A REVISION OF THE PHILIPPINE SUBGENUS *RISIOCNEMIS* (*IGNEOCNEMIS*) HÄMÄLÄINEN (ODONATA: PLATYCNEMIDIDAE)*

Gassmann, D. & M. Hämäläinen, 2002. A revision of the Philippine subgenus *Risiocnemis* (*Igneocnemis*) Hämäläinen (Odonata: Platycnemididae). – Tijdschrift voor Entomologie 145: 213–266, figs. 1–140, tables 1–3. [ISSN 0040-7496]. Published 1 December 2002.

The subgenus *Igneocnemis* Hämäläinen, 1991 of the Philippine damselfly genus *Risiocnemis* Cowley, 1934, is revised. Descriptions and diagnoses of both sex of all 15 previously recognized species are provided, and five new taxa are described: *R. antoniae* sp. n. and *R. rubricercus* sp. n. from northeastern Mindanao, *R. pistor* sp. n. from southeastern Mindanao, and *R. kaiseri* sp. n. and *R. nigra* sp. n. from Samar. The females of 11 species are described for the first time. Keys to males and females are provided. Based on extensive new collections from across the Philippine archipelago, the distribution of all species is mapped. Characters of the male ligula and appendages and the female prothorax were studied by scanning electron microscopy.

Correspondence: D. Gassmann, Institute of Evolutionary and Ecological Sciences, Section Theoretical Biology & Phylogenetics, Leiden University c/o National Museum of Natural History (Naturalis), P.O. Box 9517, NL-2300 RA Leiden, The Netherlands. E-mail: gassmann@naturalis.nnm.nl

Key-words. – Platycnemididae; Calicnemiinae; *Igneocnemis* Hämäläinen; new species; Philippines.

The genus *Risiocnemis* Cowley, 1934 is the most speciose genus of the damselfly subfamily Calicnemiinae in the Indo-Pacific region. It is endemic to the Philippine archipelago, but does not occur in the Sulu archipelago and the Palawan island chain. Generally, the species of the genus are confined to small clear streams in shady rain forest environment, occurring from lowland up to lower montane forest.

The genus is defined mainly by wing venational characters like the very distal position of the R₄, IR₃ and IR₂ veins (cf. Hämäläinen 1991a; see below for a more thorough diagnosis).

Two subgenera within the genus *Risiocnemis* were recognized by Hämäläinen (1991a) based on the species-groups defined by Liefstinck (1961): *Risiocnemis* Cowley, 1934 s. str., and *Igneocnemis* Hämäläinen, 1991. A revision of the subgenus *Risiocnemis* Cowley, 1934, was presented by Hämäläinen (1991a), but the revision of the subgenus *Igneocnemis* Hämäläinen, 1991, was postponed since a constant flow of new ma-

terial from the Roland Müller Expeditions to the Philippines was pouring in until 1997. Whereas some 1000 specimens of the genus *Risiocnemis* were present in the Müller collection in 1991, by 1997 the amount had increased to over 8300 of which some 2800 specimens belong to *Igneocnemis*. Thus, a complete taxonomic treatment of the subgenus *Igneocnemis* has become timely and it is presented here. The present paper may be considered as the second part of the series ‘The Philippine genus *Risiocnemis* Cowley (Zygoptera: Platycnemididae)’ (Hämäläinen 1991a). It also forms part of a comprehensive taxonomic and phylogenetic revision of the Indo-Pacific Calicnemiinae carried out by the first author (Gassmann 1999, 2000). The genus *Risiocnemis* now includes 36 described species, of which 20 are assigned to the subgenus *Igneocnemis*. It is worth mentioning that over 4500 specimens of the subgenus *Risiocnemis* have become available for study and one new species has been described after the revision in 1991 (Hämäläinen 2000). The new material also includes two other new species and one first male and one first female, not yet described.

* Results of the Roland Müller Zoological Expeditions to the Philippines, No. 17.

Monophyly of *Igneocnemis* and *Risioecnemis* s. l.

Several putative synapomorphies of *Igneocnemis* species point to the monophyly of the subgenus: the only smoothly crenulate wing margin (fig. 1), which is unique within the Malesian Calicnemiinae, the position of the arculus at the second antenodal vein, the angulate postclypeus and the subequal length of the first and second antennal segments. However, the monophyly of the whole genus, i. e., *Risioecnemis* sensu lato, is uncertain; several features of ligula morphology, colour pattern and female prothorax relate some species of the subgenus *Risioecnemis* to the Oriental genus *Coelliccia* Kirby, 1890, rather than to *Igneocnemis*. This question will soon be treated in detail within the scope of a phylogenetic study of the Malesian Calicnemiinae (Gassmann in prep.).

Relationships within *Igneocnemis*

Although the males of *Igneocnemis* species often differ remarkably in their coloration, in particular of the legs, structural differences are usually less conspicuous within the group. Consequently, establishing species-groups based on the shape of the male ligula (penis), as done for the subgenus *Risioecnemis* (Hämäläinen 1991a), proved to be difficult. In most species the ligula structure is quite uniform; however, some species show distinct peculiarities in the shape of the apical margin of the terminal lobes or the median incision between them; *R. ignea* (Brauer, 1868) differs from all other species by having the terminal lobes almost entirely reduced. Except for *R. flammea* (Selys, 1882) which was figured by Hämäläinen (1991a), the ligula structures of *Igneocnemis* species are examined and illustrated here for the first time.

Contrary to the males, the females of the group are quite uniform in coloration. However, they can be distinguished by the structure of the posterior pronotal lobe and the length of valvae.

Preliminary groupings within the subgenus based on, for instance, the male appendages, appeared to be weakly supported by other characters, e. g. coloration. Therefore, the definition of species-groups is postponed until a thorough phylogenetic study of the group will be available (Gassmann in prep.).

MATERIALS AND METHODS

Collections

Most of the material examined was collected by Roland A. Müller (St. Gallen, Switzerland) and his assistants and co-workers during his Philippine Expeditions (1985-1997), which since 1987 were focused mainly on odonates. The Roland Müller collection was acquired by the National Museum of Natural

History (Leiden) in 1998. For an itinerary of Roland Müller's Philippine Expeditions and a general history of dragonfly research in the Philippines see Hämäläinen & Müller (1997).

The present study is based on specimens in the following collections:

CUIC	Cornell University Insect Collection, Ithaca
ISNB	Institut Royal des Sciences Naturelles, Brussels
MCZ	Museum of Comparative Zoology, Harvard University
RMNH	National Museum of Natural History (Naturalis; formerly: Rijksmuseum van Natuurlijke Historie), Leiden (including the former Roland Müller collection)
SMFD	Senckenberg-Museum, Frankfurt

The following collection is referred to in the text (no material examined):

FMNH	Field Museum of Natural History, Chicago
------	--

Specimens examined

All specimens listed in the 'material' section of the descriptions below were examined by the senior author, except for the holotype of *R. atripes* (Needham & Gyger, 1941), holo- and allotype of *R. tendipes* (Needham & Gyger, 1941), both in MCZ, and the allotype of *R. rubripes* (Needham & Gyger, 1939) in CUIC; these specimens were studied only by the junior author. A database of additional specimens, seen only by the second author, who has preliminarily identified the entire Roland Müller odonate collection, is available from the authors upon request.

Scanning electron microscopy

The male ligula and the appendages of all species were studied by scanning electron microscopy (SEM). Since the ligula of several *Igneocnemis* species proved to be quite uniform, only a selection of species is illustrated here to show the most important structural differences. The male appendages of all species are illustrated in lateral, posterolateral and dorsal view. The female prothorax of all species was studied by SEM, except for *R. melanops* and *R. polilloensis* of which only one female specimen each was available. The anterior view of the posterior pronotal lobe of *R. fuligifrons*, *R. haematopus* and *R. ignea* could not be illustrated due to the oblique angle of the lobe. All scanning electron micrographs were taken by the first author using a JEOL SEM 6400 microscope. The objects were cleaned in 70% ethanol, air-dried and subsequently sputtered with gold for 1.5-2 min at 20 mA before examination.

Terminology

The terminology of odonate wing venation applied here follows the modified Tillyard-Fraser system (Watson & O'Farrell 1991).

Table 1. Distinguishing features of the two subgenera of *Risioecnemis* Cowley.

Character	<i>Igneocnemis</i> Hämäläinen	<i>Risioecnemis</i> Cowley
Wing: position of arculus	at Ax2	distal to Ax2
Wing: shape of apex	smoothly crenulate (fig. 1)	distinctly crenulate
Antenna: length of pedicellus	subequal to scapus	about 2 times length of scapus
Male postclypeus: shape	distinctly angulate in lateral view	smoothly angulate or rounded in lateral view
Female posterior pronotal lobe: shape	not (entirely) divided	trilobate

Measurements

The measurements of wing and abdomen were taken with a precision of 0.5 mm. The sample size is given in parentheses following the value. Only the extreme measurements of each species and sex are provided.

Measurements of female valvae were taken from the hind margin of segment 10 to the distal end of the valvae, with a precision of 0.1 mm.

The numbers of wing veins given in tables 2 and 3 serve to facilitate species identification and to supplement keys and diagnoses. The values are approximate.

Distribution maps

The distribution maps were created with the mapping programme Atlas Pro 1.5, and subsequently improved with the graphics programme Canvas 3.5.4.

SYSTEMATIC PART

Genus *Risioecnemis* Cowley, 1934

Hypocnemis Hagen in Selys, 1863: 153-154 (diagnosis).

Prionocnemis Selys, 1886: 97-98 (revised diagnosis).

Risioecnemis Cowley, 1934: 204 (designation of type species).

– Type species, designated by Cowley 1934: *Hypocnemis serrata* Hagen in Selys, 1863

Subgenus *Igneocnemis* Hämäläinen, 1991

Igneocnemis Hämäläinen, 1991a: 155, figs. 2, 4 (diagnosis, designation of type species). – Type species, designated by Hämäläinen, 1991: *Hypocnemis ignea* Brauer, 1868

Fig. 1. *Risioecnemis atripes* ♀, Mindanao Island, Davao Oriental Prov., Mt. Agtuuganon, forewing.

Diagnosis

Slender damselflies of mostly quite uniform coloration ranging from orange via red and brown to black, occasionally involving patterns of yellow-white, yellow or blue elements. Wings with apical margin smoothly crenulate; arculus always in line with second antenodal vein (Ax2; fig. 1); two postquadrilateral cells; medio-anal link more or less straight; R4 inserting at or (usually) distal to the level of subnodal vein (Sn); IR3 inserting between postnodal veins 4 to 7 (Px4 to Px7) in forewing, between Px2 to Px7 in hindwing; IR2 vein inserting between Px9 to Px16 in forewing, between Px6 to Px13 in hindwing; pterostigma not longer than one cell, medium to dark brown. Postclypeus distinctly or moderately angulate in lateral view; antenna with pedicellus subequal in length to scapus. Abdominal segments lacking distinct anterior and posterior dorsal markings; male superior anal appendages semi-acute or acute, always longer than inferior ones; subbasal ventral processes short and blunt, or elongate and acute. Male ligula with scoop-shaped lobes, varying in shape apically, or reduced; lacking terminal flagella.

Differential diagnosis of the subgenera *Igneocnemis* Hämäläinen and *Risioecnemis* Cowley

The most important differences between the subgenera are listed in table 1.

Key to the males

1. Legs either black throughout, black with bluish-white, or red-black 2
– Legs yellow or red throughout, or yellow-black... 7
2. Head either black throughout, or black with yellowish-orange head marking; thorax and abdomen black throughout; yellow area between ante-alar ridge and wing base; legs either black throughout or at least entire posterior part black; appendages black 3
– Head and thorax black throughout, abdomen black-red; legs with at least coxa, trochanter and anterior half of femur black; appendages bright red 5

3. Head black throughout; legs black with anterior parts of femur and tibia conspicuously bluish-white; superior appendage elongate, more than twice as long as inferior (fig. 28) .*R. atropurpurea*
- Head black, anteriorly with either distinct yellow stripe or with pale subrectangular markings; legs black throughout; superior appendage twice the length of inferior appendage4
4. Head black with conspicuous yellowish-white stripe covering upper part of labrum and entire anteclypeus; subbasal ventral process of superior appendage directed backwards, in line with distal part of appendage in lateral view (fig. 26)*R. atripes*
- Head black without yellow-white marking, but with pale rectangle joining eye margin anteriorly at either side; subbasal ventral process of superior appendage not in line with distal part of appendage (fig. 46)*R. nigra*
5. Head black with yellow genae; segment 8 to 10 reddish; legs black throughout; subbasal ventral process of superior appendage short, notched in posterior view (figs. 57, 67)*R. rubricercus*
- Head black throughout; either abdominal segments 7 to 10, or segments 2 to 10 red, remaining segments darkened, respectively; legs red-black; subbasal ventral process of superior appendage short, not notched in posterior view 6
6. Legs bright red with distal part of femur and posterior part of tibia black; abdominal segment 1 to 6 black-brown, segment 7 to 10 red; superior appendage with apices distinctly bent outwards in dorsal view (fig. 73); inferior appendage more than half the length of superior (fig. 30)*R. calceata*
- Legs bright red with proximal part of femur and posterior part of tibia black; abdominal segment 1 to 2 darkened, segment 3 to 10 red; superior appendage with apices very slightly bent outwards in dorsal view (fig. 88); inferior appendage about half the length of superior (fig. 60)*R. siniae*
7. Head black throughout; synthorax black, laterally with lower part or lower posterior part yellow; legs yellow or yellow-black; subbasal ventral process elongate, curved in lateral view (figs. 42, 54) 8
- Head black and/or reddish-brown; synthorax light to dark brown, in some species upper part black; legs red; subbasal ventral process of superior appendage either elongate or short (figs. 50, 58, 62) in lateral view 9
8. Synthorax laterally with upper part black, lower posterior part yellow, legs yellow throughout; superior appendage bulging in lateral view (fig. 42); subbasal ventral processes curved in posterior view (fig. 43)*R. kaiseri* sp. n.
- Synthorax laterally with upper part black, lower part yellow, black spot on posterior end of metepimeron; legs with coxa, trochanter and main part of femur yellow, distal and posterior parts of femur as well as entire tibia and tarsus black; superior appendage straight in lateral view (fig. 54); subbasal ventral processes more or less straight in posterior view (fig. 55)*R. polilloensis*
9. Subbasal ventral process of superior appendage short, apically blunt, pointed or cut off (figs. 50, 58, 63) 10
- Subbasal ventral process of superior appendage long, apically sharp 12
10. Subbasal ventral process of superior appendage only partly visible in lateral view (fig. 62); both superior and inferior appendage straight, sharp, inferior appendage about one-third length of superior; head either with frons dark red, vertex and occiput distinctly bright reddish-brown (only specimens from Cateel Bay), or frons and vertex black, only lateral parts of occiput reddish-brown (remaining populations)*R. tendipes*
- Subbasal ventral process of superior appendage well visible in lateral view (figs. 50, 58); superior appendage straight, sharp; inferior appendage slightly curved, apically rounded, either about one-half or one-third length of superior; head either with frons and vertex black, only lateral parts of occiput reddish-brown, or head reddish-brown throughout 11
11. Subbasal ventral process of superior appendage cut off in lateral view (figs. 50, 64); superior appendage apically very slightly bent upwards; head with frons and vertex black, only lateral parts of occiput reddish-brown.....*R. pistor*
- Subbasal ventral process of superior appendage pointed in lateral view (figs. 58, 68); superior appendage not bent upwards, head with frons, vertex and occiput reddish-brown throughout*R. rubripes*
12. Head either black throughout or with black frons and reddish-brown vertex and occiput; superior appendage in dorsal view with inner side distinctly concave and outer side very slightly convex (fig. 75) or inner and outer side almost straight (fig. 80) 13
- Head usually reddish-brown throughout; in case head is largely darkened then superior appendage in dorsal view with inner side kinked outwards, outer side slightly concave, subbasal process very long (figs. 48-49, 82) 16
13. Pro- and synthorax light brown; subbasal ventral process of superior appendage curved in lateral view; inferior appendage about half the length of superior 14
- Prothorax predominantly black; synthorax with upper part black, lower part yellowish- or red-

dish-brown; subbasal ventral process of superior appendage either curved or straight in lateral view; inferior appendage at least half the length of superior, or longer 15

14. Head with frons up to level of ocelli black, vertex and occiput reddish-brown *R. fuligifrons*
– Head black throughout *R. melanops*
15. Anterior pronotal lobe bright yellow; subbasal ventral process of superior appendage straight in lateral view; inferior appendage nearly as long as superior (fig. 24) *R. antoniae*
– Anterior pronotal lobe medially black, laterally orange; subbasal ventral process of superior appendage curved in lateral view; inferior appendage half the length of superior (fig. 36) *R. haematopus*
16. Superior appendage in dorsal view with inner side kinked outwards, outer side slightly concave (figs. 74, 82); subbasal ventral process of superior appendage well visible in lateral view 17
– Superior appendage in dorsal view with both inner and outer side straight (figs. 77, 78, 84); subbasal ventral process of superior appendage either entirely visible in lateral view or only partly ... 18
17. Subbasal ventral process of superior appendage long, in lateral view reaching slightly beyond the level of inferior appendage, well removed from base of appendage so that its entire base is visible in lateral view (fig. 48) *R. odobeni*
– Subbasal ventral process of superior appendage shorter, not reaching the level of inferior appendage, close to base of appendage so that its base is only partly visible in lateral view (fig. 32) *R. flammea*
18. Subbasal ventral process of superior appendage entirely visible in lateral view; inferior appendage with subbasal dorsal convulsion ridge-like, curved (fig. 38); abdomen bright red *R. ignea*
– Subbasal ventral process of superior appendage only partly visible in lateral view; inferior appendage without ridge-like bulge, curved; abdomen bright reddish darkened 19
19. Subbasal ventral processes of superior appendage almost invisible in lateral view, diverging in posterior view (fig. 41); inferior appendage more than half length of superior; superior and inferior appendages standing far apart from each other in lateral view (fig. 40) *R. incisa*
– Subbasal ventral process of superior appendage only partly visible in lateral view (fig. 52), converging in posterior view (fig. 53); inferior appendage short, about half length of superior; superior and inferior appendages not standing far apart from each other in lateral view (fig. 52) *R. plebeja*

Key to the females

The females of *R. pistior* and *R. rubricercus* are unknown.

1. Posterior pronotal lobe flat in lateral view, not or only very slightly elevated, but not more than in fig. 97; posterior pronotal margin either deeply incised (figs. 128, 130) or wave-shaped (figs. 136, 139) 2
– Posterior pronotal lobe distinctly elevated, at least as much as in fig. 107; posterior pronotal margin moderately (figs. 135, 138) or deeply (fig. 132) incised, or not at all (fig. 137) 5
2. Posterior pronotal lobe entirely flat, in line with pronotum in lateral view (fig. 93); posterior pronotal lobe with deep W-shaped median incision in dorsal view, otherwise rounded (fig. 128); a bright yellow stripe covering upper half of labrum and anteclypeus; length of valvae about 0.5 mm *R. atripes*
– Posterior pronotal lobe very slightly elevated in lateral view, either deeply incised or wave-shaped in dorsal view; no yellow marking on labrum and anteclypeus; length of valvae 1 mm or shorter .. 3
3. Posterior pronotal lobe deeply incised, median incision flanked by hook-like processes (fig. 130); forewing 1.0–1.5 mm longer than hindwing *R. calceata*
– Posterior pronotal lobe wave-shaped, with an rounded median inlet; forewing 1.0–2.0 mm longer than hindwing 4
4. Posterior margin of posterior pronotal lobe with shallow median inlet (fig. 136); pterostigma with both distal and proximal side slightly convex; forewing 1 mm longer than hindwing; length of valvae 0.5–0.8 mm *R. plebeja*
– Posterior margin of posterior pronotal lobe with a deeper median inlet (fig. 139); pterostigma with anterior side shorter than posterior side, distal side slightly convex, proximal side straight; forewing 2 mm longer than hindwing; length of valvae about 1 mm *R. tendipes*
5. Posterior pronotal lobe elevated in an angle of about 45° to synthorax (figs. 109, 113, 119), its distal margin provided with a distinct median triangular incision, dividing the lobe distally in two subtriangular parts in anterior dorsal view (figs. 132, 135, 138) 6
– Posterior pronotal lobe stronger elevated, at least as much as in figs. 95, 123, or directed forward (figs. 101, 105), its distal margin either straight (fig. 137), shallowly and smoothly incised (e.g., figs. 129, 133), or with an distinct but irregular incision flanked by pronounced hooks (fig. 127) 8

6. Triangular median incision of posterior pronotal lobe reaching beyond half the length of the latter (fig. 132); posterior lobe in lateral view somewhat concave (fig. 107) *R. incisa*
 - Triangular median incision of posterior pronotal lobe not reaching beyond half the length of the latter; posterior lobe in lateral view distinctly convex 7
7. Central part of posterior pronotal lobe narrow in dorsal (fig. 112) and anterior dorsal view (fig. 135) *R. odobeni*
 - Central part of posterior pronotal lobe broad in dorsal (fig. 118) and anterior dorsal view (fig. 138) *R. siniae*
8. Posterior pronotal lobe nearly or entirely at right angles to synthorax; if slightly bent forward, however, then anterior side of pronotal lobe always concave, i.e. its base protruded in lateral view (fig. 103) 9
 - Posterior pronotal lobe either slightly (fig. 101) or distinctly (fig. 105) directed forward; anterior side in lateral view straight 17
9. Posterior pronotal lobe very short (fig. 137), slightly lower than anterior lobe in lateral view (fig. 117); length of valvae 0.8-1.0 mm *R. rubripes*
 - Posterior pronotal lobe subequal in length to anterior lobe, or longer; length of valvae 0.8 mm or less 10
10. Posterior pronotal lobe in lateral view somewhat bulged out at base (figs. 103, 109, 125) 11
 - Posterior pronotal lobe in lateral view straight, not bulged out at base 13
11. Anterior side of posterior pronotal lobe in lateral view almost straight and only very slightly concave, oblique (fig. 125) *R. polilloensis*
 - Anterior side of posterior pronotal lobe in lateral view distinctly concave 12
12. Posterior pronotal lobe in lateral view with distal margin protruded (fig. 109); in anterior dorsal view with a wide but shallow incision, the parts lateral to it broadly rounded (fig. 133) *R. kaiseri*
 - Posterior pronotal lobe in lateral view with distal margin not protruded (fig. 103); only very slightly incised (best visible in posterior view); median part of lobe distinct and extended into lateral hooks (fig. 102) *R. haematopus*
13. Posterior pronotal lobe in anterior dorsal view with two apical processes (fig. 127); pterostigma squarish, short, but anterior side distinctly shorter than posterior side; forewing length 28.0-29.0 mm; length of valvae 0.5-0.8 mm *R. antoniae*
 - Posterior pronotal lobe in anterior dorsal view without such processes; forewing length 28.0 mm or less; length of valvae 0.3-0.8 mm 14
14. Posterior pronotal lobe in lateral view about double the length of anterior lobe (fig. 111), anterior side slightly concave; head black, except for a reddish quadrangle covering upper median part of frons and neighbouring part of vertex; pterostigma elongate, with anterior and posterior side up to four-thirds the length of proximal and distal side; length of valvae 0.3-0.5 mm *R. nigra* sp. n.
 - Posterior pronotal lobe in lateral view subequal in length to or about one third longer than anterior lobe, provided with a shallow subtriangular incision in anterior view; anterior side slightly convex; length of valvae 0.7-0.8 mm 15
15. Central part of posterior lobe rounded in dorsal view (fig. 98); posterior pronotal lobe in lateral view subequal in length to anterior lobe (fig. 99); forewing length less than 27.0 mm ... *R. flammea*
 - Central part of posterior lobe more or less straight in dorsal view (figs. 94, 126); posterior pronotal lobe in lateral view subequal in length to anterior lobe or longer; forewing length 28.0 mm or less... 16
16. Posterior pronotal lobe in lateral view subequal in length to anterior lobe (fig. 123), with a broadly rounded distal depression of posterior margin; antennal pedicellus darkened to black throughout *R. melanops*
 - Posterior pronotal lobe in lateral view about one third higher than anterior lobe (fig. 95), distal depression only in outlines (fig. 129); antennal pedicellus medium brown *R. atropurpurea*
17. Posterior pronotal lobe slightly bent forward in lateral view (fig. 101); median part with sharp lateral hooks, best visible in posterior view (fig. 122); pterostigma moderately oblique (anterior proximal corner and posterior distal corner not in line), distal side distinctly convex, posterior distal corner rounded, anterior side not depressed *R. fuligifrons*
 - Posterior pronotal lobe strongly bent forward (fig. 105); median part in posterior dorsal view with rounded hooks, distal margin slightly incised (fig. 104); pterostigma very oblique (anterior proximal corner and posterior distal corner in line), distal side straight or only very slightly convex, posterior distal corner angulate, anterior side somewhat depressed *R. ignea*

Risiocnemis antoniae sp. n.
(figs. 2-3, 24-25, 70, 90-91, 127, 140)

'*Risiocnemis* sp. n. 64' Hämäläinen & Müller 1997: 265, 279, 301.

Type material. – Holotype ♂, Mindanao, Davao Oriental, Cateel, Aliwagwag Falls, 200-300 m,

Table 2. Details in venation of *Igneocnemis* males: origin of veins IR3, R3 and IR2 (numbers refer to postnodal veins), and number of postnodals. [fw = forewing; hw = hindwing]; (n = number of measured wings [number of specimens examined]).

Species [♂]	IR3		R3		IR2		Postnodals	
	fw	hw	fw	hw	fw	hw	fw	hw
<i>R. antoniae</i> (n=10[5])	4-6	4-5	8-9	7-8	11-12	10-12	16-18	14-17
<i>R. atripes</i> (n=14[7])	5-6	5-6	7-9	6-8	11-12	10-12	16-20	16-19
<i>R. atropurpurea</i> (n=16[8])	4-5	4-5	6-9	6-7	10-12	9-10	16-20	15-18
<i>R. calceata</i> (n=10[5])	5-6	4-5	7-8	5-7	11-13	9-11	16-19	14-16
<i>R. flammea</i> (n=28[14])	5-6	4-6	7-10	7-9	10-13	10-13	15-20	14-19
<i>R. fuligifrons</i> (n=12[6])	4-6	4-5	6-10	5-8	10-13	9-12 ¹	14-18	13-17
<i>R. haematopus</i> (n=12[6])	5-6	4-5	7-10	6-8	9-13	9-12	15-19	15-17
<i>R. ignea</i> (n=10[5])	5-6	5-6	8-10	7-9	11-13	10-13	19-21	17-20
<i>R. incisa</i> (n=10[5])	4-6	2-5	8-9	7-8	10-13	9-12	16-19	14-17
<i>R. kaiseri</i> (n=10[5])	4-6	4-5	7-8	6-7	10-12	10-11	15-16	14-16
<i>R. melanops</i> (n=8[4])	5-6	4-6	7-8	6-8	10-12	10-12	16-18	15-16
<i>R. nigra</i> (n=10[5])	4-5	4-5	7-9	6-7	11-13	10-11	17-20	16-19
<i>R. odobeni</i> (n=10[5])	5-7	5-6	8-10	7-9	12-13	10-13	18-21 ²	17-20 ²
<i>R. pistoi</i> (n=10[5])	5-6	4-6	7-9	6-8	11-12	9-11	18-19	16-17
<i>R. plebeja</i> (n=12[6])	4-6	4-5 ¹	7-10	6-9 ¹	9-14	9-13 ¹	18-22	16-20 ¹
<i>R. polilloensis</i> (n=10[5])	4-5	2-5	8-9	7-8	10-12	10-12	17-20	16-19
<i>R. rubricercus</i> (n=6[3])	5-6	4-6	8-9	7-8	11-12	10-11	20-21	17-19
<i>R. rubripes</i> (n=14[7])	4-6	3-5	7-9	6-7	12-16	10-12	17-21	16-19
<i>R. siniae</i> (n=12[6])	5-6	5-7	6-8 ¹	5-7	10-11 ³	9-10	15-18 ¹	14-16
<i>R. tendipes</i> (n=26[13])	4-7	4-7	6-10	5-9	9-13	9-12	16-20	14-19

¹ n=11[6]² n=12[6]³ n=10[5]

10.iv.1995, Buenafe/Gorostiza, deposited in RMNH. – Paratypes: Mindanao Island, Davao Oriental Province: 2♂, Baganga, Brgy Upper Mikit, Mangoy Falls, 300-350 m, 6.iv.1995, Buenafe/Gorostiza. 3♂, 1♀, Boston, Caatijan, 500-550 m, 28.v.1996, Müller/Buenafe/ Gorostiza. 10♂, 3♀, Cateel, Aliwagwag Falls, 200-300 m, 10.iv.1995, Buenafe/Gorostiza. Mindanao Island, Surigao del Sur Province: 1♂, San Miguel, Suba River, 150-250 m, 13.-15.iv.1995, Müller/Buenafe/ Gorostiza. 2♂, 2♀, Tago, Meme River, 100-300 m, 12.-18.vi.1996, A. Buenafe/A. Gorostiza. All in RMNH.

Differential diagnosis

In male and female anterior side of pterostigma shorter than posterior side. Male with black head, red legs and synthorax divided into upper anterior black and lower posterior yellow part. Female with elevated posterior pronotal lobe, yellow-white anterior pronotal lobe and black stripe at posterior margin of prothorax and mesokatepisternum.

Males of *R. antoniae* sp. n. and *R. haematopus* (Selys, 1882) are very similar in coloration; however, there are distinct structural differences: in lateral view superior appendages of *R. antoniae* (fig. 24) reach only slightly beyond the tip of inferiors; in *R. haematopus*, inferiors are proportionally much shorter (fig. 36); the subbasal ventral process is straight in *R. antoniae* (figs. 24-25),

curved in *R. haematopus* (figs. 36-37); in dorsal view, the superior appendage of *R. antoniae* sp. n. is stouter at base (fig. 70) than in *R. haematopus* (fig. 76); the appendage being intermediate between the *R. flammea*- and *R. haematopus*-type (see diagnoses of the respective species). Females show obvious differences in the shape of posterior pronotal lobe: the median part is distinctly incised in *R. antoniae* (fig. 127), while the incision is only outlined in *R. haematopus* (fig. 102).

Description

Measurements. – Forewing length ♂ 25.0-28.5 mm (n=5), ♀ 28.0-29.0 mm (n=5); hindwing length ♂ 24.0-27.5 mm (n=5), ♀ 27.0-28.0 mm (n=5); abdomen length ♂ 39.5-44.0 mm (n=5), ♀ 38.5-41.0 mm (n=5).

Male (holotype). – Measurements. – Forewing length 27.0 mm; hindwing length 26.0 mm; abdomen length 43.0 mm.

Head. – Labium black with traces of yellow at posterior margin. Head otherwise black, except for distal yellow-white ring at antennal scapus and diffuse reddish-brown marking on distal two thirds of pedicellus.

Thorax. – Pronotal tubercles moderately distinct; anterior pronotal lobe yellow; median lobe black, except for a small area close to lateral end of anterior lobe.

Legs bright orange-red, with black markings at coxa, trochanter and joints.

Table 3. Details in venation of *Igneocnemis* females (for explanation see table 2).

Species [♀]	IR3		R3		IR2		Postnodals	
	fw	hw	fw	hw	fw	hw	fw	hw
<i>R. antoniae</i> (n=10[5])	6	4-6	8-10	7-8	11-13	10-12	15-17	15-16
<i>R. atripes</i> (n=10[5])	5-6	4-6	7-9	6-8	9-12	9-11	15-19	14-18
<i>R. atropurpurea</i> (n=12[6])	4-6	2-6	8-10	5-8	10-13	9-12	18-22	16-20
<i>R. calceata</i> (n=6[3])	5-6	4-5	7-8	6-7	11-14	9-12	17-21	15-17
<i>R. flammea</i> (n=10[5])	4-6	4-6	7-9	7-9	11-14	11-13	16-20	16-19
<i>R. fuligifrons</i> (n=12[6])	5-6	4-6	8-9	7-8	10-12	10-12	15-19	14-19
<i>R. haematopus</i> (n=12[6])	4-6	4-6	8-10	6-8	10-13	9-11	16-18	15-17
<i>R. ignea</i> (n=6[3])	5-6	5-6	8-9	7-8	11-12	10-11	18-22	17-21
<i>R. incisa</i> (n=10[5])	4-6	4-6	7-9	6-8	10-12	9-13	16-18	14-16
<i>R. kaiseri</i> (n=10[5])	5-6 ¹	4-5 ²	7-9	6-8	9-12	9-11	15-17	14-17
<i>R. melanops</i> (n=1[1])	6	5	9	7-8	13	12	18-19	17-18
<i>R. nigra</i> (n=6[3])	4-5	4-5	7-9	6-8	11-12	10-11	19	17-20
<i>R. odobeni</i> (n=6[3])	5-7	5-6	9-10	7-8	12-15	10-12	20-21	18-20
<i>R. plebeja</i> (n=4[2])	4-5	3-4	8-9	6	10-12	9-10	18-20	16-18
<i>R. polilloensis</i> (n=1[1])	4-5	4-5	7	6-7	10	10	14	13
<i>R. rubripes</i> (n=6[3])	4-5	2-5	7-8	6-8	11-12	9-12	18-20	16-19
<i>R. siniae</i> (n=2[1])	5-7	5	6-8	6-7	10-11	9-10	15-17	14-15
<i>R. tendipes</i> (n=16[8])	4-6	4-5	7-9	5-7	10-13	9-11	16-20	16-18

¹ n=12[6]² n=9[5]

Synthorax with upper part black, lower part yellow to light brown; the border between the two parts is diffuse and runs from anterobasal corner of mesepimeron up to somewhat beyond the posterobasal corner of mesepisternum; underside of synthorax yellow. Mesokatepisternum black, metakatepisternum yellow-brown.

Wings. – Forewing with 17 Px, hindwing 16-17 Px. Pterostigma with anterior side slightly shorter than posterior side; all sides, but especially distal and posterior side, convex; dark brown.

Abdomen. – Segment 1 to 2 light brown, segment 3 to 8 black dorsally, light brown basally; segment 9-10 almost entirely black; superior anal appendage slightly bulging out in lateral view, apically acute; sub-basal ventral process straight, directed downwards; inferior appendage straight (cf. figs. 24-25), in lateral view reaching almost as far as superior. In dorsal view, basal third of superior appendage thickened, inner side rounded; distal third narrowing, slightly directed laterally (cf. fig. 70); superior appendage reddish-brown, dorsal side darkened; inferior appendage reddish-brown, basal part and apical tip black.

Ligula. – Terminal lobes widening distally; median incision between lobes broadly rounded (cf. figs. 2-3).

Female. – Head. – Labium yellow; labrum and gena orange-brown, ante- and postclypeus light brown. Head with frons and vertex reddish, except for a weak subrectangular yellow-white spot at either side, attached to eye margin and reaching up to the level of posterior ocelli; antennal socket and scapus light brown with subdistal medium brown ring, respectively; sca-

pus also with medium brown subbasal and occasionally conspicuous distal yellow-white ring; pedicellus darkened, flagellum black; ocelli surrounded by diffuse black rings, anterior ocellus less so than posterior ones.

Thorax. – Prothorax with pronotal tubercles moderately modified; posterior pronotal lobe elevated at right angles to median lobe (fig. 91); median part of posterior lobe narrow in dorsal view (fig. 90), characteristically extended into a pair of processes in anterior view (fig. 127); anterior pronotal lobe and lower margin of prothorax yellow-white, border between anterior and median lobe occasionally black; remaining parts of prothorax light brown intermingled with dark brown, except for posterior margin of prothorax which is covered by a black lateral stripe at either side.

Legs yellow-brown, with joints and posterior parts of femora marked with black. Synthorax light brown with middorsal black carinal stripe and black markings on ante-alar ridge; black stripe joining distal margin of mesostigmal plate; posterior border of mesokatepisternum marked with a black stripe broadening ventrally.

Wings. – Pterostigma with anterior side distinctly shorter than posterior side; proximal, distal and usually also posterior side convex; light brown.

Abdomen. – Segment 1 of same colour as synthorax; segment 2 to 7 light brown, with dorsal surface darkening gradually towards the end; segment 8 to 10 including cerci and valvae dark brown intermingled with black; cerci slightly directed downwards; projecting part of valvae slightly longer than length of segment 10.

Figs. 2-5. *Risiocnemis* spp., ligula in ventral view (2, 4) and lateral view (3, 5). – 2, 3, *R. antoniae* ♂, paratype, Mindanao Island, Davao Oriental Prov., Aliwagwag Falls; 4, 5, *R. calceata* ♂, paratype, Southern Leyte Prov., Panaon Island, Anislagon Creek. Scales 100 μ m.

Remarks

Etymology. – The new species is named after Dr. Antonia Monteiro (Leiden University), who was especially struck by the red legs of the male of the present species.

Altitudinal range. – 100-550 m.

Distribution. – Northeastern and eastern Mindanao (fig. 140).

Risiocnemis atripes (Needham & Gyger) (figs. 1, 26-27, 71, 92-93, 128, 141)

Prionocnemis atripes Needham & Gyger, 1941: 146, pl.1, figs. 11,13,14.

Risiocnemis atripes, Lieftinck 1961: 142-143 (note on further material); Davies & Tobin 1984: 100; Bridges, 1994: VII.22; Hämäläinen & Müller 1997: 264, 301 (distribution); Steinmann 1997: 386; Tsuda 2000: 56.

Figs. 6-9. *Risiocnemis* spp., ligula in ventral view (6, 8) and lateral view (7, 9). – 6, 7, *R. haematopus* ♂, Catanduanes Island, Simohe Creeks; 8, 9, *R. ignea* ♂, Luzon Island, Quirino Prov. Scales 100 μ m.

Differential diagnosis

Male and female black. This species can be distinguished from other black *Igneocnemis* species by the yellow-white stripe on labrum and anteclypeus in both sexes. Male appendages are very characteristic: the subbasal ventral process is robust (fig. 27), directed backwards and in line with distal part of superior appendage in lateral view (fig. 26). Female posterior pronotal lobe in lateral view most flattened (fig. 93) compared with other *Igneocnemis* species, with char-

acteristic W-shaped incision (fig. 128); *R. atripes* is the only species in the subgenus with a black female.

Description

Measurements. – Forewing length ♂ 26.5-33.0 mm (n=7), ♀ 27.0-32.0 mm (n=5); hindwing length ♂ 26.0-31.0 mm (n=7), ♀ 26.0-30.0 mm (n=5); abdomen length ♂ 41.0-46.5 (n=7), ♀ 37.0-43.0 mm (n=5).

Male. – Head. – Labium brown-black; labrum with lower two thirds black, upper third and ante-

clypeus yellow-white; postclypeus black; gena and anterior part of frons shiny black; frons, antennal scapus and vertex black throughout; pedicellus brown-black; flagellum basally thickened for almost the length of pedicellus, medium brown.

Thorax. – Prothorax with pronotal tubercles bulging, posterior pronotal lobe bow-shaped with broadly rounded corners, approximately half the length of median lobe, not or only slightly bent upwards, posterior margin raised; prothorax black throughout.

Legs black.

Synthorax black throughout, except for the yellow wing bases.

Wings. – Pterostigma with anterior side usually somewhat shorter than posterior side; distal side convex, the remaining sides only very slightly curved; dark brown. Anal vein slightly bulged out at the point where cubital vein meets anal vein.

Abdomen. – Black, ventral part yellow; segment 8 with a yellow marking covering the lower anterior three fourths of the segment; segment 10 somewhat widened posteriorly, lower side approximately one-third shorter than upper side, tergite occasionally bulged out; upper posterior margin slightly undulate in dorsal view; superior appendage conical, acute, inner bases wide in dorsal view (fig. 71), tip slightly bent dorsally and laterally; subbasal ventral process robust (fig. 27); inferior appendage half the length of superior appendage (fig. 26).

Ligula. – Terminal lobes broad; median incision oval.

Female. – Head. – Labium yellow; labrum with lower margin yellow-orange, lower half black, upper half yellow; anteclypeus yellow, postclypeus black; vertex dark grey to black, except for the following areas: yellow coloration between eye margin and gena; reddish-brown stripe on either side of anterior ocellus reaching base of antenna, reddish-brown rings around ocelli, the lateral parts of which are distinctly extended; a touch of reddish-brown triangle just posterior to the level of posterior ocelli at either side.

Thorax. – Prothorax with pronotal tubercles moderately bulged in lateral view, posterior lobe not elevated (fig. 93), with W-shaped incision in dorsal view (figs. 92, 128); black.

Synthorax. – Mesothorax and posterior three fourths of metepisternum black, remaining parts yellowish-white.

Wings. – Pterostigma in forewing with posterior proximal corner acute in forewing, less so in hindwing; length ratio of anterior/posterior side 1:1.2 (forewing), 1:1.1 (hindwing); medium brown.

Abdomen. – Segment 1 to 6 black dorsally, yellow ventrally; segment 7 to 10 almost entirely black; cerci short, black. Length of projecting part of valvae about 0.5 mm.

Material examined

Holotype ♂, Mindanao, Mount Apo, Mainit River, 6500 ft., 27.x. (MCZ). – Other material: Mindanao Island, Bukidnon Province: 3♂, 5♀, Mt. Gantongan, Gantongan River, x.1991, A. Buenafe. 9♂, 1♀, Katanglad Mts., Lomoloyan River, x.1991, A. Buenafe. 1♂, Mebadiang, Olayan, Mt. Kalatungan, Muntian Creek, 1200-1400 m, 24.-25.xi.1995, A. Buenafe. 1♀, Mebadiang, Dumatap, Mt. Kalatungan, Mansabilan Creek, 1000-1300 m, 24.xi.1995, A. Buenafe. 1♂, Mt. Imbayao, Baungon, Tamalaong River, 25.ix.-1.x.1989, Th. Borromeo jr. 1♂, 1♀, Mt. Katanglad, Impasugong, Brgy Impalutao, Gantongan Creek, 800-900 m, 19.-29.viii.1995, A. Buenafe. Mindanao Island, Davao del Norte Province: 1♂, 1♀, Maco, Mainit, Mainit Creek, 500-700 m, 14.-17.ix.1995, A. Buenafe. 7♂, Maco, Mainit, Masara Mine, 500-700 m, 27.-28.xi.1995, A. Buenafe. Mindanao Island, Davao Oriental Province: 1♂, Baganga, Brgy Upper Mikit, Mangoy Falls, 300-350 m, 6.iv.1995, Buenafe/Gorostiza. 11♂, 5♀, Boston, Mt. Agtuaganon, Camp 55, 1020 m, 29.v.-7.vi.1996, Müller/Buenafe/Gorostiza. 4♂, 3♀, Boston, Mt. Agtuaganon, Camp 55, BMMC-Mining Company, 1020-1100 m, 29.v.-7.vi.1996, Müller/Buenafe/Gorostiza. 4♂, 3♀, Sigaboy, Tandang Sora, Yakal, Tabamban River, Langanisan Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 6♂, 2♀, Sigaboy, Tandang Sora, Yakal, Tabamban River, Tubonol Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 10♂, 1♀, Sigaboy, Tandang Sora, Yakal, Tabamban River, Buvo Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 2♂, 1♀, Sigaboy, Tandang Sora, Yakal, Tabamban River, Lakahan Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. Mindanao Island, Davao del Sur Province: 3♂, Mt. Talomo, Malagos, Baguio, Eagle Camp, Ange Creek, 700-1000 m, x.1994, A. Buenafe. Mindanao Island, Misamis Oriental Province: 1♂, Agusan, 1000 ft., 27.vii.1946, H. Hoogstraal & Celestino, det. M. A. Lieficht 1960, ex Chicago Museum. Mindanao Island, North Cotabato Province: 1♂ Alamada, Mt. Makatoring, 700-900 m, 1.-8.ii.1992, T. Borromeo. 4♂, Mt. Apo, Ilomavis, Kal-ay Creek, Sitio Sayaban, 1200-1300 m, ix.1995, A. Buenafe. 2♀, Mt. Apo, Ilomavis, Lake Agko, Babang Creek, 1600-1700 m, ix.1995, A. Buenafe. 14♂, 4♀, Mt. Apo, Ilomavis, Sodohayan Creek, Sitio Sayaban, 1200-1300 m, ix.1995, A. Buenafe. 6♂, 1♀, Mt. Apo, Lake Agko, 1200-1300 m, 29.iii.-2.iv.1995, R. A. Müller. 1♂, 3♀, Mt. Apo, Lake Agko Creek, 900-1200 m, 12.-25.ix.1994, A. Buenafe. 6♂, Mt. Apo, Marbel River, 1100-1400 m, 19.-25.ii.1994, A. Buenafe. 14♂, 1♀, Mt. Apo, Marbel River, 1100-1400 m, 15.-28.viii.1994, A. Buenafe. 5♂, 1♀, Mt. Apo, Marbel River, 700-900 m, 12.-25.ix.1994, A. Buenafe. 1♀, Mt. Apo, Marbel River, 1100-1400 m, 12.-25.ix.1994, A. Buenafe. 2♀, Mt. Apo, Philipp. National Oil Comp., forest area, 1600-1800 m, 12.-25.iii.1994, A. Buenafe. 5♂, 2♀, Mt. Apo, Matingao River, 800-1300 m, 12.-25.ix.1994, A. Buenafe. 5♂, 2♀, Mt. Apo, Sibawan Creek, 900-1200, 12.-25.ix.1994, A. Buenafe. Mindanao Island, South Cotabato Province: 1♂, Mt. Matutum, 5.-7.ii.1994, L. Vinciguerra/E. Horn. 1♂, Mt. Matutum, 500-700 m, 16.-19.ix.1993, Th. Borromeo. 1♀, Akbang, Mt. Matutum, 28.vii.1991, J. de los Reyes. 1♂, Parker Mts., T'boli, Mongocayo, 10.iv.1986, J. de los Reyes. 3♂, 1♀, Koronadel, Barrio 8, 6.ix.1987, J. de los Reyes. Mindanao Island, Surigao del Sur Province: 6♂, 3♀, Carmen, 2. Equipment Shop, km 11 Lanang Line, 600-650 m, 21.-24.ix.1995, Müller/Buenafe/Gorostiza. 4♂, 3♀, Tabon, Tabon Falls, 100-200 m, 26.v.-8.vi.1996, A. Gorostiza/A. Buenafe. 7♂, 2♀, Tandag, Hitaub Creek, 500-

10

12

11

13

Figs. 10-13. *Risioecnemis* spp., ligula in ventral view (10, 12) and lateral view (11, 13). – 10, 11, *R. nigra* ♂, paratype, Samar Island, San Isidro; 12, 13, *R. odobeni* ♂, Catanduanes Island, Simohe Creeks. Scales 100 µm.

600 m, 16.-19.iv.1995, Buenafe, Gorostiza. Mindanao Island, Zambonga del Norte Province: 1 ♂, North Manucan, 15-20 km S., 250-420 m, 13.x.58, Quato, ex Bishop Museum. All specimens except holotype in RMNH.

Remarks

Altitudinal range. – 80-1800 m.

Distribution. – Central and eastern Mindanao (fig. 141).

Risioecnemis atropurpurea (Brauer) (figs. 28-29, 72, 94-95, 129, 140)

Hypocnemis atropurpurea Brauer, 1868: 549-550, ♂ holotype, (Manila); Selys 1882: 25 (key), 26 (diff. diagnosis) 1886: 98 (key), 101 (redescription of holotype).

Prionocnemis atropurpurea, Kirby 1890: 127 (catalogue); Needham & Gyger 1939: 240 (list Philippine Zygoptera), 270 (key), 273-274 (♂ diagnosis, ♀ first description); pl. 14, figs. 180, 187, 188, 196.

Risioecnemis atropurpurea, Lieftinck 1961: 142-143 (notes on new material from FMNH); Davies & Tobin 1984: 100;

Figs. 14–17. *Risiocnemis* spp., ligula in ventral view (14, 16) and lateral view (15, 17). – 14, 15, *R. plebeja* ♂, Panay Island, Iloilo Prov., Nagaranan River, 15a, left lateral view; 15b, right lateral view; 16, 17, *R. polilloensis* ♂, Catanduanes Island, Tongao Creeks. Scales 100 μ m.

Bridges 1994: VII.22; Hämäläinen & Müller 1997: 264, 287, 290 (notes on distribution); Steinmann 1997: 386. Tsuda 2000: 56.

Differential diagnosis

Male black, with anterior parts of femur and tibia bluish-white.

Female with orange labrum and bright yellow legs; posterior pronotal lobe elevated at right angles, anterior side rounded in lateral view (fig. 95).

The male of *R. atropurpurea* is very well characterized by the conspicuous bluish-white coloration of the legs; the short subbasal ventral process of superior appendage is apically rounded (fig. 29), while it is blunt in *R. rubripes* (figs. 59, 69) and *R. tendipes* (fig. 63), cut off in *R. pistor* sp. n. (figs. 51, 65) and notched in *R. rubricercus* sp. n. (figs. 57, 67). The female posterior pronotal lobe is similar to that of *R. melanops* (fig. 123) in lateral view; however, in *R.*

18

20

19

21

Figs. 18-21. *Risiocnemis* spp., ligula in ventral view (18, 20) and lateral view (19, 21). – 18, 19, *R. pistor* ♂, Mindanao Island, Davao Oriental Prov., Lakahan Creek; 20, 21, *R. siniae* ♂, Samar Island, San Isidro. Scales 100 μ m.

melanops anterior and posterior lobes are of subequal height, in *R. atropurpurea* posterior lobe is slightly higher than anterior (fig. 95).

Description

Measurements. – Forewing length ♂ 24.0-26.5 (n=8), ♀ 26.0-28.0 mm (n=5); hindwing length ♂ 23.0-26.0 mm (n=8), ♀ 24.5-27.5 mm (n=5); abdomen length ♂ 38.5-42.0 mm (n=7), ♀ 37.0-40.0 mm (n=5).

Male. – Head. – Labium with medium part yellow to black, lacinia deep black; yellow-white ring basal to insertion of movable hook; head otherwise black, distal two thirds of antennal pedicellus medium brown.

Thorax. – Prothorax with flat median lobe; black.

Legs black with anterior parts of femur and tibia bluish-white.

Synthorax black, metepimeron occasionally dark brown. Area between ante-alar ridge and wings bright yellow-white.

Wings. – Pterostigma, moderately oblique, short; medium to dark brown.

Abdomen. – Usually black throughout; in teneral specimens the dorsal side of superior is brown or even bluish; ventral side of superior appendage in some specimens light or medium brown; superior appendage elongate, more than twice as long as inferior (fig. 28), in dorsal view straight (fig. 72); subbasal ventral process short and rounded at tip (fig. 29).

Ligula. – Terminal lobes oval and irregular apically; median incision between terminal lobes broadly oval.

Female. – Head. – Labium bright yellow-orange, movable hook diffuse brown apically; labrum and gena yellow; anteclypeus dirty-yellow, postclypeus medium brown, with distal part darkened; head otherwise medium brown, except for black antennal flagellum and diffuse dark rings around ocelli.

Thorax. – Posterior pronotal lobe with median part almost straight in anterior view, not distinctly incised or emarginate (fig. 129), anterior side of posterior lobe slightly rounded in lateral view (fig. 95); yellow-brown.

Legs bright yellow, coxa, tibia and especially tarsus somewhat darkened, joints with diffuse dark markings.

Synthorax yellow-brown, middorsal carina and parts of ante-alar ridge and mesostigmal plate black; lower part and underside bright yellow.

Wings. – Pterostigma similar as in male, but somewhat variable in shape.

Abdomen. – Medium to dark brown, segment 1 to 7 darkened dorsally; segment 8 to 10 including cerci and valvae brighter. Valvae comparatively long (0.7–0.8 mm), projecting part nearly twice as long as length of last abdominal segment.

Material examined

Holotype ♂, Luzon, labelled '*Hypocnemis atropurpurea*' [head lacking] (ISNB). – Other material: Luzon Island, Ifugao Province: 2♂, Jacmal Bunhian, 24 km E Mayoyao, 800–1000 m, 11.–13.v.1967, Hm. Torrevillas. Luzon Island, Nueva Ecija Province: 3♂, 1♀, Caranglan, Batching River, 700–850 m, 11.vi.1991, R. A. Müller. Luzon Island, Nueva Viscaya Province: 1♂, Sta Fe, Dalton Pass, 850–1200 m, 5.–18.vi.1990, A. Gorostiza. 1♀, Sta Fe, Dalton Pass area, 900 m, 8.–17.viii.1991, A. Gorostiza. 1♂, 2♀, Sta Fe, Dalton Pass, 850–900 m, 8.–9.vi.1991, R. A. Müller. 1♀, Sta Fe, Atbo River, 550–800 m, 10.vi.1991, R. A. Müller. 1♀, Sta Fe, Barrio Lohong (Mts East of Dalton Pass), 900–1000 m, 10.–23.i.1993, A. Gorostiza. All specimens except holotype in RMNH.

Remarks

Altitudinal range. – 100–1400 m.

Distribution. – Luzon; Marinduque (fig. 140).

Risioecnemis calceata Hämäläinen
(figs. 4–5, 30–31, 73, 96–97, 130, 140)

Risioecnemis calceata Hämäläinen 1991b: 196 (♂ preliminary

description), figs. 3–4 (♂ male appendages); Bridges 1994, VII: 40; Hämäläinen & Müller 1997: 264, 298, 303 (notes on distribution); Tsuda 2000: 56.

Differential diagnosis

Male black, last three abdominal segments and appendages mainly red, legs red and black; superior appendages in dorsal view slightly diverging apically (fig. 73). Female mainly medium brown, with black postclypeus; posterior pronotal lobe slightly elevated (fig. 97), deeply incised (figs. 96, 130).

R. calceata Hämäläinen 1991 and *R. siniae* Hämäläinen 1991 are quite similar in colour pattern; however, they are distinguishable by the red abdominal coloration which extends from segment 8 to 10 in *R. calceata*, from segment 3 to 10 in *R. siniae*; both species have red and black legs, but in *R. calceata* the black coloration is restricted to the posterior part of tibia and the joints while covering the larger part of femur in *R. siniae*; both species share the acute median incision between terminal lobes of ligula (figs. 4–5). See also under *R. rubricercus* sp. n.

Description

Measurements. – Forewing length ♂ 27.0–28.5 mm (n=5), ♀ 28.0–30.0 mm (n=3); hindwing length ♂ 25.5–27.0 mm (n=5), ♀ 26.5–28.5 mm (n=3); abdomen length ♂ 42.5–45.0 mm (n=5); ♀ 40.0–43.0 mm (n=3).

Male (holotype). – Measurements. – Forewing length 28.5 mm; hindwing length 27.0 mm; abdomen length 45.0 mm.

Head. – Labium black intermingled with yellow; labrum, gena, ante- and postclypeus black; frons and vertex black, occiput reddish-brown; antennal socket, scapus and basal two thirds of pedicellus reddish-brown; flagellum black, somewhat thickened basally.

Thorax. – Pronotal tubercles not modified, plain in lateral view; posterior pronotal lobe bow-shaped, not raised; prothorax black with traces of reddish-brown.

Legs bright red, coxa and trochanter yellow-black; femur, tarsus and especially posterior half of tibia partly marked with black.

Synthorax. – Mesepisternum black, except for humeral thoracic fossa; the latter and posterior half of mesepimeron diffuse medium to light brown, anterior half diffuse black. Metepisternum with upper half brown-black, lower half light brown; anterior half of metepimeron brown-black, posterior half light brown; meso- and metakatepisternum black; underside of synthorax black throughout.

Wings. – Pterostigma very oblique, black; posterior and distal side slightly concave; posterior wing border emarginating at the points where R4 and cubital vein meet anal vein, respectively.

Abdomen. – Segment 1 to basal part of segment 7 black; remainder of abdomen red, posterior third of

Figs. 22-23. *Risiocnemis tendipes*, Mindanao Island, Davao del Norte Prov., Masara Mine, 22, ligula in ventral view; 23, ligula in lateral view. Scales 100 μ m.

segment 8 up to segment 10 somewhat darkened, posterior margin of segment 10 laterally halfway marked with a black spot; superior appendage almost triangular in dorsal view (cf. fig. 73), distal end slightly bent out- and upwards; subbasal ventral process robust, bent backwards apically (cf. fig. 31), tip black; inferior appendage two-thirds the length of superior, slender (cf. fig. 30), tips black; appendages otherwise bright red.

Variation. – Labium in other specimens almost entirely dark, except for the yellow basal bulbs. Occiput in some specimens black. Coxa and trochanter can be black throughout; pterostigma light brown in one male specimen from Anislagon Dako. Insertion of R4 variable, reaching from a position at Sn (especially in hindwing) up to almost halfway the distance between Sn and Px1. The black dorsal coloration of abdominal segment 7 is somewhat extended occasionally.

Female (first description). – Head. – Labium yellow; labrum yellow-orange, basal part and medio-basal deepening occasionally darkened; ante- and postclypeus dark brown-black; gena, frons, vertex and occiput light to dark brown; antennal socket, scapus and pedicellus, except for a diffuse black area around the joint between scapus and pedicellus light to medium brown, flagellum black; ocelli surrounded by irregular black rings.

Thorax. – Pronotal tubercles well recognizable in lateral view, posterior pronotal lobe somewhat raised (fig. 97), deeply incised medially (figs. 96, 130).

Legs light brown throughout.

Synthorax brown, mesepisternum darker than remaining parts; underside of synthorax including lower parts of metepimeron light brown. Wings. – Pterostigma as in the male, but less oblique, light brown.

Abdomen. – Dark brown; paraproct well visible in dorsal and lateral view; projecting part of valvae 0.8 to 1.1 mm.

Material examined

Holotype σ , Panaon Island, San Francisco, Anislagon Dako, 300 ft., viii.1988, W. Catal. – Paratypes: Panaon Island, [Southern Leyte Province]: 1 σ , San Francisco, Anislagon Creek, 200ft., x.1988, W. Catal. 2 σ , San Francisco, Anislagon Dako, 300 ft., viii.1988, W. Catal. 2 σ , San Francisco, Anislagon Gamay, 200ft., viii.1988, W. Catal. 1 σ , San Francisco, Mt. Anislagon, 350 ft., viii.1988, W. Catal. 2 σ , San Francisco, Gabing Gamay, x.1988, W. Catal. 3 σ , San Francisco, Mt. Kaneo, 400 ft., viii.1988, W. Catal. – Other material: 1 σ , San Francisco, Anislagon River, 10.-12.x.1990, T. Borromeo jr. 2 σ , San Francisco, Gabing Gamay, x.1988, W. Catal. Dinagat Island, [Surigao del Norte Province]: 2 σ , Loreto, Balitbiton River, Mt. Canbinlio, 19.v.1988 & vii.1989, A. Buenafe. All in RMNH.

Remarks

Altitudinal range. – 50-500 m.

Distribution. – Dinagat, Panaon (fig. 140).

Note. – Contrary to the notice in Hämäläinen (1991b), the holotype has been deposited in RMNH.

Risiocnemis flammea (Selys)

(figs. 32-33, 74, 98-99, 131, 142)

Hypocnemis flammea Selys, 1882: 26 (key), 28-29 (description of male); Selys 1886: 98 (key), 104-105 (redescription).

Figs. 24–27. *Risioecnemis* spp., appendages, in lateral view (24, 26) and posterior lateral view (25, 27). – 24, 25, *R. antoniae* ♂, paratype, Mindanao, Davao Oriental Prov., Caatijan; 26, 27, *R. atripes* ♂, Mindanao Island, North Cotabato Prov., Mt. Apo, Kal-ay Creek. Scales 300 μ m.

Prionocnemis flammea: Kirby 1890: 127 (catalogue); Needham & Gyger 1939: 240 (species list of Philippine Zygoptera), 270 (note on status).

Prionocnemis ignea [nec. Brauer 1868]: Needham & Gyger 1941: 147–148, pl.1, figs. 17, 18 (♂ appendages; Mt. Apo, Mindanao).

Risioecnemis flammea: Davies & Tobin 1984: 100; Hämäläinen 1991: fig. 5 (♂ ligula); – Bridges 1994: VII:86; Hämäläinen & Müller 1997: 264, 296, 297, 298, 299, 301, 303 (distribution); Steinmann 1997: 386; Tsuda 2000: 56.

Differential diagnosis

Male with medium brown thorax, red legs and bright red abdomen.

Female with posterior pronotal lobe only slightly higher than anterior lobe (fig. 99), somewhat oblique towards posterior side; postclypeus medium brown to dark, head and legs reddish.

Males of *R. flammea* share the reddish-brown head and light brown synthorax with *R. ignea*, *R. incisa*, *R. plebeja* and *R. odobeni* (but see section on variation in latter species). However, the first three species can be easily distinguished from *R. flammea* by the structure of the appendages (see under respective species). Ap-

pendages of *R. odobeni* show common features with *R. flammea*: the distal inner side of superior being kinked outwards, the outer side slightly concave (cf. figs. 74, 82) and the subbasal ventral process moderately curved (this type of appendage will be further referred to as the *R. flammea*-type); for differences with *R. odobeni*, see diagnosis of that species. As in *R. melanops*, the female posterior pronotal lobe of *R. flammea* is as high as anterior lobe in lateral view (fig. 99); however, the anterior side is straight in *R. flammea*, but smoothly curved in *R. melanops* (cf. fig. 123); in dorsal view, median part of posterior pronotal lobe is more rounded in *R. flammea* (fig. 98) than in *R. melanops* (cf. fig. 124).

Description

Measurements. – Forewing length ♂ 20.0–28.0 mm (n=14), ♀ 21.0–27.5 (n=15), hindwing length ♂ 19.0–27.0 mm (n=14), ♀ 20.0–27.0 mm (n=15); abdomen length ♂ 32.0–42.0 mm (n=14), ♀ 34.5–39.5 mm (n=5). Variation per island (forewing length): ♂ 22.5 mm (n=2) [Biliran], ♂ 21.0–23.0 (n=2), ♀ 23.0–

Figs. 28-31. *Risioctenemys* spp., appendages, in lateral view (28, 30) and posterior lateral view (29, 31). – 28, 29, *R. atropurpurea* ♂, Luzon Island, Nueva Ecija Prov., Batching River; 30, 31, *R. calceata* ♂, paratype, Panaon Island, Anislagon Gamay. Scales 300 µm.

23.5 (n=2) [Dinagat], ♂ 22.5-24.0 (n=2), ♀ 24.5 mm (n=1) [Leyte], ♀ 21.0 mm (n=1) [Homonhon], ♂ 22.0-28.0 (n=3), ♀ 22.0-27.5 mm (n=6) [Mindanao], ♂ 23.0-23.5 (n=2), ♀ 23.0-25.0 mm (n=3) [Panaon], ♂ 20.0-22.0 (n=3), ♀ 21.0-23.0 mm (n=2) [Samar].

Male. – Head. – Labium yellow to bright red throughout; gena yellow; head otherwise bright red, with following exceptions: postclypeus medium to dark brown, antennal flagellum and distinct ring around either posterior ocellus black.

Thorax. – Prothorax with pronotal tubercles inconspicuous, with a posterior ridge well visible in lateral view; posterior pronotal lobe broadly rounded; prothorax medium brown.

Legs bright red.

Synthorax with upper part reddish-brown, lower part light brown; middorsal carina covered by a fine black stripe.

Wings. – Pterostigma slightly elongate, posterior distal corner angular; distal side very slightly convex.

Abdomen. – Usually reddish-brown, dorsally darkened on segment 5 to 6 (for variation see below). Segment 9 to 10 and appendages vividly red, except for lateral black spot on posterior margin of segment 10. Superior appendage about 1.5 times the length of segment 10, acute apically, subbasal ventral process elongate, hardly reaching level of inferior appendage in lateral view, apex bent backwards (figs. 32-33), in dorsal view inner sides kinked (fig. 74); anterior base of subbasal ventral process only partly visible in lateral view (fig. 32).

Ligula short, stout, flattened apically; terminal lobes broad, widening distally, rounded apically (cf. Hämäläinen 1991a: fig. 5).

Variation in males by islands. – In specimens from Leyte and Dinagat, the postclypeus is brown-black throughout, i.e. darker than in other populations; the middle abdominal segments, especially segments 4, 5, and 6, occasionally also anterior half of segment 7, are darkened in specimens from Leyte; specimens from Samar and Dinagat usually have segments 1 to 4 bright red, darkening gradually from segment 5 to

Figs. 32–35. *Risioecnemis* spp., appendages, in lateral view (32, 34) and posterior lateral view (33, 35). – 32, 33, *R. flammea* ♂, Mindanao Island, North Cotabato Prov., Dum Creek; 34, 35, *R. fuligifrons* ♂, Mindanao Island, Surigao del Sur Prov., Hitaub Creek. Scales 300 µm.

wards end of abdomen; in specimens from Panaon, only segments 1 to 3 are bright red, the remainder darkened. In males from Mindanao, colour of postclypeus varies from medium brown to black, darkening of abdomen from segment 4 or 5 to end of abdomen, occasionally segments 7 to 10 reddish again. For variation in size see measurements section.

Female. – Head. – Labium bright yellow, except for distal part of end-hook which is diffuse brown; labrum orange, gena yellow; anteclypeus reddish-brown, postclypeus dark brown. Rudimentary sub-rectangular markings attached to eye margin at either side; antennal scapus and pedicellus reddish-brown; flagellum black.

Thorax. – Prothorax light brown, with a touch of reddish.

Legs reddish-brown, but coxa, trochanter and proximal part of femur somewhat brighter.

Synthorax of same colour as prothorax.

Wings. – Pterostigma in forewing moderately oblique, rhomboidal, anterior and posterior sides of subequal length; in hindwing, posterior side distinctly shorter than anterior side; pterostigma light to

medium brown.

Abdomen. – Dark reddish-brown; posterior margin of segment 10 slightly concave.

Projecting part of valvae about double the length of last abdominal segment (0.7–0.8 mm).

Variation in females by islands. – Among the female specimens studied, the darkening of postclypeus varies between individuals, but apparently not significantly between different islands. For variation in size see measurements section.

Material examined

Holotype ♂, labelled '*Hypocnemis flammea* Selys', ISNB. – Other material: Biliran Island: 2♂, Naval, Mt. Sayoa, Villaconsuelo, 200–400 m, 4–7.xi.1992, Th. Borromeo. Dinagat Island, [Surigao del Norte Province]: 1♂, 1♀, Loreto, Mt. Canbinlio, Balitbiton River, ix.1989, A. Buenafe. 1♂, 1♀, Loreto, Mt. Canbinlio, Canbinlio River, 24.v. & 4.vi.1988, A. Buenafe. 2♂, 1♀, Mt. Canbinlio, ii.1989, A. Buenafe. 1♂, Loreto, Lake Danao (small), 5.v.1989, A. Buenafe. 1♂, Loreto, Lake Danao (big), 2.iv.1989, A. Buenafe. Homonhon Island, [Eastern Samar Province]: 1♀, Magellanes Point, 28.i.1989, F. Lagramada. Leyte Island: 2♂, 1♀, Hilusig, Mahaplag, Mt. Balocau, Magsuganao River, 700

36

37

38

39

Figs. 36-39. *Risiocnemis* spp., appendages, in lateral view (36, 38) and posterior lateral view (37, 39). – 36, 37, *R. haematopus* ♂, Catanduanes Island, Simohe Creeks; 38, 39, *R. ignea* ♂, Luzon Island, Aurora Prov., Lomot Creek. Scales 300 µm.

m, 18.-30.ix.1990, Th. Borromeo jr. 1♂, 1♀, Mahaplag, Hilusig, Mt. Balocau, 700 m, 2.xii.1989, Th. Borromeo jr. 1♂, Mahaplag, Hilusig, Mt. Balocau, 600 m, 17.v.1987. Mindanao Island, Bukidnon Province: 14♂, 1♀, Mt. Katanglad Impasugong, Brgy Impalutao, Gantongan Creek, 800-900 m, 19.-29.viii.1995, A. Buenafe. 1♂, San Vicente, Tamalaong River, 400-500 m, 16.-18.ii.1991, Th. Borromeo jr. 1♂, Mt. Imbayao, Tamalaong River, 600 m, 5.iv.1990, Th. Borromeo. 1♂, Mt. Imbayao, Baungon, Tanalaong River, 25.ix.-1.x.1989, Th. Borromeo jr. 2♂, Mt. Katanglad, Lomoloyan River, x.1991, A. Buenafe. 2♂, 2♀, Mt. Katanglad, Lantapan area, 900-1100 m, 26.-27.ii.1994, A. Buenafe. 3♂, Impasugong Impalutao, Natigbasan Creek, 1200-1400 m, 10.-20.v.1995, A. Buenafe. 6♂, Mt. Gantongan, Gantongan River, x.1991, A. Buenafe. Mindanao Island, Davao del Norte Province: 9♂, 1♀, Maco, Mainit, Mainit Creek, 500-700 m, 14.-17.ix.1995, A. Buenafe. 16♂, 6♀, Maco, Mainit, Masara Mine, 500-700 m, 14.-17.ix. & 27.-28.xi.1995, A. Buenafe. Mindanao Island, Davao del Sur Province: 1♂, Mt. Talomo, Malagos, Baguio, Eagle Camp, small spring, 700-1000 m, x.1994, A. Buenafe. Mindanao Island, Davao Oriental Province: 1♂, Boston, Caatijan, 500-550 m, 28.v.1996, Müller/Buenafe/Gorostiza. 15♂, 6♀, Boston, Mt. Agruuganon, Camp 55, 1020 m, 29.v.-7.vi.1996, Müller/Buenafe/Gorostiza. 2♂, Boston, Mt. Agruuganon, Camp 55, BMMC Mining Comp., 1020-1100 m, 29.v.-7.vi.1996, Müller/Buenafe/Gorostiza. 1♂, Cateel,

Aliwagwag Falls, 200-300 m, 10.iv.1995, Buenafe/Gorostiza. 1♀, Sigaboy, Tandang Sora, Yakal, Tabamban R., Buyo Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 17♂, 6♀, Sigaboy, Tandang Sora, Yakal, Tabamban R., Langanisan Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 11♂, 9♀, Sigaboy, Tandang Sora, Yakal, Tabamban R., Tubonol Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 1♀, Sigaboy, Tandang Sora, Yakal, Tabamban R., Tubonol Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 1♀, Sigaboy, Tandang Sora, Yakal, Tabamban R., Tubonol Creek, 500-700 m, 27.-28.xi.1995, A. Buenafe. Mindanao Island, Misamis Occidental Province: 1♂, Mt. Malingdang, 1000 m, 8.vi.1987, Th. Borromeo. Mindanao Island, North Cotabato Province: 6♂, 3♀, Mindanao Island, North Cotabato, Alamada, Mt. Makatoring, 700-900 m, 1.-8.ii.1992, Th. Borromeo. 3♂, Mt. Apo, Lake Agko, 1200-1300 m, 29.iii.-2.ii.1995, R. A. Müller. 2♂, Mt. Apo, Lake Agko Creek, 900-1200 m, 12.-25.ix.1994, A. Buenafe. 5♂, Mt. Apo, Ilomavis, Lake Agko, Dum Creek, 1100-1200 m, ix.1995, A. Buenafe. 4♂, Mt. Apo, Ilomavis, Kal-ay Creek, Sitio Sayaban, 1200-1300 m, ix.1995, A. Buenafe. 11♂, 1♀, Mt. Apo, Ilomavis, Sodsohayan Creek, Sitio Sayaban, 1200-1300 m, ix.1995, A. Buenafe. 6♂, Mt. Apo, Marbel River, 1100-1400 m, 19.-25.ii., 15.-28.viii.1994, A. Buenafe. 2♂, Mt. Apo, Marbel River, 700-900 m, 12.-25.ix.1994, A. Buenafe. 1♂, Mt. Apo, Matingao River, 800-1300 m, 12.-25.ix.1994, A. Buenafe. 2♂, Mt. Apo, Sibawan Creek, 900-1200 m, 12.-25.ix.1994, A. Buenafe. Mindanao Island, South Cotabato Province: 3♂, Mt. Matutum, 500-700 m, 16.-19.ix.1993,

Th. Borromeo, 4♂, 1♀, Lake Sebu, Lamlahak, Talubek, 26.i-1.ii.1994, L. Vinciguerra/E. Horn. Mindanao Island, Zamboanga del Norte Province: 1♂, Mutya, Galay River, 8.-9.xi.1990, Th. Borromeo jr. 1♂, 2♀, Tampilisan, Campoy River, 9.i.1991, Th. Borromeo jr. Panaon Island, [Southern Leyte Province]: 1♂, 2♀, San Francisco, Anislagon River, 10.-12.x.1990, Th. Borromeo jr. 1♂, San Francisco, Mt. Anislagon, 100-150 m, 2.ii.1991, Th. Borromeo jr. 2♀, San Francisco, Batong Lapad, viii.1988, W. Catal. 1♀, San Francisco, Gabing Gamay, big River, x.1988, W. Catal. Samar Island, Western Samar Province: 3♂, 5♀, Hinabangan, Bagakay, Arisona, 100-200 m, 29.viii.-20.ix.1996, A. Buenafe. 4♂, 2♀, Hinabangan, Bagakay, San Isidro, 100-200 m, 29.viii.-20.ix.1996, A. Buenafe. 1♂, Hinabangan, Bagakay, San Rafael, 50-180 m, 29.viii.-20.ix.1996, A. Buenafe. 6♂, 1♀, San Isidro, Paranas, 200-300 m, 7.-21.X.1994, Th. Borromeo. All except holotype in RMNH.

Remarks

Altitudinal range. – 200-1800 m.

Distribution. – Mindanao, Dinagat, Biliran, Homonhon, Leyte, Panaon, Samar (fig. 142).

Risiocnemis fuligifrons Hämäläinen
(figs. 34-35, 75, 100-101, 122, 143)

Risiocnemis fuligifrons Hämäläinen, 1991b: 198-200 (♂ preliminary description), figs. 9-10 (♂ male appendages); Bridges 1994, VII: 93; Hämäläinen & Müller 1997: 264, 298, 301, 302, 303 (notes on distribution); Tsuda, 2000: 56.

Differential diagnosis

Male with anterior half of head up to level of posterior ocelli black, except for reddish-brown anteclypeus; legs bright orange-red. Female brown; posterior pronotal lobe moderately directed anteriorly in lateral view (fig. 101), median part subrectangular with sharp hooks (figs. 100, 122).

The male of *R. fuligifrons* can not be confused with any other *Igneocnemis* species due to the characteristic coloration of frons and vertex; the appendages are of the *R. haematopus* - type (fig. 75, see below). However, in *R. fuligifrons* (fig. 34) superior appendages are about two times, in *R. haematopus* (cf. fig. 36) only 1.5 times as long as abdominal segment 10; in lateral view, inferior appendages of *R. fuligifrons* are comparatively straight, rather pointed apically; those of *R. haematopus* are slightly curved in lateral view, and apically rounded. The female is well recognizable by the posterior pronotal lobe (figs. 100-101, 122) which in shape and position is intermediate between *R. ignea* and *R. haematopus*.

Description

Measurements. – Forewing length ♂ 22.0-26.0 mm (n=6), ♀ 23.5-28.0 mm (n=6); hindwing length ♂ 21.0-25.5 mm (n=6), ♀ 22.5-27.0 mm (n=6); abdomen length ♂ 36.5-43.0 mm (n=6), ♀ 32.5-39.5 mm (n=6).

Male (holotype). – Measurements. – Forewing length 24.0 mm; hindwing length 23.0 mm; abdomen length 38.5 mm.

Head. – Labium yellow, anterior part including entire movable hook diffuse brown-black; labrum black, basal part reddish-brown; anteclypeus reddish-brown, postclypeus black; frons up to level between anterior and posterior ocelli black, occiput reddish-brown throughout, border between frontal and occipital coloration diffuse; antennal scapus black, except for a yellow-white distal ring, pedicellus yellow-white, flagellum black; posterior ocelli surrounded by irregular black rings.

Thorax. – Pronotal tubercles distinct in lateral view; posterior lobe broadly rounded; prothorax light brown.

Legs bright orange-red.

Synthorax light brown, brightening towards underside, middorsal carina covered by narrow black stripe.

Wings. – Pterostigma subsquare, in forewing anterior side slightly shorter than posterior side, brown-black; forewing with 16-18 Px, hindwing 16-17 Px.

Abdomen. – Brown, dorsally darkened; segment 7 largely black, segments 8 to 10 including appendages black throughout; superior appendage with subbasal ventral process curved (cf. fig. 35); basal bulge of inferior appendage elongate (cf. fig. 34), the latter reaching up to halfway the length of superior appendage.

Variation. – Coloration of frons can be less dark, the border with occiput more diffuse. One specimen from Zamboanga Peninsula (teneral?) lacks black coloration of frons and antennal scapus; pedicellus occasionally reddish-brown. Pterostigma light brown to brown-black, occasionally distal side distinctly concave. In several specimens, last abdominal segments and appendages are not darkened; instead, appendages light brown, only apical tips and tips of subbasal ventral process of superior appendage darkened.

Female. – Head. – Labium yellow, distal half of end-hook darkened; labrum and gena yellow; ante- and postclypeus medium brown; frons and vertex including antennal socket and scapus reddish-brown, antennal pedicellus lighter brown, flagellum darkened; posterior ocelli surrounded by diffuse dark rings.

Thorax. – Prothorax with pronotal tubercles distinct, rounded; posterior lobe moderately directed anteriorly (fig. 101), median part subrectangular with sharp hooks (figs. 100, 122); prothorax light brown.

Legs light brown.

Synthorax light brown with black markings on middorsal carina and ante-alal ridge.

Wings. – Pterostigma little oblique, with posterior distal corner rounded; light brown.

Abdomen. – Segment 1 light brown; remaining segments dark brown; projecting part of valvae slightly

Figs. 40-43. *Risioenemys* spp., appendages, in lateral view (40, 42) and posterior lateral view (41, 43). – 40, 41, *R. incisa* ♂, Luzon Island, Nueva Viscaja Prov., Sta Fe, Atbo River; 42, 43, *R. kaiseri* ♂, paratype, Samar Island, San Isidro. Scales 300 µm.

longer than length of last abdominal segment (0.6-0.7 mm).

Material examined

Holotype ♂, Philippines, Panaon Island, San Francisco, Mt. Anislagon, 350 ft., viii.1988, W. Catal. – Paratype: Dinagat Island, [Surigao del Norte Province]: 1 ♂, Loreto, Mt. Canbinlio, Canbinlio River, 28.v.1988, A. Buenafe. – Other material: Basilan Island, Basilan Province: 3 ♂, Lamitan, Bolingan Falls, 50-100 m, 8.iv.1991, Th. Borromeo. 4 ♂, Lamitan, Buhe-Yakan River, 100-150 m, 6.-9.iv.1991, Th. Borromeo. Leyte Island, Leyte Province: 2 ♀, Abayog, Barrio Dam, Mt. Kinagunayan, 400-500 m, 18.-20.v.1993, D. Mohagan. Mindanao Island, Lanao del Norte Province: 2 ♂, 1 ♀, Iligan, Maria Cristina Falls, 250 m, 10.-16.viii.1997, A. Buenafe. 1 ♂, 2 ♀, Linamon, Sitio Tinago, 200-400 m, 10.-16.viii.1997, A. Buenafe. Mindanao Island, Surigao del Sur Province: 8 ♂, 5 ♀, Tandag, Hitaub Creek, 500-600 m, 16.-19.iv.1995, Buenafe & Gorostiza. 1 ♂, 3 ♀, Carmen, 2. Equipment Shop, km 11 Lanang Line, 600-650 m, 21.-24.iv.1995, Müller, Buenafe & Gorostiza. Mindanao Island, Zamboanga del Norte Province: 2 ♂, 1 ♀, Tampilisan, Gampoy River, 100-150 m, 5. & 9.i.1991, Th. Borromeo & Th. Borromeo jr. Mindanao Island, Zamboanga del Sur Province: 2 ♂, Tigbao, Mt. Timolan, Tigbao Creek, 12.-21.viii.1994, Th. Borromeo. Panaon Island, [Southern

Leyte Province]: 1 ♀, San Francisco, Anislagon River, 10.-12.x.1990, Th. Borromeo jr., first female. 1 ♀, Loreto, Mt. Redondo, Midas River, 2.vi.1988, A. Buenafe. All in RMNH.

Remarks

Altitudinal range. – 50-650 m.

Distribution. – Western and northern Mindanao, Dinagat, Basilan, Panaon, Leyte (fig. 143).

Note. – Contrary to the notice in Hämäläinen (1991b), the holotype has been deposited in RMNH collection, Leiden.

Risioenemys haematopus (Selys)

(figs. 6-7, 36-37, 76, 102-103, 141)

Hypocnemis haematopus Selys, 1882: 27-28 (orig. descr. ♂ ♀ from 'Mindanao'); pl. 1, figs. 1-10 (partly in colour); 1886: 102-103 (rep. descr. ♂ ♀ 'Mindanao').

Prionocnemis haematopus Kirby 1890: 127 (catalogue); Munz 1919: 32 (table iv, comparison wing venational features), pl. xii, fig. 79 (forewing); Needham & Gyger 1939: 240 (list), 274 (diagnosis ♂ and ♀; further specimens from Luzon), pl. 14, figs. 177, 189-190.

Risioenemys reflexa Kimmins, 1936: 92-93 (description of ♀ holotype and paratype *R. reflexa* 'NW Borneo', fig. 12

Figs. 44-47. *Risiocnemis* spp., appendages, in lateral view (44, 46) and posterior lateral view (45, 47). – 44, 45, *R. melanops* ♂, Samar Island, Oras; 46, 47, *R. nigra* ♂, paratype, Samar Island, San Isidro. Scales 300 µm.

A,B: (prothorax ♀ holotype); 1971: 181 (note on holotype ♀ *R. reflexa*).

Risiocnemis haematopus, Liefstinck 1981: 105-107 (diff. diagnosis; synonymization with *R. reflexa*); Davies & Tobin 1984: 100; Hämäläinen 1991: 155, figs. 2, 4 (apical wing margin); Bridges 1994: VII:103; Hämäläinen & Müller 1997: 264, 287, 290, 296 (notes on distribution); Steinmann 1997: 386 (err. distr.: Borneo); Tsuda 2000: 56.

Differential diagnosis

Male with black head and bright red legs; synthorax with upper anterior part black and lower posterior part reddish-brown, diffuse diagonal border in between. Female light to medium brown, postclypeus darkened; posterior pronotal lobe at right angles to pronotum (fig. 103).

Male coloration very similar to *R. antoniae* sp. n.; colour pattern also relates to *R. kaiseri* sp. n. In dorsal view, the male superior appendage of *R. haematopus* has a concave inner distal side and a convex outer side (fig. 76); this type of appendage is shared by some other species and is referred to in the text as the *R. haematopus* - type. For structural differences with *R. kaiseri* sp. n., see diagnosis of that species. Female

posterior pronotal lobe resembles that of *R. fuligifrons*; for distinguishing features see diagnosis of that species.

Description

Measurements. – Forewing length ♂ 24.0-26.5 mm (n=6), ♀ 24.5-28.5 mm (n=6); hindwing length ♂ 22.5-25.5 mm (n=6); ♀ 23.5-27.5 mm (n=6); abdomen length ♂ 38.0-42.0 mm (n=6); ♀ 35.5-39.5 mm (n=6).

Male. – Head. – Labium with praementum black intermingled with yellow, remaining parts black throughout; labrum, gena, ante- and postclypeus black; antennal scapus with weak yellow-white distal ring, pedicellus with diffuse medium brown marking on median part. Head otherwise black, lateral part of occiput brownish.

Thorax. – Pronotal tubercles moderately distinct; posterior pronotal lobe slightly bow-shaped, only slightly elevated. Prothorax black, lateral parts of anterior pronotal lobe yellow.

Legs bright red, except for black markings on coxa, trochanter, posterior distal part of femur, distal end of

Figs. 48–59. *Risiocnemis* spp., appendages, in lateral view (even numbers) and posterior lateral view (odd numbers). – 48, 49, *R. odobeni* ♂, Catanduanes Island, Egwang Tapayas Creeks; 50, 51, *R. pistor* ♂, paratype, Mindanao Island, Davao Oriental Prov., Lakahan Creek; 52, 53, *R. plebeja* ♂, Panay Island, Iloilo Prov., Nagaranan River; 54, 55, *R. polilloensis* ♂, Catanduanes Island, Egwang Tapayas Creeks; 56, 57, *R. rubricercus* ♂, paratype, Mindanao Island, Davao Oriental Prov., Mt. Agtuganon; 58, 59, *R. rubripes* ♂, Mindanao Island, Surigao del Sur Prov., Carmen. Scales 300 μ m.

tibia and distal third of metatarsus.

Synthorax with upper part black, lower part light brown, the diffuse border between these parts running diagonally from lower anterior end of mesepimeron to approximately the lateral end of posterior carinal fork.

Wings. – Pterostigma very oblique, all sides slightly convex; dark brown.

Abdomen. – Segments 1 to 2 light brown, segments 3 to 7 gradually darker, segments 8 to 10 black, segment 10 in lateral view slightly bulged out dorsally; superior appendage about 1.5 times the length of abdominal segment 10, slightly bulging, with subbasal ventral process distinctly curved, slightly directed inwards (figs. 36–37); inferior appendage about half as long as superior; outer surface of superior and inferior appendage and tip of subbasal ventral process black, inner sides yellow.

Female. – Head. – Labium yellow, movable and end-hook somewhat brownish; labrum orange with traces of black; gena yellow; anteclypeus orange, post-

clypeus basally and laterally orange, median distal part diffuse brown-black; elongate bright rectangle joining eye margin at either side; antennal socket orange-brown with a distal dark brown ring; scapus orange-brown; pedicellus with basal fourth and distal third diffuse black, orange medially; flagellum black; anterior ocellus occasionally, posterior ocelli always surrounded by a diffuse dark ring.

Thorax. – Prothorax laterally protruded into a sharp ridge which starts at lateral ends of posterior pronotal lobe; pronotal tubercles distinct; posterior pronotal lobe medially extended, subrectangular with pronounced hooks (fig 102), elevated at right angles to median lobe, anterior side concave (fig 103); prothorax light to medium brown, posterior lateral margin covered by a black stripe.

Legs light brown, except for diffuse black markings at distal ends of femur, tibia, and tarsal segments.

Synthorax with upper part medium brown, lower and ventral parts brighter, except for the black markings on middorsal carina and ante-alar ridge.

Figs. 60-63. *Risiocnemis* spp., appendages, in lateral view (60, 62) and posterior lateral view (61, 63). – 60, 61, *R. siniae* ♂, Samar Island, San Isidro; 62, 63, *R. tendipes* ♂, Mindanao Island, Davao del Norte Prov., Masara Mine. Scales 300 µm.

Wings. – Pterostigma moderately oblique, anterior side very slightly shorter than posterior side; proximal and especially distal side convex.

Abdomen. – Segment 10 three times as high as long; colour of abdomen medium to dark brown. Projecting part of valvae 1.5 to 2 times the length of segment 10.

Material examined

Lectotype ♂, [erroneous locality label] Mindanao (ISNB). – Paralectotypes: 11 ♂, [erroneous locality label] Mindanao (ISNB). – Other material: Catanduanes Island: 5 ♂, 15 ♀, Gigmoto, San Pedro, Egwang Tapayas Creeks, 300-500 m, 20.-30.vi.1996, A. Buenafe. 8 ♂, 30 ♀, Gigmoto, San Pedro, Simohe Creeks, 300-500 m, 20.-30.vi.1996, A. Buenafe. 2 ♂, 9 ♀, Gigmoto, San Pedro, Tongao Creeks, 400-500 m, 20.-30.vi.1996, A. Buenafe. Luzon Island, Camarines Sur Province: 1 ♀, Camarines Sur, Mt. Isarog, Pili, 800 m, 28.iv.1965, H. M. Torrevillas. Luzon Island, Cavite Province: 1 ♀, Tagaytay, 9.ii.88, Ambon-Ambon. 1 ♀, Ternate, 1000 ft., 9.iii.1989, C. Treadaway/Th. Borromeo. Luzon Island, Laguna Province: 2 ♂, 2 ♀, Los Banos, 10.i. & 30.v.1954, H. Townes. 1 ♂, 1 ♀, Los Banos, Molawin Creek, 26.xi.1953 & 30.v.1954, M. A. Lieftinck. All except lecto- and paralectotypes in RMNH.

Remarks

Altitudinal range. – 300-500 m.

Distribution. – Southern Luzon, Catanduanes (fig. 141).

Note. – The type series of *R. haematopus* in the ISNB collection is likely not to come from Mindanao but from Luzon. Apparently, mislabelling did occur in Semper's collection; *R. haematopus* has never been found in Mindanao later. Hämäläinen & Müller (1997) listed *R. haematopus* also from Samar, based on specimens from Catbalogan, Samar (at SMFD, RMNH). These have now proven to represent *R. kaiseri* sp. n.

Risiocnemis ignea (Brauer)

(figs. 8-9, 38-39, 77, 104-105, 141)

Hypocnemis ignea Brauer 1868: 547 (♂ ♀ Luzon). – Selys 1882: 21 (key) & 24 (♂ ♀; comparison with *H. appendiculata* and *H. flammea*; the specimen from 'Luzon, Manille' hardly conspecific with *ignea*, cf. Lieftinck 1981). – Selys 1886: 98 (key) & 103-104 (description ♂ ♀). *Prionocneomis ignea*: Kirby 1890: 127 (catalogue). *Risiocnemis ignea*, St. Quentin 1970: 254 (note on holo- and allotype); Lieftinck 1981: 99-101 (description holotype ♂

and allotype ♀), figs. 7-8 (appendage holotype; prothorax allotype); Davies & Tobin 1984: 100; Hämäläinen 1991a: 155 (type species designation for subgenus *Igneocnemis*); Bridges 1994: VII.112; Hämäläinen & Müller 1997: 264, 287 (distribution); Steinmann 1997: 386); Tsuda 2000: 56

Differential diagnosis

Male with reddish-brown head, brown thorax and bright red abdomen; female with posterior lobe strongly bent forward (fig. 105) and heart-shaped apically (fig. 104).

A quite outstanding species within the subgenus, especially with regard to the male ligula, which has the terminal lobes entirely reduced (figs. 8-9); male superior appendage in shape similar to *R. incisa*; a characteristic ridge-like bulge shaped as a half circle at dorsal base of inferior appendage (fig. 38); the male differs from similarly coloured species by brighter abdominal coloration and more robust build (see also under *R. flammea*). The female of *R. ignea* can easily be recognized by the unique posterior pronotal lobe (figs. 104, 105).

Description

Measurements. – Forewing length ♂ 26.5-31.5 mm (n=5), ♀ 27.5-33.0 mm (n=3); hindwing length ♂ 26.0-30.5 mm (n=5), ♀ 27.0-32.5 mm (n=3); abdomen length ♂ 42.0-49.5 mm (n=5), ♀ 40.0-48.0 mm (n=3).

Male. – Head. – Labium yellow to orange, except for brownish distal halves of end-hooks; anterior median incision U-shaped; labrum, ante- and postclypeus reddish-brown; postclypeus angulate in lateral view, edge diffusely marked with black; remaining head of same colour, except for black antennal flagellum and the rudimentary black rings around posterior ocelli.

Thorax. – Prothorax with posterior lateral corners distinctly protruded; pronotal tubercles only slightly pronounced; posterior pronotal lobe somewhat bow-shaped, posterior margin bent upwards; prothorax light brown.

Legs bright reddish.

Synthorax with a fine black line on middorsal carina and on anterior and posterior carinal fork; mesostigmal plate shaped as narrow triangle, with a longish pit; synthorax light brown.

Wings. – Pterostigma oblique, anterior side distinctly depressed, proximal side slightly bulged out; dark brown.

Abdomen. – Bright reddish, segments 8 to 10 darkening posteriorly; ventral side of last abdominal segment two thirds the length of dorsal side; superior appendage long and semi-acute (fig. 38); subbasal ventral process long, distally bent inwards and backwards (fig. 39), apically black; inferior appendage short, straight. Bulbous base of inferior appendage

ridge-shaped, curved (fig. 38).

Ligula. – Terminal lobes very short, median incision between terminal lobes broadly rounded (figs. 8, 9).

Female. – Head. – Labium and gena yellow; labrum and anteclypeus reddish-brown, postclypeus dark brown to black; antennal socket, scapus and pedicellus reddish-brown throughout, flagellum black; posterior ocelli surrounded by distinct black rings, anterior ocellus with rudimentary ring.

Thorax. – Prothorax medium brown, with pronotal tubercles moderately distinct; posterior pronotal lobe strongly bent forward (fig 105); margin of median lobe more or less indented in lateral view.

Legs with coxa and mostly also basal parts of femur yellow, smoothly grading into reddish-brown distally.

Synthorax with upper part, occasionally including posterior parts of metepisternum and metepimeron, medium brown; lower part and underside light brown.

Wings. – Pterostigma oblique, sides of subequal length, anterior side distinctly depressed, proximal side slightly bulged out; medium to light brown.

Abdomen. – Reddish-brown, intermingled with black; projecting part of valvae longer than length of last abdominal segment (0.7-0.9 mm).

Material examined

Luzon Island, Aurora Province: 3♂, 1♀, Dinalungan, Mt. Anaguao, Alebit River area, 600-900 m, 9.-14.iii.1996, R.A. Müller. 2♂, Dinalungan, Mt. Anaguao, Bungo River, Bial Creek, 1000-1300 m, 2.-5.vi.1997, M. Dusayen. 6♂, Dinalungan, Sitio Lomot, Lomot Creek, 500-800 m, 3.-15.vii.1996, C.M. Nazareno. 1♂, Dinalungan, Sitio Payapaya, 300-500 m, 3.-15.vii.1996, C.M. Nazareno. Luzon Island, Cagayan Province: 3♂, 1♀, Claveria, Brgy Union, 100-500 m, 20.-30.v.1997, C.M. Nazareno. Luzon Island, Quirino Province: 1♀, Maddela, Sulong River, 500-650 m, 26.-27.iv.1991, Th. Borromeo. 4♂, 1♀, Maddela, Sierra Madre, Mt. Yadanán, Sitio Yadanán, 400-600 m, 15.-30.viii.1996, C.M. Nazareno. 3♂, Maddela, Sierra Madre, Sitio Dabugo, 500-700 m, 15.-30.viii.1996, C.M. Nazareno. 3♂, Maddela, Sierra Madre, Sitio Joryong, 300-500 m, 15.-30.viii.1996, C.M. Nazareno. All in RMNH.

Remarks

Altitudinal range. – 100-1400 m.

Distribution. – Northern and northeastern Luzon (fig. 141).

Note. – Holo- and allotype in the Natural History Museum Vienna were not studied; however, the present new material was compared with Liefstinck's (1981) elaborate description of the types. In earlier literature at least two different species have been wrongly identified and described as *R. ignea*. The specimen from 'Luzon, Manila' mentioned in Selys (1882) is obviously not real *ignea*; the female specimen from Laguna described and figured by Needham & Gyger (1939: 275, pl. 14 fig. 174) as *ignea* is *R. incisa*; specimens of both sexes from Mt. Apo in Mindanao listed by Need-

ham & Gyger (1941: 147-148 and pl. 1, figs. 17-18) as *igneae* are *R. flammea*; and male and female specimens from Mountain and Abra provinces listed under *R. ignea* by Liefstinck (1961) are probably *R. incisa*.

Risiocnemis incisa Kimmins

(figs. 40-41, 78, 106-107, 132, 142)

Risiocnemis incisa Kimmins, 1936: 91-92, (descr. holotype female from 'N.W. Borneo' [labelling error for Luzon], fig. 11 (prothorax ♀ holotype), 107 (species list Borneo); Liefstinck 1954: 50 (♀ holotype: catalogue Malaysian Odonata.); Kimmins 1970: 180 (notes on holotype in BMNH and on genus-group name); Liefstinck 1981: 98-105 (descr. male and female, distribution), figs. 9-10 (♂ male appendages), 11 (♀ prothorax), 12 (♀ abdomen); Kiauta & Kiauta 1981: 151-154, figs. 1-5 (karyotype); Davies & Tobin 1984: 100; Bridges 1994: VII:114; Hämäläinen & Müller 1997: 264, 287, 291 (notes on distribution); Steinmann 1997: 387 (err.: distribution Borneo); Tsuda 2000: 56.

Prionocnemis ignea [nec. Brauer 1868]: Needham & Gyger 1939: 275, pl. 14, fig. 174 (female from Laguna, Luzon, notes).

? *Risiocnemis ignea* [nec. Brauer 1868]: Liefstinck 1961: 143 (new material); cf. comments in Liefstinck 1981: 105.

Differential diagnosis

Species with very oblique pterostigma. Male with orange labrum and black postclypeus, light brown synthorax, bright orange legs, superior and inferior appendages standing well apart in lateral view (fig. 40). Female with posterior pronotal lobe broadly incised (fig. 132), elevated at an angle of up to about 45° (fig. 107); femur coloured black posteriorly.

In male, the subbasal ventral process of superior appendage is hardly or not at all visible in lateral view, thus there is a distinct gap between superior and inferior appendages (fig. 40); the subbasal ventral processes approach each other at base and diverge subsequently towards distal ends (fig. 41); these features distinguish the male from similarly coloured species (see also under *R. flammea*). The posterior pronotal lobe of female *R. incisa* differs from *R. odobeni* and *R. siniae* by the deep and wide subtriangular incision, which reaches beyond half the length of posterior lobe (fig. 132), and the anterior side of posterior lobe being slightly concave in lateral view (fig. 107).

Description

Measurements. – Forewing length ♂ 25.0-29.0 mm (n=5), ♀ 26.0-30.0 mm (n=6); hindwing length ♂ 24.0-27.5 mm (n=5), ♀ 25.0-28.0 mm (n=6); ab-

domen length ♂ 39.0-43.0 mm (n=5), ♀ 35.0-38.0 mm (n=5).

Male. – Head. – Labium yellow, increasingly brownish towards apical hooks; gena yellow; labrum light brown; anteclypeus medium brown, postclypeus dark brown; frons, vertex, antennal scapus and pedicellus reddish-brown; flagellum black.

Thorax. – Prothorax medium brown, pronotal margins marked with a fine black line.

Legs bright orange-red.

Synthorax of same colour as prothorax, anterior lower half including coxa lighter than remaining parts; mesepisternal plate marked with a fine black line.

Wings. – Pterostigma very oblique, anterior and posterior side 1.5 times length of proximal and distal side; medium brown.

Abdomen. – Bright reddish; superior appendage slender, with a shallow basal inlet at lower side in lateral view (fig. 40); subbasal ventral processes laterally flattened, knife-shaped, standing close to each other at base, diverging towards distal ends (fig. 41); inferior appendage slender, slightly curved in lateral view (not well visible in fig. 40 due to the angle of the SEM photograph), reaching slightly or distinctly beyond half the length of superior appendage; appendages reddish, except for lower yellow sides of superiors.

Variation. – In specimens from Claveria (Cagayan Province), the abdomen is not entirely reddish, but distinctly darkened dorsally, black colouring reaching from shortly distal to the base of segment 3 up to distal end of segment 7; segments 8 to 10 are mainly reddish.

Ligula. – Terminal lobes broad, widening distally, broadly rounded apically; median incision between terminal lobes oval.

Female. – Head. – Labium and gena yellow; labrum yellow, usually upper half darkened; head otherwise medium brown.

Thorax. – Prothorax with pronotal tubercles well recognizable; posterior pronotal lobe raised to an angle of about 45° (fig. 107), broadly incised (figs. 106, 132); colour of prothorax as in male.

Legs with coxa and trochanter yellow, remaining parts brown, with a touch of reddish from about the distal third of femur up to tarsus; posterior side of femur marked with conspicuous dark brown stripe.

Synthorax with anterior dorsal bulge conspicuous (figs. 106-107); colour of synthorax as in male, but difference between darker and brighter parts much less distinct.

Wings. – Pterostigma similar to male, but posteri-

FIGS. 64-69. *Risiocnemis* spp., subbasal ventral process of right (64, 65) or left superior appendage in lateral (64, 66, 68) or posterior lateral view (65, 67, 69). – 64, 65, *R. pistar* ♂, paratype, Mindanao Island, Davao Oriental Prov., Lakahan Creek; 66, 67, *R. rubricercus* ♂, paratype, Mindanao Island, Davao Oriental Prov., Mt. Agtuaganon; 68, 69, *R. rubripes* ♂, Mindanao Island, Surigao del Sur Prov., Carmen. Scales 300 µm.

Figs. 70-75. *Risiocnemis* spp., appendages in dorsal view. – 70, *R. antoniae* ♂, paratype, Mindanao Island, Davao Oriental Prov., Caatijan; 71, *R. atripes* ♂, Mindanao Island, Davao Oriental Prov., Yakal; 72, *R. atropurpurea* ♂, Luzon Island, Nueva Ecija Prov., Batching River; 73, *R. calceata* ♂, paratype, Panaon Island, Anislagon Gamay; 74, *R. flammea* ♂, Mindanao Island, North Cotabato Prov., Dum Creek; 75, *R. fuligifrons* ♂, Mindanao Island, Surigao del Sur Prov., Hitaub Creek. Scales 300 µm.

or distal corner more rounded in some specimens.

Abdomen. – Medium brown to slightly reddish; cerci medium to black-brown; length of projecting part of valvae about 0.5 mm.

Material examined

Luzon Island, Aurora Province: 1♂, Dinalungan, Sitio Payapaya, 300–500 m, 3.–15.vii.1996, C.M. Nazareno. Luzon Island, Benguet Province: 1♂, 20 mi. SW of Baguio, 2.x.1945, H. E. Milliron. Luzon Island, Bulacan Province: 1♀, Angat Dam, 28.v.1990, Th. Borromeo Sr. Luzon Island, Cagayan Province: 2♂, 2♀, Claveria, Brgy Union, 100–500 m, 20.–30.v.1997, C.M. Nazareno. Luzon Island, Ifugao Province: 1♂, Banaue, Kirakin/Kambato, 1300 m, 3.–10.i.1991, C.G. Treadaway. 1♂, 1♀, NR Kinakin, 4500 ft., 24.iii.1989, C. Treadaway. 5♂, 2♀, Jacmal Bunhian, 24 km E Mayoyao, 800–1000 m, 7.–8.iv., 4.–6. and 11.–13.v.1967, H. M. Torre Villas. 4♂, 1♀, Liwo, 8 km E Mayoyao, 1000–1300 m, 21., 30.–31.v.1967, H. M. Torre Villas. Luzon Island, Kalinga-Apayao Province: 1♂, 1♀ (incompl.), Kalinga, Balbaran, 2.v.1948, M. Celestino. Luzon Island, Mountain Province: 2♂, Banaue, 28.xii.1953, H. Townes. 1♀, nr. Kias, xi.1930, H. Townes. 2♂, Mayoyao, 1000–1500 m, 6.vii.1966, H. M. Torre Villas. Luzon Island, Nueva Ecija Province: 1♂, 1♀, Caranglan, Batching River, 700–850 m, 11.vi.1991, R. A. Müller. Luzon Island, Nueva Viscaya Province: 1♂, Sta Fe, Dalton Pass area, 900 m, 8.–17.viii.1991, A. Gorostiza. 1♂, Sta Fe, Dalton Pass, 800–1200 m, 25.–30.vi.1989, A. Gorostiza. 1♂, Sta Fe, Barrio Lohong, Mounts east of Dalton Pass, 900–1000 m, 10.–23.i.1993, A. Gorostiza. 1♂, Dalton Pass, Sta Fe, Zigsag, 500–900 m, 16.ii.1989, W. Catal. 1♂, Dalton Pass, Sta Fe, Atbo River, 500–900 m, 13.ii.1989, W. Catal. 1♂, 1♀, Sta Fe, Atbo River, 550–600 m, 10.vi.1991, R.A. Müller. Luzon Island, Quirino Province: 2♀, Sierra Madre, 20 km southeast of Maddela, 13.–14.v.1988, 'prima-ry lowland forest', J. Settele. All in RMNH.

Remarks

Altitudinal range. – 100–1500 m.

Distribution. – Northern and Central Luzon (fig. 142).

Note. – Hämäläinen & Müller (1997) included Mindoro as part of the known distributional range of *R. incisa*, based on the determination of a single female specimen from the Mansaley area (coll. Carl Cook). During the present study, the identity of this damaged specimen could not be determined reliably, and its identity remains uncertain. We think that there is not enough proof for an occurrence of *R. incisa* in Mindoro.

Risiocnemis kaiseri sp. n.

(figs. 42–43, 79, 108–109, 133, 140)

Type material. – Holotype ♂, Samar Province, Hinabangan, San Isidro, San Isidro River, 90–200 m, 31.iii.–5.iv.1997, R. A. Müller, deposited in RMNH. – Paratypes: Samar Island, Northern Samar Province: 8♂, 14♀, Las Navas, Brgy San Isidro, 100–350 m, 22.–28.v.1997, A. Buenafe. 1♂, 1♀, Malaga, 16.v.1970, C. Plateros. Samar Island, Western Samar Province:

1♂, Catbalogan, labelled '*Prionocnemis haematopus*', 22.iv.1915, G. Boettcher (SMFD). 2♂, Samar Province, Hinabangan, Bagakay, Arisona, 100–200 m, 29.viii.–20.ix.1996, A. Buenafe. 7♂, 1♀, Samar Province, Hinabangan, Bagakay, San Isidro, 100–200 m, 29.viii.–20.ix.1996, A. Buenafe. 3♂, Hinubangan, San Isidro area, 90–250 m, 5.–12.v.1997, A. Buenafe. 6♂, 2♀, Samar Province, Hinabangan, San Isidro, San Isidro River, 90–200 m, 31.iii.–5.iv.1997, R. A. Müller. Samar Island, Eastern Samar Province: 1♀, Oras, 16.–18.iv.1992, Th. Borromeo jr.

Differential diagnosis

Male yellow-legged, with upper part of synthorax black, lower part and underside of synthorax predominantly yellow. Female light to medium brown, with posterior pronotal lobe distinctly concave in lateral view (fig. 109).

The present new species is very similar to *R. haematopus* and, at first sight, differs from that species only in the yellow – instead of red – coloration of lower synthorax and legs. However, a closer look reveals structural differences: in males of *R. kaiseri* sp. n., the distal side of subbasal ventral process of superior appendage is slightly bulged out (fig. 42); whereas in *R. haematopus* it is straight (cf. fig. 36). The median part of female posterior pronotal lobe (fig. 133) is not protruded into acute hooks as in *R. haematopus* (cf. fig. 102). See also diagnosis of *R. polilloensis*.

Description

Measurements. – Forewing length ♂ 22.5–25.0 mm (n=5), ♀ 23.5–27.0 mm (n=13); hindwing length ♂ 22.0–24.0 mm (n=5), ♀ 23.0–26.0 mm (n=13); abdomen length ♂ 40.0–42.5 mm (n=5), ♀ 35.0–39.5 mm (n=13).

Male (holotype). – Head. – Labium with lateral lobes including apical hooks black; median lobes yellow intermingled with black; postclypeus sharply angulate, the distal margin of upper surface somewhat raised in lateral view; labrum, ante- and postclypeus, frons and vertex black throughout; a silver line running on either side of frons, starting at lateral corner of postclypeus, curving and joining eye margin from level of antennae onwards; antenna with scapus black, pedicellus black-brown, flagellum black; occiput yellow-orange.

Thorax. – Pronotum with anterior lobe medially black, laterally yellow; median and posterior pronotal lobe including pleura black; pronotal tubercles appearing as ridges, which slightly raise towards anterior margin in lateral view.

Legs including setae bright yellow-orange, except for distal part of tarsus, the joints and the following areas: in first pair of legs the area from base to about half the length of tibia; in second pair basal, well de-

Figs. 76-81. *Risiocnemis* spp., appendages in dorsal view. – 76, *R. baematopus* ♂, Catanduanes Island, Simohe Creeks; 77, *R. ignea* ♂, Luzon Island, Aurora Prov., Lomot Creek; 78, *R. incisa* ♂, Luzon Island, Nueva Viscaja Prov., Sta Fe, Atbo River; 79, *R. kaiseri* ♂, paratype, Samar Island, San Isidro; 80, *R. melanops* ♂, Samar Island, Oras; 81, *R. nigra* ♂, paratype, Samar Island, San Isidro. Scales 300 µm.

fined part of tibia; in third pair of legs black coloration reaches only up to trochanter.

Synthorax with upper part up to first lateral suture deep black throughout; lower part yellow, except metakatepisternum and a diffuse spot below distal end of first lateral suture; underside of synthorax yellow throughout.

Wings. – Forewing with 16 Px, hindwing 15 Px; pterostigma short, distal side not reaching the length of posterior neighbouring cell; distal side distinctly convex, basal and posterior side only slightly convex, anterior side concave to straight; medium to dark brown.

Abdomen. – Segment 1 mainly yellow; segments 2 to 6 dark dorsally, ventrally brighter; segments 6 to 10 diffuse medium brown, darkening posteriorly; segment 10 half the length of segment 9, ventral side about one-third shorter than distal side, upper posterior margin medially somewhat protruded; superior appendage robust, conical, pilose; nearly twice the length of inferiors; subbasal ventral process curved in lateral and posterior view (cf. figs. 42–43); inferior appendage straight, only apically very slightly bent inwards; superior appendage black dorsally, light brown ventrally; inferior appendage light brown with black tips; abdomen length 40.0 mm.

Ligula. – Head of ligula short, compressed, terminal lobes broad, somewhat rectangular at the ends, curved inwards.

Female – Head. – Labium yellow, anterior median incision rounded up to rectangular; labrum yellow-orange, anteclypeus light brown, postclypeus somewhat darker; frons, vertex and occiput light brown throughout, slightly reddish; flagellum about the length of pedicellus, thickened distally; scapus of same colour as vertex, pedicellus medium brown, flagellum dark brown.

Thorax. – Prothorax with anterior pronotal lobe light brown, anterior margin black; posterior pronotal lobe with wide and shallow incision in anterior view (fig. 133), flanked by broadly rounded sides, slightly higher than anterior lobe (figs. 108–109), yellow, posterior margin black.

Legs including bristles yellow, joints marked with black.

Synthorax with anterior bulge distinct, slightly incised in the middle (fig. 108); middorsal carina covered by black stripe; branches of anterior carinal fork slightly marked with black, or not at all; posterior carinal fork diffusely marked with black; dorsum of synthorax with a few black hairs.

Wings. – Pterostigma in shape similar to that of male, anterior side slightly depressed, light brown.

Abdomen. – Segment 1 mainly yellow, segments 2 and 3 mainly dark brown, segments 3 to 8 medium brown with distal fifths of segments diffusely marked with black; projecting part of valvae longer than

length of last abdominal segment (0.5–0.7 mm); cerci dark brown, somewhat brighter distally.

Remarks

Etymology. – On special request by Roland Müller, the present species is named after Mr. Markus Kaiser (State Archive St. Gallen, Switzerland) in appreciation of his contribution to the protection of natural habitats in eastern Switzerland.

Ecology. – Roland Müller (pers. comm.) observed this species to breed only in shady spring brooks extremely rich in calcium carbonate with dense bank vegetation. Interestingly, the calcified underground of the creeks matches the yellow coloration of the adults. *R. kaiseri* sp. n. apparently occurs syntopically with *R. (R.) appendiculata* (Brauer, 1868).

Altitudinal range. – 90–350 m.

Distribution. – Samar (fig. 140).

Risiocnemis melanops Hämäläinen (fig. 44–45, 80, 123–124, 141)

Risiocnemis melanops Hämäläinen, 1991b: 200 (♂ preliminary description), figs. 11–12 (♂ male appendages); Bridges 1994, VII:150; Hämäläinen & Müller 1997: 264, 296 (notes on distribution); Tsuda 2000: 57.

Differential diagnosis

Species with narrow wings. Male with black head, brown thorax, red legs and red abdomen. Female brown with bright yellow labrum, antennal pedicellus and flagellum black; anterior and posterior pronotal lobe of subequal length, anterior side of the latter slightly curved in lateral view (fig. 123), median part prominent.

The male of *R. melanops* differs from other *Igneocnemis* species by the uniform brown thorax, the red abdomen and the entirely black head; in lateral view subbasal dorsal convulsion of inferior appendage partly covering subbasal process of superior appendage (fig. 44). In lateral view, the female posterior pronotal lobe (fig. 123) is similar to that of *R. atropurpurea* (fig. 95), but shorter.

Description

Measurements. – Forewing length ♂ 25.0–26.0 mm (n=4), ♀ 25.0 mm (n=1); hindwing length ♂ 23.5–25.0 mm (n=4), ♀ 24.0 mm (n=1); abdomen length ♂ 39.5–42.0 mm (n=4), ♀ 36.0 mm (n=1).

Male. – (Holotype ♂; additional remarks, cf. Hämäläinen 1991b).

Measurements of holotype. – Hindwing length 25.0 mm; abdomen length 42.0 mm.

Head. – Labium yellow; end-hook, movable hook and parts of the area basal to them brown-black; gena and labrum brown-black, the latter with a yellow basal stripe; anteclypeus medium-brown, postclypeus

Figs. 82-87. *Risioenemys* spp., appendages in dorsal view. – 82, *R. odobeni* ♂, Luzon Island, Camarines Sur Prov., Caririca River; 83, *R. pistor* ♂, paratype, Mindanao Island, Davao Oriental Prov., Lakahan Creek; 84, *R. plebeja* ♂, Panay Island, Iloilo Prov., Nagaranan River; 85, *R. polilloensis* ♂, Catanduanes Island, Egwang Tapayas Creeks; 86, *R. rubricercus* ♂, paratype, Mindanao Island, Davao Oriental Prov., Mt. Agtuuganon; 87, *R. rubripes* ♂, Mindanao Island, Surigao del Sur Prov., Carmen. Scales 300 µm.

Figs. 88-89. *Risioecnemis* spp., appendages in dorsal view. – 88, *R. siniae* ♂, Samar Island, San Isidro; 89, *R. tendipes* ♂, Mindanao Island, Gantungan River. Scales 300 μ m.

brown-black, a weak yellow line separating postclypeus from frons; frons and vertex black, except for a light oval spot attached to either posterior ocellus directed laterally and anteriorly; antennal sockets and scapus brown-black, the latter with a distal yellow-white ring, pedicellus and flagellum medium brown, intermingled with black; occiput yellow-white.

Thorax. – Pronotal tubercles well recognizable, of moderate size; posterior pronotal lobe slightly elevated, pitched in the middle; prothorax light brown.

Legs reddish-orange.

Synthorax with black middorsal carina; black markings at posterior border of anterior synthoracic bulge and on ante-alar ridge.

Wings. – Pterostigma slightly widening distally, distal side convex, dark brown; wings narrow (width 4.0 mm).

Abdomen. – Reddish-orange, segments 4-7 with diffuse black distal ends, segments 8-10 mainly blackish; inferior appendages reaching up to half the length of superior appendages (cf. fig. 44); subbasal ventral process directed in- and downwards, bent backwards at tip (cf. fig. 45); inner side of appendage yellowish, outer side and tip of subbasal process blackish.

Ligula. – Terminal lobes comparatively long, oval apically; median incision between terminal lobes broadly rounded.

Female. – (first description). **Head.** – Labium yellow, end-hook light brown (movable hooks lacking in the single available specimen); gena light brown; labrum bright yellow; ante- and postclypeus medium brown; frons and vertex including antennal sockets and scapus light brown, pedicellus and flagellum black; posterior ocelli surrounded by diffuse black

rings; a sharp, waved black line at the border between vertex and occiput.

Thorax. – Pronotal tubercles well visible in lateral view; posterior pronotal lobe smoothly curved in lateral view (fig. 123), as high as anterior lobe; median part raised to a prominent rectangle, well visible in posterior dorsal view (fig. 124), the distal corners of which rounded, upper margin shallowly incised; prothorax light yellow-brown, anterior pronotal margin and lateral posterior margin marked with a black line.

Legs with coxa, trochanter, and femur yellow-brown, posterior parts of the latter darkened; tibia, tarsus and lateral bristles reddish-orange.

Synthorax light yellow-brown, less bright dorsally; middorsal carina, ante-alar ridge and margins of mesostigmal plate marked with black.

Wings. – R4 vein in forewing hardly distal to subnodal vein, R4 in hindwing at subnodal vein; pterostigma moderately oblique, slightly longer than high, distal side slightly convex, in hindwing anterior distal corner slightly protruded, medium to light brown.

Abdomen. – Light to dark brown; segment 1 light brown throughout, segments 2 and 3 light brown ventrally, darkening dorsally, segments 4 to 10 dark brown, intermingled with medium brown areas; cerci and valvae medium to dark brown; projecting part of valvae about one and a half times length of last abdominal segment (about 0.5 mm).

Material examined

♂ Holotype, Philippines, Samar, Catbalogan, 22.iv.1915, G. Boettcher, SMFD. – Other material: Samar Island, Eastern Samar Prov.: 3♂, Oras, 50-150 m, 16.-18.iv.1992, Th. Borromeo jr. 1♀, Oras, 11.-22.iv.1994, Th. Borromeo. In RMNH.

Figs. 90-95. *Risioenemis* spp., prothorax in dorsal (90, 92, 93) and lateral view (91, 93, 95). – 90, 91, *R. antoniae* ♀, paratype, Mindanao Island, Surigao del Sur Prov., Meme River, 90, prothorax in dorsal view; 92, 93, *R. atripes* ♀, Mindanao Island, Davao Oriental Prov., Mt. Agtuuganon; 94, 95, *R. atropurpurea* ♀, Luzon Island, Nueva Viscaya Prov., Atbo River. Scales 300 µm (90, 92, 94), and 100 µm (91, 93, 95)

Remarks

Altitudinal range. – 50–150 m.

Distribution. – Samar (fig. 141).

***Risioecnemis nigra* sp. n.**

(figs. 10–11, 46–47, 81, 110–111, 134, 143)

'*Risioecnemis* sp. n. 62' Hämäläinen & Müller 1997: 265, 279, 296.

Type material. – Holotype ♂, Samar Island, Eastern Samar Province, Oras, 50–150 m, 16.–18.iv.1992, Th. Borromeo jr., deposited in RMNH. – Paratypes: Samar Island, Eastern Samar Province: 6♂, Samar Island, Oras, 50–150 m, 16.–18.iv.1992, Th. Borromeo jr. 1♂, Samar Island, Oras, 16.–22.iv.1992, Th. Borromeo. 1♀, Samar Island, Oras, 11.–22.iv.1994, Th. Borromeo. Samar Island, Northern Samar Province: 2♂, 2♀, Samar Island, Hinabangan, Bagakay, San Isidro, 100–200 m, 29.viii.–20.ix.96, A. Buenafe. 3♂, Samar Island, Hinabangan, San Isidro, San Isidro River, 90–200 m, 31.iii.–5.iv.97, R.A. Müller. Samar Island, Western Samar Province: 3♂, Samar Island, San Jose de Buan, Mt. Hurao, San Andres, A. Buenafe. All in RMNH.

Differential diagnosis

Male mainly black, with distinct subrectangular markings lateral to mouth parts and shiny bluish-black postclypeus. Female with posterior pronotal lobe elevated at right angles, distinctly higher than anterior lobe (fig. 111).

R. nigra is the only black species in the *R. flammea*-type group, characterized by a long, slender subbasal ventral process in male superior appendage (figs. 46–47). Female is unique in the subgenus due to its high posterior pronotal lobe (fig. 111).

Description

Measurements. – Forewing length ♂ 23.0–24.0 mm (n=5), ♀ 24.5–25.5 mm (n=3); hindwing length ♂ 22.5–23.0 mm (n=5), ♀ 23.5–24.5 mm (n=3); abdomen length ♂ 39.0–40.5 mm (n=5), ♀ 28.0–38.5 mm (n=3).

Male (holotype). – Head including mouth parts black throughout, except for the basal third of labrum which is dirty-yellow, and two conspicuous rectangular markings covering the lateral parts of frons and vertex up to the level of antennae; the anterior border of those markings reaches from lateral corners of postclypeus to lower corners of forehead where it meets eye margin, the posterior border up to the level of anterior ocelli or somewhat beyond; colour of markings beige to grey; no recognizable postocular spots.

Thorax. – Prothorax with pronotal tubercles flat, posterior ridge deep; posterior lobe slightly trapezium-shaped, otherwise broadly rounded.

Legs dark brown to black.

Synthorax. – Black, but mes- and metepisternal fossae and areas joining ante-alar ridge marked with light brown, posterior ventral part of metepimeron yellow; area between ante-alar ridge and wing bases yellow-white.

Wings. – Pterostigma moderately oblique, posterior distal corner somewhat rounded, distal side convex.

Abdomen. – Dark brown to black; ventral side of segment 10 about one third shorter than dorsal side, posterior dorsal margin not elevated; superior appendage about twice the length of inferior (cf. fig. 46); appendages black, except for light brown areas around base of subbasal process of superior appendage; subbasal ventral process of superior appendage very long, diverging apically (cf. fig. 47).

Ligula. – Terminal lobes broad, widened medially, tapered and rounded apically; median incision between terminal lobes rounded (cf. figs. 10–11).

Female. – Head. – Labium either yellow-orange with apical third of end-hook reddish-brown, or black throughout, median incision rounded; gena yellow-orange; labrum and anteclypeus yellow-orange or black; postclypeus black throughout or only medially, lateral parts yellow-orange; rectangular markings as in the male, but colour shiny dark brown, black or grey; rectangles are bordered by a thick black line, respectively, reaching up to lateral corners of postclypeus and covering also parts of antennal socket and scapus; an additional black frontal stripe occasionally joining the basal border of postclypeus; antennal pedicellus yellow-orange, darkened distally, flagellum black.

Thorax. – Pro- and synthorax including legs light brown throughout.

Wings. – Pterostigma slightly asymmetrical, rhomboid, longer than high (especially in forewing), distal corner slightly protruded; light brown.

Abdomen. – Dark brown throughout; upper posterior margin of segment 10 not raised, projecting part of valvae short, slightly longer than length of that segment (about 0.5 mm).

Remarks

Etymology. – The name of the new species refers to its predominantly black coloration (*niger*, *nigra*, *nigrum* [Lat.] = black).

Ecology. – Apparently this species prefers junctions of small or very small rocky streamlets leading into bigger creeks, where it stays in the shadow of bank vegetation (R. Müller, pers. comm.).

Altitudinal range. – 50–600 m.

Distribution. – Samar (fig. 143).

Figs. 96-101. *Risiocnemis* spp., prothorax in dorsal (96, 98, 100) and lateral view (97, 99, 101). – 96, 97, *R. calceata* ♀, Panaon Island, Gabing Gamay; 98, 99, *R. flammea* ♀, Mindanao Island, Davao Oriental Prov., Langanisan Creek; 100, 101, *R. fuligifrons* ♀, Mindanao Island, Surigao del Sur Prov., Hitaub Creek. Scales 300 µm (96, 98, 100), and 100 µm (97, 99, 101).

***Risiocnemis odobeni* Hämäläinen**
(figs. 12-13, 48-49, 82, 112-113, 135, 142)

Risiocnemis odobeni Hämäläinen 1991b: 200-201 (♂ preliminary description), figs. 13-14 (♂ male appendages); Bridges 1994, VII: 172; Hämäläinen & Müller 1997: 264, 287, 290, 291 (notes on distribution); Tsuda 2000: 57.

Differential diagnosis

Male with variable coloration of head and abdomen; postclypeus in lateral view distinctly angulate; superior appendage with conspicuous elongate sub-basal ventral process (figs. 48-49). Female with median part of posterior pronotal lobe characteristically narrow in dorsal view (fig. 112), apically incised in anterior view (fig. 135); pterostigma nearly symmetrical, rhomboid, very oblique.

The male of *R. odobeni* (at least from Luzon populations, see variation section) can be recognized by the dark reddish-brown to black head, which distinctly contrasts with the light brown synthorax; length ratio superior appendage/segment 10 higher than in *R. flammea*, subbasal ventral process of superior appendage (figs. 48-49) slightly longer and more distal than in *R. flammea* (cf. figs. 32-33). Female posterior pronotal lobe (fig. 135) resembles the similarly incised lobe of *R. siniae* (fig. 138); however, in dorsal view median part of lobe is narrower in *R. odobeni* (fig. 112) than in *R. siniae* (fig. 118).

Description

Measurements. – Forewing length ♂ 24.0-28.0 mm (n=6), ♀ 27.0-27.5 mm (n=3); hindwing length ♂ 23.0-27.0 mm (n=6), ♀ 26.5-27.0 mm (n=3); abdomen length ♂ 39.0-44.0 mm (n=6); ♀ 39.0-40.5 mm (n=3).

Male. – (Holotype ♂; additional remarks, cf. Hämäläinen 1991b).

Measurements. – Hindwing length 26.0 mm; abdomen length 43.5 mm.

Head. – Labium reddish-yellow; labrum, ante- and postclypeus and remaining head dark reddish-brown to black.

Thorax. – Prothorax light reddish-brown.

Legs bright orange-red.

Synthorax light reddish-brown. Metepimeron and synthoracic underside brighter.

Wings. – Forewing with 21 Px, hindwing 19-20 Px.

Abdomen. – Segments 1 to 2 and nearly the entire anterior half of segment 3 red, remaining parts of segment 3 and segments 4 to 7 black; segments 8 to 10 light coloured, intermingled with black; anal appendages dirty-yellow to black. Superior appendage two times the length of segment 10, with long sub-basal ventral process, the latter reaching slightly beyond level of inferior appendage in lateral view (cf. fig. 47); base of subbasal ventral process entirely visible in lateral view (cf. fig. 46).

Ligula. – Terminal lobes comparatively broad, median incision oval (cf. figs. 12-13).

Variation in males. – Coloration of head and abdomen varies between male specimens from different localities: in males from Catanduanes head and abdomen are bright orange-red, but abdominal segments 7 to 10 less bright, joints darkened; in specimens from Camarines Sur Province head is dark reddish-brown to black throughout and distinctly contrasting with the brighter coloured thorax, abdominal segments 1 to 2 bright red (Himaao River males also anterior part of segment 3), segments 3 to 6 dark brown to black, segments 7 to 10 with a varying extent of reddish coloration (Himaao River males with segment 7 almost entirely black).

Female (first description). – Head. – Labium yellow, end-hook and lateral hooks orange; labrum orange; ante- and postclypeus, frons and vertex reddish; posterior ocelli surrounded by diffuse black rings; antennal socket and scapus reddish, the latter with a distal black ring; pedicellus light brown; flagellum black.

Thorax. – Pronotal tubercles well recognizable; posterior lobe long, incised apically (fig. 135), raised to an angle of about 45°, anterior side usually slightly convex in lateral view (fig. 113); pro- and synthorax light brown, underside lighter.

Wings. – Pterostigma nearly symmetrical, rhomboid, very oblique; slightly higher than long in hindwing; pterostigma light to medium brown.

Abdomen. – Brownish, except for entire segment 1 and first two-thirds of segment 2 which are of same colour as thoracic underside; projecting part of valvae slightly longer than length of segment 10 (0.6-0.8 mm).

Variation in females. – The 'first female' from Mt. Iriga is somewhat deviating from the other female specimens in having the anterior side of posterior pronotal lobe slightly concave in lateral view.

Material examined

Holotype ♂, P[hilippine] I[slands], Luzon, Mt. Iriga, Camarines Sur [province], 500-600 m, [no date], H. M. Torrevillas. Paratype: ♂, same data as holotype, H. M. Torrevillas. – Other material: Catanduanes Island: 3♂, 3♀, Gigmoto, San Pedro, Egwang Tapayas Creeks, 300-500 m, 20.-30.vi.1996, A. Buenafe. 2♂, 1♀, Gigmoto, San Pedro, Simohe Creeks, 300-500 m, 20.-30.vi.1996, A. Buenafe. 1♂, Gigmoto, San Pedro, Tongao Creeks, 400-500 m, 20.-30.vi.1996, A. Buenafe. Luzon Island, Camarines Norte Province: 2♀, Sn Lorenzo Ruiz, Sitio Bay-Bay, Patag, 400-700 m, 24.-25.ix.1997, C. M. Nazareno. Luzon Island, Camarines Sur Province: 1♀, first female, Mt. Iriga, 5-600 m, H. M. Torrevillas. 3♂, Pili, Bungao Curry, Mt. Isarog, Caririca River, 200-400 m, 4.-15.viii.1997, C. Nazareno. 3♂, Pili, Bungao Curry, Mt. Isarog, Himaao River, 200-400 m, 4.-15.viii.1997, C. Nazareno. All in RMNH.

Remarks

Altitudinal range. – 200-700 m.

Distribution. – Southeastern Luzon, Catanduanes (fig. 142).

Figs. 102-107. *Risiocnemis* spp., prothorax in dorsal (102, 104, 106) and lateral view (103, 105, 107). – 102, 103, *R. haematopus* ♀, Catanduanes Island, Egwang Tapayas Creeks; 104, 105, *R. ignea* ♀, Luzon Island, Aurora Prov., Alebit River area; 106, 107, *R. incisa* ♀, Luzon Island, Quirino Prov., Sierra Madre. Scales 300 µm (102, 104, 106), and 100 µm (103, 105, 107).

Note. – Hämäläinen & Müller (1997) listed the species also from Mindoro, based on the specimens from SMFD (coll. Rolle). However, we now consider the labelling of this specimen most likely incorrect and delete Mindoro from the range of *R. odobeni* until further proof becomes available.

Risiocnemis pistor sp. n.
(figs. 18-19, 50-51, 64-65, 83, 144)

Type material. – Holotype ♂, Philippines, Mindanao Island, Davao Oriental [Province], Sigaboy, Tandang Sora, Yakal, Tambaban River, Lakahan Creek, 400-800 m, 5.-14.x.1996, A. Buenafe, deposited in RMNH. – Paratypes: 7 ♂, same data as holotype. All in RMNH.

Differential diagnosis

Red species with black head, except for a pair of diffuse reddish-brown postocellar spots.

The present new species is very similar to *R. rubripes* (Needham & Gyger), but is distinguishable from it by a combination of characters: the black coloured mouth parts and the almost entirely black head, which are reddish-brown in *R. rubripes*; the less oblique pterostigma; the shape of superior appendage of which the subbasal ventral process is cut off apically (fig. 64), but not semi-acute as in *R. rubripes* (fig. 68); and the slightly longer superior appendage (fig. 50), the inner side of which is slightly concave (fig. 83).

Description

Measurements. – Forewing length ♂ 26.5-28.5 mm (n=8); hindwing length ♂ 25.5-27.5 mm (n=8); abdomen length ♂ 41.5-46.0 mm (n=7).

Male (holotype). – Head. – Labium with palps black-brown, median lobe dirty yellow; labrum, except for a reddish-brown basal line, black; gena and anteclypeus black; postclypeus in lateral view bulging, anterior margin not elevated, but semi-angular, shiny black; frons, vertex and occiput black, except for a pair of diffuse reddish-brown postocellar spots; antennal scapus black, pedicellus diffuse reddish-brown, black at base; flagellum black.

Thorax. – Pronotum in lateral view slightly notched in outline; posterior pronotal lobe broadly rounded, posterior margin raised in lateral view; prothorax reddish-brown intermingled with black.

Synthorax medium brown, anterior upper part darkened.

Legs bright red.

Wings. – Forewing with 18 Px, hindwing 16-17 Px; pterostigma in forewing with anterior and posterior sides longer than proximal and distal sides, in hindwing with all sides of subequal length, distal side in forewing and hindwing distinctly convex; pterostigma

dark brown; wings with a slight brownish hue; forewing length 27.5 mm; hindwing length 26.5 mm.

Abdomen. – Segments 1 to 2 reddish-brown; segments 3 to 6 black dorsally, reddish-orange ventrally; segments 7 to 10 dirty-orange; upper side of segment 10 1.5 times length of lower side; superior appendage slender, semi-acute, tip slightly bent upwards in lateral view (cf. fig. 50-51), inner sides slightly concave in dorsal view (cf. fig. 83); subbasal ventral process short, cut off apically in lateral view (cf. fig. 64), tip black; inferior appendage slightly curved upwards, 0.6 times length of superior, bright orange with black tips; when superior appendages in their outermost position, inferior appendages are visible in dorsal view (as in *R. rubripes*, cf. fig. 87); abdomen length 42.5 mm.

Ligula. – Terminal lobes distinctly notched at apical ends; incision between terminal lobes arc-shaped (cf. figs. 18-19).

Variation. – Pro- and synthorax almost entirely black in some specimens.

Female. – Unknown.

Remarks

Etymology. – A noun in apposition. We are pleased to honour Roland A. Müller by naming the present species *pistor* ([Lat.] = Müller [Germ.]).

Altitudinal range. – 400-800 m

Distribution. – Southeastern Mindanao (fig. 144).

Risiocnemis plebeja Hämäläinen
(figs. 14-15, 52-53, 84, 114-115, 136, 144)

Risiocnemis plebeja Hämäläinen, 1991b: 197-198 (♂ preliminary description), figs. 5-6 (♂ appendages); - Bridges 1994, VII: 188; Hämäläinen & Müller 1997: 264-265, 292, 295 (notes on distribution); Tsuda 2000: 57.

Differential diagnosis

Males with reddish-brown head, brown thorax, partly darkened abdomen and bright orange legs; female with wave-shaped posterior lobe (fig. 136), which is only very slightly elevated in lateral view (fig. 115).

The male can be distinguished from similarly coloured species (see under *R. flammea*) by the stout superior appendages (fig. 84) and the very short, pin-like inferior appendages (fig. 52). The ligula is unique in the group in having narrow and elongate terminal lobes (figs. 14-15), which resemble those of the *I. bidentata*-species - group of the Papuan genus *Idiocnemis* Selys (cf. Gassmann 2000).

Female posterior pronotal lobe quite similar to *R. tendipes* (Needham & Gyger).

Description

Measurements. – Forewing length ♂ 25.0-27.0 mm (n=6), ♀ 26.5-27.0 mm (n=2); hindwing length ♂ 24.0-25.5 mm (n=6), ♀ 25.5-26.0 mm (n=2); ab-

Figs. 108-113. *Risiocnemis* spp., prothorax in dorsal (108, 110, 112) and lateral view (109, 111, 113). – 108, 109, *R. kaiserii* ♀, paratype, Samar Island, Northern Samar Prov., Las Navas; 110, 111, *R. nigra* ♀, paratype, Samar Island, San Isidro; 112, 113, *R. odobeni* ♀, Catanduanes Island, Egwang Tapayas Creeks. Scales 300 µm (108, 110, 112), and 100 µm (109, 111, 113).

domen length ♂ 37.0–40.0 mm (n=5), ♀ 37.0 mm (n=2).

Male. – (♂ holotype [teneral], additional remarks). Measurements holotype. – Forewing length 26.5 mm; hindwing length 25.5 mm; abdomen length 40.0 mm.

Head. – Labium yellow; postclypeus mainly black; antennal scapus and pedicellus light orange-brown, flagellum black; posterior ocelli surrounded by distinct black rings.

Thorax. – Pronotal tubercles distinct; posterior pronotal lobe broadly rounded, posterior margin slightly elevated.

Legs orange-brown.

Wings. – Pterostigma moderately oblique, with anterior and distal side slightly convex; anterior side slightly shorter than posterior side; pterostigma light brown.

Abdomen. – Segment 10 widening towards posterior end, ventral side about two-thirds the length of dorsal side. Superior appendages less than 1.5 times longer than segment 10, in dorsal view superiors stout at base (cf. fig. 84); subbasal ventral process of moderate length (cf. fig. 53), only partly visible in lateral view (cf. fig. 52); inferior appendage very short (cf. figs. 52–53); appendages yellow-brown, with dorsal part of superiors and tips of appendages and of subbasal process black.

Ligula. – Terminal lobes elongate, apical margins oblique (cf. figs. 14–15).

Variation in males. The holotype is a teneral specimen; mature males are distinctly darker, with reddish-brown head, medium brown thorax and abdomen, the latter largely darkened, and bright orange-red legs; anteclypeus and mesostigmal plate occasionally marked with black; anterior ocellus can be surrounded by a black ring. In specimens from Panay, the lower part and underside of synthorax can be distinctly brighter than upper half; anterior side of pterostigma usually distinctly shorter than posterior side.

Female. – (first description). Head. – Labium bright yellow, postclypeus medium brown, antennal flagellum black; head otherwise light brown.

Thorax. – Posterior pronotal lobe comparatively short, wave-shaped in dorsal view (fig. 136), moderately flattened in lateral view (fig. 115); prothorax light brown, except for black anterior and posterior margin of pronotum.

Legs bright yellow, from about distal fourth of femur to distal end reddish-brown.

Synthorax with middorsal carina and carinal forks black; ante-alar ridge between antehumeral and first lateral suture black; a black spot below posterior end of second lateral suture and at posterobasal corner of metepimeron.

Wings. – Pterostigma similar to male.

Abdomen. – Segment 1 light brown, remaining segments medium brown, dorsally and apically dark-

ened; cerci blunt; projecting part of valvae longer than length of last abdominal segment (0.5–0.8 mm).

Material examined

Holotype ♂, Sibuyan Island, Magdiwang, Tampayan, Camp Ga-ong, 80–150 m, 1.–2.iv.1987, R.A. Müller. – Paratypes: 3 ♂, same data as holotype. – Other material: Panay Island, Antique Province: 2 ♂, 2 ♀, Culasi, Mt. Madia-as, Flores, 700 m, 18.–30.iv. 1993, F. Mohagan. Panay Island, Iloilo Province: 3 ♂, Lumbanao, Inca, Nagaranan River, 450–600 m, iii. 1995, A. Buenafe. Sibuyan Island: 1 ♀, Magdiwang, Silum, 200 ft., 5.iv.1987. All in RMNH.

Remark

Distribution. – Sibuyan, Panay (fig. 144).

Note. – Contrary to the notice in Hämäläinen (1991b), the holotype has been deposited in RMNH.

Altitudinal range. – 50–700 m.

Risioecnemis polilloensis Hämäläinen (figs. 16–17, 54–55, 85, 125–126, 143)

Risioecnemis polilloensis Hämäläinen, 1991b: 196 (♂ preliminary description), figs. 7–8 (♂ male appendages); Bridges 1994: VII: 188; Hämäläinen & Müller 1997: 265, 290 (notes on distribution); Tsuda 2000: 57.

Differential diagnosis

Small species. Male with black head, thorax conspicuously yellow-black; colour pattern similar to *R. kaiseri* sp. n.; however, in that species yellow coloration of synthorax is restricted to posterior lower part, in *R. polilloensis* anterior and posterior lower part of synthorax are yellow, except for conspicuous black spot on posterior end of metepimeron; legs of *R. kaiseri* sp. n. yellow throughout, those of *R. polilloensis* with coxa, trochanter and main part of femur yellow, distal and posterior parts of femur as well as entire tibia and tarsus black. Female posterior pronotal lobe similar to that of *R. haematopus*, but anterior side in lateral view more straight in *R. polilloensis* (fig. 125), distinctly concave in *R. kaiseri* sp. n. (fig. 109); female smaller and with a lower Px number than *R. haematopus* (cf. table 3).

Description

Measurements. – Forewing length ♂ 21.0–24.0 mm (n=5), ♀ 23.5 mm (n=1); hindwing length ♂ 20.5–23.5 mm (n=5), ♀ 23.0 mm (n=1); abdomen length ♂ 34.5–38.5 mm (n=5), ♀ 35.5 mm (n=1).

Male. – (Holotype ♂; additional remarks, cf. Hämäläinen 1991b).

Measurements. – Hindwing length 20.5 mm; abdomen length 34.5 mm.

Head. – Labium with median incision subtriangular, yellow, movable and end-hook dark brown. Head otherwise black, except for a pair of reddish-brown half-circles on upper half of labrum, a line of same

Figs. 114–119. *Risiocnemis* spp., prothorax in dorsal (114, 116, 118) and lateral view (115, 117, 119). – 114, 115, *R. plebeja* ♀, Panay Island, Antique Prov., Flores; 116, 117, *R. rubripes* ♀, Mindanao Island, Surigao del Sur Prov., San Miguel, Suba River; 118, 119, *R. siniae* ♀, Leyte Island, Mt. Balocau. Scales 300 µm (114, 116, 118), and 100 µm (115, 117, 119).

Figs. 120-121. *R. tendipes* ♀, prothorax in dorsal (120) and lateral view (121); Mindanao Island, Davao Oriental Prov., Tubonol Creek. Scales 300 µm (120), and 100 µm (121).

colour joining upper margin on frons, the medium brown distal three-fourths of antennal pedicellus and a yellowish-white ring at distal end of scapus.

Thorax. – Pronotum with anterior lobe yellow, anterior margin black; median lobe black, anterior lateral parts yellow; posterior pronotal lobe broadly rounded, posterior margin with shallow inlet medially, black.

Legs yellow, area around knees brownish.

Synthorax with mesepisternum, mesepimeron and mesokatepisternum black with minute yellow spots at mesothoracic fossa and on anterior part of mesepimeron; metepisternum and metepimeron yellow, with a brown spot on their posterior parts; metakatepisternum with large brown spot, otherwise yellow; underside of synthorax bright yellow.

Wings. – Pterostigma moderately oblique, anterior side very slightly depressed, distal side slightly convex, in hindwing anterior distal corner very slightly protruded; pterostigma medium brown.

Abdomen. – Segments 1 and 2 largely yellow, remaining segments gradually darkening towards abdominal end.

Ligula. – Broad terminal lobes, widening distally; median incision between terminal lobes broadly oval (cf. figs. 16-17).

Variation in males. – The metepisternal and metepimeral brown spots, as present in the type specimen, are confluent with the remaining black thoracic coloration in other specimens; metepisternum occasionally black throughout; black coloration on legs can be further extended so that posterior side of femur and entire tibia are covered by black; pterostigma with posterior distal corner more rounded in other specimens; in hindwing, pterostigma occasionally narrower

than in forewing; colour of pterostigma ranges from light to dark brown; abdomen mostly black throughout. Apparently, the holotype is a teneral specimen.

Female. – (first description). **Head.** – Labium with median incision narrow, yellow, movable and end-hook somewhat light brownish; labrum reddish-brown, with conspicuous long hairs at lower margin; gena and adjacent areas yellow; anterior parts of head lateral to mouth parts and frons yellow-white; remaining parts of head reddish-brown intermingled with black; posterior ocelli surrounded by black rings.

Fig. 122. *Risioecnemis fuligifrons* ♀, Mindanao Island, Surigao del Sur Prov., Hitaub Creek, posterior pronotal lobe in posterior view. Scale 100 µm.

Figs. 123-126.

Risiocnemis spp., prothorax in lateral view (123, 125) and posterior pronotal lobe in dorsal view (124, 126). – 123, 124, *R. melanops* ♀, Samar Island, Oras; 125, 126, *R. polilloensis* ♀, Catanduanes Island, Egwang Tapayas Creeks.

Thorax. – Prothorax with posterior pronotal lobe raised at right angles, anterior side raising as an almost straight, slightly concave line in lateral view (fig. 125); prothorax light brown to almost yellow, a conspicuous black line at posterior lateral margin.

Legs with coxa and trochanter yellow, otherwise reddish-brown, slightly more reddish than head colour, joints marked with black.

Synthorax light brown to almost yellow, upper part somewhat darker than lower part, anterior dorsal bulge predominantly black, middorsal carina marked with narrow black line.

Wings. – Pterostigma with posterior distal corner less rounded than in male, otherwise similar.

Abdomen. – Segment 1 yellow, segments 2 to 10 light to dark brown, gradually darkening posteriorly; projecting part of valvae about 0.6 mm, slightly exceeding the length of last abdominal segment.

Material examined

Pollilo Island: Holotype ♂, Philippines, Pollilo, 18.viii. 1915, G. Boettcher (SMFD). – Other material: Catanduanes Island: 1♂, 1♀, Gigmoto, San Pedro, Egwang Tapayas Creeks, 300-500 m, 20.-30.vi. 1996, A. Buenafe. 1♂, Gigmoto, San Pedro, Tongao Creeks, 400-500 m, 20.-30.vi. 1996, A. Buenafe. 1♂, Gigmoto, San Pedro, Simohe Creeks, 300-500 m, 20.-30.vi. 1996, A. Buenafe. Luzon Island, Camarines Norte Province: 1♂, Sn Lorenzo, Ruiz, Sitio Bay-Bay, Patag, 400-700 m, 24.-25.ix.1997, C.M. Nazareno. All except holotype in RMNH.

Remarks

Altitudinal range. – 300-700 m.

Distribution. – Southeastern Luzon, Polillo and Catanduanes (fig. 143).

Risiocnemis rubricercus sp. n.

(figs. 56-57, 66-67, 86, 144)

'*Risiocnemis* sp. n. 63' Hämäläinen & Müller 1997: 265, 279, 301.

Type material. – Holotype ♂, Philippines, Mindanao Island, Davao Oriental [Province], Boston, Mt. Agtuaganon, Camp 55, 1020 m, 29.v.-7.vi. 1996, Müller/Buenafe/Gorostiza, deposited in RMNH. – Paratypes: 4♂, same data as holotype. All in RMNH.

Differential diagnosis

Black species with black legs and red appendages; inner subbasal ventral processes notched.

R. rubricercus sp. n. is similar to *R. calceata* Hämäläinen with regard to abdominal coloration; however, while in *R. calceata* segments 7 to 10 are distinctly red, in *R. rubricercus* sp. n. segments 7 to 8 are just brightened, and only distal end of segment 8 to segment 10 including the appendages is distinctly red. *R. rubricercus* sp. n. can be distinguished from the three other predominantly black coloured species in the group, *R. atripes*, *R. atropurpurea* and *R. nigra* sp. n., as follows: from *R. atripes* by the absence of a basal yellow stripe on labrum as well as the absence of any other yellow or yellow-white marking; from *R. atropurpurea* by the black, not turquoise coloration of anterior parts of legs; from *R. nigra* sp. n. by the absence of frontal rectangular markings; from both *R. atropurpurea* and *R. nigra* sp. n. by the smaller size; from all three species by the red coloration of appendages as well as by distinct differences in shape of the male appendages (figs. 56-57, 66-67, 86). The superior appendage is characteristically thickened, with subbasal ventral process (fig. 67) similar to that of *R. rubripes* and *R. pistors* sp. n., but distinctly notched.

Description

Measurements. – Forewing length ♂ 30.0–32.0 mm (n=3); hindwing length ♂ 28.5–30.0 mm (n=3); abdomen length ♂ 44.5–46.0 mm (n=3).

Male (holotype). – Head. – Labrum black, basal margin yellow-orange; anteclypeus brown; postclypeus shiny black, semi-angular in lateral view; dorsal surface of head black throughout, except for a weak greyish stripe on frons, the lateral border of which touching eye margin only posteriorly; antenna black, except for yellow-white ring at distal end of scapus and diffuse reddish-brown coloration of distal half of pedicellus; flagellum thickened basally.

Thorax. – Pronotal tubercles weakly pronounced, posterior lobe broadly rounded, flat; prothorax black.

Legs black.

Synthorax black throughout.

Wings. – Arculus at Ax2; origin of R4 in forewing distal to Sn, in hindwing at Sn; forewing with 20 Px, hindwing 18–19 Px; pterostigma in forewing square, in hindwing higher than long; posterior side in forewing and hindwing convex; pterostigma dark brown; wings with a slight brownish hue; forewing length ♂ 30.0 mm, hindwing length ♂ 29.0 mm.

Abdomen. – Black, gradually brightening posteriorly; superior appendage thickened (cf. figs. 56–57, 86), reddish-orange, with tips pointed and somewhat bent downwards; subbasal ventral process short, characteristically notched (cf. fig. 67), tip black; inferior appendage more or less straight with black tip somewhat bent upwards, about half the length of superior, light brown basally, largely orange, but less conspicuously than superior; abdomen length 44.5 mm.

Ligula as in *R. pistior* sp. n. (cf. figs. 18–19).

Variation. – In one specimen, the R4 vein of both hindwings inserts at Sn.

Female. – Unknown.

Remarks

Etymology. – Noun in apposition, referring to the red appendages (ruber, rubra, rubrum [Lat.] = red; kerkos [Gr.] = tail)

Altitudinal range. – 1000 m.

Distribution. – Eastern Mindanao (fig. 144).

Risioecnemis rubripes (Needham & Gyger)
(figs. 58–59, 68–69, 87, 116–117, 137, 144)

Prionocnemis rubripes: Needham & Gyger, 1939: 240 (species list of Philippine Zygoptera), 270 (key), 275–276 (descr. of male and female), pl. 14, figs. 175–176, 183.

Risioecnemis rubripes: Davies & Tobin 1984: 101; Bridges 1994: VII.205; Hämäläinen & Müller 1997: 265, 301, 303 (distribution); Steinmann 1997: 387; Tsuda 2000: 57.

Differential diagnosis

Male reddish, with bright red legs; superior appendages usually standing far apart in dorsal view (fig. 87), subbasal ventral process of superior appendage short, tip blunt-subtriangular (figs. 58–59, 68–69). Female with posterior pronotal lobe short (fig. 137), slightly lower than anterior lobe in lateral view, raised at right angles (fig. 117); legs with a touch of red.

R. rubripes is one of four apparently closely related species from eastern Mindanao (*R. pistior* sp. n., *R. rubricercus* sp. n., *R. tendipes*), which together are characterized by the short and stout subbasal ventral process of male superior appendage; within this assemblage, *R. rubripes* is most similar to *R. pistior* sp. n. (for distinguishing characters see diagnosis of that species). It is easily distinguishable from the predominantly black coloured *R. rubricercus* sp. n., and from *R. tendipes*, which differs from *R. rubripes* by its black postclypeus and by the usually darkened pro- and synthorax. Ligula morphology relates *R. rubripes* to *R. pistior* sp. n. (figs. 18–19) and *R. rubricercus* sp. n.; all three species share apically notched terminal lobes, which are separated by an arc-shaped incision.

Description

Measurements. – Forewing length ♂ 26.0–29.5 mm (n=7), ♀ 27.5–29.5 mm (n=3); hindwing length ♂ 25.0–27.5 mm (n=7), ♀ 26.0–28.0 mm (n=3); abdomen length ♂ 40.5–45.5 mm (n=6), ♀ 38.5–39.5 mm (n=3).

Male. – Head. – Labium reddish-yellow, end- and movable hook black; labrum reddish-brown, except for the black medio-basal deepening and a pair of black spots; ante- and postclypeus together rectangular in lateral view, medium brown. Head, including antenna with scapus and pedicellus otherwise reddish-brown, dark rings around ocelli; basal part of antennal flagellum thickened.

Thorax. – Prothorax reddish-brown, with pronotal tubercles weakly pronounced; posterior lobe broadly rounded, very slightly bow-shaped.

Legs bright red.

Synthorax light brown, except for narrow black carinal stripe.

Wings. – Pterostigma oblique, posterior side convex; in hindwing, proximal and distal sides occasionally longer than anterior and posterior sides; pterostigma dark brown to black; wings slightly tinged with brown.

Abdomen. – Reddish-brown, segment 3 to anterior part of segment 7 black-brown dorsally, segment 10 widened posteriorly, upper margin dorsally somewhat protruded, lower posterior margin provided with hairs (fig. 58); superior appendage straight, pointed, subbasal ventral process hook-like in lateral view (figs. 58, 68); inferior appendage only slightly bent upwards, 0.7

Figs. 127-139. *Risiocnemis* spp., posterior pronotal lobe in anterior view (left column except 139), in dorsal view (128, 139) and anterior dorsal view (remaining right column). – 127, *R. antoniae* ♀, paratype, Mindanao Island, Surigao del Sur Prov., Meme River; 128, *R. atripes* ♀, Mindanao Island, Davao Oriental Prov., Mt. Agtuuganon; 129, *R. atropurpurea* ♀, Luzon Island, Nueva Viscaya Prov., Atbo River; 130, *R. calceata* ♀, Panaon Island, Gabing, Gamay; 131, *R.*

flammea ♀, Mindanao Island, Davao Oriental Prov., Langanisan Creek; 132, *R. incisa* ♀, Luzon Island, Quirino Prov., Sierra Madre, (preparation artefact: distal margin of right half burst); 133, *R. kaiseri* ♀, paratype, Samar Island, Northern Samar Prov., Brgy San Isidro; 134, *R. nigra* ♀, paratype, Samar Island, San Isidro; 135, *R. odobeni* ♀, Catanduanes Island, Egwang Tapayas Creeks; 136, *R. plebeja* ♀, Panay Island, Antique Prov., Flores; 137, *R. rubripes* ♀, Mindanao Island, Surigao del Sur Prov., Suba River; 138, *R. siniae* ♀, Leyte Island, Mt. Balocau; 139, *R. tendipes* ♀, Mindanao Island, Davao Oriental Prov., Tubonol Creek. Scales 100 µm.

times length of superior one (fig. 58); appendages red, tips of inferiors and the tips and/or inner margins of subbasal ventral processes of superior appendage black.

Ligula as in *R. pistior* sp. n. (cf. figs. 18–19).

Variation in males. – In some specimens, ante- and postclypeus of males are of almost the same colour as the neighbouring head parts, i.e. reddish-brown.

Female. – Head. – Labium yellowish with end- and movable hook of same colour or reddish; labrum yellow-orange; anteclypeus medium brown, postclypeus dark brown; head otherwise coloured as in male, but dark rings around ocelli occasionally weaker; antenna with scapus and pedicellus reddish-brown, flagellum conspicuously black.

Thorax. – Posterior pronotal lobe raised at right angles, very short, slightly lower than anterior lobe (figs. 116–117).

Legs, especially tibia and tarsus, red, but not as bright as in the male.

Synthorax medium brown, except for a diffuse bright area comprising underside and lateral parts of synthorax up to metathoracic stigma and basal parts of the legs.

Abdomen. – Dark brown; epiproct blunt, conspicuous; length of projecting part of valvae 0.9–1.0 mm.

Material examined

Dinagat Island: Paratype (allotype)* ♀, Dinagat, 1.iv.1931, A. C. Duyag (CUIC). – Other material: Mindanao Island, Surigao del Sur Province: 11♂, Tandag, Hitaub Creek, 500–600 m, 13.–19., 24.iv.1995, Buenafe & Gorostiza. 2♂, 1♀, San Miguel, Suba River, 150–250 m, 13.–15.iv.1995, Müller, Buenafe & Gorostiza. 5♂, 1♀, Carmen, Upper Tandag River, km 9 Lanang Line, 500 m, 24.iv.1995, Buenafe & Gorostiza. 5♂, Carmen, 2. Equipment Shop, km 11 Lanang Line, 600–650 m, 21.–24.iv.1995, Müller, Buenafe & Gorostiza. 1♀, San Miguel, foot of Diuata Mountains, Castillo, Kagda-o Creek, 300–500 m, 2.–5.iv.1998, J. M. Piamonte. All except allotype in RMNH.

Remarks

Altitudinal range. – 150–600 m.

Distribution. – Eastern Mindanao, Dinagat (fig. 144).

Note. – The whereabouts of the male holotype from Dinagat Island is not certain. It could not be found in the Cornell and Harvard collections. Comparison of the Mindanao specimens with Needham & Gyger's drawings of the appendages of holotype male and of posterior lobe of female paratype shows that they are undoubtedly conspecific. On the other hand, the single incomplete female specimen from Bohol listed and illustrated by Asahina (1968: 350) as *R. rubripes*, is definitely not *rubripes*, but possibly *R. (R.) appendiculata* (Brauer, 1868).

Risiocnemis siniae Hämäläinen

(figs. 20–21, 60–61, 88, 118–119, 138, 144)

Risiocnemis siniae Hämäläinen, 1991b: 195–196 (♂ preliminary description), figs. 1–2 (♂ male appendages); Bridges 1994, VII: 219; Hämäläinen & Müller 1997: 265, 296, 297, 298 (notes on distribution); Tsuda 2000: 57.

Differential diagnosis

Male with head, thorax black, anterior part of abdomen darkened; remaining abdomen red. Female medium brown, with black postclypeus; posterior pronotal lobe moderately elevated (fig. 119), with subtriangular incision (fig. 138) which appears broadly rounded in dorsal view (fig. 118).

Resembles *R. calceata* in many respects; for distinguishing features see diagnosis of that species.

Description

Measurements. – Forewing length ♂ 27.0–30.0 mm (n=6), ♀ 29.0–29.5 (n=2); hindwing length ♂ 26.0–29.0 mm (n=6), ♀ 27.5–28.5 mm (n=2); abdomen length ♂ 42.5–44.5 (n=6), ♀ 38.0–41.0 mm (n=2).

Male (holotype). – Forewing length 29.0 mm; hindwing length 28.0 mm; abdomen length 42.5 mm.

Head. – Black, except for distal half of antennal pedicellus which is diffuse reddish-brown, and the reddish-brown occiput.

Thorax. – Prothorax with median pronotal lobe flat, posterior lobe bow-shaped with slight median inlet and somewhat undulate laterally; prothorax black throughout.

Legs largely bright red, upper half of femur and posterior side of tibia diffuse black.

Synthorax black, except for upper parts of meso- and metathoracic fossae and the area joining ante-alal ridge above posterior end of first lateral suture, which are medium brown; synthoracic underside black, intermingled with reddish-brown.

Wings. – Forewing with 15 Px (right forewing defective in holotype), hindwing 14 Px.

Abdomen. – Segments 1 and 2 and anterior base of segment 3 mainly dark brown, remaining segments red, segments 7 and 8 somewhat darkened; segment 10 dorsally bulged out in lateral view; posterior margin marked with an elongate black spot laterally; superior appendage elongate, sharp, shaped like a narrow triangle in dorsal view (cf. fig. 88), their distal thirds deviating very slightly laterally; subbasal ventral processes only partly visible in lateral view (cf. fig. 60), in posterior view broad, somewhat flattened, diverging apically (cf. fig. 61); inferior appendage reaching to nearly halfway the length of superior; appendages red, tips of subbasal processes and inferior appendages black (cf. figs. 60–61).

Ligula. – Median incision between terminal lobes subtriangular (cf. fig. 20), terminal lobes distinctly

Figs. 140-144. Distribution of *Risiocnemis* spp. – 140, *R. antoniae*, *R. atropurpurea*, *R. calceata* and *R. kaiseri*; 141, *R. atripes*, *R. haematopus*, *R. ignea* and *R. melanops*; 142, *R. flammea*, *R. incisa* and *R. odobeni*; 143, *R. fuligifrons*, *R. nigra*, *R. polilloensis* and *R. tendipes*; 144, *R. pistor*, *R. plebeja*, *R. rubricercus*, *R. rubripes* and *R. siniae*.

widened distally (cf. fig. 21); distal ends of terminal lobes notched, but not as deep as in *R. rubripes*.

Female (first description). – Head. – Labium bright yellow, except for distal half of inner hook which is diffuse reddish-brown; labrum yellow, with a diffuse dark brown transverse stripe crossing medially; anteclypeus medium brown, postclypeus black; antennal socket and scapus medium brown, pedicellus medium brown with basal black ring; flagellum black; remaining parts of head medium brown.

Thorax. – Pronotal tubercles flat in lateral view, posterior pronotal lobe raised about 45° (fig. 118-119), medially incised and shaped as an inverse 'W' in anterior view (fig. 138); prothorax medium brown.

Legs with light brown coxa and femur; tibia and tarsus with a touch of reddish, distal end of tarsus marked with black.

Synthorax medium brown, except for the following black marked areas: ante-alar ridge between humeral and first lateral suture and below second lateral suture; the posterobasal corner of metepimeron; occasionally,

the dorsal thoracic surface is darkened.

Wings. – Pterostigma moderately oblique, all sides slightly concave, light brown.

Abdomen. – Medium to dark brown. Cerci acute. Length of projecting part of valvae 0.8-0.9 mm.

Material examined

Holotype ♂, Leyte Island, Mahaplag, Hilusig, Mt. Balocau, 600 m, 29.viii./14.ix.1986, Th. Borromeo. – Paratypes: 1♂, Mahaplag, Hilusig, Mt. Balocau, 600 m, v.1986, Th. Borromeo. 1♂, Mahaplag, Hilusig, Mt. Balocau, Magsuganao River, 700 m, 18.-30.ix.1990, Th. Borromeo jr. – Other material: Leyte Island, Southern Leyte Province: 2♀, Mahaplag, Hilusig, Mt. Balocau, 700 m, 29.xi. & 1.xii.1989, Th. Borromeo jr. 1♀, Mahaplag, Hilusig, Mt. Balocau, Magsuganao River, 700 m, 18.-30.ix.1990, Th. Borromeo jr. Biliran Island, Biliran Province: 2♂, Naval, Mt. Sayoa, Horonan Creek, 200-400 m, 30.x.-3.xi.1992, Th. Borromeo. Samar Island, Western Samar Province: 2♂, Hinabangan, Bagakay, Arisona, 100-200 m, 29.viii.-20.ix.1996, A. Buenafe. 7♂, Hinabangan, Bagakay, San Isidro, 100-200 m, 29.viii.-20.ix.1996, A. Buenafe. Samar Island, Eastern Samar Province: 1♂, Oras, 50-150 m, 16.-18.iv.1992, Th. Borromeo jr. 1♂, Oras, 11.-22.iv.1994, Th. Borromeo. All in RMNH.

Remarks

Altitudinal range. – 100-700 m.

Distribution. – Leyte, Samar (fig. 144).

Note. – Contrary to the notice in Hämäläinen (1991b), the holotype has been deposited in RMNH.

Risiocnemis tendipes (Needham & Gyger) (figs. 22-23, 62-63, 89, 120-121, 139, 143)

Prionocnemis tendipes Needham & Gyger, 1941: 147 (descr. of male and female), pl. 1 figs. 12, 15-16.

Risiocnemis tendipes, Davies & Tobin 1984: 101; Bridges 1994: VII.231; Hämäläinen & Müller 1997: 265, 301 (distribution); Steinmann 1997: 387; Tsuda 2000: 57.

Differential diagnosis

Species of variable size. Male with red legs; superior appendage apically sharp (figs. 62, 89), subbasal ventral process flattened, blunt (fig. 63). Female with posterior pronotal lobe almost entirely flat (fig. 121), wave-shaped in dorsal view (fig. 139).

Male very similar in coloration to *R. pistor* sp. n., but ligula with terminal lobes not notched (fig. 23), median incision between terminal lobes oval (fig. 22), not arc-shaped; subbasal ventral process of superior appendage shaped similar as in *R. rubripes* (cf. figs. 58-59, 68-69), but position more distal than in that species (figs. 62-63).

Female posterior pronotal lobe (figs. 120-121, 139) similar to *R. plebeja* (cf. figs. 114-115, 136), but median inlet less rounded than in that species.

Description

Measurements. – Forewing length ♂ 27.0-34.5

mm (n=13), ♀ 28.5-36.0 (n=8), hindwing length ♂ 26.0-32.5 mm (n=13), ♀ 27.0-34.0 mm (n=8); abdomen length ♂ 41.5-51.0 mm (n=12), ♀ 37.5-47.0 mm (n=8). Variation: forewing length ♂ 27.5-28.5 mm (Cateel River Bay [n=2]), 29.5-34.0 mm (remaining populations [n=11]), ♀ 29.5 mm (Cateel River Bay [n=1]), ♀ 32.0-36.0 mm (rem. pop. [n=7]); hindwing length ♂ 26.0-27.5 mm (Cateel River Bay [n=2]), 28.0-32.5 mm (rem. pop. [n=11]), ♀ 28.0 mm (Cateel River Bay [n=1]), 30.0-34.0 mm (rem. pop. [n=7]); wing width ♂ 5.0 mm (Cateel River Bay [n=2]), 5.0-5.5 mm (rem. pop. [n=11]); ♀ 6.0 mm (Cateel River Bay [n=1]), 5.5-7.5 mm (rem. pop. [n=7]); abdomen length ♂ 41.5-43.5 mm (Cateel River Bay [n=2]), 45.0-47.5 mm (rem. pop. [n=10]), ♀ 39.5 mm (Cateel River Bay [n=1]), 44.0-47.0 mm (rem. pop. [n=7]).

Male. – Head. – Labium dirty yellow-brown, in some specimens darker; labrum, gena, ante- and postclypeus black, the latter occasionally shiny greenish; postclypeus sharply angulate in lateral view; head otherwise reddish-brown, intermingled with black; antennal sockets dark brown to black, scapus mainly dark, pedicellus dark basally, bright reddish-brown medially, slightly darkened distally, flagellum dark brown, thickened basally.

Thorax. – Prothorax with pronotal tubercles unmodified, posterior pronotal lobe broadly rounded; prothorax reddish- to dark brown.

Legs bright red throughout; coxa black.

Synthorax usually with upper anterior half, including meso- and metakatepisternum black; lower posterior half light to medium brown; diagonal border between the two areas very diffuse.

Wings. – Pterostigma dark brown, distal side distinctly concave, posterior side only slightly so.

Abdomen. – Light brown to reddish, segments 3 to 10 more or less distinctly darkened posteriorly; superior appendage sharp apically (figs. 62, 89); subbasal ventral process robust, blunt apically (fig. 63); appendages in dorsal view conical, slightly thickened at base (fig. 89), red.

Ligula. – Distal corner of terminal lobe cut off (fig. 23), median incision oval, apically somewhat pointed (fig. 22).

Variation in males. – In two males from Davao Oriental Province (Norton San Roque and Cateel), the frons of the males is not black, but conspicuously dark reddish, vertex medium brown; abdomen bright red; however, due to the lack of distinct structural differences and the limited number of specimens, we consider the observed differences to be part of the natural variability between different populations and refrained from assigning a new taxon name to the Cateel Bay specimens, although they were already listed as '*Risiocnemis* sp. n.65' in Hämaläinen & Müller (1997:

265, 279, 301).

Female. – Head. – Labium bright yellow; movable hook reddish-brown, distal parts of end-hook darkened; labrum yellow to reddish-brown, occasionally lower margin lighter than remaining parts; gena brown; anteclypeus light to brown-black, postclypeus brown-black; antennal scapus light to dark brown; pedicellus light brown medially, proximal and distal ends dark; flagellum black. Head otherwise medium to dark brown, occasionally remnants of elongate postocellar spots recognizable.

Thorax. – Pronotal tubercles not pronounced; posterior pronotal lobe not elevated in lateral view (fig. 121), wave-shaped (fig. 139); prothorax brown-black.

Legs light to reddish-brown, coxa and trochanter bright yellow, posterior parts of femur and distal end of tarsus black.

Synthorax. – Upper part medium to dark brown, lower part lighter.

Wings. – Very broad; pterostigma asymmetrical, anterior side slightly shorter than posterior side.

Abdomen. – Medium to dark brown; segment 1 brighter than remaining segments; ventral side of segment 10 distinctly longer than dorsal side, or both sides of subequal length; cerci pointed distally; length of projecting part of valvae about 1.0 mm.

Material examined

Holotype ♂*, Mindanao, Mt. Apo, Galog River, 6.ix., C.S. Clagg, MCZ. Paratype (allotype) ♀*, same locality, 4.ix., C.S. Clagg, MCZ. – Other material: Mindanao Island: Bukidnon Province: 1♂, 1♀, Impasugong, Impalutao, Natigbasan Creek, 1200-1400 m, 10.-15.v.1995, A. Buenafe. 1♂, Mabadlang, Olayan, Mt. Kalatungan, Muntian Creek, 1200-1400 m, 24.-25.xi.1995, A. Buenafe. 1♀, Katanglad Mts., Lomolayan River, x.1991, A. Buenafe. 1♂, 1♀, Mt. Kalatungan, Talakag, Brgy Mebadiang, Magamanason Creek, Sitio Olayan, 1000-1100 m, 5.-18.viii.1995, A. Buenafe. 1♂, Mt. Katanglad, Lantapan area, 900-1100 m, 26.-27.ii.1994, A. Buenafe. 10♂, Mt. Katanglad, Impasugong, Brgy Impalutao, Gantongan Creek, 800-900 m, 19.-29.viii.1995, A. Buenafe. Davao del Norte Province: 2♂, 1♀, Maco, Mainit, Mainit Creek, 500-700 m, 14.-17.ix.1995, A. Buenafe. 5♂, Maco, Mainit, Masara Mine, 500-700 m, 27.-28.xi.1995, A. Buenafe. Davao del Sur Province: 1♂, 1♀, Mt. Talomo, Malagos, Baguio, Eagle Camp, Ange Creek, 700-1000 m, x.1994, A. Buenafe. 3♂, 1♀, Mt. Talomo, Malagos, Baguio, Eagle Camp, Kal-lay Creek, 700-1000 m, x.1994, A. Buenafe. Davao Oriental Province: 8♂, Boston, Mt. Agtuaganon, Camp 55, BMMC-Mining Company, 1020-1100 m, 29.v.-7.vi.1996, R.A. Müller, A. Buenafe & A. Gorostiza. 14♂, 1♀, Boston, Mt. Agtuaganon, Camp 55, 1020 m, 29.v.-7.vi.1996, R.A. Müller, A. Buenafe & A. Gorostiza. 14♂, Sigaboy, Tandang Sora, Yakal, Tabamban River, Buyo Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 18♂, Sigaboy, Tandang Sora, Yakal, Tabamban River, Langanisan Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 13♂, 2♀, Sigaboy, Tandang Sora, Yakal, Tabamban River, Tubonol Creek, 400-800 m, 5.-14.x.1996, A. Buenafe. 1♂, Norton San Roque, 200-250 m,

11.iv. 1995, Roland A. Müller, labelled 'red, sparse veined'. 1♂, Cateel, Sta Filomena, 50-100 m, 9.iv.1995, Buenafe/Gorostiza, labelled 'red, sparse veined; hot spring'. 1♀, Cateel, Aliwagwag Falls, 200-300 m, 10.iv.1995, Buenafe/Gorostiza, labelled 'red, sparse veined'. Lanao del Norte Province: 1♂, Kapatagan, Mt. Puting, Bato Sapad, 250 ft., x.1988, W. Catal. North Cotabato Province: 3♂, 6♀, Alameda, Mt. Makatoring, 700-900 m, 1.-8.ii.1992, T. Borromeo. 8♂, 1♀, Mt. Apo, Ilomavis, Kal-ay Creek, Sitio Sayaban, 1200-1300 m, ix. 1995, A. Buenafe. 2♂, Mt. Apo, Ilomavis, Sodsohayan Creek, Sitio Sayaban, 1200-1300 m, ix.1995, A. Buenafe. 31♂, 6♀, Mt. Apo, Lake Agko, 1200-1300 m, 29.iii.-2.iv.1995, R.A. Müller. 2♂, Mt. Apo, Lake Agko Creek, 900-1200 m, 12.-25.ix.1994, A. Buenafe. 1♂, Mt. Apo, Lake Mainit, 1450 m, 2.iv.1995, A. Buenafe. 2♀, Mt. Apo, Ilomavis, Lake Agko, Babang Creek, 1600-1700 m, ix.1995, Alex Buenafe. 5♂, Mt. Apo, Ilomavis, Lake Agko, Dum Creek, 1100-1200 m, ix. 1995, A. Buenafe. 4♂, 1♀, Mt. Apo, Marbel River, 700-900 m, 12.-25.ix.1994, A. Buenafe. 9♂, 4♀, Mt. Apo, Marbel River, 1100-1400 m, 19., 24.-25. ii.1994, A. Buenafe. 1♀, Mt. Apo, Marbel River, 1200-1300 m, 2.iv.1995, A. Buenafe. 1♀, Mt. Apo, Matingao River, 800-1300 m, 12.-25.ix.1994, A. Buenafe. 1♀, Mt. Apo, Philippine National Oil Company, 1600-1800 m, 12.-25.iii.1994, A. Buenafe. South Cotabato Province: 1♀, Lake Sebu, Bulol Ungge, 20.-22.i.1994, J. de los Reyes. 2♀, Lake Sebu, Lamlahak, Talubek, 26.i.-1.ii.1994, L. Vinciguerra & E. Horn. 1♂, 1♀, Akbang, Mt. Matutum, 28.vii.1991, J. de los Reyes. Surigao del Sur Province: 3♂, 1♀, Tabon, Tabon Falls, 100-200 m, 26.v. & 8.vi.1996, A. Gorostiza & A. Buenafe. Zamboanga del Sur Province: 3♂, 1♀, Tigbao, Mt. Timolan, Tigbao Creek, 12.-21.viii.1994, T. Borromeo. All except holo- and paratype in RMNH.

Remarks

Altitudinal range. – 100-1800 m.

Distribution. – Mindanao (fig. 143).

Risiocnemis (Igneocnemis) spec. indet.

Material examined. – Philippines, Luzon Island: 2♀, Los Banos, 18. & 21.ii.1914, G. Boettcher, SMFD.

The two examined specimens from a series of 11 similar females from the same site could not be assigned to any of the described species. Their posterior pronotal lobe is very similar to that of *R. tendipes*, but, however, is more strongly raised than in that species.

The status of these specimens remains unclarified until males become available.

DISTRIBUTION OF THE SUBGENUS

Based on the distribution of species of the subgenus *Igneocnemis*, four major areas of endemism in the Philippines can be recognized: Luzon, the West Visayans, the East Visayans, and the Mindanao region. Across Luzon island, one species, *R. atropurpurea*, is widespread, but both northern and southern

Luzon have their own endemic species, i.e. northern Luzon *R. ignea* and *R. incisa*, and southern Luzon *R. haematopus*, *R. odobeni* and *R. polilloensis*. Four species are endemic to the East Visayans: *R. kaiseri* sp. n., *R. melanops*, *R. nigra* sp. n. and *R. siniae*. The island of Mindanao has seven endemic species in total, three of them widespread on the island (*R. atripes*, *R. fuligifrons*, *R. tendipes*) and three of them restricted to eastern Mindanao: *R. antoniae* sp. n., *R. rubricercus* sp. n. and *R. rubripes*. *R. calceata* occurs in Dinagat and Panaon, at the border between East Visayan and Mindanao subregions. Only one species (*R. plebeja*) is known to be endemic to the West Visayan region (here: Panay and Sibuyan islands). The most widespread species is *R. flammeea* which is distributed across the Mindanao and East Visayan subregions. Unfortunately, our knowledge of the occurrence of *Igneocnemis* species in the Mindoro region is still uncertain, but like in the subgenus *Risiocnemis* endemic species can be expected.

The biogeography of the Philippine Calicnemiinae will be discussed in a future paper on the phylogeny and historical biogeography of the Southeast Asian and Indo-Pacific representatives of the subfamily and will therefore not be further evaluated here. For traditionally recognized biogeographic regions of the Philippines see Vane-Wright (1990) and Hämäläinen & Müller (1997).

ACKNOWLEDGMENTS

We are grateful to Mr. Roland Müller (St. Gallen, Switzerland) for helpful informations of any kind and for suggesting the name of *R. kaiseri*. The first author thanks Prof. Dr. E. Gittenberger and Mr. J. van Tol (University of Leiden and National Museum of Natural History, Leiden) for supervising the present study and Prof. Dr. C. M. Naumann (Zoological Research Institute and Museum Alexander Koenig, Bonn) for critically reviewing the manuscript. For loaning specimens, both authors would like to thank Dr. P. Grootaert and Mr. J. Cools (Institut Royal des Sciences Naturelles, Brussels), Dr. H. G. Schroeder (Senckenberg-Museum Frankfurt), Mr. C. Vogt and Dr. P. D. Perkins (Museum of Comparative Zoology, Harvard University) and Mr. E. Richard Hoebeke (Cornell University Insect Collection, Ithaca). The first author's thanks are due to Mrs. G. Lamers and Dr. W. de Priester (Institute of Molecular Plant Sciences, Leiden University) for help during his SEM studies. Dr. W. Piel kindly assisted with the mapping programme.

The present study is supported by the Dutch Life Science Foundation (ALW, formerly SLW), which is subsidized by the Netherlands Organization for Scientific Research (NWO)

REFERENCES

- Asahina, S., 1968. Records and notes on Philippine Odonata. – Japanese Journal of Zoology 15: 349-376, pls. 1-2.
- Brauer, F., 1868. Dritter Bericht über die von Herrn G. Semper mitgetheilten, von dessen Bruder auf den Philippinen gesammelten Neuropteren und Beschreibung einer neuen Libellen-Gattung aus dem Museum Godeffroy in Hamburg. – Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien 18: 541-558.
- Bridges, C. A., 1994. Catalogue of the family-group, genus-group and species-group names of the Odonata of the world (third edition). – C. A. Bridges, Urbana, Illinois.
- Davies, D. A. L. & Tobin, P., 1984. The dragonflies of the world: a systematic list of the extant species of Odonata. 1. Zygoptera, Anisozygoptera. – Societas Internationalis Odonatologica Rapid Communications (Suppl.) 3: 1-127.
- Gassmann, D., 1999. Taxonomy and distribution of the *inornata* species-group of the Papuan genus *Idiocnemis* Selys (Odonata: Zygoptera: Platycnemididae). – Invertebrate Taxonomy 13: 977-1005.
- Gassmann, D., 2000. Revision of the Papuan *Idiocnemis bidentata*-group (Odonata: Platycnemididae). – Zoologische Mededelingen Leiden 74: 375-402.
- Hämäläinen, M., 1991a. The Philippine genus *Risioicnemis* Selys (Zygoptera: Platycnemididae). 1. Subgenus *Risioicnemis*. – Odonatologica 20: 151-194.
- Hämäläinen, M., 1991b. Preliminary descriptions of seven new *Risioicnemis* species of the subgenus *igneocnemis* Hämäläinen, 1991. – Odonatologica 20: 195-201.
- Hämäläinen, M., 2000. *Risioicnemis seidenschwarzi* spec. nov., an endangered damselfly from Tabunan forest in Cebu, the Philippines (Odonata: Platycnemididae). – Entomologische Berichten, Amsterdam 60: 46-49.
- Hämäläinen, M. & R. A. Müller, 1997. Synopsis of the Philippine Odonata, with lists of species recorded from forty islands. – Odonatologica 26: 249-315.
- Kiauta, B. & M. A. J. E. Kiauta, 1981. The karyotype of *Risioicnemis incisa* Kimmins, 1936 from Luzon, The Philippines (Zygoptera: Platycnemididae). – Odonatologica 10: 151-154.
- Kimmins, D. E., 1936. The Odonata of the Oxford University Sarawak Expedition. – Journal of the Federated Malay States Museums 18: 65-108.
- Kimmins, D. E., 1970. A list of the type-specimens of Odonata in the British Museum (Natural History), Part 3. – Bulletin of the British Museum (Natural History) Entomology 24: 171-205.
- Kirby, W. F., 1890. A synonymic catalogue of Neuroptera Odonata, or dragonflies. With an appendix of fossil species. – Gurney & Jackson, London.
- Lieftinck, M. A., 1954. Handlist of Malaysian Odonata. A catalogue of the dragonflies of the Malay Peninsula, Sumatra, Java and Borneo, including the adjacent small islands. – Treubia (Supplement) 22: i-xiii, 1-202, 1 map.
- Lieftinck, M. A., 1961. New and interesting Odonata from the Philippines. – Fieldiana Zoology 42: 119-149.
- Lieftinck, M. A., 1981. Some little-known species of *Risioicnemis* Cowley from the Philippine Islands, with notes on their synonymy, morphological characters and larval structure (Zygoptera: Platycnemididae). – Odonatologica 10: 93-107.
- Munz, P. A., 1919. A venational study of the suborder Zygoptera (Odonata) with keys for the identification of genera. – Memoirs of the American Entomological Society 3: 1-78, pls. 1-20.
- Needham, J. G. & M. K. Gyger, 1939. The Odonata of the Philippines. 2. Suborder Zygoptera. – Philippine Journal of Science 70: 239-314, pls 11-22 excl.
- Needham, J. G. & M. K. Gyger, 1941. More Odonata from the Philippines. – Philippine Journal of Science 74: 141-151, pl. 1 excl.
- Selys-Longchamps, E. de, 1882. Odonates de Philippines. – Annales de la Sociedad Española de Historia Natural 11: 5-34, pl. 1.
- Selys-Longchamps, E. de, 1886. Révision du synopsis des Agrionines, I. Les Légions *Pseudostigma*, *Podagrion*, *Platycnemis* et *Protonевра*. – Mémoires Couronnés et autre Mémoires. Académie Royale des Sciences des Lettres et des Beaux-Arts de Belgique 38: i-iv, 1-233.
- Steinmann, H., 1997. World catalogue of Odonata. I: Zygoptera. Das Tierreich, vol. 110. – Berlin, New York.
- St. Quentin, D., 1970. Katalog der Odonaten-Typen im Naturhistorischen Museum Wien. – Annalen des Naturhistorischen Museums Wien 74: 253-279.
- Tsuda, S., 2000. Distributional list of world Odonata. – S. Tsuda, Osaka.
- Vane-Wright, R. I., 1990. The Philippines - key to the biogeography of Wallacea? – In: Knight, W. J. & J. D. Holway. Insects and the rainforests of South East Asia (Wallacea). – London.
- Watson, J. A. L. & A. F. O'Farrell, 1991. Odonata (Dragonflies and Damselflies). – In: Naumann, I. D. The Insects of Australia. 2nd ed., vol. I. Melbourne.

Received: 7 March 2002

Accepted: 24 June 2002