THE DRAGONFLIES *(ODONATA)* OF NEW GUINEA AND NEIGHBOURING ISLANDS

Part VI. Results of the Third Archbold Expedition 1938 - '39 and of the Le Roux Expedition 1939 to Netherlands New Guinea (I. Anisoptera)

by

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This publication, which is to be regarded as a continuation of my monograph on the Odonata of New Guinea, forming the 6th part thereof [1]), is based mainly upon two recent expeditions that quite shortly one after the other were sent into the interior of New Guinea. The first of these has been the Netherlands Indian-American Expedition to Netherland New Guinea (Third Archbold Expedition to New Guinea 1938 - '39), the second being the New Guinea Expedition 1939 of the "Koninklijk Nederlandsch Aardrijkskundig Genootschap" (Royal Netherlands Geographical Society) under the direction of C. C. F. M. LE ROUX, usually simply referred to as the Le Roux Expedition 1939.

The main object of the Archbold Expedition, which was led by RICHARD ARCHBOLD, the well-known Research Associate of the American Museum of Natural History, New York, was to explore the eastern part of the Nassau Range, i.e. the surroundings of Lake Habbema (3225 m) and Mt. Wilhelmina (4750 m), but extensive collections were also made at various stations between Hollandia and the central mountain range. The Expedition was originally without an entomologist, but in consultation with Mr ARCHBOLD it was decided that the Netherlands Indian Government would endeavour to find in this country some one to accompany this Expedition in that capacity. The initiative thereto had already proceeded from Dr L. J. TOXOPEUS who had placed himself at the Expedition's disposal and who was thereupon instructed to join its staff. For the collecting and preparing of the insects and other invertebrates, Mr TOXOPEUS was to be assisted by Mr J. OLTHOF and two native collectors. The entomological party began collecting at Hollandia on June 17th, 1938, and returned to Java on April 20th, 1939. Some random collecting of Odonata was done on June 13th at Jef Kasim, on the extreme western point of New Guinea (opposite Salawati I.), on June 15th at Manokwari, and on June 16th, 1938,

[1]) For the 5 preceding instalments, published by the author under the same head, see: *Nova Guinea 15* Zool. 5, 1932, p. 485 - 602; *17* Zool. 1, 1933, p. 1 - 66; *17*, 1935, p. 203 - 300; N.S. *1*, 1937, p. 1 - 82; and N.S. *2*, 1938, p. 47 - 128.

at Bosnik on the Island of Biak (Schouten Islands), all of this en route to Hollandia; also these catches have been included in the present paper [1]).

The zoologist of the Le Roux Expedition was Professor H. BOSCHMA, Director of the Rijksmuseum van Natuurlijke Historie at Leiden. Seeing that the members of the Archbold Expedition in the meanwhile had returned, Professor BOSCHMA was able to engage the same two native collectors that quite recently had done their work with the preceding expedition in the snow mountain region. The base camp of the Le Roux Expedition was located at Enarotali, on the shore of Lake Paniai (1742 m), the largest of the three Wissel Lakes (Central W. New Guinea), which had been discovered in 1937 [2]). This Expedition was of much shorter duration than the Archbold Expedition, and this is mainly the cause why the results of the former could hardly be compared with those of the latter.

Originally it had been the idea to work up the material of these two expeditions separately and to publish the results independently; but it soon became apparent that, although the main bivouacs of the two parties in New Guinea were about 300 kilometres apart as the crow flies, there would be certain advantages in working them up together: first of all because this would greatly facilitate a comparison between these two faunal regions, and secondly because such combined working up would provide a better insight into the variability and the racial formation on the one hand, and into the geographical distribution of the regional forms on the other.

The writer of this article, as a matter of fact, has gone a good deal further than this, owing to the fact that, in addition to the material of the Archbold and Le Roux Expeditions, he had at his disposal also numerous collections, great and small, from various European, Australian and American museums, which in the course of the years he had either been requested to work up, or which he had had the opportunity of studying at these institutions. Furthermore, in the Museum in Buitenzorg there are available the very extensive collections gathered by W. STÜBER in northern New Guinea, part of which have even now been

[1]) Our major source of information on the Third Archbold Expedition has been L. J. BRASS's most interesting paper entitled "The 1938 - 39 Expedition to the Snow Mountains, Netherlands New Guinea", *Journ. Arnold Arboretum*, 22, 1941, p. 271 - 342, 7 pls (1 map). This excellent publication contains valuable details on the climate, ecology, and phytogeography of the various collecting stations. For the general itinerary of the Expedition, a list of the localities visited and the position of the camps, reference should also be made to L. J. TOXOPEUS's short paper published in *Treubia*, 17, 1940, p. 273 - 279, and route map. Other itineraries of the collecting party, including the activities concerning collecting and those from which an idea of the country were formed, have been published by L. J. TOXOPEUS in a series of papers entitled "Entomologische notities uit Nieuw Guinea" (*Ent. Meded. Ned. Indië*, 4, 1938, p. 37 - 43; *5*, 1939, p. 11 - 17, 24 - 37, 59 - 71; *6*, 1940, p. 17 - 21, 37 - 43; *7*, 1941, p. 13 - 18, 45 - 48). A popular description of Lake Habbema and surroundings has been published by A. L. RAND ("Flying Birdmen", *Nat. Hist. Mag.* 46, Oct. 1940, p. 136 - 141). For a detailed description of the Baliem Valley see L. J. BRASS, *The Geogr. Review*, 31, 1941, p. 555 - 569, photographs & map. Also: R. ARCHBOLD, *Nat. Geogr. Mag.* 79, 1941, p. 315 - 338, and A. L. RAND, *Amer. Mus. Novit.* No. 1102, 1941, p. 5 and 1122, 1941, p. 1 - 2.

[2]) A description of a botanical journey north of Lake Paniai, with an excellent map of the region visited, was published by P. J. EYMA (*Ned. Ind. Geogr. Meded.* 1, 1941, p. 4 - 14, photographs & route map).

insufficiently studied and described, together with various smaller collections made individually by his enthusiastic collaborators in New Guinea.

Only quite recently the Buitenzorg Museum has come into the possession of a small but exceedingly interesting collection obtained by E. LUNDQUIST and his helpers from the south coast of the Vogelkop region in western New Guinea, and from the Kowiai region to the east of Kaimana. In the following pages material belonging to this collection is indicated by the suffix "Negumy Expedition" [1]). In so far as this could contribute to a better understanding of the species dealt with, the most important species also of this expedition, as well as all novelties, have been included here. The same holds good for the smaller collections above referred to, that were gathered more or less haphazardly. Wherever a revision of all regional species was found to be necessary or where there was too great a confusion in the nomenclature, it was considered desirable to also include in the discussion, for a proper understanding of the mutual relationships, various allied species from the surrounding island groups. In many instances, in fact, this has been necessary in order to prevent all useless repetition in future faunistic treatments of other islands.

A good deal of attention has been paid to the accurate registration of the examined specimens of each species. Extralimital material, that is to say individuals examined that pertain to species having a distribution outside the actual region investigated, has been separately mentioned in every instance.

In this paper I have, at the end of the description of each species, also critically summarized the distribution area thereof thus far known: I hope that this laborious task will be of some value also to others besides myself.

As regards the literature cited, where well known and widely distributed species are concerned only those writings have been mentioned containing material from New Guinea. In all other instances either the principal literature has been indicated, or else all publications known to me have been enumerated.

With reference to the illustrations it need only be stated that the greatest care has been bestowed upon them. The drawings of the sexual organs of the species belonging to one genus have in all instances, of course, been enlarged on the same scale.

The results of the Archbold Expedition surpass in the number of different species by far those of all other expeditions, being almost equal to those rich collections of STÜBER obtained from the region around the Humboldt Bay. The number of new genera and species, therefore, obtained from the central mountain range, is obviously very great, especially amongst the Zygoptera.

This publication deals only with the *Anisoptera* of the Archbold Expedition. The second part, which I hope will soon follow, is to comprise the *Zygoptera*, thus completing for the time being the systematic portion of my monograph on the Odonata of New Guinea.

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[1]) "Negumy" stands for "Nederlandsche Maatschappij voor Nieuw-Guinea", (Director Mr E. J. F. VAN DUNNÉ), seated at Batavia.

Concerning the larvae of the Odonata collected by the members of the Archbold Expedition and the Le Roux Expedition, I hope to issue a special report in due time, in connection also with the many larvae received by me from STÜBER.

At the end of the second part of this article I propose to summarize in a separate chapter the zoogeographical conclusions that may be drawn from the very abundant material I had at my disposal.

It has been found impossible to make mention here of all those in this country and abroad that have assisted me, also this time, by lending or presenting material: needless to say, I am grateful to all of them.

I may be permitted here to give a word of praise to Mr TOXOPEUS who, as the entomologist of the Archbold Expedition, accomplished his task from beginning to end with unflagging energy, sometimes under the most trying circumstances.

The following is a list of the new and already known species discussed in this paper, with new or additional localities.

Fam. Libellulidae.

Tetrathemis irregularis **papuensis**, subsp. n. — N. New Guinea.
„ „ *dives* RIS versus *papuensis* LIEFT. — Central N. New Guinea.
„ „ *dives* RIS. — S. New Guinea.
„ „ *cladophila* TILL. — Aroe Is.; N. Australia.
Nannophlebia alexia LIEFT. — N. New Guinea.
„ *ampycteria* LIEFT. — N. New Guinea.
„ *anatya* LIEFT. — N. New Guinea.
„ *axiagasta* LIEFT. — N. New Guinea.
„ *amphicyllis* LIEFT. — N. New Guinea.
„ *biroi* (FÖRST). — N. New Guinea.
Microtrigonia gomphoides LIEFT. — N. New Guinea.
Diplacina hippolyte LIEFT. — N. New Guinea.
„ *ismene* LIEFT. — N. & N.E. New Guinea.
„ *smaragdina* SELYS. — N. & N.E. New Guinea.
Lyriothemis hirundo RIS. — N. New Guinea.
„ *meyeri* (SELYS). — New Guinea (universal).
Nesoxenia mysis mysis (SELYS). — Waigeoe I.; New Guinea (universal); Aroe Is.
„ „ *interrogata* (SELYS). — Schouten Is. (Biak).
„ „ **moluccana**, subsp. n. — Halmahera; Morotai; Boeroe; Kei Is.
„ „ **tarafia**, subsp. n. — N. New Guinea (part).
„ „ **mutans**, subsp. n. — W. New Guinea (part).
Agrionoptera insignis papuensis SELYS. — Schouten Is.; N. New Guinea.
„ „ *similis* SELYS. — N.E. & S.E. New Guinea; Aroe Is.; Halmahera; Ceram; Saparoea; Soela; Kei Is.; New Britain; New Ireland.
„ „ *allogenes* TILL. — S. New Guinea; Aroe Is.; N. Australia.
„ „ **cynthiae**, subsp. n. — Tanimbar Is.
„ *longitudinalis* SELYS. — N. New Guinea.
Protorthemis coronata (BRAUER). — New Guinea (universal).

Orthetrum glaucum (BRAUER). — N. New Guinea.
„ *sabina sabina* (DRURY). — N. New Guinea.
„ „ **viduatum**, subsp. n. — Central N. New Guinea.
„ *villosovitt. villosovittatum* (BRAUER). — N. & Central New Guinea.
Brachydiplax duivenbodei (BRAUER). — N. New Guinea.
Raphismia bispina (HAGEN). — N. New Guinea.
Diplacodes bipunctata (BRAUER). — Central W. & N. New Guinea.
Neurothemis decora (BRAUER). — N. New Guinea.
„ **luctuosa**, sp. n. — S. New Guinea.
„ *stigmatizans bramina* (GUER.). — N. New Guinea.
„ *ramburi* (= *palliata* auct.) **papuensis**, subsp. n. — New Guinea (universal); Aroe Is.
Crocothemis nigrifrons (KIRBY). — N. New Guinea.
Rhodothemis rufa (RAMB.). — N. New Guinea.
Huonia thalassophila (FÖRST., excl. auct.). — N. E. New Guinea.
„ **arborophila**, nom. nov. (= *thalassophila* auct. nec FÖRST.). — New Guinea (universal).
„ *epinephela* FÖRST. — W. & N. New Guinea.
„ **hylophila** sp. n. — Central N. New Guinea.
„ **aruana**, sp. n. — Aroe Is.
„ **silvicola**, sp. n. — W. New Guinea.
„ *oreophila* LIEFT. — N. & Central New Guinea.
„ spec. indet. (*nov.*). — Central New Guinea.
Lanthanusa cyclopica RIS. — N. New Guinea.
„ **richardi**, sp. n. — Central New Guinea.
„ **lamberti** sp. n. — Central New Guinea.
Trithemis festiva (RAMB.). — N. New Guinea.
Zyxomma elgneri RIS. — N. New Guinea; N. Australia.
„ *multinerve* CARPENTER. — W. & N. New Guinea.
„ *petiolatum* RAMBUR. — New Guinea (universal).
Pantala flavescens (FABR.). — N. & Central New Guinea.
Rhyothemis hurleyi TILL. — N. & S. New Guinea.
„ *phyllis obscura* SELYS. — Boeroe; Ceram; Halmahera; Morotai.
„ „ **beatricis**, subsp. n. — W., N. & S. New Gunea.
„ „ *chloë* KIRBY. — Aroe Is.; N. Australia.
„ *princeps princeps* KIRBY. — S. New Guinea; N. Australia.
„ „ **irene**, subsp. n. — N. New Guinea.
„ *regia* **juliana**, subsp. n. — N. New Guinea (scattered).
„ „ *exul* RIS. — Kei Is.
„ „ *chalcoptilon* BRAUER. — Samoa.
„ *resplendens* SELYS. — Moluccas; New Guinea (universal); N. Australia.
Hydrobasileus brevistylus (BRAUER). — New Guinea (universal); Halmahera.
Tramea virginia (RAMB.). — China; Annam; Billiton I.
„ *loewi loewi* BRAUER. — Ceram (type re-described); S. W. New Guinea.
„ „ **tillyardi**, subsp. n. (= *loewi* auct.). — N. Australia; S. New Guinea; Kei Is.; Tanimbar Is.
Tramea **aquila**, sp. n. — N. New Guinea.
„ *rosenbergi* BRAUER. — Celebes; Soela Is.; Ambon.
„ *eurybia eurybia* SELYS. — N. & S. New Guinea; Ambon; Boeroe; Flores; Komodo.
„ „ **monticola**, subsp. n. — Central New Guinea.

Tramea euryale SELYS. — Celebes; Ambon, etc.
„ **propinqua**, sp. n. — New Guinea (universal); New Ireland.
Urothemis signata aliena SELYS. — New Guinea (coastal).

Fam. Corduliidae

Hemicordulia silvarum RIS. — New Guinea (universal).
„ **cyclopica**, sp. n. — N. New Guinea.
„ **hilbrandi**, sp. n. — Central W. New Guinea.
„ **olympica**, sp. n. — Central New Guinea.
„ **ericetorum**, sp. n. — Central W. & Central New Guinea.
Procordulia astridae LIEFT. — N. & Central New Guinea.
„ *leopoldi* FRAS. — N. & Central New Guinea.
Anacordulia stüberi LIEFT. — N. New Guinea.
Synthemis gracilenta LIEFT. — N. New Guinea.
„ *primigenia* (FÖRST.). — N. New Guinea.
Macromia terpsichore FÖRST. — N. New Guinea; New Britain.
„ **eurynome**, nom. nov. — S. New Guinea.
„ *melpomene* RIS. — N. & S. New Guinea.

Fam. Gomphidae

Ictinogomphus australis australis (SELYS). — N. Australia.
„ „ *lieftincki* (SCHMIDT). — W. & N. New Guinea;? Halmahera.

Fam. Aeshnidae

Agyrtacantha dirupta (KARSCH). — New Guinea (universal).
„ *microstigma* (SELYS). — New Guinea (universal).
„ **othello**, sp. n. — N. New Guinea.
Plattycantha spec. indet. (*nov.*) — Central New Guinea.
„ spec. indet. (*nov.*). — Central W. New Guinea.
Gynacantha rosenbergi BRAUER. — N. New Guinea.
Oreaeschna dictatrix LIEFT. — Central W. New Guinea.
Anax guttatus BURM. — Java (re-described); Malaysia; N. New Guinea; Aroe Is.; New Britain; Banda Is.; Celebes.
„ **indicus**, sp. n. (= *guttatus* partim, auct.). — India.
„ *selysi* FÖRST. — Central N. & E. New Guinea (paratype re-defined).
„ *fumosus fumosus* HAGEN. — Ternate; Boeroe (type re-defined).
„ „ **celebense**, subsp. n. — Celebes.
„ *panybeus* HAGEN. — N. Celebes.
„ *gibbosulus* (RAMB.). — N. Australia; S. New Guinea; Kei Is.; Banda Is.; Ambon; Halmahera; Soemba; Flores.
„ *maclachlani* FÖRST. — S. W. & N. New Guinea.
„ **pugnax**, sp. n. — Central New Guinea.

Odonata (Anisoptera) collected by the Third Archbold Expedition 1938 - '39.

1 *Tetrathemis irregularis* **papuensis**, subsp. n.
2 *Tetrathemis irregularis dives* versus *papuensis* LIEFT.
3 *Nannophlebia alexia* LIEFT.
4 *Nannophlebia ampycteria* LIEFT.
5 *Nannophlebia anatya* LIEFT.
6 *Nannophlebia axiagasta* LIEFT.
7 *Nannophlebia amphicyllis* LIEFT.
8 *Nannophlebia biroi* (FÖRST.)
9 *Microtrigonia gomphoides* LIEFT.
10 *Diplacina hippolyte* LIEFT.

11 *Diplacina ismene* LIEFT.
12 *Diplacina smaragdina* SEL.
13 *Lyriothemis hirundo* RIS.
14 *Lyriothemis meyeri* (SEL.)
15 *Nesoxenia mysis mysis* (SEL.)
16 *Nesoxenia mysis interrogata* (SEL.)
17 *Agrionoptera insignis papuensis* SEL.
18 *Agionoptera longitudinalis* SEL.
19 *Protorthemis coronata* (BR.)
20 *Orthetrum glaucum* (BR.)
21 *Orthetrum sabina sabina* (DR.)
22 *Orthetrum sabina* **viduatum**, subsp. n.
23 *Orthetrum villosovittatum villosovittatum* (BR.)
24 *Brachydiplax duivenbodei* (BR.)
25 *Raphismia bispina* (HAG.)
26 *Diplacodes bipunctata* (BR.)
27 *Neurothemis decora* (BR.)
28 *Neurothemis stigmatizans bramina* (GUER.)
29 *Neurothemis ramburi* **papuensis**, subsp. n.
30 *Crocothemis nigrifrons* (KIRBY)
31 *Rhodothemis rufa* (RAMB.)
32 *Huonia* **arborophila**, sp. n.
33 *Huonia epinephela* FÖRST.
34 *Huonia* **hylophila**, sp. n.
35 *Huonia oreophila* LIEFT.
36 *Huonia* spec. indet. **(nov.)**
37 *Lanthanusa* **richardi**, sp. n.
38 *Lanthanusa* **lamberti**, sp. n.
39 *Trithemis festiva* (RAMB.)
40 *Zyxomma elgneri* RIS.
41 *Zyxomma multinerve* CARP.
42 *Zyxomma petiolatum* RAMB.
43 *Pantala flavescens* (FABR.)
44 *Rhyothemis hurleyi* TILL.
45 *Rhyothemis phyllis* **beatricis**, subsp. n.
46 *Rhyothemis princeps* **irene**, subsp. n.
47 *Rhyothemis resplendens* SEL.
48 *Hydrobasileus brevistylus* (BR.)
49 *Tramea* **aquila**, sp. n.
50 *Tramea eurybia* **monticola**, subsp. n.
51 *Urothemis signata aliena* SEL.
52 *Hemicordulia silvarum* RIS.
53 *Hemicordulia* **olympica**, sp. n.
54 *Hemicordulia* **ericetorum**, sp. n.
55 *Procordulia astridae* LIEFT.
56 *Procordulia leopoldi* FRAS.
57 *Anacordulia stüberi* LIEFT.
58 *Synthemis gracilenta* LIEFT.
59 *Synthemis primigenia* (FÖRST.)
60 *Macromia terpsichore* FÖRST.
61 *Macroma melpomene* RIS.
62 *Ictinogomphus australis lieftincki* (SCHMIDT)
63 *Agyrtacantha dirupta* (KARSCH)
64 *Agyrtacantha microstigma* (SEL.)
65 *Agyrtacantha* **othello**, sp. n.
66 *Plattycantha* spec. indet. (nov.)
67 *Gynacantha rosenbergi* BR.
68 *Anax selysi* FÖRST.
69 *Anax maclachlani* FÖRST.
70 *Anax* **pugnax**, sp. n.

Odonata (Anisoptera) collected by the Le Roux Expedition 1939.

1 *Orthetrum villosovittatum villosovittatum* (BRAUER).
2 *Diplacodes bipunctata* (BRAUER).
3 *Tramea eurybia* **monticola**, subsp. n.
4 *Hemicordulia* **hilbrandi**, sp. n.
5 *Hemicordulia* **ericetorum**, sp. n.
6 *Plattycantha* spec. indet. **(nov.)**.
7 *Oreaeschna dictatrix* LIEFT.
8 *Anax gibbosulus* RAMB.
9 *Anax* **pugnax**, sp. n.

Fam. LIBELLULIDAE.

Genus **Tetrathemis** BRAUER.

Leaving three Ethiopian species out of consideration, the genus *Tetrathemis* according to RIS (Cat. Coll. SELYS, Lib. fasc. 9, 1909) is represented in the Oriental and Australian regions only by the following 5 species:

1. *T. platyptera* SELYS. — Hab.: India through Burma and Siam to Malaysia.
2. *T. yerburyi* KIRBY. — Hab.: Ceylon.
3. *T. flavescens* KIRBY. — Hab.: Malaysia.
4. *T. irregularis hyalina* KIRBY. — Hab.: Malaysia, south-eastwards to Timor.
   T. — *irregularis* BRAUER. — Hab.: Philippine Is.
   T. — *leptoptera* (SELYS). — Hab.: Celebes and Moluccas (New Guinea errore!).
5. *T. cladophila cladophila* TILLYARD. — Hab.: N. Australia; Aroe Is.
   T. — *dives* RIS. — Hab.: South New Guinea.

Unfortunately, RIS's grouping of species and subspecies was based exclusively on venational characters and colouring of the wings, no mention being made of the colour-scheme of the body or the male anal appendages.

I have made a study of the accessory genitalia and anal appendages of the males; and although no appreciable differences could be detected in the structure of the hamuli or penes, the superior anal appendages show slight but constant differences. In addition, both sexes have as distinguishing characters body-colour. Though a faunistic paper of the character of this on which I am now engaged does not afford a suitable opportunity for defining the various insular types of the entire Archipelago in a detailed way, I am convinced that by the employment of these neglected characters it is possible to satisfactorily revise the *irregularis-cladophila* group of the genus.

Malaysian specimens of *irregularis hyalina,* which I have before me, — including also examples of the Lesser Sunda islands Bali, Soembawa, Flores, Soemba and Timor —, are very dark [1]), agreeing closely in wing-colour and colour-pattern of the body with nomino-typical *irregularis* in my collection from the Philippines; but they differ from the latter in details of the neuration and in the structure of the superior anal appendages of the male. In the Philippine specimens, the latter resemble strikingly those of the eastern races, mentioned below.

Unfortunately enough, the ♂ of the typical race *irregularis,* has never been described [2]). The type is a ♀ from Luzon and the description is very full. I have only three ♂ and one teneral ♀, all from Maloong, Basilan I., P.I., and these compare very well with BRAUER's description; but I am not sure whether or not these southern individuals correspond with examples of Luzon. The ranges of *i. irregularis* and *i. hyalina* (terr. typ. Borneo!) probably meet on Palawan and the Sulu Islands (Jolo), whence it would be of great interest to study material.

The subspecies *T.i. leptoptera,* from Celebes and the Moluccas, is larger in size, the wing-bases are strongly tinted and the colouring of the body is

[1]) Topotypical *i. hyalina,* which I possess from West and East Borneo, have the dark stripes on the sides of the thorax somewhat narrower than in examples from Sumatra, Java and elsewhere. If a further splitting up of *hyalina* would become necessary, KRÜGER's name *sumatrana* (*Stett. ent. Zeitg.* 63, 1902, p. 191 - 193) would be available for individuals from Sumatra, Java and Bali. Examples from Flores, Soemba &c are again slightly different in some respects. (See also key to the subspecies).

[2]) In NEEDHAM & GYGER's recent paper "The Odonata of the Philippines" (*Philipp. J. Sci.* 63, 1937: 72 - 73, figs), no description of *irregularis* is given.

much paler than in both *i. irregularis* and *i. hyalina;* the superior appendages, however, are shaped similarly to the Philippine and eastern races.

The new subspecies *T.i. papuensis,* — and *i. dives* as well —, have appendages rather similar to *i. irregularis* and *i. leptoptera* but differ widely from the former in body-colour, the yellow markings on head, thorax and abdomen being much more extensive, even more so than in *i. leptoptera.*

Finally, in *T. i. cladophila,* all dark markings are so much reduced as to become obsolete, the superior appendages being again of the same type as the other subspecies of eastern distribution.

In his discussion of *Tetrathemis cladophila* TILLYARD, originally described from Cooktown, the late Dr RIS says: "Diese eigentümliche Form, von der mir der Entdecker eine Cotype gütigst zur Untersuchung sandte, könnte wohl als Subspecies bei *irregularis* eingereiht werden. Bei dem noch sehr kleinen Material habe ich aber vorgezogen sie einstweilen als Species stehen zu lassen ..... Der auffallendste Unterschied gegen *irregularis* ist ausser der Flügelfärbung die Aufhellung der Körperfärbung an Kopf und Thorax, in ähnlicher Weise wie wir dies bei *Nannophlebia* und *Lathrecista*-Formen des gleichen Faunengebietes wieder finden werden" (*loc. cit.* p. 49). Later, the same author extended the known range of *T. cladophila* farther north-west to the Aroe Islands while a new subspecies, *cladophila dives* RIS, was described from Southern New Guinea (Nova Guinea, 9 Zool. 3, 1913, p. 505 - 506 and *op. cit.,* 16, 2, 1919, p. 1045 fig. 606 [wings ♂♀].

Unfortunately, I have neither been able to study m a l e s of *Tetrathemis* from the Aroe Islands nor examples of that sex in good condition from Queensland or other parts of N. Australia; but after examining closely all important characters, and from the material of other subspecies which I have been able to examine, I am strongly of opinion that RIS's suggestion, that *cladophila* might be a subspecies of *irregularis,* should be adopted; and consequently, it is evident, that *dives* should also be transferred to the same formenkreis.

So far as body-colouring is concerned, it follows that there are clearly two series, one western group, including *i. irregularis* and *i. hyalina,* being very dark and of moderate size; and one eastern group, comprising *i. papuensis, i. dives* and *i. cladophila,* which are pale-coloured and, generally, are smaller in size. Between these groups stands *leptoptera,* which has the colour-pattern of the thorax like the western subspecies, but the extent of yellow on the abdomen similar to the eastern races; it is moreover a good bit larger in size.

Upon structural grounds we have to separate the two series in a somewhat different way. The western group of *i. hyalina* is purely Malaysian (including it is true the examples of the Lesser Sunda Islands), whilst *i. irregularis* (Philippines) and *i. leptoptera* (Celebes and the Moluccas) join on to the eastern group.

Were is not for the existence of the Philippine and Celebesian subspecies, one should certainly regard the western and eastern series as belonging to quite different species; but both of them share the characters of either of the two groups.

In the following tentative key, which is given with the view to assisting in the classification of the oriental forms of *Tetrathemis*, and which may prove of some assistance for future research, I have therefore adopted what seems to me the method least open to objection in treating all insular representatives of this group as subspecies of *irregularis* [1]).

Key to the subspecies of *Tetrathemis irregularis*.

1. Seventh abdominal segment with an isolated oval yellow twin-spot or with two closely approximated tiny yellow streaks, occupying the basal one-fifth to almost one-half of the length of segment, but entirely restricted to its dorsal surface. Wing bases usually hyaline, or faintly tinged with yellow at extreme base. Median lobe of labium black 2

1'. Basal half to two-thirds of 7th abdominal segment with a complete, or ventrally nearly complete, orange-yellow ring, this ring sometimes finely interrupted by the black median carina 3

2. Generally 1 + 1 (rarely 2 + 1) *Cux* in fore wing, 2 (rarely 3) in hind wing. Wings either entirely hyaline in both sexes, or slightly tinged yellow at extreme base (♂), more deeply so and golden-yellow to level of Ax_2-Ax_3 (♀); or hyaline with faint yellow nodal fleck. First lateral thoracic yellow band distinctly wider than the black stripe covering the second suture (typical *hyalina*, Borneo); or only slightly wider than this stripe (*sumatrana*, Sumatra, Java, Bali); or both bands exactly equal in width (Lesser Sunda Is., Soembawa, Flores, Soemba, Timor). ♂ Sup. anal apps. in profile view gently downcurved before middle of their length, ventral carina with a row of 6 - 10 strong teeth, the basalmost tooth situated somewhat before to slightly beyond the middle of the length of appendage; very obliquely truncated and provided with a slender dorso-apical tooth (pl. 23 fig. 1 - 4). ♂ abd. 17 - 18, hw. 20 - 22 (Malaysia); 20, 23 (Flores); 20, 24 (Timor). Hab.: Malaya, Sumatra, Java, Less. Sunda Is., Borneo, Banguey. **i. hyalina**

2'. Generally 3 + 1 or 4 + 1 *Cux* in fore wing, 3 in hind wing. Wings hyaline (♂) or slightly tinged basally (♀). First lateral thoracic yellow band equal in width to or even a little less wide than the black stripe covering the second suture (pl. 23 fig. 9). ♂ Sup. anal apps. in profile view after a slight constriction rather abruptly downcurved beyond the middle of their length, ventral carina with a row of 5 strong teeth, the basalmost tooth situated very considerably beyond the middle of the length of appendage; tips somewhat expanded, truncated almost under right angles and provided with a short, irregular, dorso-apical tooth (pl. 23 fig. 5). ♂ abd. 17, hw. 20 mm. Hab.: Philippine Is. ..... **i. irregularis**

3. Celebes: First lateral thoracic yellow band equal in width to the black stripe covering the second suture, and to the pale area on metepimeron

[1]) As a matter of fact, the three remaining, and well-characterized, Asiatic species, viz. *flavescens* KIRBY, *yerburyi* KIRBY, and *platyptera* SELYS, are left out of consideration here.

where this in widest (pl. 23 fig. 10). Ventral surface of thorax marked with deep black similarly to *i. hyalina* and *i. irregularis*, but labium more broadly black on middle. Generally 3 + 1 (less frequently 4 - 6 + 1) *Cux* in fore wing, 4 (3 - 6) in hind wing. Wing-bases to level of Ax_2-Ax_4 strongly flavescent, with deep rich golden-yellow (♂) or burnt-brown (♀) rays in *sc* and *cu*. ♂ Sup. anal apps. shaped much as described for *i. irregularis*, but tips still more truncated and apical tooth blunt, or obsolete (pl. 23 fig. 6). Larger: ♂♀ abd. ± 19, hw. 22 - 23 mm. — Moluccas (♂ Soela Is.; Ambon Is.): First lateral thoracic yellow band somewhat broader than the black stripe over the second suture, the latter narrower than the pale area on metepimeron where this is widest. Venter of thorax as before, labium similar to *i. hyalina* and *i. irregularis*. *Cux* $\frac{2-4+1}{3-4}$. Wings either hyaline, with extreme bases faintly yellowish, or with bases and costal area light yellow. ♂ Sup. anal apps. as before. Smaller: ♂ abd. 16.5 - 18, hw. 20 - 21 mm. (See also RIS, *loc. cit.* 1909, p. 48 - 49). Hab.: Celebes, Moluccas.

i. leptoptera

3'. First lateral thoracic yellow band amply two times as broad as the black stripe over the second suture and the pale area on metepimeron where this is widest (*i. papuensis* and *i. dives*), or considerably broader (*i. cladophila*). Venter of thorax entirely greenish-yellow, or diffusely marked with pale brown. Median lobe of labium invariably yellow. ♂ Sup. anal apps. shaped similarly to *i. leptoptera*. 4

4. Black stripe over the second lateral suture of thorax complete, black, slightly metallic, almost half as wide as the pale yellow band crossing the spiracle (pl. 23 fig. 11). Frons metallic-blue or-green. 5

4'. Black stripe over the second lateral suture of thorax indistinct, brownish, usually reduced to two diffuse spots on either end of the suture (pl. 23 fig. 12). Frons entirely orange, or with some metallic black colouring along base and in the median furrow (typical *cladophila*), or metallic blue-green dorsally (Aroe Is.). Wing-bases strongly tinged with yellow. **i. cladophila**

5. Wing-bases in both sexes rich golden-yellow or -brown with dark brown rays in *sc* and *cu*. ..... **i. dives**

5'. Wings either entirely hyaline, or with a diffuse yellow nodal fleck; no dark brown rays in *sc* and *cu*. ..... **i. papuensis**

Tetrathemis irregularis papuensis, subsp. n. (pl. 23 fig. 7 and 11).

1909. RIS, Cat. Coll. SELYS, Lib. 9, p. 46 (key, pars), 48 - 49 (pars!). — ♂♀ New Guinea; ♂♀ Geelvink Bay (*irreg. leptoptera*).

Material studied. — North New Guinea (W. to E.): 2 ♂ (ad.), Hollandia, 26.vii.1938, J. OLTHOF. — 48 ♂, 8 ♀ (ad.), Hollandia, vi-vii (2 ♂ 1 ♀), 27.viii - 4.ix (15 ♂, 1 ♀), xi-xii.1930 (18 ♂, 1 ♀), i-ii. (8 ♂ 3 ♀, *in cop.*), iii (5 ♂ 1 ♀), iv-vi.1931 (1 ♀); 13 ♂, 2 ♀, Second Hill Range (ca 40 km south of Hollandia), 300 - 400 m, ix.1930 (5 ♂ 2 ♀), iii.1932 (8 ♂); 3 ♂ (ad.), Tami River

plain, ii.1933; 1 ♂, ca 15 km S. of Bougainville Mts., 400 m, Njau Sanké, xi.1935. All W. STÜBER leg. — 6 ♂, 7 ♀, Torricelli Mts, 200 - 1000 ft., ii.1939, E. L. CHEESMAN (Adelaide Museum).

M a l e (Hollandia). — Labium yellow, with the mesial one-fourth to one-fifth of each of the lateral lobes, as well as the apical margin of both very narrowly, sharply defined deep black; the foot of the sessile, vase-shaped black mark thus formed being represented by a diffuse, fine longitudinal brownish line over the middle of the median lobe, which otherwise is yellow. Labrum glossy black. Ante- and postclypeus as well as a narrow frontal stripe bordering the fronto-clypeal suture, slightly expanded laterally and widely interrupted (or almost so) mesially, yellow. Frons and vertex shining dark metallic-green or blue. Occipital triangle and rear of the head glossy black.

Prothorax black, anterior and posterior lobes bright yellow.

Synthorax deep bronzy-black with definite steely green or blue reflections, especially on the dorsum. Ventral (posterior) half of each mesinfraepisternite and a broad leaf-shaped juxtahumeral spot, occupying the outer half of each episternite and reaching half-way up the dorsum, bright greenish-yellow. Sides with two sharply defined bronzy-black bands, one slightly irregular over the humeral suture and the other, narrower and rather straight, over the second lateral suture, the area between these two bands distinctly wider than either of the two (amply twice as broad as the second black stripe), bright greenish-yellow in colour; metepimeron for the most part similarly coloured (pl. 23 fig. 11). Thorax dirty yellow underneath, with an indistinct brownish transverse mark on middle of posterior third.

Legs black; coxae, trochanters and the basal two-thirds of the flexor sides of first pair of femora, yellow. Posterior femora armed with a row of 19 - 22 closely set, backwardly directed, fine teeth.

Wings clear; bases usually hyaline. In the majority of specimens both fore and hind wings bear a very diffuse, faint yellow cloud under the nodus, the extent and depth of the colour being variable and dependent partly on age and maturity; some showing no colouring at all, the majority a small and very faint spot, whilst in others the nodal fleck is more deeply yellow and fairly extensive. Only one male (Hollandia, iii.1931) has the bases of the hind wings also slightly yellowish; lastly, in very old individuals, the wings are slightly smoky all over the membrane, without any trace of yellow marks.

Neuration similar to *irregularis*, but more open, *Cux* $\frac{3+1}{3}$, with rare exceptions (fore wing 4 + 1, or 2 + 1; hind wing 2) Antenodals $\frac{7-8}{7}$, postnodals $\frac{5-6}{5}$, in equal rates. Pterostigma black, covering 1½ cell approximately.

Abdomen black, marked with bright yellow on first two segments and the sides of 3, with orange on 4 - 7, as follows: Segm. 1 with a large, 2 with a still larger, very broad lateral spot, occupying most of the sides and part of the dorsum, extending almost to the apical border and prolonged dorsalwards at

the base so as to save a trapezoidal, black dorsal spot, strongly narrowed basad. Segm. 3 with about the basal half of the sides yellow, intermingled with orange, this mark extending obliquely well beyond the transverse suture; 4 with a paired dorso-lateral spot just behind the suture, occupying slightly over one-fourth of the length of segment; 5 and 6 with elongate orangish sub-basal spots restricted to the lower half of the sides, decreasing in size and length posteriorly; 7 with a conspicuous orange ring, — narrowly separated by black from the apical border of the preceding segment —, occupying almost exactly its basal half; 8 - 10 and anal appendages black.

Anal appendages shaped as shown in pl. 23 fig. 7; superiors brownish, truncated and slightly excised apically; app. inf. projecting beyond apices of superior pair.

Female (Hollandia). — Very similar in markings to the male but for the following differences.

Yellow line bordering the fronto-clypeal suture a little wider and fading to orange against the metallic blue cap covering the frons.

Dark marks on thorax slightly less metallic, very dark brown instead of black; stripe covering the second suture a trifle narrower than in male.

Wings either entirely hyaline, or, in the majority, with a pale yellow nodal patch, very variable in size but occasionally of a rich golden-yellow or amber tint.

Abdomen of the usual form, marked similarly to the male. Genital organs not differing from those of typical *irregularis*.

Length: ♂ abd. + app. 15.7 - 16, hw. 18 - 18.3; ♀ 15 - 16.7, 18.8 - 20.4 mm.

With regard to differences in colour of body and wings, the present fine series of *Tetrathemis* from the lowlands of North New Guinea neatly fills the gap between the darkly coloured western races of *irregularis* BRAUER (including the intermediate *i. leptoptera* SELYS from Celebes and the Moluccas), and the pale-bodied *cladophila* TILLYARD of North Australia and the Aroe Islands.

Tetrathemis irregularis dives RIS (versus **papuensis** LIEFT.) (pl. 23 fig. 8).

1913. RIS, Nova Guinea 9 Zool. 3, p. 505 - 506. — ♂♀ S. New Guinea, Lorentz River territ. (*cladophila dives*).

1919. RIS, Cat. Coll. SELYS, Lib. 16, 2 p. 1045, fig. 606 (wings ♂♀ S. New Guinea).

Material studied. — C. North New Guinea: 3♀ (ad.), Bernhard Camp, 50 m, 5.viii, 1.x and 22.xii.1938, J. OLTHOF; 1 ♀ (ad.), Bernhard Camp B, 100 m, 12.iv.1939; 1 ♂ (ad.), Araucaria Camp, 800 m, 2.iv.1939, L. J. TOXOPEUS.

Male (Araucaria Cp). — Differs from *i. papuensis* in the colour of wings, which from base almost to the nodus are of a rich golden-yellow tint. No traces of brown rays in basal spaces of wings. Light body-markings slightly larger than in *i. papuensis*, though not nearly so extensive as in *i. dives*. Abd. + app. 15.3, hw. 18 mm.

Female (Bernhard Cp). — One example is exactly identical with the male, but for the colour of the basal half of the wings, which are still more deeply stained with yellow; traces of dark brown rays in *sc* of all wings. Abd. 15.9, hw. 20.4 mm.

Two other females have the proximal part of the wings much more palely saffronated, but there are distinct — though short — brownish rays in *sc* and *cu* of both pairs of wings. Abd. 14.8, hw. 18.4 - 18.8 mm.

Lastly, one example (Bernhard Cp B) agrees in almost every respect with a paratype of *dives* from the Noord River, which I have before me (pl. 23 fig. 8). The yellow abdominal spots and rings are a little smaller and the deep amber-coloured wing-patches extend almost as far out as the nodus instead of half-way that distance; the dark brown rays in *sc* and *cu* reach Ax_1 and Cux_1, respectively. Abd. 15.5, hw. 19.4 mm.

On comparing RIS's description and photographs of the southern subspecies *T. i. dives*, with those given in the present paper of the northern *T. i. papuensis*, these central New Guinean individuals are clearly intermediate, showing the instability of certain colour-differences in the interior of New Guinea where the ranges meet and where they resemble each other very closely. Probably interbreeding occurs along the boundaries of their respective areas.

Distribution: N. Central New Guinea.

Tetrathemis irregularis cladophila TILLYARD (pl. 23 fig. 12).

?1906. TILLYARD, Proc. Linn. Soc. N. S. Wales, 31, p. 487 - 489, pl. 44 fig. 6 (apps. ♀). — ♀ Kuranda, N. Queensland (*flavescens*).
1908. TILLYARD, Ibid. 33, p. 647 - 649 pl. 14 fig. 5 (♂ insect). — ♂♀ Cooktown, N. Queensland.
1909. RIS, Cat. Coll. SELYS, Lib. 9, p. 49 - 50 fig. 9 (♂ wings). — Paratype re-described.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 527 - 528. — ♂♀ Aroe Is. (*cladophila*).
1919. RIS, Ibid. 16^2, p. 1044 - 1045, fig. 605 (wings ♂♀). — ♂♀ Aroe Is. (*c. cladophila*).

Material studied. — 1 ♀ (ad.), Aroe Is., Dobo, 5.v.1939, R. G. WIND. — 2 ♀ (ad.-juv.), N. Queensland, 6 - 22.x.1938, R. G. WIND.

One of the two Australian examples is immature but both of them correspond with TILLYARD's description of *T. flavescens* from Kuranda; only the wings are strongly tinged with golden-yellow from base to nodus. The labrum of the adult specimen yellow, dark brown on the middle. Frons orange-yellow without any indication of metallic shine. Vertex metallic-blue. Thorax marked with dull olive-brown and pale glaucous quite similar to that of the ♀ from Dobo (pl. 23 fig. 12), which differs from the Australian examples only in that the wings are tinged with yellow from the base to the end of the triangles, and in having the frons metallic-blue, except for a diffuse yellow frontal stripe bordering the clypeal suture.

$Cux\frac{3+1}{3}$ (Aroe), $\frac{3-4+1}{3-4}$ (Queensland).

It is extremely unfortunate that no description has ever been given of the

anal appendages af the ♂, although RIS writes: "..... keine Unterschiede gegenüber *irregularis*" (l.c. p. 50).

From TILLYARD's description and RIS's notes on this subspecies it would appear that *cladophila* is a variable insect. It is more likely, however, that two subspecies exist in N. Australia, and that examples from Kuranda should be traced distinct from *cladophila*.

Distribution: Aroe Is.; North Queensland.

Nannophlebia alexia LIEFTINCK.

1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 14 - 15 (key ♂♀), 23 - 24 fig. 6, 14 - 15. — ♂♀ N. New Guinea.

Material studied. — North New Guinea: 6♀ (ad.), Bernhard Camp, 50 m, 15.viii.1938 (1 ♀), and Bernhard Camp B, 100 m, 5 - 10.iv.1939, L. J. TOXOPEUS.

Not differing from the typical series.

Distribution: North New Guinea.

Nannophlebia ampycteria LIEFTINCK (pl. 25 fig. 29 - 31).

1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 15 (key ♀), 22 - 23 fig. 13. — ♀ N. & N. E. New Guinea.

Material studied. — North New Guinea: 2 ♀ (ad.), Hollandia, vi-vii.1938, and 1 ♀ (ad.), Bernhard Camp B, 100 m, 11.iv.1939, L. J. TOXOPEUS. — 9 ♂, 12 ♀ (ad.), N. New Guinea, southern Bewani Hills (S. of Bougainville Range), East Tami, 25.x.1935; 7 ♂, 25 ♀ (ad.), Upper course of Korimé River, Tarafia, ca 600 m, Nonno (Japoe) Hills, ca 15 km S. of the Bougainville Range, 400 m, 7 - 21.ii.1936, all W. STÜBER. Allotype ♂: Nonno Hills, 7 - 21.ii.1936, W. STÜBER.

Male (ad., *adhuc ignota*). — Small species. Differs from the female as follows.

Labrum glossy black, with a minute reddish point upon the middle along base and occasionally an additional reddish or yellowish point on either side of it. The black spot on the middle of the frons rather diamond-shaped and after a slight constriction always attached with the black basal stripe in front of the median ocellus, which is quite conspicuous.

Pro- and synthorax marked similarly to the female.

Wings hyaline, bases diffusely and palely saffronated, in fore wing to about as far as the internal triangle, in hind wing to the distal angle of *t* or a little beyond. Pterostigma deep black.

Antenodals $\frac{7}{6}$, postnodals $\frac{5}{5}$.

Abdomen shaped as in the allied species; black, marked with light green on first two segments, orange-yellow on the following segments. Markings on segm. 3 - 6 hardly different from those of the female and also similar in principle to those of *biroi*, but narrower (size and shape rather intermediate between

anatya and *biroi*, the ring on 6 incompletely divided by the median carina and of the same length as the black basal portion of the segment. Remaining segments black, unmarked.

Genitalia coloured as described for *axiagasta* (*loc. cit.*, p. 17). Lobus anterior similar to that species; interior branches of hamuli more distinctly sickle-shaped, resembling those of *anatya*, but apices more strongly curved. Lobus posterior slender, narrowly triangular (pl. 25 fig. 31).

Anal appendages very pale yellow, almost white, bases of superiors a little darkened above and extreme apices of all black. App. inf. narrowly triangular (pl. 25 fig. 29 - 30).

Length: abd. + app. 17.5 - 18, hw. 17.8 - 18.5 mm.

This little species is easily distinguished from its allies by the quite characteristic colour-pattern of the thorax and the presence of 7 antenodal cross-veins on the fore wing. The anal appendages are exactly intermediate in shape and length between those of *axiagasta* LIEFT., and *anatya* LIEFT.

Distribution: North New Guinea.

Nannophlebia anatya LIEFTINCK.

1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 14 (key ♂), 18 - 19 fig. 9 - 10. — ♂ N. New Guinea.

Material studied. — N. New Guinea: 1♂(ad.), Bernhard Camp, 50 m, 12.iv.1939, L. J. TOXOPEUS.

The only example of this rare species is true to the type. Since publication of the original description, W. STÜBER sent me also a few females from the Tami River plain, in the southern Bewani Hills.

Distribution: North New Guinea.

Nannophlebia axiagasta LIEFTINCK.

1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 14 - 15 (key ♂♀), 16 - 17 fig. 6 - 8. — ♂♀ N. & N.E. New Guinea.

Material studied. — N. New Guinea: 1 ♂, 6 ♀ (ad.-juv.), Hollandia, vi-vii.1938, L. J. TOXOPEUS.

Distribution: North and East New Guinea.

Nannophlebia amphicyllis LIEFTINCK.

1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 15 (key ♂♀), 25 - 27 fig. 16 - 17. — ♂♀ Cycloop Mts.

Material studied. — N. New Guinea: 1♂(juv.), 2♀ (ad.), Araucaria Camp, 850 m, 5.iii (1 ♀), and 700 m, 22.iii.1939 (♂♀), L. J. TOXOPEUS. — Living colours: "Face, labium, thoracic and abdominal markings yellow-green; appendages pale yellow" (♀).

Identical with our series from the Cycloop Mts. Apparently restricted to mountainous regions up to 1200 metres above sea-level.

Distribution: North New Guinea.

Nannophlebia biroi (FÖRSTER).

1900. FÖRSTER, Termész. Füzetek, 23, p. 82 - 84 fig. 1 - 3 (♂ genit.). — ♂ (nec ♀) Astrolabe Bay (*Tetrathemis*).
1903. FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 514, 520 - 521. — Remarks.
1909. RIS, Cat. Coll. SELYS, Lib. 9, p. 59. — Type re-examined (*lorquini lorquini*).
1919. RIS, Ibid. 16, 2, p. 1048. — Comp. notes.
1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 14 - 15 (key ♂♀), 19 - 21 fig. 6, 11 - 12. — ♂♀ N. & N.E. New Guinea.

Material studied. — N. New Guinea: 3 ♂, 4 ♀ (ad.), Bernhard Camp, 50 m, 5, 15 and 25. viii, 1 and 20.ix.1938, 13.iv.1939; and Bernhard Camp B, 100 m, 11.iv.1939 (1 ♀), L. J. TOXOPEUS.

Apparently rather a common species in low country.

Distribution: North & North-east New Guinea.

Microtrigonia gomphoides LIEFTINCK.

1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 36 (key)-39, fig. 23 - 25. — ♂♀ Cycloop Mts.

Material studied. — N. New Guinea: 1 ♀ Hollandia, vi-vii.1938: 2 ♀ (ad.), Above Bernhard Camp, 700 m, 29.iii; 1 ♀ (ad.), Rattan Camp, 1150 m, 14.ii; 1 ♀ (juv.), 1 ♀ (ad.), Sigi Camp, 1350 & 1500 m, 15 & 21.ii.1939. All L. J. TOXOPEUS. — Living colours: "Mouth-parts grey-green, thorax brown dorsally. Pale thoracic and abdominal marks light green. Appendages light yellow" (♀ ad., Rattan Cp.).

All specimens agree in having two cubito-anal cross-nerves in the hind wing and hence should be referred to *gomphoides*. However, in two females (above Bernhard Cp., and Rattan Cp.) the dark humeral and lateral thoracic stripes are blurred out and the pale abdominal rings are rather narrower than in typical examples. In the absence of a male I prefer to identify these slightly aberrant individuals with *gomphoides* with some doubt.

Distribution: North New Guinea.

Diplacina hippolyte LIEFTINCK.

1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 44 (key ♂), 57 - 58 fig. 31, 33. — ♂♀ Cycloop Mts.

Material studied. — N. New Guinea: 4 ♂ (ad.), Lower Mist Camp, 1600 m, "near waterfall", 14.i (3 ♂), and 1500 m, 31.i; 5 ♂ (ad.), Rattan Camp, 1150 m, 14.ii, and 1200 m, 20-21.ii.1939. All L. J. TOXOPEUS. — Living colours: "Colours light glaucous" (Lower Mist Cp, 1600 m).

Distribution: North New Guinea.

Diplacina ismene LIEFTINCK.

1933. LIEFTINCK, Nova Guinea, 17 Zool. I, p. 44 (key ♂), 55 - 57 fig. 31-32. — ♂♀ N. New Guinea.

Material studied. — N. New Guinea: 4 ♂, 1 ♀, Hollandia, vi-vii.1938; 1 ♂ (ad.), Above Bernhard Camp, 700 m, 29.iii; 3 ♂ (ad.), Araucaria Camp, 800 m, 28.iii & 2.iv.1939, L. J. TOXOPEUS. — 2 ♂, 2 ♀ (ad.), E. New

Guinea, labelled: "Gegagalu (Sattelberg), bei Simbang, W. Wahnes 1.5.1899" & "C. Wahnes, Sommer 1900" (1 ♀), serial nos 1504, 1509, 1510, & 1595 of the Michigan Museum (FÖRSTER collection), Ann Arbor.

Distribution: North and North-east New Guinea.

Diplacina smaragdina SELYS.

1878. SELYS, Mitt. Zool. Mus. Dresden, 3, p. 294, 320. — ♂♀ Karoon (N. W. New Guinea).
1879. SELYS, Ann. Mus. civ. Genova, 14, p. 305, 306. — Same specimens.
1899. FÖRSTER, Entom. Nachr. 25, p. 190 - 191. — Remarks.
1909. RIS, Cat. Coll. SELYS, Lib. 9, p. 94 - 96, fig. 65 - 67. — ♂♀ N. New Guinea (types) (*s. smaragdina*).
1915. RIS, Nova Guinea 13 Zool. 1, p. 114 (key). — ♂ S. W. New Guinea.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1058 (key), 1060. — Same spec.
1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 43 (key ♂), 52 - 55, fig. 30. — ♂♀ N. & C. New Guinea.

Material studied. — New Guinea (W. to E.): 5 ♂, 1 ♀, Hollandia, vi-vii.1938; 1 ♂, Dojo, foot of S. Cycloop Mts, 150 m, 19.iv.1939; 1 ♂, 1 ♀ (ad.), Bernhard Camp, 50 m & Bernhard Camp B, 100 m, 7 & 12.iv.1939; 8 ♂, 3 ♀ (ad., 1 pair *in côp.*), Araucaria Camp, 7 - 800 m, 3-30.iii.1939. All L. J. TOXOPEUS. — 1 ♂ (ad.) E. New Guinea, labelled: "Huongolf/C. Wahnes, Sattelberg, 900 m, i.1896", "*Diplacina wahnesi* FÖRSTER's hand, *nom. nud.*), serial no. 2282 of the Michigan Museum, Ann Arbor.

This is the commonest and most widely distributed species of the genus in New Guinea. Our examples from Araucaria Cp. are a little larger and somewhat darker than those from the Humboldt Bay country, but otherwise do not differ from these. In 1938 I have been able to examine the types in the Brussels Museum.

FÖRSTER's "*wahnesi*" (nom. in litt.) is identical with *smaragdina*. MARTIN's specimen in the Genoa Museum, which I have also re-examined, has been wrongly identified with *smaragdina*; it is a typical example of *D. antigone* LIEFT. and bears the following label: "Gerakanumu, Astrolabe Range (S. E. New Guinea), 16.ii.1893, L. LORIA". (See MARTIN, *Bull. Soc. ent. Ital.* 60, p. 197, no description).

Distribution: New Guinea (universal).

Lyriothemis hirundo RIS.

1913. RIS, Nova Guinea, 9 Zool. 3, p. 509 - 510. — ♀ S. New Guinea.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1062 - 1063, fig. 618. — Same example.
1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 59 (key)-62 fig. 34. — ♂♀ S. & N. New Guinea.

Material studied. — N. New Guinea: 1 ♂ (ad.), Cycloop Mts, 900 m, 25-26.vi.1938; 4 ♂, 12 ♀ (ad.), Araucaria Camp, 800 m, 3-30.iii.1939, L. J. TOXOPEUS. — Living colours: "Markings yellow, growing darker posteriorly" (♀ Araucaria Cp, 3.iii).

Distribution: North and South New Guinea.

Lyriothemis meyeri (SELYS).

1878. SELYS, Mitt. Zool. Mus. Dresden, 3, p. 308. — ♂♀ "Ansus, Jobi" (on Japen I.); N. W. New Guinea; Salawati, Waigeoe and Japen (*Calothemis*).
1879. SELYS, Ann. Mus. civ. Genova, 14, p. 289 ("Waigiou, Salvatti, Soron"), 305 ("Karoons"). (*Orchistemis*).
1898. FÖRSTER, Termész. Füzetek, 21, p. 281. — ♂♀ Astrolabe Bay (*Calothemis*).
1909. RIS, Cat. Coll. SELYS, Lib. 10, p. 102 (key), 103 - 104 (incl. ref.), fig. 72 - 73. — ♂♀ Ansoes (Japen I.), ♂♀ N. W. & N. E. New Guinea.
1909. VAN DER WEELE, Nova Guinea, 5 Zool. 3, p. 386. — ♂♀ N. New Guinea.
1909. VAN DER WEELE, Ibid. 9 Zool. 1, p. 20. — ♂ S. New Guinea.
1913. RIS, Ibid. 9 Zool. 3, p. 509. — ♂♀ S. New Guinea; ♂♀ Waigeoe I.
1915. CAMPION, Trans. Zool. Soc. London, 20, p. 491. — ♂♀ S. New Guinea.
1915. RIS, Nova Guinea 13 Zool. 2, p. 115. — ♂♀ S. W. New Guinea.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1062. — ♂♀ Waigeoe I.; W. & S. New Guinea.
1933. LIEFTINCK, Nova Guinea, 17 Zool. 1, p. 59 (key).

Material studied. — N. New Guinea: 1 ♂, 2 ♀, Hollandia, vi-vii & Nettar (Lake Sentani), 23-30.vi.1938; 9 ♂, 9 ♀ (ad.), Bernhard Camp, 50 m, 26-28.vii, 5-15.viii, 14-28.ix, 3-8.x.1938, 22.xii.1938, and 7.ii.1939; 2 ♂, 1 ♀ (ad.), Bernhard Camp B, 100 m, 7-10.iv.1939. All L. J. TOXOPEUS.

Besides the above mentioned examples I have examined numerous other specimens from almost all known localities, including those from the islands of Salawati, and Waigeoe, from the southcoast of the Vogelkop (Soengei Moetoeri) and the Argoeni Bay (south of Babo), and the southcoast of West New Guinea (Soengei Aindoea).

In the Leiden Museum is a single ♂ from the island of Obi, in the Moluccas, collected by BERNSTEIN.

Distribution: Moluccas (Ternate and Obi only); continental New Guinea (universal), and satellite islands Salawati, Waigeoe and Ansoes (Japen I.).

Nesoxenia mysis SELYS.

In the present state of our knowledge of the genus *Nesoxenia* only four subspecies of *N. mysis* including the typical race, are known, viz., *N.m. interrogata* (SELYS), *N.m. mysis* (SELYS), *N.m. dahli* RIS, and *N.m. cingulata* KIRBY. The two last mentioned subspecies are from the Bismarck Archipelago and the Solomon Islands, respectively, and will not concern us here.

Since the completion of the monograph of the Libellulinae by the late Dr F. RIS (Cat. Coll. SELYS, Lib. fasc. 10, 1909 and 16[2], 1919), the present author has been able to examine a rich material and to accumulate considerable further distributional records, which are here set forth in detail, as the majority are from places and localities little known to the entomologist and of some interest from a zoogeographical point of view.

During a short visit to the Schouten Islands, off the N.-coast of New Guinea, Mr TOXOPEUS, on his way to the Humboldt Bay, has been fortunate enough to take two males of the long-lost '*Agrionoptera interrogata*' of DE SELYS. The capture of a few topotypical examples of *interrogata* is of great interest as it

enables me to deal with the difficult formenkreis of *Nesoxenia mysis* in a more satisfactory way than had otherwise been possible.

Besides typical *interrogata* I have examined examples from the Moluccas, the Kei and Aroe islands; also from the island of Waigeoe, and from several continental localities on West New Guinea.

Little attention has been paid by previous authors to the colour-scheme of the thorax in the species here discussed; but a close examination of the thoracic colour-pattern has yielded reliable characters for the discrimination of five distinct subspecies. On the other hand, the shape and size of the yellow marks on the abdomen proved to be of little or no importance. The venation is also very variable and the presence of one or two rows of cells in the discoidal field of the fore wings is closely correlated with the size of the insects and cannot be used as a means of distinction.

The typical race, *mysis* SELYS, is apparently distributed over almost the whole of the island of New Guinea, inclusive of the satellite islands of Misool (terr. typ.) and Waigeoe, whilst specimens from the Aroe Islands do not differ from those of the lowlands of South New Guinea; these again are practically identical with northern individuals and examples of FÖRSTER's *puella* from the eastern provinces of the island (Huon Gulf).

N.m. interrogata, from the Schouten Islands, stands rather apart on account of its thoracic markings and superior size, although some examples of *moluccana* from Halmahera and Boeroe are even larger, rivalling specimens of *mysis* from the Huon Gulf, which are among the largest of continental New Guinea.

Besides *N. mysis* with its subspecies *interrogata,* New Guinea is inhabited by two other forms of *Nesoxenia* which, although closely allied to *mysis,* differ from the other subspecies by their smaller size, different colour-scheme of the thorax, and also in the shape and colour of the male anal appendages.

One of these, *N. m. mutans,* subsp. n., of which only a single pair (in excellent state of preservation) is available for study, was discovered at Babo, on the northcoast of the Bombarai peninsula, southern shore of the MacCluer Gulf. It is of smaller size and much darker colouring than typical *mysis,* which is known from the southcoast of the Vogelkop (on the opposite side of the MacCluer Gulf), as well as from the Argoeni Bay (which is only about 20 miles south of Babo), and from the southcoast of the 'neck' of West New Guinea.

From 1931 onwards I have received from Mr STÜBER long series of typical *mysis* from the hill-country to the south and southeast of the Humboldt Bay (N. New Guinea), as far eastwards as the southern Bewani Hills. In 1935, however, STÜBER also visited Tarafia (or Tarfia) in the west, about 140 km west of Hollandia. In this locality he captured a few examples of a small *Nesoxenia* that was at once recognised by him as a form not captured earlier or elsewhere. In a letter to me, dated 17th August 1935, STÜBER called my attention to this insect and expressed the view that it might be distinguished from the better known subspecies *mysis;* I am now able to confirm this opinion and

to give a description of this race, which I have named *N.m. tarafia,* subsp. n. Unfortunately, we know nothing as to whether *N. m. mutans* or *N. m. tarafia* are to be encountered in company with the widely spread *N.m. mysis;* so much is certain that at Babo *m. mutans* was the only *Nesoxenia* collected, whilst at Tarafia *m. mysis,* though occurring not far away from this locality, was not closely associated with *tarafia.*

On these grounds I have preferred to regard both forms as subspecies of *N. mysis* rather than considering them distinct species.

Lastly, the subspecies *N. mysis moluccana* subsp. n., was erroneously identified with *interrogata* by RIS, the type of *interrogata* from 'Mysore' (= Schouten Is.) being unknown to him. This subspecies has apparently a wide distribution in the Moluccas, and as has been pointed out already bij RIS (*loc. cit. postea,* 1910), the same race inhabits the Kei Islands, whereas on the Aroe Islands it is replaced by *mysis.*

The five subspecies of *N. mysis* may be distinguished by the following

Key to the subspecies of *N. mysis.*

1. Black stripe along first lateral thoracic suture narrow but complete, and widest ventrally; black stripe along upper half of second lateral suture not fused dorsally with the first lateral stripe. Antehumeral yellow patches more or less ?-shaped, not confluent with the pale colour of the mesepimeron. A distinct brownish or black stripe on each side of the thorax ventrally (pl. 24 fig. 13 - 14). Labium usually pale-coloured, median lobe and inner margin of lateral lobes sometimes blackish or brown. ♂ Sup. anal apps. black, inferior one yellowish. ..... **m. moluccana**

1'. Black stripe along first lateral thoracic suture ceasing at the spiracle or at least interrupted at a level either dorsal or ventral to it; black stripe along upper half of second lateral suture much broader, nearly always fused on both ends with the upper portion of the first lateral stripe so as to enclose an oval or triangular yellow metepisternal spot. ..... 2.

2. Antehumeral yellow patches markedly ?-shaped, ventral portion separated from the mesinfraepisternum at least by a diffuse brownish line and from the pale colour on mesepimeron by a continuous broad black band along humeral suture. 3

2'. Antehumeral yellow patches less distinctly ?-shaped, ventral portion broadly confluent with the pale colour on mesinfraepisternum and with a ventral off-shoot of the pale mesepimeral band : hence no continuous black band along humeral suture. Black marks on lower half of sides and venter of thorax better developed than in *m. interrogata* (pl. 24 fig. 16). Usually two rows of cells in the discoidal field of fore wing. Labium yellow, unmarked. ♂ Sup. anal apps. black, inferior one yellowish (pl. 41 fig. 165). **m. mysis**

3. Lower half of thoracic sides pale-coloured; black metepisternal and metepimeral marks stopping short at level of the spiracle; metepimeron divided

longitudinally by a narrow stripe, fading away and tapering ventrally. Brownish stripe on either side of the thorax ventrally indistinct (pl. 24 fig. 15). Two rows of cells in the discoidal field of fore wing. Labium yellow, median lobe and inner margin of lateral lobes more or less brownish or black. ♂ Sup. anal apps. black, inferior one yellowish. **m. interrogata**

3'. Lower half of thoracic sides alternately black and yellow; black metepisternal marks widely interrupted at a point dorsal to the spiracle, the lower mark in the form of a black band along lateral suture running downwards from a point just dorsal to the spiracle; metepimeron divided longitudinally by a very broad band (pl. 24 fig. 17 - 18). Only one row of cells in the discoidal field of fore wing. ♂ Anal apps. entirely black. Subspecies of small size. ..... 4.

4. Labium throughout pale yellow. Venter of thorax pale, unmarked. ♂ Sup. anal apps. with the apices evenly and finely pointed, lower margin with 3 strong interior teeth (pl. 41 fig. 164). ..... **m. tarafia**

4'. Labium with the median lobe and the inner border of the lateral lobes deep black. Venter of thorax marked with three blackish-brown dots. ♂ Sup. anal apps more strongly outbent on middle, apices more abruptly pointed, lower margin with only 2 inconspicuous tubercles (pl. 41 fig. 163). **m. mutans**

Nesoxenia mysis mysis (SELYS) (pl. 24 fig. 16, pl. 41 fig. 165).

1878. SELYS, Mitt. Zool. Mus. Dresden, 3, p. 294, 311. — ♂♀ Misool I. (*Agrionoptera mysis*).

1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 122 (key), 124 - 125 (full references). — ♂♀ Misool I., Waigeoe I., and N. New Guinea.

1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 528. — ♂♀ Aroe Is.

1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1067 (incl. references). — S. & W. New Guinea (Kaimana); Aroe Is.

Material studied. — N. New Guinea (W. to E.): 5 ♂, 1 ♀ Waigeoe I., BERNSTEIN (Leiden Museum). — 6 ♂, 1 ♀, Hollandia, vi-vii.1938; 8 ♂, 11 ♀ (ad.), Bernhard Camp & River, 50 m, 1.vii-3.xi.1938 & 12.iv.1939, L. J. TOXOPEUS. — Large series (both sexes), Hollandia, Kressi River plain (Mameda-Warim), Tami River plain, Bewani Hills (3 - 500 m), S. Bougainville Mts, 2 - 400 m, 1930 - 1937, various dates; 1 ♂, Dempta Hills, 600 m (150 km west of Hollandia), 12.iii.1936; all W. STÜBER. — 1 ♀, Boundary Mts, Vanimo, sea-level to 1000 ft, iv.1939, and 2 ♀, Torricelli Mts, 200 - 1000 ft., ii.1939, E. L. CHEESMAN (Adelaide Museum). — 9 ♂, 11 ♀ (mostly ad.), Astrolabe Bay, Bongu, W. WAHNES, 9.12.1898, "im Urwalde" (FÖRSTER's hand), all labelled: "*Nesoxenia puella*" by FÖRSTER; 1 ♂, 1 ♀ (ad.), Huon Gulf, Simbang, C. WAHNES, xi-i.1905/06, "*Nesoxenia*" (FÖRSTER's hand); 1 ♂, 1 ♀ (ad.), labelled: "Astrolabe B., Erima, BIRO 1896" (printed labels), unidentified! (topotypical examples of *N. puella* FÖRSTER). All these in the Michigan Museum, Ann Arbor (FÖRSTER collection). — W. New Guinea (W. to E.) : 2 ♀ (ad.), Soengei Tisa, southcoast of the

Vogelkop, 8 & 11.v.1941; 2 ♀ (ad.), Aaroea, Kowiai distr. (Argoeni Bay), southcoast Bombarai Peninsula, 4.viii.1941; 5 ♂, 3 ♀ (ad.), Tarera, Lakahia (Etna) Bay, southcoast, 28.vii.1941; 1 ♀ (ad.), Arja River (W. of Oeta), southcoast, 27.vi.1941; all E. LUNDQUIST, Negumy Expedition. — S. New Guinea (W. to E.): 1 ♂ (ad.), Lorentz Exp. 1909, Lorentz River, Bivak Islet, H. A. LORENTZ (ex Mus. Amsterdam); 1 ♀ (ad.), Digoel River, Mappi Post, iv.1938, J. M. VAN RAVENSWAAY CLAASEN. — Aroe Is.: 1 ♀ Dobo, 28.v.1939, R. G. WIND; 1 ♂, 1 ♀ (ad.), id., Batoe Bakar, 19.v.1938, P. BUWALDA.

This subspecies has been discussed at length by RIS (*loc. cit.* 1910). As has been pointed out by him, the thorax exhibits a colour-pattern of black and yellow, varying but little in long series from one locality. In fully adult specimens the ground-colour is a delicate pale viridine yellow (RIDGWAY), and the dark markings are sharply pronounced. In pl. 24 fig. 16 a dark ♂ specimen from Bernhard Camp on the Idenburg River is figured. In many specimens, especially those from the west and southwest, the black marks on the sides of the thorax are more abbreviated ventrad and generally more reduced. The size is subject to considerable variation. Our largest specimens are from the Huon Gulf (♂ abd. + app. 26, hw. 29 mm), whilst examples from Erima, Astrolabe Bay (♂ 22, 25 mm) are among the smallest of our series.

The ♂ and ♀ from Batoe Bakar, Aroe Is., are exactly identical with examples from western New Guinea.

Distribution: Misool I. (terr. typ.), Waigeoe I., New Guinea (universal), and Aroe Is.

Nesoxenia mysis interrogata (SELYS) (pl. 24 fig. 15).

1878. SELYS, Mitt. Zool. Mus. Dresden, 3, p. 294, 312. — ♀ "Kordo, Mysore" (Schouten Islands) [1]) (*Agrionoptera interrogata*).

1879. SELYS, Ann. Mus. civ. Genova, 14, p. 300, 302. — Same spec. (*A. interrogata*).

Material studied. — 2 ♂ (ad.), N. New Guinea, Schouten Islands, Biak I., Bosnik, 16.vi.1938, L. J. TOXOPEUS.

Labium yellow with most of the median lobe brown, and a brown stripe bordering the inner margin of the side-lobes.

Black marks on the sides of the thorax fading to brown and ill-defined ventrally.

Wing-bases slightly and diffusely yellowish. Triangles in fore wing free (1 ♂) or traversed (1 ♂); *ti* two-celled. Two rows of cells in the discoidal field of fore wings to a level as far as 1 cell beyond origin of *Rspl.*

Antenodals $\frac{13-14}{12}$, postnodals 13 - 14.

[1]) The locality "Kordo, Mysore" is a misprint for the native village Korido, on the southcoast of the island of Soepiori (one of the Schouten islands), "Mysore" (or Misore) being an old name for these islands, more properly for the island of Biak. See also LIEFTINCK, *Nova Guinea* 17, 1935, p. 265, and A. B. MEYER & L. W. WIGLESWORTH, The Birds of Celebes and the neighbouring islands, 1, 1898, map III & IV.

Inferior anal appendage brownish-yellow.

Length: abd. + app. 25.2 - 27.0, hw. 27.5 - 28.5 mm.

Distribution: Schouten Islands.

Nesoxenia mysis moluccana, subsp. n. (pl. 24 fig. 13 - 14).

1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 122 (key, pars), 123 - 124 (full references, excl. Selysi) fig. 90 (wings), 91 (genit. ♂). — Elbor (? Ekon, Halmahera), Halmahera, Batjan, Kei (*mysis interrogata*).

1919. RIS, Ibid. 16, 2, p. 1067. — ♂♀ Ceram, no descr. (*m. interrogata*).

1930. LIEFTINCK, Treubia, 7 Suppl. p. 309 - 310. — ♂ Boeroe (*m. interrogata*).

Material studied. — 1 ♂, 2 ♀, N. Halmahera, BERNSTEIN; 2 ♂, 1 ♀ Morotai, BERNSTEIN (Leiden Mus.); 1 ♂, Boeroe, Wa'Katin, 11.iv.1921, L. J. TOXOPEUS. — 1 ♂, 1 ♀, Kei Islands, Toeal, no 206 & 208, 1922, H. C. SIEBERS [1]).

A homogeneous series, readily distinguished from *mysis* and *interrogata* by the very different colour-scheme of the thorax.

The extent of the black marks on the labium and of the yellow rings on segments 3 - 6 of the abdomen is apparently somewhat variable, but in the material examined by me I can find no appreciable differences in the abdominal marks with those of *m. mysis* and *m. interrogata*. The labium is entirely yellow in the series examined by me and the triangle of the fore wings is invariably free; *ti* two-celled. Two rows of discoidal cells in fore wing. Two *Cux* in hind-wing ($\frac{1.1}{3.3}$ in the Boeroe specimen).

As types of this subspecies I have selected a pair from Halmahera, now in the Leiden Museum.

Distribution: The N. Moluccan islands Morotai, Ternate, Halmahera, Batjan, Boeroe, and Ceram; Kei Is.

Nesoxenia mysis tarafia, subsp. n. (pl. 24 fig. 17, pl. 41 fig. 164).

Material studied. — 3 ♂ (2 ad.), 1 ♀ (semiad.), N. New Guinea, ca 150 km W. of Humboldt Bay (Hollandia), Dempta Hills, 600 m, Tarafia, 10.v.1935, W. STÜBER.

Male. — Head coloured similarly to *mysis mysis*, but labium very slightly brownish along the inner border of the lateral lobes. Antehumeral yellow patches interrupted dorsally, similar in principle to *m. mysis* and allied subspecies; ventral portion not distinctly ?-shaped, only slightly intruded by black and hence much more squarish in shape, with the inner prolongation obliterated; separated from the pale colour on mesepimeron by a continuous broad black band. Mesinfraepisternum mottled with black. Black stripe along first lateral suture very broad, widely interrupted mid-way its length, its upper portion enclosing a yellow metepisternal spot. A very broad black band over the middle of the metepimeron, widest ventrally. Thorax yellowish underneath, unmarked.

[1]) This subspecies was collected also by Miss C. LONGFIELD on Ceram (♀ Piroe, 27.xii.1929) and on the Kei Islands (♂ near Toeal, 21.vii.1929). The specimens are now in the British Museum. (LONGFIELD, *in litt.*).

Legs coloured similarly to *m. mysis*.

Wings narrower with the apices slightly more rounded than in *m. mysis*. Neuration as in that subspecies, but discoidal field of fore wings with only one row of cells as far as the origin of the vein *Rspl*, or slightly beyond that level. Antenodals $\frac{11-12}{9-10}$, postnodals 10 - 11.

Abdomen as in *m. mysis*. Genitalia identical to those of that species.

Anal appendages black, including the inferior one. Superior pair decidedly less strongly outcurved on middle than in the typical race and also less than in *m. mutans*, apices less abruptly, more evenly, and more finely pointed; lower margin with 3 strong interior teeth instead of at least 4 (generally 5 - 7) in *mysis* and its subspecies *moluccana* and *interrogata* (pl. 41 fig. 164).

Female. — Very similar to the male. Body-markings identical. Wings with distinct rusty-brown spots at extreme base: fore wing in *sc* and *cu* to Ax_1 and *Cux*, hind wing in *c* to Ax_1, in *sc* to Ax_2, and in *cu* to slightly over Cux_1. One row of discoidal cells in fore wing. Nodal index $\frac{11.12.12.11}{12.11.10.11}$.

Abdomen marked similarly to *mysis mysis*. Genital organs not different.

Length: ♂ abd. + app. 20.2 - 20.5, hw. 22.0 - 22.3; ♀ 21.2, 23.5 mm.

This dainty little insect is a diminution of *m. mysis*, from which it is easily distinguished by the characters mentioned in the key.

Distribution: N. New Guinea (part).

Nesoxenia mysis mutans, subsp. n. (pl. 24 fig. 18, pl. 41 fig. 163).

Material studied. — 1 ♂, 1 ♀ (ad.), W. New Guinea, MacCluer Gulf, Babo (northcoast of Bombarai Peninsula), 22-23.viii.1941, E. LUNDQUIST (Negumy Expedition). The specimens are holo- and allotype.

Male. — Differs from *m. tarafia* in the following respects.

Labium with the median lobe deep black, divided longitudinally by a narrow rusty-brown stripe; inner border of each of the lateral lobes sharply defined black.

Colour-pattern of synthorax (pl. 24 fig. 18) sharply pronounced, deep bronzy-black on a pale viridine yellow background. Light marks on thoracic sides similar in principle to *m. tarafia*, but more extensive, especially the dorsal and posterior off-shoots of the mesepimeral fascia. Venter of thorax pale yellowish-brown with three, slightly diffuse, oval blackish-brown marks, two of which are placed in the long axis of the body, parallel to and anteriorly confluent with the black metepimeral band, and one transverse apical mark.

Wings a trifle broader and apices slightly more produced than in *m. tarafia* (intermediate in shape between *m. mysis* and *m. tarafia*). Discoidal field of fore wing commencing with a single divided cell, thence with a single row of cells to as far as the wing border.

Antenodals $\frac{12.11}{9.10}$, postnodals 10 - 11. Pterostigma black, slightly longer than in *m. tarafia*.

Anal appendages all black, exactly intermediate in shape between *m. mysis* and *m. tarafia*: superior pair slightly less outcurved than in the typical subspecies, but more so than in *tarafia*; sub-apical inferior protuberance smaller and more pronounced than in *mysis*, but neither obtuse-angulate nor strongly armed as in *tarafia*, and with only two low tubercles (pl. 41 fig. 163).

Female. — Identical with the male except for sexual differences. Wing-bases distinctly spotted with rusty-brown in *c - sc* and *cu* to a level slightly beyond Ax_1 and *Cux* in both pairs. Right fore wing triangle crossed. Nodal index $\frac{13.13.14.12}{14.13.12.13}$. Long stretches in the discoidal field of fore wing with two rows of cells.

Abdominal markings as in the allied subspecies.

Length: ♂ abd. + app. 21.5, hw. 23.5; ♀ 23.0, 25.0 mm.

This new subspecies most closely resembles *tarafia* in size and markings.

Distribution: W. New Guinea (part).

Agrionoptera insignis RAMBUR.

Determination of subspecies of *A. insignis* affords unusual difficulties owing to considerable instability of characters and to seemingly discontinuous distribution of some races. The delimitation of the various races on any plylogenetic system would be an enormous undertaking, since it would entail the examination not only of a rich material from very many small islands and archipelagoes (comprising an area limited by the Nicobar Is. and Burma in the west, the New Hebrides and Union Is. in the East) but also of a mass of evidently more or less nearly related 'races', which, so far as I can yet see, differ from each other in little or nothing except size, neuration and scheme of markings. These characters, moreover, are often exhibited in a very haphazard way, and certain features that have been used in support of the admission of local races may fall within the limits of individual variation.

While engaged with a study of these red-bodied *Agrionoptera*, I often could not withhold the opinion that similarity of environment is responsible for the development of similar characters, for we know of several instances of an insular subspecies inhabiting two regions lying far apart from each other, which are yet almost exactly alike in outward appearance. The forces of natural selection responsible for 'moulding' a subspecies of that kind would then have been similar in both areas and would have thus called forth parallel characters. This would imply that seemingly identical subspecies with a discontinuous distribution are not necessarily related.

A good example of such a difficult case presents itself with *Agrionoptera insignis similis*, which is commonly found in the Moluccas and the Kei Islands. In New Guinea it is replaced by *A. insignis papuensis*, spread well nigh all over the island, though occurring in a different form on the Schouten Islands and changing into *A. insignis allogenes*, from the Australian continent, in the southern districts and on the Aroe Islands.

However, on the eastcoast of New Guinea and in the Bismarck Archipelago, *similis* suddenly emerges in a form hardly to be distinguished from the subspecies of the Moluccas. As already stated by FÖRSTER [1]), at the Astrolabe Bay as well as on the Huon Gulf both subspecies, *papuensis* and *similis*, occur side by side, without mingling together. I was able to convince myself of this phenomenon, on the basis of the material from the Michigan Museum. This is very interesting because it would indicate that both subspecies cannot be considered as such, but as belonging to different species.

On the Aroe Islands the same phenomenon occurs as well. While we find on the Kei Islands exclusively the Moluccan subspecies *similis*, on the Aroe Islands, besides the Australian *allogenes* (which in the most common form there), we meet with *similis* as well! I actually received both subspecies from Dobo in the same enveloppe.

Though one would therefore all the more be inclined to suppose that there are perhaps two different species, I was forced to abandon this idea; firstly, on account of the complete lack of good morphological points of distinction in the structure of anal apps. and genitalia; and, secondly, because the subspecies *similis* itself is linked up through transitional forms with the typical *insignis* of Java [2]).

In this connection it is instructive to point out a similar case occurring with the genus *Rhinocypha*, from which more than one form can be observed both in the western as in the eastern part of New Guinea, which on similar grounds I have been forced to classify all as races of but one species, viz. *Rhinocypha tincta*. (See: *Nova Guinea*, N. S., 2, 1938, p. 49 - 70).

So much is certain, that in New Guinea and surrounding islands at least three forms of *insignis* occur; one of these, which I have associated with SELYS's 'var. *papuensis*', ranges from the Vogelkop to as far as the Huon Gulf and has even been observed at an altitude of 1000 m above sea level. Superficially it is very similar to typical *insignis* of Java, but it is undoubtedly more intimately related with the Australian *allogenes*, which inhabits also the southern provinces of New Guinea, and is the chief representative of the *insignis* formenkreis on the Aroe Islands. As we have seen above, the third subspecies, *similis*, has been found in northeast New Guinea.

To the east of New Guinea and the Bismarck Archipelago, *A. insignis insularis* KIRBY (of which *salomonis* FÖRSTER is a synonym), inhabits the Solo-

[1]) „Für das papuanische Gebiet in engerem Sinne kommen zwei *insignis*-Formen zur Geltung, 1) die *similis*-Form, 2) die *papuensis*-Form.

Erstere bewohnt besonders die papuanische Inselwelt, letztere vielleicht nur die Nordküste von Neu-Guinea und sehr nahe gelegene Inseln (z. B. Tami im Huongolf). Beide Formen besitzen nur eine einzige Submedian-Querader in beiden Geschlechtern. Sie fliegen am selben Orte, so z. B. auf Tami und bei Bongu. An letzterem Orte sind sie zu wahrhaft herrlicher Entfaltung gelangt, so, dass sie auch vom ältesten Autor als zwei verschiedene „Arten" anerkannt würden". (*Ann. Mus. Nat. Hung.* 1, 1903, p. 534).

[2]) Compare for instance *quatornotata* SELYS, of Celebes and the Philippines on the one side, and a number of intermediate insular forms known from the Lesser Sunda islands, Sangihe & Talaud, the Tanimbar islands, Micronesia, &ç, on the other side.

mon Islands. In opposition to KIMMINS and SCHMIDT, who in following RIS still classify this race as belonging to *similis*, *insularis* appears to be sufficiently characterized to stand as a marked subspecies all of its own. I have not seen any material from finding-places located in a more eastern direction than the Solomon group.

Key to regional subspecies of *A. insignis* (males).

1. Thoracic sides preponderantly yellow. Wings narrow. Neuration open. *t* in f.w. comparatively small and wide, nearly always free, basal side less than two times as long as costal side, distal side nearly always a little fractured; *ti* traversed only once (very rarely 3-celled). Discoidal field of f.w. with 2 rows of cells up to the origin of the bridge or to level of *Bx*, and occasionally with only a single row at places; Cu_1 only weakly curved; only one row of cells between Cu_2 and the anal wing-border where most widely separated, with rare exceptions, i.e. only few isolated divided cells. Yellow mesepisternal thoracic patches similar in principle to *i. similis*. Abdomen slim and very slender, intermediate segments not noticeably expanded in lateral dimension; sides of segm. 1 - 2 and basal half of 3 largely yellowish, 3 - 7 blood-red, each with a narrow but quite distinct black apical ring (occupying about the distal fourth of 7), progressively wider from before backwards, and with the lateral tergal margins also obscured, growing darker from segm. 3 onwards; remainder black. Subspecies generally of smaller size. ..... **i. papuensis** and **i. allogenes**

1'. Thoracic sides coloured preponderantly black, or black and yellow in about equal proportion. 2

2. Wings comparatively broad, bases at least slightly yellowish. Neuration close. *t* in f.w. narrow, nearly always traversed, basal side fully two times as long as costal side, distal side nearly always straight; *ti* nearly always 3-celled. Discoidal field of f.w. with at least 2 rows of cells up to the origin of the bridge and often commencing with 1 × 3 cells. Cu_1 rather strongly curved; generally more than one row of cells between Cu_2 and the anal wing-border where most widely separated. Yellow mesepisternal thoracic patches conspicuous, indented by black dorsally. Abdomen slender but comparatively strongly built, basal segments inflated, intermediate segments a little expanded; sides of segm. 1 (or 1 - 2) with yellow spots, dorsum and sides of 2 - 7 throughout unicolorous orange-red, dorsum of 8 often also with small red basal points or spots; remainder black. Ventral surface of abdomen black (sternites more or less red in Moluccan specimens!). Subspecies of larger size. ..... **i. similis**

2'. Wings narrow, bases hyaline. Neuration open. *t* in f.w. very wide, uncrossed, basal side less than two times as long as costal side, distal side straight; *ti* traversed once. Discoidal field of f.w. with 2 rows of cells up to level of *Bx*; Cu_1 almost straight; only one row of cells between Cu_2 and the

anal wing-border where most widely separated, or at most with a few Y-shaped veins. Yellow mesepisternal thoracic patch broadly and longitudinally divided so as to form two isolated streaks (pl. 24 fig. 19). Abdomen short and stout, basal segments but little inflated, intermediate segments not expanded; coloration red, from the transverse carina of segm. 2 to as far as segm. 7, including most of the dorsum of 8, with only the posterior carinae finely black. Subspecies of small size. ..... **i. cynthiae**

Agrionoptera insignis papuensis SELYS (pl. 24 fig. 24).

1879. SELYS, Ann. Mus. civ. Genova, 14, p. 303, 324. — ♂♀ N.W.-coast of New Guinea, and Doré (*A. insignis* race? *similis* varieté *papuensis*).
1898. FÖRSTER, Termész. Füzetek, 21, p. 283 - 284. — ♂♀ Astrolabe Bay (Subrasse *papuensis*).
1909. FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 533 - 534 (pars). — N.E.-coast New Guinea.
1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 141 (pars!). — New Guinea (partim) (*insignis similis*).
1919. RIS, Ibid. 16, 2, p. 1068 - 1069 (pars!). — ♂♀ Kaimana, S.W. New Guinea (*insignis similis*).

Material studied. — W. New Guinea (W. to E.): 1 ♀, Soengei Jakati, westcoast of the 'neck' of the Vogelkop, 19.v.1941; 2 ♂, 2 ♀, Babo and Agonda, northcoast of Bombarai Peninsula, 22 - 25.viii.1941; 4 ♂, Kaimana, Kowiai distr., southcoast, 5.vi.1941; 2 ♂, 2 ♀, Tarera, Lakahia (Etna) Bay, southcoast, 25 - 26. vii.1941; 11 ♂, 4 ♀, Soengei Siera, 19.vi.1941, Sei Arja, 26 - 28. vi.1941, and Sei Aindoea, 5 - 17. vii.1941, all southcoast between Etna Bay and Oeta; all E. LUNDQUIST (Negumy Expedition). 1 ♂, Kaimana, Kowiai distr., southcoast, 17.xi.1941, J. J. VAN DER STARRE. — N. New Guinea (W. to E.): 3 ♂ (ad.), Schouten Is., Biak I., Bosnik, 16.vi.1938, L. J. TOXOPEUS. — 1 ♀, van Rees Hills, Mamberamo Valley, Batavia rapids (low country), iii-iv.1940, J. P. K. VAN EECHOUD. — 2 ♂, 1 ♀, Pionierbivak, vii.1920 & 7.i.1921, W. C. VAN HEURN. 2 ♀, Hollandia, vi-vii.1938, L. J. TOXOPEUS. — Large series (both sexes), Hollandia & environs (Nafri Rd., Asé River; Nettar, 400 m; Second Hill Range, 3 - 400 m; various dates, 1930 - 1934; 2 ♂, Cycloop Mts, 1000 m, xii.1934; all W. STÜBER. — 12 ♂, 10 ♀, Bernhard Camp & River, 50 m, 20.vii-22.xii.1938, and 12.iv.1939; 1 ♀ Araucaria River, 800 m, 10.iii.1939, L. J. TOXOPEUS. — 6 ♂, 3 ♀, Torricelli Mts, 200 - 1000 ft., ii. 1929, E. L. CHEESMAN (Adelaide Museum). — 2 ♂, 2 ♀ (ad.), Astrolabe Bay, Bongu, 1899, CARL WAHNES (labelled by FÖRSTER, but unnamed); 1 ♂ (ad.), Huon Gulf, Taimi Islet, CARL WAHNES, labelled: "*A. papuensis* Selys Rasse *bonguensis* Foerster ♂" (FÖRSTER's hand); all in the Michigan Museum, Ann Arbor.

Although I have not seen typical *papuensis* from the N.W.-coast (Manokwari, Andai and the Doré Bay), it is almost beyond doubt that individuals of West New Guinea and those of the N. and N.E.-coasts and the hill-country north of the central mountain range, are identical with this form. All agree in having the neuration open, the triangles wide and invariably free, and *ti*

traversed by a single cross-nerve (occasionally also free). Few females only show a tendency to the development of additional cross-veins. In the original description the black apical rings to segments 3 - 6 of the abdomen are explicitly mentioned.

Although there should be no room for confusion with subspecies *similis*, yet it is quite obvious that RIS (l.c. 1910) had two subspecies before him among the New Guinean material in SELYS's collection; and although he did not maintain that *similis* was the same as *papuensis*, these two races were not separated owing to lack of sufficient material. The characters which distinguish the two subspecies have already been mentioned in the key.

A. i. papuensis appears, in the western, northern and north-eastern portion of its range, to be very constant; but less so on the Schouten Islands, whence I possess a few specimens which are in fact exactly intermediate between *similis* from the Moluccas and E. New Guinea, and *papuensis* from the N.-coast of New Guinea. In this form the black apical rings to the abdomen, though slightly smaller than in *papuensis*, are very well marked; but the body-size and the wing venation resemble *similis* (*t* a little narrowed and traversed, *ti* sometimes three-celled, 2 - 3 rows of discoidal cells in fore wing). As to the shape and extent of the yellow marks on the sides of the thorax, these do not differ from *papuensis* of Hollandia and elsewhere (pl. 24 fig. 24).

Distribution: W. & N. New Guinea and Schouten Is.

Agrionoptera insignis similis SELYS (pl. 24 fig. 20 - 23).

1879. SELYS, Ann. Mus. civ. Genova, 14, p. 303. — ♂♀ Ternate, Halmahera (*insignis* race? *similis*).
1900. RIS, Arch. Naturgesch. 1, p. 182 - 183. — ♂♀ Bismarck Arch. (*similis*).
1900. KARSCH, Abh. Senckenb. naturf. Ges. 25, p. 226 - 227. — ♂♀ Batjan, Ternate, Halmahera, Amboina (*insignis*).
1903 FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 533 - 534. — Huon Gulf (Tami); Astrolabe Bay (Rasse *similis*).
1909. MARTIN, Bull. Soc. ent. Ital. 60, p. 197. — Astrolabe Range, S. E. New Guinea (*insignis*).
1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 136 (key), 140 - 141 (pars!), fig. 100 (genit. ♀ Halmahera). — Loc. diff. (partim!).
1913. RIS, Abh. Senckenb. naturf. Ges. 34, p. 528. — ♂♀ Kei Is.
1915. RIS, Nova Guinea, 13 Zool. 2, 115 (pars!). — ♂♀ Ceram only.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1068 - 1069 (pars!). — ♂♀ Ceram only.
1926. LIEFTINCK, Treubia 7, p. 287. — ♂♀ Boeroe.
1930. LIEFTINCK, Ibid. 7 Suppl., p. 311, 319, 323 - 326, pl. 8 - 9 (larva, sub ? *Diplacina phoebe*) Boeroe.

Material studied (regional). — N. New Guinea (W. to E.): 1 ♂, Astrolabe Bay, Stephansort, 12.11.1900, BIRÓ leg. et ded.; 4 ♂, id., Bongu, 1898, C. & W. WAHNES, one ♂ identified with *"Agrionoptera similis"* by FÖRSTER (Michigan Museum, Ann Arbor). 8 ♂, 3 ♀, Huon Gulf, Simbang, CARL WAHNES 1900, some identified with *"A. similis"* by FÖRSTER (Michigan Museum, Ann

Arbor). — S.E. New Guinea: 1 ♂, Astrolabe Range, Moroka, 9.viii.1893, L. LORIA (Genova Museum). — Aroe Is.: 1 ♂, Dobo, v.1932, M. E. WALSH ded. (together with examples of *A. i. allogenes*!).

Extra-limital material. — Long series of both sexes, N. Halmahera, Tobelo, v-viii.1931, M. J. VAN DIEJEN. — 1 ♂, Saparoea I., ex FÖRSTER coll., Mus. Ann Arbor. — 2 ♂, 1 ♀, Ceram, Amahai/Liang, Elpapoetih Estate, xii-i.1937/38, F. K. A. CLARINGBOULD; 2 ♂, 1 ♀, Awaia (S. Ceram), 24.xi and Tehoroe (S. Ceram), 23.xi.1941, J. J. VAN DER STARRE. — 4 ♂, 1 ♀, Soela I., Sanana and Mangoli, ix.1939, S. BLOEMBERGEN. — 3 ♂, Kei Is., Toeal, no. 59, Gg. Daab, no. 105 & 134, 6.iv.1922, H. C. SIEBERS; 1 ♂, Elat, 15.xi. 1941, J. J. VAN DER STARRE; 2 ♂, "Kl. Kei, Toeal" and "Key", without date, ex coll. J. LINDEMANS; 1 ♀, "Key, 1.vii", ex FÖRSTER coll., Mus. Ann Arbor. — 1 ♂, 9 ♀ (ad., alcoholic specimens), New Britain, Arawe, 1930, H. HEDIGER (Basle Museum). 1 ♂, N. New Britain, Blanche Bay, Herbertshöh, C. WAHNES, 1899; 1 ♂ N. New Ireland, Lavongai Is. (New Hannover), C. WAHNES 1899; 3 ♂, 3 ♀ (ad.) W.-coast op New Ireland, Nusa Is., C. WAHNES 1899 (Michigan Museum, Ann Arbor).

In the series of specimens from many localities which I have examined, only the body size and extent of the red colouring on the eighth abdominal segment are variable. The wing-bases in Moluccan individuals are decidedly more strongly flavescent than in those from N.E. New Guinea, but otherwise these examples are quite similar, leaving no doubt of their belonging to the same subspecies. All individuals have the thoracic sides heavily striped with black. The characters enumerated in the key should readily distinguish this subspecies from its allies, although intermediates may occur in the islands between Celebes and the Moluccas and in those west of New Guinea.

The discontinuous distribution of *A. i. similis* is especially worth attention.

Distribution: The Moluccan islands Ternate, Halmahera, Batjan, Obi (?, ♀), Soela Sanana & Soela Mangoli, Boeroe, Amboina, Saparoea, and Ceram; Banda Is. (?, ♀); Kei Is.; Aroe Is.; N.E. & S.E. New Guinea; Bismarck Archipelago.

Agrionoptera insignis allogenes TILLYARD (pl. 24 fig. 25 - 28).

1906. TILLYARD, Proc. Linn. Soc. N.S.W. 31, p. 485 - 486 (full descr.). — ♂♀ N. Queensland (*insignis*?).
1908. TILLYARD, Ibid. 33, p. 641 - 643. — N. Queensland, notes (*allogenes*).
1910. RIS, Cat. Coll .SELYS, Lib. 10, p. 137 (key), 142. — ♂♀ N. Australia, ♂ New Caledonia, ♂ Aroe Is.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 529. — ♂♀ Aroe Is.; ♂♀ Cape York.
1913. RIS, Nova Guinea 9 Zool. 3, p. 510 - 511. — ♂ Lorentz River, S. New Guinea (*insignis similis*).
1915. RIS, Ibid. 13 Zool. 2, p. 115 (pars!). — ♂♀ Kaimana, S. W. New Guinea (*insignis similis*).
1915. RIS, Nova Caledon. Zool. 2, p. 68 - 69 (descr.). — ♂♀ Loyalty Is.
1917. TILLYARD, Biol. Drag. Cambridge, p. 298 fig. 155 (♂ wings, Queensland).

1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1069 (incl. references). — ♂♀ Aroe Is.; ♂♀ Cape York; ♂♀ Loyalty Is.

1926. TILLYARD, Rec. Austral. Mus. 15, p. 163. — ♀ juv. Goaribari Is., S. New Guinea.

Material studied. — S. New Guinea (W. to E.): 2 ♂, 3 ♀, Digoel River, Mappi, Ederat, and Namkajamme, xii.1938 and ii.1939, J. M. VAN RAVENSWAAY CLAASEN. 1 ♂, Merauke, iv.1939, R. G. WIND. — Aroe Is.: 3 ♂, 1 ♀, Dobo, v.1932 & iii.1933, M. E. WALSH ded.; 1 ♂, id., P. Kobror, 30.v.1938, P. BUWALDA. — N. Australia: 1 ♂, N. Queensland, Redlynch, 3.xii.1938, R. G. WIND.

Originally described from N. Queensland, this subspecies has subsequently been discovered in New Caledonia, the Aroe Islands, and southern New Guinea. *A. i. allogenes* differs from *papuensis* in the extreme reduction of the bronzy-black bands on the sides of the thorax, as is clearly shown in pl. 24 fig. 25 - 28. Judging by a series of 7 ♂ and 4 ♀ from the coastal provinces of S. New Guinea and the Aroe Islands, *allogenes* besides being paler is a much more slenderly built insect, the dark colours of the thorax are less deepened, and the wings are slightly narrower with the venation still more open than in *papuensis*. *Allogenes* is so well described in both sexes by TILLYARD and RIS that further description is hardly necessary, unless it be to mention that the width of the black lateral bands of the thorax is variable, these bands however being seldom so broad as would appear from TILLYARD's description of the Queensland type.

A. i. allogenes shows a strong tendency to subspecies *papuensis* and we may confidently look for intermediates somewhere in the low south-western or south-eastern districts of the island.

Distribution: S.W. and S. New Guinea; Aroe Is.; N. Australia; New Caledonia and Loyalty Is.

Agrionoptera insignis cynthiae, subsp. n. (pl. 24 fig. 19).

Material studied. — 2 ♂, 2 ♀ (ad.), Tanimbar (Timorlaoet) Islands, P. Jamdena, iv.1938, P. BUWALDA; 1 ♂ (ad.), id., Larat I., 20.xii.1929, Miss C. LONGFIELD (Buitenzorg Mus.). (1 ♂ in the Brit. Mus., Tanimbar Is., Saumlaki, 19.xii.1929, Miss C. LONGFIELD, not studied by the author). — Holotype ♂ and allotype ♀, P. Jamdena, iv.1938, P. BUWALDA.

Male (ad.). — Labium yellow with a narrow black stripe, bluntly pointed anterad, over its middle; hence, the median lobe and a narrow stripe along inner border of each of the lateral lobes, deep black; this stripe narrower and decidedly more pointed anterad than in the allied subspecies.

Synthorax deep greenish bronzy-black marked with yellow as shown in pl. 24 fig. 19. Pale marks obscured by bluish pruinescence in one very old male.

Legs black, basal two-thirds of anterior femora yellow interiorly.

Wings very narrow, entirely hyaline, greyish-yellow enfumed in old individuals. Reticulation more open than in *i. similis* but decidedly denser than in *i. papuensis* and *i. allogenes*. Triangles uncrossed, costal side of *t* in fore wing

about two-thirds as long as basal side, hence costal sides of *t* and *ti* subequal in length; *ti* traversed by a single, curved, transverse cross-nerve. Only one *Cux* in all wings.

Discoidal field of fore wing with two rows of cells up to the fork of M_{1-3}. Pterostigma dark brown. Antenodals $\frac{13-15}{11-13}$, postnodals $\frac{9-12}{8-12}$.

Abdomen shorter than hind wing. Basal segments less inflated and third segment less narrowed posteriorly than in the other subspecies, then rather stout, triquetral to the end. Dorsum of segm. 1 dark brown, sides with an oval yellow spot; dorsum and sides of 2 - 7 throughout deep orange-red, only the apical and lateral spinules of 4 - 6 black and the apical border of 7 narrowly; 8 also red except a broad apical annule occupying the terminal third, and the lateral borders broadly, black; 9 - 10 wholly black. Sternites and distal half of lower tergal surfaces of 5 - 7, obscured.

Anal appendages black, shaped similarly to those of *papuensis* and *allogenes*.

Female (ad.). — Head and thorax coloured similarly to those of the male. Thoracic markings not easily made out in one example on account of a complete, thin, purplish-blue pruinescence (very similar in appearance to that of adult *Potamarcha obscura*).

Wings enfumed brownish-yellow all over the membrane, except bases and apices, which are hyaline. Neuration as in the male. Antenodals $\frac{10.15.15.13}{12.12.14.10}$, $\frac{11.13.14.11}{11.11.11.10}$.

Abdomen with the first two segments coloured as in the male. Segm. 3 - 7 throughout dark red with the sternites and a continuous black stripe along the lateral tergal margins, black; besides, each of these has a very fine apical ring of black which on segm. 7 occupies only its terminal one-seventh. Remainder of abdomen and appendages black.

Length: ♂ abd. + app. 24.3 (type) - 25.9, hw. 28 (type) - 29.5; ♀ 24 - 25, 29.8 - 31.3 mm.

Distribution: Tanimbar Is.

Agrionoptera longitudinalis SELYS.

1878. SELYS, Mitt. Zool. Mus. Dresden, 3, p. 294, 312 - 313. — ♂♀ Ternate & Halmahera.
1898. FÖRSTER, TERMÉSZ. Füzetek, 21, p. 282 - 283, tab. 13 fig. 3 & 4. — ♂♀ Astrolabe Bay (*karschii*).
1903. FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 535 - 536. — ♂♀ Huon Gulf (Rasse *biserialis*).
1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 134 (key), 142 - 144 (incl. references), fig. 101 (wings ♀ N.W. New Guinea). — Moluccas; New Guinea (s. lat.), N. Australia.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 529. — ♂♀ Aroe Is.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1069 - 1070. — Waigeoe I., S. & W. New Guinea; Aroe Is.

Material studied. — N. New Guinea: 17 ♂, 4 ♀, Hollandia, vi-vii. 1938 & 19.iv.1939; 6 ♂, 1 ♀, Araucaria Camp, 800 m, 7-27.iii.1939, L. J. TOXOPEUS.

A common species. I have seen examples of almost all known localities and from all over New Guinea.

Distribution: Moluccas (Halmahera, Ternate, Batjan, Ceram), continental New Guinea (universal), and satellite islands Gebeh (between Halmahera and Waigeoe), Waigeoe, and Salawati; Aroe Is.; N. Queensland (Cooktown, Cairns, Kuranda).

Protorthemis coronata (BRAUER).

1866. BRAUER, Verh. Zool.-bot. Ges. Wien, 16, p. 565 - 566. — ♂♀ Ceram (*Libellula*).
1898. FÖRSTER, Termész. Füzetek, 21, p. 286 - 287. — ♂♀ Astrolabe Bay (*Wahnesi*).
1909. VAN DER WEELE, Nova Guinea, 9 Zool. 1, p. 20, 22. — ♂ Lorentz R., ♂ Etna Bay (S. New Guinea).
1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 147 (key), 149 - 151 (full references), fig. 106 - 107. — ♂♀ loc. diff.
1919. RIS, Ibid. 16, 2, p. 1070. — ♂ S. W. New Guinea.
1932. FRASER, Mém. Mus. Roy. Hist. Nat. Belg. (hors série) 4, 3, p. 20 - 21. — ♂♀ W. New Guinea.

Material studied. — N. New Guinea: 15 ♂, 16 ♀ (ad.), Hollandia, vi-vii.1938 & 19.iv.1939; 1 ♂ (ad.), Cycloop Mts, 900 m, 26.vi.1938; 10 ♂, 11 ♀ (ad.), Bernhard Camp & River, 50 m, vii-x and xii.1938; 1 ♀ (ad.) Bernhard Camp B, 100 m, 12.iv.1939; 1 ♀ (ad.), Araucaria Camp, 800 m, 2.iv.1939. L. J. TOXOPEUS. — Besides these, numerous specimens of other Papuan localities and from New Britain have been examined by the author.

Male specimens from the "Vogelkop" and the islands to the west of it agree with those from the Bismarck Archipelago in that the wings are much less extensively black-tipped than in those of the intermediate districts. Other differences are not manifest. I have not seen Moluccan examples of *coronata*.

The type of FÖRSTER's *P. wahnesi* is a ♂ in the Michigan Museum, Ann Arbor, labelled "Ebene der Astrolabebai, Carl Wahnes leg. 1891" (or 1897?) (Mrs HOWARD K. GLOYD, in litt.). This species is the same as *coronata*.

Distribution: Moluccas (Ceram only); continental New Guinea (universal) and satellite islands Salawati, Waigeoe, and Roon; New Ireland, New Britain, Duke of York I.

Orthetrum glaucum (BRAUER).

1865. BRAUER, Verh. Zool.-bot. Ges. Wien, 15, p. 1012 - 1013. — ♂ Ceylon (*Libellula glauca*).
1909. MARTIN, Bull. Soc. ent. Ital. 60, p. 197. — Astrolabe Range, S. E. New Guinea.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1093. — ♂ Finschhafen, E. New Guinea.

Material studied. — N. New Guinea: 1 ♂, Hollandia, vi-vii. 1938; 1 ♀, Rattan Camp, 1150 m, 14.ii; 1 ♀, Araucaria Camp, 800 m, 4.iii; 1 ♂ (semiad.), Bernhard Camp B, 100 m, 13.iv.1939, L. J. TOXOPEUS.

Apparently a rather scarce species in New Guinea, although it has repeatedly been captured in the lowlands of the Mamberamo-basin and several other river systems of the north.

Distribution: Extends from the W.-coast of peninsular India to South China, including the whole Malayan Archipelago. Finsch Harbour (Morobe D., E. New Guinea) is probably the most eastern locality known for this species.

Orthetrum sabina sabina (DRURY) (pl. 25 fig. 32).

1770. DRURY, Ill. Exot. Ins. 1, tab. 48 fig. 4, p. 114 - 115 (pars). — China (*Libellula*).
1898. FÖRSTER, Termész. Füzetek, 31, p. 279. — ♂♀ Astrolabe Bay.
1909. VAN DER WEELE, Nova Guinea 5 Zool. 3, p. 386. — ♂ N. W. New Guinea.
1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 180 (key), 223 - 225 (full references), fig. 133 (wings), 149 (genit. ♂). — New Guinea (loc. diff.).
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 529 - 530. — ♂♀ Aroe Is.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1090 - 1091. — New Guinea (loc. diff.); Aroe Is.

Material studied. — N. New Guinea: 2 ♂, 1 ♀, Hollandia, vi-vii; 2 ♂, 4 ♀, Bernhard Camp, 50 m, 6-27.viii, 19-21.ix, 10-11.xi.1938, L. J. TOXOPEUS.

Universally distributed throughout the whole of the East Indian Archipelago, and a very common species in the lowlands of New Guinea.

Distribution: Egypt, through Asia to N. Australia and Oceania.

Orthetrum sabina viduatum, subsp. n. (pl. 25 fig. 33).

Material studied. — Central N. New Guinea: 16 ♂, 12 ♀ (several juv., and two pairs *in côp.*), Baliem Valley, 1600 m, 15.xi-16.xii, and id., 1750 m, 23.xi.1938, L. J. TOXOPEUS. — Holotype ♂ and allotype ♀: 11. xii.1938 (*in côp.*).

This is a very small edition of the common *sabina* with the following conspicuous differences:

Male (ad., holotype). — Median lobe of labium dirty yellow-green instead of brownish-black or black. Labrum and lateral lobes of labium pale ochreous. Clypeus and frons dirty greenish-yellow; frons with the black basal stripe similar to *s. sabina,* but the undulated blackish-brown stripe in front of the transverse carina is wanting and replaced by a very indistinct brownish median dot, just in front of the carina. Sides of postclypeus and frons pale glaucous. Vertex black anteriorly, obscurely green above.

Prothorax similar to *s. sabina,* but pale marks more restricted.

Synthorax entirely different in colour, as follows. Median carina finely black. A fairly broad, mid-dorsal, longitudinal band, Ochraceous-tawny; on each side of the median fascia a straight postmedian (or antehumeral) Light turtle green band, which is only slightly wider than the mid-dorsal band and much narrower than in *s. sabina,* slightly tapered and outcurved dorsally, each of them limited laterally by a narrow, almost straight, Light seal brown antehumeral dark stripe, which, on its upper end is also slightly outcurved and tapered to a point. Ante-alar triangles pale turtle green between black carinae. Area between dark antehumeral stripe and humeral suture of a delicate Walnut

brown tint, as is also the greater part of the mesinfraepisternum. Stripe over the humeral suture shaped as shown in the figure, Mummy brown (or even darker), with slight bronzy reflections. Mesepimeron with a very conspicuous, slightly curved fascia of a delicate light turtle green tint; this light-coloured area limited posteriorly and ventrally by a narrow stripe of the same width and colour as that joining the humeral suture and continued downwards so as to form an isolated spot of the same green colour upon lower portion of each mesinfraepisternite; the remainder of the mesepimeron and the entire metepisternite Snuff brown slightly intermingled with green along the dark mesepimeral stripe, along dorsal carinae, and along second lateral suture. A Bister-coloured stripe over the second suture. Metepimeron Water green, this colour especially vivid along the lateral suture and the latero-ventral carina, intermingled with pale greyish-brown on middle of surface. Venter of thorax pale coloured (pl. 25 fig. 33).

Legs black; all femora yellowish-green on their inner surfaces, and basal two-thirds of posterior pair brown, exteriorly. Carinae of tibiae bright yellow, basally.

Wings hyaline; 12 - 14 antenodal cross-veins in fore wing. Neuration exactly similar to the typical subspecies, but pterostigma relatively much longer, bright ochreous between black nervures.

Abdomen identical in shape to *s. sabina*. Dark markings of basal segments much reduced, as follows: — Segm. 1 dirty greenish-yellow, not bordered with black posteriorly; 2 - 3 similarly coloured, 2 only the dorsal, the upper portion of the lateral, and the ventral carinae finely black; intersegmental ring pale-coloured; 3 similar to *s. sabina*, but black lines much narrower; 4 with broad, oval dorsal black spot, pointed basad, strongly constricted behind middle of segment and confluent posteriorly with a very broad, apical, dark brown ring (Pale colouring much more extensive than in *s. sabina*); 5 and 6 black, each with conspicuous, rather X-shaped, orange-yellow spots, finely interrupted mid-dorsally, occupying amply the distal half of each segment (These pale spots much smaller, elongate-oval in *s. sabina*); 7 - 9 bronzy blackish-brown; 10 with the basal two-thirds broadly so, the posterior third pale green, and the apical border (inclusive of the spines), narrowly black.

Genitalia: exactly similar in shape to those of the typical subspecies, but anterior lamina greenish-yellow tipped with black instead of entirely black, the bunch of bristles ferruginous; hamulus also pale-coloured, carinae black; genital lobe black, yellow posteriorly.

Anal appendages shaped similarly to *s. sabina;* but superior pair more slender and somewhat less abruptly pointed apicad, coloured ochreous-yellow instead of creamy-white.

[The holotype male of *O. s. viduatum* is a full-coloured, perfectly preserved specimen. The body-colouring is faded in most of the paratypes of that sex, and in these the ground-colour of the thorax is of a rather uniform Snuff-brown tint, except the pale antehumeral and posthumeral (mesepimeral) bands, which

stand out as very clear turtle-green bands, the latter being especially conspicuous and surrounded by brownish-black lines. The colour of the metepimeron is also a little variable. The dark abdominal markings invariably are of a much paler tint than in typical *sabina,* never deep black, and the ground-colour is dirty greenish-brown or -yellow instead of bright green.]

F e m a l e (ad., allotype). — Resembles the male in most respects, but generally more uniformly coloured. Mid-dorsal thoracic pale stripes narrower, less conspicuous and usually not so pure green. Posthumeral (mesepimeral) green fascia similar to the ♂, but slightly less broad. Thoracic sides uniform grey-brown without other markings than a yellowish-white stripe bordering the latero-ventral carina.

Legs more extensively greyish-brown, only the apical sixth of posterior femora black.

Wings tinged with greyish-brown all over the membrane in old adults; pterostigma dark ochreous.

Ground-colour of abdomen dull greyish-brown, markings indistinct, but generally similar to those of the ♂. Sides of segm. 3 and sternal plates thinly pruinose white. Genital organs and anal appendages as in typical *sabina,* appendages dirty yellowish-brown.

Length: ♂ abd. + app. 31 - 33, hw. 32.7 - 34.0, pt. 4.2; ♀ 32.0 - 32.7, 32.8 - 34.7, 4.2 mm.

In identifying the above described aberrant *Orthetrum* from the Baliem Valley (also named 'Groote Vallei', or Grand Valley), it was immediately apparent that it was a true *O. sabina,* but at the same time it was interesting to note that, while the insect structurally very nearly approaches typical *sabina,* both sexes of the Baliem insect differ widely from it in the colour-scheme of the head and thorax, and in being of smaller size.

It is very interesting to find this sharply differentiated population in a high, ecologically isolated valley in the center of New Guinea, while large series from various other parts of New Guinea show only the usual individual variation also exhibited by *sabina* populations from outside our faunal limits.

As has been pointed out by A. L. RAND [1]) and L. J. BRASS [2]), the Baliem Valley contains an area of completely isolated grassland averaging about 10 miles wide by 40 long, and varies from 1200 - 2400 meters in altitude. Since several species of butterflies, dragonflies and grassland birds are known to occur commonly in this ecologically isolated habitat, L. J. TOXOPEUS [3]), RAND and BRASS (l.c.) have each of them considered the possible origin of this area of secondary grassland and discussed the question as to how there are animals, many of them endemic, living in these "areas of disturbed conditions". Accord-

[1]) *Amer. Mus. Novit.* no. 1102, 1941, p. 5 and no. 1122, 1941, p. 1 - 2.
[2]) *The Geogr. Review,* 31, 1941, p. 555 - 569, map and photographs.
[3]) *Entom. Meded. Ned.-Indië,* 6, 1940, p. 17 - 21, pl. 3.

ing to RAND, the most evident solution is that given by RAND & BRASS [1]) and ARCHBOLD & RAND [2]); for details the reader is referred to these publications.

Distribution: Central North New Guinea (Baliem Valley).

Orthetrum villosovittatum villosovittatum (BRAUER).

1868. BRAUER, Verh. Zool.-bot. Ges. Wien, 18, p. 167 - 168. — ♀ Ambon, ♂ Cape York (*Libellula villosovittata*).
1898. FÖRSTER, Termész. Füzetek, 21, p. 279 - 281 fig. genit. ♂. — ♂♀ Astrolabe Bay (*fenicheli*).
1903. FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 537 - 538. — Astrolabe Bay & Huon Gulf (*fenicheli*).
1909. VAN DER WEELE, Nova Guinea 9 Zool. 1, p. 20. — ♂♀ S. New Guinea.
1910. RIS, Cat. Coll. SELYS, Lib. 10, p. 237 - 239 (full references). — ♂♀ E. New Guinea.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 530. — ♂♀ Aroe Is.
1915. RIS, Nova Guinea 13 Zool. 2, p. 116. — ♀ S. W. New Guinea.
1919. RIS, Cat. Coll. SELYS, Lib. 16. 2, p. 1094 - 1095 (incl. ref.). — ♂♀ S. & E. New Guinea; ♂♀ Aroe Is.
1926. TILLYARD, Rec. Austral. Mus. 15, p. 164. — ♂♀ S. New Guinea.

Material studied. — N. and Central New Guinea (W. to E.): 13 ♂, 20 ♀ (several juv.), Lake Paniai (Wissel Lakes group), 1740 m, 21-30.viii, and 2-28.ix; 2 ♂, Kotaboe and Dejateda, on Lake Paniai, 24.viii and 3.ix; 8 ♂, 5 ♀, Araboe Bivouac, 10 miles N.E. of Lake Paniai, ca 1800 m, 1-24.x, and 1-2.xi.1939; all H. BOSCHMA. — 15 ♂, 4 ♀, Hollandia, vi-vii; 1 ♀ Cycloop Mts, 400 m, 28.vi; 6 ♂, 1 ♀, Lake Sentani, Kajaboe & Nettar, 23-30.vi.1938; 1 ♀, Dojo, foot of Cycloop Mts, 150 m, 19.iv.1939; 2 ♂, 1 ♀ Bernhard Camp, 50 m, and Bernhard Camp B, 100 m, 23.viii.1938 & 6-12.iv.1939; 21 ♂, 10 ♀, Araucaria Camp, 800 m, 12-28.ii, 3-11.iii, 2.iv and 3.vi.1939, L. J. TOXOPEUS.

In the series before me the Papuan individuals of this species can neither be separated from the Moluccan topotypes, with which I have compared them, nor from examples of N. Australia. There is obviously much individual variation in size, which in our collection is clearly demonstrated by the series from Lake Paniai, the majority of which contains unusually small specimens whilst others are of the same size as examples from Hollandia. Lake Paniai, ca 1800 m alt., is probably the highest altitude ever recorded for this species.

Distribution: From the Moluccan islands Boeroe, Batjan and Halmahera in the West, via the Kei and Aroe Is. to New Guinea in the East (universal). Australia as far south as Sydney.

Brachydiplax duivenbodei (BRAUER).

1866. BRAUER, Verh. Zool.-bot. Ges. Wien, 16, p. 569 - 570. — ♂ New Guinea (*Perithemis*).
1898. FÖRSTER, Termész. Füzetek, 21, p. 281. — ♂ Astrolabe Bay (*Microthemis*).
1910. RIS, Cat. Coll. SELYS, Lib. 11, p. 360 (key), 365 - 366 (incl. references), fig. 216 (wings). — ♂ Geelvink Bay.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 530 - 531. — ♂♀ Aroe Is.
1919. RIS, Ibid. 16, 2, p. 1124. — ♂♀ Aroe Is.

[1]) *Bull. Amer. Mus. Nat. Hist.* 77, 1940, p. 373 - 376.
[2]) *Ibid.* 68, 1935, p. 534, 556 - 557.

Material studied. — N. New Guinea: 1 ♂, Hollandia, 23.vi. 1938; Bernhard Camp, 50 m, 7.ix.1938, and Bernhard Camp B, 100 m, 10.iv. 1939, L. J. TOXOPEUS.

Although less common in New Guinea than *B. denticauda* (BRAUER), apparently widely distributed in low country. I have seen examples from various localities scattered all over the island, and from most other islands whence reported.

Distribution: .The Philippines, Celebes and Banggai Is. (Bangkei); the Lesser Sunda islands Soembawa, Flores and Soemba; the Moluccan islands Halmahera, Ternate, Batjan, Soela Sanana and Soela Mangoli, Boeroe, Ambon and Ceram; New Guinea (terr. typ.) and Salawati I.; Aroe Is. and Cape York (N. Australia).

Raphismia bispina (HAGEN).

1867. HAGEN, Stett. ent. Zeitg. 28, p. 91. — ♂ Morotai and Halmahera (*Diplax*).
1879. SELYS, Ann. Mus. civ. Genova, 14, p. 289. — Salawati, Sorong (*Brachydiplax thoracantha*).
1910. RIS, Cat. Coll. SELYS, Lib. 11, p. 369 - 370 (incl. references) fig. 219 - 221 (wings, genit., metast.). — ♂ Salawati.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 531. — ♂♀ Aroe Is.
1915. RIS, Nova Guinea 13 Zool. 2, p. 116. — ♀ S. W. New Guinea.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1127. — ♀ S. W. New Guinea; ♂♀ Aroe Is.

Material studied. — N. New Guinea: 2 ♂, 1 ♀, Hollandia, vi-vii.1938, L. J. TOXOPEUS.

A littoral species.

Distribution: E.-coast of Malay Peninsula; Doerian I. (Riouw Archip.); Billiton; Krakatau-group (Strait Sunda); N.-coast of Java and Karimoendjawa Is.; coastal districts of Borneo; Palawan and the Philippines; Celebes and Banggai Is. (= Bangkei); Morotai; Batjan, Halmahera, Soela Sanana, Boeroe, Ambon and Ceram; New Guinea, Sorong and Salawati I.; Aroe Is. and Cape York (N. Australia).

Diplacodes bipunctata (BRAUER).

1865. BRAUER, Verh. Zool.-bot. Ges. Wien, 15, p. 503. — ♂♀ Tahiti, New Caledonia (*Libellula* (*Diplax*)).
1911. RIS, Cat. Coll. SELYS, Lib. 12, p. 462 (key), 471 - 472.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 531. — ♂♀ Aroe Is.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1154. — ♂♀ Aroe Is.

Material studied. — Central New Guinea (W. to E.): 22 ♂, 14 ♀ (mostly ad.), Lake Paniai (Wissel Lake group), 1740 m, 21-29.viii & 4-12. ix.1939, H. BOSCHMA. — 27 ♂, 9 ♀ (mostly ad., 2 pairs *in cop.*), Baliem River Camp, 1600 m, 19-30.xi and 2-15.xii.1938; 2 ♂, 2 ♀, Mountain-ridges around Baliem Valley, ca 2000 m, 12.xi.1938, L. J. TOXOPEUS.

The discovery of this oceanic and migratory species in the high mountains of New Guinea is of considerable interest. It has not previously been reported

from the island, but is a common appearance in the Pacific and elsewhere. Like *Ischnura aurora* it shows strong migratory tendencies; and the occurrence of both species at similar high altitudes in the Grand Valley of the Baliem as well as in the immediate surroundings of Lake Paniai is rather surprising.

Distribution: Kei Is.; Aroe Is.; New Guinea (central); Australia and New Zealand; throughout Melanesia, Micronesia and Polynesia as far East as the Marquesas Islands.

Neurothemis decora (BRAUER).

1866. BRAUER, Verh. Zool.-bot. Ges. Wien, 16, p. 567 - 568. — ♀ Amboina (*Polyneura*).
1898. FÖRSTER, Termész. Füzetek, 21, p. 277 - 279. — ♂♀ Astrolabe Bay (*paradisea*).
1903. KRÜGER, Stett. ent. Zeitg. 64, p. 269 - 270. — ♂♀ New Guinea.
1909. MARTIN, Bull. Soc. ent. Ital. 60, p. 196. — S.E. New Guinea.
1909. VAN DER WEELE, Nova Guinea, 5 Zool. 3, p. 386. — ♂♀ N. New Guinea.
1909. VAN DER WEELE. Ibid. 9 Zool. 1, p. 19. — ♂♀ S. New Guinea.
1911. RIS, Cat. Coll. SELYS, Lib. 13, p. 551 (key), 557 - 559 (incl. ref.). — E. & S. New Guinea.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 532. — ♂♀ Aroe Is.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1168. — ♂♀ Aroe Is.
1926. RILLYARD, Rec. Austral. Mus. 15, p. 164. — ♂♀ S. New Guinea.

Material studied. — N. New Guinea: 6 ♂, 1 ♀ (isochr.), Kojaboe and Lake Sentani, 24-30.vi.; 3 ♂, 1 ♀ (isochr.), Hollandia, vi-vii.; 52 ♂, 43 ♀ (all isochr.), Bernhard Camp, 50 m, 15.vii-15.xi. & 19-24.xii.1938, 8-11.ii & 11-14-iv. 1939, L. J. TOXOPEUS.

I have seen a great many specimens of *decora* from various localities in New Guinea, including a fine series of both sexes from the S.W.-coast, west of Oeta (Negumy Expedition). Examples from the southern and eastern parts of the island do not differ from those of the western and northern districts. Apparently a very common species in low country.

Distribution: New Guinea (universal). Originally described from Ambon, but there remains strong doubt about the occurrence of this species in the Moluccas.

Neurothemis luctuosa, sp. n.

Material studied. — 3 ♂ (ad.), S.W. New Guinea, Digoel River territory, low country, Mappi Post, iv.1938 (holotype), and same county, near Ederat, ii.1939 (paratypes), Lieutenant J. M. VAN RAVENSWAAY CLAASEN leg.

Allied to *N. oligoneura*.

Male. — Labium dark brown, its median lobe and the anterior border of lateral lobes somewhat lighter brown. Mouth-parts and mandible-bases light brown. Labrum brownish-black or black, anteclypeus dark brown, postclypeus blackish brown, the sutures paler brown. Frons black, rugose, with steely dark blue reflection. Vertex blackish-brown. Occipital triangle dark brown, rear of the head black.

Pro- and synthorax, legs, and abdomen, throughout velvet black without any pale colouring. Mid-dorsal carina of thorax finely and trochanters anteriorly, dark brown. Sides of the thorax, from level of the humeral suture downwards, and under surfaces, slightly pruinose grey-blue.

Wings of the usual shape, but broader at base and with the apical part more pointed than in *oligoneura*. Reticulation dense, but no secondary cross-veinlets present. No cross-veins in the area between *R* and M_1 proximal to the base of the bridge. Discoidal field of fore wing commencing with 1 × 4 rows of cells, thence with 3 - 4 rows, and with 8 - 10 marginal cells; Cu_1 very strongly curved. *Cux* $\frac{1.1}{2.1}$ (paratypes: $\frac{1.1}{1.1}$), *Htx* $\frac{2.2}{1.0}$, *Tx* $\frac{2.2}{1.1}$; *ti* 4 - 5 celled; *Bxs* $\frac{0.0}{1.0}$ (paratypes: $\frac{0.0}{0.0}$, $\frac{1.0}{0.0}$). Two rows of cells between *Rs-Rspl* in fore wing, one in hinder pair; 1 - 2 rows between *Ms-Mspl*. Two rows of cells between M_3 and M_4 from level of nodus to the wing border in fore wing, one row with ca 5 doubled cells where most widely separated in hind wing. Anal loop made up of 45 - 46 cells. Nodal index $\frac{9.12\frac{1}{2}.13\frac{1}{2}.9}{9.\ 10.\ 10.\ 9}$ (type), $\frac{9.13\frac{1}{2}.13\frac{1}{2}.9}{10.\ 11.\ 10.\ 9}$, $\frac{9.13\frac{1}{2}.14\frac{1}{2}.10}{9.\ 10.\ 10.\ 10}$ (paratypes). Membranula dark gray. Pterostigma rather short and wide, covering 2½ cells; dark reddish brown in colour.

Membrane in opaque view black, or very dark brownish-black with slight steely dark blue and bronze reflections on upper surface, more brilliantly metallic blue on lower surface of wings; a fairly regular triangular area at apices of wings hyaline in transmitted light, slightly opalescent in opaque view. Margin of dark area slightly irregular and concave, beginning near distal end of pterostigma and running almost straight backwards to apex of *Rs* in fore wing, at middle of pterostigma to four cells proximal to *Rs* in hind wing. Nervures in hyaline area black.

Abdomen only slightly widened at base and tapered very gradually to the end, triquetral in cross-section; rather shiny, basal segments slightly pruinose laterally.

Anal appendages of the usual shape, superior pair dirty pale brown, inferior one slightly darker, its borders black.

In one of the old adult paratypes the frons is steely greenish black instead of blue-black; most of the abdomen (except the terminal segments) is overlaid thinly with greyish pruinescence, whilst the opaque colour of the wings extends further outwards so that the hyaline area at apices of wings begins at distal end of *pt* in fore wing and near the distal end of same in hind wing.

Length: abd. + app. 20, hw. 24, pt. 2.8 mm (holotype); 20 - 20.8, 24.3 - 25, 2.7 mm (paratypes).

Female unknown.

This fine new species stands between *N. decora* (BRAUER) and *N. oligoneura* BRAUER, but is at a glance distinguished from both by its smaller size, the greater extent of the opaque area of the wings, etc. Apparently a very scarce

species and probably restricted to the coastal districts of southern New Guinea. At Mappi it was found in company with *N. oligoneura*, which is a common species at Merauke and probably elsewhere on the south.

Distribution: South New Guinea.

Neurothemis stigmatizans bramina (GUÉRIN).

1832. GUÉRIN, Voyage autour du Monde (Voy. Coquille), Zool. t. 2 (2) div. 1, Névropt. p. 194 (1830). — ♂ Port Praslin, New Ireland (*Libellula*).
1867. BRAUER, Verh. Zool.-bot. Ges. Wien, 17, p. 286, 289 - 290. — New Guinea (♀ *innominata* + ♂ *elegans* + ♀ *diplax*: partim).
1879. SELYS, Ann. Mus. civ. Genova, 14, p. 289. — Waigeoe, Salawati, N. W. New Guinea (*oculata*).
1898. FÖRSTER, Termész. Füzetek, 21, p. 275 - 277. — ♂♀ Astrolabe Bay (*elegans*).
1903. KRÜGER, Stett. ent. Zeitg. 64, p. 280 - 283. — ♂♀ New Guinea (*oculata*).
1909. VAN DER WEELE, Nova Guinea 5 Zool. 3, p. 385. — N. New Guinea (*stigm.* race *b*).
1909. VAN DER WEELE, Ibid. 9 Zool. 1, p. 19, 22. — S. New Guinea (*stigmatizans elegans*).
1909. MARTIN, Bull. Soc. ent. Ital. 60, p. 196. — Astrolabe Range, S. E. New Guinea (*oculata*).
1911. RIS, Cat. Coll. SELYS, Lib. 13, p. 553 (key), 574 - 578, fig. 337 - 338 (wings ♀ E. New Guinea). — ♂♀ New Guinea (general); ♂♀ Aroe Is. (incl. *manadensis* partim; W. New Guinea).
1913. RIS, Nova Guinea 9 Zool. 3, p. 512. — Saonek (Waigeoe I.); S. New Guinea; Aroe Is.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 532 - 533. — ♂♀ Aroe Is.
1915. RIS, Nova Guinea 13 Zool. 3, p. 86, 116. — S. & W. New Guinea.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1169. — ♂♀ W. New Guinea; ♂♀ Aroe Is.
1926. TILLYARD, Rec. Austral. Mus. 15, p. 164. — ♂♀ S. New Guinea.
1932. FRASER, Mém. Mus. Roy. Hist. Nat. Belg. hors série, 14, 3, p. 31. — ♂♀ Aroe Is.

Material studied. — N. New Guinea: 2 ♂, 3 ♀ (isochr.), N.W. New Guinea, Jef Kasim, coastal marsh opposite S.-point of Salawati I., 13.vi. 1938, L. J. TOXOPEUS; 3 ♂, 1 ♀ is., Hollandia, vi-vii; 1 ♀ (isochr.), Lake Sentani, 23-30.vi.; 14 ♂, 4 ♀ (isochr. & heterochr.), S. Cycloop Mts, 400 m, 28.vi.1938, J. OLTHOF; 20 ♂, 17 ♀ (isochr.), Bernhard Camp, 50 m, 15.vii-15.xi, 19-24.xii. 1938; 8-11.ii & 11-14.iv.1939; and Bernhard Camp B, 100 m, 7.iv.1939 (1 ♀). L. J. TOXOPEUS et al.

Extremely common throughout the whole of New Guinea and adjacent islands.

Distribution: New Guinea (universal) and satellite islands Salawati, Waigeoe, Saonek, and Japen; Aroe Is.; Bismarck Archipelago; Solomon I.; New Hebrides; Union Is.

Neurothemis ramburi papuensis, subsp. n.

1911. RIS, Cat. Coll. SELYS, Lib. 13, p. 550 (key), 553 - 554, 556. — ♂ Geelvink Bay; ♂ Astrolabe Bay; ♀ Aroe Is. (*palliata*).
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 531 - 532. — ♂♀ Aroe Is. (*palliata*).
1915. RIS, Nova Guinea, 13 Zool. 2, p. 86. — ♂♀ C. S. New Guinea (*palliata*).
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1166 - 1167. — ♂♀ Aroe Is. (*palliata*).

Material studied. — West New Guinea: 5 ♂, 1 ♀ (isochr.), MacCluer Gulf, Bintoeni Bay ('neck' of the Vogelkop), Soengai Jakati, 18.v. 1941, E. LUNDQUIST (Negumy Expedition). 1 ♂ Kaimana, Kowiai distr., south-coast, 17.xi.1941, J. J. VAN DER STARRE. — North New Guinea (W. to E.): 2 ♀ (isochr., juv.), Manokwari, native coll. — 1 ♂ (ad.), S. Cycloop Mts, near Lake Sentani, 150 m, 18.iv.1939, J. OLTHOF; 1 ♂ (ad.), Araucaria Camp, 800 m, 27. iii.1939, L. J. TOXOPEUS. — Large series (both sexes), Hollandia, v, vii, 27.viii-4.ix.1930, i-ii, iii, iv-vi.1931; 6 ♂ (ad.), Second Hill Range, ca 40 km south of Hollandia, 400 m, ix.1930; 2 ♂, 2 ♀ (ad., *in cop.*), ca 15 km S. of Bougainville Mts, 400 m, Njau Sanké, 15-30.xi.1935; all W. STÜBER leg. — 6 ♂, 4 ♀ (isochr.), Astrolabe Bay, "Urwald von Bongu, 9.xii.1898, W. WAHNES", "Mt. Hansemann, BIRÓ, 6.iv.1901", and "Bongu, Carl WAHNES, 1898/1900"; 1 ♂, "Neuguinea"; 1 ♂, Huon Gulf. All in the Michigan Museum, Ann Arbor. — S. E. New Guinea: 1 ♂ ad., Astrolabe Range, Fiume Purari, 12.i.1894, L. LORIA (Mus. Civico, Genoa). — Aroe Is.: 1 ♂ P. Kobror, 30.v.1938, P. BUWALDA; id., 16 ♂, 2 ♀ (isochr.) Dobo, vii.1932, M. E. WALSH ded. — Holotype ♂, Lake Sentani 18.iv.1939, J. OLTHOF; allotype ♀, Hollandia, iii.1931, W. STÜBER.

This is the species known as *Neurothemis palliata* (RAMBUR) by most students in Odonata. Unfortunately, the specific name *palliata* (see RAMBUR, *Hist. Nat. Ins. Névropt.* 1842, p. 129) must be dropped as a synonym of *fluctuans* FABRICIUS, since RAMBUR's type ♂ of *palliata* is nothing else than a somewhat large-sized example of *fluctuans*. In 1938 I have examined the type from Sumatra (with incomplete abdomen), in the Paris Museum, and this is doubtless a true *fluctuans*.

Neurothemis ramburi was described by BRAUER (*Verh. Zool.-bot. Ges. Wien*, 16, 1866, p. 568 - 569) after a ♂ from Celebes with reduced wing-markings. The name *ramburi* has since been retained in the literature to designate a variety of "*palliata*", in which the brown colour of the fore wing does not extend beyond level of the nodus and that of the hind wing to one or two cells after that level. It has been pointed out by RIS (l.c.) that all intergradations exist between typical "*palliata*" and its variety *ramburi*, even in one locality; and although I have found that in some places (e.g. in the Lesser Sunda Islands) [1]) the variety prevails over typical "*palliata*", RIS's statement is doubtless correct.

Neurothemis ramburi is distributed all over the Malay Archipelago, from Poeloe Wé (off the north-west point of Sumatra) in the northwest to the whole of New Guinea in the east.

The typical subspecies has its headquarters in Celebes, the Moluccas and adjacent islands, where it is about equally abundant as *N. stigmatizans manadensis* (BOISD.). Males may be distinguished from that species by the more pointed wings, much smaller and narrower pterostigma, by the brown area in hind wing being abbreviated and irregularly rounded on posterior side, and by the presence of only a single cubito-anal cross-vein in hind wing. The ♀ of typical *ramburi* is polychromatic.

[1]) See LIEFTINCK, *Revue Suisse Zool.* 43, 1936, p. 142 - 143.

In the western part of the Archipelago, *ramburi*, though locally common, is only sparingly distributed, and in most localities is replaced by *fluctuans* F., which it resembles closely. Malaysian and Philippine *ramburi* are an average smaller in size than examples from Celebes and the Moluccas, but otherwise are practically alike. Certain examples in my collection from a few localities in Sumatra and Java are exactly intermediate between *ramburi* and *fluctuans*, and these are probably the result of cross-breeding. RIS has reported from the Philippines intermediates between *ramburi* and *terminata* RIS.

Our new subspecies *papuensis* differs from typical *ramburi* as well as from the more common form ("*palliata palliata*" olim), in the following respects:

New Guinea. ♂. 1) Wings comparatively broader and more abruptly pointed; 2) pterostigma narrower and a little shorter, coloured pinkish-buff, to russet or darker brown instead of blood-red; 3) invariably two (occasionally three) cubito-anal crossveins in hind wing instead of only one.

Female. — Neuration, shape of wings and colour of pterostigma as in male. Isochromatic. Two forms. *a*) Dark colour in fore and hind wing extending from base to half-way between nodus and *pt*, abruptly cut off under right angles apically, the border forming almost a continuous line in specimens with folded wings; colour dark golden- to reddish-brown with darker rays in *sc* and *cu*, fading to dark brown or blackish-brown beyond nodus; wing-tips hyaline. *b*) Wings burnt brown from base to one cell before nodus in fore wing and to nodus in hind wing, or, correspondingly, to slightly after the nodus; limits almost straight; wing-tips hyaline.

Size variable in both sexes.

Aroe Is. Male. — The majority of specimens differ from the New Guinean series only in that the wing-markings are slightly less extensive, viz. reaching to about half-way between *nod* and *pt* and in having a strongly convex apical margin in fore wing. *Cux* in hind wing 2.2, 3.2 or 3.3 in about equal ratio.

Female. — Resembles the dark-coloured individuals from New Guinea in all respects (see RIS's description, l.c. 1913, p. 531 - 532). The differences found between individuals from the Aroe Islands and New Guinea on the one hand and all western populations on the other hand, are sufficiently well-marked to justify subspecific differentiation.

Distribution: New Guinea (universal); Aroe Is.

[Two males in our collection from Toeal, Kei Islands, are long-winged individuals with bright red pterostigma and only one *Cux* to all hind wings, and hence are definitely not *papuensis*, approaching *N. r. martini* (KRÜGER) fairly closely (see RIS, l.c. 1911, p. 557).]

Crocothemis nigrifrons (KIRBY).

1894. KIRBY, Ann. Mag. Nat. Hist (6) 14, p. 19. — ♂ Queensland (*Orthetrum*).
1909. VAN DER WEELE, Nova Guinea, 5 Zool. 3 p. 386. — ♀ N. New Guinea.
1910. FÖRSTER, Wien. ent. Zeitg. 29, p. 54 - 55. — ♂ Astrolabe Bay (*papuana*).

1911. RIS, Cat. Coll. SELYS, Lib. 13, p. 533 (key), 542 - 544 (incl. ref.), fig. 322 (wings), 323 (genit. ♂). — N. New Guinea.

Material studied. — N. New Guinea: 1 ♂, Kojaboe, Lake Sentani, 30.vi.1938, J. OLTHOF. — Additional material: Long series (both sexes), North New Guinea, Hollandia and Lake Sentani, sea-level to 80 m, vi-vii and xi-xii.1930, i-ii, iii and iv-vi.1931, W. STÜBER.

The adult male of this species can hardly be described as having "der ganze Körper blauschwarz", as it is stated in RIS's monograph. In well-preserved examples the entire abdomen is pruinosed pale dirty blue, exactly as in *Orthetrum glaucum*. Female with the sides of the thorax and the abdomen ventrally also thinly pruinose bluish-white.

Common around Lake Sentani but otherwise apparently very local. I have also seen examples from the Northern Territory and N. Queensland, in Australia.

Distribution: N. New Guinea and N. Australia.

Rhodothemis rufa (RAMBUR).

1842. RAMBUR, Hist. Nat. Ins. Névropt. p. 71. — ♀ hab. ign., ♂ Java (*Libellula*).
1909. VAN DER WEELE, Nova Guinea 9 Zool. 1, p. 22. — ♂♀ S. New Guinea (*Crocothemis*).
1911. RIS, Cat. Coll. SELYS, Lib. 13, p. 592 - 593, fig. 350 (wings). — ♂♀ New Guinea.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 533. — ♂♀ Aroe Is.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1172. — ♂♀ Aroe Is.
1926. TILLYARD, Rec. Austral. Mus. 15, p. 165. — ♂ S. New Guinea.

Material studied. — N. New Guinea: 1 ♂, Kojaboe, Lake Sentani, 30.vi.1938, J. OLTHOF.

Papuan *R. rufa*, of which I possess also a ♀ from the southcoast of West New Guinea and a good many specimens collected by STÜBER, besides being of smaller size, differs in several other points from Malaysian examples in our collection; but as no sufficient material from the Moluccan islands is yet available for comparison, it would be most unwise to create a new name for the most eastern subspecies only. It is hoped to deal with this species as soon as more material will be available for study.

Distribution: From India and Ceylon through Burma, Indo China and Malaysia to Celebes, the Philippines, the Lesser Sunda island Flores, the Moluccan islands Batjan, Ceram, and Soela Mangoli; New Guinea (universal); Aroe Is.; and N. Australia.

Huonia thalassophila FÖRSTER (pl. 25 fig. 34).

1903. FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 520. — ♂♀ Huon Gulf.
1913. RIS, Cat. Coll. SELYS, Lib. 14, p. 745. — Partim: ♀ Sattelberg, Huon Gulf.

Material studied. — N. E. New Guinea: 1 ♀ (in bad condition), labelled: "Bongu, Astrolabebai, C. WAHNES 1898", "*Huonia* Type *thalassophila* Förster ♀" (FÖRSTER's hand), in the Brussels Museum; 1 ♂, 1 ♀ (ad.), labelled: "Huongolf, Inland, Agololo, 1400 m, 1913" (FÖRSTER's hand), unidentified, in the Michigan Museum, Ann Arbor.

As I have pointed out elsewhere, the species re-named *arborophila* nom. nov. on the next page, and discussed at length in a previous paper on New Guinean dragonflies (*Nova Guinea*, 17, 1935, p. 272 (key), 277 - 279), did not fit FÖRSTER's brief description of *thalassophila*. In my account of that species I followed RIS in referring all specimens from the southern and northern parts of New Guinea to FÖRSTER's species, but felt some doubt as to the correctness of this determination. I take the opportunity here of correcting previous mistakes.

In 1938 I found a ♀ in the Brussels Museum collection that was labelled *thalassophila* by FÖRSTER himself; the type-designation is worthless since the true types (♂ and ♀) are in the Michigan Museum, Ann Arbor and could not be studied. Two other examples of the FÖRSTER collection, both topotypical, but of much later date and unidentified, were sent to me for study by Mrs HOWARD K. GLOYD. The three examples that I now take to be the true *thalassophila*, correspond closely with FÖRSTER's brief notes on that species. In addition to the points noted by FÖRSTER as serving to characterize this species, I am able to supply a figure of the ♂ anal appendages from the Agololo example, and give the following description.

M a l e (ad.). — Labium with the median lobe black save for a greenish band over its middle; lateral lobes pale glaucous, each narrowly bordered with black along mesial and inner third of anterior margin. Mandibles and labrum also glaucous-green, labrum finely bordered with black anteriorly. Clypeus and frons glaucous-green, frons with a ill-defined, brownish-black dorsal spot occupying the basal half of the upper surface, this spot continued half-way downwards as a narrow basal stripe along the margin of compound eyes. Vertex high, conical, rugose. Occipital triangle black, with two conspicuous yellow spots posterior to it. Rear of the head black, spotted with green along lower margin of compound eyes.

Thorax brownish-black marked with bright turtle-green (RIDGWAY) similar to *arborophila* (*loc. cit.* fig. 36 C), but upper portion of the mesepimeral green spot confluent with the upper spot on metepisternum so as to form a T-shaped mark; green marks on metapleurae slightly more extensive.

Legs black, coxae for the greater part green as is also a stripe along inner surfaces of fore and middle femora. Posterior femora longer and more strongly curved than in *arborophila*, armed with a row of 11 - 12 backwardly directed sharp teeth along distal half of inner margin.

Wings hyaline, shaped similarly to *arborophila*. Neuration more open; pterostigma dark brown, slightly shorter than in that species. Nodal index $\frac{6.8\frac{1}{2}.8\frac{1}{2}.6}{6.\ 7.\ 7.\ 6}$. Fore wing triangle normal, costal side distinctly longer than in *arborophila;* arculus slightly before Ax_2.

Abdomen slender but decidedly more spindle-shaped than *arborophila*, widest at the apex of segm. 8; terminal segments more expanded in lateral dimension. Markings greenish-yellow, not differing in size and shape from those of *arborophila*; segm. 7 - 10 black.

Genitalia very similar, but inner branch of hamulus slightly longer and less curved, genital lobe more slenderly pointed and longer than in *arborophila*.

Anal appendages orange-yellow; superior pair in profile view less straight in their basal portion, with the dorsal concavity situated more proximad than in *arborophila;* ventral projection less conspicuous and rectangulate, situated slightly b e f o r e mid-way their length instead of acute-angulate and situated much b e y o n d that level in *arborophila* (cf. fig. 39 on p. 279, *loc. cit.*, and pl. 25 fig. 34).

F e m a l e. — Closely resembles the male.

Mouth-parts and face coloured as in the opposite sex, but black markings along base of frons replaced by diffuse cinnamon-brown. Vertex also pale brown.

Thorax tawny instead of black; markings identical, deep glaucous-green (RIDGWAY). Coxae and trochanters pale-coloured; legs otherwise as in male.

Wings hyaline, neuration (position of arculus, etc.) as in male. Pterostigma brown. Nodal index $\frac{6.9\frac{1}{2}.8\frac{1}{2}.6}{7.\ 7.\ 7.\ 7}$.

Abdomen of the usual shape, segments cylindrical, but terminal ones (6 to 8) decidedly more expanded than in the ♀ of *arborophila*. Markings greenish-yellow, identical with those of the male.

Sternite of 8th segment simple, very shallowly excavated on middle so as to form two slightly convex rims whose margins are a little swollen.

Anal appendages a little longer than in *arborophila*, amply two times as long as segm. 10, slender, conical, finely pointed, the tips distinctly outbent (almost straight in *arborophila*), black.

Length: ♂ abd. + app. 26, hw. 29, pt. 2.4; ♀ 23.5, 28, 2.5 mm.

D i s t r i b u t i o n: N. E. New Guinea.

Huonia arborophila, nom. nov.

1909. MARTIN, Bull. Soc. ent. Ital. 60, p. 167. — ♂ Astrolabe Range, S. E. New Guinea (*thalassophila*).

1912. RIS, Cat. Coll. SELYS, Lib. 14, p. 744 - 745 fig. 423 (genit. ♂). — Partim: ♂♀ S. New Guinea (*thalassophila*).

1913. RIS, Nova Guinea 9 Zool. 3, p. 512. — S. New Guinea (*thalassophila*).

1915. RIS, Ibid. 13 Zool. 2, p. 86. — ♂♀ S. New Guinea (*thalassophila*).

1935. LIEFTINCK, Ibid. 17, p. 272 (key), 277 - 279 fig. 36, 38 - 39. — ♂♀ N. & S.W. New Guinea (*thalassophila*).

M a t e r i a l s t u d i e d. — N. N e w G u i n e a: 1 ♂, 1 ♀ (ad.), Bernhard Camp, 50 m, 16 & 23.viii.1938, J. OLTHOF; 37 ♂, 11 ♀ (3 pairs *in côp.*), Araucaria River & Camp, 800 m, 6.i (1 ♂), 3-25.iii, and 1-2.iv.1939, L. J. TOXOPEUS. — Additional material: — 7 ♂, 1 ♀, N. New Guinea, Kressi plain, Kressi, 120 km S.W. of Lake Sentani, 200 - 450 m, and Mameda, 200 m, i.1932, v and 25.viii. 1934; 1 ♀, Nettar near Hollandia, 400 m, iv-vi.1932; 9 ♂, 7 ♀ (4 pairs *in côp.*), East Tami, Upper course of Korimé River, ca 600 m, east of Humboldt Bay, 21.x.1935; 22 ♂, 9 ♀, 15 km S. of Bougainville Mts, east of Humboldt Bay, Nonno (Japoe) Hills, 400 m, Koffo to Njau Kolonjé, 7-21.ii.1936; 9 ♂, 5 ♀, southern Bewani Hills, 3 - 500 m, Jetti, viii, Josko, xi, and Kwimmi, x-xii.1936,

Fumb River, 20-30.iv.1937, Keerom River, x.1938, Ken River, 18.ii and Parfi, 20.v.1939. All W. STÜBER leg. — 1 ♂ (ad., segm. 5 - 10 missing), labelled: "N. Guinea S.E. (Astrolabe Range), Moroka, 1300 m, ix.1893, L. LORIA" (printed), "*Huonia thalassophila* Förster" (MARTIN's hand), in Museo Civico, Genoa.

This common and widely distributed species has been discussed at length in the third part of my monograph (1935).

It differs from *thalassophila* FÖRST. chiefly in the greater amount of black colour on the labium and frons, a feature that has also been mentioned by RIS (*loc. cit.* p. 745, last paragraph, sub *thalassophila*); especially in the ♀ this seems a good distinguishing mark from *thalassophila*. Both sexes also differ in the less clubbed appearance of the abdomen, the higher nodal index and denser venation, and lastly, in the ♂ anal appendages, figured in my previous paper.

Distribution: New Guinea (universal).

Huonia epinephela FÖRSTER (pl. 25 fig. 35).

1903. FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 517 - 519, fig. 1 (genit. ♂). — ♂♀ Huon Gulf.
1909. MARTIN, Bull. Soc. ent. Ital. 60, p. 197. — ♂ Astrolabe Range, S. E. New Guinea.
1912. RIS, Cat. Coll. SELYS, Lib. 14, p. 743 - 744 fig. 421 (wings, type ♂), 422 (genit. ♂, S. New Guinea). — ♂♀ S. New Guinea; ♀ Sattelberg.
1913. RIS, Nova Guinea, 9 Zool. 3, p. 512. — ♂♀ S. New Guinea.
1935. LIEFTINCK, Ibid. 17, p. 270 - 271 (key), 279 - 281 fig. 32, 36, 40 - 41 (structures). — ♂♀ N. & N.E. New Guinea; not Aroe Is.!

Material studied. — W. New Guinea (Vogelkop): 3 ♂ (ad.), Soengei Anakasi (westcoast of the 'neck' of the Vogelkop), 15.v.1941, E. LUNDQUIST (Negumy Expedition). — N. New Guinea: 4 ♂, 1 ♀ (ad.), Hollandia, 4.vii.1938; 6 ♂ (1 juv.), 1 ♀ (ad.), Araucaria Camp, 800 m, 2, 9, 21-28.iii.1939; 6 ♂ (ad.), Bernhard Camp B, 100 m, 5 - 8 iv., and Waterfall near Bernhard Camp B, 150 m, 13.iv.1939, L. J. TOXOPEUS.

A homogeneous series, not differing from other examples from New Guinea, including the type (discussed in a previous paper and now in my own collection), and a very large number of additional specimens from the southern Cycloop Mts (1000 - 1200 m), the Bougainville Mts, 400 m, from East Tami (upper course of Korimé River, ca 600 m), and from the Dempta Hills, 600 m, all collected by W. STÜBER, 1932 - 1937.

The status of *'epinephela'* from southern New Guinea is uncertain. When RIS described this species in 1912, it was from the type and one paratype in the Budapest Museum, but the single pair from the Lorentz River territory was not described. He remarked on the ♂ that: ".....unterscheidet sich von den Typen einzig durch kleine goldgelbe Flecken der Flügelbasis: &c" (l.c. p. 744). It may be noted, however, that RIS's drawing of the ♂ genitalia is different from that given in the present paper of a Hollandia specimen (pl. 25 fig. 35), which resembles the type in all respects. The hamule of *epinephela*

bears a strong hooklike inner branch and the outer branch is elongate, whereas from RIS's drawing the whole structure would appear to be more like that of *aruana;* also the shape of the anterior lobe is different.

More material from South New Guinea is needed to settle the point whether such individuals are specifically distinct or not.

H. epinephela is apparently a common and widely distributed species. It occurs from sea-level up to about 1200 m, in dense forest.

Distribution: New Guinea (universal?).

Huonia hylophila, sp. n. (pl. 26 fig. 36 - 37).

Material studied. — Central New Guinea: 2 ♂ (ad.), Araucaria Camp, 800 m, 28.iii & 3.iv.1939, L. J. TOXOPEUS. Holotype: 28.iii.1939.

Closely allied to *epinephela* FÖRST. and *aruana* m., but distinct from both.

Male. — Head coloured exactly as in *epinephela.* Posterior lobe of prothorax a little longer than in that species. Synthorax black, spotted with yellow as in *epinephela,* but the first lateral band, which in the last mentioned species is only very rarely obliterated, is interrupted above its middle, forming a triangular dorsal spot and an elongate ventral streak.

Legs black; posterior femora distinctly curved, and rather strongly convex posteriorly; armature as in *epinephela.*

Wings less elongate and broader basally than in *epinephela,* but tips similarly rounded. Pterostigma a little wider but not longer than in that species. Fore wing triangle with the costal side straight. Neuration otherwise quite similar to *epinephela.* Nodal index $\frac{8.10\frac{1}{2}.9\frac{1}{2}.7}{8.\ 8.\ 8.\ 8}$ (type), $\frac{7.10\frac{1}{2}.10\frac{1}{2}.7}{7.\ 9.\ 9.\ 7}$ (paratype).

Abdomen very strongly spindle-shaped, segm. 3 a little narrower, 7 - 8 however decidedly more expanded in lateral dimension, than in *epinephela.* Markings small, of the same size and shape as in *epinephela.*

Genitalia (pl. 26 fig. 37) black. Anal appendages clear yellow instead of orange-yellow, shaped as described in the key; superior pair partly black, inferior one black, spotted with yellow as shown in pl. 26 fig. 36.

Length: abd. + app. 32.5, hw. 36-36.7, pt. 3 mm.

Female unknown.

Of the two species, *epinephela* and *hylophila,* the former (at least at Araucaria Camp) is evidently the commonest of the two; in this locality both species occur together as one of the two examples of *hylophila* was in a paper enveloppe containing also *epinephela,* apparently collected indiscriminately.

Distribution: New Guinea (central).

Huonia silvicola, sp. n. (textfig. 1).

Material studied. — West New Guinea (Vogelkop): 1 ♂ (ad.), Soengai Anakasi (westcoast of the 'neck' of the Vogelkop), 14.v.1941, E. LUNDQUIST (Negumy Expedition). The specimen is the holotype.

Closely resembling *aruana*, sp. n. and *epinephela* FÖRST., but differing fro both in details of the genital organs and anal appendages.

M a l e. — Head coloured exactly as in *epinephela* from the same localit except that the black colour of the labium is still more extensive, the yello patches on each of the lateral lobes being rather crescent-shaped, occupyi less than one-half of the entire surface of each.

No green lateral spots on prothorax.

Synthorax marked with green similarly to *epinephela*, except for the fo lowing differences. First lateral (mesepimeral) green fascia obliterated, divid into a subtriangular dorsal spot (which is about equal in size to the round sp on the upper end of the mesepisternum) and a curved streak upon the midd of the mesepimeron; the ventral (mesinfraepisternal) spot similar to *epinephel*

There is no additional, small, postero-dorsal pale spot on the metepimero

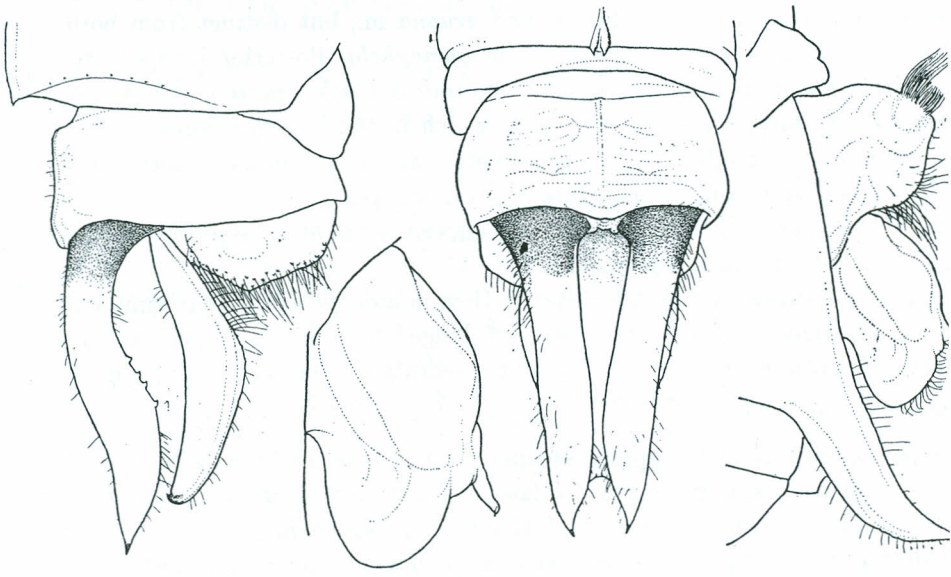

Fig. 1. *Huonia silvicola*, spec. nov. ♂ Anal appendages, right side and dorsal vie and genitalia, right side view, with hamulus, more highly magnified.

Legs black; posterior femora more curved than in *epinephela* and with row of 13 - 14 minute, backwardly directed teeth along ventral margin.

Wings hyaline, slightly smoky along posterior border and at apices. On 1 *Cux* in hind wing. Costal side of *t* in fore wing very slightly fractured. Nod index $\frac{8.10\frac{1}{2}.11\frac{1}{2}.9}{7.\ 8.\ 8.\ 8}$.

Abdomen a little shorter and slightly more spindle-shaped than in *epin phela;* shape and size of the yellow marks practically identical in the two specie

Genitalia shaped as shown in text-fig. 1 and as described in the key.

Anal appendages distinctly shorter than segm. 9 + 10, superiors only litt longer than 9, coloured dirty orangish; bases and extremities of superior pa black.

Length: abd. + app. 30.9 hw. 34.8, pt. 3.0 mm.

Female unknown.

Distribution: West New Guinea.

Huonia aruana, sp. n. (pl. 26 fig. 38, 38a & 39).

1935. LIEFTINCK, Nova Guinea 17, p. 281 - 282. — Partim: ♂ Dobo, Aroe Is. (*epinephela*).

Material re-examined. — 1 ♂ (ad.), Aroe Is., Dobo, v.1932, native collector, Mrs M. E. WALSH don. The specimen is the holotype.

A description of this insect, which I had regarded as being probably only a subspecies of *epinephela,* has been given in the above mentioned paper.

Were it not for the shape of the male anal appendages and genital organs, which are entirely unlike those of *epinephela,* I would not have hesitated to look upon the specimen as a very aberrant example of that species. In addition, however, some weight must be allowed to the shape of the wings and the venational peculiarities.

The discovery of yet two other closely allied species, viz. *hylophila* sp. n., from the mountains of the interior of New Guinea, and *silvicola* sp. n., from the coastal forests of the Vogelkop, in West New Guinea, both of them — as fate would have it — captured in the same locality and almost on the same day as true examples of *epinephela,* leads me to take the specific distinction of all three forms (*aruana, hylophila* and *silvicola*) for granted.

The general agreement is so close that it seems necessary to give in the key short descriptions of the colours, genital organs and anal appendages, which are here figured for the first time.

Distribution: Aroe Is.

Key to the known species of the *H. epinephela*-group (Males).

1. Sup. anal apps. light yellow in colour, bases and extreme tips black, about as long as segm. 9 - 10 taken together, of slender build and evenly pointed apicad; upper margin in profile view with two slight convexities, lower margin smooth and rounded, provided with a row of 5 - 6 minute black tubercles. Inf. app. for the greater part yellow, narrowly triangular in ventral view, lateral borders at first a little convex, then slightly concave, apex slightly notched, in side view evenly and slightly upcurved. Genital hamule with a strong hook-like ventral projection (pl. 25 fig. 35). First lateral thoracic green band nearly always complete. Posterior femora nearly straight. Only one *Cux* in all wings. Costal side of fore wing *t* generally fractured distally. Abdomen moderately spindle-shaped. ..... **epinephela**

1'. Sup. anal apps. shorter than segm. 9 + 10, shaped otherwise. Posterior femora strongly curved. 2

2. Sup. anal apps. orange-yellow, almost for their basal half black, slightly outcurved beyond middle, outer border at first convex, then concave, and finally again convex in dorsal aspect; basal three-fourths stout and parallel-

sided in profile view, tips abruptly and finely pointed; lower margin carinate, with a distinct acute-angulate projection beyond the middle of its length and provided with a row of 5 - 7 robust black teeth. Inf. app. black, spotted with yellow as shown in figure; very broad at base, apex slightly notched, strongly and abruptly upcurved in side view (pl. 26 fig. 36). Genital hamule with a small obtuse ventral tubercle (pl. 26 fig. 37). 1 *Cux* in hind wing. Costal side of fore wing *t* straight. First lateral thoracic green band obliterated. Abdomen very strongly spindle-shaped. ..... **hylophila**

2'. Sup. anal apps. orange, only the bases and tips black; lower margin in profile view at most with an obtuse-angulate projection beyond the middle of its length. Inf. app. orange, tipped with black. Abdomen moderately spindle-shaped. 3

3. Sup. anal apps. bright orange, bases and tips black, basal half in side view distinctly sub-basally constricted; lower margin of each smooth and rounded, but obtuse-angulate beyond the middle of its length, and with a row of 6 - 7 minute black tubercles; in dorsal view at first distinctly constricted, then inflated beyond middle, and finally tapering to a point, the outer border of each appendage convex. Inf. app. triangular in shape, rather abruptly upcurved in side view, apex slightly notched (pl. 26 fig. 39). Genital hamule with a short, hook-like ventral projection (pl. 26 fig. 38). 2 *Cux* in hind wing. Costal side of fore wing *t* straight. First lateral thoracic green band complete. ..... **aruana**

3'. Sup. anal apps. dirty orange, bases and extremities black, basal half in side view more definitely curved with upper and lower margin parallel to one another, without obtuse-angulate projection beyond the middle of its length, slightly carinate ventrally, with a row of 4 - 5 minute, though acute, black denticles; in dorsal view outer and inner border sub-parallel from base almost to apex, which is finely pointed, the outer border of each appendage almost straight. Inf. app. triangular in shape, gradually upcurved in side view, apex more deeply notched (text-fig. 1). Genital hamule with a fine, very slender, sickle-shaped ventral process. 1 *Cux* in hind wing. Costal side of fore wing *t* fractured near apex. First lateral thoracic green stripe obliterated. ..... **silvicola**

Huonia oreophila LIEFTINCK.

1935. LIEFTINCK, Nova Guinea 17, p. 271 (key), 274 - 277, fig. 33 (not 35!), 34, 36. — ♂♀ Cycloop Mts., N. New Guinea.

1937. LIEFTINCK, Ibid. N. S. 1, p. 82 (corrigendum).

Material studied. — Central N. New Guinea: 1 ♂, 1 ♀ (ad.), Rattan Camp, 1150 - 1200 m, 9 & 21.ii.1939; 2 ♂, 3 ♀ (ad.), Sigi Camp, 1500 m, 17-22.ii.1939, L. J. TOXOPEUS. — Living colours: "Appendages orange; twin-spot on middle of abd.-segments yellow, remaining marks pale green". — Additional (topotypical) material: 19 ♂, 3 ♀, southern Cycloop Mts, 1000 m, xii. 1934 and 12.viii.1935, W. STÜBER.

Very similar to the topotypical series, from the southern Cycloop Mts., but differing a little in the size of the green markings of the thorax, which are somewhat enlarged, especially the mesepimeral band that coalesces in some examples with the upper and lower metepisternal spots. In one ♀ the black metepimeral bands are reduced to mere lines, the lower two metepisternal green flecks being so much enlarged as to form a single broad band, whilst the dark interspaces are diffuse brownish instead of deep black.

This very distinct species is apparently restricted to high altitudes.

Distribution: N. and Central New Guinea.

Huonia spec. nov. (indet.).

Material studied. — Central N. New Guinea: 3 ♀ (ad.), Araucaria Camp, 800 m, 18 & 21.iii, and Mountain-ridge between Idenburg River and Araucaria Camp, 900 m, 16.iii.1939, L. J. TOXOPEUS.

These three examples disagree in so many characters with other species known to me that I believe they may represent a new species, but without a male specimen it would be most unwise to name them as such.

All are of about the same size as *epinephela*, but the head-markings are entirely different, resembling those of *oreophila* rather closely. Also in other respects these females come nearest to that species, but are unique in *Huonia* by having the upper parts of the mesepimeral and metepisternal yellow bands on the thorax obliterated.

Distribution: Central New Guinea.

Lanthanusa cyclopica RIS.

1906. VAN DER WEELE, Tijdschr. v. Entom. 49, p. 183, pl. 8 fig. 59 (genit. ♀, *sine nomen*).

1909. VAN DER WEELE, Nova Guinea, 5 Zool. 3, p. 386. (Nov. gen. nov. spec., *sine nomen*). — ♀ Cycloop Mts.

1912. RIS, Cat. Coll. SELYS, Lib. 14, p. 746 (generic diagnosis), 747, fig. 424 (wings ♀ type) — ♀ Cycloop Mts.

Material studied: — 1 ♀ (ad. type), N. New Guinea, Cycloop Mts, 14.iv.1903 (Netherlands New Guinea Expedition), in the Leiden Museum.

This species I have examined at Leiden in 1938. Though being of much smaller size, it is obviously related to *richardi*, sp. n., the most noteworthy differences being found in the venation, and the thoracic colour-pattern.

L. cyclopica is unique in having all triangles traversed by a cross-vein; the pterostigma is only 2.5 mm long (3.5 - 3.8 mm in *richardi*). It also differs from *richardi* in the obliterated humeral band, the dorsal portion of which is isolated and in the form of a small, transverse streak under each of the ante-alar triangles; the sides of the thorax are chiefly brown, with a small triangular fleck placed under each of the fore and hinder wings and with a greenish point above the spiracle.

The genital organs of the type have been described and figured by VAN DER WEELE (*loc. cit.*).

The male of *L. cyclopica* is still unknown. Although this species was constantly looked for by Mr STÜBER, during many years in succession, he has not succeeded to trace it.

Distribution: Cycloop Mts, North New Guinea, alt.?

Lanthanusa richardi, sp. n. (pl. 27 fig. 40 - 41, 44).

Material studied. — Central N. New Guinea: 2 ♂, 3 ♀, Mist Camp, 1800 m, 9.i (2 ♀ semiad.), 11.i (♀ ad.), and 14.i.1939 (2 ♂ ad.); 5 ♂, 1 ♀, Sigi Camp, 1500 m, 17.ii (1 ♂ ad.), 18.ii (1 ♂ ad.), 1350 m, 19.ii, "large mountain-stream" (1 ♂ juv.), 1500 m, 20.ii (1 ♀ ad.), 27.ii.1939 (2 ♂ ad.); 1 ♂ (juv.), Baliem River, 1600 m, 16.xii.1938. All L. J. TOXOPEUS. — Living colours: "Markings pale glaucous to yellow-green. Upper appendages black and yellow, lower appendix yellow" (♂ Sigi Cp, 1500 m, 17.ii.1939, L.J.T.).

Holotype ♂ and allotype ♀: Mist Camp, 1800 m, 14.i. (♂) and 9.i.1939 (♀).

Male (ad.). — Labium palest olive-yellow or -grey, the median lobe black, the lateral lobes very flat and wide, with a fine black line along mesial border of each. Mandible bases olive-yellow, tips brownish. Labrum pale olive-yellow, very narrowly bordered with black. Clypeus and frons dull olive-green; frons with a straight, purplish-brown basal streak from eye to eye, occupying most of the dorsal surface and almost as wide as the vertex is long. Vertex trapezoidal, its surface finely wrinkled, purplish-brown in colour. Occipital triangle smooth, shining, rounded off posteriorly, reddish brown. Rear of the head dark reddish-brown with a greenish spot halfway down along margin of compound eyes.

Prothorax dark purplish-brown, posterior lobe curved down on the back of the mesothorax, almost semicircular, fringed with very long, brownish-grey pencil-pairs.

Synthorax long and rather narrow; ground-colour a delicate Malachite green or Asphodel green (RIDGWAY), marked with warm purplish-brown (Vandyke brown, RIDGWAY). The green markings are as follows: the dorsal carina and a small transverse, reniform, ventral spot; a very characteristic, gracefully curved humeral spot, the green extending laterally along the humeral suture for its median one-third only, curving upwards and inwards so as to end abruptly on either side of the upper end of the median carina; the lower posterior portion of the mesinfraepisternite; a narrow irregular stripe along inner side of first lateral suture; most of the metapleurae, and the whole under surface of the thorax. The green colour on the metepisternum encloses a tripartite brown spot surrounding the spiracle and extending dorsal to it. A brown stripe on the second lateral suture confluent with a curved mark between the lower portions of the two lateral sutures, shaped as shown in pl. 27 fig. 44.

Legs long and robust. Posterior femora extending back to tips of genital hamule, almost straight, armed with a row of 26 - 27 minute, closely set, backwardly directed, curved, pointed teeth which decrease gradually in size from apex to base, disappearing at about the basal one-fifth of the total length of femur; apical tooth followed by 2 - 3 short spines. Anterior pair of femora armed with 2 - 3 robust interior sub-apical spines; intermediate femora with 24 - 25 minute denticles and 2 - 3 terminal spurs. Tarsal claws with robust interior tooth. Coxae green, spotted with black. Legs black, trochanters and femora of anterior two pairs with a broad green interior stripe; femora of posterior pair dark reddish-brown, except the knees, which are black; tibiae and tarsi black.

Wings shaped as in the genotype. Neuration also as in the typical species, with the following exceptions. All *t* and *ht* invariably free; *t* with its distal side markedly convex; Cu_1 in fore wing originating from the anal angle of *t*, but anal angle of *t* connected with the proximal side of *ti* by means of a short intercalated stalk; *ti* with a single transverse cross-nerve, or three-celled, in about equal ratio. Invariably 2 *Cux* in hind wing. No *Bxs*. Cu_1 in hind wing distinctly separated from the anal angle of *t*. Proximal side of *t* in hind wing in line with *arc* or — in both wings of one ♀ only! — situated very slightly proximal to it. One row of cells between *Rs-Rspl*. Nodal index: $\frac{8.10\frac{1}{2}.11\frac{1}{2}.7}{8.\ 8.\ 8.\ 8}$ (type); paratypes with $\frac{10\frac{1}{2} - 11\frac{1}{2}}{8 - 9}$ antenodals and $\frac{6 - 8}{7 - 8}$ postnodals. Membranula greyish-black. Pterostigma rather large and wide, brownish-yellow between thick black nervures. Wing-membrane entirely hyaline, or slightly tinged with grey or yellow in aged individuals.

Abdomen (discoloured in the type) short and slender, strongly spindle-shaped; basal segments compressed, much more inflated in dorso-ventral than in lateral dimension, from base of segm. 4 to the middle of 6 cylindrical, very slim and slender (0.8 mm); then widened, roof-shaped, attaining its greatest width of 2.5 mm at the apex of segm. 7, from which point the abdomen again tapers to the end. Brownish-black, 7 - 8 intermingled with red-brown, obscurely marked with green on basal segments, which colour turns to dull orangish on segm. 3 - 6. Segm. 1 - 2 green; 2 with the longitudinal and transverse carinae finely black; a oblique, isolated, squarish lateral spot and a longitudinal streak connecting the transverse suture with the posterior border, also black; a black transverse streak, widest mid-dorsally, along hind margin. Segm. 3 greenish-yellow, but with an apical ring and all carinae and sutures black and, in addition, with a thick, longitudinal, brownish black band on either side running from base to apex of segment so as to form 8 more or less squarish pale spots. Segm. 4 and 5 brownish-black, each with a roundish basal spot on each side of the black dorsal carina. Segm. 6 with a conspicuous, oblique, orange-yellow mark occupying most of the segment, but finely divided by black mid-dorsally;

the basal one-fifth and apical one-sixth of this segment black. Segm. 7 - unmarked.

Genitalia (pl. 27 fig. 41): hamuli black, their basal portion and a ventr streak green. Glans penis armed with a very conspicuous, strongly chitinize deeply forked, shining black process; the branches of the fork curved and t apices flattened, slightly divaricate and broadly spoon-shaped, projecting w beyond the hamuli when viewed laterally. Hamuli simple, hook-shaped. Genit lobe very long and slender, green, tips pointed, black.

Anal appendages shaped as shown in pl. 27 fig. 40, shorter than segı 9 + 10; superior pair with the basal two-thirds black, fading to brown distall the apical part ochreous-yellow in colour, as is also the inferior appendage.

F e m a l e (ad., allotype). — Head coloured as in male. Prothorax shap as in the opposite sex, tawny-olive in colour.

Synthorax (discoloured): ground-colour ochraceous-buff instead of gree marked similarly to the male, but coloured russet or Dresden brown, inste of warm purplish-brown; hence all markings less sharply defined and pal than in the opposite sex.

Legs coloured as in male, but basal two-thirds of anterior femora pa brownish-yellow, the remainder black; posterior two pairs of femora pa reddish-brown, the knees sharply defined black. A row of 15 - 17 minute, slend spines almost along full length of ventral carina of posterior femora; these tee gradually but slightly increasing in length from base to near the apex, a with 1 - 2 strong terminal spurs.

Wings long and broad. Neuration open, exactly as in male; *ti* 2 - 3 celle *Arc* at Ax_2 (allotype), or slightly distal to it (paratypes). Nodal index $\frac{7.11\frac{1}{2}.10\frac{1}{2}}{9.\ 8.\ 8.}$ (allotype), $\frac{7.11\frac{1}{2}.10\frac{1}{2}.8}{7.\ 8.\ 8.\ 8}$ and $\frac{7.11\frac{1}{2}.11\frac{1}{2}.8}{7.\ 9.\ 9.\ 9}$ (paratypes). Pterostigma pale orang yellow, heavily framed in black. Membrane hyaline (allotype), or very slightl smoky (one paratype); bases to about as far as Ax_1 faintly and diffusely tinge with yellow.

Abdomen more robust with intermediate segments wider than in male, b yet somewhat spindle-shaped. Markings obscured and discoloured, but a parently similar in principle to the male; dark longitudinal side-bands on segr 2 - 3 wider, squarish spot on either side of 2 tapering away to postero-ventr margin, and pale streaks along lower margin of 4 - 6 more conspicuous. Segn 7 - 10 dark brown, unmarked. Structure of 8th sternite and valvula vulv exactly as described by RIS for *L. cyclopica* (*loc. cit.* p. 747).

Anal appendages and tuberculum yellow, the former with a dark brow margin, and pale streaks along lower margin of 4 - 6 more conspicuous. Segn 10, exterior margin straight, interior margin strongly convex in dorsal view tips acutely pointed.

Length: ♂ abd. + app. 30, hw. 33.3, pt. 3.0 mm (holotype); 29.0 - 32.0, 33.5 35.2, 3.3 - 3.5 mm (paratypes); ♀ 31.0, 38.5, 3.5 mm (allotype), 31.8 - 33.0, 36.8 39.0, 3.5 - 3.8 mm (paratypes).

This fine insect resembles *L. cyclopica* in general facies. It differs in the thoracic pattern, its superior size and in venational characteristics.

With this species I have associated the name of RICHARD ARCHBOLD, the leader of the Archbold Expedition.

Distribution: Mountains of Central New Guinea, 1500 - 1800 m.

Lanthanusa lamberti, sp. n. (pl. 27 fig. 42 - 43, 45).

Material studied. — Central N. New Guinea: 2 ♂ (ad.), Moss-forest N. of Lake Habbema, 2850 m, 23.viii.1938; 2 ♂ (ad.), Moss Forest Camp, 5 km N.E. to Lake Habbema, 2800 m, 25.x and 5.xi.1938; L. J. TOXOPEUS. Holotype: Moss Forest Cp, 2800 m, 25.x.1938. — Living colours: "Thoracic markings light blue-green; abdominal rings rather more green" (2 ♂, Moss Forest, 2850 m, 23.viii.1938, L.J.T.).

Male (ad.). — Labium bright Maize- to Apricot-yellow (RIDGWAY); black are: the median lobe, two transverse impressed streaks on either side of it on each of the lateral lobes, a rather broad stripe, widest basally, along mesial margin of lateral lobes produced on either side into a narrow stripe along anterior border of each. Genae, mandible-bases, and labrum greenish-yellow, tips of mandibles red-brown. Labrum with a toadstool or T-shaped black mark, the stem of the T in the form of a triangular spot, which is widest basally and almost interrupted apically. Clypeus light Paris-green, postclypeus with a transverse depression on each side of the middle. Lower portion of frons with a distinct, waved, transverse carina, the area anterior to it (between carina and clypeal suture) coloured black on the middle; blackish-brown basal streak shaped similarly to *richardi,* but only half as wide as the vertex is long. Vertex blackish-brown, as in *richardi.* Occipital triangle reddish-brown, turning to green posteriorly so as to form two more or less distinct greenish points. Rear of the head shining brownish-black, marked with three yellow spots placed in line along margin of compound eyes.

Prothorax reddish-black or black with a longitudinal twin-spot upon middle and most of the posterior lobe, bright green; posterior lobe somewhat elevated, crescent-shaped, fringed with very long brown pencil-hairs.

Synthorax long, wider than in *richardi;* ground-colour a delicate pale Sulphate-green (RIDGWAY) in well-coloured examples, in others (including the type) discoloured to Veronese-green above, fading to yellow laterally, marked with warm blackish-brown to almost black. Pale marks sharply defined, as follows: the dorsal carina and a small transverse, ventral twin-spot; a small triangular or oval spot placed immediately in front of each of the ante-alar triangles; a large, oval, isolated humeral patch, occupying the outer half or less of the middle or lower two-thirds of each mesepisternite. Sides of thorax variegated with black as shown in pl. 27 fig. 45; under surfaces pale green.

Legs long and robust. Posterior femora extending back to a little beyond tip of genital lobe, slightly curved, armed with a row of ca 30 minute teeth

and 2 - 3 apical spines, which are similar to those of *richardi;* armature of legs otherwise as in that species. Legs black, coxae largely green, trochanters and basal two-thirds of anterior and intermediate femora with a green interior stripe.

Wings faintly tinged greyish- or greenish-yellow all over the membrane. Shape broader than in *richardi;* neuration decidedly more close, but otherwise very similar to the preceding species. All *t* and *ht* free; distal side of *t* straight or convex; Cu_1 in fore wing originating from a point a little before anal angle of *t,* which is connected with the proximal side of *ti* by means of a short intercalated stalk; *ti* with a single transverse cross-nerve (2½), or three-celled (1½). 2 *Cux* in hind wing. No *Bxs*. Position of Cu_1 in hind wing as in the other species. Proximal side of *t* in hind wing in line with *Arc,* or very slightly proximal to it. One row *Rs-Rspl*. Nodal index $\frac{9.11½.11½.10}{10.8.8.11}$ (type); antenodals $\frac{11½ - 12½}{8 - 9}$, postnodals $\frac{9 - 10}{10 - 11}$ (paratypes). Membranula blackish. Pterostigma a little smaller and narrower than in *richardi,* yellow-brown between thick black nervures.

Abdomen short and robust, strongly spindle-shaped, but much more compactly built than in *richardi;* intermediate segments 1.2 mm wide where most constricted, greatest width at apex of segm. 7 (2.8 mm). Deep black, conspicuously marked with green on basal segments, this colour turning to orange or ochreous from the apical half of 3 to 6. Segm. 1 dark red-brown, with a small mid-dorsal spot, the lower part of the sides, and the membrane between 1 and 2, green. Segm. 2 black, dorsum with the apical part, posterior to the transverse carina, bright green; this colour finely interrupted by black dorsally, and laterally, by a similar though shorter line; sides black with an elongate green patch, placed dorsal to the genital lobe, which is likewise black. Segm. 3 in one paratype with four squarish green spots in front of the transverse carina, two on each side of the black mid-dorsal band, connecting the base with the transverse suture, which itself is also black; this segment with an additional set of four spots, each of which is rounded off posteriorly, situated behind the transverse suture, the two lowermost spots before and behind this suture confluent beneath so as to fill in most of the sides. In the type and one paratype all four spots on either side of the black dorsal stripe are fused, but some basal and apical traces and the transverse carina, are black. Lastly, in one other paratype, the conjugation of these spots is incomplete as only the anterior spots are isolated, the posterior ones being confluent basally. Segm. 4 - 6 each with small, paired dorso-basal spots, diminishing in size from segment to segment, and with a large latero-ventral crescent-shaped mark, placed on the middle of each segment and meeting its fellow of the opposite side to form conspicuous oval yellow marks underneath. On segm. 6 these median latero-ventral patches of yellow are very much larger, extending upwards so as to nearly touch one another on mid-dorsum, where they are separated only by the black mid-dorsal carina, leaving only the base and apex of the segment black. Segm. 7 entirely black save for a large ventral oval spot; 8 and 9 similar to preceding segment

but in addition with two closely approximated basal, mid-dorsal, triangular spots (vestigial on 9); 10 entirely black.

Genitalia (pl. 27 fig. 43): hamuli black. Glans penis armed with a short, squarish, shining black, two-pronged process; the prongs flattened, slender, finger-shaped, widely distant, extending back to only half-way the curled hook of hamuli. Genital lobe black, longer than hamuli, but much shorter than in *richardi* and bluntly pointed apicad.

Anal appendages shaped as shown in pl. 27 fig. 42, shorter than segm. 9 + 10; basal one-third to one-fourth of superior pair black, the distal part ochreous in colour, as is also the inferior appendage.

Length: abd. + app. 29.4, hw. 35.0, pt. 3 mm (holotype); 28.0 - 29.7, 35.0 - 35.6, 3 mm (paratypes).

Female unknown.

This extremely handsome *Lanthanusa* most nearly resembles *L. richardi*, the only other species of which the ♂ is also known. It is a much more compactly built insect with a less spindle-shaped abdomen, broader wings and denser venation.

It also has more black on the labium, and the posterior femora are black instead of red-brown. But the best distinguishing characters are found in the thoracic colour-pattern, and in the genital organs and appendages of the male.

L. lamberti is the highest recorded Libellulid from New Guinea.

I have named this species after Dr LAMBERTUS J. TOXOPEUS, the entomologist of the Archbold Expedition.

Distribution: High mountains of Central New Guinea (2800 - 2850 m).

Trithemis festiva (RAMBUR).

1842. RAMBUR, Hist. Nat. Ins. Névropt., p. 92 - 93. — ♂ India (*Libellula*).
1867. BRAUER, Verh. Zool.-bot. Ges. Wien, 17, p. 289. — New Guinea (*Dythemis infernalis*).
1879. SELYS, Ann. Mus. civ. Genova, 14, p. 305, 324. — N. W. New Guinea (*infernalis*).
1912. RIS, Cat. Coll. SELYS, Lib. 14, p. 761 - 762 (key), 796 - 799 (incl. ref.), fig. 456 (wings), 457 (genit. ♂).

Material studied. — N. New Guinea: 1 ♂, Hollandia, 11.vii. 1938, L. J. TOXOPEUS.

A rare species in New Guinea. I have seen only few examples from the environs of Hollandia (Humboldt Bay) in the north, and from Milne Bay in the east.

Distribution: From Cyprus, Asia Minor, Abessynia eastwards to as far as Formosa and Loo Choo. A common species throughout Malaysia, the Lesser Sunda Islands, Celebes, and the Philippines, but becoming scarcer eastwards. Known also from the Moluccan islands Ambon and Ceram, and from the Tanimbar Is.

Zyxomma elgneri RIS.

1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 902 (key), 905 - 906, fig. 525 (wings). — ♂♀ Cape York; ♂ Aroe Is.

1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 533. — ♂ Aroe Is.

Material studied. — N. New Guinea: 3 ♂, 2 ♀, Bernhard Camp B, 100 m, 8-11.iv.1939, L. J. TOXOPEUS. — 9 ♂, 3 ♀ (semiad.-ad.), Hollandia and environs, 0-200 m, "at dusk", xi-xii.1930, i-ii, iii, iv-vi.1931; 1 ♀ (ad.), Nettar, near Lake Sentani, 300 m, ix-xi.1932, all W. STÜBER. — [1 ♂ (ad.), N. Australia, N. T., Pt. Darwin, Botanical garden, 13.iv.1931, Ed. HANDSCHIN leg.].

This species is new to the fauna of New Guinea.

The Australian example in our collection fits RIS's description in all respects. 9½ antenodals in fore wings; abd. + app. 29, hw. 29.5 mm.

The specimens from New Guinea differ from the Australian ones in their slightly larger size and in that the last antenodal cross-nerve of the fore wing is almost invariably complete or, in other words, the incomplete last antenodal cross-nerve in *c* is lacking, except in very few cases, as follows: 8.8 (2 ♂ Hollandia), 8½.8 (1 ♂ Holl.); 9.8 or 8.9 (1 ♂, 2 ♀ Holl., 1 ♂ Bernhard Cp.); 9.9 (3 ♂ Holl., 1 ♂♀ Bernh. Cp.); 9.9½ (1 ♂ Holl.); 9½.9½ (1 ♀ Holl.); 9.10 or 10.9 (1 ♂ Holl., 1 ♂♀ Bernh. Cp.); 10.10 (1 ♀ Nettar). Immature specimens have the wings entirely hyaline with the exception of the brown basal spots.

In the adult ♂ the wing-membrane is saffronated and the apices, from one cell before *pt*, are diffusely pale brown. The ♀ resembles the ♂, but the basal spot is *sc* is dark rusty-brown, and the apical patch of brown is reduced to a pale brown cloud of variable extent under the pterostigma, the apices being hyaline.

Length: ♂ abd. + app. 30 - 33, hw. 31 - 35; ♀ 31 - 35, 32.5 - 36.5 mm.

Distribution: North New Guinea; Aroe Is.; North Australia.

Zyxomma multinerve CARPENTER.

1897. CARPENTER, Scient. Proc. Roy. Dublin Soc. 5. 8 (n.s.), p. 435 tab. 16 fig. 1 - 4. — E. New Guinea (*multinervis*).

1909. VAN DER WEELE, Nova Guinea, 5 Zool. 3, p. 386. — ♂ N. W. New Guinea (*obtusum*).

1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 902 (key), 906 - 908 (incl. references), fig. 526 (wings), 527 (genit. ♀). — ♂ N. W. New Guinea; ♂♀ Aroe Is.

1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 533. — ♂♀ Aroe Is.

Material studied. — N. New Guinea: 1 ♂ (ad.), Bernhard Camp B, 100 m, 10.iv.1939, L. J. TOXOPEUS. — Long series (ad., both sexes), Hollandia & environs, and Tami River plain, 0 - 400 m, all the year round at dusk, 1930 - 1933; East Tami, x.1935, W. STÜBER. — 1 ♀ (ad.), Astrolabe Bay, Stephansort, BIRÓ 1897; 1 ♀, Huon Gulf, Wiwa River, 1.xii.1906, C. WAHNES; both ex coll. F. FÖRSTER (Michigan Mus., Ann Arbor). — W. New Guinea (southcoast): 2 ♂, 1 ♀ (ad.), Soengei Aindoea, 4-6.vii.1941, E. LUNDQUIST (Negumy Expedition).

Semi-adult examples of the Aroe Islands have been described by RIS. The present series shows that the wing-markings in adult specimens of both sexes are better pronounced and darker, especially the apical and nodal patches of the ♀. The ♀ from Stephansort is a very old example that has the wings coloured uniformly dark golden-brown, with ill-defined dark brown basal streaks and wing-tips, and with the nodal flecks obliterated. Nodal index variable; fore wing with 11½-15½ antenodals.

Adult males have the sides of the thorax and the basal segments of the abdomen pruinosed white.

Apparently a common species where found.

Distribution: Ceram (Moluccas); New Guinea (universal); Aroe Is.

Zyxomma petiolatum RAMBUR.

1842. RAMBUR, Hist. Nat. Ins. Névropt. p. 30, tab. 2 fig. 4d. — ♂ Bombay.
1909. VAN DER WEELE, Nova Guinea 5 Zool. 3, p. 386. — ♀ N. New Guinea.
1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 901 (key), 903 - 905 (incl. references), fig. 323 (wings). — ♀ N. New Guinea.

Material studied. — N. New Guinea: 14 ♂, 9 ♀, Bernhard Camp B, 100 m, 7-13.iv.1939, L. J. TOXOPEUS. Living colours: "Mouth-parts and head pale grey, frons pale brownish grey; thorax pale grey, abdomen yellow-brown with brown rings, tips of appendages dark brown" (♀ juv. "beaten from shrubbery"). — Long series (both sexes), Hollandia and environs, "at dusk", all the year round, 1930 - 1933, W. STÜBER. — 1 ♀ Huon Gulf, Wiwa, xii.1905, CARL WAHNES leg., ex coll. FÖRSTER (Michigan Mus., Ann Arbor). — W. New Guinea (southcoast): 2 ♂, 3 ♀, Oemar and Arja River, W. of Oeta, 24-28.vi.1941, and Soengei Aindoea, 5-6.vii.1941, E. LUNDQUIST (Negumy Expedition).

This is an extremely variable species both in the colouring and reticulation of the wings as in its body-size.

The males fit RIS's description (*loc. cit.* p. 904) closely, agreeing also in all respects with examples in our collection from Malaysian and Moluccan islands, and from Celebes.

Young females are remarkable in having the wing-bases often tinted a deep golden- or burnt-brown with the centre of the coloured cells subhyaline; in fore wing these basal marks extend to as far as $Ax_{6\text{-}10}$ in *sc*, in *m* and between sectors of *Ara* to the end of *t* or to the fork of $M_{1\text{-}2}$-M_3, and in *cu;* in hind wing up to the nodus in *sc*, from there obliquely and irregularly to the bend of A_2 or to the apex of the anal loop, and finally in a convex curve parallel to the wing-border to the end of the membranula, leaving only 1 - 2 marginal cell-rows hyaline. This conspicuous dark patch disappears gradually with age when the wings (except the extreme basal dark spots) become either almost hyaline, or throughout smoky-brown.

The number of antenodal cross-veins in the fore wing varies from 9½ to 12½ in both sexes.

Length: ♂ abd. + app. 36.5 - 41.5, hw. 31.0 - 34.5; ♀ 40.0 - 43.0, 35.0 - 38.0 mm.

Distribution: From India and Ceylon eastwards through Burma, Indochina and Loo Choo; throughout Malaysia, Celebes and the Philippines to as far as New Guinea (universal) and N. Australia. Also reported from the Seychelles.

Pantala flavescens (FABRICIUS).

1798. FABRICIUS, Suppl. Ent. syst. p. 285. — India (*Libellula*).
1909. VAN DER WEELE, Nova Guinea, 5 Zool. 3 p. 385. — N. W. New Guinea.
1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 917 - 920 (incl. references), fig. 533 (wings). — Aroe Is.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 533. — Aroe Is.
1919. RIS, Cat. Coll. SELYS, Lib. 16, 2, p. 1221. — W. New Guinea.
1932. FRASER, Mém. Mus. Roy. Hist. Nat. Belg., hors sér., 4, 3, p. 34. — Aroe Is.

Material studied. — N. New Guinea: 2 ♂, 1 ♀, Hollandia, 22.vi & 11-15.vii.1938; 1 ♀, Iebèlè, 2250 m, 9.xi.1938; 9 ♂, 8 ♀, Baliem River Camp and Valley, 1600 - 1650 m, 20.xi-16.xii.1938; 1 ♂, Araucaria Camp, 800 m, 25. iii.1939, L. J. TOXOPEUS.

Distribution: Almost cosmopolitan, throughout the tropics and warmer temperate countries.

Rhyothemis hurleyi TILLYARD (pl. 30 fig. 62 - 65).

1926. TILLYARD, Rec. Austral. Mus. 15, p. 165-166 fig. 6 (wing-base). — ♂ S. New Guinea.

Material studied. — North New Guinea: 4 ♀, Hollandia, 21.vi; 4 ♂, 1 ♀, Kojaboe and Nettar near Lake Sentani, 29-30.vi.1938, L. J. TOXOPEUS; 1 ♂, Bernhard Camp, 50 m, 15.x.1938, J. OLTHOF. — Long series (both sexes), Hollandia and surroundings, 0 - 400 m, 1931 - 1937, W. STÜBER. — 1 ♂, 6 ♀, Mamberamo River valley, Pionierbivak, 30 m, vii-medio xi.1939, J. P. K. VAN EECHOUD. — South New Guinea: 2 ♂, Digoel River territ., Obaa district, vi.1939, J. M. VAN RAVENSWAAY CLAASEN.

A well-defined and only little known species, not closely related to any of the other members of the genus except, perhaps, *severini* RIS, from Indochina, from which it differs in several points.

The many specimens before me from the northern plains of New Guinea do not agree in all respects with TILLYARD's description and drawing of the type series from Lake Murray and Aramia Lakes, in Papua; and since TILLYARD's description of the ♂ is incomplete, no description of the abdomen being given, it is deemed advisable to give a complete description of the northern individuals, including an account of the ♀, which has not yet been described.

Male (Hollandia, &c). — Head and thorax coloured similarly to the type, except for the following differences. Vertex entirely, and frons above, deep

metallic purple-red or -blue, fading to ferruginous and flesh-ocher ventrally; clypeus ochraceous-tawny. Labrum black. Labium black, the side-lobes ochraceous distally.

Thorax mummy-brown, sides with steely reflections.

Wing-membrane hyaline; distal portion, especially that of hind wings, rather strongly flavescent or smoky in aged individuals. Fore wing with *sc* from base to Ax_1 and *cu* from base to Cux_1 filled in with brown; pterostigma dark brown, with two cross-veins below it, the cell enclosed by these veins a little shorter than *pt* itself and filled in with brown in all specimens examined. Hind wing with *pt* slightly shorter and having the space below it also brown, from a little before level of base of *pt* to a little beyond its distal side. Basal portion of hind wing from costa to posterior margin rich deep metallic purple in opaque view, Liver-brown (RIDGWAY) in transmitted light, the cell-centres slightly paler; boundary between this colour and the hyaline portion irregular, as shown in pl. 30 fig. 62 - 63; on *c-sc* the purple covers the first two to three out of six antenodals, cutting almost transversely across the inner angle or first cells of the discoidal field, then abruptly widens at Cu_1 distad, and finally runs obliquely and irregularly to a point on the posterior margin distad of the main rounded curve of the anal part of the wing; the average maximum and minimum extent is shown in pl. 30 fig. 62 and 63. Neuration and nodal indices as shown in these photographs.

Abdomen slender, of the usual shape, blackish brown. Most of the sides of segm. 1 - 3 (except the sutures and carinae) reddish brown; basal two-thirds of 4 - 7, basal half of 8 and a side-spot on 9, coloured dark red-brown (Hay's russet to Liver-brown in RIDGWAY); 10 and appendages black.

Anal appendages a little shorter than segm. 9 + 10, superiors longer than inferior, without sub-apical angular projection, but lower margin armed with a row of 5 denticles.

Female (Hollandia, including allotype). — Resembles the male in colour and markings very closely. Head paler, vertex and frons bright ochraceous-orange with very low metallic glaze; frons with a diffuse metallic-purple or -blue basal line, slightly variable in width, but always narrow; pile black. Face and labrum coloured as in male. Labium more extensively ochraceous, the median lobe at least partly black.

Wings shorter and broader; fore wing unmarked, lacking the basal and apical brown spots. Base of hind wing marked similarly to the male, presenting the same slight variation and the same metallic purplish and blue reflections in opaque view; no brown spot under *pt* (pl. 30 fig. 64 & 65).

Thorax and abdomen marked as in male; abdomen more cylindrical, with the red-brown basal rings of 1 - 7 occupying most of the segments. Sides of segm. 1 - 5 and under surfaces of 1 - 7 pruinosed bluish-white.

Valvula vulvae very short, trapezoidal, its posterior border slightly concave, side-angles rounded.

Anal appendages as long as segm. 10, conical, pointed.

Length: ♂ abd. + app. 21.5 - 25.0, hw. 32.0 - 35.0, pt. fw. 2.0 - 2.5; ♀ 20.5 - 22.0, 30.0 - 35.5, 2.0 - 2.5 mm.

These northern individuals differ from the type in the brown basal patch of the hind wing being somewhat larger and more irregularly outlined. They also invariably lack the peculiar, small, metallic purple blotch at the posterior margin of the hind wing, situated at one-third from the apex, somewhat before the middle of the distance between the ends of M_3 and Rs, present in the type and in our examples from the Digoel River.

The two males from Mappi (Digoel) correspond closely with the typical series, the metallic-brown marginal blotches of the hind wing being quite conspicuous.

Otherwise there is a striking similarity between typical *hurleyi* from southern New Guinea and the specimens described above from the lowlands of the northern part of the island, so much so that the above distinctions do not appear to warrant their separation as distinct subspecies. Until more specimens of the southern region of New Guinea have been compared with those of the north, I refrain from giving the latter a new subspecific name.

Distribution: Lowlands of New Guinea (universal?).

Rhyothemis phyllis (SULZER).

Rhyothemis phyllis, and *R. regia* as well, participate in the fate of a great many other variable species of the family of the *Libellulidae* distributed over a considerable part of southeastern Asia, namely that in the course of time — presumably mainly through the effect of isolation — it has formed numerous races that extend from Burma eastward, over the whole of the East Indian Archipelago, and thence into northern Australia and the greater part of the northwestern Pacific islands and Polynesia.

Besides isolation, I feel sure, the climate also has impressed its stamp upon the appearance of these various races. Whereas the body-colour of this species remains practically unchanged throughout its extensive habitat, the colour pattern of the wings appears to be extremely sensitive to external influences with the result that the wings have been subject, from island to island, to either an expansion or a reduction of the dark and yellow designs. It may be of interest to note that there is no question of any gradual increase or subsidence of the colour-pattern at the base, the nodus, or the tips of the wings, either as one goes from east to west or from north to south, or vice-versa; on the contrary, the races of *R. phyllis* with large spots, in Malaysia, are replaced by subspecies with greatly reduced spot-patterns in Celebes and the Philippines whereas in New Guinea and in Queensland other races, with more extensive designs, make their appearance; further eastward still the wing spots are again smaller. Thus it seems that any particular continuity is lacking, and this phenomenon leads us to suspect that local climatic influences from island to island play a considerable part in the development of the pigment of the wing membrane

RIS, in the Selysian monograph (*Cat. Coll. Selys, Lib.* fasc. 15, 1913) defined the subspecies of *R. phyllis* known at that date and gave keys to the subspecies, numbering 9 in all. Since that date only one subspecies has been added, viz, *R. phyllis aequalis,* from the New Hebrides, which was described by KIMMINS [1]), who also published a photograph of the ♂ of *R. phyllis marginata* RIS, from New Britain.

RIS himself admits that his way of grouping does not pretend to be final, or even complete, seeing that the material at his disposal was far too inadequate; it is evident that he believed that with more abundant material for investigation it would be very likely that additional subspecies could be defined. Consequently RIS had to content himself with lumping under one single designation the populations of these insects which, though exhibiting mutually differing characteristics, are found each as such on numerous scattered small islands or island groups. More specifically the description of *R. phyllis obscura* was based upon material of greatly diverging outward appearance and originating from mutually distant islands. As a matter of fact, at least two different subspecies are found in the Moluccas, none of them having been properly characterized. Our collection comprises specimens from the Soela Islands that are practically identical with *R. p. snelleni* from Celebes; Ambon is the terra typica of *R. p. obscura,* the type of which, however, is still practically unknown, and has never been properly described. It is not impossible that the only known specimen of Boeroe (♀), described by me in a previous paper, pertains to the identical subspecies. By the absence of any material from Ambon and Ceram, [2]) we can do no better either, than referring also to *obscura* the small race that occurs on Halmahera, and which is here described and photographed for the first time.

I have made some fifty ♂ and ♀ wing-preparations of the principal insular subspecies of *R. phyllis* from Malaysian islands, Flores, Celebes, the Philippines, Halmahera, Boeroe, Soela Islands, New Guinea, Aroe Is., and Queensland. This article having mainly a faunistic tendency, the following short survey takes into account only three subspecies of the Mid-Eastern Isles, comprising the Moluccas, New Guinea with the Aroe Islands, and northern Australia. A short discussion of the subspecies of the Moluccas and of northern Australia must be included, seeing that in New Guinea a race has been found to occur which is more or less intermediate between the two other subspecies, but which at the same time diverges quite considerably therefrom. It is very likely, moreover, that both in the extreme western and in the southeastern parts of New Guinea other distinct geographical subspecies occur; but of these regions up to the present no, or but inadequate, material has reached us, and the same must be said also of the surrounding satellite islets.

The following, somewhat lengthy key will, I trust, elucidate the subspecies at present known to me and will leave a more adequate impression of the

[1]) *Ann. Mag. Nat. Hist* (10) 18, 1936, p. 78-79 fig. 7 (apps. ♂), pl. 3 fig. B (♂ insect).

[2]) See footnote on page 508 of this paper.

actual condition in the eastern portion of this archipelago. But even today our knowledge is still far from complete.

Key to some subspecies of *Rhyothemis phyllis*.

1. Anal area of hind wing comparatively narrow, basal portion on posterior margin gradually expanded proximal to end of A_2; anal margin between base of wing and anal angle but slightly convex. Basal spots of hind wing small. Anal boundary of anterior brown basal patch meets anal margin at end of membranula or beyond that point. Yellow band short and narrow, not or rarely exceeding 2.2 mm in width (♂♀), and not (♂) or only rarely (♀) extending beyond A_2; posterior brown patch small, 1.3 - 1.6 mm separating it from posterior margin of wing. Nodal spots variable, usually small. Usually at least traces of antenodal and postnodal brown rays in *c* and *sc*. Apical spots small, encircling wing-tips. Size variable. (Halmahera and Boeroe specimens small). Measurements: ♂ abd. + app. 22.0 - 23.3, hw. 29.5 - 31.7; ♀ 17.7 - 19.0, 27.8 - 29.5 mm (Halmahera). ♀ 19.0, 30.3 mm (Boeroe). ..... **p. obscura**

1'. Anal area of hind wing broad, basal portion on posterior margin rather abruptly expanded proximal to end of A_2; anal margin between base of wing and anal angle strongly convex. Basal spots of hind wing generally much more extensive. Yellow band narrow or broad, but nearly always extending well beyond A_2 distally (♂♀); posterior brown patch considerably larger, only 1 mm or less separating it from posterior margin of wing. ... 2

2. Anal boundary of anterior brown basal patch on hind wing meets anal margin proximal to (rarely at) end of membranula. Yellow band broad, at least 2.8 mm in width, usually considerably wider (3.0 - 4.7 mm in ♂♀). Posterior brown patch extending distad to as far as A_1 or A_2 (♂) or from beyond A_1 to half-way between A_1 and Cu_2 (♀); 0.2 - 1.0 mm separating it from posterior margin of wing. Nodal spots when present pale brown, very small, covering a single proximal cell or less in both pairs of wings (♂♀), or at most 2 - 3 cells and expanding analwards as far as *Rs* in fore wing (♀, maximum). No traces of brown spots in basal part of fore wing, nor antenodal and postnodal brown streaks in *c* and *sc* (♂♀); or at most pale brown rays in *c* and basal part of *sc* in fore and hind wing, and in *ht* back to *arc* in fore wing (♀). Apical spots small, commencing 1 - 2 cells beyond *pt* in all wings (♂), or at *pt* in fore wing only (♂♀). Measurements: ♂ abd. + app. 21.7 - 26.0, hw. 31.0 - 35.5; ♀ 18.2 - 21.0, 30.0 - 34.0 mm (Hollandia). ♂ 23.0 - 23.5, 35.0 - 36.4; ♀ 20.0, 36.0 mm (Merauke). **p. beatricis**

2'. Anal boundary of anterior brown basal patch on hind wing meets anal margin beyond end of membranula, or at that point. Yellow band narrow, 2 mm or less (♂), 2 - 3 mm (♀) in width. Posterior brown patch extending distad from slightly beyond A_1 to near Cu_2 (♂), or from 3 cells proximal to Cu_2 to beyond level of nodus and confluent with the enlarged nodal spot;

0.0 - 1.0 mm separating it from posterior margin of wing. Nodal spots dark brown, very conspicuous, covering from 2 - 4 proximal (antenodal) and ½ - 1 distal (postnodal) cells in fore wing, and from 1 - 3 or more and ½ - 1 cells in hind wing (♂); ♀ with nodal spots at least as large as in darkest ♂, generally much more extensive, and more or less completely connected across wing with posterior brown patch, enclosing yellow and hyaline areas; hind wing between *Nod* and *pt* in addition with an isolated brown fleck at centre of wing between M_3-*Mspl*. Dark individuals (♂♀) with traces of brown spots in basal part of fore wing (*c, sc, cu, Arc,* region of *t*) and ♀ in addition with brown rays in costal field proximal to *pt*. Apical spots commencing at distal side of *pt* in *c*, one cell beyond it anally (♂); or from slightly before that level to as far as midway *pt* (♀), inner boundary usually running straight across wing to end of M_1-M_2. Measurements: ♂ abd. + app. 21.7 - 25.3, hw. 32.5 - 36.0; ♀ 19.5 - 22.0, 32.0 - 35.0 mm (Redlynch). ♀ 17.8, 30.0 mm (Aroe Isl.). ♀ 23.0, 35.5 mm (N.S. Wales). ..... **p. chloe**

Rhyothemis phyllis obscura SELYS (pl. 28 fig. 46 - 49).

1868. BRAUER, Zool.-bot. Ges. Wien, 18, p. 715. — Amboina (*obscura*, nom. nud.).
1878. SELYS, Mitt. Zool. Mus. Dresden, 3, p. 293, 299. — Amboina (*obscura*).
1913. RIS, Cat. Coll. SELYS, Lib. fasc. 15, p. 944 (pars!). — ♂ Batjan; ♂ Amboina; ♂ Ceram; ♀ "Moluques".
1930. LIEFTINCK, Treubia, 7 Suppl., p. 312 - 313. — ♀ Boeroe.

Material studied. — 1 ♀ (ad.), Boeroe I., Leksoela, 16.iii.1921, L. J. TOXOPEUS. — 10 ♂, 10 ♀ (ad.-juv.), N. Halmahera, Tobelo, medio 1930, vi-vii.1931 and iv.1933, M. J. VAN DIEJEN. 1 ♂, N. Halmahera, BERNSTEIN (Mus. Leiden, *"Rh. ? amaryllis"*); 1 ♀, N. Halmahera, BERNSTEIN (Mus. Leiden, *"Rh. anacharis* Hag. i.l."). — 1 ♀, Morotai Id. (Mus. Leiden, indet.).

It may be noted that BRAUER's name *obscura,* which is nothing but a nomen nudum, was adopted by SELYS who remarked on it (sub *R. snelleni*) that: *"l'obscura* BRAUER, d'Amboine, possède au contraire au nodus une tache noire plus grande que chez la *phyllis"* (l.c. p. 299). Whether SELYS ever saw the type or not, is not recorded, but RIS, who had also one ♂ from the same island, says: "Der Name *obscura*..... wird in erster Linie der Molukkenform zugeteilt werden müssen. Indessen ist auch für diese unser Material sehr ungenügend" (l.c. p. 944). As no description of the true *obscura* had ever been published, all specimens in SELYS's and his own collection were united by RIS under *obscura*. When he re-defined this subspecies, thirty-five years after SELYS had named it, is was — besides a ♂ of New Guinea, and a large series of both sexes of the Aroe Islands — from only very few specimens of various Moluccan islands.

The two ♂ from Batjan in SELYS's collection, though of much larger size (abd. 25, hw. 37) are, without doubt, from the description, the same as our specimens from N. Halmahera.

The males from Amboina, Ceram and Pt. Moresby were taken on the whole and, as RIS said himself, resembled the specimens of Batjan fairly closely, except that the brown stripes in the costal field of the wings were lacking. Unfortunately, no full descriptions of these males from Amboina and Ceram were given. A ♀, labelled "Moluques" had large nodal spots, a narrow yellow basal fascia, but again no dark costal rays; it measured: abd. 20, hw. 32 mm. Lastly, a fine series in RIS's own collection from the Aroe islands was also identified with *obscura* by RIS, who gave a good description of both sexes and remarked that they were difficult to distinguish from the few Moluccan specimens he had, but at the same time resembled closely the Queensland race, *phyllis chloe*. I believe these Aroe insects may represent a distinct subspecies. Nevertheless, with only a single ♀ before me, I do not feel justified in naming it as such. They are decidedly not *obscura*, as suggested by RIS, but may provisionally be classified with *chloe*, from Queensland (*postea*).

It will be seen from the above facts that, in Moluccan populations of *phyllis*, the dimensions of the abdomen and wings are very variable, together with the size of the nodal spots, the presence or absence of dark rays in the costal area, also the extent and width of the basal spots of the hind wings; and that these separate characters are not constant in a series of few specimens from different islands of the Moluccas.

The name *obscura* is here applied to a Moluccan subspecies of *phyllis* in which the hind wings are relatively narrow basally, the dark basal spots being small, lying enclosed in a narrow yellow fascia; with usually rather small nodal spots, but with distinct antenodal and postnodal dark rays in the costal area of both wings in the majority of specimens, and with small apical spots.

It may ultimately be found desirable to separate as a distinct subspecies the Halmahera and Batjan population of *obscura* from the Ambon-Boeroe-Ceram form, but in my opinion better characters for the latter will have to be found than those given by RIS [1]).

As regards body-colouring our Halmahera specimens exhibit no important differences either between themselves or from the New Guinean *p. beatricis*, except that the metallic-green or -blue colour in front of the head is more extensive, the orange tint of the lower portion of the frons in *beatricis* being largely replaced by dull greenish-black in *obscura*.

The wings are photographed in pl. 28. They are stained with light brownish-yellow all over the membrane in adult specimens. Young individuals have well-developed antenodal and postnodal brown rays in the costal area of all wings, but in several adult males these dark streaks are obsolete or absent.

The ♀ of Boeroe has been described at length in a previous paper.

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[1]) I have lately received two males and one female in perfect condition from Awaia, Ceram, captured by Mr J. J. VAN DER STARRE, on Nov. 10th and 24th, 1941. These individuals approach *p. obscura* from Halmahera fairly closely, but they are of larger size.

Further information on the range and variation of *R. p. obscura* would be very useful.

The type of *Rhyothemis amaryllis* SELYS is a ♂ from Manado (N. Celebes) and does not concern us here.

Distribution: The Moluccan islands Halmahera, Morotai, Batjan, Boeroe, Amboina, and Ceram (Terra typica: Amboina).

Rhyothemis phyllis beatricis, subsp. nov. (pl. 28 fig. 50 - 53, pl. 29 fig. 54 - 56).

1898. FÖRSTER, Termész. Füzetek, 21, p. 271 (footnote). — Astrolabe Bay (*phyllis*).
?1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 944 - 945 (pars!) — ♂ Port Moresby (*phyllis obscura*).
?1915. RIS, Nova Guinea 13 Zool. 2, p. 117. — ♂ S. W. New Guinea (*phyllis obscura*).
?1919. RIS, Cat. Coll. SELYS, Lib. 16², p. 1222. — ♂ S. W. New Guinea (*phyllis obscura*).
?1926. TILLYARD, Rec. Austral. Mus. 15, p. 165. — ♀ Fly River, S. New Guinea (*phyllis chloë*).

Material studied. — West New Guinea: 1 ♂, Kaimana, Kowiai distr., southcoast, 17.xi.1941, J. J. VAN DER STARRE. — North New Guinea (W. to E.): 1 ♂, 2 ♀, Mamberamo River Valley, Pionierbivak, 30 m, vii-medio xi.1939, J. P. K. VAN EECHOUD; 1 ♀, Hollandia, 25.vi.1938, L. J. TOXOPEUS; 25 ♂, 19 ♀ (ad.), Hollandia and environs, 30.v-4.ix.1930, iii.1931, E. Tami, x.1935, all W. STÜBER; 1 ♀, Torricelli Mts, 200 - 1000 ft., ii.1939, E. L. CHEESMAN (Adelaide Museum); 1 ♂ (juv.), Astrolabe Bay, Stephansort, 20.xii.1899, ex coll. F. FÖRSTER (Michigan Mus., Ann Arbor). — South New Guinea: 2 ♂, 1 ♀, Merauke, iii-iv.1939, R. G. WIND. — Holotype ♂ and allotype ♀: Hollandia, 27.viii-4.ix.1930, W. STÜBER.

Male (North New Guinea). — Labium, mandibles and labrum brownish-black; clypeus light yellow; vertical portion of frons yellow turning to bright orange dorsally, dorsal surface shining dark metallic-green or black, this colour ill-limited on middle above, but laterally in the form of a thick, short stripe descending along the eye-margin for about ¾ of the length of frons. Vertex metallic greenish or bluish black. Occipital triangle reddish-brown.

Prothorax dull black, synthorax reddish-bronze above and on upper parts of sides, metallic greenish-black laterally and beneath.

Legs black, the coxae and trochanters brown.

Wings strongly tinged with pale golden-brown all over the membrane; veins brown, golden yellow and yellow in places. Markings as described in the key and as appears from pl. 28 fig. 50 - 51. Nodal spots either entirely absent or reduced to a rusty brown antenodal spot in *c* and *sc* on both pairs of wings, covering at a maximum the distal half or two-thirds of the space between last (incomplete) antenodal and nodus in fore wing. Pterostigma dark brown.

Abdomen and anal appendages black, basal segments brownish laterally.

Female. — Resembling the ♂, but the labium usually somewhat paler and the bright orange colour of the frons often replaced by a dull yellow-brown. Basal fascia of frons wider, shining metallic-green, usually sharply delimited anteriorly. The legs are brown, or brownish black instead of black.

Wing-markings similar in principle to the ♂, but nodal spots usually larger and more definite. No antenodal brown rays in *c*, *sc* and *ht* in the great majority of specimens (pl. 28 fig. 52 - 53).

The few examples of this species in our collection from the Astrolabe Bay and south New Guinea do not differ in any way from those of the northern part of the island. In one ♂ (Merauke, pl. 29 fig. 55) the orange fascia on the hind-wing is narrower than in any other specimen examined by me, but otherwise there is not the slightest approach to *chloe*.

The status of RIS's ♂ example from Kaimana (S.W.-coast of the 'Vogelkop') and one ♂ from Pt. Moresby (S.E.-coast) remains uncertain; the former is said to resemble individuals of the Aroe Islands, but no description is given. Our male from Kaimana resembles large-spotted Hollandia specimens very closely.

This beautiful and conspicuous subspecies is chiefly characterized by the great width of the opaque, bright orange, basal fascia in the hind wing and the reduction of the dark nodal spots. As may appear from our photographs and descriptions, *R. phyllis beatricis* differs considerably both from *obscura* as well as from *chloe*, resembling Malaysian examples of *phyllis* rather closely. It differs, however, in the shape of its wings, which are shorter, much less drawn out and throughout of a brownish-yellow colour instead of having a pale golden-yellow tint. The anal area of the hind wing of *phyllis* is relatively broader and the anal margin decidedly more outcurved than in *beatricis;* moreover, the posterior brown patch in the hind wing of *phyllis* is not nearly so extensive as in *beatricis*, being always separated from the anal border by a broad hyaline area, which in *beatricis* is either very narrow or absent altogether.

Distribution: West, North and South New Guinea.

Rhyothemis phyllis chloe KIRBY (pl. 29 fig. 57 - 61).

1894. KIRBY, Ann. Mag. Nat. Hist. (6) 14, p. 16. — ♀ Mackay, Queensland (*chloë*).
1901. MARTIN, Mém. Soc. Zool. France, 19, p. 222. — Queensland (*chloë*).
1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 939 (key), 947, pl. 5 (col. fig. ♂ wings). — ♂♀ Queensland; ♂ Cooktown; ♂♀ Cape York.
1913. RIS, Ibid. p. 939 (key, pars!) 944 - 945. — ♂♀ Aroe Is. (*phyllis obscura*).
1926. TILLYARD, Ins. Austr. and New Zealand, Sydney, p. 86. — "Common as far south as Brisbane".

Material studied. — 1♀ (ad.), Aroe Is., Dobo, 20.v.1939, R. G. WIND. — 19 ♂, 29 ♀ (ad.), N. Australia, N. Queensland, Redlynch, ix and 7.xi.1938, R. G. WIND. 1 ♀ (semiad.), C. W. Australia, New South Wales (ex coll. J. LINDEMANS, author's coll.).

Male (Redlynch). — Labium greyish- or brownish-black, the mesial one-fourth of each of the side-lobes yellowish. Labrum dark brown or blackish; clypeus testaceous; frons and vertex coloured similarly to *ph. beatricis* in adult specimens. Occipital triangle black.

Thorax, legs and abdomen not different in colour from *ph. beatricis*.

Wings strongly tinged with pale golden-brown all over the membrane, as in the previous subspecies. Markings as described in the key and as appears from pl. 29 fig. 58 - 59. In our series individuals in which the black bands and flecks are most extensive prevail over those with reduced wing-markings, although many specimens lack the small dark spots in the basal parts of the fore wings.

Female (Redlynch). — Labium almost or wholly black. Head otherwise coloured exactly as in the ♀ of *ph. beatricis*.

As in the ♂, dark-winged individuals predominate, and in some of them the orange fascia on the hinder wings is almost entirely surrounded by dark brown (pl. 29 fig. 60 - 61).

The small ♀ of Dobo, Aroe Islands, is the only specimen of *phyllis* of these islands examined by me. It is a great deal smaller in size than typical *chloe*, but in other respects resembles Australian specimens closely. It is here placed with *chloe*, but probably represents a distinct subspecies (pl. 29 fig. 57).

Our single ♀ from "New South Wales" is exactly intermediate between the two females from Redlynch, photographed in pl. 29 fig. 60 - 61.

This extremely handsome insect appears to be common in North Queensland. Our females fit Kirby's description of that sex closely.

Distribution: Aroe Islands; N. Australia as far south as Brisbane; N. S. Wales (north?).

Rhyothemis regia Brauer and **princeps** Kirby.

Up to the present the various forms of *Rhyothemis regia* have all of them been regarded as being subspecies of one single species diffused over very considerable areas of the East Indian Archipelago and further eastward as far as Samoa. However, a careful examination of the genital organs and of the anal appendages of the ♂, as also of the colouring of the head of either sex, has made it evident that the insect thus far known as *regia* actually represents two species which, though very closely related, are nevertheless sharply distinct morphologically. The species *regia*, having been known ever since 1867, is distributed over an enormous area which does not merely comprise the eastern part of the area of distribution of *R. phyllis*, as even Ris still maintained in 1913, but which westward abundantly overlaps that of the latter species up to the extreme northern point of Sumatra.

Now the remarkable point in this connection is that *regia* has a typical island distribution. In the western part of its area it has not as yet been found in any of the Greater Soenda Islands, but it has been encountered in two of the islands to the west of Sumatra, namely in Simaloer and in Enggano, and furthermore on the tiny islet of Poeloe Wé, close to the northern-most point of Sumatra. In the east it turns up again in the islands of Palawan and Mindoro (Philippines), Soemba, Northern Celebes, various islands of the Moluccan

group, and in the Kei Islands; furthermore in one spot in northern New Guinea, the Marianne Islands, and then again quite suddenly in Samoa where it seems to be quite common.

In view of this peculiarly discontinuous distribution area one is obviously led to surmise that *R. regia* constitutes a species exhibiting strong migratory tendencies and that its presence in isolated and unfrequented islands can be accounted for by assuming that the insects were driven there in the course of time by the wind and that in this way the distribution area from time to time is being further extended. Wherever the conditions were favourable to their survival they managed to hold their own, whilst in many instances they altered their appearance under the influence of the changed local conditions and formed well definable strains. As far as our knowledge goes at present the centre of the distribution area of *R. regia* is situated somewhere in the Moluccas whence this species has spread.

Upon the discovery that two mutually differing types of *regia* occur side by side in the region south of the Humboldt Bay in northern New Guinea is based our assumption of a second species closely allied to *regia,* one of which is found very commonly over the whole of the northern lowland. This is of smaller proportions and of a lighter colour than is the other, which occurs only in a few quite localized spots. The former morphologically corresponds entirely with *R. princeps* KIRBY, of northern Queensland, the latter with *R. regia* BRAUER, of Amboina. An examination of very copious material, comprising most of the known localities in the East Indian Archipelago, has definitely proven that *R. regia* occurs scattered from Poeloe Wé, in northern Sumatra, to Samoa. Both species in their turn form various geographical subspecies very readily definable in the case of *princeps,* but very much more difficult to define in the case of *regia.* The subspecies of *regia* whose habitat is New Guinea is of very much rarer occurrence and is much more locally concentrated than is the Papuan subspecies of *princeps.*

Let us now consider what nomenclature is available for these species and subspecies.

1867*a*. — *R. regia* BRAUER, Verh. Zool.-bot. Ges. Wien, 17, p. 24 - 25. — ♂♀ Amboina.

1867*b*. — *R. chalcoptilon* BRAUER, Ibid., p. 25 - 26. — ♀ Samoa.

1878. — *R. pretiosa* SELYS, Mitt. Kön. Zool. Mus. Dresden, 3, p. 299 - 300. — ♂♀ "Moluques".

1894. — *R. princeps* KIRBY, Ann. Mag. Nat. Hist. (6) 14, p. 16. — ♂♀ Queensland.

1913. — *R. exul* RIS, Cat. Coll. SELYS, Lib. fasc. 15, p. 949, 951 - 952, fig. 548 - 549 (♀ wings), pl. 6. — ♂♀ Kei Is.

R. regia, chalcoptilon, pretiosa, and *exul* are structurally similar, for which reason they must be considered to be subspecies of *regia.* The writer knows of other strains of this species, but since they have a westward distribution we need

not concern ourselves with them here. The name *R. princeps* is available for the other, smaller, and light coloured species of northern Australia and New Guinea.

The only constant differences between the two species to be found in both sexes are the following:

R. regia.

Labium all black. Anteclypeus dull brownish (♂) centred with yellow (♀), postclypeus brownish-black or black. Frons and vertex shining purplish- or bluish-black, excepting a narrow (♂) or somewhat broader (♀) ferruginous or yellow-brown stripe along full length of fronto-clypeal suture.

Genital hamule with the inner branch not overlapping genital lobe, abruptly hooked downwards and backwards. Genital lobe distinctly swollen basally and outbent posteriorly (pl. 33 fig. 86).

Sup. anal appendages of ♂ in side view somewhat clubbed, widest much beyond half-way its length; last intero-ventral tooth situated beyond ⅔ of its length; apex blunt or furnished with a minute tooth (pl. 33 fig. 87).

Ground-colour of wing generally sub-hyaline.

Species of robust build and comparatively large size.

R. princeps.

Labium yellow, or pale brown, the median lobe sometimes obscured. Clypeus yellow, orange, or pale brown. Frons either entirely yellow, orange-red or reddish-purple with an ill-defined black basal stripe; or metallic-purple on top and vertex also purplish black.

Genital hamule with the inner branch slightly overlapping genital lobe, more evenly downcurved and less strongly hooked backwards. Genital hamule narrower, very slightly swollen basally and but little outbent posteriorly (pl. 33 fig. 88).

Sup. anal appendages of ♂ in side view more slender, less widened beyond half-way its length; last intero-ventral tooth situated much before ⅔ of its length; apex more slender, distinctly and acutely pointed (pl. 33 fig. 89).

Ground-colour of wing generally strongly amber-coloured.

More slenderly built and of smaller size.

Rhyothemis princeps KIRBY.

Rhyothemis princeps princeps KIRBY (pl. 32 fig. 78 - 85).

1894. KIRBY, Ann. Mag. Nat. Hist. (6) 14, p. 16. — ♂♀ Mackay, Queensland (*princeps*).
1901. MARTIN, Mém. Soc. Zool. France, 19, p. 222. — Queensland (*princeps*).
1909. VAN DER WEELE, Nova Guinea, 9 Zool. 1, p. 19. — ♂ Lorentz River, S. New Guinea (*pretiosa*).
?1909. MARTIN, Bull. Soc. ent. Ital. 60, p. 196. — Astrolabe Range, S. E. New Guinea (*pretiosa*).
1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 949 (key, pars!), 952 - 953 (pars!) pl. 6 (wings ♂♀ col. fig. Queensland). — ♀♂ N. Australia, loc. diff. (*regia chalcoptilon*).
1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 950 (pars!). — ♀ Lorentz River, S. New Guinea (*regia regia*).

1913. RIS, Nova Guinea, 9 Zool. 3, p. 512 (descr.). — ♀ Lorentz River, S. New Guinea (*regia*).

1926. TILLYARD, Rec. Austral. Mus. 15, p. 165. — ♂♀ Fly River territ., S. New Guinea (*regia chalcoptilon*).

Material studied. — South New Guinea: 1 ♂ (ad.), Digoel River, Obaa district, vi.1939, J. M. VAN RAVENSWAAY CLAASEN. 1 ♂, 4 ♀ (juv.-semiad.), Merauke, iii-iv.1939, R. G. WIND. — 3 ♂, 6 ♀ (partly juv.), N. Australia, North Queensland, Redlynch, 20.ix, 6 & 16.xi, 20-24.xii.1938, R. G. WIND. — 2 ♀, N. Queensland, Prince of Wales Island, 10.ii, and Horn Island, 2.iii.1939, R. G. WIND.

Examples of *princeps* from south New Guinea are quite similar to north Australian specimens in my collection, except that the hyaline areas of the wings of the former are somewhat more extensive in both male and female. As has been shown by RIS (*loc. cit.* p. 953 and coloured figures in pl. 6), these differences are probably not constant and lie within the range of individual variation. Specimens from Mackay, Cairns and Redlynch are among the darkest of the series, whilst those of Cooktown and Cape York are almost exactly similar to those from the opposite coast of south New Guinea. In view of this I consider it unwise to establish a new subspecific name for *princeps* of southern New Guinea. In pl. 32 the plus and minus variant types of both sexes and of both localities in our collection are photographed.

New Guinea. — Most specimens are immature and the vitreous wing-spots are hyaline, except in the adult ♂ from the Digoel River (pl. 32 fig. 82) in which these spots are distinctly yellowish. Dark markings Brussels brown (juv.-semiad.) to Raw umber (ad.). The colour of the head of this ♂ may be described as follows:

Labium pale yellow; labrum black. Clypeus and vertical surface of frons dull brownish-yellow; frons growing darker upwards, the tubercles throughout shining purplish-brown, as is also the vertex. [The immature females have the face still pale-coloured, some obscure colouring being only traceable in one of them, upon vertex and along base of frons].

Australia. — Male (ad.). Head coloured exactly as in the ♂ from Digoel. — Female (ad.). Labium and clypeus pale brownish-yellow; labrum black. Frons, as far upwards as the dorsal sulcus, bright orange, with a rather thick basal stripe of black (slightly metallic-blue), prolonged forward for a short distance into the sulcus. Vertex brownish-orange.

Vitreous spots yellowish in mature examples, except the apices of the fore wings (♀), which are hyaline (pl. 32 fig. 80 - 81). The wings of our ♀ examples from Prince of Wales Id. and Horn Id. are exactly alike those from Merauke, photographed in pl. 32 fig. 84 - 85.

Size small. New Guinea: ♂ abd. + app. 20.5 - 22.0, hw. 29.3 - 30.3; ♀ 17.5 - 19.0, 29.0 - 30.4 mm. Australia: ♂ 20.0 - 21.7, 29.0 - 30.8; ♀ 18.6 - 20.0, 28.5 - 30.0 mm.

Distribution: South New Guinea and North Australia (Queensland).

Rhyothemis princeps irene, subsp. n. (pl. 31 fig. 70 - 73, pl. 33 fig. 88 - 89).

1913. RIS, Cat. Coll. SELYS, Lib. fasc. 15, p. 949 (key, pars!), 950 (pars!). pl. 6 (fig. ♂ N. Guinea). — ♂ C. New Guinea (*regia regia*).

Material studied. — North New Guinea (W. to E.): 1 ♂, Mamberamo River valley, Pionierbivak, 30 m, vii-medio xi.1939; and 2 ♂, 10 ♀, same country, Batavia rapids, van Rees Hills, 50 m, iii-iv.1940, J. P. K. VAN EECHOUD; 1 ♂, 1 ♀ Mamberamo River, Prauwenbivak, xi.1920, W. C. VAN HEURN; 6 ♂, 4 ♀, Mamberamo River, Albatrosbivak, v.1926 and Hoofdbivak, 250 m, ix.1926, W. M. DOCTERS VAN LEEUWEN. — 3 ♂, Hollandia, 29.vi, 9-11.vii.1938; 11 ♂, 21 ♀, Bernhard Camp, 50 m, 15.vii-15.xi.1938, J. OLTHOF; 4 ♂, 9 ♀, Araucaria Camp, 800 m, 8-21.iii, 1-2.iv.1939, L. J. TOXOPEUS. — 35 ♂, 25 ♀, Hollandia, v, v-vii, 27.viii-4.ix.1930, i-ii, ii-iii and xi-xii.1931, all W. STÜBER. — 1 ♂ (def.), "Hamburg-Südsee Expedition, No. 484, Kaiserin Augustafluss III, 21 s.m. Luftlinie aufwärts, seeartige Erweiterung bei Isthmus, 25.v.1909, G. DUNCKER leg." (Mus. Hamburg). — 1 ♂, 1 ♀, Astrolabe Bay, Bongu, 1899, CARL WAHNES, "im Urwalde", ex coll. F. FÖRSTER (Michigan Mus., Ann Arbor).

Male. — Labium either entirely pale yellow, or the basal edges of the lateral lobes, and the median lobe, obscured. Labrum black. Anteclypeus dirty greyish-yellow; postclypeus pale brown or dull orange. Frons bright orange; the basal half or less of the horizontal portion obscured, usually bronzy-brown or -black, ill-limited anteriorly, and with slight metallic reflections; in many specimens the dark basal stripe is reduced so much as to become obsolete and restricted to some obscure colouring in the basal depression in front of the vertex. Vertex red, orangish, or bronzy-brown, always pale-coloured. Occipital triangle brownish.

Wings comparatively long. All vitreous areas strongly amber-tinted in all stages of maturity. Dark areas more vividly brown, and not so dark as in typical *princeps*; Cinnamon brown (juv.) to Prout's brown (ad.) in transmitted light, with brilliant golden-bronze, blue and coppery reflections in opaque view.

Dark pattern very distinctive and remarkably constant, either sharply delimited or (more rarely) ill-defined ('cloudy'): this condition very obviously not depending on the age of the insect. Markings shaped as shown in pl. 31 fig. 71 (♂) and 72 (♀) in the great majority of specimens, but *Rs-Rspl* spot usually also confluent with the basal patch, and vitreous areas in the discoidal field of both pairs of wings often larger. Dark postnodal costal rays invariably absent.

Genitalia and anal appendages shaped as shown in pl. 33 fig. 88 & 89 and as described in the key on p. 513.

Female. — Closely similar to the ♂, but for the following differences. Colours of face and frons slightly less bright, frons often Mars yellow instead of orange, and with the obscure basal stripe more sharply defined, widest on middle, and with slight blue metallic lustre.

Wings coloured similarly to the ♂, but vitreous spots in the discoidal field and usually also in the anal loop more conspicuous. Apices between *pt* and the tips of wings in the majority of specimens with a narrow subhyaline costal spot.

Immature females have the wings diffusely and 'cloudy' brown, one extreme being photographed in pl. 31 fig. 73. These are rare exceptions.

Length: ♂ abd. + app. 20.5 - 23.0, hw. 29.0 - 33.5; ♀ 18.0 - 21.4, 28.5 - 33.0 mm.

Easily distinguished from *p. princeps* by the considerably more restricted opaque areas of the wings, which strongly suggest the colour-pattern of *R. regia* and its subspecies; also the wings are less darkly pigmented and in the ♂ on the average 1 mm longer than in the typical subspecies. *R. princeps irene* is at once distinguished from *R. regia* by having the mouth-parts pale-coloured instead of black, by the weak forms and smaller size, and by the genitalia and anal appendages of the ♂ wholly different.

A very common species in the lowlands and hill-country of north New Guinea.

Distribution: North New Guinea, from sea-level up to 800 m alt.

Rhyothemis regia BRAUER

It is hard to give the exact limits of the habitat of the races of this species and still harder to say when the variations are sufficiently constant and marked to separate them. A review of this species is badly needed for the races seem curiously mixed in Malaysia, the Lesser Sunda Islands, Palawan, the Philippines, Celebes, and the Moluccas.

The type of *R. regia* is from Amboina, I have erroneously identified a well-marked race from Boeroe with *R. regia exul* RIS [1]); this latter subspecies is confined to the Kei Islands whilst the subspecies from Boeroe (which possibly also occurs elsewhere in the Moluccas) corresponds closely with SELYS's description of *pretiosa* [2]), the type of which is from "Moluques". Good series of true *regia* are not available for comparison and additional material from many Moluccan islands is required before the various races can be finally accepted. I am strongly of opinion, however, that both *R. regia regia* BRAUER (terra typ.: Amboina) and *R. regia pretiosa* SELYS (terr. typ.: "Moluccas"; Boeroe [1])) may prove to be separable from other subspecies.

Distribution: N. point of Sumatra (Poeloe Wé); Simaloer; Enggano; Soemba; Celebes; Palawan; Philippines (Basilan, Mindanao and Mindoro); Ternate, Boeroe and Amboina; Kei Is.; New Guinea; Mariannes; Samoa.

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[1]) *Treubia* 7, 1926, p. 295 - 296, pl. 5 fig. 15 - 16 (wings ♂♀ Boeroe) (*R. regia exul*).

[2]) RIS in the Monograph lumps *pretiosa* and many other eastern forms under *regia*, but considers that many of them may possibly be discriminated. The racial divisions adopted by RIS can only be regarded as tentative.

Rhyothemis regia juliana, subsp. n. (pl. 31 fig. 74 - 77, pl. 33 fig. 86 - 87).

Material studied. — North New Guinea: 3 ♂ (ad.), Lake Sentani, "water-lily pond, 300 m", 9-10.i.1933; 2 ♂ (ad.), Kressi Valley (W. of Lake Sentani), Kressi, 400 m, vii.1934; 1 ♂ (ad.), Upper course of Korimé (Grimme) River, (ca 100 km W. of Lake Sentani), Berap Lakes (smallest of three lakes), ca 400 m, 9.iii-iv.1936; 1 ♂ (ad.), southern Bewani Hills, upper course of Tami River (5 day's march S. of Hollandia), Ampas distr., 250 m, Uskwar, 17.iv.1937; all W. STÜBER. Holotype: Pond near Lake Sentani, 9.i.1933, W. STÜBER, with collector's note: "very similar to *Rh. regia* but twice the size of that species; frons steely purple instead of orange and black" (*in litt.*, 2.ii.1933).

BRAUER's description of the two sexes of *R. regia regia* is very full and we need not repeat it.

R. regia juliana agrees with other races of the same formenkreis in the genitalia and appendages of the ♂ (pl. 33 fig. 86 - 87), and in the colour of the head. The wing-pattern, however, is distinctive, conforming with that of no other subspecies. As appears from our photographs on pl. 31 there is considerable variation in extent of the bronzed brown wing-markings, and the present small series clearly shows that this variation does not strictly depend on geographical distribution as all specimens are from about the same locality.

It comes nearest to typical *regia,* from Amboina (RIS, *loc. cit.* 1915, pl. 6), from which it differs in the shape of the vitreous spots, whose lower portions are much more extensive apicad, confluent with the upper portion and surrounding a brown patch over *Rs-Rspl,* or stopping short at level of proximal end of *pt.* In typical *regia* there is a large vitreous dot placed on the end of *Rspl,* which is absent in *juliana,* except in one ♂ from Sentani (pl. 31 fig. 74) where it is vestigial and removed cephalad. Three out of seven individuals have dark brown rays connecting *nod* with *pt*; five individuals have hyaline patches on the base of the discoidal field of the fore wings (vestigial in two of these), which are also lacking in typical *regia.* The wing-pattern of none of the seven specimens is exactly identical and there are intermediates between figs. 75 and 76; also the body-size is variable, all specimens being different in this respect.

Length: abd. + app. 24.0 - 27.0, hw. 32.8 - 39.0 mm.

On comparing the present series with examples from Ternate and Boeroe (*regia pretiosa* SEL.) and the Kei Islands (*regia exul* RIS), I am of opinion that, in spite of the variability shown, several other subspecies of *regia* can be distinguished, provided that good series are available to establish the range of variation of each of them.

The correctness of the specific distinction between *R. princeps* and *R. regia,* expounded on pages 511 - 513 of this paper, is fully corroborated by the collector's statement that *princeps irene* and *regia juliana* can be held apart in the field (*antea*).

Distribution: North New Guinea (scattered).

Rhyothemis regia exul RIS (pl. 30 fig. 66 - 69).

1913. RIS, Cat. Coll. SELYS, Lib. fasc. 15, p. 949 (key), 951 - 952 (pars!), fig. 548 - 54 (♀ wings). pl. 6 (col. fig. ♂♀ wings). — ♂♀ Kei Ids.

Material studied. — 3 ♂, 2 ♀ (ad.), Kei Islands, Klein Kei Toeal, 1920, ex coll. J. LINDEMANS; 1 ♂ juv., same locality, No. 27, 1922, H. C SIEBERS.

This very distinct subspecies is intentionally included in the present accoun with the view to comparing it with other forms of *regia,* from which it is no different structurally. *R. regia exul* is interesting on account of the existenc of dichromatic females, one of these having the distal half of the wing entirely hyaline (not yellowish! pl. 30 fig. 68 - 69), whilst the other form i closely similar to the ♂. The four males in our collection resemble RIS's spe cimens in all respects, except that in two of them the dark *Rs-Rspl* flecks ar lacking in all wings, the uncoloured parts of which having a distinct yellowis tint (pl. 30 figs. 66 - 67, extremes).

This subspecies most closely resembles *regia pretiosa,* from Boeroe an Ternate, but differs from it in the greater reduction of the wing-marks an in that the ♀ is dimorphic; it is also separated from other races includin *pretiosa* by being of smaller size [1]).

Length: ♂ abd. + app. 23.0 - 24.8, hw. 33.3 - 35.2; ♀ 20.0 - 20.5, 31.4 - 33.0 mm

Distribution: Kei Islands.

Rhyothemis regia chalcoptilon BRAUER.

1867. BRAUER, Verh. Zool. bot. Ges. Wien 17, p. 25 - 26. — ♀ Samoa (*chalcoptilon*)
1868. BRAUER, Ibid. 18, p. 715. — Samoa (*chalcoptilon*).
1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 949 (key, pars!), 952 - 953 (pars!), fig. 55 (wings, type ♀). — ♀ Samoa.
1927. FRASER, Insects of Samoa (London), 7 fasc. 1, p. 40. — ♂♀ Samoa (*regia cha coptilon* + *regia exul*).

I have not seen this subspecies. In 1913, when RIS suggested that *princep* might be the same as *chalcoptilon,* it was on account of the great similarit of the wing-pattern between the type ♀ of *chalcoptilon* and the same sex o *princeps*. I am indebted to Mr O. H. SWEZEY, Entomologist at the Experimen Station, Honolulu, for kindly sending on request a note of the head-colours o Samoan specimens. In a letter dated April 7, 1941, he writes me: "The colo ration of the face of the male specimens agrees with your description of th color of typical *regia* as given in your letter, i.e. vertex and frons shining pu plish-black, the postclypeus, labrum and labium are shining black, and th other parts dull brownish. There is no yellow anywhere". This definitely place the Samoan insect in the formenkreis *regia* and proves the error of RIS's st tement.

[1]) A ♀ from Soemba was provisionally identified with *exul* by RIS, who remark that more material from the Lesser Sunda Islands would probably justify the fou dation of a new subspecies.

Apparently a common lowland species.

Distribution: The Moluccan islands N. Halmahera, Batjan, Boeroe, Ambon and Ceram; New Guinea (universal) and satellite island Salawati; Bismarck Archipelago and N. Australia (Cape York, Queensland).

Hydrobasileus brevistylus (BRAUER).

1866. BRAUER, Novara Reise, p. 83 - 84, 104. — ♂♀ Australia (Melbourne) (*Tramea brevistyla*).
1903. FÖRSTER, Ann. Mus. Nat. Hung. 1, p. 528. — ♂♀ Astrolabe Bay (Subrasse *papuanus*).
1909. VAN DER WEELE, Nova Guinea 9 Zool. 1, p. 21. — ♂♀ S. New Guinea.
1913. RIS, Cat. Coll. SELYS, Lib. 15, p. 966 - 968 (incl. ref.), fig. 557 - 560 (genit., wings). — ♂♀ S. New Guinea; ♂♀ Aroe Is.
1913. RIS, Abh. Senckenb. Naturf. Ges. 34, p. 534. — ♂♀ Aroe Is.
1926. TILLYARD, Rec. Austral. Mus. 15, p. 165. — ♂♀ S. New Guinea.

Material studied. — N. New Guinea: 5 ♂, Kojaboe (Lake Sentani), 30.vi.1938, J. OLTHOF.

Not appreciably different from specimens in our collection of N. Australia and Halmahera. We also possess a long series from the surroundings of Hollandia, a few examples of Manokwari and the Mamberamo valley, and a series from Merauke. Apparently fairly common in low country.

Distribution: The Moluccan islands Halmahera and Ceram; New Guinea (universal); Aroe Is.; Australia as far south as Melbourne and Sydney.

Genus **Tramea** HAGEN.

The Old World species of this genus stand much in need of revision. As to their proper place it is therefore perhaps convenient to give a complete list, in order of date of publication, of the names that have in the course of years been given to the Old World species of *Tramea*. Only references to papers containing the original description are given, followed by the sex and the type-locality. As far as possible appropriate reference is also given as to where type specimens are to be found.

Of the undermentioned names those printed in italics are mere synonyms whilst those in bold italic type are valid names. I have added in square brackets [ ] a short note after each specific name now considered a synonym, indicating what the name really stands for. It is certain that some at least of the twelve valid 'species' enumerated in this list must be given subspecific rank, but we need to know more of the variability and ranges of the various Ethiopian, Indian and Pacific forms before linking them.

1773. *T. chinensis* DE GEER, Mém. Ins., 3, p. 556, tab. 26, fig. 1. — Hab. ign. (*Libellula*). Type: lost? [Homonym of *L. chinensis* LINNÉ (*Neurobasis* nob.) = *virginia* RAMB.].
1805. ***T. basilaris*** PALISOT DE BEAUVAIS, Ins. Afr. Amér. p. 171, tab. 2, fig. 1. — Oware (*Libellula*). Type: lost.

1839. *T. chinensis* BURMEISTER, Handb. Ent. 2, p. 852. — ♀ Madras (India) (*Libellula*). Type: Mus. Halle. [= *T. burmeisteri* KIRBY].

1832. ***T. limbata*** DESJARDINS, Rapport Soc. Maurice, 1. — ♂♀ Mauritius (*Libellula*). Type & cotypes: Mus. Brussels.

1842. ***T. virginia*** RAMBUR, Hist. Nat. Ins. Névr., p. 33. — ♂ coll. SERVILLE, "Amer. sept." (error! Asia or.), ♀ hab. ign. (*Libellula*). Type: ♂ Mus. Brussels.

1842. *T. incerta* RAMBUR, Hist. Nat. Ins. Névr., p. 34. — ♂ hab. ign. coll. LATREILLE (*Libellula*). Type: Mus. Brussels. [= *limbata* DESJ. teste RIS].

1842. *T. mauriciana* RAMBUR, Hist. Nat. Ins. Névr., p. 34. — Ile de France (*Libellula*). Type: lost? Cotype: Mus. Brussels. [= *limbata* DESJ. teste RIS].

1842. ***T. similata*** RAMBUR, Hist. Nat. Ins. Névr., p. 36. — ♀ hab. ign. (*Libellula*). Type: Mus. Brussels.

1842. *T. stylata* RAMBUR, Hist. Nat. Ins. Névr., p. 37. — ♂ Bombay (*Libellula*). Type: Mus. Brussels. [= *similata* RAMB.].

1866. ***T. loewi*** BRAUER, Verh. Zool.-bot. Ges. Wien, 16, p. 563. — ♂ Ceram. Type: Mus. Vienna; cotypes (N. Australia): Mus. Hamburg.

1866. ***T. rosenbergi*** BRAUER, Verh. Zool.-bot. Ges. Wien, 16, p. 564. — ♂ Ceram. Type: Mus. Vienna.

1867. ***T. transmarina*** BRAUER, Verh. Zool.-bot. Ges. Wien, 17, p. 21, 505. — ♀ Fiji. Type: Mus. Hamburg.

1867. *T. samoensis* BRAUER, Verh. Zool-bot. Ges. Wien, 17, p. 22, 505. — ♂ Samoa. Type: Mus. Hamburg. [= *transmarina* BRAUER].

1878. ***T. eurybia*** SELYS, Mitt. Mus. Dresden, 3, p. 298. — ♂ N. Celebes. Type: Brit. Museum.

1878. ***T. euryale*** SELYS, Mitt. Mus. Dresden, 3, p. 298. — ♂♀ N. Celebes. Type: ♀ Mus. Brussels.

1878. ***T. continentalis*** SELYS, Mitt. Mus. Dresden, 3, p. 299. — ♂ Dakar. Type: Mus. Brussels.

1889. ***T. burmeisteri*** KIRBY, Trans. Zool. Soc. London, 12, p. 316. — ♂♀ N. India & Ceylon. Types: Brit. Museum.

1889. *T. translucida* KIRBY, Trans. Zool. Soc. London, 12, p. 315. — ♀ N. India. Type: Mus. Brussels. [= *similata* RAMB.].

1889. ***T. madagascariensis*** KIRBY, Trans. Zool. Soc. London, 12, p. 317 - 318. — ♂♀ Madagascar. Types: Brit. Museum?

1898. *T. biroi* FÖRSTER, Termész. Füzetek, 21, p. 273. — ♂ Astrolabe Bay, N. E. New Guinea (*loewi* Subrasse *b.*). Type: Mus. Budapest. [= *eurybia* SELYS ♂].

1909. *T. petaurina* FÖRSTER, Jahrb. Nassau, 62, p. 230. — ♀ Huon Gulf, N. E. New Guinea (*löwii* Rasse *p.*). Type: Mus. Ann Arbor. [= *eurybia* SELYS ♀.].

T. basilaris BEAUV. — This species has been dealt with in RIS's monograph in great detail. It is characterized by the peculiar shape of the genital organs

of the ♂ and the vulvar scale of the ♀, both structures having been adequately figured by RIS. Doubtless most closely related to *T. loewi* BRAUER and allied forms. — Africa.

T. burmeisteri KIRBY. — Very similar to the preceding species; considered a subspecies of *basilaris* by RIS, which is probably correct. I possess several examples of both sexes, from Upper Assam and peninsular India, and found them well agreeing with the existing descriptions. — India and Ceylon.

T. limbata DESJ. — This species needs further elucidation. Short descriptions of the two sexes (DESJARDINS's types) have been published by RIS in the monograph. The genital organs have neither been described nor figured, but according to RIS they are apparently very similar to those of ***similata*** (India), ***transmarina*** (Fiji), ***euryale*** (Celebes), ***continentalis*** (Africa), and ***madagascariensis*** (Madagascar), which are all of them traced as "forms" or "varieties" of *limbata* by RIS. It may be noted, however, that *limbata* and *madagascariensis* occur together on Madagascar, the latter having only part of the frons metallic-violet, so that both unquestionably represent distinct species! If *T. limbata* (Mauritius) and *similata* (India) [1]) should also prove to be independent species, which is not unlikely, the next-oldest name *transmarina* must be considered the nominate subspecies of the aggregation. Doubtless the future will show, as more extensive and perfectly preserved material becomes available, that several of the above mentioned forms, including our new species *propinqua* from New Guinea, which have now given specific rank, are instead subspecies of one wide-ranging and plastic entity.

T. virginia RAMB. — Any course other than to consider *virginia* a distinct species seems unwarranted. I possess a good series of both sexes from China (Shanghai and prov. Fukien), and in the Michigan Museum is a ♂ from Phuc-Son, Annam. Until recently it had not yet been reported from the Malay Archipelago, but Mr F. J. KUIPER collected a single ♂ on Billiton Island, Tandjong Pandan, 23th Nov., 1936, which does not differ in any way from Chinese specimens. The occurrence of this species so far south is of exceptional interest as it clearly shows that *virginia* is a specific unit, and that RIS's suggestion that "es nicht unwahrscheinlich auch zu den *limbata*-Formenkreis [i.e. *euryale* nob.] gehört und vielleicht mit diesem sich verbinden wird durch noch zu entdeckende Formen aus dem indisch-chinesischen Uebergangsgebiet" (*Cat. Coll.* SELYS, p. 979), is ill founded. No such connecting forms are known, and *T. euryale* is a common dragonfly spread all over Malaysia, including the island of Billiton.

T. virginia most nearly resembles *T. eurybia*, from which it differs in a number of characters. In the ♂ the genital lobe is more elongate and the hamule somewhat longer and stouter; in the ♀ the valvula vulvae, although shaped similarly to that of *eurybia*, is longer and in well preserved specimens projects

[1]) We have for comparison one ♂ from Ceylon, Passara, 1200 m, 20.ix.1938, collected by the author; and one from S. India, Hoskoti (Mysore), 12.x.1924, collected by Mr F. C. FRASER.

beyond the apex of the ninth sternite. The dark basal mark of the hind wing of *virginia* is reddish golden brown to burnt-brown surrounded by a broad golden-yellow areola, and the base of the fore wing is also tinted with golden-amber; in *eurybia*, however, the basal mark of the hind wing is deep reddish-brown and there are no conspicuous golden-yellow areolae or basal spots of that colour. In *virginia* ♂ the frons is olivaceous suffused with rose-red or vermillion and bears a sharply defined, broad black border at base, which has a metallic-bronze or -blue reflex; in *eurybia* ♂ the frons is throughout dark red, slightly obscured at extreme base only.

I am deliberately of opinion that *T. virginia* and *T. eurybia* are quite distinct species.

T. loewi Br.
T. rosenbergi Br.
T. eurybia SEL.
T. euryale SEL.

} These species are discussed in the following pages.

Key to some oriental species of *Tramea*.

1. ♂. Genital lobe very prominent, elongate, at least 2½ times as long as it is wide. Hamule very long and slender, about twice as long as genital lobe, almost straight, evenly and but slightly tapering from base toward apex, which, after a sudden constriction, is abruptly hooked ventrad and a little laterad (pl. 33 fig. 94). Anterior surface of frons yellow brown to dark red (Morocco Red), its dorsal surface metallic-bronze with low Corinthian purple reflections; vertex reddish brown, purplish black anteriorly. Labium yellow-brown, median lobe and basal one-third of lateral lobes black. Labrum black, its side-edges brown. Basal spots on hind wing of moderate size. Maximum extent (only 1 ♂): in *c* and *sc* almost to Ax_2, in *m* almost to *Arc*, in *cu* to half-way in *t*, 2 basal cells in discoidal field, 3 between Cu_1-Cu_2, 6 between Cu_2 and *Cuspl*, then along *Cuspl* to almost as far as its bend, and from there backwards to posterior border which it meets about 6 cells proximal to apex of anal loop. Average extent: almost Ax_1, half-way in *m*, almost proximal side of *t*, and from there parallel to distal course of Cu_2 in straight, irregular or slightly convex line towards posterior border which it meets well distal to tornal angle. Minimum extent: 1 mm less extensive. No hyaline marginal area beyond membranula; no golden or amber-coloured areolae. — ♀. Mouth-parts coloured as in ♂. Frons yellow or orange with a sharply defined, thick, metallic-blue basal stripe. Basal spot on hind wing well delimited, similar to ♂ but not nearly reaching posterior border of wing, well rounded posteriorly and curving basad so as to save both a hyaline posterior area of 2 - 3 mm width as well as a small oval or triangular hyaline marginal area beyond membranula, which are finely connected along anal border of wing; no or only extremely narrow golden or amber-coloured areolae along outer border of basal

marking. Vulvar scale very long and robust, deeply cleft into two long, thumb-shaped lamellae that are longer than 9th segment, overlapping its sternal plate, their basal third approximated, distal two-thirds divergent (pl. 34 fig. 100). Slender species of medium size. ..... **rosenbergi**

1′. ♂ Genital lobe less prominent, at most 2 times as long as it is wide. Hamule shorter, basal third broad, thence more abruptly narrowed toward apex. Frons either metallic-violet, throughout deep red, or yellow and light red with a dark basal stripe of variable extent. ♀ Vulvar scale shorter, at most slightly longer than segm. 9, deeply cleft into two broadly ovate, parallel or divaricate lamellae. 2

2. ♂ Frons throughout brilliant dark Pansy Violet or Raisin Purple, except a narrow transverse stripe, slightly variable in width, bordering the fronto-clypeal suture, and a smooth triangular area (occupying the latero-ventral edges of the frons against the eye-margin), yellowish, brown or red; vertex also brilliant violet, its anterior surface purplish-black. Labium yellowish, or pale brown, median lobe and the extreme bases of lateral lobes usually obscured, or black. Labrum black, its side-edges brown. Width of head over the eyes: ♂ 8.0 - 8.2, ♀ 8.3 - 8.5 mm. Genital lobe oval, rounded apicad, slightly constricted basally, from 1½ to 2 times as long as it is wide. Hamule very slender, overlapping genital lobe, gently tapering, upper margin almost straight, distal portion of lower margin slightly convex, apices evenly narrowed with a strong, curved end-hook (pl. 33 fig. 90 - 91). Basal spots on hind wing of very small to medium size; maximum extent to proximal side of *t* and in almost straight line parallel to the transverse cell-rows towards posterior border. No (or only vestigial) hyaline or sub-hyaline marginal area beyond *mb;* no golden or amber-coloured areolae. Black mark on segm. 8 of abdomen extensive: basal half in lateral view diagonally red, distal half black; 9 black save for a longitudinal red latero-ventral mark. — ♀. Mouth-parts coloured as in ♂. Colour of head otherwise as in *rosenbergi;* a thick black stripe on base of frons with metallic-blue, -purplish, or -green reflections. Basal spot on hind wing either very small or (in *propinqua*) very similar to *rosenbergi*. Vulvar scale pl. 34 fig. 98. **limbata**-group [1])

2′. ♂. Frons deep red, orange, or yellowish, whether or not striped with black basally, this stripe variable in width and depth of colour. Genital lobe short, markedly constricted basally, round or broadly ovate. Hamule of variable size and shape. Basal spot on hind wing variable in both sexes. ♀. Frons coloured similarly to ♂, but dark basal stripe always present. ... 3

3. ♂. Genitalia protuberant. Hamule longer and more slender, overlapping genital lobe (even when retracted) for at least one half of the longitudinal section of the lobe; its distal portion straight or almost so and its upper margin in profile view also straight or even a little concave before the

[1]) Including *transmarina* (not seen by me), *euryale* and *propinqua*, among austro-oriental forms. For a discussion *vide postea*.

apex of the hamule; end-hook small (pl. 33 fig. 92 - 93). Frons and face Carmine to Ox-blood red in perfectly preserved specimens, obscure basal stripe very inconspicuous, often absent altogether (♂), or frons bright yellow to orange with distinct bluish-black basal stripe (♀). Thorax Morocco red; hair reddish-brown. Abdomen Nopal red. Black marks on segm. 8 and 9 of abdomen restricted to the dorsum, these segments in lateral view predominantly red. Basal spot on hind wing very variable, but always extensive, reaching beyond proximal side of *t*, Burnt sienna with English- or Brazil red veins in *e. eurybia*, or Maroon in *e. monticola*. No golden or amber-coloured areolae (♂); hyaline marginal area beyond *mb* absent or only small (*e. eurybia*), or very conspicuous (*e. monticola*). Bases of fore wings nearly always with traces of dark spots in *sc*, *cu*, and the anal field. — ♀ Valvula vulvae robust, lamellae shaped much as in the *limbata*-group, reaching to as far as the end of segm. 9 or slightly beyond that level, but somewhat more slender and more widely divaricate from base to apex (pl. 34 fig. 99). Head large, width over the eyes: ♂ 8.5 - 8.9, ♀ 8.7 - 9.0 mm. Robust species of medium size. ..... **eurybia** [1])

3′. ♂. Genitalia smaller, less protuberant, or declivous. Hamule shorter, slightly or distinctly downcurved and less slender, less noticeably (or not at all) overlapping genital lobe; its upper margin in profile view usually distinctly convex before apex. Face and frons yellow to Salmon-orange, frons dorsally Grenadine red or Flame scarlet in perfectly preserved specimens, with a narrow but well-defined shining black (or metallic blue-black) basal stripe. Thorax paler, dark sutural bands more distinct than in *eurybia;* hair pale brownish- to silvery-grey. Abdomen between Flame scarlet and English red. Black marks on segm. 8 and 9 of abdomen more extensive, similar to the *limbata*-group. Basal spot on hind wing variable, much less extensive than in *eurybia* but coloured similarly to that species, or (*loewi tillyardi*) Bay with Orange chrome veins. Golden or amber-coloured areolae usually distinct, though often narrow or absent altogether. Bases of fore wings hyaline. — ♀ Valvula vulvae less robust, lamellae (usually) shorter, parallel or divaricate from base to apex. Width of head over the eyes: ♂ 7.4 - 8.2, ♀ 7.5 - 8.2 mm. Species of smaller size and more slender build. 4

4. ♂ Genitalia more projecting and larger than in *l. loewi* and *l. tillyardi*, but less protuberant than in *eurybia*. Hamule also rather intermediate in shape between *eurybia* and *loewi*, sometimes more projecting than in pl. 33 fig. 95, evenly downcurved; apex of genital lobe more prominent and less smoothly rounded than in *l. loewi* or *l. tillyardi*. Thorax Mikado- to Snuff brown, traces of metallic-black sutural stripes moderately distinct. Basal spot on hind wing narrow, regular, almost or completely reaching posterior border of wing, approaching the condition seen in *rosenbergi* and *propinqua*, but surrounded by a narrow areola of golden-amber which is most distinct along the anal bend of the spot. Minimum extent: half-way between *Cux*

[1]) With one subspecies, viz. *T. eurybia monticola*, discussed *postea*.

and proximal side of *t*, one basal cell enclosed between *Cu* + *A* and *Cuspl*, 1½ mm along *Cuspl*, thence parallel to the transverse cell-rows in slightly convex curve to posterior border of wing, near which it curves basalwards to enter the margin somewhat proximal to tornal angle; entirely enclosed in the basal patch is a small, crescent-shaped, sub-hyaline marginal areola just beyond and of the same length as *mb*. Maximum extent: in *sc* almost to Ax_1, *m* ¾ up to *Arc*, *cu* almost to proximal side of *t*, 2 - 3 basal cells between *Cu* + *A* and *Cuspl*, from 2 - 3 cells before the bend of *Cuspl* crossing A_2 before its bend, thence in a slightly convex curve parallel to that vein to posterior border of wing, which it reaches slightly distal to tornal angle; hyaline marginal areola beyond *mb* vestigial or absent. — ♀ Basal spot much as in ♂, but wider, of darker tint, and falling more short of the posterior border of wing; maximum extent: *cu* and proximal half of *t*, from there straight across wing to *Cuspl* just before its bend, thence strongly and convexly curving inwards to enter the margin proximal to tornal angle; a large, triangular or semicircular, subhyaline or yellowish, marginal area beyond *mb*, usually distinctly longer than that, and often finely confluent along anal border with the hyaline seem along posterior border of wing. Amber-yellow areolae usually distinct, though often very narrow. Valvula vulvae similar in form to the *limbata* (*euryale*)-group, but lamellae reaching to as far as end of segm. 9 or slightly beyond that level, parallel-sided and closely approximated, never divaricate (pl. 34 fig. 101). ..... **aquila**

4'. ♂ Genitalia very small, declivous. Hamule not or only very slightly overlapping genital lobe, upper margin in profile view distinctly convex, apex abruptly hooked, the tooth small; genital lobe globular. ♀ Valvula vulvae shorter than segm. 9, the lamellae not nearly reaching apex of that segment, ovate, widely divaricate (pl. 34 fig. 104). (*loewi loewi:* unknown)..... 5

5. ♂ Genitalia: pl. 33 fig. 97. Face and latero-distal portions of frons generally paler than in *aquila* and *l. loewi*. Thorax, ground-colour in both sexes faded, never brownish or reddish, with sutural bands more distinct than either of these two species, greyish- or brownish-black and largely confluent so as to save two broad Buffy citrine to Tawny olive lateral bands. ♂ Basal spot on hind wing sharply defined, ragged, only slightly variable. Minimum extent: basal traces in *c* and *sc* bordering *Sc*, in *m* half-way to *Arc*, *cu* to proximal side of *t*, thence on across wing to *Cuspl* and from there after a slight basalward incision abruptly hooked outwards along *Cuspl* to about 2 cells before its bend, thence again hooked basad and in a strongly convex line curving inwards to meet the wing-marging proximal to tornal angle, leaving uncoloured a broad area (3 - 4 cells) along posterior border of wing; hyaline (or yellowish) marginal areola beyond *mb* moderately large, subtriangular in outline; amber-coloured areolae narrow and often clearly perceptible only around the anal portion of the basal patch. Maximum extent: in *c*, *sc* and *m* amply half-way up to Ax_1 and *Arc*, entering *t* for

a short distance, one cell in discoidal field and from there to *Cuspl;* then suddenly hooked outwards along *Cuspl* to one cell before its bend, and finally in a convex curve to tornal angle; uncoloured posterior area 2 - 3 cells wide. ♀ Basal spot similar to ♂, or slightly more extensive (amply half-way in *t,* bend of *Cuspl*), much darker and surrounded by a distinct amber-coloured areola; uncoloured posterior area still wider (4 - 5 cells) and more or less broadly connected with a large, elongate, sub-hyaline marginal fenestra beyond *mb.* Valvula vulvae distinctly shorter than in *aquila,* the lamellae wider, not reaching end of segm. 9 and strongly divaricate (pl. 34 fig. 103). Body-colouring, especially of thoracic sides, even paler than in ♂. ..... **loewi tillyardi**

5'. ♂ Genitalia: pl. 33 fig. 96. Head coloured similarly to *aquila.* Thorax, ground-colour Mikado brown with traces of metallic-black sutural stripes similar to *aquila.* Basal spot on hind wing shaped similarly to small-spotted individuals of *l. tillyardi;* fenestra beyond *mb* yellow; amber-coloured areolae distinct (pl. 38 fig. 125). ..... **loewi loewi**

Tramea loewi loewi BRAUER (pl. 33 fig. 96, pl. 38 fig. 125).

1866. BRAUER, Verh. Zool.-bot. Ges. Wien, 16, p. 563 - 564. — ♂ Ceram (*Löwii*).

Material studied. — West New Guinea: 1 ♂ (ad.), Kaimana (southcoast), 3.vi.1941, E. LUNDQUIST (Negumy Expedition). Extralimital material. — 1 ♂ (ad., holotype), labelled: "Kaup, Ceran 1867" (unknown hand), "*Tramea Löwii* K." (BRAUER's hand), with prefix written in red ink: "Brau. Type", and two other labels: "*Loevii* det. Brauer" and "*Loewi,* det. Zerny" (printed), ex Vienna Museum.

Up to this time, this species was known only from the nomino-type described by BRAUER. The original description is excellent, yet it is necessary to point out that BRAUER's comments on the genitalia are inadequate. I have therefore carefully studied these organs (pl. 33 fig. 96) and feel that the position close to the Australian subspecies, suggested by RIS, is the logical and natural solution. Although the type differs from Australian insects, no useful purpose is gained by separating them specifically, thus obscuring relationship and common origin, which should be as much the purpose of taxonomy as to point out differences.

It has been my good fortune to receive, shortly before the completion of this paper, a second example of this interesting insect among the Odonata captured by Mr LUNDQUIST and his two native assistants, and taken at Kaimana, S.W. New Guinea. This is an adult male in perfect state of preservation, which, by its wing-spots and body-colours, is undoubtedly a true *loewi,* differing strikingly from examples of *l. tillyardi* of the Australian continent in the colours of the thorax, which are exactly similar to the type specimen from Ceram. The only discrepancies are found in the genital hamule, which is identical in shape

with that of Australian specimens and, further, in the tint of the basal wing marking which is somewhat darker, less red, than in the type.

The measurements of the type are: abd. + app. 29.0, hw. 38.8, width of head 7.6 mm, those of the Kaimana specimen: abd. + app. 30.8, hw. 39.6, width of head 7.7 mm.

Distribution: Ceram (terr. typ.), W. New Guinea.

Tramea loewi tillyardi subsp. nov. (= *loewi* auct.) (pl. 33 fig. 97, pl. 34 fig. 103).

1869. BRAUER, Verh. Zool.-bot. Ges. Wien, 19, p. 9. — E. Australia (*löwii*).
1878. SELYS, Mitt. Mus. Dresden, 3, p. 293 (pars, "Austral. sept.") (*loewii*).
1901. MARTIN, Mém. Soc. Zool. France, 19, p. 221. — Australia (*loëwii*).
1908. TILLYARD, Proc. Linn. Soc. N.S.W. 32, p. 721 - 722. — W. Australia (*loewii*).
1909. VAN DER WEELE, Nova Guinea 9 Zool. 1, p. 21. — ♀ Merauke, S. New Guinea (*limbata loewii*).
1909. FÖRSTER, Jahrb. Nassau. Ver. Naturk. Wiesbaden, 62, p. 230 — ♀ Queensland (*löwii*).
1910. RIS, in MICHAELSEN & HARTMEYER, Fauna Südw. Austral. 2, p. 443 (note) (*limbata* forma).
1913. RIS, Cat. Coll. SELYS, Lib. fasc. 16, p. 971 (key), 975 - 977 (pars!). — ♂♀ Australia; ♂♀ Aroe Is.; ♂♀ Kei Is.; ♀ S. New Guinea (*loewi*).
1913. RIS, Abh. Senckenb.-Naturf. Ges. 34, p. 535 - 536. — ♂♀ Kei Is.; ♂♀ Aroe Is.; ♂♀ Thursday, Darnley and Hammond Isles; ♂♀ Australia (*loewi*).
1917. TILLYARD, Biology of Dragonflies, fig. 29, 36 (larva), 103 (♀ vulvar scale), 136 (♂ wings). — Australia (*loëwii*).
1926. TILLYARD, Ins. Austral. & New Zealand, p. 86, pl. 4 fig. 8 (♀ insect) (*loewii*).
1933. LIEFTINCK, Revue Suisse Zool. 40, p. 431 - 432 (taxon. notes & habits). — ♂♀ N. Australia (*loewi* auct. ? nec BRAUER).

Material studied. — 6 ♂, 6 ♀, North Australia, N.T., Port Darwin, Marrakai, Bullrun Swamp, Katherine, Shoebridge and Adelaide River, 14.iv.-5.vi.1931, ED. HANDSCHIN; 7 ♂, 1 ♀, N. Queensland, Redlynch & Stoney Creek, 19.viii-20.ix and 7.xii.1938, Edge Hill, 25.viii.1938, Kuranda, 12.viii.1938, R. G. WIND. Holotype ♂: Redlynch, 4.ix.1938; allotype ♀: Kuranda, 12.viii.1938.

1 ♀, South New Guinea, Merauke, iii.1939, R. G. WIND.

1 ♂, Tanimbar Ids, Jamdena, iv.1938, P. BUWALDA.

6 ♀, Kei Ids, Toeal, Klein Kei, 1920, ex coll. J. LINDEMANS (5 ♀), and "Toeal, Kei, leg. HINTERMAYER" (1 ♀, ex coll. FÖRSTER, Michigan Museum, Ann Arbor).

In a previous paper (1933, p. 432) I considered this to be a species distinct from *loewi* BRAUER, which I compared primarily with the formenkreis *euryale* SELYS (= *limbata* auct.). I have before me the type of *loewi* from Ceram, which I am now certain has nothing to do with *euryale* and allies, as it proves to be exceedingly close to the Australian species. It has even been found necessary to consider the latter a subspecies of *loewi;* but without more satisfactory comparative material of *loewi,* little would be gained by further discussing their

affinity, which is evident. The two subspecies may be separated from each other by the strikingly different colour of the thorax, whilst there is also a slight difference in the form of the genitalia of the male.

The first adequate descriptions of the Australian *Tramea loewi* — now considered a subspecies of the typical (Moluccan) insect — were published by RIS in 1913 and 1915, and, together with that given in the previous key, these descriptions will serve to its easy recognition.

Measurements. — ♂ abd. + app. 29.9 - 33.0, hw. 37.3 - 41.0, width of head 7.5 - 8.1; ♀ 32.0 - 33.0, 40.2 - 41.2, 7.8 - 7.9 mm.

S. New Guinea. — The single Papuan specimen of *l. tillyardi* in our collection is an adult female in excellent condition from Merauke. It resembles Australian specimens in every respect. The pale colour of the thorax with its bluish black humeral and lateral bands, the amber-coloured areola surrounding the very dark basal spot of the hinder wings, the yellowish wing-membrane and the pale-coloured pterostigma, are particularly striking features, to which may be added the short and rounded vulvar lamellae.

Abd. + app. 31.4, hw. 38.5, width of head 7.5 mm.

Tanimbar I. — One male, agreeing in every detail with specimens from North Australia and at the same differing from typical *loewi* which I have now been able to report also from the southcoast of West New Guinea.

Abd. + app. 32.3, hw. 39.8, width of head 7.9 mm.

Kei Islands. — The position of this form is somewhat obscure, and as the male sex not available for comparison with Australian specimens, it cannot now be further elucidated. RIS (l.c. p. 977, sub *loewi* = *l. tillyardi* subsp. n.), has given a fairly complete description of the ♂; and on the evidence of the shape of the genitalia, the existence of a rather broad yellow areola surrounding the dark basal patch, and a similarly coloured area beyond the membranula of the hinder wings, RIS considered it to be most closely allied to *T. l. loewi* BRAUER from Ceram, the type of which he had not studied.

The colour of the frons of these males is described as: "lebhaft rot", and "Breite, etwas diffuse, violette Stirnbasisbinde". The description of the ♀ is insignificant as no mention is made of the shape of the vulvar scale. Measurements (teste RIS): ♂ abd. 34, hw. 43, app. sup. 4.8; ♀ 32, 45, 3.5 mm.

Female (Mus. Buitenzorg & Ann Arbor). — These specimens correspond closely with RIS's description. They are of greater size, and differ somewhat from *loewi tillyardi* (= *loewi* auct.) in that the vulvar scale is a little longer, the lobes reaching almost as far as the apex of the 9th abdominal segment; but the head and thorax are coloured similarly to Australian specimens.

I think it most likely that this insular form of the Kei Islands is also a subspecies of *loewi*.

I have not seen specimens from the Aroe Islands, which, according to RIS, resemble Australian insects closely.

Distribution: Throughout Australia (terr. typ.) as far south as Sydney; South New Guinea (Merauke); Aroe Is.; Kei Is., Tanimbar (Timorlaoet) I.

Tramea aquila, sp. n. (pl. 33 fig. 95, pl. 34 fig. 101).

Material studied. — North New Guinea (W. to E.): 1 ♂, Lake Sentani, ii. 1933, W. STÜBER; 1 ♂, 2 ♀, Hollandia, 30.vi, 26.vii and 5.viii.1938, J. OLTHOF & L. J. TOXOPEUS; 2 ♀, Second Hill range (south of Hollandia), 400 m, ix.1930 & 10.vi.1931, W. STÜBER; 2 ♀, Bernhard Camp, 100 m, 27.ix.1938 & 9.iv.1939, J. OLTHOF & L. J. TOXOPEUS; 2 ♂, Nonno (Japoe) Hills, 15 km S. of Bougainville Mts, 400 m, 7-21.ii.1936; 8 ♂, 5 ♀, Southern Bewani Hills, upper course of Tami River (5 day's march S. of Hollandia), Ampas distr., 2 - 300 m, Pauwasi River, 7-9.vi.1939 and Parfi, 300 m, 10-21.vi.1939, W. STÜBER. Holotype ♂ and allotype ♀: Pauwasi River, 7.vi.1939.

This fine new species bears a close superficial resemblance to *T. propinqua* and *loewi*. Yet it is very distinct from both, as may appear from the key to the species in which I have given the essential features to separate *aquila* from the other species of the genus. *Aquila* is chiefly characterized by its vivid light red colours and small, slender proportions. It is doubtless most closely related to *loewi*, from which it differs primarily in the shape of the genitalia of the ♂ and the vulvar lamina of the ♀, and in the colouring of the head and thorax.

The blackish basal stripe of the frons is distinct, though narrow, especially so in the ♂, and coloured bronze-black or black in both sexes instead of metallic blue-black in the ♀ of *loewi*.

The dark basal patch to the hinder wings of the ♂ is comparatively narrow, resembling that of *T. propinqua* rather closely in shape and extent; but it is less sharply delimited, not so dark, the basal veins having a paler red tint, whilst the anal portion of it at least is surrounded by a amber-coloured areola which is absent in *propinqua*.

Measurements. — ♂ abd. + app. 29.0 - 32.0, hw. 37.2 - 40.5, width of head 7.4 - 8.2; ♀ 30.0 - 32.0, 38.8 - 42.5, 7.7 - 8.2 mm.

It is interesting to note that Mr STÜBER, while collecting at Hollandia in the years 1930 - 1933, captured large series of *T. propinqua* and *eurybia* and none of *aquila*, whereas Dr TOXOPEUS and his assistants, who collected also at Hollandia in 1938, only secured *aquila*. On the other hand, Mr STÜBER found all three species on several occasions flying in company of each other on lake Sentani.

Distribution: North New Guinea.

Tramea rosenbergi BRAUER (pl. 33 fig. 94, pl. 34 fig. 100).

1866. BRAUER, Verh. Zool.-bot. Ges. Wien, 16, p. 564 - 565. — ♂ Ceram.

?1913. RIS, Cat. Coll. SELYS, Lib. fasc. 16, p. 985 - 986 (♂ Celebes, *T. rosenbergi* det. SELYS), p. 986 (♂ "Elbor" [Moluccas]). — (*limbata* forma d^{v} and e^{1}).

Material studied. — Celebes (N. to S.): 3 ♂, 1 ♀, Donggala distr., Paloe, Boladangko (Koelawi), 700 m, 14.ii.1941, S. Kaloewi, 1000 m, 14.x.1940, Pipikoro, 900 m, 13.iii.1941, P. M. FELIX. 12 ♂, 5 ♀, Loewoe distr.,

Masamba, Rante Karoea (1700 m), Bolokan (16 - 1700 m), Sidamoektoe and Tamoekoe, ix-xi.1940, L. L. A. MAURENBRECHER; 5 ♂, 1 ♀, same distr., Todjamboe (20 km N. of Palopo), 7 - 800 m, 12.vii.1936, L. J. TOXOPEUS, and 20-23.iv. 1941, E. VONK et al.; 6 ♂, same distr., Nanggala, Rantepao, 700 m, xi.1937, native coll., F. C. DRESCHER ded. 1 ♂, Bone (Watampone) distr., S. Bone, Beroe (alt.?), 20.viii.1936, K. W. M. STEUP.

1 ♂, 1 ♀ (ad., ♀ allotype), Soela Islands, Soela Mangoli, Lampaoe (sea-level), ix.1939, S. BLOEMBERGEN.

1 ♂ (ad.), Ambon, Goenoeng Soja, 19.iv.1941, E. LUNDQUIST (Negumy Expedition).

As far as our present knowledge goes this striking and distinctive species is limited to the island of Celebes and the northern Moluccas. It is exceedingly close superficially to *T. euryale,* with which it has doubtless been confused in more than one collection. The great length of the genital lobe and hamule of the ♂ and of the vulvar lamellae of the ♀, and also the less extensive dorsal patch of metallic-purple on the frons of the ♂, as already mentioned in the key, are the fundamental features used in separating these species. *T. rosenbergi* is also a trifle more robust than *euryale.*

The considerable series now before us exhibits in the most convincing fashion the stability of these features as diagnostic criteria, drawn as the evidence is from several series of material each collected in a single area. The variability in both sexes is very light and all populations examined are practically alike.

RIS's report of a ♂ from S. Celebes as cited above (in the Brussels Museum) was the sole information on this species as a Celebesian insect; I have neither verified this nor his other records, which therefore remain somewhat uncertain.

BRAUER's description of the ♂ is very accurate and need not be repeated here. The ♀ has not yet been described.

Female. — Labium yellowish, the median lobe usually obscured or black, and a diffuse stripe along base and inner border of lateral lobes occasionally also obscured. Labrum reddish brown basally, apical margin broadly black, or with a ill-defined, broad, toadstool-shaped black mark. Clypeus dirty olive-yellow, side-edges of postclypeus pale olive-green in perfectly preserved specimens. Frons bright light orange, intermingled with green laterally, with a broad, sharply defined, metallic blue-black basal stripe. Vertex black anteriorly, orange on dorsal ridge, greyish-olivaceous posteriorly.

Thorax coloured similarly to *euryale.*

Fore wings entirely hyaline, including the bases. Basal spot on hind wing elongate, loop-shaped. Minimum extent: almost half-way between *Cux* and proximal side of *t,* one basal cell along *Cuspl,* then parallel to the anal cell-rows and in a convex curve far away from posterior border to a point much before tornal angle, where it nearly enters the anal border of wing, running parallel to it for a short distance, then curves away from it again and finally enters the wing-border quite near the end of the membranula so as to save a hyaline, oval,

marginal fenestra (finely connected along margin with the hyaline area along posterior border) beyond *mb*. Maximum extent: traces in *c-sc* and base of *m*, in *cu* almost as far as proximal side of *t*, 1 - 3 basal cells between *Cu* + *A* and *Cuspl*, along *Cuspl* to 4 cells before its bend and from there irregularly curving backwards to the wing-border much before tornal angle, surrounding a small, crescent-shaped, hyaline marginal fenestra just beyond *mb*. No golden-yellow or amber-coloured areolae.

Abdomen red, intersegmental rings between segments 3 - 7 very finely black; dorsum of 8 and 9 and longitudinal carinae black, each of these segments with a subtriangular, red side-spot. Ventral surfaces of tergites 4 - 8 black with blue pruinescence. Valvula vulvae shaped as shown in pl. 34 fig. 100 (Soela Is.).

The specimens before me measure as follows:

Celebes. — ♂ abd. + app. 33.5 - 34.4, hw. 41.7 - 42.7, diam. of head 8.2 - 8.4; ♀ 33.0 - 36.2, 41.3 - 44.5, 8.3 - 8.7 mm.

Soela. — ♂ abd. + app. 33.5, hw. 40.0, diam. of head 8.2; ♀ 34.0, 43.6, 8.3 mm.

Ambon. — ♂ abd. + app. 32.0, hw. 38.7, diam. of head 7.8 mm.

The distribution of *T. rosenbergi* may extend beyond the island of Celebes and the northern Moluccas, but no positive evidence to that effect is at present available. It is a common species in the mountainous districts of central Celebes, whence no individuals of *T. euryale* have so far been taken.

Distribution: Celebes (universal?), 700 - 1700 m alt.; the Moluccan islands Soela Mangoli, ? "Elbor" (? Halmahera), Ambon and Ceram.

Tramea eurybia eurybia SELYS (pl. 33 fig. 92 - 93, pl. 34 fig. 99 & 102, pl. 38 fig. 123).

1878. SELYS, Mitt. Mus. Dresden, 3, p. 298. — ♂ N. Celebes (Manado) (*eurybia*).
1898. FÖRSTER, Természs. Füzetek, 21, p. 273. — ♂ Astrolabe Bay (*loewi* Subrasse *biroi*).
1909. FÖRSTER, Jahrb. Nassau. Ver. Naturk. Wiesb., 62, p. 230. — ♀ Huon Gulf (*löwii* Rasse *petaurina*).
1913. RIS, Cat. Coll. SELYS, Lib. fasc. 16, p. 977 (pars), 985 (pars); 986 (pars). — ♂♀ Lombok, Savoe (*limbata* d^2), ♂ W. Australia (*limbata* e^2).
1926. LIEFTINCK, Treubia, 7, p. 297 (♂ descr.). — ♂ Boeroe (*limbata* forma d^2-e^2).
1930. LIEFTINCK, Treubia, 7 Suppl. p. 313 - 314 (♀ descr.), 326 - 328, fig. 5 - 6 (larval structures). — ♂♀ Boeroe (*limbata* subspec.).
1936. LIEFTINCK, Revue Suisse Zool. 43, p. 148 (discussion Less. Soenda Ids., not seen) (*limbata eurybia*).

Material studied. — North New Guinea (W. to E.): 1 ♂, 4 ♀, Kressi plain, Kressi (120 km SW of Lake Sentani), 400 - 450 m, i.1932; 1 ♀, same region, Berap Lakes, 9.iii-11.iv.1936; 7 ♂, 1 ♀ (*in cop.*), Lake Sentani, "water-lily pond", 300 m, 9.i and ii.1933; 11 ♂, Hollandia and environs, ix-xii. 1930 and i.1932; 1 ♂, southern Bewani Hills, upper course of Tami River, 300 - 500 m, Ampas distr. (Lat. 3^0 10^1 S., Long. 140^0 54^1 E.), 17.ix.1937; all W.

STÜBER. — 1 ♂, Astrolabe Bay, Erima BIRÓ 1896, holotype *T. biroi* FÖRSTER (Mus. Budapest). — South New Guinea (west); 2 ♂, Berau Peninsula, Aja Maroe, xii.1937, J. M. VAN RAVENSWAAY CLAASEN.

Extralimital material. — 3 ♂, Ambon, Goenoeng Soja, 18.iv.1941, E. LUNDQUIST (Negumy Expedition). — 3 ♂, 1 ♀, Boeroe I. (S. Moluccas), Rana, Wa'Katin and Wai Eno, iv-vi.1921, L. J. TOXOPEUS. — 1 ♂, 1 ♀, Komodo I. (Lesser Sunda Ids), vii.1937, J. K. DE JONG. 4 ♂, W. Flores, Laboean Badjo and Mboera, vi. 1937, J. K. DE JONG.

Male (N. New Guinea). — Mounth-parts and face carmine, except the labrum which is black distally, or wholly obscured, and the mid-lobe of the labrum, which is usually blackish, as are also the intero-basal edges of the side-lobes. Frons dark red (carmine to ox-blood red in perfectly preserved specimens), its upper surface very shining and with low bronzy glaze; extreme base obscured, the basal stripe thus formed ill-defined and often very indistinct. Vertex red, its vertical portion blackish anteriorly. Blackish sutural stripes of synthorax incomplete, very narrow, not metallic.

Basal spot on hind wing large. Minimum extent: in *c* and *sc* to half-way between Ax_3 - Ax_4 (hyaline along costal margin), in *m* at base only, in *ht* partly, in *cu* on into t filling up the entire space, 3 - 5 basal cells in discoidal field, 4 - 7 cells between Cu_1 and $Cu + A$, then 1 - 2 cells back between $Cu + A$ and *Cuspl*, on along *Cuspl* as far as its bend, and from there in a broad curve to the anal margin, which it reaches a little beyond tornal angle; no golden-yellow areolae. (FÖRSTER's type and 1 ♂ from Hollandia). In the majority of specimens the basal spot reaches to one cell beyond distal angle of *t*, then straight across wing towards Cu_1, following that vein as far as the forking of Cu_2 - A_1, and finally curving backwards parallel and near to A_1, entering the wing-margin at a point slightly before apex of anal loop. Maximum extent: in *c-sc* to beyond Ax_4, 2nd cross-vein between R—M_{1-3}, 4 - 5th cross-vein between sectors of *Arc*, 1 - 2 cells back in discoidal field, along Cu_1 as far as one cell beyond bend of anal loop, following course of A_1 and reaching anal margin slightly before apex of anal loop. (Few specimens from Hollandia, one from Aja Maroe).

There is a definite amount of variation in the presence of the hyaline marginal area beyond *mb*, as in FÖRSTER's type of *biroi* and in 3 out of a series of 22 males (including one of the pair from Aja Maroe) this isolated, semicircular area measures 3 - 4 mm along anal margin of wing and has a depth of 8 - 10 transverse anal cells; of the remaining 19 specimens 7 are entirely without the hyaline fenestra (including 1 ♂ in which the dark basal spot is very extensive), whilst in 12 others the area is only small, crescent-shaped, often ill-defined, and from 3 - 6 anal cells deep. Nearly all small-spotted individuals (including the type of *biroi*) show some rusty-brown colouring at extreme base of the fore wings, occuppying from 1 - 3 basal cells in the anal field, and in many heavily spotted males there are, in additon, definite, though small, brown spots in *sc* and *cu*, reaching from the wing-base almost or fully half-way to Ax_1 and *Cux*,

respectively. The colour of the pterostigma is decidedly darker than in *propinqua* or *rosenbergi*, i.e. dark red, or even reddish-black, agreeing in this respect with SELYS's description of the type of *eurybia*.

The genitalia of the ♂ are figured in pl. 33 fig 92 - 93.

Female. — Essentially resembling the ♂, save for the following points.

Mouth-parts and face light Ochraceous-buff, frons bright Antimony yellow, labium obscured to some extent in the majority of specimens. Vertex greyish, ochraceous-buff on top. Basal stripe of frons narrow (at most two-fifths as wide as the upper surface of frons) and ill-defined anteriorly, blackish in colour with low metallic-blue reflex. Occipital triangle ochraceous-tawny.

Thorax paler than in ♂, Tawny or Buckthorn brown, with the sutures narrowly black (partly incomplete).

Basal spot on hind wing large, shaped similarly to the ♂, but distinctly darker and coloured less red than in the ♂, with orange instead of red veins. Minimum: in *c - sc* to between Ax_3 - Ax_4, distal angle of *t*, 6 cells in discoidal field, along Cu_1 as far as two cells before the nod of anal loop and from there almost parallel to A_1 to about 0.5 - 1.5 mm before posterior margin, from where it curves backwards parallel and near to the wing-margin so as to enter the anal margin before tornal angle. Maximum: in *c - sc* almost as far as Ax_4, 4th cross-vein between sectors of *Arc*, 3 - 4 cells distal to *t*, 12 - 14 cells in discoidal field, bend of anal loop (but not surpassing A_1), then curving abruptly back to anal margin of wing. A narrow (0.6 - 1.0 mm), but quite distinct amber-coloured or golden-yellow areola neatly surrounds the indented border of the dark basal marking. Hyaline area beyond *mb* small or of moderate size (at most 1½ times as long as the membranula along margin), subtriangular in outline, only 6 - 9 transverse anal cells deep.

Fore wing at least with a minute, diffuse, amber-coloured marking at extreme base, occupying the first two basal cells of the anal field (2 examples); this spot more conspicuous, deeper in tint and slightly larger, extending distally to as far as mid-way between base and Ax_1 in sc, and almost to *Cux* in *cu* (4 examples).

Abdomen red, lateral and apical carinae of segm. 3 - 10 finely black; intersegmental rings usually obscured. Black marks of 8 and 9 similar to ♂, 10 dark reddish, but often also partly obscured.

Valvula vulvae red, shaped as shown in pl. 34 fig. 99.

Anal appendages reddish-black, or entirely blackish.

Length: ♂ abd. + app. 32.5 - 34.8, hw. 41.4 - 43.5, width of head 8.5 - 8.9; ♀ 32.5 - 35.5, 44.0 - 46.6, 8.7 - 9.0 mm.

The synonymy established above was suggested to me by SELYS's original description of *eurybia*, but it was not before I had come across his comments regarding the colour of the frons and the small basal spots to the fore wings that the species could be classified with reasonable certainty. The description of *eurybia* is grossly superficial and so utterly inadequate that its recognition would

have been hardly possible without the rich material, now before me, from the Moluccas and New Guinea. This description runs as follows:

"♂ Abdomen 33, aile inférieure 41 mm.

Presque intermédiaire entre les *T. Chinensis* Degeer [= *virginia* RAMB.] et *Mauriciana* Rambur. [= *limbata* DESJ.].

Diffère de la *Mauriciana* par le front, qui est brun luisant, et non violet acier en dessus, la vésicule du vertex roussâtre; la lèvre supérieure noirâtre. — enfin la présence de deux gouttelettes obscures à la base des ailes supérieures.

La tache basale brun noirâtre des ailes inférieures ressemble à celle de la *Mauriciana*, mais elle est un peu plus large vers le bord postérieur après la membranule, et elle na pas de marque hyaline près du bord anal.

L'*Eurybia* diffère de la *Chinensis* par les deux petites marques obscures des ailes supérieures (à la base entre la nervure souscostale et la médiane et la postcostale) ce qui rappelle la *lacerata* Hag. de l'Amérique septentrionale — l'absence de marque hyaline au bord anal des ailes inférieures sans la grande tache noirâtre — enfin les quatre ailes non lavées de jaunâtre à la base. — le ptérostigma (long de 2 mm aux supérieures, de 1¾ aux inférieures) est noirâtre (brun chez la *Chinensis*).

Les ailes supérieures ont 14 nervules antécubitales, 10 - 11 postcubitales, et 4 - 5 cellules posttrigonales.

♀ (Inconnue).

Patrie: Menado (Célèbes). Un mâle unique, Collection Mac Lachlan." [The spacings are mine].

Unfortunately, I have been unable to examine the nominotype, but the male insects in our collection from the low country of New Guinea agree fairly closely with the above description, and I have no doubt but that FÖRSTER's *biroi* ♂ is also the same insect as *eurybia*, his *"löwii* Rasse *petaurina"* from the Huon Gulf being almost certainly the ♀ of that species.

It is possible that a detailed distributional study may show *eurybia* to be divisable into more geographical races than can at present be recognised. If the typical *eurybia* from Celebes should prove sufficiently distinct from the New Guinean form, than the name *biroi* can be retained for a subspecies of *eurybia* from the lowlands of New Guinea.

Eurybia is apparently a widely distributed and variable species that has its headquarters probably in New Guinea, from where it has spread towards the west via the Moluccas as far as Celebes and the Lesser Sunda islands.

I have found it desirable to append the following notes and descriptions of *eurybia* populations which inhabit other islands of the Archipelago.

Male (Ambon). — When compared with our series of New Guinean *eurybia*, the present examples are seen to be of the same size and robust build, with broad wing-markings. In one of them the pterostigma is coloured dark

brown, in the others it is black. There are no traces of a hyaline marginal area beyond *mb* nor is there any indication of a golden-yellow areola bordering the hind wing mark. All agree in having minute, but quite definite, rusty brown spots at extreme base in *sc* and *cu* of the fore wing, and one or two basal cells in the anal field are likewise tinged brownish. Genitalia as in *eurybia* from New Guinea.

M a l e (B o e r o e). — In size and colour of the body these males do not show noteworthy differences from Ambonese or New Guinean individuals, but the basal spot on hind wing is noticeably smaller: in *c - sc* as far as Ax_1, halfway in *m*, proximal side of *t*, along *Cuspl* as far as 2 cells before its bend, then slightly but abruptly back, running almost parallel to A_1 towards the wing-margin to a point about midway between tornal angle and apex of anal loop. No golden-yellow areolae; hyaline fenestra beyond *mb* absent or small, crescent-shaped, shorter than *mb* itself. Fore wing with traces of brown colouring in *cu* and the anal field at extreme base.

Genitalia not different from our series from New Guinea and Ambon.

F e m a l e. — One adult specimen in our collection. Frons orange, basal stripe narrow, blackish in colour, ill-limited anteriorly. Basal spot on hind wing large, but, like in the ♂, considerably smaller than in New Guinean examples: in *c - sc* to as far as Ax_1, basal third in *m*, proximal side of *t*, 4 basal cells between *Cu + A* and *Cuspl*, along that vein as far as 3 cells before its bend, and from there almost parallel to A_1 to 2 mm before posterior margin, from where it curves strongly backwards to enter the anal margin much before tornal angle. Hyaline area beyond *mb* very large, triangular, 1½ times as long as *mb* itself and 10 - 12 transverse anal cell-rows deep on its widest point. No amber-coloured areolae. Fore wing, at extreme base, with the slightest trace of dark colouring in *cu* and anal area. Pterostigma reddish.

Curiously enough, our series from Ambon and Boeroe are not alike, the form from Boeroe having noticeably more reduced wing-markings than the Ambonese. We have noticed the same phenomenon in *Rhyothemis regia*, and probably also in *R. phyllis*; I am unable at the present to give a satisfactory explanation for these facts. (The reader is referred to our discussion of the variability of *Rhyothemis* species on p. 508, 517 of this paper).

M a l e (F l o r e s, K o m o d o). — Closely similar to our series from New Guinea and showing the same variability in the extent of the basal spot on hind wing (3 ♂, 1 ♀). No amber-coloured areolae; hyaline area beyond *mb* wanting or very small. Bases of fore wings unmarked. One ♂ differs from the others in that the basal spot on hind wing is shortened and narrowed, reaching the anal margin at tornal angle instead of much beyond that level. Genitalia of f e m a l e: pl. 34 fig. 102.

Size very variable (generally smaller than in the other series): ♂ abd. + app. 30.5 - 32.0, hw. 38.7 - 45.0, width of head 7.0 - 8.3 mm. The f e m a l e does not differ in any way from New Guinean specimens.

According to RIS (l.c. 1913, p. 985), specimens in the British Museum from the islands of Lombok and Savoe, examined by him, are labelled *eurybia,* "mit deren Beschreibung sie auch sehr nahe übereinstimmen". Yet, our material does not seem to be quite typical as the minute dark spots on the base of the fore wings are wanting, and the genital hamule appears to be a trifle longer than in our series of specimens from other localities.

Distribution: N. Celebes (terr. typ.); the Lesser Sunda islands Lombok, Savoe, Komodo, and Flores; the Moluccan islands Ambon and Boeroe; New Guinea (universal in low country); W. Australia.

Tramea eurybia monticola, subsp. n. pl. 38 fig. 124).

Material studied. — Central New Guinea (W. to E.): 3 ♂, Lake Paniai (Wissel Lakes group), 1740 m, 12.xi.1939, H. BOSCHMA. — 3 ♂, 1 ♀ (♀ juv.), Baliem Camp, 1600 m, 30.xi, 12-16.xii.1938, L. J. TOXOPEUS. Holotype ♂ and allotype ♀: Baliem Camp, 1600 m, 16.xii & 30.xi.1938, respectively.

Male (holotype). — Colour of head and body, and structure of genitalia exactly similar to *e. eurybia.*

Differs from topotypical *eurybia* and from all populations of this species procured in the lowlands of New Guinea, by being of slightly smaller size; but it is chiefly characterized and well distinct from *e. eurybia* by having the basal spot on hind wing coloured a rich Maroon or Claret-brown instead of Burnt sienna. Moreover, this basal marking is conspicuously and deeply indented, basally, by a very large, sharply delimited, night-cap shaped marginal fenestra beyond *mb*; this vitreous spot is purely hyaline, about 4.5 mm wide along the wing-border, and invades the dark spot costalwards for a considerable distance so as to reach almost the mid-rib of the anal loop (*Cuspl*) near its base. The anal portion of the dark basal patch falls more short of the posterior border of wing than in any specimen of *eurybia* examined (even more so than in the ♀ of the typical race), in which the basal mark extends right across wing to reach its margin much beyond tornal angle instead of much before that point (pl. 38 fig. 124); moreover, the outer border of the dark spot is usually surrounded by a distinct (though very narrow) amber-coloured areola. In one ♂ (Baliem R.), the basal marking is less deeply indented, the hyaline area having a depth of only 7 - 8 cell-rows.

Female (juv., allotype). — Differs only from the male in sexual characteristics and the basal marking on hind-wing, which is shaped as shown in pl. 38 fig. 125. The bases of the fore wings are unmarked.

Length: ♂ abd. + app. 32.0 - 33.2, hw. 39.3 - 42.2, width of head 8.1 - 8.3; ♀ 32.0, 42.7, — mm.

This conspicuous insect is placed without much hesitation as a mountain race of *eurybia.* Our two series from Paniai in the west and the Baliem valley in the east are surprisingly similar. This close similarity between populations

of one subspecies occurring in two widely separated mountain areas of New Guinea, is, I think, unique among the regional species of Odonata.

Distribution: Mountains of Central New Guinea.

Group of **Tramea limbata** DESJ.

As already pointed out in our introductory discussion of the Old World members of the genus *Tramea*, we are by no means convinced of the correctness of the classification of the species as given in 1913 by RIS in the Selysian monograph. Although this author's revision placed our knowledge of the various elements of the group on a solid foundation which unquestionably will remain the basis for future taxonomic work on the subject, the weak point of RIS's study is its failure to redescribe, or at least to analyse with reasonable completeness, DESJARDINS's and some of BRAUER's and SELYS's types of *Tramea*, which species are often unrecognizable from the original descriptions as no details concerning the genital organs of both sexes were given. Until these types are analysed in greater detail their recognition will remain difficult in certain cases.

I find it necessary to trace all 'forms' of the *limbata*-group as distinct species, but at the same time it should be emphasized that indications of very close relationship *inter se* of *transmarina*, *euryale*, and *propinqua* are clearly evident, so that the two new species of this cluster, described in this paper, are evidently geographical subspecies of either *transmarina* or *euryale*: leaving out of account the Ethiopian *limbata* on geographical grounds, any future selection of a nominotype should, I think, be made from those two species.

Tramea euryale SELYS.

1878. SELYS, Mitt. Mus. Dresden, 3, p. 298. — ♂♀ N. Celebes (Manado) (*T. Euryale*).
1913. RIS, Cat. Coll. SELYS, Lib. fasc. 16, p. 986 (♀ Manado) (*limbata* forma d^{s} part.).

Material studied. — 1 ♂ (ad.), S. W. Celebes, Parepare distr., Parepare (coast), 3.ii.1940, J. J. VAN DER STARRE; 1 ♀ (ad. allotype), N. W. Celebes, Donggala distr., Paloe Bay, Paloe (coast), 29.iv.1912, L. J. TOXOPEUS ded.

1 ♂ (ad.), Ambon, Goenoeng Soja, 19.iv.1941, E. LUNDQUIST (Negumy-Expedition).

The many records of this species (sub nomine "*limbata* DESJ.", form. div.) in the existing literature on oriental Odonata are omitted here as some of them at least doubtfully apply to *euryale*.

The re-discovery in Celebes of this common and widely distributed insect is of considerable interest as it removes any doubt as to whether *rosenbergi* and *euryale* were different specifically or conspecific. Our Celebesian material of the former is sufficiently extensive to show *euryale* can easily be separated from *rosenbergi*, and it is highly probable that the two species occur together in certain

places of the island, as they do on the island of Ambon where both insects were actually taken in company of each other on the same day.

The single topotypical ♂ in our collection resembles Javan examples in almost every respect, whilst the ♀ compares very well with SELYS's brief description of the type from Manado.

Female (allotype). — Labium brownish-yellow, median lobe black. Labrum with a heavy T-shaped black spot, surrounding two small pale spots on either side of the middle. Clypeus and frons pale orangish, the latter with a heavy purplish-blue basal band. Vertex and rear of the head brown. Thorax reddish-brown, sutures narrowly blue-black.

Wings hyaline, basal veins pale red. Basal spot on hind wing extremely small, reddish-brown: in *cu* half-way to *Cux* and from there in a somewhat ragged, convex line to the end of *mb*. No yellow areolae.

Segm. 1 - 7 of abdomen red, transverse sutures between 4 - 7 very finely black.

Valvula vulvae shaped as in *T. propinqua* (pl. 33 fig. 90 - 91).

Length: ♂ abd. + app. 35.0, hw. 42.8, diam. of head 8.2; ♀ 35.3, 44.0, — mm (Celebes); ♂ 33.5, 42.0, 8.2 mm (Ambon).

It may be added that the present individuals are practically indistinguishable also from examples in the Buitenzorg Museum from Sumatra, Billiton, Enggano, the Krakatau-group, Java, Karimoendjawa Ids, Kangean, and Basilan (Philippines), whereas Bornean specimens seem to be sufficiently distinct to warrant their separation as a subspecies.

Distribution: Malaya, Sumatra, Billiton, Enggano, Krakatau Ids, Java, Karimoendjawa Ids, Kangean, Basilan, Celebes (terr. typ.), Ambon.

Tramea propinqua, sp. n. (pl. 33 fig. 90 - 91, pl. 34 fig. 98).

1900. RIS, Arch. f. Naturgesch. 1, p. 176 - 177. — ♂♀ New Britain (*rosenbergi*).
1913. RIS, Cat. Coll. SELYS, Lib. fasc. 16, p. 977 (New Guinea, pars!). — ♀ C. New Guinea (*loewi*).
1913. RIS, Ibid. p. 986. — ♂ Aroe Is. (*limbata* forma e^3).
?1913. RIS, Abh. Senckenb. naturf. Ges. 34, p. 534 - 535. — ♂ Aroe Is.; ♂ Cooktown (*limbata rosenbergi*).
1915. RIS, Nova Guinea, 13 Zool. 2, p. 117. — ♂ S.W. New Guinea (*limbata* forma e^6).
1919. RIS, Cat. Coll. SELYS, Lib. fasc. 16^2, p. 1222 - 1223. — ♂ S.W. New Guinea (*limbata*, forma e^1-e^2).

Material studied. — North New Guinea (W. to E.); 1 ♂ Kressi plain, Kressi (120 km SW of Lake Sentani), 400 m, vii.1934; 33 ♂, 5 ♀ (ad.), Hollandia and environs, 0 - 200 m, vi-vii, vii, 27.viii-4.ix, ix, xii-xi.1930, iii.1931, i, vii and viii.1932, ix.1933; 19 ♂, 11 ♀ (ad., 10 pairs *in cop.*), Lake Sentani, 300 m, ii.1933; 1 ♀ (ad.), Njau Sanké (15 km S. of Bougainville Hills), 400 m, xi-1935; all W. STÜBER. — 1 ♂, Astrolabe Bay, Stephansort, BIRÓ, 2.ii. 1900 (ex coll. FÖRSTER, Michigan Museum, Ann Arbor). — West New Guinea: 4 ♂, Kaimana (southcoast), 3 - 5.vi.1941, and Soengei Aindoea (south-

coast), near Oeta, 7.vii.1941, E. LUNDQUIST (Negumy Expedition). — South New Guinea: 1 ♂, Digoel River territ., Mappi post, Namkajamme, xii.1938, J. M. VAN RAVENSWAAY CLAASEN.

Extralimital material: 1 ♂, W.-coast of New Ireland (Neu Mecklenburg), Island Nusa, CARL WAHNES 1899 (ex coll. FÖRSTER, Michigan Museum, Ann Arbor).

Holotype ♂ and allotype ♀: Lake Sentani, ii.1933, W. STÜBER.

Male (Hollandia). — Head coloured as described in the key; thorax similar to *rosenbergi*.

Neuration on basal part of wings red. Base of fore wings unmarked. Basal spot on hind wing somewhat similar in size to *rosenbergi* and coloured as in that species. Minimum extent: trace in *sc*, in *cu* to *Cux*, from there along A_3 slightly raggedly straight across wing to a point near posterior margin where it curves inwards to enter the margin somewhat before tornal angle; no hyaline marginal area beyond *mb* and no golden-yellow areolae. Maximum extent: in *c* and *sc* to Ax_1 (not entirely filling up these spaces), diffusedly half-way in *m*, in *cu* almost as far as proximal side of *t*, three basal cells enclosed between *Cu* + *A* and *Cuspl*, following the course of *Cuspl* for 2 - 3 cells, thence somewhat raggedly straight across wing parallel to the transverse cell-rows in very slightly convex curve to posterior border, which it reaches much beyond tornal angle; no golden-yellow areolae and no traces of a hyaline marginal area beyond *mb*.

Abdomen red; no black, dorsal intersegmental rings, but lateral carinae black and venter of abdomen partly (or wholly) obscured. Segm. 8 with a large, subtriangular, black dorsal mark, widest posteriorly; 9 also largely black except a rectangular or trapezoidal red lateral spot; 10 red with an ill-defined, black, or almost black, dorsal patch; intersegmental membranes between 8 - 9 and 9 - 10, pale red.

Genitalia: pl. 33 fig. 90 - 91.

Anal appendages obscured, sometimes almost black, but usually rather dark red, this colour especially vivid on bases of superior pair.

Female (Hollandia). — Differing from the ♂ in the following respects.

Frons bright orange in perfectly preserved examples, with a sharply defined, metallic-blue basal stripe occupying slightly more than the basal half of its dorsal surface.

Basal spot on hind wing somewhat variable, shorter and wider, and usually also decidedly darker in colour, its boundaries more irregular and angulate, than in the ♂. Minimum extent: in *c* and *sc* almost half-way up to Ax_1, basal third in *m*, in *cu* as far as half-way btween *Cux* and proximal side of *t*, then back to the branching of *Cu* + *A* and *Cuspl*, on along *Cuspl* for only one cell, continuing its course in a neatly convex curve across the wing to a point far away from the posterior border of wing, well rounded posteriorly and curving basad to the anal border of wing much before tornal angle so as to save a broad hyaline posterior area; no (or only traces of) hyaline marginal area beyond *mb*, and no golden-yellow areolae. Maximum extent: in *c* and *sc* to Ax_1 (in *c* post-

erior half of cell only), and traces beyond that level along *sc* in next cell, basal half in *m*, in *cu* to half-way in *t*, 2 - 3 basal cells in discoidal field, 3 between Cu_1-Cu_2, 7 - 8 between Cu_2 and *Cuspl*, then following abruptly the course of *Cuspl* to one cell proximal of its bend, and from there almost in a circular curve strongly back to anal border, which it meets slightly beyond the middle of the breadth of the wing, running quite near and almost parallel to the tornal angle. Hyaline marginal area beyond *mb* entirely wanting in 13 specimens, a spur of it in 3 specimens, distinct and semicircular in outline (2.6 mm long) in one ♀ (Lake Sentani, 10.i.1933).

Abdomen coloured exactly as in the ♂. Vulvar scale black, shaped as in pl. 34 fig. 98.

Length: ♂ abd. + app. 32.5 - 34.5, hw. 39.7 - 43.0, width of head 8.0 - 8.2; ♀ 33.0 - 35.0, 42.0 - 45.5, 8.3 - 8.5 mm.

Our ♂ from Stephansort (Astrolabe Bay) and the one from New Ireland are exactly identical with typical specimens from Hollandia.

Our four males from Kaimana and S^{ei} Aindoea, in West New Guinea, are true to small-spotted individuals of the Humboldt Bay country in the mid-north; in one of them there are no traces of brown spots in *c-sc* of the hinder wing.

The position of the single ♂ from the Digoel River is somewhat obscure, the basal spot on hind wing is as small as it is in small-spotted individuals of the northcoast, but the genital hamule and lobe resemble those of *loewi* rather closely, whilst the purplish frontal patch is somewhat smaller and less brilliant than in typical *propinqua*.

I am not at all sure about the status of the males reported by RIS from the Aroe Islands; the colour of the frons of these specimens is said to be "o b e n ganz violettmetallisch" (the spacings are mine), and the great length of the genital hamule is explicitly mentioned: "Hamulus steil, gerade und sehr gross, den Lobus mindestens um dessen eigene Länge überragend" (RIS, l.c. p. 535). Both characters would point to *rosenbergi* rather than to *propinqua*. Of the material in SELYS's collection, enumerated by RIS in the monograph, only the ♀ from "Nouv.-Guinée intérieure" appears to belong to this species (RIS, l.c. p. 977).

This new species differs from *T. euryale* and *transmarina* in the much greater extent of the dark patches on the base of the hinder wings.

D i s t r i b u t i o n: New Guinea (universal ?), low country; Aroe Is. (?); New Britain; New Ireland; N. Queensland (Cooktown).

Urothemis signata aliena SELYS (pl. 38 fig. 126).

1878. SELYS, Mitt. Mus. Dresden, 3, p. 294 - 305. — ♀ New Guinea (*aliena*).

1897. SELYS, Ann. Soc. ent. Belg. 41, p. 74 - 75, 77 - 78. — ♀ New Guinea (*Macrodiplax* (?) *aliena* & *Urothemis consignata*).

1909. VAN DER WEELE, Nova Guinea, 9 Zool. 1, p. 22. — ♂ S. New Guinea (*sanguinea aliena*).

1913. RIS, Cat. Coll. SELYS, Lib. 16, p. 1025 - 1026, fig. 589 (♂ wings, Merauke). — ♂♀ Centr. & S. New Guinea (*signata bisignata*).

Material studied. — North New Guinea (W. to E.): 1 ♂, 1 ♀, Kressi plain, Berap Lakes (120 km S. W. of Lake Sentani), ca 400 m, 9.iii-11.iv.1936, W. STÜBER. 1 ♂, Lake Sentani, Kojaboe, 30.vi.1938, J. OLTHOF. 37 ♂, 9 ♀, Hollandia and environs, 0 - 400 m, 27.viii-4.ix, ix, xi-xii.1930, i-ii.1931, W. STÜBER. Allotype ♂: Hollandia, xi-xii.1930.

South New Guinea: 1 ♂, 1 ♀ Digoel River territ., Namkajamme, xii. 1938, and Ederat, ii.1939, J. M. VAN RAVENSWAAY CLAASEN.

The specific features of *U. signata* have been fully set forth by RIS when discussing the species in the Selysian monograph, and their repetition here is not necessary. Owing to the lack of sufficient material from many localities, the key to the subspecies referred to *signata* by him could not be prepared without lumping together a number of forms which, with more material, might have proved to be distinct subspecies, and therefore this key was somewhat too generalized. RIS had but few individuals from the Australian region, viz. the type of *U. consignata* SELYS, a ♂ from Merauke and another ♂ from Bowen, Queensland. He was led to use *bisignata* BRAUER as the name for a complex of forms including the Papuan subspecies for which SELYS had proposed the name *aliena* over sixty years ago. He had further established the identity of SELYS's ♀ from "Nouvelle Guinée intérieure", only from the evidence of the type in the Brussels Museum, but as this individual is a teneral and poorly preserved specimen, he was undecided whether it was different from *bisignata* or not.

I have examined two males from the southern Philippines and a good series of both sexes from Java and elsewhere [1]), which are clearly *bisignata*.

When compared with *signata bisignata*, its nearest relative, *aliena* is at once separable by a combination of characters; our extensive series of forty males, thirty-seven from a single locality, presents a good index to the variation which occurs in *aliena*, and which is of no great importance.

As the ♂ of *aliena* has not yet been described, I have selected a Hollandia specimen as the allotype.

Male (Hollandia). — Face and frons throughout Flame scarlet in perfectly preserved specimens; frons neither obscured nor slightly metallic.

Thorax and abdomen coloured much as in *signata bisignata* but for the following differences. Dark band along humeral and lateral thoracic sutures more pronounced, but not sharply delimited. Abdomen with mid-dorsal longitudinal black stripes on segm. 8 and 9 narrower, not or only slightly widened from base to apex of segment, often linear or almost absent.

Genitalia: lamina anterior and posterior lobe shaped similarly to *s. bisignata*. Hamule longer and slenderer than in the other subspecies, projecting downwards under right angles instead of inclined gradually backwards, apex abruptly curled

[1]) Specimens in our collection from other islands outside our faunal limits will not concern us here.

sidewards and finely pointed instead of evenly tapering to a backwardly directed blunt point (pl. 38 fig. 126).

Wings hyaline; neuration as in the other subspecies of *signata*. Traces of amber-coloured basal spots usually present on extreme base of fore wing (first anal cell). Basal spot on hind wing small, very little variable, shaped similarly to *s. bisignata* but less dark, orange-rufous or Sanford's brown instead of dark Auburn, and with the amber-coloured areola inconspicuous or altogether wanting; basal spots in *c-sc* amber-yellow, never brown. Pterostigma dirty reddish, or brown, between thick black nervures.

Female (Hollandia). — Differs from *s. bisignata* as follows:

A fairly distinct, though ill-defined, brownish stripe along humeral and second lateral sutures of thorax, each posterior stripe joining its fellow on the opposite side across the ventral surface of the thorax so as to form a continuous transverse fascia.

Legs reddish-brown and black; apical one-sixth or less of posterior femora, apices of tibiae very narrowly, and tarsi entirely, black.

Wings: basal spot on hind wing very variable, either deep amber-coloured to as far as slightly beyond *Cux* (without dark cell-centres), or with the basal cells in the anal field coloured as in the ♂ and surrounded by a golden-yellow areola. In three old adults the wings are somewhat smoky with the apices slightly obscured, whilst the basal patches on hind wing are reduced to diffuse dirty orangish spots in *cu* barely as far as *Cux*, and in the anal area to as far as A_2.

Abdomen reddish- to dark greyish-brown. Transverse carinae usually obscured, but sometimes all segments with more conspicuous and broader brownish-black apical rings. Ventral surface of abdomen with distinct, ill-defined brownish patches, one on each side, on posterior half of segments 2 - 7; these marks often confluent on middle and enlarged so as to form distinct transverse apical bands. Genital structures not different from *s. insignata*. Eggs (protruding in several specimens) coloured bright yellow.

Length: ♂ abd. + app. 25.0 - 27.0, hw. 35.0 - 37.0; ♀ 24.0 - 25.5, 36.0 - 37.0 mm.

The single ♂ from Ederat (Digoel River valley), does not differ in any way from northern individuals of that sex, but the ♀ from Namkajamme, a locality which is but few miles distant from Ederat, corresponds very closely with SELYS's description of the type of *"Macrodiplax ?aliena"* so far as body-colouring is concerned. The present ♀ is an aged individual with damaged wing-tips, in which the colours of the body have faded. The dark humeral and second lateral sutures of the thorax are sharply defined and very conspicuous, standing out as deep black bands on a yellowish-brown background, whilst the mesepisternum is of a greyish-brown tint.

The wings are tinted greyish-yellow all over the membrane, the basal spot on hind wing is only small, sharply defined, dark ferruginous-brown in colour, whilst there are no traces of golden-yellow areolae.

Legs coloured as in other specimens of *aliena*.

The abdomen is dirty brown with conspicuous black carinae and transverse apical rings of the same colour, widest ventrally, to all segments except the basal ones.

Abd. 27.0, hw. 35.0 mm.

This subspecies is easily distinguished from *s. bisignata* by the slightly different shape of the genital hamule of the ♂. Both sexes of *aliena* further differ from *bisignata* by having only the tips of the posterior femora black and the posterior tibiae entirely orange-yellow instead of wholly brownish-black or black.

Lastly, the much reduced basal spots on the hind wings and the dark stripes over the lateral sutures of the thorax may serve to distinguish *aliena* from its nearest relative.

RIS's specimen of *'U. signata bisignata'* from Bowen, Queensland, possibly also belongs here.

Distribution: New Guinea (universal along the coasts); ? Queensland.

Fam. CORDULIIDAE.

Hemicordulia silvarum RIS (pl. 35 fig. 104 - 107).

1903. FÖRSTER, Ann. Mus. Nat. Hung, 1, p. 542. — ♂ Astrolabe Bay (*assimilis*).
1913. RIS, Nova Guinea 9 Zool. 3, p. 500 (key), 504 - 505 fig. 24 (♂ apps.), 25 (♂ wings). — ♂♀ S. New Guinea.
1915. RIS, Ibid. 13 Zool. 2, p. 85. — ♂♀ S. New Guinea, no descr.
1926. TILLYARD, Rec. Austral. Mus. 15, p. 161. — ♂ „Papuan Gulf", S. New Guinea.

Material studied. — North New Guinea (W. to E.): 3 ♀, Mamberamo River plain, van Rees Hills, Batavia Rapids, 20 m, iii-iv.1940, J. P. K. VAN EECHOUD. — 1 ♂ (ad.), Baliem Valley, 1600 m, 12.xii.1938, "no yellow marks"; 5 ♂, 8 ♀ (mostly ad.), Araucaria Camp, 800 m, 3 & 30.iii and 3.vi.1939; 2 ♂, 3 ♀, Bernhard Camp B, 100 m, 5-10.iv.1939; 1 ♀, above Bernhard Camp, 600 m, 13.iv.1939; all L. J. TOXOPEUS. — 36 ♂, 34 ♀, Hollandia, Pim, Lake Sentani and environs, 0 - 300 m, 23.ix, xi-xii.1930, i-ii, iii, iv-v.1931, iv-vi, 31.x.1932, 26.iv. 1933; Tami River valley, 25.i-18.ii.1933; Mameda, 20-22.xi.1934; Kressi plain, Kressi (120 km SW of Lake Sentani), 200 - 450 m, i.1932, and Berap Lakes, 7-21.iii.1936; Dempta Hills, 600 m, iii.1936, W. STÜBER. — 2 ♂, 2 ♀, Cycloop Mts, 700 m, 5-8.ix & 27.xi.1933, and 1000 m, 8.viii.1935, W. STÜBER. — 14 ♂, 14 ♀, southern Bewani Hills, upper course of Tami River, 300 - 500 m, Gerere, 1.xii, Jarom (Major), 24-26.x, Josko and Njau, xi.1936; Kwimmi-Arso, ii-iii, Uskwar, 6.iii, 12-30.iv & 2.v.1937; Fumb River, 20-30.iv.1937; Ampas distr., Kali Bau (Lat. 3° 10′ S., Long. 140° 54′ E.), 31.i.38; Keerom River, 100 m, 25.ii.1939; Parfi, 300 m, 13.vi.1939; Afikop, 800 m, 13.vi.1939, all W. STÜBER. — 1 ♂, Torricelli Mts, sea-level to 2000 ft, i.ii.1939, E. L. CHEESMAN (Adelaide Museum). — 1 ♂ (ad.), labelled: "N.-Guinea, Biró, 23.xii.1899, Astrolabe Bay,

Stephansort" (printed), "*Hemicordulia assimilis* Selys ♂" (FÖRSTER's hand), in Mus. Budapest.

South New Guinea (W. to E.): 1 ♂ (ad.), Kaimana, 6.vii.1941, E. LUNDQUIST (Negumy Expedition); 2 ♂, 2 ♀ (ad.), Lorentz River territ., Bivouac No. 3, ca 750 m, 9-11.xi.1909, H. A. LORENTZ (paratypes), author's coll., ex Mus. Amsterdam); 1 ♀ (ad.), Digoel River territ., Namkajamme, xii.1938, J. M. VAN RAVENSWAAY CLAASEN; 1 ♂ (juv.), Merauke, iii.1939, R. G. WIND.

As RIS already has accurately described both sexes of this graceful and common species, I will only add a few important points, and give some measurements which may be compared with those of other regional species of *Hemicordulia*.

The colour-scheme of thorax and abdomen varies very greatly in both sexes according to the age of the insect and no attempt can be made to subdivide the species into regional forms. In the adult male the prevailing colour of the thorax is Tawny-olive to Snuff brown with rather narrow metallic-green bands which are conspicuous on dorsal half of the mesepisterna (along the upper end of the humeral suture) and along the second lateral suture on the metepimeron; the abdomen in such specimens being obscured so much as to become entirely of a dull bronzy or purplish black tint, except the sides of the basal segments, which are shiny brown with low metallic lustre. In less mature and juvenile specimens the two basal segments, including the genital organs, are yellow or brownish, whilst segm. 3 - 8 bear large yellow side-marks which on 3 and 4 are broadly interrupted behind the transverse carinae so as to form a rather rectangular spot before and a slightly longer oval spot behind the carina; many juveniles, moreover, have the apical margin of segm. 10 also bordered with yellow.

This marked variability was also noticed by STÜBER and Dr TOXOPEUS, as witness the collector s remarks on the enveloppes of very old examples, e.g. "no yellow markings" (♂ Baliem Valley, 12.xii. 38, L. J. T.).

Male (ad.). — Pterostigma dark brown, $\frac{1.4 - 1.5}{1.2 - 1.3}$ mm long. Membranula grey.

Legs black; coxae and anterior femora light brown, anterior tibiae darker brown. Tibial carinae brown, along distal half of first pair, absent on second pair, and almost along full length of posterior pair. Length of posterior femur (excl. troch.!) 6.6 mm.

Genitalia (pl. 35 fig. 105): hamulus pale brown, the end-hook obscured; genital lobe yellow; pile golden yellow.

Anal appendages (pl. 35 fig. 104) very slim and slender, superior pair 3.2 - 3.4 mm long, slightly longer than segm. 9 and 10 taken together.

Female. — The ♀ resembles the ♂ closely; the genital structures are figured in pl. 35 fig. 106 - 107.

Size variable. Length: ♂ abd. + app. 33.0 - 36.0, hw. 28.0 - 31.0; ♀ 32.5 -34.5, 29.4 - 31.3 mm.

H. silvarum is undoubtedly the commonest species of the genus in the Indo-Australian archipelago.

FÖRSTER's specimen from the Astrolabe Bay, identified by him with *assimilis* SELYS, is an adult male which does not in any way differ from Hollandia specimens.

Distribution: New Guinea (universal).

Hemicordulia cyclopica, sp. n. (pl. 35 fig. 108 - 109).

Material studied. — 1 ♂ (ad.), North New Guinea: Cycloop Mts, 1000 m, 8.viii.1935, W. STÜBER.

Male (holotype). — Labium pale orange-yellow. Mandible-bases and labrum dull orange, the latter fringed with orangish hairs. Clypeus and most of the frons in profile view, dull greyish-olive with dark brown hairs. Frons rounded, shaped and sculptured similarly to *silvarum* and *hilbrandi;* orange, palest along fronto-clypeal suture, fading to dull olive-grey laterally; horizontal part of same with a transverse, bright metallic-blue, dorsal mark, which is ill-defined laterally and in front, where it acquires a more greenish tint; seen directly from above the orange ground-colour remains visible on both sides and in front of the metallic dorsal patch. Vertex also similar in shape to *silvarum,* finely and densely punctured, bluish-purple in colour. Occipital triangle dark brown.

Synthorax brilliant dark metallic blue-green alternated with yellowish-brown markings, as follows: a large marking occupying the lower half of the mesepisternum, the entire mesinfraepisternum, posterior half of mesepimeron, the entire metinfraepisternum, middle of the metepisternum, from a level slightly above the spiracle upwards (the latter area intermingled with metallic-blue), and the posterior half of metepimeron. The pale marks are ill-defined and nowhere very pronounced, except on lower portion of mesepimeron where it is surrounded by metallic-blue. Venter of thorax brown.

Legs with the coxae and most of the first two pairs of femora brown; tibiae, tarsi and posterior legs black. Tibial carinae dark brown, almost black, along distal half of first pair, absent on second pair, and almost along full length of posterior pair of tibiae. Length of posterior femur 7.0 mm.

Wings with some yellow points at extreme base only; membrane slightly flavescent, except at the tips. Neuration as for genus. Nodal index $\frac{5.7.7.6}{6.5.5.6}$. Pterostigma black, small, scarcely longer than in *silvarum,* $\frac{1.7}{1.3}$ mm long. Membranula dark grey.

Abdomen robust, only very slightly constricted on third segment and not noticeably spindle-shaped, widest on apex of segment 6. Dorsum of segment 2 and 3 somewhat shiny, metallic-green, fading to pale brown laterally; colouring on the sides of 1 and 2 and base of 3 very indefinitely intermingled with yellowish. Remaining segments dull metallic purplish-black with slightest indi-

cation of brownish, elongate, lateral marks on 3 - 7; 8 - 10 and appendages black.

Genitalia (pl. 35 fig. 109): hamulus pale brown, the long and very slender end-hook black; genital lobe brown.

Anal appendages of decidedly more robust build and much shorter than in *silvarum;* superior pair 3.0 mm long and exactly as long as segments 9 and 10 taken together; inferior appendage somewhat shorter than upper pair, very slender, but more triangular than in *silvarum* (pl. 35 fig. 108).

Length: abd. + app. 39.0, hw 34.6 mm.

F e m a l e unknown.

This very distinctive species differs from the common Papuan *H. silvarum* in its superior size and solid build; also in the robust and spindle-shaped abdomen. *H. cyclopica* is at once distinguished from *silvarum* by the different shape of the genital hamule and lobe, and by the much heavier and shorter anal appendages.

H. cyclopica, sp. n. definitely approaches *H. oceanica* SELYS, from Tahiti, most closely among the numerous described species of the genus.

In June, 1938, I have confronted the holotype of *H. cyclopica* with the type of *H. oceanica* in the Brussels Museum. This enabled me to ascertain that the two insects belong to different species; the chief differences may be best understood on giving them in tabular form:

H. oceanica SELYS (holotype).	*H. cyclopica,* sp. n. (holotype).
Small and slender (abd. + app. 30.5, hw. 28.5 mm).	Large and robust (abd. + app. 39.0, hw. 34.6 mm).
Frons metallic-green dorsally, this colour extended downwards to as far as half-way its vertical surface.	Frons metallic blue-green on dorsum only.
Thorax emerald green, only the posterior half of mesepimeron with a narrow yellow band; infraepisternites also somewhat yellowish.	Thorax metallic-green with rich brownish-yellow markings (see description).
Femora and tibiae brown, only the apices of femora slightly darker interiorly.	Legs largely black.
Genitalia (distorted and damaged).	Genitalia (see description).
Abdomen metallic green; yellow marks indistinct on basal segments, those on 4 - 7 distinct though rather small.	Abdomen purplish black; pale marks indistinct.
Anal apps. of slender form; sup. pair in dorsal and lateral view cylindrical, each distinctly twice outcurved	Anal apps. larger and stouter, superiors less strongly curved basally, distal half of each almost straight both

(near base and before apex), with inwardly curved obtuse apices; seen obliquely from beneath each sup. app. bears a sharp, longitudinal, latero-ventral ridge which is continuous from base to apex [1]). in dorsal and lateral view; seen obliquely from beneath each sup. app. bears a sharp, longitudinal latero-ventral ridge which leaves off abruptly at about halfway its length (pl. 35 fig. 108).

Both species have seven antenodal cross-nerves in the fore wing.

It is quite difficult to understand why FRASER considers *H. oceanica* SELYS to be a subspecies of *H. assimilis* SELYS, from Celebes, the latter in fact being a totally different species.

FRASER by this slip, was led moreover to use *assimilis* SELYS 1871 as the base name for this species, when of course *oceanica* should have been considered the nominate subspecies of the aggregation as *oceanica* has page priority over *assimilis*.

Distribution: North New Guinea (1000 m alt.).

Hemicordulia hilbrandi, sp. n. (pl. 35 fig. 110 - 111).

Material studied. — 2 ♂ (1 juv.), West Central New Guinea: Wissel Lakes group, Lake Paniai, 1742 m, 22.viii (paratype) and 4.ix.1939 (holotype), H. BOSCHMA (Le Roux Expedition).

Male (ad., holotype). — Labium palest yellow. Mandible-bases and labrum testaceous, fringed with pale brown hairs. Clypeus, sides and lower portion of the vertical surface of frons, uniform olive-brown with brown hairs. Frons shaped and sculptured as in *silvarum* and *cyclopica,* olive-brown; horizontal surface brilliant metallic-green, this colour somewhat more extensive anteriorly than in *cyclopica,* so that the brown ground-colour in front of it is barely visible in dorsal view. Vertex shaped as in *silvarum,* finely punctured, purplish-green in colour. Occipital triangle dark brown.

Synthorax brilliant metallic-green alternated with yellowish-brown as described for *cyclopica,* but all pale marks slightly more extensive, as e.g. the lower three-fifth instead of the lower half of the mesepisternum is pale brown; posterior half of metepimeron strongly intermingled with metallic-green. Venter of thorax greyish-testaceous.

Legs coloured exactly as in *cyclopica.* Tibial laminae as in that species, those on anterior tibiae occupying the distal four-seventh of their length.

Wings with a minute yellow basal spot in *cu,* not extending beyond *Cux* in hind wing; membrane slightly flavescent. Neuration as for genus. Nodal index $\frac{5.6.7\ 5}{8.5.5.7}$ (type), $\frac{6\ 6.7.6}{7.5.5.6}$ (paratype). Pterostigma black, very small: $\frac{1.3}{0.9}$ mm long. Membranula dark grey.

[1]) The appendages of the type of *H. oceanica* SELYS resemble closely in shape those figured by FRASER for *H. cupricolor* FRAS., from Samoa (*Insects of Samoa,* London, B.M. 1927, pt. 7 fasc. 1, p. 38 text-fig. 4).

Abdomen slender, but not nearly so strongly spindle-shaped as in *silvarum* and with basal segments less constricted. Colouring similar to *silvarum,* but basal segments not definitely yellow laterally, 1 - 2 (and 3 partly) shining brown with metallic-green reflections on dorsum. Remaining segments dull metallic purplish-black with moderately distinct, dull orangish lateral marks on 4 - 7; these basal marks are sub-triangular in shape, widest basally, tapering and fading away slightly beyond half-way the length of each segment; 8 - 10 and appendages black.

Genitalia (pl. 35 fig. 111): hamulus very small, much narrower than in *silvarum,* brown, the curved end-hook black; genital lobe widely distant from hamulus in both specimens, triangular and similar in shape to *silvarum,* but with the apex more abruptly pointed so as to form a nipple-shaped apical knob.

Anal appendages comparatively solidly built; superior pair very slender but strongly twisted sub-basally, rather thick and almost straight in profile view, 2.6 mm long and a little longer than segm. 9 and 10 taken together; inferior appendage shorter than the superiors, triangular, shaped much as in *cyclopica* (pl. 35 fig. 110).

Length: abd. + app. 31.1, hw. 27.8 mm. The paratype is a teneral specimen.

This little species is nearly related to *H. silvarum* RIS, and probably also to *H. erico* ASAHINA, from the Caroline Islands [1]). It differs from these species, and from *H. oceanica* as well, in the shape of the genital organs and appendages.

Named in honour of Professor HILBRAND BOSCHMA, director of the Rijksmuseum van Natuurlijke Historie, Leiden.

Distribution: West Central New Guinea (1740 m alt.).

Hemicordulia olympica, sp. n. (pl. 36 fig. 114 - 115, pl. 37 fig. 116 - 117).

Material studied. — Central New Guinea: 19 ♂, 18 ♀ (mostly ad., one pair *in cop.*), Lake Habbema and surroundings, 3225 - 3300 m, 31.vii-18.ix.1938 (4 spec. freshly emerged, with exuviae, 1-3.viii; 2 ♂, 4 ♀ juv., "at night and early on morning at lamp", 20-27.viii). 3 ♂ (ad.), Fens in moss-forest on mountain slope N. of Lake Habbema, 3000 m, 23-24.viii.1938. 1 ♀ (juv.), Moorland N. E. of Lake Habbema, 3300 m, 15.viii.1938. 4 ♂, 2 ♀ (ad.), Moss Forest Camp, 2800 m, 16, 25 & 29.x.1938. 1 ♀ (juv.), Top Camp, 2100 m, 24.i. 1939. L. J. TOXOPEUS et al. — Holotype ♂ and allotype ♀: Lake Habbema, 3225 m, 21.viii.1938, L. J. TOXOPEUS. One ♂ (Lake Habbema, 10.viii.1938) with collector's note: "Hunts far from land over open water, but also over small brooks and frequently over moorland. Observed capturing small damselflies during flight" (L. J. T.).

A sturday, hairy species with metallic deep black body and sides of thorax and abdomen conspicuously adorned with bright yellow (Light cadmium or Lemon-chrome) spots.

[1]) *Tenthredo,* 3, 1940, p. 8 - 10, pl. 2 fig. 5 - 6, textfigs. 13 - 18.

Male (ad.). — Head broad; eyes transverse, much wider than long, meeting mid-dorsally for an unusually short distance, which is distinctly shorter than the occipital triangle is long. Face broad. Labium pale yellow. Mandible-bases and labrum dirty grey-ochreous to pale greyish-green, its anterior border brownish. Clypeus light brownish olive, or between Tea green and Glaucous-gray in very old examples; basal half of postclypeus with a fairly distinct yellowish transverse mark on each side of the middle along fronto-clypeal suture. Frons shaped as usual, sloping surface ochraceous-tawny to cinnamon brown laterally, growing paler (glaucous-gray) towards the middle and deepening to russet or mummy brown upwards; sulcus moderately deep; dorsal surface transversely wrinkled, brilliant metallic peacock green with an oval, bright yellow dorso-lateral spot, placed on either side between the metallic patch and the margin of compound eye. Vertex of the usual trapezoidal shape. Pile dark brown.

Synthorax robust and hairy; pile silvery-grey and brown. Ground-colour Mars brown with low metallic greenish-blue or blue areas chiefly confined to the epimera of the meso- and metapleurae. Dorsal surface of thorax usually somewhat lighter in colour, cinnamon-brown to russet, each of the mesepisternites with a transverse yellow spot, placed immediately in front of the ante-alar triangles and of about the same size as the latter. Sides with four, very sharply pronounced, roundish yellow spots which have an average diameter of 1.4 mm; one almost circular spot is placed on the lower third of the mesepimeron; the second, rather more triangular spot, of about half the size of the first, is situated just posterior to the dorsal end of the first lateral suture, under the dorsal carina of each metepisternite; the two remaining dots are subequal in size, slightly oval, and but little smaller than the first, situated on the dorsal and ventral third of the metepimeron. These four spots are all of a bright light cadmium or lemon-chrome tint and contrast strongly against the dark ground-colour of the thoracic sides. Ventral surface of thorax tawny.

Legs of the usual shape and size, entirely black, the coxae and trochanters dark brown. Tibial carinae distinct, ending in a short spine, along distal four-seventh of anterior pair, absent on second pair and almost along full length of posterior pair. Length of posterior femur (excl. troch.) 8.0, of posterior tibia 7.9 mm.

Wings hyaline, neuration closer and all veins stronger than in such slender forms as *silvarum* and allied lowland species. Membrane tinted with amber (especially along the veins) except at extreme base, in adult specimens, throughout pale yellowish in juvenile males. Extreme bases of both fore and hinder wing with vestiges of dark ferruginous or blackish brown spots in *c* and *sc*, and in the hinder wing moreover in *m*, *cu* and the anal area. Antenodals 7 - 8 in fore wing, 4 - 5 in hinder wing; postnodals 6 - 7 and 7 - 9, respectively. Membranula pure white, the distal one-third or two-fifths dark rusty-brown. Pterostigma very narrow, of moderate size, blackish-brown.

Abdomen robust and spindle-shaped, ventral surface of segments 4 - 8 flattened. Basal segments somewhat inflated (2.8 mm across segm. 2), 3 constricted

on middle (1.4 mm) and from this point gradually and conspicuously expanded as far as the end of 6, where the abdomen attains its greatest width of 3.4 mm; finally it gradually decreases again in width towards the end of segm. 10 (2.3 mm). Colour throughout dull black, only the dorsum and sides of 1 - 2 and basal half of 3 smooth and shiny dark metallic blue-black. Yellow marks conspicuous, as follows: A subtriangular or elongate mid-lateral yellow mark on 3, which, starting at the transverse suture, usually meets the posterior border of 2, where it is narrowest; besides this a vestige of a similar spot upon middle of posterior half of 3; segm. 4 - 8 each with conspicuous chrome-yellow baso-lateral triangular spots, gradually increasing in size and largest on segm. 7, where the spot reaches beyond the basal one-third along ventral border. These baso-lateral spots are also conspicuous on the ventral surfaces of the tergites 5 - 8. Segm. 9 and 10 blackish-brown or black.

Genitalia (pl. 36 fig. 115) blackish, long soft pile on anterior lobe yellow; hamule brown, its apex black; genital lobe black, the hairs dark brown.

Anal appendages robustly built, black, the dorsal surface of the inferior one often dark brown; shape as shown in pl. 36 fig. 114; superior appendages 3.0 - 3.1 mm lang, very little longer than segm. 9 and 10 taken together.

Female (ad.). — Exactly similar to the male, but for the following differences.

Face usually somewhat paler, with the yellow streaks on each side against the frontal suture on postclypeus generally ill-defined and often inconspicuous.

Wings with the basal spots more distinct and slightly enlarged, deep rusty-brown in colour, limits diffuse; in the hinder wing the basal spot in *c-sc* extends distad as far as Ax_1, or slightly before or beyond that level, in *cu* as far as *Cux* or a little further, and 2 - 3 cells in the anal field. Membrane either greyish-hyaline, or dirty yellowish, especially along the costal margin of both pairs of wings. Membranula and pterostigma as in the male.

Abdomen shaped similarly to the male; yellow marks somewhat larger, the paired spots on 7 about two-fifth as long along ventral border as the segment itself. Segment 2 with a roundish or somewhat triangular yellow dot upon the middle of the sides, near ventral border. Segment 9 also with an additional, though small, basal yellow side-spot.

Valvula vulvae brown, not or only slightly projecting ventrad, shaped as shown in pl. 37 fig. 116 - 117. Anal appendages 2.5 - 2.7 mm, black, shaped as in the figure.

Length: ♂ abd. + app. 34.0 - 38.5, hw. 32.6 - 34.4, pt. $\frac{1.5}{1.3}$; ♀ 36.7 - 40.0, 34.5 - 36.4, pt. $\frac{1.8}{1.6}$ mm.

This magnificent Corduliid is the most striking insect among the aquatic fauna of Lake Habbema. With the exception of *H. ericetorum* sp. n., which appears to reach its highest altitude here, *H. olympica* was the only Anisopter

breeding in the lake. Associated with these two dragonflies were several species of *Oreagrion* and *Ischnura*.

The following quotations are taken from BRASS's [1]) very full and interesting account of the climate and phytogeography of the Lake Habbema area, where entomological collections were made between June 29 and Sept. 18, 1938.

"Lake Habbema lies in the outermost and shorter of two broad grassy valleys that run parallel to the axis of the range on a high, shelf-like plain. The Habbema valley is perhaps twice as long as the lake, which has a length of about 4 km., a width of 2 km., and is 3225 m. above sea level. The inner valley, in which a headwater stream of the Balim proper flows westward and the Wamena tributary eastward from an almost imperceptible divide, continues for an undetermined distance far to the west in the direction of Mt. Carstensz. The bottoms of these valleys of the high plain are flat and treeless. They contain many little pools and are drained by winding streams lined with the curious *Cycas*-like tree-ferns peculiar to high altitudes in New Guinea. There are also numerous pools on the tops of the smooth ridges that separate the two high valleys and form the rim of the Grand Valley." (p. 276).

"The upper end and much of the south shore of the lake were bordered by open marsh. Several timbered ridges touched on the north shore, where a deep bay provided a sheltered anchorage for the flying-boat and a good site for the camp." (p. 316).

"Despite warm clothing, good food and housing and an abundant supply of firewood, there was not much margin of comfort when, as it frequently did, the temperature fell below freezing point, and even the hardiest individuals felt the cold when afield in the chilling drizzle that accompanied the normal afternoon mist. On clear days, when the sun shone intensely bright and the rapid evaporation of high altitudes so dried the less sappy plants of the open ground that they crunched and broke underfoot, standard shade temperature rose as high as 21° C., while relative humidity fell as low as 33 per cent. Native personnel as well as Europeans were troubled with sunburn and cracked lips in the week of almost rainless weather that closed the month of July. A grass temperature of 36° was recorded on a sunny day on which maximum shade temperature reached only 18°.

August was a month of inconstant weather in which rain fell on eighteen days, hail on three occassions, and there were two thunderstorms. Most of the rain fell during the afternoon and night. Only two days were wet throughout. Heavy fogs over the lake and its surroundings, of which there were twelve in August, lasting from before dawn to about 7.30 a.m., were followed almost invariably by bright sunshine until at least early afternoon. On such days the fog would be cleared by a slight southeast breeze, followed by a fitful east air, then a gusty northeast breeze that brought up dark driving clouds, mist and rain. A six day spell of bleak unsettled weather, with intermittent rain, came, however, from the southeast. No violent winds were experienced.

The frequent rains of August were sufficient tot compensate evaporation and keep the peaty soil in a constant moist to wet condition, but there was little surface run-off. Receipts from drainage and precipitation on its surface failed to balance discharge and evaporation from the lake, the waters of which fell 20 cm. during this period, exposing beaches of sand and oozy mud, but were brought back to their former level by heavy rains during the afternoon and night of August 31.

[1]) L. J. BRASS, "The 1938-'39 Expedition to the Snow Mountains, Netherlands New Guinea". *Journal Arnold Arboretum*, 22, 1941, p. 271-342, 7 full-tone pls. and map.

Rainfall records were kept by the military party for the three months August to October. The records for August are not available. During September, measurable precipitations on 21 days gave a total of 284 mm. In October, falls of 4 to 25 mm. on 21 days totalled 258 mm." (p. 317).

"The peaty character of the soil on the highlands of the Snow Mountains and the weather experienced at Lake Habbema, where a camp was maintained for four months (July 20 - November 18) in the southeast season or "dry monsoon", point to the area being climatically wet." (p. 330).

"Temperatures for the period July 26 to September 3 were: maximum (37 days) 11 - 21, mean 18, minimum (38 days) minus 3 — plus 4.5, mean 1.1° C. There were 14 minimum readings of zero C. or lower. Diurnal variation ranged from 10 to 22.5°, as compared with 6.5 to 14° for the 2800 m. Camp (Moss Forest Camp). Readings of relative humidity were made for the purpose of ascertaining extreme rather than average conditions. It was found to range from 92 % to 100 % at 6.30 a.m., and from 76 % to 82 % at 6 p.m. (sundown). In dry sunny weather, readings of 33 % to 59 % were obtained at noon, and 46 % to 58 % at 1 p.m." (p. 317 - 318).

"Closed forest, as described, occupied but a small part of the wooded ridges in the Lake Habbema area. The prevailing tree communities of the sandstone ridges, which approached the open grasslands of the valleys and hollows in extent, were at best an open forest of smut-darkened *Libocedrus* and *Podocarpus papuanus*, and on basal slopes often no more than a low savanna stand of *Libocedrus* alone. Fastigiate and symmetrical when young, the *Libocedrus* trees assumed distorted shapes in age, when their bizarre appearance was heightened by gouty *Myrmecodia* spp., which occurred everywhere as epiphytes on the conifers and also grew on the ground. Golden-brown and purplish bryophytes on the trees, and brilliant little *Dendrobium* spp. with orange, red, green or purple flowers, provided patches of colour. The ground vegetation which controlled the habitat in these forest successional or subclimax communities ranged from dwarf bog grasses and herbs to long tussock grasses, ericoid shrubberies and scrubs of broad-leaved trees stunted to the stature of shrubs. Pits dug in the shrubberies went through 20 to 50 cm. of peat before encountering a bleached subsoil of grey sand containing fragments of the parent sandstone." (p. 320).

"Marshes of considerable extent spread back from the upper end, much of the south shore, and part of the northern bay of the lake. Forming a lipped edge where the marshes touched on the lake, were deep soft beds of peaty material which, when walked on, yielded as if afloat. The marsh vegetation consisted of a thick stand of *Deschampsia* and *Scirpus*, a metre or more high. The outlet stream of the lake, which flowed wide and deep before dropping away in rapids, was also edged with *Scirpus* beds and tall *Carex*, and contained quantities of submerged *Potamogeton*. Plentifully tufted in sandy marginal shallows of the lake were two species of *Isoetes*." (p. 323).

H. olympica was a common species usually seen patrolling the shore of Lake Habbema or balanced over still water, mostly flying far out of reach of a long-handled insect net. Mr TOXOPEUS told me that the adult males were as wary as hawks, requiring a very swift swing of the net and a sure aim. As long as its habits were still unknown it was hopeless to attempt their capture and it lasted a fortnight before one of the collectors succeeded to catch an adult specimen. But later a fair series of both sexes were taken about the edge of the forest, close to the shore among the bushes of *Vaccinium* and *Rhododendron*.

It was also found to the northeast of the lake in the high moss forest at 2800 m alt., and frequently seen wandering over the fens at 3000 metres on a mountain slope, some being caught north of the lake on a small plateau with undrained *Sphagnum* ponds and conifers recalling the Lake Habbema surroundings [1]). Judging from its absence from the Iebèlè and Balilem river camps, the single individual captured on the mountain ridge where the Top Camp was sited (2150 m) probably is a straggler.

H. olympica probably develops only in quiet water. The nymphs were found sheltering under decaying wood or, still more frequently, under boulders along the shore of the lake. When ready to emerge they usually crawl but a few inches above the water's edge. The exuviae were generally found clinging to standing aquatic plants, e.g. rushes and long grass, or adhering to dead branches of trees fallen into the water; quite a number were found on the sides of the small wooden landing-stage of the hydroplane "Guba" and after some time a few were even clinging to the collapsible canoe used by the members of the expedition to crossing the lake. In a few cases the exuviae were hung up on bushes or found adhering to the bark of a *Libocedrus* tree at some distance of the water. As they were commonly attached to a fragile support they soon fell into the water or were blown away by the wind. Many juveniles were actually found with their exuviae and several others which had not yet attained their full powers of flight were captured in the moorland and sparse coniferous forest surrounding the lake.

On rainy days emergence would take place during the night, teneral individuals then being attracted to light, settling at dawn on the canvas of the tents.

Hemicordulia olympica, and its smaller relative *ericetorum,* are no doubt members of a luxuriant group of highly specialized forms, which, by their hairy appearance and compact build, are adapted to a life in the cold mountainous regions of New Guinea and therefore stand somewhat apart from other members of the genus. A noteworthy character is that afforded by the conspicuous markings of the thorax and abdomen, giving the body of these insects a curious quasi-archaic appearance. A somewhat similar condition obtains in the Australian genus *Synthemiopsis;* and when on August 4th, Mr TOXOPEUS, in a letter from Lake Habbema Camp, sent me a first description and photograph of freshly emerged *H. olympica,* I was inclined to suspect a possible relationship between that genus and our *Hemicordulia.* Some months afterwards, on examining the dried specimens, this proved to be entirely unjustified and both species, though being new to science, agreed in every respect, venationally as well as structurally, with true *Hemicordulia.*

Hemicordulia, like the Libellulid genus *Diplacodes,* is one of the few 'modern', or ectogenic, Australian dragonflies that, having passed northwards into the Papuan region, has spread far and wide beyond its Australian

[1]) The highest recorded altitude of *H. olympica* was at 3850 m, near a small lake at Scree Valley Camp, but no specimens could be taken there.

zoocentre. As is clearly shown by its distribution, the genus has most decided powers of dispersal but not generally a wide specific range. In New Guinea *Hemicordulia* with 5 species is well represented but not a single of these species occurs in Australia. The period of time elapsed since their penetration into the Papuan region is quite unknown, but being highly specialized insects with great powers of dispersal and with apparently great flexibility of organization, species of *Hemicordulia* could easily have adapted themselves to the climate and changed environmental conditions and became modified in accordance with these new conditions, producing several special forms in different localities. Those forms possessing great adaptability to varied conditions and exceptional vigour of constitution were able to establish themselves at high altitudes and to reach a country which would be likely to have its higher mountains and favourable subalpine stations to a great extent unoccupied, or occupied — if ever — by indigenous forms unable to compete with these immigrants. This possibly indicates a somewhat recent invasion of the ectogenic elements from Australia.

[TILLYARD, in his "Biology of Dragonflies" [1]) has already pointed out that the fauna of the Papuan portion of the Australian Region is so different from that of the rest that one may well question the wisdom of including the two within one region. In the Odonata, at any rate, the Papuan fauna, as far as TILLYARD knew it some twenty-five years ago, has closer affinities with the Oriental than with the Australian fauna proper. He thought it advisable, however, not to proceed to any definite decision yet, because the highlands of New Guinea were not yet explored. It is just at these higher levels that the Australian character of the fauna might have been expected to make itself felt, whereas the Oriental portion is flagrantly noticeable along the overheated coast-line, as it is also in North Queensland. But instead of finding in the high mountains of New Guinea a number of archaic derivatives of the rich autochthonous (palaeogenic or entogenic) Odonate fauna of the Australian region, and apart from the more recent and highly developed *Hemicorduliae,* we meet — as the most striking feature of the Papuan fauna — with an immense number of purely endemic genera and species, many of these also highly specialized, which do not in the least show relation with either the Oriental or the Australian faunas. This suggests that the semi-continent of New Guinea is at least as self-contained a zoocentre as Australia, and the very obvious paucity of essentially Australian genera obliges us to place the union of New Guinea with Australia at a very remote epoch. Of these e n t o g e n i c groups of Australia, which form the autochthonous fauna of that part of the world, only the genera *Diphlebia, Synthemis* and the *Argiolestes*-group have found their way into New Guinea. These are obviously archaic genera and have followed their own lines of development in New Guinea. No single p a l a e o g e n i c element of the Australian fauna has so far been found in the Papuan region].

[1]) The University Press, Cambridge, 1917, p. 292.

Hemicordulia ericetorum, sp. n. (pl. 36 fig. 112 - 113, pl. 37 fig. 118 - 119).

Material studied. — Central New Guinea (W. to E.): 16 ♂, 4 ♀ (partly juv.), Lake Paniai (Wissel Lakes group), 1740 m, 23-30.viii, and 1 & 29.ix; 2 ♂, 2 ♀ (ad.), Araboe Bivouac, 10 miles N. E. of Lake Paniai, ca 1800 m, 9 & 26.x, and 3.xi.1939. All H. BOSCHMA (Le Roux Expedition). — 3 ♂, 6 ♀ (mostly ad.), Lake Habbema, 3225 m, 21.viii.1938 (1 ♀), Moss-forest N. of Lake Habbema, 2850 and 2950 - 3000 m, 22-24.viii.1938 (3 ♂, 5 ♀). 7 ♂, 6 ♀ (3 ♂, 2 ♀ ad.), Moss Forest Camp, 2600 m, 21-27.x.1938; 1 ♀ (ad.), id., 2700 m, 17.x.1938; 5 ♀ (2 ad.), id., 2800 m, 16 & 23.x.1938. 2 ♂, 4 ♀ (juv.), Above Moss Forest Camp, 3000 - 3050 m, 25.x & 5.xii.1938. 10 ♂, 13 ♀ (5 ♂, 6 ♀ ad.), Iebèlè Camp and River, 2150 - 2300 m, 23-28.x, 7 - 16 & 30.xi, 3.xii.1938. 8 ♂, 7 ♀ (5 ♂, 1 ♀ ad.), Baliem River Camp, 1600 m, 20-21.xi and 6-16.xii.1938. 2 ♀ (ad.), Mist Camp, 1800 m, 3-9.i.1939; 1 ♂ (ad.), Above Mist Camp, 2100 m, 17.i.1939. 1 ♂, 5 ♀ (2 ♀ ad.), Top Camp, 2100 m, 22-28.i and 2-4.ii.1939. All L. J. TOXOPEUS. — Holotype ♂ and allotype ♀: Baliem Valley, 1650 m, 14.xii.1938, L. J. TOXOPEUS.

Closely allied and similar to *H. olympica,* but of much smaller size and less brightly coloured.

Male (ad.). — Head shaped and coloured exactly as in *olympica,* but labrum entirely grey-ochreous and postclypeus without yellowish markings laterally; no distinct dorso-lateral yellowish spots on the frons, but dorsal metallic-green patch sharply delimited, widest in front and rather more trapezoidal in shape, the pale ground-colour well-visible laterally.

Synthorax robust and hairy; pile long, silvery-grey, very conspicuous, especially on the metapleurae. Ground-colour Mummy brown with metallic blue-green lustre better developed than in *olympica* especially on dorsal half of mesepisterna and along upper two-thirds of humeral and second lateral sutures; each of the mesepisternites with a vague, transverse, pale greenish or yellowish-white spot, placed immediately in front of the ante-alar triangles. Sides marked with three or four light yellow spots, similar in principle to *olympica,* but much less conspicuous, less sharply defined and of smaller and different size. One elongate spot, parallel to the humeral suture, is placed on the lower third of the mesepimeron; it is rounded and most distinct ventrally, somewhat tapering and fading away dorsally, and, when reaching its maximum size, about 2.0 mm long and 0.8 mm wide; the second yellow point or spot (usually indistinct or absent altogether) is situated just posterior to the dorsal end of the first lateral suture, under the dorsal carina of the metepisternite; the remaining dots are placed upon the lower and upper parts of the metepimeron: the lowermost is elongate or oval, only little smaller than the mesepimeral dot and runs parallel to the second suture, whereas the dorsal spot — though being a little shorter — is definitely more roundish and runs parallel to the dorsal margin [1]). These spots strongly contrast against the dark ground-colour,

[1]) In one ♂ from Iebèlè, 2250 m, the two metepimeral yellow spots tend to coalesce.

but not nearly to such an extent as in *olympica*. Ventral surface of thorax tawny.

Legs as in *olympica*. Tibial carinae distinct, ending in a short spine, along distal two-thirds of anterior pair, absent on second pair and almost along full length of posterior pair. Length of posterior femur (excl. troch.) 6.3, of posterior tibiae 6.1 mm.

Wings hyaline, neuration close, veins strong. Membrane slightly amber-tinted in old individuals. Extreme base of both fore and hinder wing usually with mere ferruginous-brown traces in *c* and *cu*. Antenodals 7 - 8 in fore wing; postnodals 5 - 6 (f.w.) and 6 - 7 (h.w.). Membranula dark grey, pure white basally and at extreme apex. Pterostigma of small size, reddish-brown, dirty red in semi-adult specimens.

Abdomen rather slender, distinctly spindle-shaped, but to a less extent than in *olympica*, ventral surface of segment 4 - 8 flattened. Basal segments somewhat inflated (2.4 - 2.5 mm across segm. 2), 3 constricted on middle (1.4 mm) and from this point gradually expanded as far as the end of 6, where the abdomen attains its greatest width of 2.6 mm; finally it gradually decreases again in width towards the end of segm. 10 (1.8 mm). Colour blackish-brown to black, with low metallic-green lustre on segm. 2 - 3 and base of 4; remainder of abdomen with slight bronzy reflections. Yellow marks very distinct, but less conspicuous than in *olympica*, as follows: an almost complete, pale yellow, mid-lateral fascia on 3, extending longitudinally from base almost to apex, slightly narrowed and rounded posteriorly but mostly ill-defined and often obscured; segm. 4 - 8 each with conspicuous bright yellow baso-lateral triangular spots, those on 4 square, occupying the entire lateral surface from base to transverse carina and followed by a less distinct oval yellow patch upon the distal third of the sides; on 5 the spots are about half the size of those on the preceding segment, occupying hardly over one-fifth the length of segment, while on 6 to 8 they are again of larger size, distinctly triangular in shape and sharply pronounced, on 7 almost meeting one another at extreme base along the mid-dorsal carina, and prolonged along the side-margin, extending one-fourth to one-third the length of segments and largest on segm. 7. (In immature specimens vestiges of baso-lateral spots are also present on 8). On the flattened ventral surface of the abdomen, which otherwise is of an uniform brown colour, the yellow basal spots are also conspicuous on the tergites of segm. 3 - 7. Segm. 9 and 10 unmarked, the apical third of 10 usually brown.

Genitalia (pl. 36 fig. 113 - 113a) dark brown, end-hook of hamule black; pile greyish, on genital lobe black.

Anal appendages black, middle portion of superior pair and upper surface of inferior appendage dark reddish-brown in colour; shape as shown in pl. 36 fig. 112; superior appendages 2.8 - 2.9 mm long, as long as segm. 9 and 10 taken together.

F e m a l e (ad.). — Differs from the ♂ only in the following respects: The transverse, metallic-green patch on dorsal surface of frons less conspicuous and definitely smaller, usually reduced to two ill-defined, more or less roundish light

metallic-green patches on top of frons, which are surrounded by brown even along base; vertex light brown, slightly metallic posteriorly.

Synthorax as in male, but ground-colour lighter brown, especially on dorsum; pale marks similar to male.

Wings smoky yellow in old specimens, especially at apices, with traces of basal yellow rays in *sc* and *cu* only (allotype). In young individuals the membrane is hyaline, but the basal saffroning, though ill-defined, extends as far as the arculus.

Abdomen shaped and coloured similarly to the male in perfectly preserved examples. Pale markings on sides of segm. 2 - 3 obscured, usually so much so as to become obsolete.

Valvula vulvae light brown, slightly projecting ventrad, shaped as shown in pl. 37 fig. 118 - 119. Anal appendages as long as segm. 9 and basal half of 10 taken together, 1.8 mm, brownish-black, shaped as in the figure.

Length: ♂ abd. + app. 31.0 - 34.0, hw. 29.4 - 31.4, pt. $\frac{1.3}{1.2}$; ♀ 32.4 - 34.4, 29.0 - 32.2, $\frac{1\,1\text{-}1.2}{1.0\text{-}1\,1}$ mm.

H. ericetorum is evidently a much more widely spread species in New Guinea than *olympica*. Its general occurrence at Lake Paniai (1750 m) in the west and the valleys north of the Nassau Range towards the east suggests that it occupies, scattered over the island, all marshy mid-mountain stations upwards to very high levels. In the Snow Mountain region at any rate it extends from the bottom of the Baliem Valley at 1650 m up the central range to an altitude of 3225 m at Lake Habbema, — where it is largely replaced by *H. olympica*. Apparently most common at about 2150 - 2300 metres, e.g. in the Iebèlè Valley. This camp stood on a grass patch on the high right-hand bank of the Bèlè river, here a rapid mountain stream with a rocky and bouldery bed, which was about 20 m wide. The relative abundance of *ericetorum* in this locality, where no marshes or lakes were found, seems rather astonishing, but may be explained by the fact that the valley provides open grounds surrounded by steep mountain slopes: sheltered marshes possibly are not far away from this spot.

No larvae of *H. ericetorum* were discovered by either of the two expeditions.

Distribution: Central New Guinea (1600 - 3225 m alt.).

Procordulia astridae LIEFTINCK (pl. 37 fig. 120 - 122).

1935. LIEFTINCK, Nova Guinea, 17, p. 295, 299 (pars, ♀ only). — ♀ N. New Guinea (*sylvia* part., ♀).

1935. LIEFTINCK, Treubia, 15, p. 189 - 190. — ♂♀ N. New Guinea.

Material studied. — N. & C. New Guinea: 1 ♂ (ad.), Lower Mist Camp, 1550 m, 29.i.1939, L. J. TOXOPEUS. — 11 ♂, 17 ♀ (several pairs taken *in côp*), S. Cycloop Mts, 1000 m, 21.ii, iv, viii-ix.1935, W. STÜBER.

The capture of a single male of this very conspicuous and scarce species by Mr TOXOPEUS and a series of both sexes by Mr STÜBER, enables me to give the following additional descriptions of the two sexes of *P. astridae.*

M a l e (ad.). — Labium Mars yellow; labrum Xanthine orange; clypeus Brussels brown. Frons short and broad, rounded, with a distinct, almost acute, transverse ridge in front; lower portion of vertical surface smooth and shiny, finely and sparsely punctured; upper portion coarsely wrinkled, brown, acquiring dorsally a metallic-green lustre. Horizontal portion of frons brilliant metallic-green, this colour replaced by brown laterally in dorsal view; sulcus deep; hair dark brown. Vertex trapezoidal, very slightly concave dorsally in frontal view, finely punctured, dark greenish and purplish black. Occipital triangle smooth, blackish-brown.

Synthorax very brilliant metallic-green, except the ante-alar triangles, a narrow humeral line, the infraepisternites, and fine lines along the sutures, which are reddish- to dark brown. Pubescence conspicuous, consisting of long and soft, silvery- or greyish-yellow hairs all over the thorax. Venter of thorax brown.

Legs long and slender; coxae dark grey-brown. Femora and tibiae bright Sanford's brown, only the extreme apices obscured (black); tarsi black. Posterior femur (excl. troch.) 9.0, posterior tibia 9.2 mm long. Tibial laminae distinct, but reduced to a very short sub-apical ridge, of about one-twelfth of the entire length and ending in a short spine, on anterior pair of tibiae, which themselves are rather strongly curved; absent on second pair; and almost along full length (except basal one-twelfth) on posterior pair.

Wings hyaline, or strongly flavescent, according to maturity; bases golden yellow as far out as *Cux* in hind wing. Neuration brown, *Arc* usually at Ax_2, but often slightly proximal to it, especially so in hinder wing. Fore wing triangle always traversed by a single transverse cross-vein, hind wing *t* free; *ti* in fore wing irregular, five-sided (anal side not coinciding with anal angle of *t*). Only one *Cux* in both fore and hinder wing. Nodal index variable: $\frac{10-12}{6-8}$ antenodals, $\frac{6-8}{8-10}$ postnodals. Pterostigma small, orange, $\frac{1.4-1.6}{1.2-1.4}$ mm long.

Abdomen long and slender, definitely less expanded and less spindle-shaped, than in *leopoldi,* attaining its maximum width very gradually at the end of segm. 9. Ground-colour reddish brown; metallic-green lustre less intensive and the green lighter than in *leopoldi,* especially vivid on dorsum of segm. 1 - 3 and 4, then gradually less bright and intermingled with bronze colour from before backwards; 8 - 10 dull purplish bronzy-black in fully adult examples. Segm. 6 - 9 each with an indistinct, somewhat transverse, subtriangular, rusty-brown lateral apical spot. Under surfaces of all segments brown. Sides of segm. 2, including the auricles (which are low and rounded) and genital organs, brown.

Anal appendages, brown; superiors of robust build, parallel, shaped as in pl. 37 fig. 120; inferior appendage sub-truncated apicad.

F e m a l e (ad.). — Similar in most respects to the male. To the description of the type, the following notes may be added.

The wings are coloured similarly to the opposite sex, but in most specimens the basal spots, though ill-defined apically, are somewhat more extensive, and in addition, there is a pale yellow patch between nodus and pterostigma, in the costal half of fore wing. The position of *Arc* and the proximal side of the hind wing triangle are slightly variable.

Abdomen in fully adult specimens exactly identical in shape to the male; its slender form is noteworthy.

Coloration as in the opposite sex; apical segments slightly but distinctly expanded in dorso-ventral dimension.

Valvula vulvae and anal appendages shaped as in pl. 37 fig. 121 - 122; valves scarcely projecting ventrad.

Length: ♂ abd. + app. 42.0 - 43.0, hw. 39.4 - 40.5; ♀ 43.0 - 44.0, 42.8 - 44.5 mm.

Distribution: North and Central New Guinea (1000 - 1550 m alt.).

Procordulia leopoldi FRASER.

1932. FRASER, Mém. Mus. Roy. d'Hist. Nat. Belg. hors sér. 4, 3, p. 19 - 20 fig. 3 (apps. ♂). — ♂ Lake Anggi, N. W. New Guinea.

1935. LIEFTINCK, Nova Guinea, 17, p. 295 (key)-298 fig. 47 (ins. ♂), 48 (apps., genit. ♂), 49 (genit. ♀). — Type ♂ re-descr., ♂♀ New Guinea.

Material studied. — N. & C. New Guinea: 1 ♀, Hollandia, 4.vii.1938; 3 ♂, Araucaria Camp and River, 800 m, 12, 17 - 18.iii.1939, L. J. TOXOPEUS.

This species has been discussed by me at length in a previous paper (loc. cit.). Since that date I have received from Mr STÜBER a great many specimens of both sexes mostly from the Cycloop Mts (ca 100 m alt.), but also from the southern Bewani Hills (Lat. 3° 10' S., Long. 140° 54' E.) and other localities in low country. *P. leopoldi* is typically a species of the lower mountain-zone and the individuals captured on the foot-hills of the mountains are evidently stragglers.

Distribution: New Guinea (universal ?).

Anacordulia stüberi LIEFTINCK.

1938. LIEFTINCK, Nova Guinea, N. S. 2, p. 127 - 128, fig. 52 (genit. ♀). — ♀ N. New Guinea.

Material studied. — N. New Guinea: 1 ♀ (semiad.), Bernhard Camp, 60 m, 23.xii.1938, J. OLTHOF; 1 ♀ (juv.), Araucaria River, 800 m, 10.iii.1939, L. J. TOXOPEUS. — Living colours: "Markings brown and black" (♀ Araucaria River).

Since publication of my description of *A. stüberi*, I have received from Mr J. P. K. VAN EECHOUD a fine series of both sexes captured at Pionierbivak, Mamberamo River, 30 m, vii-medio xi.1939, and from Mr STÜBER a pair from Wembi, 270 m, southern Bewani Hills, southeast of the Humboldt Bay, 18.xii.1937. These examples will be discussed in the final part of my monograph.