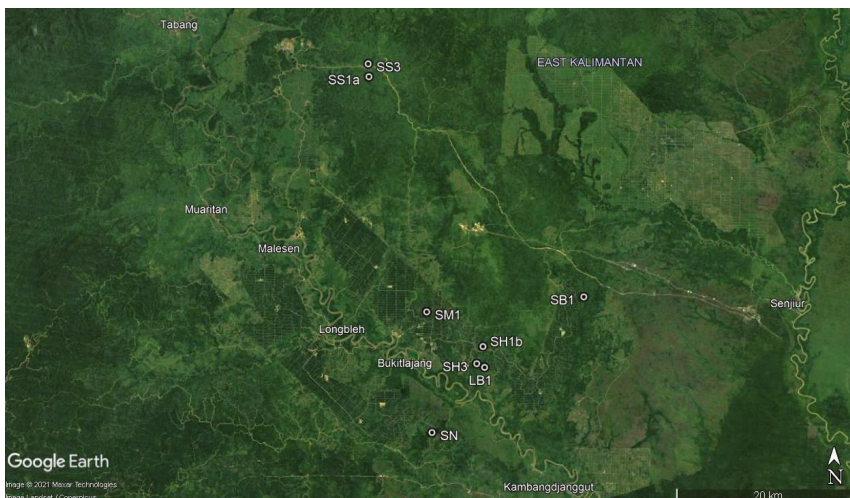


Figure 2. An overview of the study sites, base image from Google Earth.

LB. Loa Buluh REA KON office area:

LB1. Semi-open swamp area (0.2424N, 116.3192E, ca. 21m a.s.l.) in disturbed forest.

LB2. Drain in Oil Palm, beside track (near LB4, ca. 15-25m a.s.l.).

LB3. Pond near LB4, coordinates not recorded.

LB4. In and around offices and accommodation (0.2485N, 116.3062E, ca. 50m a.s.l.).

SH. Sungai Hapay (disturbed forest):

SH1. Mainstream, sampled in two areas: (a) not far from LB4 (representative coordinates 0.2465N, 116.3143E, ca. 18m a.s.l.); (b) upstream (representative coordinates 0.2627N, 116.3176E, ca. 19m a.s.l.). Fig. 3 shows a section of Sungai Hapay.

SH2. Tributary to SH1a, coordinates not taken, ca. 18-24m a.s.l.

SH3. Muddy pool in forest (0.246N, 116.3115E, ca. 15m a.s.l., Fig. 4) and along trail in forest near SH1.



Figure 3. A section of Sungai Hapay (SH1).



Figure 4. A muddy pool in forest at location SH3, habitat for *Mor-tonagrion alcyone*.



Figure 5. A section of Sungai Buung (SB1).



Figure 6. A section of Sungai Senget (SS1).



Figure 7. Tributary to Sungai Senget (SS3).

SB. Sungai Buung, stream in disturbed and second growth forest:

SB1. Mainstream (representative coordinates 0.3111N, 116.4159E, ca. 41-42m a.s.l.), Fig. 5.

SB2. Tributary (0.3115N, 116.4134E, ca. 50m a.s.l.).

SB3. Ditch at forest edge near SB1.

SM. Sungai Muai:

SM1. Small stream and surrounds in mature Oil Palm (representative coordinates 0.2965N, 116.2627E, ca. 24-27m a.s.l.)

SM2. Road in mature Oil Palm near SM1.

SS. Sungai Senget (disturbed forest):

SS1. Mainstream, sampled (a) downstream of road (representative coordinates 0.5255N, 116.2063E, ca. 54-56m a.s.l.); (b) upstream of road (representative coordinates 0.538N, 116.2056E, ca. 56-57m a.s.l.). Fig. 6 shows a section of the stream.

SS2. Tributary downstream of road (0.5221N, 116.205E, ca. 54m a.s.l.).

SS3. Tributary upstream of road (representative coordinates 0.541N, 116.2049E, ca. 57-67m a.s.l.). Fig. 7 shows a section of this small stream.

SN. Sungai Nyiur Conservation Area (disturbed forest):

SN1. Swamp with small stream (0.1789N, 116.2679E, ca. 41m a.s.l.)

SN2. Ditch just outside the conservation area.

Species recorded

All records are from 2009 and are presented as day/month. "*" indicates that this is the first published record for East Kalimantan.

Zygoptera**Euphaeidae**1. *Dysphaea dimidiata* Selys, 1853

Although this record was made prior to the publication of Hämäläinen, Dow & Stokvis (2015), which revised the Bornean *Dysphaea* species, from RDs notes and the habitat where the record was made there is little room for doubt that the species concerned was *D. dimidiata* rather than one of the other two species known from Borneo.

SS1a – ♂♂, 5/8.

2. *Euphaea impar* Selys, 1859

SB1 – ♂, 3/8. SS1a – ♂♂, 5/8.

Philosinidae3. *Rhinagrion borneense* (Selys, 1886)

SS2 – ♂, 5/8. SS3 – ♂♂, 8/8.

Argiolestidae4. *Podolestes orientalis* Selys, 1862

SN1 – ♂, 7/8.

Calopterygidae

5. *Neurobasis longipes* Hagen, 1887

SS1a – ♂, ♀, 5/8.

6. *Vestalis amaryllis* Lieftinck, 1965

Although the species of the *amoena*-group of *Vestalis* are difficult to identify reliably without magnification, a hand lens view of the male anal appendages is sufficient to distinguish this species and the next.

SS1a – ♂, 5/8. **SS3** – ♂, 8/8.

7. *Vestalis amoena* Hagen in Selys, 1853

SS1a – ♂♂, 5/8. **SS2** – ♂, 5/8. **SS3** – ♂♂, ♂ + ♀, 8/8.

Chlorocyphidae

8. *Heliocypha biseriata* (Selys, 1859)

SS1a – ♂♂, 5/8. **SS3** – ♂♂, 8/8.

9. *Libellago aurantiaca* (Selys, 1859)

SB1 – ♂♂, 3/8.

10. *Libellago hyalina* (Selys, 1859)

SH1a – ♂♂, 2/8. **SH1b** – ♂♂, 4/8. **SB1** – ♂♂, 3/8. **SM1** – ♂♂, ♀, 9/8. **SN1** – ♂♂, ♀♀, 7/8.

11. *Libellago semiopaca* (Selys, 1873)

SH1b – ♂♂, ♀, 4/8. **SB1** – ♂, 3/8. **SS1a** – ♂♂, 5/8

Platycnemididae

12. *Coeliccia* sp.

This appeared to be an unnamed species, examples of which are present amongst old material from East Kalimantan in the collections of the Naturalis Biodiversity Centre.

SB2 – ♂, 3/8. **SS2** – ♂♂, 5/8. **SS3** – ♂♂, ♀, 8/8.

13. *Copera vittata* (Selys, 1863)

LB1 – ♂, 6/8. **SH1b** – ♂, ♀, 4/8. **SB1** – ♂♂, 3/8. **SM1** – ♂♂, 9/8.

14. *Elattoneura analis* (Selys, 1860)

SH1a – ♂, 2/8. **SH1b** – ♂♂, ♀♀, 4/8. **SH2** – ♂, 6/8. **SB1** – ♂♂, 3/8. **SM1** – ♂♂, 9/8.

SS1a – ♂♂, 5/8. **SS3** – ♂♂, 8/8. **SN1** – ♂, 7/8.

15. *Elattoneura aurantiaca* (Selys, 1886) *

SB1 – ♂, 3/8. **SN1** – ♂♂, 7/8.

16. *Elattoneura longispina* Lieftinck, 1937

Although superficially similar to *E. analis*, the rather bizarre anal appendages of the male are obvious with a hand lens examination.

SH1a – ♂, 2/8. **SH2** – ♂, 6/8.

17. *Onychargia atrocyana* Selys, 1865

LB1 – ♂, 6/8. **LB4** – ♂ (at lights in evening), 3/8. **SH3** – ♀, 2/8.

18. *Prodasineura collaris* (Selys, 1860)

SB2 – ♂♂, ♂ + ♀, 3/8. **SN1** – ♀♀, 7/8.

19. *Prodasineura dorsalis* (Selys, 1860) *

Although there is no published record of this species from East Kalimantan, there are specimens (many among unidentified material) from the province in the Naturalis Biodiversity Center.

SB2 – ♂, ♀, 3/8.

20. *Prodasineura hyperythra* (Selys, 1886)

SS2 – ♂, 5/8. **SS3** – ♂♂, 8/8.

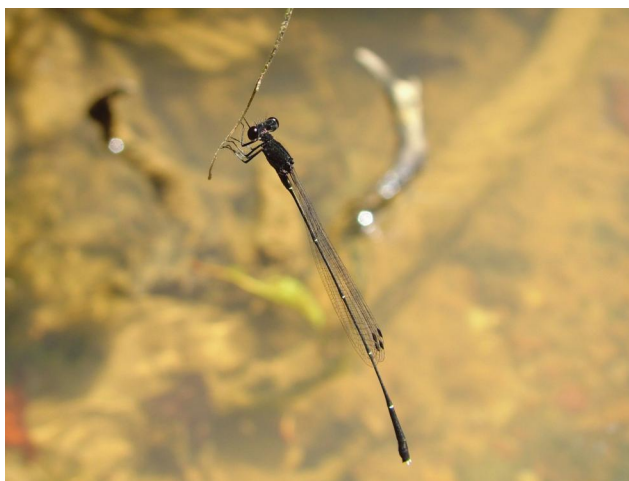


Figure 8. Male *Prodasineura* sp. cf. *tenebricosa* at Sungai Senget.

21. *Prodasineura* sp. cf. *tenebricosa* Lieftinck, 1937

Males from Sungai Hapay were examined using a hand lens and judged to be *P. tenebricosa* or close. Photographs (see Fig. 8) from Sungai Senget show a male with entirely or almost entirely white superior anal appendages, not a typical condition in *P. tenebricosa*, however although Lieftinck (1937) indicates that the anal appendages of the males in the type series (from West Kalimantan) are entirely black, some individuals from Sarawak have the apex of the superior appendages white. Moreover, anal appendage colour can be variable in *Prodasineura*, for instance there is considerable variation in the colour of the anal appendages of male *P. humeralis* (Selys, 1860), even within some single populations, in Peninsular Malaysia. It is worth noting here that Lieftinck (1937: 84) expressly notes that the type series of *P. tenebricosa* lacks any pale “median longitudinal line on the abdominal segments 2-4”, such a line is clearly visible in Fig. 8, but it is also variably present (although rarely or never so well developed) in confirmed *P. tenebricosa* from Sarawak, so that this is a variable character. RD does not recall if the taxon at Sungai Senget was examined under a hand lens, in his notes they are included with the cf *tenebricosa* from Sungai Hapay, but it is possible that this was merely an assumption based on similar

colouration and made in the belief that further checking would be possible later. The exact identity of the taxon or taxa included under this name here must remain open, although *P. tenebricosa* certainly occurs in East Kalimantan.

SH1a – ♂♂, ♂+♀, 2/8. **SH1b** – ♂♂, 4/8. **SS1a** – ♂♂, 5/8.

22. *Prodasineura verticalis* (Selys, 1860) *

SS1a – ♂, 5/8. **SS3** – ♂♂, 8/8.

Coenagrionidae

23. *Aciagrion borneense* Ris, 1911

SS1b – ♂, 8/8.

24. *Argiocnemis femina* (Brauer, 1868)

LB2 – ♀, 2/8. **SB2** – ♀, 3/8. **SM1** – ♀, 9/8.

25. *Amphicnemis* sp.

RDs notes lump *Amphicnemis* from two locations under one heading, *A. sp.* cf *erminea* Lieftinck, 1953, however that identification must be regarded as extremely tentative, especially since the illustrations available of *A. erminea* at the time were far from ideal for identification purposes and there is no confirmed record of the species from East Kalimantan. Hence we have listed this taxon as *Amphicnemis* sp. However it was certainly not either of the two named species with published records from East Kalimantan (*Amphicnemis amabilis* Lieftinck, 1940 and *Amphicnemis mariae* Lieftinck, 1940).

LB1 – ♂, 6/8. **SN1** – ♂♂, ♀♀, 7/8.

26. *Archibasis incisura* Lieftinck, 1949 *

SM1 – ♂, 9/8.

27. *Archibasis tenella* Lieftinck, 1949

SS1a – ♂♂, 5/8. **SS3** – ♂♂, 8/8.

28. *Archibasis viola* Lieftinck, 1949

LB1 – ♂, 6/8. **SM1** – ♂♂, 9/8.

29. *Argiocnemis* sp.

This appears to be the same *Argiocnemis* species often reported from Sarawak and widespread in Sundaland (for instance see Note 40 in Dow (2021)).

SS1a – ♂ (in backwater), 5/8.

30. *Ceriagrion cerinorubellum* (Brauer, 1865)

LB1 – ♂♂, 6/8. **SH1b** – ♀, 4/8. **SH3** – ♂, 2/8. **SM1** – ♂♂, 9/8. **SN1** – ♂, 7/8.

31. *Mortonagrion* sp. cf *aborensis* (Laidlaw, 1914) *

RD's notes suggest some doubt over whether this taxon was *M. aborensis*, also see Note 42 in Dow (2021) on the form occurring in Borneo.

SB1 – ♂♂, ♀♀, 3/8. **SB2** – ♀, 3/8.

32. *Mortonagrion alcyone* (Laidlaw, 1931)

There are few published records of this species (which is in need of redescription) but it was common in the Loa Buluh area in August 2009. Fig. 9a shows a nearly fully mature

male, Fig. 9b an immature male (another view of the same individual is shown in the cover photo).

LB1 – ♂♂, 6/8. **SH3** – ♂♂, ♀, 2/8. **SB2** – ♂♂, 3/8. **SM1** – ♂♂, ♀, 9/8. **SN2** – ♂♂, ♀♀, 7/8.



Figure 9. Males of *Mortonagrion alcyone*: (a) nearly fully mature; (b) immature.

33. *Mortonagrion ?forficulatum* Lieftinck, 1953

From RDs notes the single female of this taxon found was certainly not one of the two preceding species and what could be seen with a hand lens did not contradict identification as *M. forficulatum*, which is known to occur in East Kalimantan. However this identification can hardly be regarded as air tight.

LB1 – ♀, 6/8.

34. *Pseudagrion lalakense* Orr & van Tol, 2001

LB2 – ♂♂, ♀, 2/8. **SM1** – ♂♂, 9/8. **SS1b** – ♂, 8/8.

35. *Pseudagrion pilidorsum* (Brauer, 1868)

SM1 – ♂♂, ♂+♀, 9/8.

36. *Teinobasis rajah* Laidlaw, 1912

LB1 – ♂, 6/8.

Anisoptera

Aeshnidae

37. *Heliaeschna* sp. (*crassa* Krüger, 1899 or *idaea* (Brauer, 1865))

LB4 – ♂ (at lights at ca. 7.45 PM), 8/8.

Gomphidae

38. ?*Burmagomphus* sp.

Very little can be said about this record without specimens, even the genus is uncertain.

SH1b – 2 ♀♀ (both teneral), 4/8.

39. *Gomphidia maclachlani* Selys, 1873

SS1a – ♂, ♀, 5/8.

40. *Ictinogomphus decoratus melaenops* (Selys, 1858)

SM1 – ♂♂, 9/8. **SN2** – ♂, 7/8.

41. *Leptogomphus* sp.

Without specimens there is no way to be sure about the identity of these, but from the habitat *L. coomansi* Laidlaw, 1936 is the most likely species.

SS3 – ♂, ♀ (both teneral), 8/8.

42. *Macrogomphus decemlineatus* Selys, 1878 *

Fig. 10 shows a female in hand.

SH1b – ♀, 4/8. **SM1** – ♂, 9/8.



Figure 10. Female *Macrogomphus decemlineatus*.

43. *Megalogomphus buddi* Dow & Price, 2020

This species was listed in RD's notes as *Megalogomphus sumatranus* and is therefore *M. buddi* (see Dow & Price (2020)).

SS1a – ♂♂ (one found dead in spiderweb), ♀, 5/8.

Macromiidae

44. *Epophthalmia vittigera* (Rambur, 1842)

SM2 – ♂ (hawking over road in afternoon), 9/8.

Libellulidae

45. *Acisoma panorpoides* Rambur, 1842

LB2 – ♂, 2/8.

46. *Brachydiplax chalybea* Brauer, 1868

LB2 – ♂, 2/8. **SM1** – ♂♂, 9/8.

47. *Brachygonia oculata* (Brauer, 1878)

LB1 – ♂♂, ♀, 6/8. **SN1** – ♂, 7/8.

48. *Cratilla lineata* (Brauer, 1878)

SM1 – ♂, 9/8.

49. *Cratilla metallica* (Brauer, 1878)

SH1a – ♀, 2/8. **SH1b** – ♂♂, 4/8. **SS1a** – ♂♂, 5/8.

50. *Lathrecista asiatica* (Fabricius, 1798)

This species was found at small, shallow pools under Oil Palm, a habitat that it appears to like. Fig. 11 shows a male.

SM1 – ♂, 9/8.



Figure 11. Male *Lathrecista asiatica* in Oil Palm.

51. *Nannophya pygmaea* Rambur, 1842

LB1 – ♂♂, ♀, 6/8. **SB3** – ♂♂, 3/8.

52. *Neurothemis terminata* Ris, 1911

Seehausen & Dow (2016) revised methods of identification for the red winged *Neurothemis* species, and it is possible that some of the records below actually refer to *N. ramburii* (Brauer, 1866), however at least male *N. terminata* is more reliably identified by the shape and extent of its wing markings than either *N. fluctuans* or *N. ramburii*, so we have left the records with RD's field identification here.

- LB1** – ♂, ♀ ♀, 6/8. **LB2** – ♂ ♂, 2/8. **SH3** – ♀, 2/8. **SB1** – ♂ ♂, 3/8. **SS1a** – ♂, ♀, 5/8.
SM1 – ♂, ♀ ♀, 9/8. **SN2** – ♂, ♀ ♀, 7/8.
53. *Onychothemis culminicola* Förster, 1904
SH1b – ♀, 4/8. **SS1a** – ♂ ♂, 5/8.
54. *Orchithemis pulcherrima* Brauer, 1878
SM1 – ♂, ♀, 9/8. **SN1** – ♂, ♀, 7/8.
55. *Orthetrum chrysis* (Selys, 1891)
SB1 – ♂ ♂, 3/8. **SH1b** – ♂, 4/8. **SM1** – ♂, 9/8.
56. *Orthetrum sabina* (Drury, 1773)
LB2 – ♂, 2/8. **LB3** – ♂ ♂, 6/8. **SB1** – ♂ ♂, ♀, 3/8. **SS1a** – ♂, 5/8. **SS1b** – ♂, 8/8.
SN2 – ♂, 7/8.
57. *Orthetrum testaceum* (Burmeister, 1839)
LB4 – ♂ (perched outside building), 2/8. **SS1a** – ♂, ♀, 5/8.
58. *Pantala flavescens* (Fabricius, 1798)
SS1a – ♂, 5/8.
59. *Rhodothemis rufa* (Rambur, 1842)
LB2 – ♂, 2/8.
60. *Rhyothemis obsolescens* Kirby, 1889
LB1 – ♂ ♂, 6/8. **SB1** – ♀ ♀, 3/8.
61. *Rhyothemis phyllis* (Sulzer, 1776)
LB2 – ♂, 2/8. **SB1** – ♀, 3/8. **SN2** – ♀ ♀, 7/8.
62. *Rhyothemis triangularis* Kirby, 1889
SS1b – ♂ (found dead on a leaf), 8/8.
63. *Tetrathemis hyalina* Kirby, 1889
LB1 – ♂, 6/8. **SS3** – ♂, 8/8.
64. *Trithemis aurora* (Burmeister, 1839)
SH1b – ♂, 4/8. **SB1** – ♂, 3/8. **SS1a** – ♀, 5/8. **SM1** – ♂ ♂, ♀, 9/8.
65. *Trithemis festiva* (Rambur, 1842)
SM1 – ♂, 9/8.
66. *Tyriobapta torrida* Kirby, 1889
SH2 – ♂ ♂, ♀, 6/8.

Discussion

Including the records presented here, there are published records of 151 species of Odonata from East Kalimantan, although uncertainty over the identity of the species concerned is not confined to the records in this publication. It is perhaps instructive to compare this with the number of species known from Sarawak. East Kalimantan has an area of approximately 127,347km², Sarawak has a similar area (124,450km²) but there are published records of 312 species of Odonata at the time of writing. Even if the eastern side

of Borneo is less diverse in Odonata than the rest of the island, many more species must still await discovery in East Kalimantan. In fact the known odonate fauna of East Kalimantan is dominated by species found in lowland and mostly low gradient habitats, the result of a complete lack of sampling of Odonata in the mountainous interior parts of the province. It is particularly notable that only three members of the Platystictidae, compared with 30 known from Sarawak, have been recorded from East Kalimantan.

The system of riparian buffers and conservation areas managed by REA KON undoubtedly do a great deal to maintain the diversity of Odonata within their area and REA KON are to be commended for the part they are playing in the conservation of the flora and fauna of East Kalimantan. With the planned construction of the new Indonesian capital (to be called “Nusantara”) in East Kalimantan, which will result in a rapid and very large increase to the human population of the province, efforts such as those of REA KON will be all the more important. Given the changes that have already occurred in the province and the great changes that will soon occur it is vital for conservation that the very significant shortfalls in our current knowledge of the odonate fauna of the province be addressed soon. There is a pressing need for more surveys for Odonata in East Kalimantan. Priority should be given to surveys in the poorly studied mountainous areas and area where Nusantara will stand (Penajam Paser Utara), and conservation strategies, including monitoring need to be developed for this area, which will be affected heavily by the ongoing development.

Acknowledgements

RD is grateful to REA KON and Rob Stuebing for allowing him to visit the Loa Buluh area and owes special thanks to Daud Lenjau, Ingan Njuk, Wiji Aini, Yusuf Lawey and Kahang Aran for assistance in the field. Museum Zoologicum Bogoriense, BRIN are to be thanked for holding the specimens collected.

References

- Asahina, S., 1986. A list of the Odonata from Thailand. Part XV. Aeschnidae. Tombo 29(3/4): 71–106.
- Bárta, D. & A. Dolný, 2013. Dragonflies of Sungai Wain. Ecological Field Guide to the Dragonflies of Lowland Mixed Dipterocarp Forest of Southeastern Kalimantan. Taita Publishers, Hradec Králové.
- Cleary, D.F.R., 2016. Diversity and composition of plants, butterflies and odonates in an *Imperata cylindrica* grassland landscape in East Kalimantan, Indonesia. Journal of Tropical Ecology 32:555–560. <https://doi:10.1017/S026646741600050X>
- Cleary, D.F.R., A.Ø. Moers, K.A.O. Eichhorn, J. van Tol, R. de Jong & S.B.J. Menken, 2004. Diversity and community composition of butterflies and odonates in an ENSO-induced fire affected habitat mosaic: a case study from East Kalimantan, Indonesia. Oikos 105: 426–446.
- Dolný, A., D. Bárta, S. Lhota, Rusdianto & P. Drozd., 2011. Dragonflies (Odonata) in the Bornean rain forest as indicators of changes in biodiversity resulting from forest modifications and destruction. Tropical Zoology 24: 63–86.
- Dow, R.A., 2010a. A review of the *Teinobasis* of Sundaland, with the description of *Teino-*

- basis cryptica* sp. nov. from Malaysia (Odonata: Coenagrionidae). International Journal of Odonatology 13(2): 205–230, plate II.
- Dow, R.A., 2010b. Revision of the genus *Coeliccia* (Zygoptera: Platycnemididae) in Borneo. Part I: The *borneensis*-group of species. Zoologische Mededelingen Leiden 84(7): 117–157.
- Dow, R.A., 2021. An annotated checklist of the Odonata (Insecta) known from Sarawak with records to district level. Sarawak Museum Journal LXXX1, No. 101 (New Series); Special Issue 10: 313–422.
- Dow, R.A., S.G. Butler, G.T. Reels, P.O.M. Steinhoff, F.R. Stokvis & J. Unggang, 2019. Previously unpublished Odonata records from Sarawak, Borneo, part IV: Bintulu Division including the Planted Forest Project and Similajau National Park. Faunistic Studies in Southeast Asian and Pacific Island Odonata 27: 1–66.
- Dow, R.A., C.Y. Choong & A.G. Orr, 2007. Two new species of *Chalybeothemis* from Malaysia, with a redefinition of the genus (Odonata: Libellulidae). International Journal of Odonatology 10 (2): 171–184.
- Dow, R.A., M. Hämäläinen & F.R. Stokvis, 2015. Revision of the genus *Devadatta* Kirby, 1890 in Borneo based on molecular and morphological methods, with descriptions of four new species (Odonata: Zygoptera: Devadattidae). Zootaxa 4033(3): 301–349. <http://dx.doi.org/10.11646/zootaxa.4033.3.1>
- Dow, R.A. & A.G. Orr, 2012. *Drepanosticta simuni* spec. nov. from Borneo with notes on related species (Zygoptera: Platystictidae). Odonatologica 41(3): 283–291.
- Dow, R.A. & A.G. Orr, 2021. On the identity of two species of *Tyriobapta* (Odonata: Libellulidae) from Sundaland. Notulae odonatologicae 9(6): 296–305.
- Dow, R.A. & B.W. Price, 2020. A review of *Megalogomphus sumatranus* (Krüger, 1899) and its allies in Sundaland with a description of a new species from Borneo (Odonata: Anisoptera: Gomphidae). Zootaxa 4845(4): 487–508. <https://doi.org/10.11646/zootaxa.4845.4.2>
- Dow, R.A., F. Stokvis & R.W.J. Ngiam, 2017. Revision of the Genus *Leptogomphus* Selys in Borneo, including gene trees and a two marker molecular phylogeny (Odonata: Anisoptera: Gomphidae). Zootaxa 4358(2): 201–257. <https://doi.org/10.11646/zootaxa.4358.2.1>
- Fraser, F.C., 1932a. Résultats Scientifiques du Voyage aux Indes Orientales Néerlandaises de LL. AA. RR. le Prince et la Princesse Léopold de Belgique. Odonata. Mémoires du Musée royal d'Histoire naturelle de Belgique (hors serie) 4(3): 5–34.
- Hämäläinen, M., Dow, R.A. & Stokvis, F.R., 2015. Revision of the Sundaland species of the genus *Dysphaea* Selys, 1853 using molecular and morphological methods, with notes on allied species (Odonata: Euphaeidae). Zootaxa 3949(4): 451–490. <http://dx.doi.org/10.11646/zootaxa.3949.4.1>
- Kalkman, V.J. & R.J.T. Villanueva, 2011. A synopsis of the genus *Rhinagrion* with description of two new species from the Philippines (Odonata: Megapodagrionidae). International Journal of Odonatology 14(1): 11–31.
- Karsch, F., 1903. Odonaten In: Kükenthal. Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft 25: 211–230.

- Lieftinck, M.A., 1937. Descriptions and records of South–east Asiatic Odonata. *Treubia* 16: 55–119.
- Lieftinck, M.A., 1939a. On the true position of the genus *Orolestes* McLach., with notes on *O. wallacei* (Kirby), its habits and life–history (Odon., Lestid.). *Treubia* 17(1): 45–61.
- Lieftinck, M.A., 1939b. Critical notes on the Malaysian species of *Idionyx*, Hagen (Odon). *Treubia* 17(3): 199–204.
- Lieftinck, M.A., 1940a. Revisional notes on some species of *Copera* Kirby. With notes on habits and larvae (Odon., Platycnemididae). *Treubia* 17(4): 281–306.
- Lieftinck, M.A., 1940b. Descriptions and records of South–east Asiatic Odonata (II). *Treubia* 17: 337–390.
- Lieftinck, M.A., 1948. Descriptions and records of South–east Asiatic Odonata. *Treubia* 19: 221–278.
- Lieftinck, M.A., 1949. The dragonflies (Odonata) of New Guinea and neighbouring islands. Part VII. Results of the Third Archbold expedition 1938–1939 and of the Le Roux Expedition 1939 to Netherlands New Guinea (II. Zygoptera). *Nova guinea New Series* 5: 1–271.
- Lieftinck, M.A., 1950. Further studies on Southeast Asiatic species of *Macromia* Rambur, with notes on their ecology, habits and life history, and with descriptions of larvae and two new species (Odon., Epophthalmiinae). *Treubia* 20: 657–716.
- Lieftinck, M.A., 1953a. Additions to the odonate fauna of the Indo–Australian Archipelago. *Treubia* 22(1): 233–269.
- Lieftinck, M.A., 1953b. The Odonata of the island Sumba with a survey of the dragonfly fauna of the Lesser Sunda Islands. *Verhandlungen der Naturforschenden Gesellschaft in Basel* 64(1): 118–228.
- Lieftinck, M.A., 1954. Handlist of Malaysian Odonata. A catalogue of the dragonflies of the Malay Peninsula, Sumatra, Java and Borneo, including the adjacent small islands. *Treubia* (Suppl.) 22: i–xiii + 1–202.
- Lieftinck, M.A., 1960. Considerations on the genus *Lestes* Leach with notes on the classification and descriptions of new Indo–Australian species and larval forms (Odonata, Lestidae). *Nova Guinea* 10(8): 127–171, plates II–V.
- Lieftinck, M.A., 1964a. Synonymic notes on east asiatic Gomphidae with descriptions of two new species (Odonata). *Zoologische Mededelingen* 39: 89–110.
- Lieftinck, M.A., 1964b. Some Gomphidae and their larvae, chiefly from the Malay peninsula (Odonata). *Zoologische Verhandelingen* 69: 1–38.
- Lieftinck, M.A., 1965a. Some Odonata of the genus *Drepanosticta* Laidlaw, chiefly from the Malay peninsula (Platystictidae). *Zoologische Mededelingen* 40(21): 171–186.
- Lieftinck, M.A., 1965b. The species–group of *Vestalis amoena* Selys, 1853, in Sundaland (Odonata, Calopterygidae). *Tijdschrift voor Entomologie* 108(11): 325–364.
- Lieftinck, M.A., 1968. A review of the genus *Oligoaeschna* Selys in Southeast Asia. *Tijdschrift voor Entomologie* 111(5): 137–186, plates 12–13.
- Lieftinck, M.A., 1971. Studies in Oriental Corduliidae (Odonata) I. *Tijdschrift voor Entomologie* 114 (1): 1–63.

- Orr, A.G., 2002. Notes on the *Rhinocypha cucullata* Selys group from Borneo, with a description of *R. viola* spec. nov. (Zygoptera: Chlorocyphidae). *Odonatologica* 31(3): 287–295.
- Ris, F., 1919. Libellulinen 9. Collections Zoologiques du Baron Edm. De Selys Longchamps. *Catalogue Systématique et Descriptif* 16: 1043–1278.
- Seehausen, M. & R.A. Dow, 2016. Morphological studies and taxonomic considerations on the 'reddish-brown-winged' group of *Neurothemis* Brauer, 1867 with the description of *N. taiwanensis* sp. nov. (Odonata: Libellulidae). *International Dragonfly Fund Report* 93: 1–101.
- van Tol, J., 2006. Odonata. Pp 12–15 in: *Gunung Lumut Biodiversity Assessment*, (Ed.) van Tol, J., Naturalis Biodiversity Centre, Leiden.
- van Tol, J. & Norma-Rashid, Y., 1995. The genus *Euphaea* Rambur in Borneo (Odonata: Euphaeidae). *Tijdschrift voor Entomologie* 138: 131–142.

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