THE PHILIPPINE GENUS \textit{RISIOCNEMIS} COWLEY (ZYGOPTERA: PLATYCNEMIDIDAE). 1. SUBGENUS \textit{RISIOCNEMIS*}

M. HÄMÄLÄINEN
Department of Agricultural and Forest Zoology, University of Helsinki, SF-00710 Helsinki, Finland

Received January 7, 1991 / Accepted February 4, 1991

The genus is divided into 2 subgenera, viz. \textit{Risiocnemis} (typified by \textit{R. serrata} [Hagen]) and \textit{Igneocnemis} subg. nov. (typified by \textit{R. ignea} [Brauer]). The subgenus \textit{Risiocnemis} is revised. 14 of the known 15 spp., incl. 10 new spp., are classified into 4 species groups, viz. (1) appendiculata group (appendiculata [Brauer], erythrura [Brauer], praeusta sp. n., confusa sp. n., kiautai sp. n., moroensis sp. n.); — (2) arator group (ator sp. n.); — (3) rolandmuelleri group (rolandmuelleri sp. n.); and — (4) serrata group (serrata [Hagen], asahinai Kitagawa, gracilis sp. n., varians sp. n., pulchra sp. n., laguna sp. n.). \textit{R. elegans} Kitagawa is not placed into any group, since no material was available for examination. Of gracilis sp. n. only ♂ and from moroensis sp. n. only ♀ are known; from the other spp. n. both sexes are described. Females of \textit{R. appendiculata} and \textit{R. erythrura} are described for the first time. \textit{R. cornuta} (Brauer), the lectotype of which is designated, is synonymized with \textit{R. serrata} (Hagen). Separate keys to the males and females are given and a review of studies on the genus is presented.

INTRODUCTION

\textit{Risiocnemis} Cowley, 1934 is a rather aberrant genus of Platycnemididae endemic to the Philippine islands. Until now 15 species have been described, two of which are mere synonyms.

The present review is based mainly on two large collections of Philippine dragonflies. The material gathered by Mr Roland A. Müller and his collaborators contains over 1000 \textit{Risiocnemis} specimens, referable to no less than 20 species, half of which are new. The collection of the late Dr F. Ris, deposited at

* Results of the Roland Müller Zoological Expeditions to the Philippines, No. 7.
the Senckenberg Museum, consists of ca. 250 specimens, mainly collected by G.
Boettcher in the 1910's. This material includes many other new species, not
represented in the Müller material. Besides these, all *Risiocnemis* specimens
deposited at the Rijksmuseum van Natuurlijke Historie (Leiden) and the Institut
Royal des Sciences Naturelles (Brussels) were also studied, and necessary type
specimens were borrowed from other museums.

Since the material at hand more than doubles the number of known species, a
revision of the genus is attempted, in spite of the belief that some further new
species will soon be discovered from the numerous, still inadequately studied
islands, or await description in different museum collections, not studied by me.

Using the criteria presented by LIEFTINCK (1981) in his species group
division, the genus is divided into two subgenera, *Risiocnemis* and *Igneocnemis*
subgen. nov. The revision will be presented in two parts, the present paper dealing
with species of the subgenus *Risiocnemis*, typified by *R. serrata* (Hagen), while
the second paper will be concerned with species of the subgenus *Igneocnemis*,
typified by *R. ignea* (Brauer). The latter will also contain a general discussion on
the genus, including a detailed comparison of the two subgenera, an attempt to
clarify the affinity of the subgenera and species groups within them, and notes on
the distribution pattern of the species.

It is evident that *Risiocnemis* is a fairly large genus, developed in an array of
closely similar species in different islands, many of which appear restricted to one
or a few islands. The bulk of the known species occur in Luzon and Mindanao; no
species is known from the Palawan island group and from the Sulu archipelago.
All species seem to be strictly rheophilous, mostly inhabiting small jungle streams
and creeks.

**GENUS RISIOCNEMIS COWLEY**

*Risiocnemis* COWLEY, 1934: 204.

= *Hypocnemis* Hagen in SELYS LONGCHAMPS, 1863: 153-154; preoccupied
name.

= *Prionocnemis* SELYS LONGCHAMPS, 1886: 222-223; preoccupied name.

Type species: *Hypocnemis serrata* Hagen in SELYS LONGCHAMPS, 1863:
154-155.

**REVIEW OF LITERATURE**

The genus *Hypocnemis* Hagen was erected in SELYS LONGCHAMPS (1863; pp. 153-154; sep.;
pp. 9-10) to accommodate a single species, *H. serrata* Hagen, from Manila. It was one of the four full
genera in the "Legion *Platycnemis* " of SELYS LONGCHAMPS (1863). In the corrections section of
his "Révision du Synopsis des Agrionines", SELYS LONGCHAMPS (1886, pp. 222-223)
proposed the name *Prionocnemis* as a substitute name for *Hypocnemis*, which is preoccupied by
*Hypocnemis* Cabanis, 1847 in Aves.

A few years later SELYS LONGCHAMPS (1891a; p. 216) found out that *Prionocnemis* was also
Revision of *Risiocnemis* Cowley, part 1

A preoccupied name — by *Prionocnemis* Schiödte, 1837 in Hymenoptera, and he somewhat conditionally proposed *Nesocnemis* as a substitute name, stating “Cela nous oblige malheureusement à changer encore. Prenons si Ton veut le nom de *Nesocnemis*”. This publication is dated 1st October 1891. However, in another paper published in the same year, but after 7th November (possibly in December), SELYS LONGCHAMPS (1891b) introduced the same name *Nesocnemis* as a new subgeneric name to accommodate a single species from Madagascar, *Nesocnemis sinuatipennis* n. sp., and placed the new subgenus into *Prionocnemis*. Thus, he created a nomenclatorial confusion, which must have remained unnoticed by COWLEY (1934), who introduced the name *Risiocnemis* to replace *Prionocnemis*.

Strict adherence to the rules would require keeping *Nesocnemis* Selys, 1891 as the correct replacement name for *Prionocnemis* Selys, 1886 and to consider *Risiocnemis* Cowley, 1934 as an unnecessarily introduced junior synonym. However, I prefer to continue the use of *Risiocnemis*, since in my view, changing of this established name, in use for more than 50 years, to a name never used after its introduction 100 years ago and forgotten even by its own author after one month (!), would not help to bring stability in the nomenclature.

BRAUER (1868) described five species in *Hypocnemis*: *ignea, appendiculata, cornuta, atropurpurea* and *erythraea*. SELYS LONGCHAMPS (1882) added *H. haematopus* and *H. flammaea* and provided an amended diagnosis of the genus and a key. SELYS LONGCHAMPS (1886; pp. 97-106) gave detailed descriptions of the 8 known *Hypocnemis* species.

Over 50 years elapsed until new species were described by KIMMINS (1936): *Risiocnemis incisa* and *R. reflexa*. NEEDHAM & GYGER (1939) treated the genus still under the name *Prionocnemis*. They pointed out the correlation of the crenulated wing apex with the distal position of the arculus, and described one new species, *P. rubripes*. Two further taxa, *Prionocnemis atripes* and *P. tendipes*, were added by NEEDHAM & GYGER (1941). These have remained the latest novelties of the genus until KITAGAWA (1990) recently described *R. asahinai* and *R. elegans*.

LIEFTINCK (1958, p. 254; 1963, p. 526) discussed briefly the affinities of *Risiocnemis* with some Oriental and Papuan platycnemid genera. In a very useful paper on some little known species, LIEFTINCK (1981) pointed out that Kimmims's *R. incisa* and *R. reflexa* were erroneously labelled as originating from Borneo, and that they in fact came from the Philippines, likely from Luzon, *reflexa* being conspecific with *haematopus* Selys, 1882. He also presented a diagnosis of the genus, divided it into two species groups and gave a detailed characterization of the second species group, typified by *R. ignea*.

KIAUTA & KIAUTA (1981) studied the karyotypic morphology of *R. incisa* and discussed the survival potential and distribution of the species in terms of cytotoxicologic evidence.

The larval stage is known only in *R. serrata*. It was first described and illustrated by NEEDHAM & GYGER (1939; pp. 271-273, pl. 14). Subsequent descriptions and discussions on its affinities to larvae of related genera were presented by LIEFTINCK (1958, pp. 285-286; 1963, pp. 526, 533-534, 540; 1981, pp. 96-97).

**DIAGNOSIS OF THE GENUS**

Diagnoses or definitions of the genus have been presented by SELYS LONGCHAMPS (1863, pp. 153-154, sep.: pp. 9-10; 1882, pp. 22-24; 1886, pp. 97-98), LIEFTINCK (1933, pp. 127-128), NEEDHAM & GYGER (1939, pp. 269-270) and LIEFTINCK (1981, pp. 94-95). Thus only a brief diagnosis is presented here:

---

1 Already the next year SELYS LONGCHAMPS (1892, p. 106) found out that his subgeneric name *Nesocnemis* is a junior synonym of *Tatocnemis* Kirby, 1889, a genus at present placed in Megapodagrionidae.
A genus of the platycnemid Calicnemidinae, characterized by the aberrant position of R4+5 and IR3, the origin of which is situated more distally than usual; R4+5 arise at the subnodus or slightly distal to it and IR3 is removed to the level of Px3-5. R3 and IR2 are situated further distally, in the position typical of the family. The border of the wing apex is either distinctly crenulated, or smoothly sinuate due to shallow emarginations between the tips of the main veins.

DEFINITION OF SUBGENERA

LIEFTINCK (1981) divided the genus into two species groups, the first of these typified by R. serrata and the second one by R. ignea. He gave good characterizations of both groups and wrote (p. 95) that his "... group characters may ultimately prove useful for the definition of subgenera". Considering the scope of differences in the two groups, especially in venation and penile structure, I think that it is best to give the groups a subgeneric status.

Table I
Details of venation in species of the subgenus Risiocnemis: origin of veins IR3, R3 and IR2 (at level of postnodals — — — —), and the number of postnodals. — [Fw = fore wing, hw = hind wing]

<table>
<thead>
<tr>
<th>Species</th>
<th>IR3</th>
<th>R3</th>
<th>IR2</th>
<th>Postnodals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fw</td>
<td>hw</td>
<td>fw</td>
<td>hw</td>
</tr>
<tr>
<td>appendiculata</td>
<td>4-5</td>
<td>3-4</td>
<td>7-9</td>
<td>6-8</td>
</tr>
<tr>
<td>erythrura</td>
<td>4-5</td>
<td>3-4</td>
<td>7-9</td>
<td>7-8</td>
</tr>
<tr>
<td>praeusta sp. n.</td>
<td>4-5</td>
<td>3-4</td>
<td>7-9</td>
<td>7-8</td>
</tr>
<tr>
<td>confusa sp. n.</td>
<td>4-5</td>
<td>3-4</td>
<td>8-9</td>
<td>7</td>
</tr>
<tr>
<td>kitautai sp. n.</td>
<td>3-4</td>
<td>3-4</td>
<td>8-9</td>
<td>6-8</td>
</tr>
<tr>
<td>moroensis sp. n.</td>
<td>4-5</td>
<td>4</td>
<td>8-9</td>
<td>6-7</td>
</tr>
<tr>
<td>arator sp. n.</td>
<td>4-5</td>
<td>3-4</td>
<td>8-10</td>
<td>7-8</td>
</tr>
<tr>
<td>rolandmuelleri sp. n.</td>
<td>3-5</td>
<td>3-4</td>
<td>7-9</td>
<td>6-8</td>
</tr>
<tr>
<td>serrata</td>
<td>3-5</td>
<td>3-4</td>
<td>7-9</td>
<td>6-7</td>
</tr>
<tr>
<td>asahiri:zi</td>
<td>4-5</td>
<td>3-5</td>
<td>7-9</td>
<td>7-8</td>
</tr>
<tr>
<td>gracilis sp. n.</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>varians sp. n.</td>
<td>4-5</td>
<td>3-4</td>
<td>7-8</td>
<td>6-7</td>
</tr>
<tr>
<td>pulchra sp. n.</td>
<td>4-5</td>
<td>3-4</td>
<td>8</td>
<td>6-7</td>
</tr>
<tr>
<td>laguna sp. n.</td>
<td>4</td>
<td>3-4</td>
<td>8</td>
<td>6-7</td>
</tr>
<tr>
<td>elegans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subgenus RISIOCNEMIS Cowley, 1934

Type species: Hypocnemis serrata Hagen in SELYS LONGCHAMPS, 1863, pp. 154-155.

Diagnosis. — Wing apex distinctly crenulated; arculus placed well distal to Ax2 (Figs 1, 3). Penis structure variable, side lobes with or without filaments (Figs 6-16).
Subgenus *IGNEOCNEMIS* subgen. nov.

**Type species:** *Hypocnemis ignea* BRAUER, 1868, p. 547.

**Diagnosis.** — Wing apex only smoothly sinuous; arculus in line with Ax2 (Figs 2, 4). Penis structure quite uniform, glans deeply cleft into scoop-shaped lobes (Fig. 5).

A more detailed comparison of the characters of the subgenera, as well as a discussion of their affinity will be presented in the second part of the revision.

Figs 1-4. Wing apex and base in the two subgenera: — (1, 3) *Risiocnemis (Risiocnemis) serrata*, ♂. — (2, 4) *Risiocnemis (Igneocnemis) haematopus* (Selys), ♀.

**TREATMENT OF THE SPECIES OF THE SUBGENUS RISIOCNEMIS**

The subgenus is divided into four species groups, mainly on the basis of the penile structure. The sequence of the groups is not arbitrary, but shows an affinity, which will be discussed in the second part of the revision.

The structure of the anal appendages provides the best characters for separating males of different species. Females can usually be told apart by the structure of the prothorax. The keys are based on the study of these structures; in a few cases other characters must also be consulted for a reliable identification. The apex of the abdomen does not provide characters that allow species identification in females. The ovipositor valves extend to the level of the apex of the anal appendages, or very slightly exceed it; the lower margin of the ovipositor valves are usually furnished with 16-20 denticles.

SEM photography was used as means for illustration, since it provides an easy and accurate way to depict the complex structures. A JEOL JSM-820 scanning microscope was used. Prior to viewing specimens were coated with gold using JEOL Fine Coat Ion Sputter JFC-1100. Magnifications of 50-70x (120-140x in Figs 72, 76) were used for photographing male appendages and female thoracic structures and those of 150-220x for penile structures. For photographing females of some species, the prothorax was detached from the pterothorax in order to minimize the damage to the specimen.

The provenance of the specimens photographed or illustrated is indicated in the "material studied" section of each species.
KEY TO THE MALES

1. On dorsal view the inner margin of superior appendages sinuous, with a distinct bulge inwards in the apical third of the appendage (Figs 56-58) ........................................ 2
   — On dorsal view the inner margin of superior appendages straight or slightly arched without a bulge inwards ...................................................... 4
2. Superior appendages clearly longer than segment 10 (Fig. 59) ....................... varians
   — Superior appendages of the same length or only a little longer than segment 10 .......... 3
3. Superior appendages shaped on dorsal view as in Figure 58; very abruptly narrowed in apex ........................................................... laguna
   — Superior appendages shaped on dorsal view as in Figure 57 ........................ pulchra
4. Inferior appendages not reaching to the level of the apex of superiors .................. 5
   — Inferior appendages reaching or slightly exceeding the level of the apex of superiors .... 9
5. Ventral process of superior appendages long and narrow or robust and triangular, ca 1/3 or more of the length of the appendage .............................. 6
   — Ventral process of superior appendages small, spine-like; 1/4 or less of the length of the appendage ................................. kiautai
6. Ventral process very long and narrow near the base (Figs 32-33) ................. kiautai
   — Ventral process more or less triangular .......................................................... 7
7. Apical side of the ventral process at a 90° angle with the appendage (Fig. 54) .... gracilis
   — Apical side of the ventral process at a 130° angle with the appendage (Fig. 34) .... confusa
8. Inferior appendages reaching only to midway of the length of the superiors (Fig. 50) serrata
   — Inferior appendages reaching well over the midway of the length of the superiors (Fig. 52) .......................................................... asahinai
9. Ventral process of superior appendages very broad and triangle shaped; the apical side of the process at 150° angle with the appendage (Figs 35-37) .... rolandmuelleri
   — Ventral process directed obliquely basalwards (Figs 44-45) ................................ arator
10. Ventral process directed straight ventrad or somewhat apicad .......................... 11
11. Ventral process long, well removed from the base; superior appendages distinctly longer than segment 10 (Figs 17-18) .............................. appendiculata
   — Ventral process nearer the base; superior appendages only a little longer than segment 10.12
12. Length of the ventral process about 1/3 of the length of the appendage (Figs 19-20). Glans of penis with pear-shaped, rounded side lobes (Fig. 7) .......... erythrura
   — Length of the ventral process less than 1/3 of the length of the appendage (Figs 21-22). Glans of penis with boot-shaped side lobes with narrow stem (Fig. 8) .......... praeusta

KEY OF THE FEMALES

1. Median lobe of prothorax protuberated with distinct tubercles .......................... 2
   — Median lobe of prothorax more or less raised, but without distinct tubercles .......... 7
2. Tubercles rather low, very gently sloping on the anterior side (Fig. 72) .......... serrata
   — Tubercles prominent, steeply raised .............................................................. 3
3. Tubercles sharply pointed at apex; middle lobe of the posterior lobe broad, plate-like (Figs 46-47) .............................................................. arator

2 Male of R. moroensis unknown. R. elegans Kitagawa not included in the key, since no material was available for study.
3 Female of R. gracilis unknown; R. elegans Kitagawa not included.
Figs 11-16. Penis of five *Risiocnemis* species: — (11) *R.* arator sp. n.; — (12) *R.* roandmuelleris sp. n.; — (13) *R.* serrata; — (14) *R.* asahinai; — (15-16) *R.* varians sp. n. — [Fig. 16 dorsal view; — others oblique lateral view]

— Tubercles rather blunt at apex; middle lobe of the posterior lobe different

4 Posterior side of the tubercle more steeply raising than the anterior side; thus the tubercle slanting slightly backwards; middle lobe of the posterior lobe bilobed (Figs 73-74) .. *asahinai*

— Tubercle upright, very prominent
5 Middle lobe of the posterior lobe triangular, with rather pointed apex (Figs 68, 75-76)\textit{varians}  
— Middle lobe of the posterior lobe rounded or kidney-shaped, with bilobed or notched apex \textit{varians}  
6 Middle lobe of the posterior lobe rounded and notched at apex (Fig. 70) \textit{laguna}  
— Middle lobe of the posterior lobe kidney-shaped, distinctly bilobed (Fig. 69) \textit{pulchra}  
7 In the posterior lobe, the lateral lobes forming a right angle with the middle lobe seen in lateral view \textit{rolandmuelleri}  
— Lateral lobes parallel with the middle lobe in lateral view \textit{confusa}  
8 Lateral lobes very long and narrow, directed straight backwards (Figs 48-49) \textit{moroensis}  
— Lateral lobes directed obliquely forward, partly overlapping the middle lobe in frontal view (Figs 40-41) \textit{tulipra}  
9 Lateral lobes longer than the middle lobe when seen in lateral view (Figs 42-43) \textit{moroensis}  
— Lateral lobes shorter than the middle lobe in lateral view \textit{confusa}  
10 Lateral lobes well removed from the middle lobe, directed obliquely laterad in dorsal view (Figs 38-39) \textit{kiautai}  
— Lateral lobes near to the middle lobe, quite parallel with it \textit{erythrura}  
11 Lateral lobes narrow or somewhat pointed (Figs 23-24) \textit{appendiculata}  
— Lateral lobes rather broad; rounded (Figs 25-28) \textit{moroensis}  
12 Pterostigma with costal side slightly shorter than anal side (Fig. 30) \textit{praestua}  
— Pterostigma with costal side much shorter than anal side; pterostigma thus more oblique (Fig. 29) \textit{erythrura}

THE \textit{R. APPENDICULATA} SPECIES GROUP

This group contains species in which the structure of the glans is rather unspecialized, being divided into flat side lobes without flagella. The median lobe of the female prothorax is without distinct pronotal tubercles. Males are variably coloured: \textit{appendiculata} reddish and \textit{kiautai} black. Colouring of three species, \textit{erythrura}, \textit{praestua} and \textit{confusa} is quite similar, a combination of black and red. \textit{R. moroensis} is placed into this group with some hesitation, since its male is still unknown. However, its prothoracic structures resemble those in the females of the \textit{appendiculata} group.

Species of the group are widely distributed in the archipelago, but are predominantly southern.

\textit{RISIOCNEMIS APPENDICULATA} (BRAUER, 1868)  
Figures 6, 17-18, 23-24

\textit{Hypocnemis appendiculata} BRAUER, 1868: 548 (orig. descr. of a $\delta$ from Mindanao); — SELYS LONGCHAMPS, 1882: 24, 26, 27 (note on the type specimen: "Mindanao, au commencement de juillet et dans la seconde moitié du mois d’aôut [Semper]"); — SELYS LONGCHAMPS, 1886: 98, 105-106 (additional terenal $\delta\delta$ from Mindanao; redescri.).

\textit{Prionocnemis appendiculata}: KIRBY, 1890: 127 (Mindanao); — NEEDHAM & GYGER, 1939: 270, 276, pl. 14: figs 181-182 ($\delta\delta$ from some provinces in Mindanao and Dinagat, brief characterization of $\delta$, fig. anal app.)

\textit{Risioenmis appendiculata}: LIEFTINCK, 1961: 142 ($\delta\delta$ from Mindanao, notes on size); — LIEFTINCK, 1974: 113, 129-130 ($\delta\delta$ from Mindanao; figs $\delta$ anal app.); — LIEFTINCK, 1981: 94 (wing crenulation); — DAVIES & TOBIN, 1984: 100 (Mindanao); — TSUDA, 1986: 49 (Philippines).

Type material. — Holotype: male specimen with pin labels: /Mind./ 32 / 561 / Hypocnemis appendiculata Brau. Mindanao/. I have added a label "Hypocnemis appendiculata Brauer, 1868."


**Diagnosis.** — Species with crenulated wing apex. Male: red. Superior appendages longer than segment 10, inferiors reaching as far as the superiors; superiors with a long and narrow process directed straight ventrad, well removed from base. Female: median lobe of prothorax only slightly raised. Posterior lobe with a broad middle lobe; separate lateral lobes rather narrow and pointed, lower than the middle lobe.

**MALE.** — The descriptions by BRAUER (1868) and SELYS LONGCHAMPS (1886) and figures of anal appendages by LIEFTINCK (1974) and those in the present paper (Figs 17-18) allow an easy identification of the male.

Specimens from Mindanao and Dinagat are uniformly bright reddish brown, most of the postclypeus being shining black; middorsal carina black and subalar ridge furnished with tiny black marks. In some older specimens from Mindanao the dorsum of the pterothorax is somewhat darkened. In specimens from
Panaon, Leyte, Homonhon and Bohol the dorsal side of abdominal segments 3-5 is distinctly darkened, blackish in older specimens. Teneral specimens are light reddish yellow with distinct whitish apical rings on segments 3-6.

Wings with brownish tinge in some specimens. Ac usually nearer to Ax1 than Ax2. R4+5 distal to subnodus in both wings. Other details of venation are presented in Table I. Pterostigma with anal side slightly longer than costal side; colour reddish brown.

Penis. — Glans gently cleft into rather broad and flat side lobes; the apical part of the lobes being expanded basalwards and apicad (Fig. 6).

Measurements (mm). Hw. 19-23; — abd. 31-38. — Specimens from Mindanao and Leyte are larger and those from Homonhon smaller than specimens from Dinagat and Panaon.

FEMALE (first description). — Postclypeus shining black, middorsal carina and parts of subalar ridge black. Body otherwise all brown. Dorsum of pterothorax somewhat darker than the sides. Teneral specimens with rather large and complete whitish subapical rings on segments 2-7, a reminiscence of which is also visible in mature specimens, except in the old ones. Pterostigma pale brown.

Prothoracic structures as in Figures 23-24. Median lobe only slightly raised. Middle lobe of the posterior lobe broad, bordered by small and rather narrow lateral lobes, more or less triangular and pointed. The lateral lobes vary in size to some extent, but are always lower than the middle lobe; smallest in Homonhon specimens.

Measurements (mm). — Hw. 19.5-23.5; — abd. 29.0-32.5.

Distribution. — Mindanao, Dinagat, Panaon, Leyte, Samar, Homonhon, Bohol.

Notes. — There seem to be small structural differences in populations from different islands, which would require a more detailed analysis. Females are quite similar to those of erythrura and praeusta, but can easily be told apart by the narrower lateral lobes of the posterior lobe.

R. appendiculata seems to be a quite common species in the East Visayan and Mindanao subregions, occurring at the same sites with praeusta at least in Leyte, Panaon and Dinagat, and possibly also with erythrura in Mindanao.

RISIOCNEMIS ERYTHRURA (BRAUER, 1868)
Figures 7, 19-20, 25-26, 29


Prionocnemis erythrura: KIRBY, 1890: 127 (Philippines).


**Type material.** — Holotype: male specimen with pin labels: /Placer / 562 / 130 / Hypocnemis erythrura Brau. Philipp./ Hypocnemis erythrura Br. ♂. I have added the following label: "Hypocnemis erythrura Brauer, 1868. Holotype. Rev. M. Hämäläinen 1990". — The holotype (from Placer, Surigao del Norte province, North Mindanao) is deposited in coll. Selys Longchamps at IRSN. At present the specimen lacks abdominal segments 4-10 and appendages.
Other material studied. — 8 ♂ (Figs 7, 19-20), 6 ♀ (Figs 25-26, 29), Mindanao, Surigao, 12-II, 14/29-V, 30-X/16-XI-1915, G. Boettcher leg. (SMF); — 1 ♂, Siargao, 6-IX-1916, G. Boettcher leg. (SMF); — 1 ♂, Mindanao, Surigao, L. Mainit, 30-XI-1959, Quate leg. (RMNH).

Diagnosis. — Moderately large species with crenulated wing apex. Male: black and red. Superior appendages as long as segment 10, inferiors reaching as far as the superiors. Superiors with a robust subbasal ventral process. Female: median lobe of prothorax only slightly raised; posterior lobe with a broad middle lobe, bordered with rounded lateral lobes, much lower than the middle lobe.

Male. — Head. — Labrum shining dark brown, apical border pale in some specimens. Anteclypeus yellowish. Postclypeus and genae shining black. Head above mat black, brownish dots on sides of the lateral ocelli.

Thorax. — Prothorax mat black. Dorsum and most of the sides of pterothorax mat black. Underside of thorax brown in the basal half, pale yellowish in the apical part; the pale colour extending upwards to the lower apical edge of metepisternum. Anterior half of metepimeron brown. Legs dark brown, hind femora yellowish brown.

Abdomen. — Long and slender, three apical segments somewhat broadened. Segment 1 yellowish white, apical half blackish on dorsum. Segment 2 blackish brown, yellowish ventrolaterally. Segments 3-5 blackish brown, with pale yellowish subapical rings, incomplete on dorsum, broadest below. Segment 6 blackish brown, turning scarlet red apicad. Segments 7-10 and anal appendages all scarlet red.

Teneral specimens are pale brown, with complete yellowish white subbasal rings on segments 3-5.

Superior appendages (Figs 19-20) as long as segment 10, with a robust subapical ventral process; the process about 1/3rd of the length of the appendage. Inferiors reaching as far as the superiors.

Wings. — Ac in fore wing nearer to Axl than Ax2, in midway in hind wing. R4+5 in continuation or distal to subnodus. Other details in Table I. Pterostigma rather large and oblique; anal side distinctly longer than costal side, proximal side oblique and distal side convex; colour brown.

Penis. — Of the appendiculata type; side lobes of glans pear-shaped, rounded (Fig. 7).

Measurements (mm). — Hind wing 25.0-27.5; — abdomen 39-44.

Female (first description). — Brown, with black markings as in appendiculata. Prothoracic structures as in Figures 25-26. Median lobe only slightly raised. Posterior lobe with broad middle lobe, bordered with rounded lateral lobes, lower than the middle lobe. Pterostigma similar as in male, shaped as in Figure 29.

Measurements (mm). — Hw. 24.0-26.5; — abd. 34.5-36.5.

Distribution. — Mindanao, Siargao.

Notes. — See under the next species.
Material. — **Holotype δ**: Leyte, South Leyte prov., St. Bernard, Catmon, 24-VI-1989, A. Buenafe leg.; at present in coll. Roland A. Müller (St Gallen, Switzerland), to be deposited at SMF — **Paratypes** (all from Müller's material and from Leyte): 16 δ (Figs 8, 21-22), 6 Φ (Figs. 30), from the same site as the holotype, 20/26-VI-1989, A. Buenafe leg.; — 1 δ, South Leyte prov., Catmon, Mt San Bernhard, IV-1990, A. Buenafe leg.; — 1 δ, South Leyte, St. Bernard, Bo Catmon, Mt Ha- pag, (1500 m), IX-1989, A. Buenafe leg.; — 1 δ, Leyte, Mahaplag, Hilusig, Mt Balocoaue, (600 m), V-1986, Th. Borromeo leg.; — 1 δ, as above, 29/VIII/14-IX-1986; — 1 δ, as above, 15/18-V-1987; — 2 Φ, locality as above, (700 m), 29-XI/1-XII-1989, Th. Borromeo jr leg.; — 1 δ, 1 Φ, locality as above, Magsuganao River, (700 m), 18/30-IX-1990, Th. Borromeo jr leg. — 1 δ and 1 Φ paratype in RMNH, the rest in coll. Müller and Hämäläinen. — Other material from coll. Müller: From Panaon (all from San Francisco, W. Catal leg., unless otherwise stated): 6 δ, 4 Φ, Mt Anislagon, (350 ft), VIII-1988; — 7 δ, 3 Φ (Figs 27-28), Anislagon Dako, (300 ft), VIII-1988; — 5 δ, 1 Φ, Panan-awan Creek, VIII-1988; — 3 δ, 2 Φ, Pag-ubayan River, VIII-1988; — 3 δ, Anislagon Gamay, (200 ft), VIII-1988; — 17 δ, Mt Kanao, (400 ft), VIII-1988; — 9 δ, 7 Φ, Batong Lapad, VIII-1988; — 2 δ, 3 Φ, Gabing Gamay, big river, X-1988; — 1 δ, Tabon River, Lilo-an, X-1988; — 2 δ, 1 Φ, Anislagon Creek (200 ft), X-1988; — 4 δ, 6 Φ, Anislagon River, 10/12-X-1990, Th. Borromeo jr leg. — From Dinagat (all from Loreto, A. Buenafe leg.): — 1 δ, Mt Canbinlio, Balitbiton River, 10/17-VI-1988; — 4 δ, as above, 24-IV/6-V-1988; — 4 δ, 1 Φ, as above, IX-1989; — 17 δ, 2 Φ, Mt Canbinlio, Canbinlio River, 4/18-VI-1988; — 2 δ, Mt Redondo, Midas River, 2/5-VI-1988; — 1 δ, Danao Lake, II-1989; — 1 δ, as above, 2-IV/5-V-1989; — 17 δ, 1 Φ, Mt Canbinlio, II-1989; — 5 δ, as above, VII-1989; 4 δ, 1 Φ, Mt Tristan, II-1989; — 1 δ, Mt Redondo, II-1989; — 2 δ, 1 Φ, Maribo River, 25/26-IV-1989; — 1 δ, Mt Redondo, Layongan, 15-V-1989; — 1 δ, Layongan, Mt San Ramon, VI-1989. — Other material at SMF: 3 δ, Biliran, 20-X-1915, G. Boettcher leg.; — 3 δ, Panaon, 7-XII-1915, G. Boettcher leg.

**Diagnosis.** — Species with crenulated wing apex. Male: black and red. Superior appendages as long as segment 10, furnished with a subbasal ventral process. Inferiors reaching as far as the superiors. Female: median lobe of prothorax only slightly raised. Posterior lobe with broad middle lobe, bordered with rounded lateral lobes, lower than the middle lobe.

**MALE.** — **Head.** — Labrum and postclypeus shining black; anteclypeus and the base of mandibles yellowish white. Head above mat black, with brownish dots on the sides of the lateral ocelli.

**Thorax.** — Prothorax black, brownish on sides. Pterothorax black on dorsum and on sides above the level of the stigma. Whole ventral surface of thorax yellowish white, the pale colour extending upwards covering the posterior corner of the hind coxa, at least the posterior part of the metinfraepisternum, most of the metepisternum and the whole metepimeron. Base of wings white. Legs black or blackish brown, but in one paratype specimen all femora pale brown. In specimens from Dinagat hind femora are pale brown.

**Abdomen.** — Shaped as in *erythrura*. Dorsum of segment 1 blackish brown, sides broadly yellowish white. Segment 2 blackish brown, the ventrolateral edge narrowly pale yellowish. Segments 3-5 blackish brown; subapical markings
restricted to small pale ventrolateral spots. Segments 6-10 wholly scarlet red; in specimens from Dinagat and Biliran also the dorsum of segment 5 red in the apical part.

Teneral males resemble mature females in colour; dorsum of thorax being
brown, ventral side paler. Abdomen with complete subapical pale rings on segments 3-5; apical segments pale red.

Anal appendages shaped as in Figures 21-22. Superiors as long as segment 10, furnished with a subbasal ventral process; the process a little less than 1/3rd the length of the appendage. Inferiors reaching as far as the superiors. Anal appendages red; apex of the ventral spine and apex of the inferiors black.

Wings. — Position of Ac variable, usually a trifle closer to Ax1 than Ax2. R4+5 distal to subnodus or in continuation to it. Other details in Table I. Pterostigma smaller and less oblique than in *erythrura*, anal side a little longer than costal side (the difference smallest in Dinagat specimens), proximal side less oblique than in *erythrura*; colour reddish brown.

Penis. — Of the *appendiculata* type; side lobes of glans boot-shaped with a narrow stem (Fig. 8).


FEMALE. — Similarly coloured as *appendiculata* and *erythrura*; body brown apart from the shining black postclypeus, black middorsal carina and black marks on subalar ridge. Dorsum of abdomen dark brown in older specimens. Teneral females with broad whitish subapical rings on segments 3-5.

Prothoracic structures as in Figures 27-28, very similar to those of *erythrura*. Median lobe only slightly raised; posterior lobe with broad middle lobe, bordered with rounded lateral lobes, which are lower than the middle lobe.

Pterostigma a little smaller and the proximal side less oblique than in *erythrura* (Fig. 30); colour pale brown.

Measurements (mm). — Leyte: hw. 25-26; — abd. 36.5-37.0. — Panaon: hw. 22-25; — abd. 31.5-36.0. — Dinagat: hw. 21.0-22.5; — abd. 31-34.

Distribution. — Leyte, Panaon, Biliran, Dinagat.

Notes. — In its appearance this species is very similar to *erythrura*. Most confidently the males can be told apart by differences in the penile structure.
Furthermore, in *erythrura* the ventral process is somewhat larger than in *praeusta*. The pterostigma is differently shaped, in *erythrura* larger and more sharply angulated in its anterior corner than in *praeusta*. In *erythrura* the dark colouring on the thorax is more extensive, the ventral surface being darkened in the anterior half, whereas in *praeusta* the whole anterior surface is pale.

Females are more difficult to separate, since the prothoracic structures are very similar. The shape of the pterostigma provides the best separating characters (Figs 29-30).

According to the present knowledge the ranges of these two species do not overlap. It is interesting to note that the two islands (Dinagat, Siargao) just off the northern coast of Mindanao are inhabited by different species.

**RISIOCNEMIS CONFUSA** SP. N.

_Figures 9, 34, 40-41_

*Prionocnemis erythrura* (neé Brauer, 1868): NEEDHAM & GYGER, 1939: 270, 274, pl. 14, figs 178-179 (from [Luzon] Tayabas province, Quezon Park; Brief $\delta$ characters, with figs of appendages).

**Material.** — **Holotype** $\delta$ (semimature; Fig. 34): Paete, [Laguna Prov.], Luzon, Phil[ippines], 28-VI-1916, G. Boettcher leg.; deposited at Senckenberg Museum, Frankfurt/Main. — **Paratypes:** 1 $<$ (teneral; Fig. 9), 2 $\varphi$ (Figs 40-41), same site and date as holotype (SMF); — 1 $\varphi$ (mature) [Luzon], [Quezon Prov.], Quezon Park, Tabayas [Tayabas], P.I., F. Juan leg. (CU, preserved in alcohol vial, wings mounted on plate).

**Diagnosis.** — Species with crenulated wing apex. Male: black and red (?). Inferior appendages extending to midway of the length of the superiors. Superiors with a broad, triangular ventral process near the base. Female: median lobe of female prothorax only slightly raised. Posterior lobe of prothorax with a small and rounded middle lobe; in the lateral view at right angle with long, forwardly slanting lateral lobes.

**MALE.** — **Head.** — Labrum, postclypeus and genae shining black. Head above mat black, brownish on sides of the lateral ocelli and on the postocular area. In the holotype specimen the face is shining dark brown and the head above brown with a darker figure around the antennae and ocelli. In the teneral paratype specimen the head is pale brown throughout.

Prothorax and pterothorax very dark blackish brown throughout, also the ventral surface all dark. In the holotype specimen the thorax is wholly warm chestnut brown, pale brown in the teneral specimen. Legs reddish brown in the mature specimen and yellowish brown in younger specimens.

Abdomen in the mature specimen deep brown on segments 1-6, darkest on segments 1-2. Segments 7-10 paler (the colour faded; reddish according to NEEDHAM & GYGER (1939). In the holotype specimen the abdomen is warm
chestnut brown, somewhat darkened around the segmental joints; in the teneral specimen the abdomen is light brown, with broad whitish subapical rings on segments 3-6, the rings becoming broader towards the apical segments.

Anal appendages shaped as in Figure 34; superiors as long as segment 10, inferiors reaching to midway of the length of the superiors. Superiors with a broad, triangular ventral process near the base.

Wings. — Ac much nearer to Ax1 than Ax2. R4+5 distal to subnodus or in continuation to it. Other details in Table I. Pterostigma longer than high, sides almost parallel; colour brown.

Penis. — Of the appendiculata type: side lobes of glans short, of rather uniform width (Fig. 9).

Measurements (mm). — Hw. 22.5-23.5; — abd. 33-34.

FEMALE. — Head, thorax and abdomen chestnut brown. Segments 2-5 with pale subapical spots on sides. Postclypeus dark only in the middle and in the lateral edges. Head with a black figure as in the holotype male, but the surroundings of the lateral ocelli paler.

Prothoracic structures as in Figures 40-41. Median lobe only slightly raised. Posterior lobe with small and rounded middle lobe, directed obliquely up- and backwards. Lateral lobes closely bordering the middle lobe, long and narrow, curved both forward and inwards, their tips overlapping the margins of the middle lobe when seen in frontal view. In lateral view the middle and lateral lobes are at a right angle.

Lower margin of ovipositor valves with ca 25 fine denticles.

Measurements (mm). — Hw. 20-23; — abd. 34.0-37.5.

Distribution. — Luzon.

Notes. — The colouring of mature males of this northernmost species of the group resembles apparently quite closely that of erythrura and praeusta. It can easily be separated from these species by the shape of the anal appendages.

RISIOCNEMIS KIAUTAI SP. N.

Figures 10, 32-33, 38-39

Material. — Holotype ♂: Philippines, Sibuyan Island, Magdiwang, Tampayan, Camp Ga-ong, (80-150 m), 1/12-IV-1987, Roland A. Müller leg.; at present in coll. Roland A. Müller (St Gallen, Switzerland), to be deposited at SMF. — Paratypes (all from Sibuyan Island, Magdiwang): 4♂ (Figs 32-33), 4 ♀, from the holotype site, 18-III/12-IV-1987, R.A. Müller leg.; — 3 ♀ Tampayan, New St. Gallen, (70 m), 5-IV-1987, R.A. Müller leg.; — 2 ♀, Jao-Asan, (20-100 m), 4-VIII-1986, R.A. Müller leg.; — 2 ♂, 2 ♀ (Figs 38-39), Tampayan, Pawala River, (50 m), 19/31-VII-1986, R.A. Müller leg.; — 1 ♂, 1 ♀, Silum (5-100 m), 3-VIII-1986, R.A. Müller leg.; — 2 ♂ (Fig. 10), 1 ♀, Mt Guiting-Guiting, (50-300 m), 19/26-VI-1986, Th. Borromeo leg.; — 1 ♂, 2 ♀, Katingas, 29-III-1987, A. Buenafe leg. — 1 ♂, 1 ♀ paratype at RMNH and in coll. B. Kiauta each, the rest in coll. Müller and Hämäläinen.

Etymology. — Named after Prof. Dr Bastiaan Kiauta (Bilthoven, The Netherlands) in appreciation of his generous help and support in my efforts in odonatology, and for bringing me in contact with Roland A. Müller.
Figs 32-37. Male anal appendages of three *Risiocnemis* species: — (32-33) *R. kiautai* sp. n.; — (34) *R. confusa* sp. n.; — (35) *R. rolandmuelleri* sp. n.; specimen from Negros; — (36-37) same, specimens from Sibuyan. — [Figs 32, 34-36 lateral view; — Figs 33, 37 oblique posterolateral view]

**Diagnosis.** — Species with crenulated wing apex. Male: black. Superior appendages short, inferiors not quite reaching to the level of the apex of the superiors. Superiors with a very long ventral process near the base. Female:
median lobe of prothorax only slightly raised. Posterior lobe with a rather broad middle lobe, directed obliquely up- and backwards, in lateral view forming a bridge over the apical margin of the raised median mesostigmal process.

**MALE. — Head.** — Labrum ivory blue, lower margin narrowly black. Base of mandibles partly blue. A broad metallic-blue belt crossing the face from eye to eye, covering ante- and postclypeus and frons up to the level of the upper end of the scape of antennae. In the frons of mature specimens the blue belt is more or less divided by black below the median ocellus. Head above mat black, with obscure brownish spots on the postocular area and around the ocelli.

**Thorax.** — Prothorax black with sickle shaped pale markings on median lobe. Pterothorax wholly black. Base of wings bluish. Coxae and trochanters black, femora pale brown, with extensor surface and joints dark brown. Tibiae and all spines blackish brown.

**Abdomen** black. Joint between segments 1-2 distinctly blue on dorsum. Dorsum of segment 2 with a pair of subapical spots, very small and obscure. Segments 3-6 with pale subapical X-shaped markings on dorsum, very obscure. Dorsum of segment 10 obscurely pale.

Teneral males are very pale. Head with blue band as in mature specimens. Prothorax bluish white. Sides of pterothorax broadly bluish white, pale brownish on middorsum and on the ventral side. Abdomen bluish white, pale brownish ventrolaterally; apical segments and all joints darker.

**Anal appendages** as in Figures 32-33. Superiors rather short, a trifle shorter than segment 10; furnished with a very long ventral process near the base. Inferiors not quite reaching to the level of the apex of superiors. Superiors pale blue, whitish on apex; inferiors black.

**Wings.** — Ac in midway between Ax1 and Ax2. R4+5 distal to subnodus, or in continuation to it in hind wing. Other details in Table I. Pterostigma slightly longer than high, sides almost parallel; colour dark brown.

**Penis.** — Of the *appendiculata* type; side lobes of glans very large and broad (Fig. 10; note the inward curled apical margin of the side lobe).

**Measurements (mm).** — Hw. 20-23; abd. 34.0-37.5.

**FEMALE.** — Dark brown, with obscure metallic bluish markings. Head coloured as in male. Median lobe of prothorax obscurely blue on dorsum, blackish brown below. A blue, somewhat obscure and irregular fascia extending from mesostigmal plate to the posterior end of the metepisternum. An obscure blue mark also in the posterior part of the metepimeron. In teneral specimens the pale blue colouring is more extensive on the sides. Coxae dark brown; legs otherwise pale brown, joints and extensor surface of femora darker.

Abdomen dark brown on sides. Dorsum of segments 2-10 very dark metallic bluish throughout (the colour obscure, and apparently disappearing in old specimens), with apex of segments 2-5 distinctly paler, whitish blue in some specimens. Abdomen of teneral females coloured as in teneral males.
Prothoracic structures as in Figures 38-39. Median lobe only slightly raised. Posterior lobe with rather broad middle lobe, directed obliquely up- and backwards towards the raised median mesostigmal process, forming a bridge over its apical margin. Lateral lobes drop-shaped in dorsal view, directed obliquely laterad.

Measurements (mm). — Hw. 20-24; — abd. 30-35.

Distribution. — Sibuyan.

Notes. — The black colouring and short appendages with a long basoventral process enable an easy identification of the male of this species. It occurs together with rolandmuelleri at the same sites in the Sibuyan Island.

RISIOCNEMIS MOROENSIS SP. N.

Figures 31, 42-43


Diagnosis. — Rather large species with crenulated wing apex. Female: blackish brown. Median lobe of the prothorax somewhat raised. Middle lobe of the posterior lobe broad, lateral lobes higher than the middle lobe.


Prothorax dark brown. Prothoracic structures as in Figures 42-43. Median lobe somewhat raised in the apical part. Middle lobe of the posterior lobe broad and oblong, quite similar to that of erythura and praeusta. Lateral lobes higher than the middle lobe. Pterothorax dark brown, paler ventrally. Legs pale yellowish brown, extensor surface of femora darker. Abdomen uniform dark brown.

Wings. — Ac nearer to Axl than Ax. R4+5 distal to subnodus in fore wing and in continuation to it in hind wing. Other details in Table I. Pterostigma with anal side 1.5 times longer than costal side, shaped as in Figure 31; coloured pale brown.

Measurements (mm). — Hw. 29-30; — abd. 42-43.

MALE unknown.

Distribution. — Mindanao.

Notes. — This is apparently the largest species in the subgenus. Because of its superior size and distinct shape of the posterior lobe of prothorax, it was named even though the male is still unknown.
Figs 38-43. Structures of female prothorax of three *Risiocnemis* species: — (38-39) *R. kiautai* sp. n.; — (40-41) *R. confusa* sp. n.; — (42-43) *R. moroensis* sp. n. — [Figs 38, 42 dorsal view; — Figs 39, 41 lateral view; — Figs 40, 43 oblique dorsolateral view]

**THE *R. ARATOR* SPECIES GROUP**

This group contains only a single known species from northern Luzon. The apical folds of the glans are modified to long whip-shaped processes. The female