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**The genus *Nososticta* Hagen
(Odonata: Platycnemididae)
from the Papuan region
with descriptions of ten new species group taxa**

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Abstract. The males and, when available, females of ten new species and subspecies of *Nososticta* are described from the Papuan region. They are: *Nososticta caerulea* sp. nov. (♂ holotype: Papua New Guinea, Upper Sepik Basin, 09-vi-2010, ♀ described), *Nososticta finisterrae satisbona* ssp. nov. (♂ holotype: Papua New Guinea, Goodenough Island, 26-x-1953), *Nososticta interrupta* sp. nov. (♂ holotype: Indonesia, Papua Province, Kabupaten Asmat, Vriendschap R., 21-25-vii-2009), *Nososticta kaizei* sp. nov. (♂ holotype: Indonesia, Papua Province, Yapen Island, Ambaidiru village, 15-vii-2006, ♀ described), *Nososticta azurosignata* sp. nov. (♂ holotype: Papua New Guinea, Survey Site 2, Sepik Basin, 25-ii-2010), *Nososticta longicauda* (♂ holotype: Papua New Guinea, Darai Plateau, 24-vii-2003), *Nososticta manuscola* sp. nov. (♂ holotype: Papua New Guinea, Manus Island, 23-ix-2011, ♀ described), *Nososticta parafonticola* sp. nov. (♂ holotype: Papua New Guinea, Upper Sepik Basin, 10-11-xii-2009, ♀ described), *Nososticta tricolorata* sp. nov. (♂ holotype: Papua New Guinea, Upper Sepik Basin, 01-xii-2009) and *N. truncata* sp. nov. (♂ holotype: Papua New Guinea, Ivimka camp, Lakekamu, 15-xi-1996). In addition females of *N. africana* Schmidt, 1944, *N. aurantiaca* (Lieftinck, 1938) and *N. hiroakii* Sasamoto, 2007 are described and the morphology and variability of a number of additional species is discussed. Diagnostic characters of the available genders are illustrated, habitat conditions are given and their affinities are discussed. Live photos of selected species are presented. Keys to the males of all *Nososticta* species known from New Guinea and the Solomon Islands, and to the described females from this region are included. *Nososticta lorentzi* Lieftinck, 1938 is considered a synonym of *N. nigrifrons* (Ris, 1913) (syn. nov.).

Key words. Dragonfly, damselfly, Zygoptera, new species, Papua New Guinea, Indonesia, New Guinea, Solomon Islands, Aru Islands, Raja Ampat Islands

Introduction

The genus *Nososticta* currently includes 61 species found in Australia (12), New Guinea and adjacent islands (38, one of them shared with the Solomon Islands), the Solomon Islands (1, shared with New Guinea), the Moluccas (6), Sulawesi (1), and the Lesser Sundas, Java and Sumatra (4). The genus was established by HAGEN in SELYS (1860) based on *Alloneura solida* Hagen in Selys, 1860 from Australia. Molecular analyses including the closely related African and Asian *Prodasineura* and *Ellatoneura* showed that *Nososticta* is a monophyletic clade although it remains to be tested whether species occurring west of Wallace's line indeed belong to *Nososticta* (DIJKSTRA et al. 2014). The males of most species are morphologically rather uniform but differences in male appendage structure and in colour patterns are useful diagnostic characters. Many of the Papuan species are very colourful, matching in this respect the wonderful birds-of-paradise (Passeriformes: Paradisaeidae) of the region. The current paper focuses on the species occurring in what is here called the Papuan Region: the Solomon Islands and New Guinea including the Aru and Raja Ampat Islands (Misool, Salawati, Batanta, and Waigeo).

A small number of species occurring in this region were described by SELYS (1886), FÖRSTER (1897, 1898), MARTIN (1903), and RIS (1913a, 1913b). The true richness of the area however was demonstrated by the work of M.A. Lieftinck who described numerous species (LIEFTINCK 1932, 1933, 1937, 1938, 1949, 1960) and redescribed and often illustrated all the previously described species. Since LIEFTINCK's (1960) final work on the genus only six species have been added to the fauna of the Papuan region, by THEISCHINGER & RICHARDS (2006a, 2006b), SASAMOTO (2007), MICHALSKI et al. (2012), and THEISCHINGER & KALKMAN (2014); in addition GASSMANN & RICHARDS (2011) confirmed that *N. africana* Schmidt, 1944, originally thought to be from Africa, is actually a species from the Solomon Islands. This brings us to a total of 38 species presently known from the Papuan region. Material collected recently by SJR, and additional material provided to us by Vincent J. Kalkman include ten species and subspecies that are described as new below. This large number of new species is based on field-work in relatively small areas of New Guinea and it seems likely that several dozens of species remain to be discovered and described. In order to

introduce the novelties in the most appropriate context, to show numerous and various affinities and to facilitate future work on the group, we considered it desirable to provide a key to the males and the known females of all taxa of the Papuan region. The keys complement and update the comprehensive tables and keys provided by MICHALSKI (2012).

Material and methods

Terminology for species descriptions largely follows WATSON & O'FARRELL (1991). Colouration is given as detectable from the preserved material supplemented with observations of photographs of animals in life. Measurements are given in millimetres (mm). A number of species are illustrated in life for the first time. A key for identification of the males of all *Nososticta* now known from the Papuan region is produced following the system used by KALKMAN & ORR (2013), which is slightly different from that of MICHALSKI (2012). Males of Papuan *Nososticta* are first subdivided into groups defined by the most easily detectable colouration characteristics. Although these groups are probably not monophyletic, some species clusters within each group probably are. A more elaborate key for the males is then given for each of four groups. Because these keys are based on colouration it is important to go through several or all of the four groups if the colour patterns cannot be clearly made out and matched. Keys to the females are based almost exclusively on published illustrations. Line drawings, generally of prothorax, synthorax, and anal appendages, are given for almost all known taxa. Most of them were taken from LIEFTINCK (1932, 1937, 1938, 1949, 1960) and are reproduced often with very slight modifications. The new black and white synthorax illustrations were done in a style similar to LIEFTINCK (1949) in order to facilitate comparison and thus future work. All new illustrations were done with the aid of a camera lucida and are not to scale.

Illustrations are numbered individually or as groups. Within the groups (mostly rows) the order of individual illustrations is generally from left to right and from top to bottom. In the figure captions the illustrated details are abbreviated as follows:

AAd anal appendages, dorsal

AAI anal appendages, lateral

AAv anal appendages, ventral

AIV	appendix inferior, ventral
alPd	anterior lobe of pronotum, dorsal
ASl	appendix superior, lateral
ASv	appendix superior, ventral
Pd	prothorax, dorsal
Pl	prothorax, lateral
plPc	posterior lobe of pronotum, caudal
plPd	posterior lobe of pronotum, dorsal
plPl	posterior lobe of pronotum, lateral
Sf	synthorax, frontal
Sfl	synthorax, frontal and lateral
Sflv	synthorax, frontal, lateral and ventral
Sl	synthorax, lateral

Instead of an Index an alphabetical checklist is given in tabular form (Appendix 1). It provides information about the species' distributions and about the availability of illustrations of both genders.

Material of newly described species is deposited in the collection of Museum Naturalis (RMNH) in Leiden, The Netherlands, and in the South Australian Museum (SAMA) in Adelaide, South Australia. Some additional material is deposited in the Museum Zoologicum Bogoriense (MZB), Cibinong, Java, Indonesia.

***Nososticta africana* (Schmidt, 1944)**

(Figs 35, 73)

Material studied

Papua New Guinea, Wanui Camp and nearby Garden Site, East New Britain Province (05°21.638'S, 152°05.266'E): 1♀ (SAMA 07-001321), Forest stream at Wanui Camp, 25-iii-2000; 1♀ (SAMA 07-001323), clearing in sun at Wanui Camp, 22-iii-2000; 3♀ (SAMA 07-001325–27), 4♂ (SAMA 07-001329–32), Garden Site on river, 14-iii-2000; all S.J. Richards leg.

Male

All males agree reasonably well with the description and illustration of SCHMIDT (1944).

Female

Head – Largely black; only basal margin of labium yellowish grey and a broad transverse pale orange frontal bar from eye to eye.

Thorax – Pronotum black with small lateral patch of anterior lobe, and connected with it, sides of median lobe, pale yellow; propleura whitish yellow; suture between pronotum and pleura broadly lined with black; posterior lobe with pair of upright inner lobes and pair of medially directed inner lobes. Synthorax pattern as illustrated, largely black; ante-humeral stripes about $\frac{1}{2}$ as long as mesanepisternum and less wide than their distance from mid-dorsal carina, pale orange; a thin posterior stripe on mesepimeron and all of metanepisternum, most of posterior half of metepimeron, postero-ventral tips of katapisterna and adjacent anterior area of postcoxae yellowish white to whitish yellow. Poststernum yellowish white with extensive black patches. Legs with coxae and trochanters largely whitish yellow, only procoxa anteriorly, meso and metacoxa anteriorly and laterally and trochanters posteriorly black; femora basally (fore leg) up to $\frac{3}{4}$ length (hind leg) yellowish white merging into black; remainder of legs largely black with face of tibiae somewhat paler.

Wings – Membrane clear with slight brownish tinge, venation black; pterostigma dark grey, about twice as long as wide; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; postnodals 17/14.

Abdomen – Tergum 1 black with sides yellowish white; terga 2–9 and S10 largely black with only extreme latero-ventral margin somewhat paler in 3–7; tergum 2 in addition with pair of small anterodorsal, large anterolateral and small posterolateral patches, tergum 3 with medially narrowly separated pair of anterodorsal spots and tergum 8 with large somewhat swallow-tailed whitish yellow dorsal patch over more than $\frac{1}{2}$ its length. Sterna black. Ovipositor dark reddish brown reaching about the length of S10 beyond end of S10; valves black with posterior $\frac{1}{4}$ to $\frac{1}{3}$ ventrally serrated. Anal appendages black or black with brown central patch.

Measurements [mm] – Hind wing 19.0–19.3; abdomen 27.1–29.0.

Comments – *Notoneura africana* was described on the basis of a specimen in the Museum für Naturkunde Berlin, Germany (ZMHB) labelled »Massawa, Eritrea, 29.12.1897«, and was originally claimed to be »die erste afrikanische *Notoneura*-Art« (SCHMIDT 1944). PINHEY (1962) stated that »the species *africana* described by Schmidt arose from an error in mistaking Massua, Solomon Islands, for Massowa, Eritrea« and suggested that the genus and species be omitted from the Ethiopian fauna. Only recently GASSMANN & RICHARDS (2011) carefully examined *Nososticta* specimens from New Britain and found that *N. africana* definitely occurs in the Solomon Islands and that PINHEY (1962) had been correct concerning its provenance.

***Nososticta aurantiaca* (Lieftinck, 1938)**

(Photo 1, Figs 24, 77)

Material studied

All Indonesia, West Papua: 2♂, 2♀, Batanta Island, Warinkabom (00°50.196'S, 130°43.318'E), 10-vi-2005, S.J. Richards leg.; 2♂ (MZB), Salawati Island, Weybya (00°57.383'S, 130°47.060'E), 24–29-vi-2005, S.J. Richards leg.; 2♂, Kabupaten Wondama-Mioswaar, 02°06.685'S, 134°20.7210'E, 18–27-vii-2009, survey KEP, J. Kaize leg. (RMNH); previously reported as »*Nososticta* spec. (*aurantiaca* group)« by KAIZE & KALKMAN (2010).

Male

All males agree reasonably well with the description and illustration of LIEFTINCK (1932).

Female

Head – Largely black; most of labium whitish, only apex of lobes and palps black; a moderately wide pale yellow frontal bar from eye to eye.

Thorax – Pronotum black, posterior lobe as illustrated, with forward-directed lobes long and slender, distinctly widened apically; pleura largely yellowish white. Synthorax with pattern as illustrated; largely black; antehumeral patches orange to almost reddish brown, about ½ as long as mesanepisternum and about as wide as their distance from mid-dorsal carina;

mesepimeron postero-dorsally merging into a bit of reddish brown, ventrally narrowly pale yellow adjacent to the largely same coloured metepisternum; most of metepimeron and postero-ventral tip of katepisterna yellowish white; metapleural suture broadly lined with greyish brown to black. Legs with coxae and trochanters largely yellowish white, meso and mesocoxa with some blackish grey anteriorly and laterally; femora basally yellowish white merging into black at about $\frac{1}{4}$ – $\frac{1}{2}$ length, otherwise black as is most of remainder of legs apart from somewhat paler face of tibiae. Poststernum yellowish white.

Wings – Venation black, membrane clear and pterostigma blackish-grey, about twice as long as wide; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; postnodals 13–15/12–14.

Abdomen – Terga and S10 black, except most of sides of tergum 1 and latero-ventral edge of terga 2–9 dull yellowish white to greyish yellow. Sterna black. Ovipositor reddish brown, protruding beyond S10 by about length of S10, valves black, posterior $\frac{1}{2}$ serrated ventrally. Anal appendages pale yellow.

Measurements [mm] – Hind wing 18.5–18.8; abdomen 28.6–30.2.

***Nososticta beatrix* (Lieftinck, 1949)**

(Photo 2, Figs 11, 56)

Material studied

Papua New Guinea: 3♂ (SAMA 07-001336–38), Survey Site 2, Upper Sepik Basin (04°39.181'S, 141°55.374'E, 80 m a.s.l.), 26-ii-2010; 1♂ (SAMA 07-001339), Survey Site 6, Sepik Basin (04°42.068'S, 141°50.524'E, 125 m a.s.l.), 12-iii-2011, all S.J. Richards leg.

Comments – The listed males (Photo 2) have the pale synthoracic patches much more extensive than specimens from Indonesian New Guinea that were illustrated by LIEFTINCK (1949). Also the terminal abdominal segments appear considerably lighter and brighter than described by LIEFTINCK (1949). The anal appendages of the fresh males, however, agree well enough with the original description and illustrations indicating that the

population from PNG may be considered only a lighter version of *Nososticta beatrix*. Clinal variation in colouration and pattern is possible.

***Nososticta caerulea* sp. nov.**

(Photo 3, Figs 25, 59)

Material studied

Holotype ♂. Papua New Guinea, Upper Sepik Basin, Survey Site 11 (04°24.337'S 142°02.716'E, 40 m a.s.l.), 09-vi-2010, S.J. Richards leg. (SAMA 07-001340).

Paratypes (all from Papua New Guinea). 2♂ (SAMA 07-001341–42), same data as holotype; 1♀ (SAMA 07-001343), same data as holotype, 10-vi-2010; 1♂ (SAMA 07-001345), same data as holotype, 14-iii-2011, C. Muller leg.; 1♂ (SAMA 07-001347), Survey Site 9, Sepik Basin (04°24.238'S, 142°17.563'E, 55 m a.s.l.), in swamp, 03-iii-2011, S.J. Richards leg.

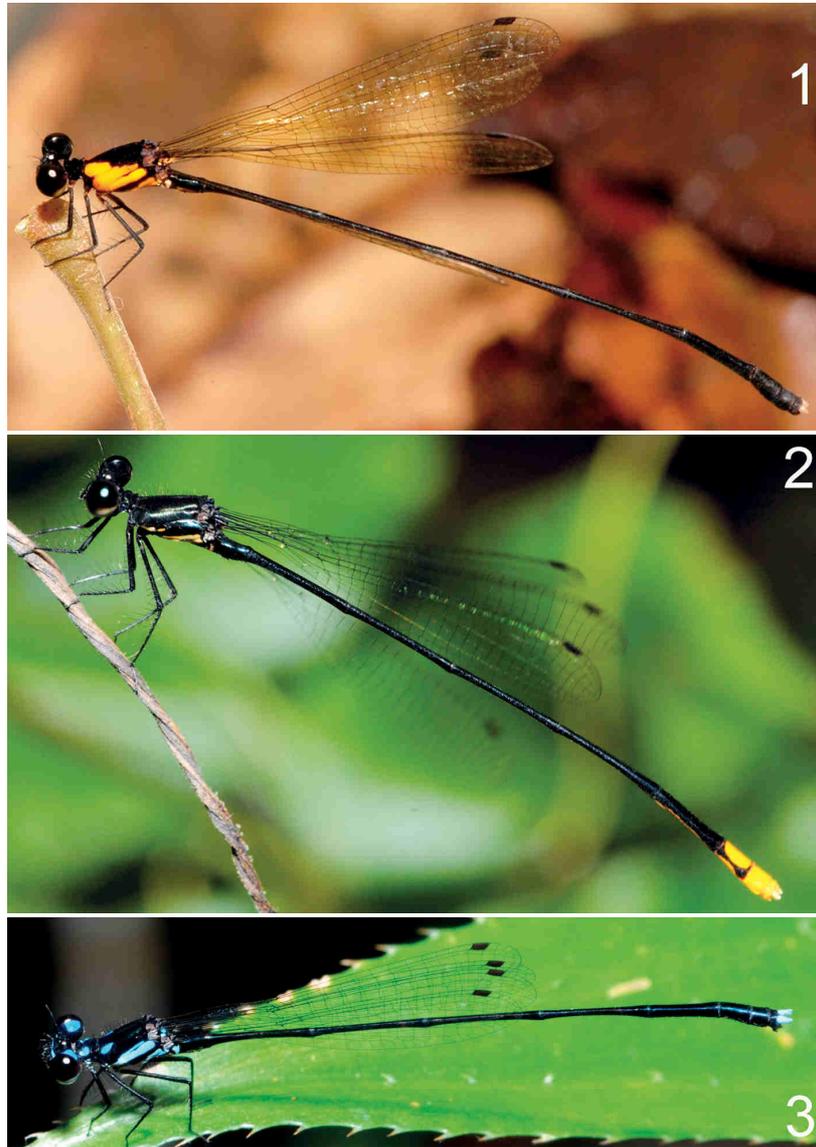
Etymology

The specific name *caeruleus*, a Latin adjective meaning blue, refers to the colouration of the species, which is strongly marked with blue.

Male

Head – Black with moderately broad cerulean blue bar from eye to eye across the anterior frons (and including much of genae) and large cerulean blue post-ocular patch each side; a few tiny pale blue patches on intersegmental membrane between labrum and anteclypeus.

Thorax – Pronotum and prothoracic pleura largely black; a large cerulean blue patch from lateral corner of anterior lobe over most of the rounded elevation of median lobe of pronotum on each side; three bluish white spots on propleura. Synthoracic pleura largely black with pale patches as illustrated (Fig. 25): a small vivid blue patch in anterolateral corner of mesanepisternum, very slightly radiating into adjacent margins of mesokatepisternum; and a large cerulean blue patch covering approximately posterior 1/3 of mesepimeron and anterior 2/3 of metepisternum (intersegmental suture in between lined black), fading into bluish white somewhat ventral to metastigma, and approximately posterior 1/2 of metepimeron pale blue. Poststernum



Photos 1–3. *Nososticta* spp., males, in life: 1 – *N. aurantiaca*, Batanta Island, Indonesia. Photo: SJR (10-vi-2005); 2 – *N. beatrix*, Sepik Basin, PNG. Photo: SJR (10-iii-2011); 3 – *N. caerulea* sp. nov., Sepik Basin, Papua New Guinea. Photo: SJR (01-iii-2011).

bluish white with patches of pale greyish brown. Fore leg with coxa and trochanter bluish white and blackish grey and remainder black, except for the blackish brown claws; middle and hind leg similar to fore leg but coxae laterally largely darkened and femora basally somewhat brightened.

Wings – Membrane hyaline; venation black; postnodals 12–14/10–11; pterostigma of both wings black, approximately 1.5 times as long as wide, generally overlying 1 cell (2 veins); no transverse cross-vein descending from distal margin of discoidal cell to wing margin; Ac situated at level of Ax1.

Abdomen – Terga largely black; tergum 1 with large blue lateral patch and small bluish white ventral patch; tergum 2 with small squarish blue posterolateral smudge; terga 3–6 black with slightly indicated brownish subapical lateral patches; terga 7–9 and S10 black. Sterna grey to black. Anal appendages large and prominent, the long hatchet-shaped superiors pale cerulean blue, the stout inferiors black (Fig. 25).

Measurements [mm] – Hind wing 15.2–15.5; abdomen (including appendages) 25.8–27.0.

Female

Head – Much as in male; bar across face markedly paler blue; a tiny blue spot each side, adjacent to eye margin and immediately before post-ocular patch.

Thorax – Much as in male; structure of prothorax as illustrated (Fig. 59); blue mesanepisternal patch slightly smaller; posteroventral corner of mesokatepisternum blue; mesepimeral/metepisternal patch slightly paler blue and metepimeral patch even paler and slightly larger; dark stripe on and along metapleural suture and on metapostepimeron paler and less clearly defined. Dark patches on poststernum paler and less distinct. Legs and wings much as in male; 13–14/10–11 postnodals.

Abdomen – Much as in male; tergum 1 with dark spot in bluish lateral patch; tergum 2 with lateral smudge of greyish blue, extending almost its

full length; terga 3–5 much as in male but tergum 3 additionally with small basal brownish yellow spot; terga 6–8 almost all black; tergum 9 largely black with basal $\frac{1}{5}$ (laterally) to almost $\frac{1}{2}$ (dorsally) bluish grey; S10 bluish grey dorsally, black laterally. Ovipositor brown, valves black, apical $\frac{1}{3}$ ventrally finely serrate, reaching well beyond apex of anal appendages which are pale to dirty bluish grey.

Measurements [mm] – Hind wing 16.5; abdomen 26.5.

Habitat

This small species was always encountered perched on low vegetation in sunny patches in swampy but also in drier lowland forest in the Sepik Basin. It is unusual among New Guinean *Nososticta* in that none of the individuals encountered were associated with streams or rivers. The two known locations, both in the upper Sepik Basin, are known or considered likely to be periodically flooded during heavy rainfall, but flowing-water habitats were absent and only small pools of water were present on the forest floor during the period that the specimens were collected. Given the extent of potentially suitable habitat available this species may have a broad distribution in the region.

Differential diagnosis

Both sexes of *Nososticta caerulea* sp. nov. can be distinguished from all other Papuan *Nososticta* species by the presence of blue post-ocular spots. The male (Photo 3, Fig. 25) also stands out by virtue of the unusual shape and the large size of the superior anal appendages. No close relationship with any known species is apparent.

***Nososticta callisphaena* (Lieftinck, 1937)**

(Photo 4, Figs 23, 66)

Material studied

Papua New Guinea: 2♂ (SAMA 07-001348–49), Survey Site 2, Upper Sepik Basin (04°39.181'S, 141°55.374'E, 80 m a.s.l.), 27-ii-2010; 1♂ (SAMA 07-001350), Survey Site 2, 26-ii-2010; 2♂ (SAMA 07-001351–52), Survey Site 6, Sepik Basin (04°42.068'S, 141°50.524'E, 125 m a.s.l.), 11-iii-2011.

Comments – In all males examined the mid-dorsal black area between the ante-humeral patches is broader than that illustrated by LIEFTINCK (1937) (Fig. 23) and is largely parallel sided (Photo 4). In contrast to Lieftinck's illustrations there is also a fine black line connecting the black dorsal mesanepisternal area with the black ventral mesepimeral area, and the metapleural suture is more widely and distinctly lined with black. Given these differences it is probable that populations of *N. callisphaena* may vary between, and possibly beyond, these extremes. Based on the completely black face, the colour pattern of tergum 2 and the shape of the anal appendages the new material is considered a darker variant of *N. callisphaena* than the material described by LIEFTINCK (1937).

***Nososticta chalybeostoma* (Lieftinck, 1932)**

(Figs 6–7, 51)

Material studied

Papua New Guinea: 1♂ (SAMA 07-001354), Survey Site 10, Upper Sepik Basin (04°37.247'S, 141°41.380'E, 440 m a.s.l.), 13–14-xii-2009; 4♀ (SAMA 07-00135–58), Unnamed Limestone Ridge in Upper Sepik Basin (04°38.637'S, 141°40.747'E, 950 m a.s.l.), 10–11-xii-2009, S.J. Richards leg.; 3♂ (det. Lieftinck), New Guinea, Humboldt Bay, W. Stüber leg. (RMNH).

Comments – As can be seen from Figure 7, the male from Survey Site 11 is much darker than typical *N. chalybeostoma* (Fig. 6). The fresh specimen, however, agrees in general appearance and in the shape of the male anal appendages with the material Lieftinck identified as *N. chalybeostoma*. The anal appendages of all males studied – including three specimens that were also examined by Lieftinck – have an acutely serrate inner edge of the superior appendages. This contrasts with LIEFTINCK'S (1937) illustration of the species, but inasmuch as we examined material, but not including the holotype, that LIEFTINCK (1937) identified as *N. chalybeostoma* we conclude that his illustration of the male terminalia of (Fig. 6) is incorrect and that they are accurately portrayed here in Figure 7.



Photos 4–7. *Nososticta* spp., males, in life: 4 – *N. callisphaena*, Sepik Basin, PNG. Photo: SJR (27-ii-2010); 5 – *N. cyanura*, Sepik Basin, Papua New Guinea. Photo: SJR (03-ii-2010); 6 – *N. erythrura efasciata*, Sepik Basin, Papua New Guinea. Photo: SJR (24-ii-2010); 7 – *N. f. finisterrae*, Tualapa, Papua New Guinea. Photo: SJR (12-vii-2008).

***Nososticta finisterrae satisbona* ssp. nov.**

(Fig. 50)

Material studied**Holotype** ♂. Papua New Guinea, Goodenough Island, 900 m, 26-x-1953 (RMNH).**Paratypes**. 3♂, same data as holotype (RMNH).**Etymology**

The subspecific name refers to the occurrence of the species on Goodenough Island, the name being translated into Latin in the form of the adjective *satisbonus*.

Male

Head – Black with moderately broad blue bar from eye to eye across anterior frons and indication of rusty-brown oval patch each side from lateral ocellus to halfway to antennal base.

Thorax – Prothorax with pleura largely pale bluish to yellowish and notum largely black, the anterior lobe with pale lateral spot and the median lobe laterally all pale blue; broadly black along suture between pleura and notum. Synthoracic pleura black patterned with blue as follows: a dorsally more or less pointed, ventrally rounded or truncate, patch covering at least 70% of length of and approximately 30% of width of mesanepisternum, along and close to mesopleural suture; anterior $\frac{2}{3}$ of metanepisternum; most of posterior $\frac{1}{2}$ of metepimeron; posteroventral corner of meso- and metakatepisternum. Posterodorsal corner of metepimeron black connecting with black metapostepimeron. Poststernum yellowish with large black patches. Coxae anteriorly and in part laterally black, posteriorly and in part laterally yellow; trochanters variably brown to black, femora black with base brownish yellow; tibiae including spines, tarsi and claws yellowish to blackish brown or even black.

Wings – Membrane hyaline, venation black; pterostigma of both wings black, overlying at least 1 and $\frac{1}{2}$ cells; Ac well proximal to Ax1; no transverse

cross-vein descending from distal margin of discoidal cell to wing margin; postnodals 17–19/15–17; CuP reaching wing margin at approximately $\frac{1}{2}$ length of first cell following discoidal cell.

Abdomen – Terga largely black, sterna yellowish to greyish brown. Much of sides of tergum 1, ventral portion of tergum 2, and an almond-shaped dorsal spot each side at the base of tergum 3 pale; terga 8 and 9, except for ventral edge, and at least dorsal half of S10 bright yellow to orange. Anal appendages bright yellow to orange, often somewhat darkened, the superiors rather rounded, not slender or conical.

Measurements [mm] – Hind wing 23.0–25.9; abdomen (including appendages) 36.8–41.2.

Female

Unknown.

Comments – The male of *N. finisterrae satisbona* ssp. nov. (Fig. 50) is of course most similar to *N. f. finisterrae* (Figs 48–49). The male can be distinguished from the nominate subspecies by the combination of a laterally very bright blue median lobe of the pronotum, long (70–90% of mesanepisternum) tapered, dorsally almost pointed blue ante-humeral stripes, very extensively yellow to orange coloured abdominal terga 8 and 9 and S10 and rather plump rounded anal appendages. *Nososticta f. finisterrae* is for the present defined as including a range of populations with variably coloured (dark-pale/bright) median lobe of pronotum, variably long (50–80% of mesanepisternum) blue, ante-humeral patches not dorsally tapered, variably coloured black to almost completely yellow/orange abdominal terga 8 and 9 and S10 and anal appendages of variable size and shape, from slightly conical to rather plump and rounded. Considerable material from a number of localities of what is here considered as *N. finisterrae* is available. It is, however, not possible at present to distinguish clearly definable units other than the island population described above or to be sure that all populations included are conspecific.

***Nososticta hiroakii* Sasamoto, 2007**

(Figs 19, 70)

Material studied

All from Indonesia, Papua Province, Biak-Supiori, 0–50 m a.s.l., V.J. Kalkman leg. (RMNH): 2♂, (00°43.414'S, 155°42.121'E), 17-x-2008; 1♂, 4–5 m medium-large brook, (00°41.908'S, 135°35.370'E), 18-x-2008; 7♂, Kampung Marsram, 0–50 m a.s.l., small steep brook (00°46.389'S, 135°43.089'E), 17-x-2008; 1♂, 00°49.805'S, 135°40.749'E, 19-x-2008; 1♂, 1♀, Papua Province, Biak, 0–50 m a.s.l., marshy forest (mainly sago) with streams (00°47.019'S, 135°35.165'E), 21-x-2008.

Male

All males agree well with the description of the species by SASAMOTO (2007) except that the inner margin of the ante-humeral patch appears not as straight as in the original description (see Fig. 19).

Female

A pair collected in copula makes it possible to present the first description of the female.

Head – Much as given by SASAMOTO (2007) for the male but with the transverse band across the face pale yellow.

Thorax – Prothorax with colour pattern and structure as illustrated (Fig. 70); the dorsal portion shiny black, the sides pale yellow. Synthorax with pattern as illustrated (Fig. 70), shiny black with the pale patches pale yellow with a slight touch of greenish. Legs as described for the male by SASAMOTO (2007) but with the pale areas pale yellow slightly greenish.

Wings – Membrane clear; venation black; pterostigma blackish grey, covering slightly more than 1 underlying cell; postnodals 14–15/13; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin at approximately ½ length of the first cell following discoidal cell.

Abdomen – Tergum 1 shiny black, laterally with pale yellow U-shaped mark; terga 2–7 black, narrowly pale yellow along ventral margin, tergum 2 in addition with small pale yellow almond-shaped lateral spot at base; terga 8 and 9 and S10 black. Ovipositor reddish brown; the valves largely black with close to apical half ventrally finely serrate, reaching well beyond the pale yellow anal appendages.

Measurements [mm] – Hind wing 18.5; abdomen 29.2.

***Nososticta interrupta* sp. nov.**

(Fig. 43)

Material studied

Holotype ♂. Indonesia, Papua Province, Kabupaten Asmat, Vriendschap R. (06°20.20'S, 138°52.72'E), 21-25-vii-2009, survey WWF-KEP, J. Kaize leg. (RMNH).

Paratype. 1♂, Indonesia, Papua Province, Kab Mappi–Senggo (6°39.10'S, 139°13.70'E), 19-vii-2009, survey WWF-KEP, J. Kaize leg. (RMNH).

Etymology

Interruptus, -a, -um, perfect participle of the Latin verb *interrumpo*, -ere (to interrupt) refers to the medially interrupted pale bar from eye to eye across the anterior frons.

Male

Head – Largely black; only extreme base of labium pale and a rather wide, medially distinctly interrupted transverse bar across anterior frons and genae adjacent to postclypeus greenish to bluish white to pale yellowish.

Thorax – Prothorax with notum black and almost all of pleura pale blue. Synthoracic pleura largely black with pale patches as illustrated (Fig. 43): the short, moderately wide, oval mesepisternal patch completely and widely separated from the long metepisternal patch, and this again well separated from the subtriangular metepimeral patch, all of them whitish blue; katapisterna possibly tipped pale. Poststernum largely dark. Legs largely black, only outer face of procoxa and posterior rim of meso- and metacoxa pale blue.

Wings – Venation black; membrane clear; pterostigma greyish black, slightly widening distally, close to twice as long as wide, overlying almost one cell; 15/13–14 postnodals; no transverse cross-vein descending from distal margin of discoidal cell to wing margin, only a transverse cross-vein descending distal to postero-distal angle of discoidal cell in both hind wings of holotype but not of paratype; CuP reaching wing margin between $\frac{1}{4}$ and $\frac{1}{3}$ length of first cell following discoidal cell.

Abdomen – Tergum 1 black with two pale blue patches each side; terga 2–9 black, only somewhat paler along ventral margin; S10 black. Sterna largely black. Anal appendages appearing rather dark, the superiors short with long, largely parallel sided tooth.

Measurements [mm] – Hind wing 17.4–17.8; abdomen (including appendages) 29.1–30.2.

Female

Unknown.

Differential diagnosis

Both available males of *N. interrupta* sp. nov. are immature and somewhat shrivelled. It is assumed that the pale coloured patches would be markedly brighter in mature individuals. In colour pattern *N. interrupta* (Fig. 43) appears closest to *N. marina* (Ris, 1913) (Fig. 45). The male of *N. interrupta* sp. nov. has the pale frontal bar medially interrupted and the anal appendages rather dark in contrast to the complete frontal bar and pale yellow anal appendages in *N. marina*. This material was previously published as »*Nososticta* spec. A« in KAIZE & KALKMAN (2011).

***Nososticta kaizei* sp. nov.**

(Photo 17, Figs 22, 71)

Material studied

Holotype ♂. Indonesia, Papua Province, Yapen Island, Ambaidiru village, brook (kali Manatiuna) running through village and degraded forest (1°45.799'S, 136°10.732'E), 15-vii-2006, J. Kaize leg. (RMNH).

Paratypes (all from Indonesia, Papua Province, Yapen; all RMNH). 9♂, 8♀, 11–16-vii-2006, same locality as holotype, J. Kaize & V.J. Kalkman leg.; 3♂, 2♀, 2 km from Ambaidiru village, brook (kali Tiuna) running through forest (Ambaidiru: 01°45.799'S, 136°10.732'E), 14–20-vii-2006, J. Kaize & V.J. Kalkman leg.; 2♂, 1♀, Ambaidiru village (01°45.799'S, 136°10.732'E), July 2006, J. Kaize & V.J. Kalkman leg.; 1♂, Kampung, Mambo (01°45.819'S, 136°9.870'E), 12-vii-2006, V.J. Kalkman leg.; 1♂, 1♀, near Tatui (01°50.217'E, 136°6.316'S), small stream through Pandanus Swamp, 22-vii-2006, V.J. Kalkman leg.; 5♂, Yobi, river partly in degraded forest and partly in virgin forest, 18-vii-2006, V.J. Kalkman leg.

Etymology

The species is named for John Kaize who very successfully collected dragonflies, including this species, in New Guinea.

Male

Head – Largely black with following exceptions; most of labium yellowish white, a rather wide and straight pale yellow bar from eye to eye across anterior frons and genae adjacent to postclypeus, and a very small oval patch each side from lateral ocellus to halfway to antennal base rusty brown.

Thorax – Prothorax with notum black, pleura pale to orange yellow and only adjacent to lobes narrowly black. Synthorax black with pale orange yellow patches as illustrated (Fig. 22): mesepisternal and mesepimeral patches bright orange; metepimeral patch orange antero-dorsally, gradually merging into paler yellow postero-ventrally; patch in metepimeron yellowish white. Poststernum pale yellow. Legs largely black, only coxae and trochanters, extreme base of profemur, base of mesofemur and basal $\frac{2}{3}$ of metafemur dull to dark greyish yellow, and metatibia greyish brown.

Wings – Venation black; membrane suffused with dark yellow; pterostigma blackish grey, very slightly widening distally, about twice as long as wide and overlying little more than 1 cell; 15–18/14–16 postnodals; a transverse crossvein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin at about half length of first cell following discoidal cell.

Abdomen – Tergum 1 dorsally black, laterally pale greyish yellow; tergum 2 dorsally and dorso-laterally widely black, latero-ventrally dark greyish yellow, terga 3–9 black, all with ventral margin narrowly markedly paler, terga 3–5 in addition with an indication of a ventro-lateral subapical brownish spot connected with the pale margin; S10 black. Sterna largely black. Anal appendages pale yellow, the superiors with large pointed inner tooth.

Measurements [mm] – Hind wing 18.1–22.0; abdomen (including appendages) 31.8–37.5.

Female

Head – Much as in male, with the pale bar across the face slightly paler tending toward pale orange.

Thorax – Colouration of thorax much as in male and illustrated (Fig. 71); structures of anterior and posterior lobe of pronotum as illustrated (Fig. 71). Synthoracic pattern as illustrated (Fig. 71), the mesothoracic patches pale to dirty orange, the metathoracic patches whitish to pale greyish yellow.

Wings – Much as in male; membrane clear; pterostigma dark brownish grey; postnodals 15–17/14–15.

Abdomen – Colouration much as in male; the brownish subapical ventro-lateral spots on terga 3–5 more strongly developed. Ovipositor pale greyish brown to yellow; valves black ventrally serrated for $\frac{2}{5}$ their length, reaching well beyond the pale brownish yellow anal appendages.

Measurements [mm] – Hind wing 18.6–22.8; abdomen 29.5–35.3.

Habitat

The species is only known from Yapen Island where it seems to be common and widespread. It was found in brooks in forest from around sea level to 600 m a.s.l.

Differential diagnosis

Nososticta kaizei sp. nov. is most similar to *N. aurantiaca* (Lieftinck, 1938). In male *N. kaizei* sp. nov. (Photo 17, Fig. 22) the inner margins of the ante-humeral patches are straighter and more parallel to each other or further apart than in *N. aurantiaca* (Photo 1, Fig. 24) and in the other similar species, *N. plagiata* (Selys, 1886) (Fig. 21) and *N. callisphaena* (Lieftinck, 1937) (Photo 4, Fig. 23). The metapleural suture of *N. kaizei* is more narrowly lined with black or more sharply defined than in any of these species. Male *N. aurantiaca* and *N. callisphaena* also generally have adjacent to the mesokatepisternum a dark patch that is consistently lacking in *N. kaizei*. The female of *A. kaizei* sp. nov. (Fig. 71) is very similar in both colouration and shape of the posterior lobe of pronotum to *N. aurantiaca* (Fig. 77) and *N. hiroakii* Sasamoto, 2007 (Fig. 70) but has a markedly narrower black lining on the metapleural suture.

***Nososticta azurosignata* sp. nov.**

(Photo 9, Fig. 31)

Material studied

Holotype ♂. Papua New Guinea, Survey Site 2, Upper Sepik Basin (04°39.181'S, 141°55.374'E, 80 m a.s.l.), 25-ii-2010, S.J. Richards leg. (SAMA 07-001359).

Paratypes (all from Papua New Guinea). 1♂ (SAMA 07-001360), same data as holotype; 1♂ (SAMA 07-001361), trail behind Survey Site 4 (04°38.841'S, 141°47.876'E, 290 m a.s.l.), 03-ii-2010; 2♂ (SAMA 07-001362–63), Survey Site 4, 13-ii-2010; 1♂ (SAMA 07-001364) Survey Site 7, (04°40.802'S, 141°46.188'E, 560 m a.s.l.) 12-ii-2010; 1♂ (SAMA 07-001365), Survey Site 6 (04°42.068'S, 141°50.524'E, 125 m a.s.l.), 13-iii-2011; all S.J. Richards leg.

Etymology

The specific name is a composite of two Latin words, *azurum* (stem *azuro-*, noun for shining blue colour) and *signatus*, *-a*, *-um* (marked with), the perfect participle of *signo*, *-are* (to mark), and refers to the colouration of the species.

Male

Head – Largely black; only base and midline of labium whitish yellow and a rather wide and slightly sinuous bar from eye to eye across anterior frons and genae adjacent to postclypeus bright cerulean blue.

Thorax – Prothorax almost completely black, only a bluish white spot on epimeron. Synthoracic pleura largely black with pale patches as illustrated (Photo 9, Fig. 31): mesepisternal, mesepimeral, and metepisternal patches bright cerulean blue; metepimeron brown and bluish white. The blue mesepimeral patch may vary significantly in shape (e.g., compare the live Photo 9 and Fig. 31). Poststernum pale yellowish. Legs largely black, only metacoxa, metatrochanter and base of metafemur somewhat paler.

Wings – Venation black; membrane slightly suffused with greenish yellow; pterostigma slightly widening distally, at least twice as long as wide, overlying hardly more than 1 cell; 12–17/11–15 postnodals; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin between $\frac{1}{4}$ and $\frac{1}{3}$ length of first cell following discoidal cell.

Abdomen – Tergum 1 dorsally black, laterally bluish white with small black patch; tergum 2 black with brownish yellow latero-ventral patch; terga 3–9 black with ventral margin narrowly pale; S10 black. Sterna brown to black. Superior anal appendages pale (bluish white) with large rather obtuse tooth, inferiors brownish grey to black.

Measurements [mm] – Hind wing 18.2–19.2; abdomen (including appendages) 28.8–32.0.

Female

Unknown.

Habitat

This species was common along small streams in hill forest in the upper Sepik Basin where the adults perched on low vegetation in sunny patches.

Given the extent of suitable habitat in the region this species probably has a broad distribution in northern New Guinea.

Differential diagnosis

With the mesepimeral blue patch smaller than the ante-humeral patches the male of *N. azurosignata* sp. nov. (Fig. 31) appears similar only to *N. truncata* sp. nov. (Fig. 32). The ante-humeral patches are distinctly narrower and less rounded in *N. azurosignata* than in *N. truncata*, and the superior anal appendages are conical with a large inner tooth in *N. azurosignata*, truncate, but with a small inner tooth in *N. truncata*.

Nososticta longicauda sp. nov.

(Fig. 4)

Material studied

Holotype ♂. Papua New Guinea, Gulf Province, Darai Plateau, (06°23.944'S, 142°58.568'E, 420 m a.s.l.), 24-vii-2003, S.J. Richards leg. (SAMA 07-001366).

Etymology

The specific name *longicauda* (compounded from Latin *longus* for long and *cauda* for tail), a noun in apposition, refers to the elongate superior anal appendages of the male.

Male

Head – Black with a broad transverse pale bluish to yellowish bar from eye to eye across the anterior frons and a hardly noticeable rust-brown spot between each lateral ocellus and antennal socket.

Thorax – Pronotum black, propleura largely pale yellowish to bluish, narrowly black adjacent to pronotum; anterior lobe of pronotum rather complex in structure. Synthoracic pleural area anterior to interpleural suture black and a moderately wide stripe covering metapleural suture and some adjacent area including most of metakatepisternum brownish black, area in between largely pale blue to pale yellowish. Poststernum pale yellowish to blue. Fore coxa and trochanters from pale to dark yellow and somewhat

clouded with brown, meso- and metacoxa darker, blackish brown anteriorly and much paler posteriorly, remainder of legs blackish brown to black.

Wings – Membrane hyaline; venation black; pterostigma of both wings black, overlying slightly more to considerably more than one cell; Ac at or slightly proximal to Ax1; generally (3:1) a transverse cross-vein descending from distal margin of discoidal cell to wing margin; postnodals 20–22/19; CuP reaching wing margin between $\frac{1}{5}$ and $\frac{1}{2}$ length of first cell following discoidal cell.

Abdomen – Black with much of sides of tergum 1 and part of ventro-lateral edge of tergum 2 pale yellowish and with apical margin of dorsal face of S10 ochreous to orange. Anal appendages ochreous to orange; superiors long and rather parallel sided as seen in profile with large basal tooth set at a considerable angle; inferiors deeply excavated between base and rather stout curled apex.

Measurements [mm] – Hind wing 21.5; abdomen (including anal appendages) 36.0.

Female

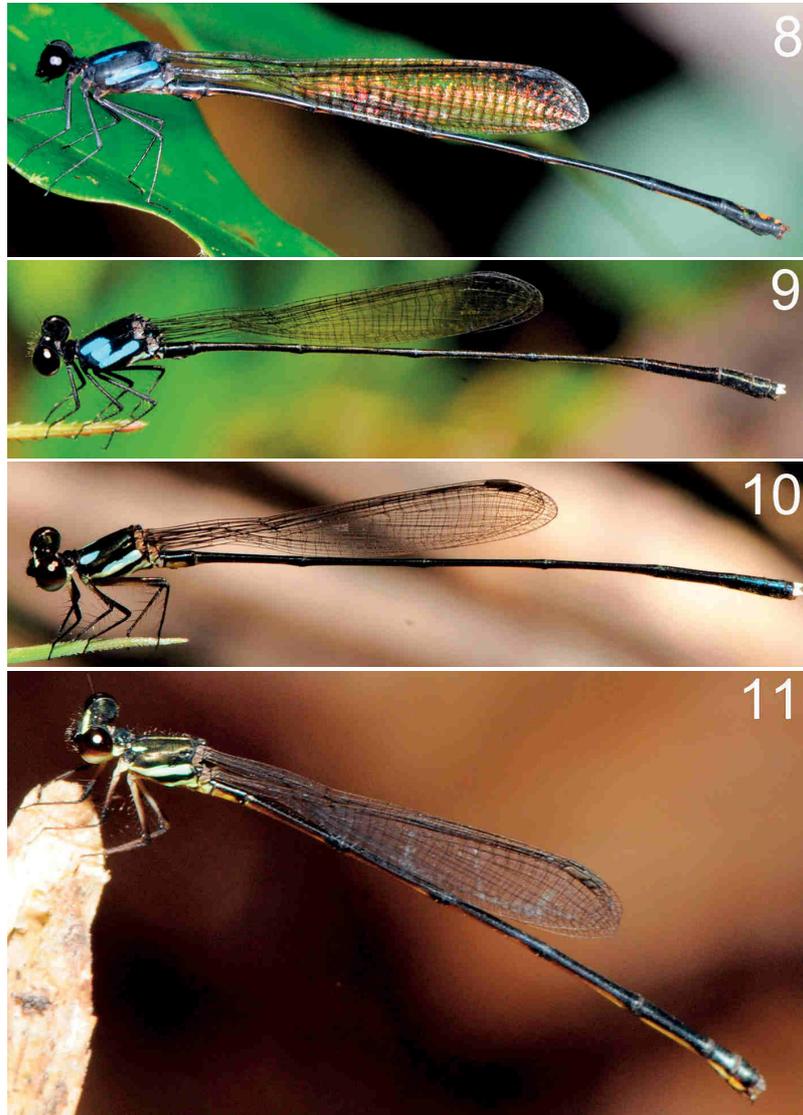
Unknown.

Habitat

The only known specimen was found perched on low vegetation in dappled sun in low hill forest dissected by small streams, many of them quite short due to the limestone substrate.

Differential diagnosis

Nososticta longicauda sp. nov. is very similar in colour pattern to *N. smilodon* Theischinger & Richards, 2006 from Dark End Lumber in the Kikori Basin and to *N. acuminata* Michalski et al., 2012 from Lakekamu, Gulf Province and it is probably most closely related to them. The male terminalia of the three species, however, are quite different from each other. The male superior anal appendages of the larger *N. longicauda* (Hw 21.5 mm, Px 19–22)



Photos 8–11. *Nososticta* spp., in life: 8 – *N. f. finisterrae*, male, Gugusu, Papua New Guinea. Photo: SJR (07-ix-2009); 9 – *N. azurosignata* sp. nov., male, Sepik Basin, Papua New Guinea. Photo: SJR (13-iii-2011); 10 – *N. manuscola* sp. nov., male, Manus Island, Papua New Guinea. Photo: SJR (23-ix-2011); 11 – *N. manuscola* sp. nov., female, Manus Island, Papua New Guinea. Photo: SJR (22-ix-2011).

are markedly longer and lower in profile with the finger-like tooth set much further from the apex than in the smaller *N. acuminata* (Hw 18.0–19.6 mm, Px 13–17) and *N. smilodon* (Hw 19.2–19.4 mm, Px 15–17), giving them a quite different appearance. Differences in the posterior lobe of the female pronotum will probably be found to reflect these differences.

***Nososticta manuscola* sp. nov.**

(Photos 10–11, Fig. 27)

Material studied

Holotype ♂. Papua New Guinea, Manus Island, near Pelipowai Village (02°11.922'S, 146°55.742'E, 20 m a.s.l.), 23-ix-2011, S.J. Richards leg. (SAMA 07-001367).

Etymology

The specific epithet refers to the occurrence of the species on Manus Island.

Male

Head – Largely black; only approximately basal half of labium pale greyish blue and a rather wide and slightly sinuous bar from eye to eye across anterior frons and genae adjacent to postclypeus bright light blue.

Thorax – Pronotum black, median lobe slightly raised into a well-rounded bump each side; propleura bright light blue. Synthoracic pleura largely black with bright to paler blue patches as illustrated (Photo 10, Fig. 27): mesepisternal patch bright blue, suboval with inner margin approximately parallel to median carina, slightly longer than $\frac{1}{3}$ of anepisternum; mesepimeral/metepisternal patch bright light blue, roughly parallel sided, covering full length of metepisternum; metepimeral patch lighter blue, as long as metepimeron; posteroventral corner of katapisterna blue, more extensive in metakatepisternum; narrow ventral section of metakatepimeron dirty blue. Poststernum very pale blue. Coxae and trochanters pale blue, meso- and metacoxa anteriorly with small dark basal patch; femora with upper face and apical section black, otherwise brownish to greyish yellow; tibiae with inner face and apically black, otherwise largely greyish to brownish yellow;

tarsi black; claws brown; overall the forelegs are darkest, the hind legs palest.

Wings – Venation black; membrane hyaline; pterostigma brownish- to blackish grey, slightly widening distally, approximately twice as long as wide and overlying 1 cell; 14–15/12 postnodals; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin between $\frac{1}{2}$ and $\frac{4}{5}$ length of first cell following discoidal cell.

Abdomen – Tergum 1 dorsally black, laterally dirty bluish white with small black patch; tergum 2 black with pale brownish to yellowish blue latero-ventral patch; terga 3–9 black with ventral margin narrowly pale, only tergum 3 with indication of small pale basal spot each side; S10 black. Sterna pale to blackish brown. Superior anal appendages pale blue, with large rather pointed apically blackened tooth, inferiors pale brownish to bluish grey.

Measurements [mm] – Hind wing 17.4; abdomen (including appendages) 30.2.

Female

Details not available but see individual illustrated in Photo 11.

Habitat

The holotype and figured female were found in severely disturbed lowland forest near a small, clear stream at Pelipowai on the south-central coast of Manus Island. Both individuals were perched on low vegetation in full sunlight.

Differential diagnosis

The male of *N. manuscola* sp. nov. (Fig. 27) is very similar to *N. marina* (Ris, 1913) (Fig. 45). It can be distinguished from that species by having a transverse cross-vein descending from the distal margin of the discoidal cell to the wing margin and the blue appendages, versus no such cross-vein and pale yellow anal appendages.

***Nososticta nigrifrons* (Ris, 1913)**

(Photo 13, Figs 28–29, 75)

Material studied

Papua New Guinea: 1♂ (SAMA 07-001368), Survey Site 2, Upper Sepik Basin (04°39.181'S, 141°55.374'E, 80 m a.s.l.), 25-ii-2010; 1♂ (SAMA 07-001369), Survey Site 2, 26-ii-2010; 1♂ (SAMA 07-001370), Survey Site 2 (in cop.), 27-ii-2010; 1♀, (SAMA 07-001371), Survey Site 2 (in cop.), 27-ii-2010; 1♂, (SAMA 07-001372), Survey Site 6 (04°42.068'S, 141°50.524'E, 125 m a.s.l.) 13-iii-2011; 1♂ (SAMA 07-001373), Survey Site 5, Upper Sepik Basin, (04°31.589'S, 142°08.076'E, 65 m a.s.l.), 24-ii-2011; 1♂, (SAMA 07-001374), River Sapoi 4.6 km S Ivimka Camp (07°44.083'S, 146°29.75'E, ~120 m a.s.l.), 17-xi-1996; all S.J. Richards leg.

Comments – The material reported here is homogeneous, and consistent with the original description of the synthorax of *N. nigrifrons* (Ris, 1913). However the anal appendages of the type of *N. nigrifrons* are missing and the anal appendages of our material agree very well with *N. lorentzi* Lieftinck, 1938. The synthorax pattern illustrated for this species by LIEFTINCK (1938), particularly the pattern of mesepimeron and metepisternum, appears very strange, and is not typical of *Nososticta* species. We conclude that the male of *N. lorentzi* is an atypical individual of *N. nigrifrons* and *N. lorentzi* Lieftinck, 1938 is considered a synonym of *N. nigrifrons* (Ris, 1913) (syn. nov.).

***Nososticta parafonticola* sp. nov.**

(Photo 15, Figs 42, 61)

Material studied

Holotype ♂. Papua New Guinea, unnamed limestone ridge in Upper Sepik Basin (04°38.637'S, 141°40.747'E, 950 m a.s.l.), 10–11-xii-2009, S.J. Richards leg. (SAMA 07-001375).

Paratypes (all from Papua New Guinea). 7♂ (SAMA 07-001376–82), same data as holotype; 1♂ (SAMA 07-001383), Survey Site 1, Sepik Basin (04°39.185'S, 141°43.448'E, 850 m a.s.l.), 06–08-xii-2009; 2♂ (SAMA 07-001384–85), Survey Site 1, 07-vi-2010; 1♂, 1♀ (SAMA 07-001386–87), Survey Site 1, 30-xi-2009; 1♂ (SAMA 07-001388), Survey Site 1, sun patch below first creek down from camp, 30-xi-2009; 1♂ (SAMA 07-001389), Survey



Photos 12–15. *Nososticta* spp., males, in life: 12 – *N. melanoxantha*, Sepik Basin, Papua New Guinea. Photo: SJR (29-ix-2010); 13 – *N. nigrifrons*, Sepik Basin, Papua New Guinea. Photo: SJR (26-ii-2010); 14 – *N. nigrofasciata*, Sepik Basin, Papua New Guinea. Photo: SJR (25-ii-2011); 15 – *N. parafonticola* sp. nov., Sepik Basin, Papua New Guinea. Photo: SJR (02-ii-2010).

Site 1, 01-xii-2009; 1♀ (SAMA 07-001390), trail above Survey Site 1, 04-xii-2009; 1♂ (SAMA 07-001391), Survey Site 3, Sepik Basin (04°42.859'S, 141°55.517'E, 135 m a.s.l.), 28-v-2010; 1♂ (SAMA 07-001392), Survey Site 4, Sepik Basin (04°38.841'S, 141°47.876'E, 290 m a.s.l.), 04-ii-2010; 1♂ (SAMA 07-001393), Survey Site 4, 05-ii-2010; 1♂ (SAMA 07-001394), Survey Site 4, 02-ii-2010; 1♂ (SAMA 07-001395), Survey Site 4, 13-ii-2010; 1♂ (SAMA 07-001396), Survey Site 2, Upper Sepik Basin (04°39.181'S, 141°55.374'E, 80 m a.s.l.), 25-ii-2010; all S.J. Richards leg.

Etymology

The specific name refers to the similarity of this species to *Nososticta fonticola* (Lieftinck, 1932).

Male

Head – Largely black; only base of labium and a rather wide bar from eye to eye across anterior frons and genae adjacent to clypeus largely pale greyish yellow to pale blue, with a transverse line, medially somewhat widened, between anterior frons and clypeus and anterolateral corners of clypeus remaining black, or even the postclypeus black with only a blue spot each side.

Thorax – Prothorax largely black with only epimeron pale brownish yellow; a spiny nipple each side on top of median lobe. Synthoracic pleura largely black with markedly paler stripe posterior to metapleural suture and even paler metakatepisternum, and with distinctly pale patches as illustrated (Fig. 42): mesepisternal patch greyish green to greenish blue; mesepimeral patch bluish grey; metepimeral patch pale greyish white. Poststernum very pale greyish-brown. Legs black, only coxae, trochanters and extreme base of metafemur greyish brown.

Wings – Venation black; membrane hyaline; pterostigma slightly expanded toward midlength and distal, particularly in forewing, approximately 1.6 times as long as wide, overlying 1 to almost 2 cells; 13–17/12–15 postnodals; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin well to slightly before ½ length of first cell following discoidal cell.

Abdomen – Tergum 1 dorsally black, laterally greyish yellow with brown spot; tergum 2 black with orange/brown lateral patch; terga 2–7 black, merging into brown and paler along ventral margin; terga 8 and 9 largely brownish orange, basally, ventro-laterally and apically merging into black; S10 dorsally brownish orange, merging into black laterally/ventrally. Sterna largely black. Anal appendages brownish orange, the superiors trifold with long apical lobe, perpendicular conical dorsal branch and smaller blunt basal inner branch, the inferiors without marked gap between base and long flat subtriangular apical lobe.

Measurements [mm] – Hind wing 17.3–19.8; abdomen (including appendages) 28.9–33.0.

Female

Head – Much as in male; pale bar across face reduced to pale greyish to yellowish brown triangular patch each side between base of postclypeus and eye margin, adjacent to these spots across anterior frons broadly but ill-defined grey to blackish grey and largely markedly paler than remainder of head.

Thorax – Prothorax dorsally largely black, laterally dirty bluish grey, with median lobe conical in lateral view (Fig. 61). Synthorax much as in male; mesepisternal patch at least 80% length of this pleuron; pale metepisternal patch bluish grey, metepimeral patch pale greyish blue, dark stripe in between (on and along metapleural suture) and on metapostepimeron paler and less clearly defined. Poststernum paler, largely almost bluish. Legs and wings much as in male; 15/13–14 postnodals.

Abdomen – Much as in male; lateral brown spot on tergum 1 hardly apparent; tergum 2 black with only smudge of greyish along ventral margin; terga 3–9 largely black, only distal edge of terga 8 and 9 brownish grey; S10 black. Sternum 1 pale greyish brown; other sterne largely black. Ovipositor pale reddish brown; valvae black, with at least apical $\frac{2}{5}$ ventrally finely serrate, reaching well beyond apex of brownish grey to black anal appendages.

Measurements [mm] – Hind wing 20.0–20.6; abdomen 29.0–30.1.



Photos 16–18. *Nososticta* spp., males, in life: 16 – *N. rosea cruentata*, Sepik Basin, Papua New Guinea. Photo: SJR (25-ii-2011); 17 – *N. kaizei* sp. nov., Yapen Island, Indonesia. Photo: V.J. Kalkman (vii-2006); 18 – *Nososticta rufipes*, male and female specimen (paratypes) collected by M.A. Lieftinck 1948 on Misool Island, Indonesia (RMNH). Taken from THEISCHINGER & KALKMAN (2014), photo: V.J. Kalkman.

Habitat

This species was extremely common throughout the Upper Sepik Basin, where it occurred in low vegetation along small clear streams at elevations ranging from at least 200–850 m a.s.l.

Differential diagnosis

Nososticta parafonticola sp. nov. is most similar to, and probably most closely related to *N. fonticola*. The male of *N. parafonticola* sp. nov. (Fig. 42) has the outer and inner lobe of the inferior anal appendages less strongly separated from each other than in *N. fonticola* (Fig. 39). In the female of *N. parafonticola* sp. nov. (Fig. 61) the lobes of the pronotum are subequal in height, while in the female of *N. fonticola* (Fig. 62) the anterior lobe is much higher than the other lobes.

***Nososticta rosea cruentata* (Lieftinck, 1932)**

(Photo 16, Figs 16–17, 72)

Material studied

All Papua New Guinea: 3♂ (SAMA 07-001397–99), Survey Site 5, Upper Sepik Basin (04°31.589'S, 142°08.076'E, 65 m a.s.l.), 25-ii-2011; 1♂ (SAMA 07-001400), Survey Site 2, Upper Sepik Basin (04°39.181'S, 141°55.374'E, 80 m a.s.l.), 25-ii-2010; 2♂ (SAMA 07-001401–02), Survey Site 2, 27-ii-2010; 1♂ (SAMA 07-001403), Survey Site 6, Sepik Basin (04°42.068'S, 141°50.524'E, 125 m a.s.l.), 11-iii-2011; all S.J. Richards leg.

Comments – In contrast to the original description and illustration of LIEFTINCK (1932) all males of this species studied by us have a moderately large to large orange mesepimeral patch. LIEFTINCK (1932) described *Notoneura cruentata* and distinguished it from *Caconeura rosea* Ris, 1913 mainly by its longer ante-humeral patches and more obtuse wings. In his illustration of the synthorax (Fig. 16) there is no sign of a pale/bright mesepimeral patch. LIEFTINCK (1937) subsequently illustrated the female (Fig. 72) and listed numerous male and female specimens. He concluded that *cruentata* is a subspecies of *N. rosea* (= *N. rosea cruentata*) but did not mention deviations of his new material from the type. Our material is therefore quite different from *N. rosea cruentata* as described but an examination of LIEFTINCK's (1937) material

showed that it included specimens without a mesepimeral patch and some with a mesepimeral patch of variable size, up to the size illustrated here in Photo 16. Furthermore, there is some variability in the shape of the wing apex (number of the post-pterostigma cross-veins between C and R). We conclude that *N. rosea cruentata* is very variable in these characters, that the above material belongs there, and that its status as a subspecies of *N. rosea* is appropriate.

***Nososticta tricolorata* sp. nov.**

(Fig. 37)

Material studied

Holotype ♂. Papua New Guinea, large stream below Survey Site 1, upper Sepik Basin (04°39.185'S, 141°43.448'E, 850 m a.s.l.), 01-xii-2009, S.J. Richards leg. (SAMA 07-001404).

Etymology

The specific name, a composite of two Latin words, *tri-* (from *tres*, *tria*, *trium* for three) and *coloratus*, *-a*, *-um* (perfect participle of *coloro*, *-are*, to colour), refers to the colouration of the species. The three very distinct colours present are black, blue and orange.

Male

Head – Largely black; only base of labium brown and a narrow, slightly sinuous bar from eye to eye across anterior frons and genae adjacent to postclypeus pale blue.

Thorax – Prothorax completely black. Synthoracic pleura black with pale patches as illustrated (Fig. 37): mesepisternal patch pale blue; metepisternal stripe pale bluish in dorsal half merging into brownish orange in ventral half; base and posterior patch of metepimeron brownish adjacent to black areas, gradually merging into yellowish white. Poststernum pale yellow. Legs black, only inner face of metacoxa, base of meso- and metatrochanter and extreme base of metafemur paler; a well-developed inferior tooth on all claws.

Wings – Venation black; membrane hyaline; pterostigma slightly widening distally, about 1.5 times as long as wide, overlying up to 1 ½ cells; 19/16

postnodals; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin between $\frac{2}{3}$ and full length of first cell following discoidal cell.

Abdomen – Tergum 1 dorsally black, laterally yellowish with brown spot; terga 2–6 black, merging into brown and paler along ventral margin; terga 7–9 and S10 brownish orange. Sterna largely black. Anal appendages brownish orange, the superiors slightly bilobed, bearing a small pointed tooth, and slightly lighter than the inferiors.

Measurements [mm] – Hind wing 24.0, abdomen (including appendages) 38.0.

Female

Unknown.

Habitat

The sole known specimen of this species was perched high above a steep waterfall in the upper Sepik Basin. Given the extent of suitable habitat in the region this species may have a wide distribution in northern New Guinea.

Differential diagnosis

In having S7–10 and anal appendages dark orange the male of *N. tricolorata* sp. nov. (Fig. 37) is very similar to *N. e. erythrura* (Liefstinck, 1932) (Fig. 46). It can be distinguished from this species by the plump bilobed superior anal appendages and by having a well-developed inferior tooth on all tarsal claws versus simple superior anal appendages and absence of an inferior tooth on the claws in *N. e. erythrura*.

***Nososticta truncata* sp. nov.**

(Fig. 32)

Material studied

Holotype ♂. Papua New Guinea, Ivimka camp, Lakekamu (approximately 146°29'S, 07°44'E, top of hill; 180 m a.s.l.), 15-xi-1996, S.J. Richards leg. (SAMA 07-001405).

Etymology

The specific name refers to the shape of the superior anal appendages of the male. *Truncatus*, *-a*, *-um* is the perfect participle of the Latin verb *trunco*, *-are* (to lop off).

Male

Head – Largely black; only base of labium whitish yellow and brown, apices of mandibles and a small oval patch adjacent to each lateral ocellus in direction antennal base reddish brown, and a medially interrupted bright azure blue bar, rather wide laterally, from eye to eye across anterior frons and genae adjacent to postclypeus.

Thorax – Prothorax almost completely black, only two whitish blue spots on epimeron. Synthoracic pleura largely black with pale pattern as illustrated (Fig. 32); episternal and epimeral patches bright cerulean blue; poststernum bluish white with greyish black patches. Legs largely black, only coxae with pale blue posterolateral patch, trochanters with anterior face brownish to whitish yellow and extreme base of femora partly yellowish brown, palest in metafemur.

Wings – Venation black; membrane hyaline, pterostigma black, slightly widening distally, approximately twice as long as wide, overlying close to 1½ cells; 16–17/14–15 postnodals; Ac situated very close to level of Ax1; a transverse cross-vein descending from distal margin of discoidal cell to wing margin; CuP reaching wing margin between slightly less to slightly more than ½ length of first cell following discoidal cell.

Abdomen – Tergum 1 largely greyish black, with narrow almond-shaped subapical blue patch each side; tergum 2 shiny black with small pale patch along ventral margin for about the third quarter of its length; terga 3–7 black with small blue semi-circular to roughly pentagonal antero-dorsal patch decreasing in size from anterior to posterior segments, and with ventral margin narrowly pale; tergum 8 largely black, widely blue along ventral margin; tergum 9 and S10 black. Sterna largely black. Superior anal appendages in lateral view very deep, truncate to slightly swallow-tailed, largely blue, black

in apical ventral corner; with small inner tooth; inferior appendages brownish grey to black.

Measurements [mm] – Hind wing 18.5, abdomen (including appendages) 32.0.

Female

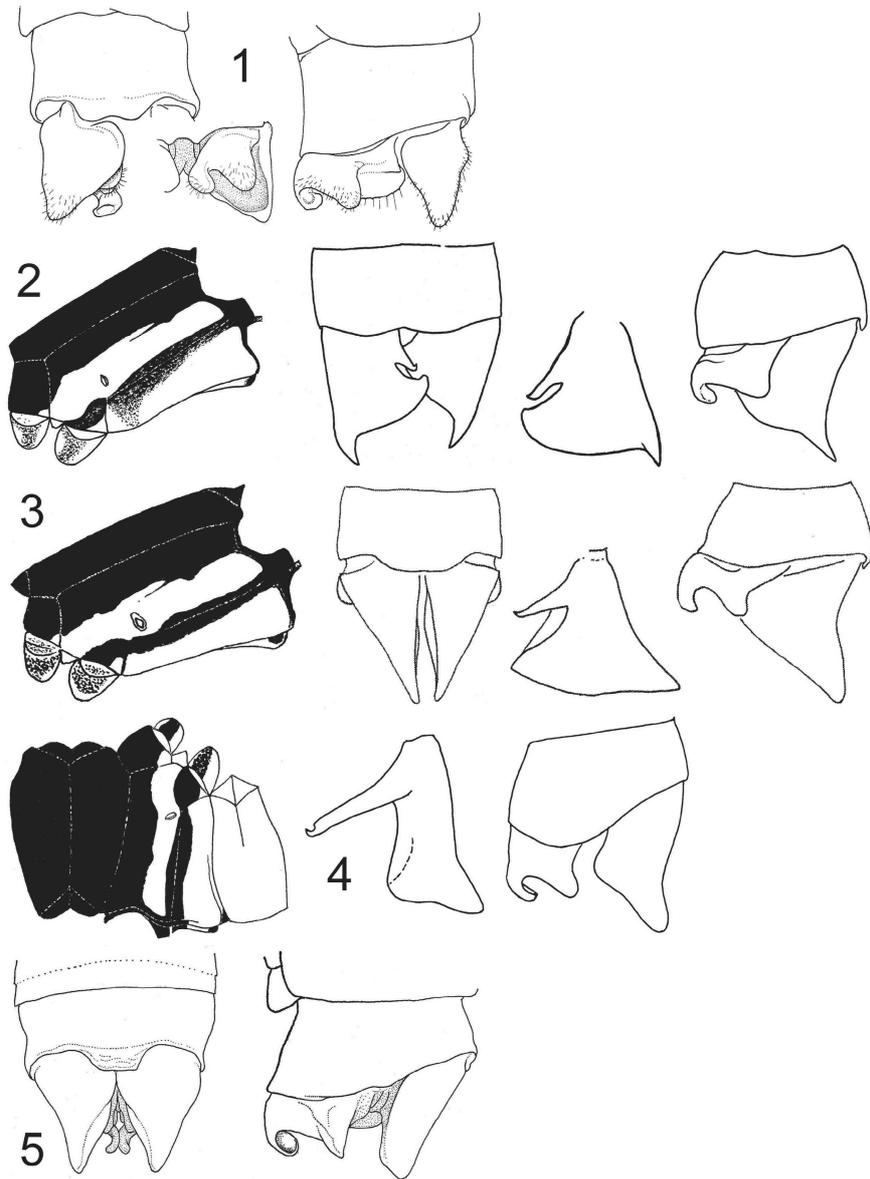
Unknown.

Habitat

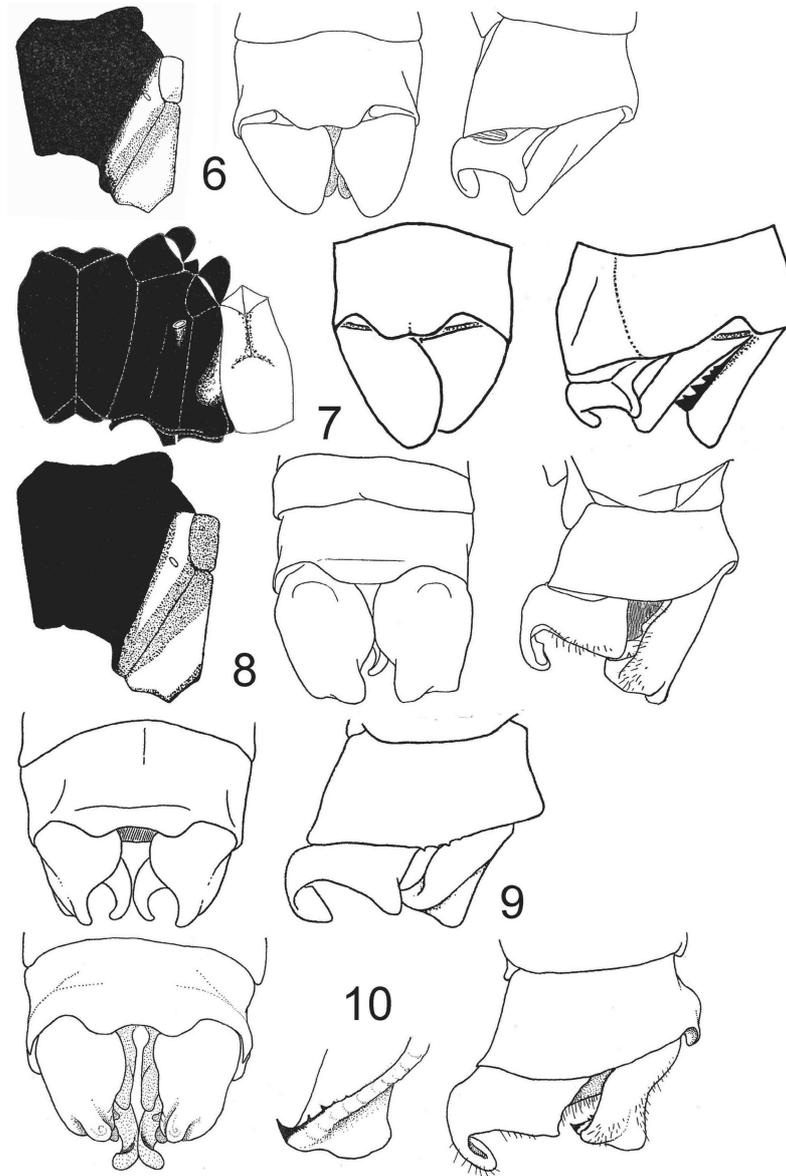
The only known specimen of this species was collected in forest along a trail on the ridge top of a small hill above the Sapoi River.

Differential diagnosis

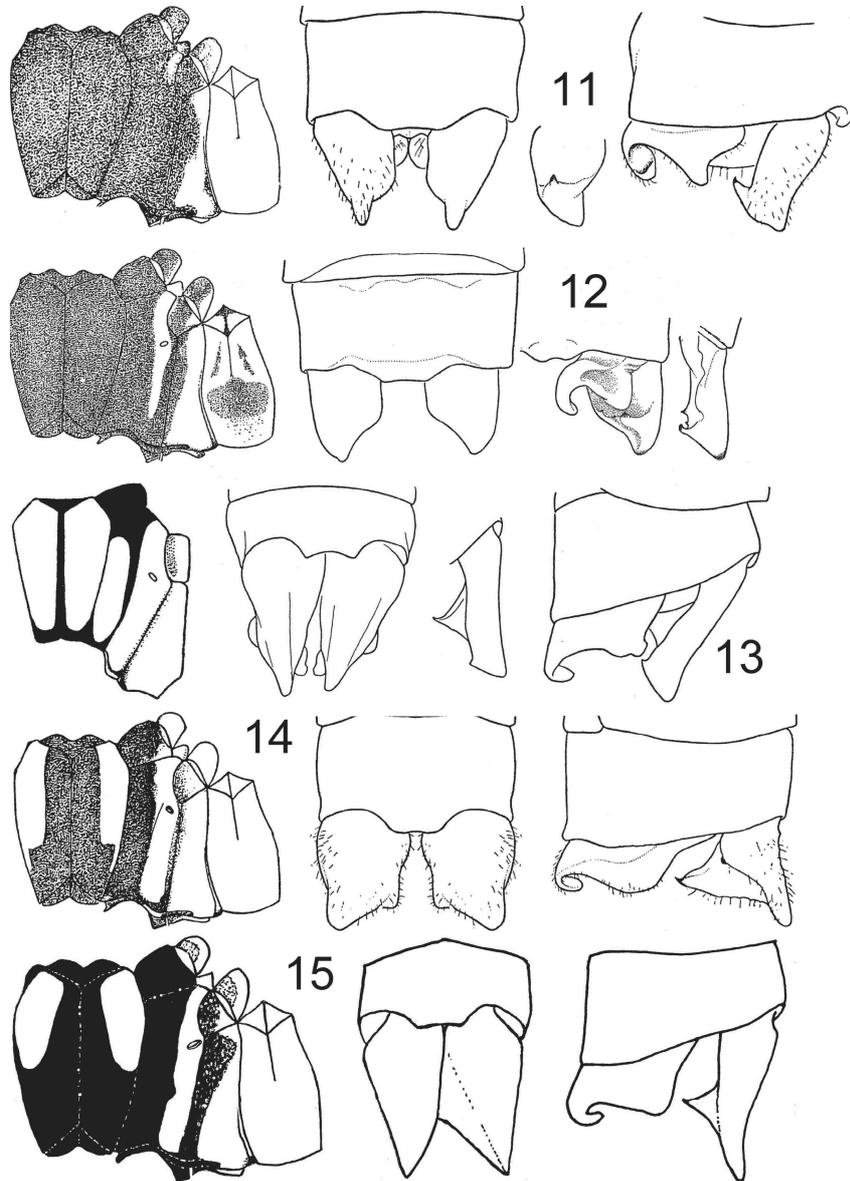
With the mesepimeral blue patch smaller than the ante-humeral patches the male of *N. truncata* sp. nov. (Fig. 32) appears similar only to *N. azurosignata* sp. nov. (Fig. 31). The ante-humeral patches are distinctly wider in *N. truncata* than in *N. azurosignata*, and the superior anal appendages are conical with a large inner tooth in *N. azurosignata* but, truncate with a small inner tooth in *N. truncata*. Appendages similar to those of *N. truncata* seldom occur, being present in only one other Papuan species, *N. thalassina* (Lieftinck, 1949). However this species clearly differs from *N. truncata* on the basis of rather bluntly rounded (Fig. 32) instead of slender drop-shaped (Fig. 26) ante-humeral patches. There are two Australian species, *N. coelestina* (Tillyard, 1906) and *N. koolpinyah* Watson & Theischinger, 1984 with very different colour patterns from *N. truncata* but with similar male superior anal appendages (WATSON & THEISCHINGER 1984); moreover the posterior lobe of the female pronotum of these Australian species is very similar to *N. thalassina*. These similarities suggest a connection between the *Nososticta* faunas of Papua and Australia.



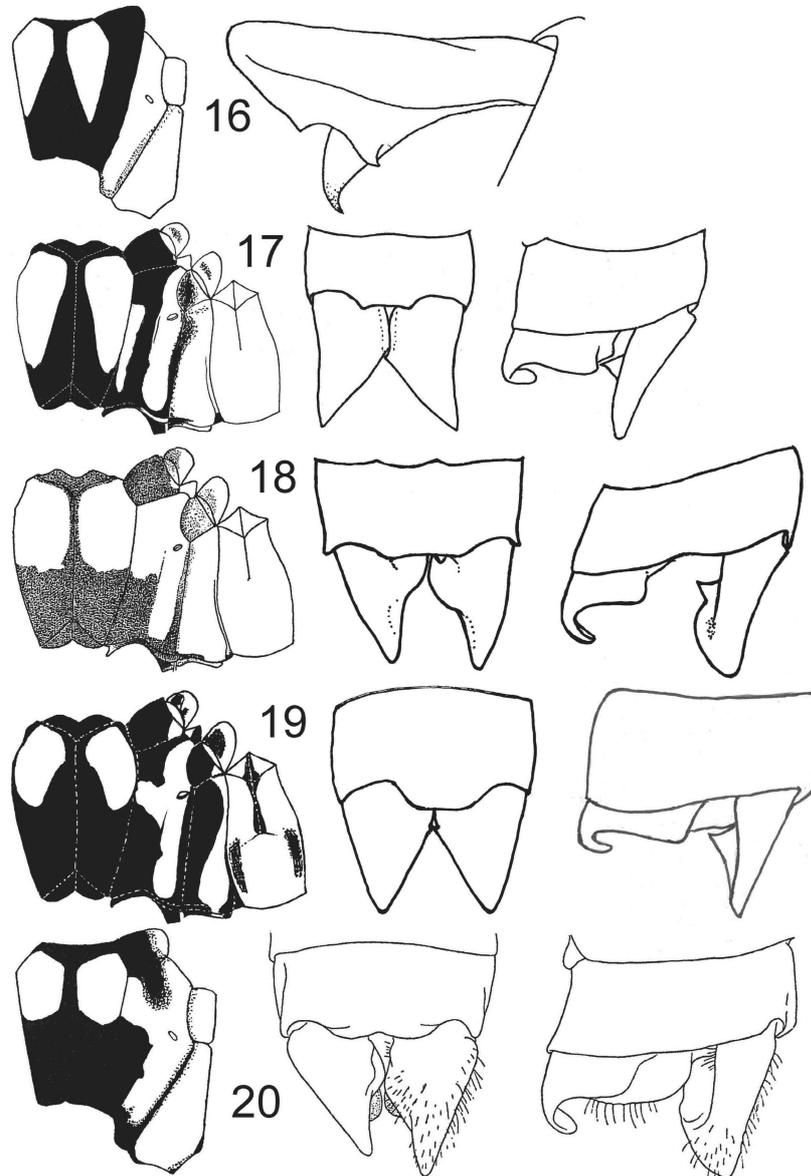
Figures 1–5. *Nososticta* species, males: 1 – *N. atrocyana*: AAd, AAv, AAI; 2 – *N. acuminata*: Sl, AAd, ASI, AAI; 3 – *N. smilodon*: Sl, AAd, ASI, AAI; 4 – *N. longicauda* sp. nov.: Sflv, ASI, AAI; 5 – *N. evelynae*: AAd, AAI.



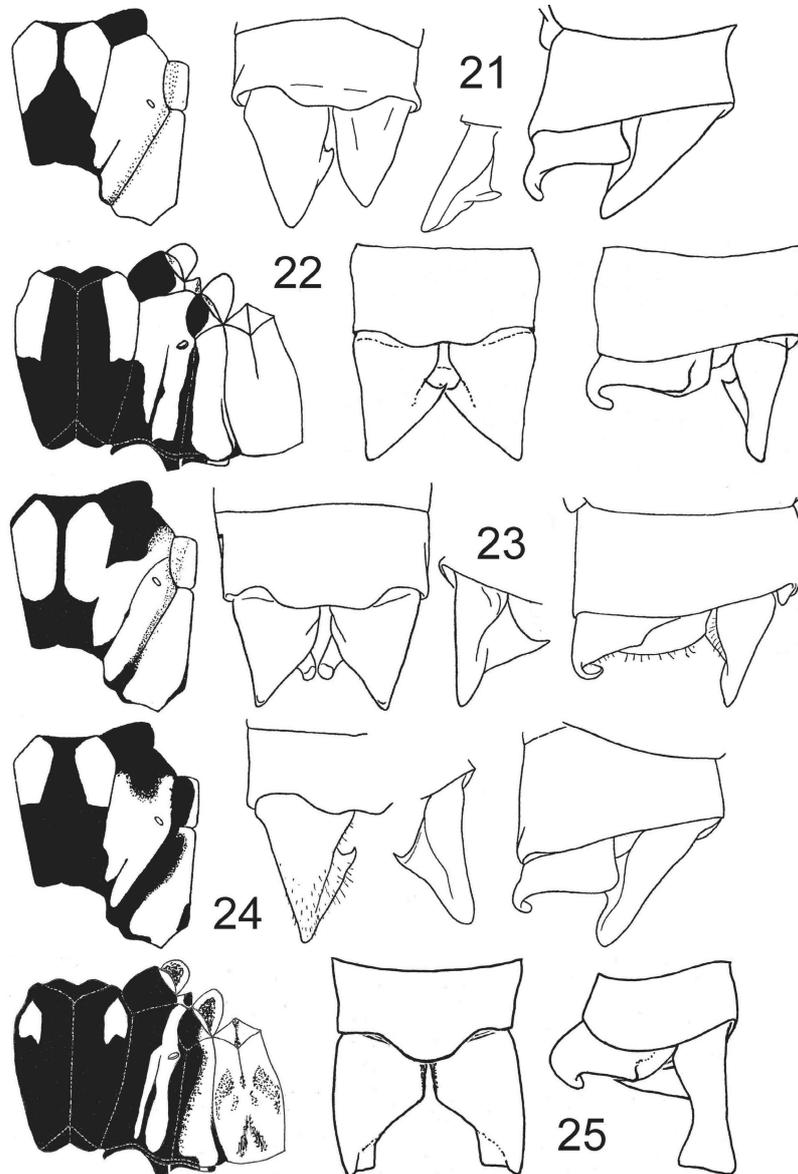
Figures 6–10. *Nososticta* species, males: 6 – *N. chalybeostoma*: Sfl, AAd, AAI; 7 – *N. chalybeostoma* from PNG, Survey Site 10, Sepik Basin: Sflv, AAd, AAI; 8 – *N. cyanura*: Sfl, AAd, AAI; 9 – *N. wallacei*: AAd, AAI; 10 – *N. pyroprocta*: AAd, ASI, AAI.



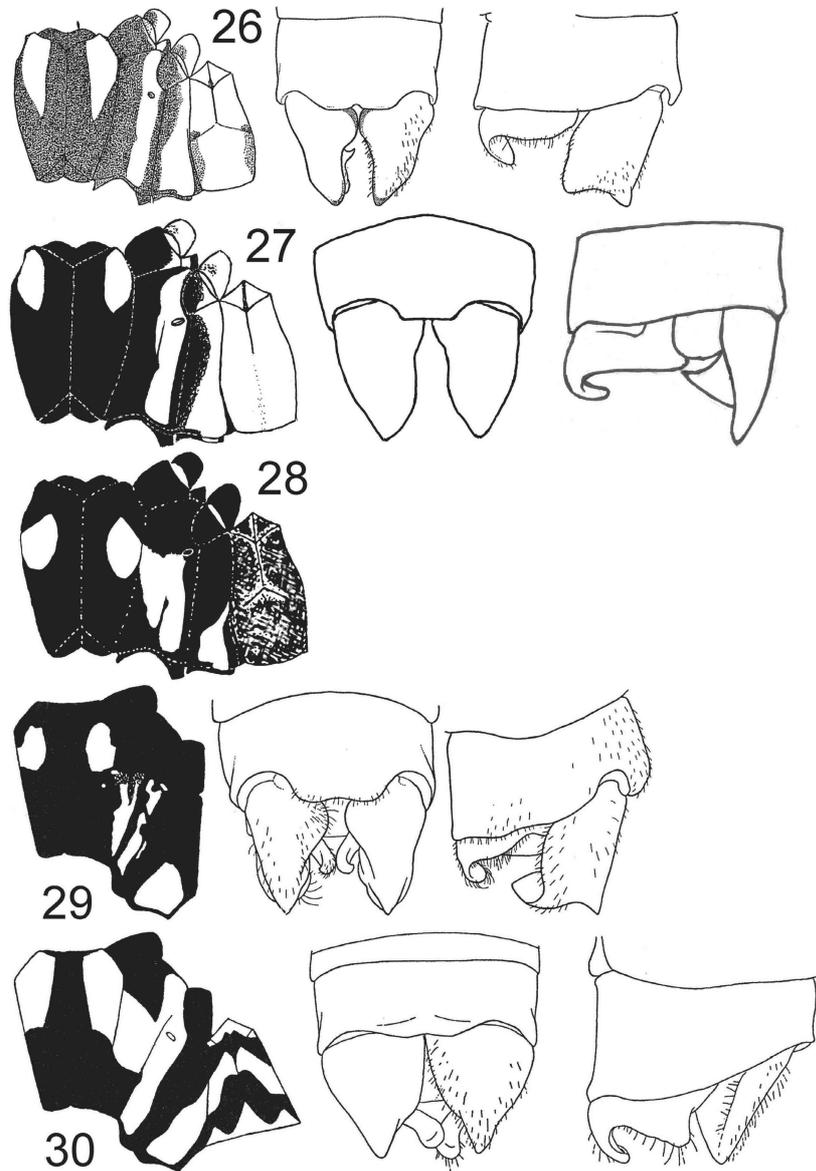
Figures 11–15. *Nososticta* species, males: 11 – *N. beatrix*: Sflv, AAd, ASv, AAl; 12 – *N. irene*: Sflv, AAd, AAv, ASl; 13 – *N. xanthe*: Sfl, AAd, ASl, AAl; 14 – *N. rangifera*: Sflv, AAd, AAl; 15 – *N. rosea rosea*: Sflv, AAd, AAl.



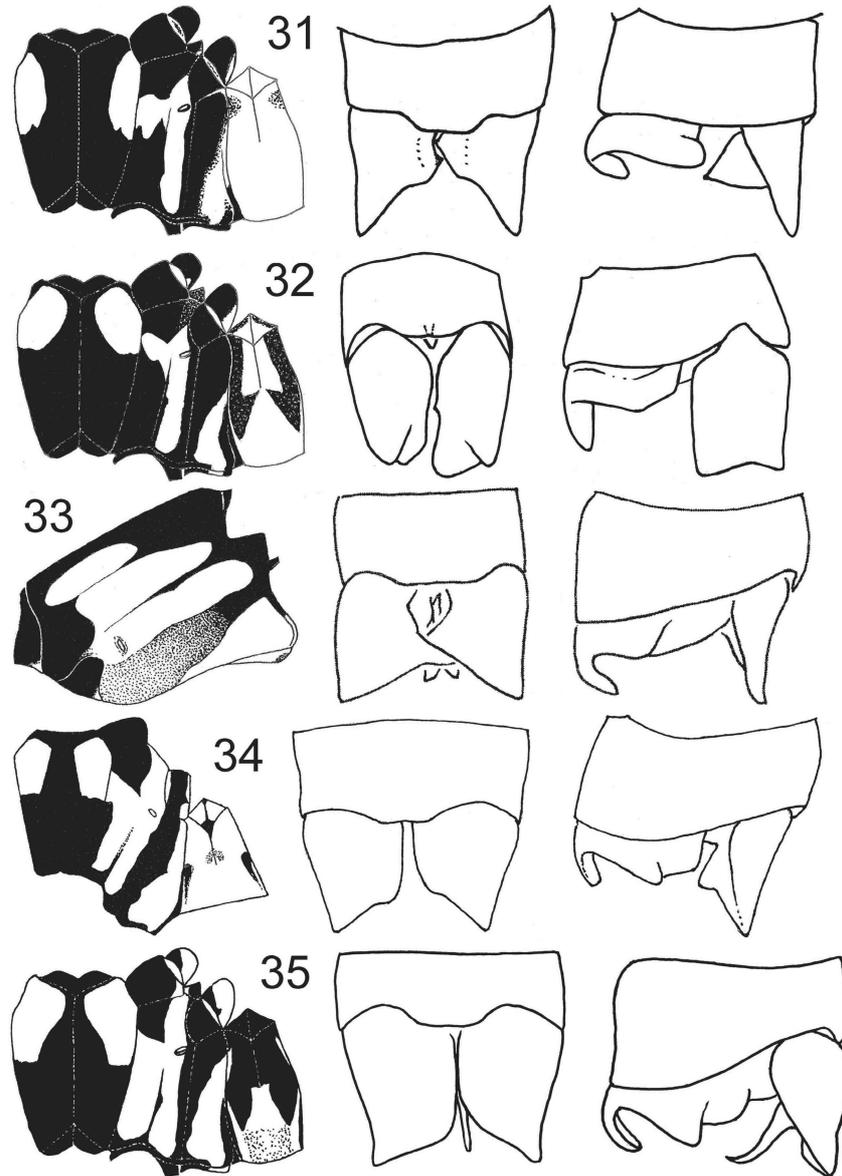
Figures 16–20. *Nososticta* species, males: 16 – *N. rosea cruentata*: Sfl, ASI; 17 – *N. rosea cruentata* from Papua New Guinea, Survey Site 2: Sflv, AAd, AAI; 18 – *N. melanoxantha*: Sflv, AAd, AAI; 19 – *N. hiroakii*: Sflv, AAd, AAI; 20 – *N. plagioxantha*: Sfl, AAd, AAI.



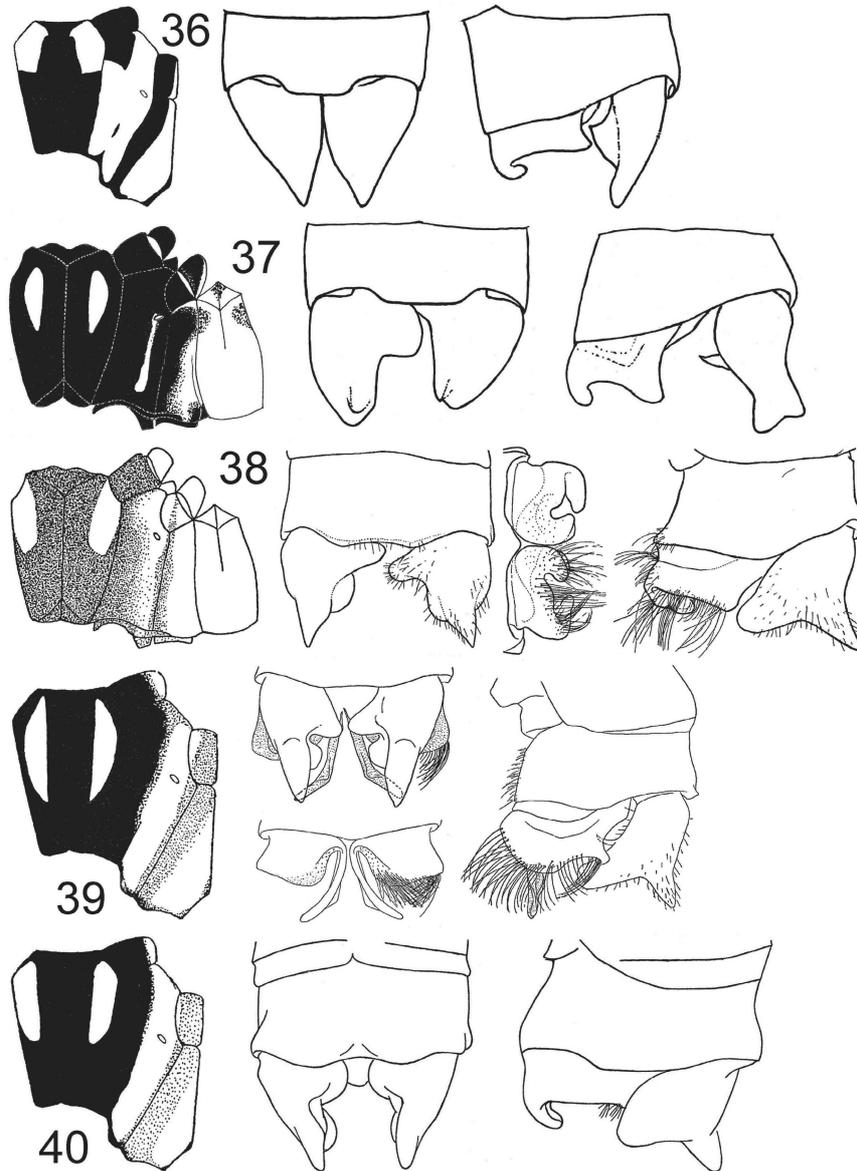
Figures 21–25. *Nososticta* species, males: 21 – *N. plagiata*: Sfl, AAd, ASI, AAI; 22 – *N. kaizei* sp. nov.: Sflv, AAd, AAI; 23 – *N. callisphaena*: Sfl, AAd, ASI, AAI; 24 – *N. aurantiaca*: Sfl, AAd, ASI, AAI; 25 – *N. caerulea* sp. nov.: Sflv, AAd, AAI.



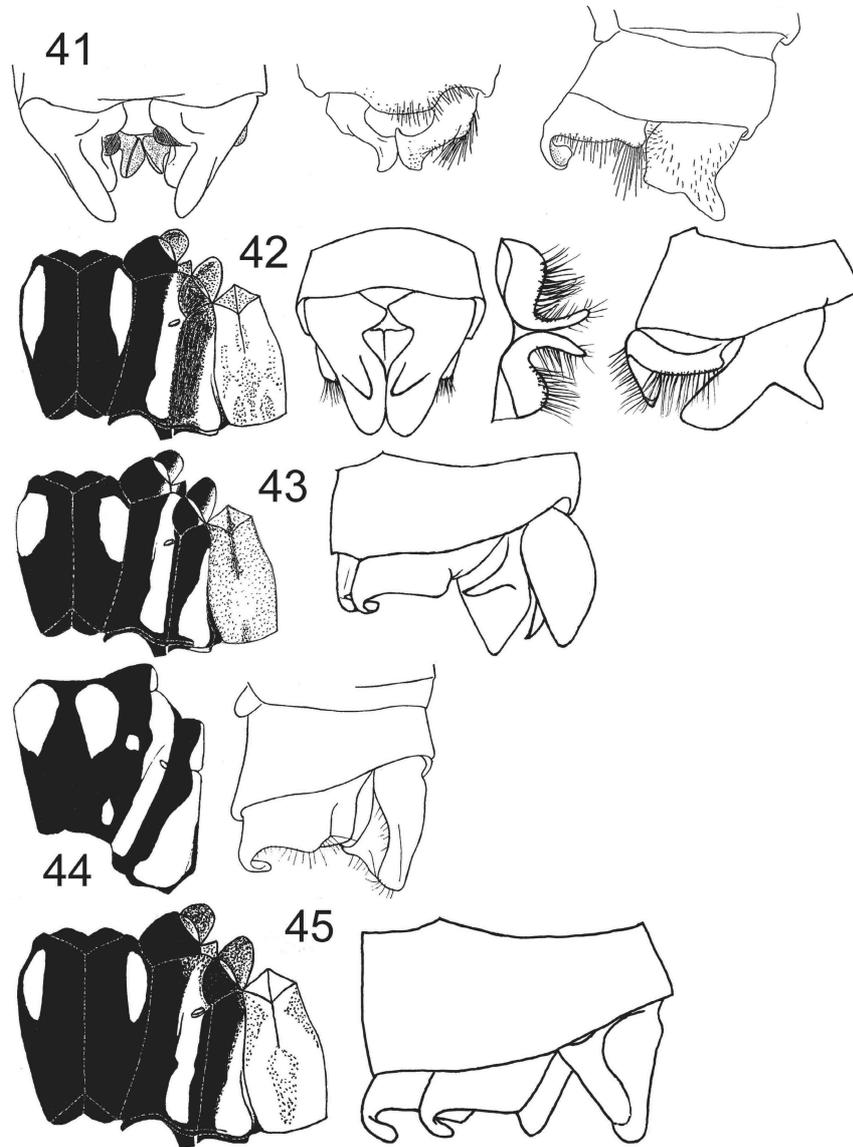
Figures 26–30. *Nososticta* species, males: 26 – *N. thalassina*: Sflv, AAd, AAI; 27 – *N. manuscola* sp. nov.: Sflv, AAd, AAI; 28 – *N. nigrifrons*: Sflv; 29 – *N. lorentzi* = *N. nigrifrons*: Sfl, AAd, AAI; 30 – *N. nigrofasciata*: Sflv, AAd, AAI.



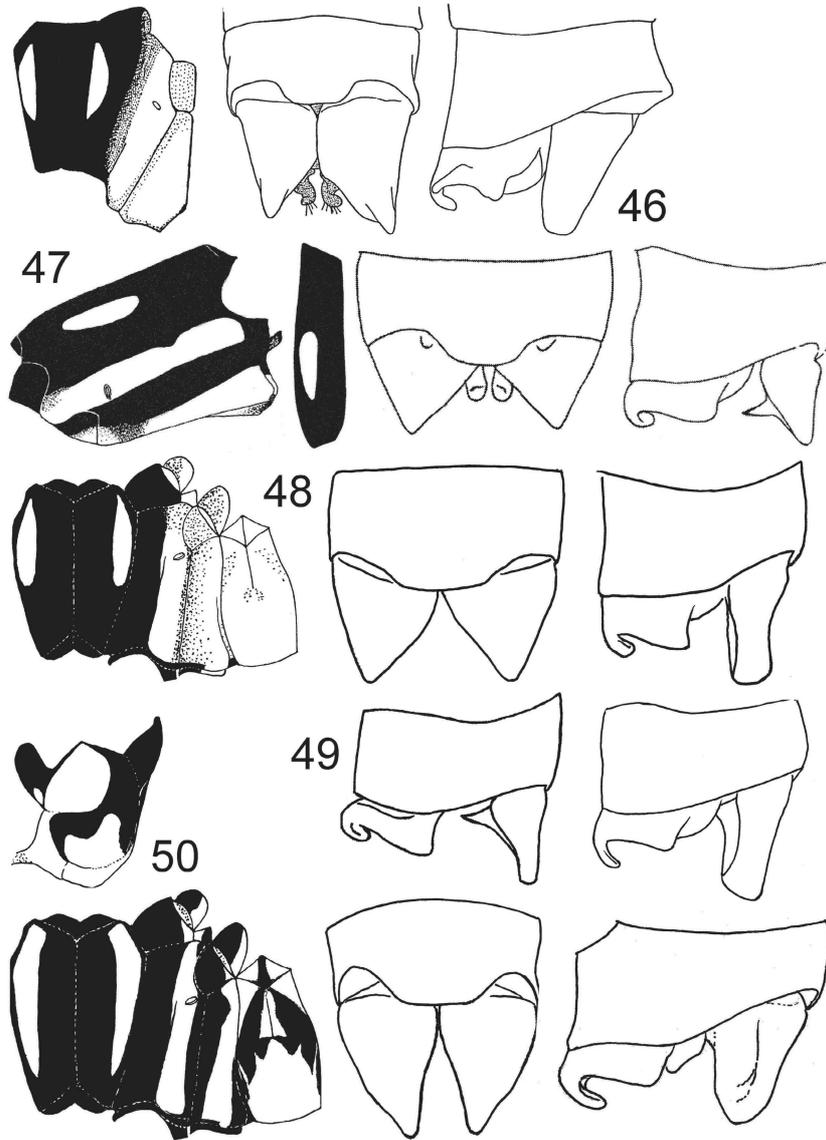
Figures 31–35. *Nososticta* species, males: 31 – *N. azurosignata* sp. nov.: Sflv, AAd, AAl; 32 – *N. truncata* sp. nov.: Sflv, AAd, AAl; 33 – *N. conifera*: Sl, AAd, AAl; 34 – *N. salomonis*: Sflv, AAd, AAl; 35 – *N. africana*: Sflv, AAd, AAl.



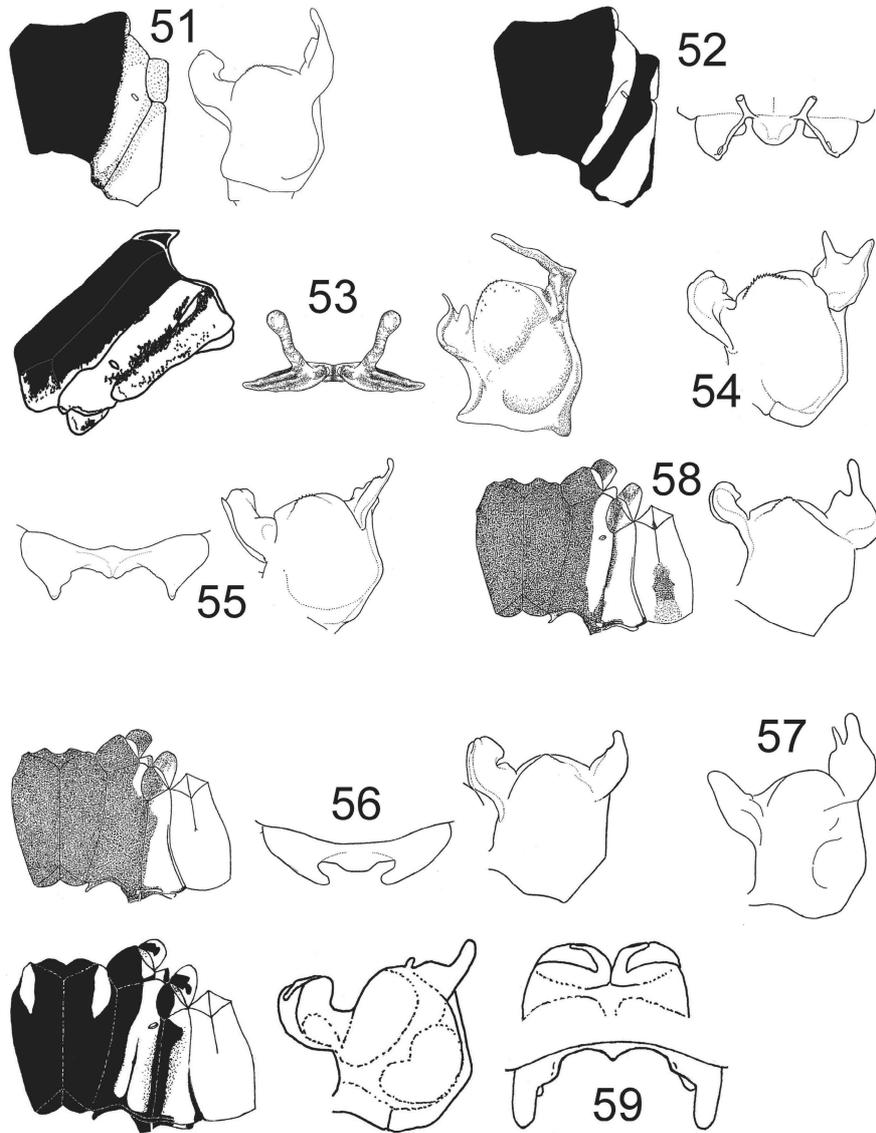
Figures 36–40. *Nososticta* species, males: 36 – *N. commutata*: Sfl, AAd, AAl; 37 – *N. tricolorata* sp. nov.: Sflv, AAd, AAl; 38 – *N. silvicola*: Sflv, AAd, Alv, AAl; 39 – *N. fonticola*: Sfl, AAd, Alv, AAl; 40 – *N. astrolabica* from LIEFTINCK (1932): Sfl, AAd, AAl.



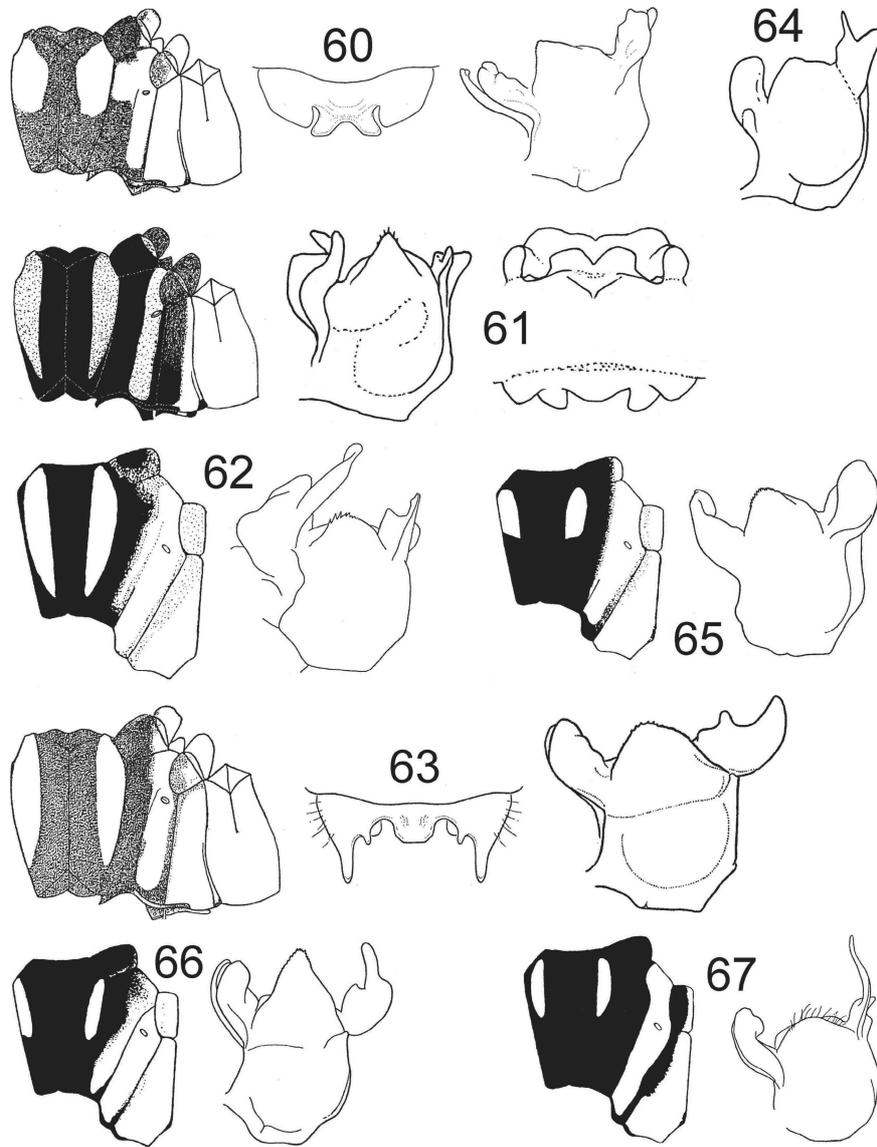
Figures 41–45. *Nososticta* species, males: 41 – *N. astrolabica* (Förster) from LIEFTINCK (1937): AAd, Alv, AAI; 42 – *N. parafonticola* sp. nov.: Sflv, AAd, Alv, AAI; 43 – *N. interrupta* sp. nov.: Sflv, AAI; 44 – *N. eburnea* (Förster): Sfl, AAI; 45 – *N. marina* (Ris): Sflv, AAI (strongly compressed and distorted).



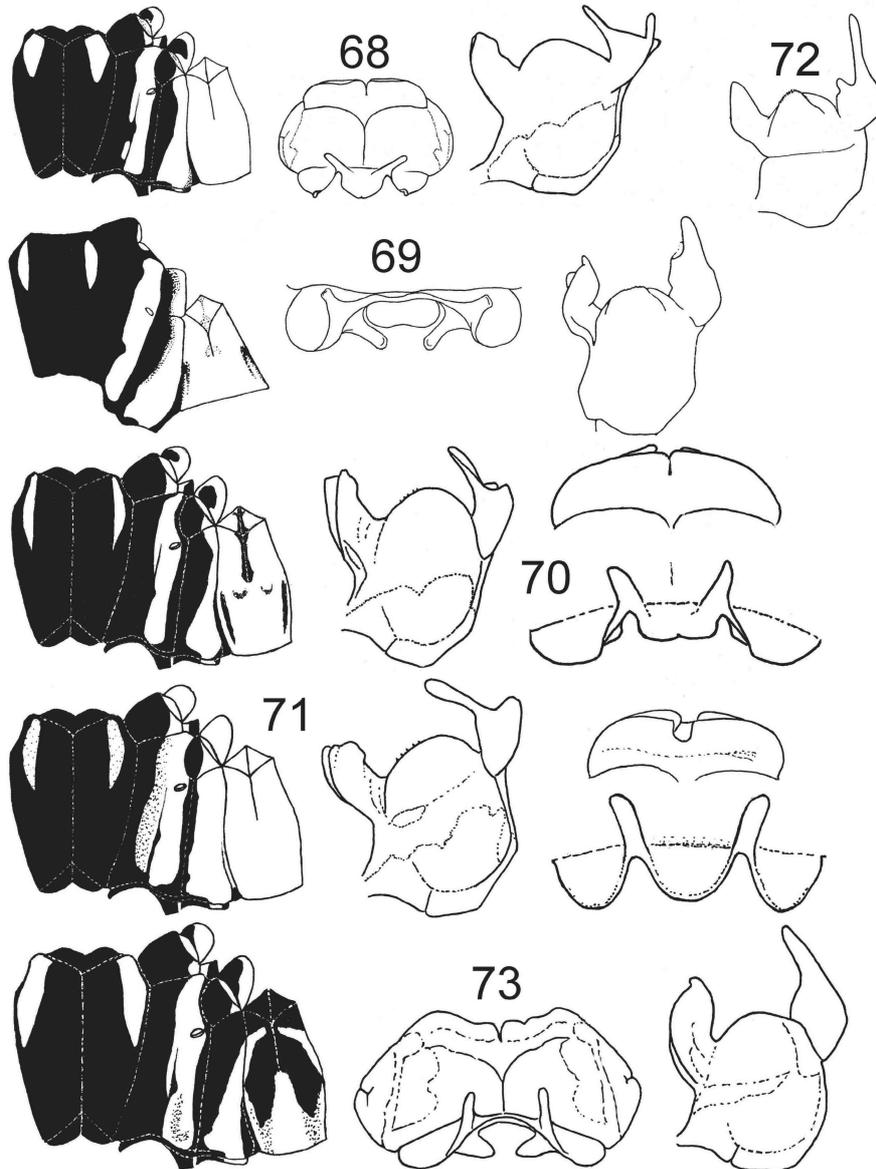
Figures 46–50. *Nososticta* species, males: 46 – *N. e. erythrura*: Sf, AAd, AAI; 47 – *N. acudens*: Sl, Sf, AAd, AAI; 48 – *N. f. finisterrae*: Sflv, AAd, AAI; 49 – *N. f. finisterrae*: AAI (from PNG, Gulf Province), AAI (from PNG, Eastern Highlands); 50 – *N. finisterrae satisbona* ssp. nov.: Pl, Sflv, AAd, AAI.



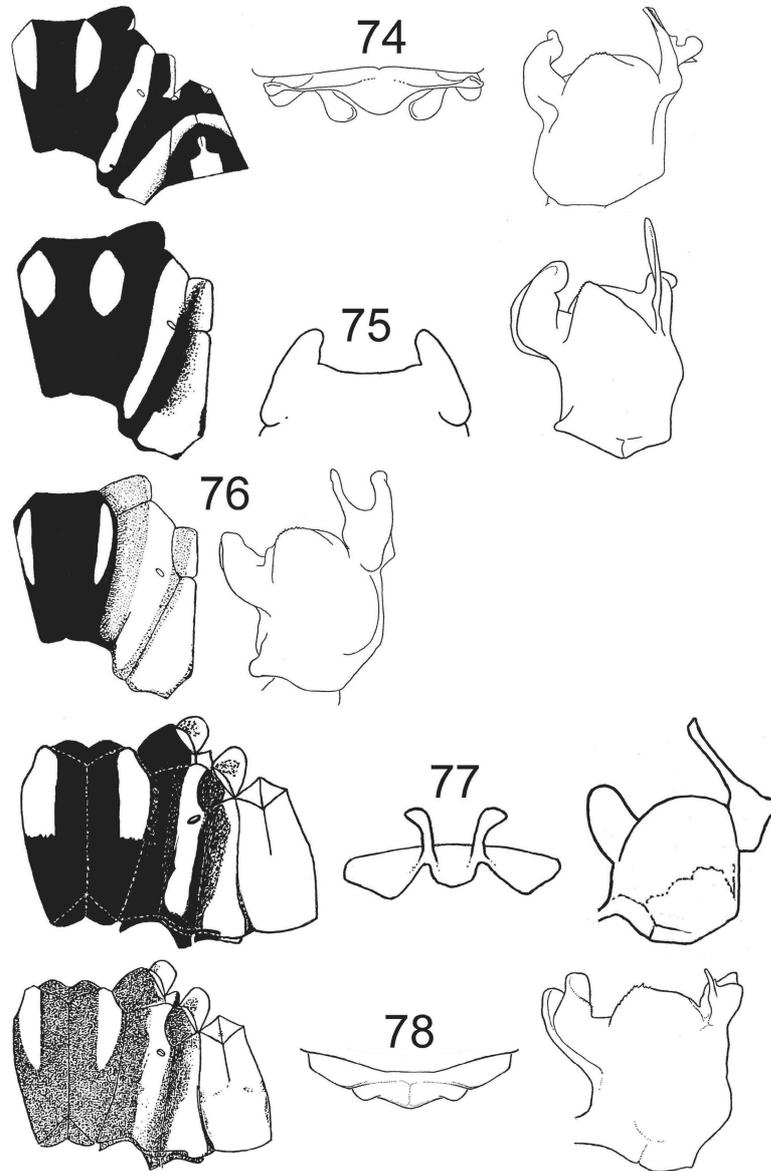
Figures 51–59. *Nososticta* species, females: 51 – *N. chalybeostoma*: Sfl, plPd; 52 – *N. eburnea*: Sfl, plPd; 53 – *N. acuminata*: Sfl, plPd, PI; 54 – *N. atrocyana*: PI; 55 – *N. pyroprocta*: plPd, PI; 56 – *N. beatrix*: Sflv, plPd, PI; 57 – *N. cyanura*: PI; 58 – *N. irene*: Sflv, PI, plPd; 59 – *N. caerulea* sp. nov.: Sflv, PI, alPd, plPd.



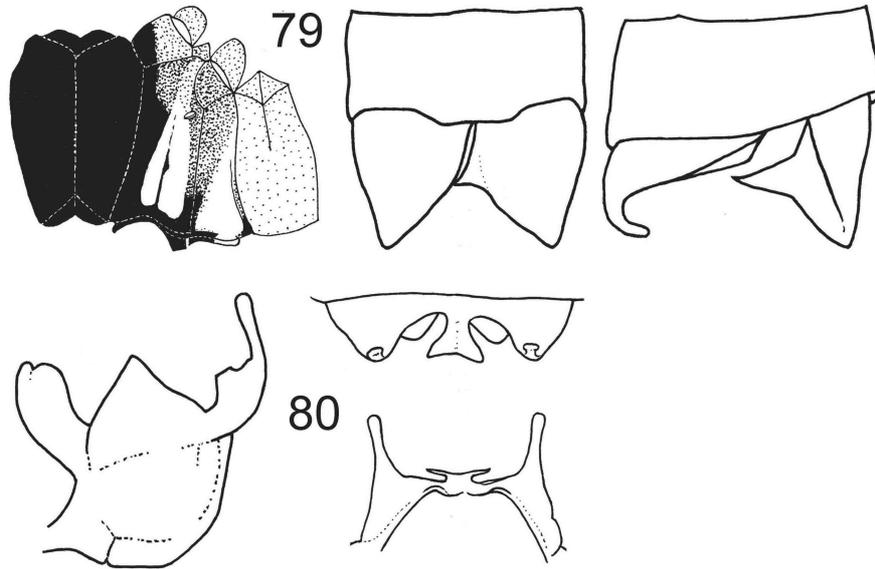
Figures 60–67. *Nososticta* species, females: 60 – *N. melanoxantha*: Sflv, plPd, P; 61 – *N. parafonticola* sp. nov.: Sflv, Pl, alPd, plPd; 62 – *N. fonticola*: Sfl, Pl; 63 – *N. rangifera*: Sflv, plPd, Pl; 64 – *N. finisterrae*: Pl; 65 – *N. plagioxantha*: Sfl, Pl; 66 – *N. callisphaena*: Sfl, Pl; 67 – *N. erythroprocta*: Sfl, Pl.



Figures 68–73. *Nososticta* species, females: 68 – *N. commutata*: Sflv, Pd, Pl; 69 – *N. salomonis*: Sflv, plPd, Pl; 70 – *N. hiroakii*: Sflv, Pl, alPd, plPd; 71 – *N. kaizei* sp. nov.: Sflv, Pl, alPd, plPd; 72 – *N. rosea cruentata*: Pl; 73 – *N. africana*: Sflv, Pd, Pl.



Figures 74–78. *Nososticta* species, females: 74 – *N. nigrofasciata*: Sflv, pPd, PI; 75 – *N. nigrifrons*: Sfl, pPd, PI; 76 – *N. erythrura*: Sfl, PI; 77 – *N. aurantiaca*: Sflv, pPd, PI; 78 – *N. thalassina*: Sflv, pPd, PI.



Figures 79, 80. *Nososticta rufipes*: 79 – male: Sflv, AAd, AAv; 80 – female: Pl, plPd, plPc.

Keys to the *Nososticta* species recorded from the Papuan region

Interpretations of species largely follow LIEFTINCK (1932, 1933, 1938, 1949, 1960).

For technical reasons the only red-legged species is keyed out first, but it could also be included in group A.

In the keys the abbreviations used for geographical regions are:

NNG northern New Guinea; mainland New Guinea north of the central cordillera

PNG Papua New Guinea

SNG southern New Guinea; mainland New Guinea south of the central cordillera

Keys to the males

- I – Species with legs orange/red (Photo 18; Fig. 79); Indonesia:
 Vogelkop Peninsula *N. rufipes*
- II – Species with legs largely black (Photos 1-10, 12-17; Figs 1-50):
- 1a – Front of synthorax completely black, without any pale ante-
 humeral patches **Group A**
- 1b – Front of synthorax with pale/bright patches of blue, yellow, green
 or orange 2
- 2a – Front of synthorax with orange patches **Group B**
- 2b – Front of synthorax with blue, yellow or green patches 3
- 3a – Tip of abdomen blue **Group C**
- 3b – Tip of abdomen not blue **Group D**

Group A: Front of synthorax completely black, without any pale ante-humeral patches

- 1a – Frons with a pale/bright fascia running from eye to eye or with
 pale lateral patches between clypeus and eye margins 2
- 1b – Frons and face without pale/bright markings 7
- 2a – Frontal fascia blue 3
- 2b – Frontal fascia or lateral frontal patches white, yellow or orange
 (not blue) 5
- 3a – Anterior two thirds of metepisternum pale from subalar ridge to
 slightly ventral of spiracle; abdomen including terminal seg-
 ments largely black; anal appendages as illustrated (Fig. 1).
 Indonesia: Waigeo *N. atrocyana*
- 3b – Metepisternum pale for its entire length, from subalar ridge to
 mesopostcoxa (Figs 2–4); terminal abdominal segments at least
 dorsally marked clearly with yellow or orange 4

- 4a – S9 and 10 dorsally marked with yellow/orange; superior anal appendages with tip thinly attenuated (Fig. 2). PNG: Gulf Province *N. acuminata*
- 4b – S8-10 dorsally marked with yellow/orange; superior anal appendages short, deep and subtriangular in profile, with tip blunt (Fig. 3). PNG: Gulf Province *N. smilodon*
- 4c – S10 dorsally marked with yellow/orange; superior anal appendages long, shallow and almost parallel sided in profile, with tip blunt (Fig. 4). PNG: Gulf Province *N. longicauda*
- 5a – Pterostigma reddish-brown, swollen. Indonesia: Sorong *N. dorsonigra*
- 5b – Pterostigma brown or black, widened distally 6
- 6a – Frontal markings reduced to tiny lateral streaks connecting the postclypeus with the margin of compound eyes; anal appendages as illustrated (Fig. 5), superiors subrectangular in profile. Indonesia: Waigeo *N. evelynae*
- 6b – Frontal markings more substantial, enlarged at least laterally; anal appendages as illustrated (Fig. 46 = nominate subspecies). Indonesia and PNG: NNG and Yapen *N. erythrura efasciata*
- 7a – Abdomen including terminal segments largely black 8
- 7b – Abdomen with at least terga 8 and 9 and S10 largely blue, white, yellow, orange or red 9
- 8a – Terga 8 and 9 dorsally completely black; anal appendages as illustrated (Figs 6–7), the superiors white or orange-white and with inner margin sharply serrate. Indonesia and PNG: NNG *N. chalybeostoma*
- 8b – Terga 8 and 9 dorsally with posterior articulation blue; anal appendages as illustrated (Fig. 8), the superiors blue and bluntly hooked downward terminally. Indonesia: NNG *N. cyanura*

- 9a – Terminal abdominal segments (S8–10) dorsally largely blue; anal appendages as illustrated (Fig. 9), the superiors slightly hooked downward terminally. Indonesia: Yapen *N. wallacei*
- 9b – Terminal abdominal segments dorsally largely yellow to orange and pink **10**
- 10a – Bright colouration of terminal segments including at least part of tergum 7 **11**
- 10b – Bright colouration of terminal segments not including tergum 7 . **12**
- 11a – Superior anal appendages much longer than S10 and branched at tip. Indonesia: Waigeo *N. erythroprocta*
- 11b – Superior anal appendages not much longer than S10, sub-apically with dorsal bump and hooked downward terminally (Fig. 10). Indonesia: Misool and Sorong *N. pyroprocta*
- 12a – Pale patch on metepisternum usually small (Fig. 11) but may vary in size (Photo 1); abdominal tergum 8 with isolated median spot of variable length bright orange, tergum 9 and S10 entirely light orange; anal appendages (Fig. 11) light orange with rather narrow tip. Indonesia and PNG: NNG *N. beatrix*
- 12b – Pale patch on metepisternum substantial, extending to well dorsal and ventral of spiracle (Fig. 12); intersegmental membrane between S8 and 9 and tergum 10, including membrane between 9 and 10 entirely pink-coloured; anal appendages (Fig. 12) pink, the superiors much wider than deep. Indonesia: NNG Idenburg River basin *N. irene*

Group B: Front of synthorax with patches of orange

- 1a – Pale/bright ante-humeral patch or pale ante-humeral plus mesepimeral patch isolated from pale metepisternal patch (Figs 13–17) 2
- 1b – Pale/bright ante-humeral patch, pale mesepimeral patch and pale metepisternal patch broadly connected or adjacent (Figs 18–24) 5
- 2a – Pale/bright ante-humeral patches almost as long as mesanepisternum; mesepimeral patch wide, isolation line from metepisternal patch narrow; anal appendages as illustrated (Fig. 13). Indonesia: Salawati and Bird Head *N. xanthe*
- 2b – Pale/bright ante-humeral patches markedly shorter than mesepisternum; mesepimeral patch not developed or narrow, isolation stripe from metepisternal patch wider (Figs 14–17) 3
- 3a – Front of synthorax with black area between ante-humeral patches largely parallel sided; anal appendages as illustrated (Fig. 14). Indonesia: SNG *N. rangifera*
- 3b – Front of synthorax with ante-humeral patches tapered so that black area between them steadily expands posteriorly (Figs 15–17) 4
- 4a – Pale ante-humeral patches occupying less than basal $\frac{2}{3}$ of length of mesepisternum; no pale/bright mesepimeral patch; anal appendages as illustrated (Fig. 15). Indonesia: Aru Islands *N. rosea rosea*
- 4b – Pale ante-humeral patches occupying more than basal $\frac{2}{3}$ of length of mesepisternum (Figs 16–17). Indonesia, PNG: NNG *N. rosea cruentata*
- 5a – Pale patch on mesepimeron occupying ventral half or less of mesepimeron (Figs 18–20) 6
- 5b – Pale patch on mesepimeron occupying almost whole length of mesepimeron (Figs 21–24) 8

- 6a – Mesepimeron pale/bright adjacent to mesokatepisternum (Fig. 18). Indonesia, PNG: NNG *N. melanoxantha*
- 6b – Mesepimeron with an area adjacent to mesokatepisternum black (Figs 19–20) 7
- 7a – Black stripe on and along metapleural suture wide and only approximately one half of metepimeron pale; anal appendages as illustrated (Fig. 19). Indonesia: Biak and Supiori Islands .. *N. hiroakii*
- 7b – Black stripe on and along metapleural suture narrow and metepimeron almost entirely pale; anal appendages as illustrated (Fig. 20). Indonesia: NNG *N. plagioxantha*
- 8a – Mesepimeron pale adjacent to mesokatepisternum (Figs 21–22) 9
- 8b – Mesepimeron with an area adjacent to mesokatepisternum black (Figs 23–24) 10
- 9a – Pale ante-humeral patches longer than half the mesepisternum, drop-shaped, mid-dorsally narrowly separated; most of dorsal half of mesepimeral patch as wide as metepisternal patch; anal appendages as illustrated (Fig. 21). Indonesia: Vogelkop Peninsula & Misool *N. plagiata*
- 9b – Pale ante-humeral patches about one half the length of mesepisternum, oval to subrectangular, mid-dorsally widely separated; most of dorsal half of mesepimeral patch only half as wide as metepisternal patch; anal appendages as illustrated (Fig. 22). Indonesia: Yapen *N. kaizei*
- 10a – Face black; S2 dorsally yellow with dark pattern; synthoracic pattern and anal appendages as in Fig. 23 (but see also variation as discussed). Indonesia and PNG: NNG . *N. callisphaena*
- 10b – Face black with pale crossbar; S2 dorsally black; black medial area separating pale ante-humeral patches steadily expanding posteriorly; metapleural suture widely marked with dark, ventrally as wide as more dorsally (Fig. 24). Indonesia: Waigeo, Batanta, Salawati *N. aurantiaca*

Group C: Front of synthorax with patches of blue, yellow or green; tip of abdomen blue

- 1a – Light (bright blue) post-ocular spots; anal appendages as illustrated (Fig. 25). PNG: NNG *N. caerulea*
- 1b – Light post-ocular spots not developed 2
- 2a – Ante-humeral patches reduced to fine lines along end of humeral suture. Indonesia: SNG *N. pseudexul*
- 2b – Ante-humeral patches not reduced to lines 3
- 3a – Pale patch or patches not developed on mesepimeron (Figs 26–27) 4
- 3b – Pale patch or patches developed on mesepimeron (Figs 28–36) 5
- 4a – Ante-humeral patch slightly longer than ½ of mesanepisternum; anal appendages truncate (Fig. 26). Indonesia: SNG *N. thalassina*
- 4b – Ante-humeral patch shorter than ½ of mesanepisternum; anal appendages subconical with large inner tooth (Fig. 27). Manus Island *N. manuscola*
- 5a – Face completely black; superior anal appendages dorsally slightly acuminate, and with ventral expansion (lateral aspect) (Figs 28–29). Indonesia, PNG: NNG, SNG *N. nigrifrons*
- 5b – Blue bar, sometimes medially interrupted, from eye to eye across anterior frons including genae 6
- 6a – Pale mesepimeral patch ending far short of subalar ridge (Figs 30–32) 7
- 6b – Pale mesepimeral patch reaching close to subalar ridge (Figs 33–36) 9
- 7a – Pale ante-humeral and mesepimeral patches subequal in size; anal appendages as illustrated (Fig. 30). PNG: NNG .. *N. nigrofasciata*
- 7b – Pale ante-humeral patch much larger than mesepimeral patch (Figs 31–32) 8

- 8a – Poststernum lacking extensive dark patches; superior anal appendages subconical with large inner tooth (Fig. 31). PNG: NNG *N. azurosignata*
- 8b – Poststernum with distinct and extensive dark patches; superior anal appendages truncate with small inner tooth (Fig. 32). PNG: Gulf Province *N. truncata*
- 9a – Pale ante-humeral patch not including area anterior to metakatepisternum; anal appendages as illustrated (Fig. 33). PNG: Gulf Province *N. conifera*
- 9b – Pale ante-humeral patch including area anterior to metakatepisternum (Figs 34–36) **10**
- 10a – Pale mesepimeral patch forming anteriorly distinctly stepped level with posterior margin of ante-humeral marks; anal appendages as illustrated (Fig. 34). Indonesia, PNG, Solomon Islands: Aru, Yapen, Biak, Bismarck Islands *N. salomonis*
- 10b – Pale mesepimeral patch not so stepped; anal appendages as illustrated (Figs 35–36) **11**
- 11a – Pale ante-humeral patch longer than $\frac{1}{2}$ of mesanepisternum; black band on metapleural suture dorsally much narrower than ventrally (Fig. 35). PNG: Bismarck Islands *N. africana*
- 11b – Pale ante-humeral patch shorter than $\frac{1}{2}$ of mesanepisternum; black band on metapleural suture less strongly tapered (Fig. 36). PNG: Bismarck Islands *N. commutata*

Group D: Front of synthorax with patches of blue, yellow or green; tip of abdomen not blue

- 1a – Superior anal appendages bifurcate or apically bilobed (Figs 37–42) 2
- 1b – Superior anal appendages not bifurcate or apically bilobed (Figs 43–50) 6
- 2a – Pale metepisternal patch short and narrow; superior anal appendages apically slightly bilobed (Fig. 37); abdominal terga 7–9 and S10 largely orange. PNG: NNG *N. tricolorata*
- 2b – Pale metepisternal patch long and wide; superior anal appendages bifurcate (Figs 38–42); abdominal terga 8 and 9 and S10 largely orange 3
- 3a – Black stripe along metapleural suture narrow and metakatepisternum largely pale; anal appendages as illustrated (Fig. 38). Indonesia: Vogelkop Peninsula *N. silvicola*
- 3b – Black stripe along metapleural suture wider and metakatepisternum largely dark (Figs 39–42) 4
- 4a – Inferior anal appendages in ventral view deeply notched between medial and lateral lobe (Fig. 39). Indonesia: NNG .. *N. fonticola*
- 4b – Inferior anal appendages not deeply notched between medial and lateral lobe (Figs 40–42) 5
- 5a – Medial lobe of inferior anal appendages widened apically (Figs 40–41). PNG: Madang and Morobe Province *N. astrolabica*
- 5b – Medial lobe of inferior anal appendages not widened apically (Fig. 42). PNG: NNG *N. parafonticola*
- 6a – Terminal abdominal segments dark; superior anal appendages largely yellow or orange, or even dark 7
- 6b – Several abdominal segments and anal appendages largely yellow or orange 9

- 7a – Pale/bright frontal bar medially interrupted; superior anal appendages apparently dark and with long narrow tooth (Fig. 43). Indonesia: SNG *N. interrupta*
- 7b – Pale/bright frontal bar medially not interrupted 8
- 8a – Small pale patches on mesepimeron; anal appendages as illustrated (Fig. 44). Indonesia: Moluccas, Kai Islands (very close to Aru Islands) *N. eburnea*
- 8b – Mesepimeron lacking pale patches (Fig. 45). Indonesia, PNG; Aru and SNG *N. marina*
- 9a – Synthoracic pattern and anal appendages as in Fig. 46; S7–10 marked with, or largely, orange. Indonesia and PNG: NNG and Yapen *N. erythrura erythrura*
- 9b – Only S8–10 or S9–10 or just S10 dorsally and laterally marked with, or largely, yellow/orange 10
- 10a – Pale ante-humeral patch well dorsal of mesokatepisternum and shorter than ½ the length of mesepisternum; superior anal appendages short and strongly conical (Fig. 58); S8–10 marked with yellow or largely yellow (Fig. 47). PNG: Gulf Province *N. acudens*
- 10b – Ventral section of pale ante-humeral patch partly running along mesokatepisternum and at least ½ the length of mesepisternum; superior anal appendages variable in length and only slightly conical (Figs 48–50); S8–10, only S9 and 10, or only S10 marked with yellow, or largely, yellow 11
- 11a – Median lobe of pronotum laterally black, largely black or blue; pale ante-humeral patch fairly short and lanceolate, 50–80 % length of mesanepisternum (Fig. 48, 49). PNG: Simbu and Milne Bay Province, widespread SNG *N. finisterrae finisterrae*
- 11b – Median lobe of pronotum laterally all bluish; pale ante-humeral patch dorsally tapered and more or less pointed, 70–90 % length of mesanepisternum (Fig. 50). PNG: Goodenough Island *N. finisterrae satisbona*

Keys to the females of *Nososticta* species from the Papuan region

- I. Species with legs orange/red (Photo 18; Fig. 80); Indonesia: Vogelkop Peninsula *N. rufipes*
- II. Species with legs largely black (as in Photo 11; Figs 51–78):
- 1a – Front of synthorax (mesanepisterna) without pale/bright ante-humeral patches **Group A**
- 1b – Front of synthorax (mesanepisterna) with pale/bright ante-humeral patches **Group B**

Group A: Front of synthorax without pale/bright ante-humeral patches

- 1a – A transverse pale/bright bar across anterior frons and genae 2
- 1b – No transverse pale/bright bar across anterior frons and genae 5
- 2a – Frontal bar orange/red, not reaching eye margins; synthoracic pattern and prothoracic details as in Fig. 51. Indonesia and PNG: NNG *N. chalybeostoma*
- 2b – Frontal bar reaching eye margins 3
- 3a – Frontal bar bright ochreous; synthoracic pattern and prothoracic details as in Fig. 52. Recorded only from Indonesia: Moluccas, Kai Islands (very close to Aru Islands) *N. eburnea*
- 3b – Frontal bar pale/blue or yellow 4
- 4a – Frontal bar pale/blue; synthoracic pattern and prothoracic details as in Fig. 53. PNG: Gulf Province *N. acuminata*
- 4b – Frontal bar yellow; prothoracic details as in Fig. 54. PNG: Gulf Province *N. atrocyana*
- 5a – Dorsum of S8–10 not all black 6
- 5b – Dorsum of S8–10 black 7
- 6a – Dorsum of S8–10 entirely orange; prothoracic details as in Fig. 55. Indonesia: Misool and Sorong *N. pyroprocta*
- 6b – Dorsum of S8–10 at least partly olivish or yellowish. Indonesia: Yapen *N. wallacei*

- 7a – Pale metepisternal patch very small, restricted to area ventral of metastigma; synthoracic pattern and prothoracic details as in Fig. 56. Indonesia and PNG: NNG *N. beatrix*
- 7b – Pale metepisternal patch larger, not restricted to area ventral of metastigma (Fig. 58) 8
- 8a – Labrum with purplish reflections; prothoracic details as in Fig. 57. Indonesia: NNG *N. cyanura*
- 8b – Labrum with metallic green reflections; synthoracic pattern and prothoracic details as in Fig. 58. Indonesia: NNG, Idenburg River basin *N. irene*

Group B: Front of synthorax with pale/bright ante-humeral patches

- 1a – Blue post-ocular patches present; synthoracic pattern and prothoracic details as in Fig. 59. PNG: NNG *N. caerulea*
- 1b – No pale/bright post-ocular patches 2
- 2a – A distinct pale/bright mesepimeral patch connecting ante-humeral and metepisternal patch; synthoracic pattern and prothoracic details as in Fig. 60. Indonesia, PNG: NNG *N. melanoxantha*
- 2b – No pale/bright mesepimeral patch connecting ante-humeral and metepisternal patch (Figs 61–77) 3
- 3a – Pale/bright ante-humeral patch reddish brown, reduced to a minute comma-shaped point at humeral suture, almost touching anterior margin of mesepisternum. Indonesia, SNG *N. pseudexul*
- 3b – Pale/bright ante-humeral patch much more extensive 4
- 4a – Pale/bright ante-humeral patch very long (at least 75 % of length of mesepisternum (Figs 61–73) 5
- 4b – Pale/bright ante-humeral patch not longer than 60 % length of mesepisternum (Figs 64–77) 7
- 5a – Median lobe of pronotum distinctly conical; synthoracic pattern and prothoracic details as in Fig. 61. PNG: NNG *N. parafonticola*
- 5b – Median lobe of pronotum more or less rounded (Figs 62–63) 6

- 6a – Anterior lobe of pronotum very prominent; synthoracic pattern and prothoracic details as in Fig. 62. Indonesia: NNG *N. fonticola*
- 6b – Anterior lobe of pronotum not at all prominent; synthoracic pattern and prothoracic details as in Fig. 63. Indonesia: SNG .. *N. rangifera*
- 7a – No cross-vein descending from distal side of discoidal cell to wing margin; prothoracic details as in Fig. 64. PNG: Simbu and Milne Bay Province distribution, Goodenough Island .. *N. finisterrae*
- 7b – A cross-vein descending from distal side of discoidal cell to wing margin 8
- 8a – Pale/bright ante-humeral patch very narrow (not more than half as wide as distance from middorsal carina) or short (less than half as long as mesepisternum (Figs 65–71) 9
- 8b – Pale/bright ante-humeral patch longer and/or wider (Figs 72–78) 15
- 9a – Median lobe of pronotum high and conical; synthoracic pattern and prothoracic details as in Fig. 66. Indonesia, PNG: NNG; *N. callisphaena*
- 9b – Median lobe of pronotum more or less rounded and not prominent 10
- 10a – Pale/bright ante-humeral patches fairly distant from collar; synthoracic pattern and prothoracic details as in Fig. 65. Indonesia: NNG *N. plagioxantha*
- 10b – Pale/bright ante-humeral patches very close to collar (Figs 67–77) 11
- 11a – Posterior lobe of pronotum with side lobes produced into long upright filamentous horns; synthoracic pattern and pro-thoracic details as in Fig. 67. Indonesia: Waigeo *N. erythroprocta*
- 11b – Posterior lobe of pronotum with side lobes not produced into long upright filamentous horns (Figs 68–71) 12

- 12a – Outer lateral sub-lobe of posterior lobe of pronotum standing erect (Figs 68–69) 13
- 12b – Outer lateral sub-lobe of posterior lobe of pronotum not standing erect (Figs 70–71) 14
- 13a – Inner lateral sub-lobe of pronotum directed forward; synthoracic pattern and prothoracic details as in Fig. 68. PNG: Bismarck Islands *N. commutata*
- 13b – Inner lateral sub-lobe of pronotum not directed forward; synthoracic pattern and prothoracic details as in Fig. 69. Indonesia, PNG and Solomon Islands: Aru, Yapen, Biak, Bismarck Islands *N. salomonis*
- 14a – Metapleural suture broadly lined with black; synthoracic pattern and prothoracic details as in Fig. 70. Indonesia: Biak and Supiori Island *N. hiroakii*
- 14b – Metapleural suture narrowly lined with black; synthoracic pattern and prothoracic details as in Fig. 71. Indonesia: Yapen .. *N. kaizeii*
- 15a – Posterior lobe of pronotum including an upright branch, as long as medial lobe; prothoracic details as in Fig. 72. Indonesia and PNG: Aru, SNG *N. rosea*
- 15b – Posterior lobe of pronotum not including an upright branch as long as medial lobe (Figs 73–77) 16
- 16a – Poststernum with very distinct and extensive black patches (Figs 73–74) 17
- 16b – Poststernum without distinct and extensive black patches 18
- 17a – Posterior lobe of pronotum with four sub-lobes; synthoracic pattern and prothoracic details as in Fig. 73. PNG: Bismarck Islands *N. africana*
- 17b – Posterior lobe of pronotum with five sublobes; synthoracic pattern and prothoracic details as in Fig. 74. PNG: NNG . *N. nigrofasciata*

- 18a – Ante-humeral patch not much longer than wide; synthoracic pattern and prothoracic details as in Fig. 75. NNG, SNG . *N. nigrifrons*
- 18b – Ante-humeral patch much longer than wide (Figs 76–78) **19**
- 19a – Ante-humeral stripes narrow, about ½ as wide as their distance from middorsal carina; synthoracic pattern and prothorax as in Fig. 76. NNG *N. erythrura*
- 19b – Ante-humeral stripes wider, about as wide as their distance from middorsal carina (Figs 77, 78) **20**
- 20a – Inner lobe of posterior lobe of pronotum long slender forward directed; synthoracic pattern and prothoracic details as in Fig. 77. Indonesia: Waigeo, Batanta, Salawati *N. aurantiaca*
- 20b – Inner lobe of posterior lobe of pronotum not long, slender and forward directed; synthoracic pattern and prothoracic details as in Fig. 78. Indonesia: SNG *N. thalassina*

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Appendix 1. Checklist and known distributions of the platycnemidid damselfly genus *Nososticta*.

Species number Species/subspecies	Sulawesi	Molluccas	Lesser Sundas, Java, Sumatra New Guinea	Solomon Island (incl. Bougainville)	Australia	Figure male	Figure female	New Guinean species absent from key to the females
1 <i>acudens</i> Theischinger & Richards, 2006			x			47		Absent
2 <i>acuminata</i> Michalski, Richards & Theischinger, 2012			x			2	53	
3 <i>africana</i> (Schmidt, 1944)			x			35	73	
4 <i>astrolabica</i> (Förster, 1898)			x			40, 41		Absent
5 <i>atrocyana</i> (Lieftinck, 1960)			x			1	54	
6 <i>aurantiaca</i> (Lieftinck, 1938)			x			24	77	
7 <i>azurossignata</i> sp. nov.			x			31		Absent
8 <i>baroalba</i> Watson & Theischinger, 1984					x			
9 <i>beatrix</i> (Lieftinck, 1949)			x			11	56	
10 <i>caerulea</i> sp. nov.			x			25	59	
11 <i>callisphaena</i> (Lieftinck, 1937)			x			23	66	
12 <i>chalybeostoma</i> (Lieftinck, 1932)			x			6, 7	51	
13 <i>circumscripta</i> (Selys, 1886)		x						
14 <i>coelestina</i> (Tillyard, 1906)					x			
15 <i>commutata</i> (Lieftinck, 1938)			x			36	68	
16 <i>conifera</i> Theischinger & Richards, 2006			x			33		Absent
17 <i>cyanura</i> (Lieftinck, 1932)			x			8	57	
18 <i>diadesma</i> (Lieftinck, 1936)		x						
19 <i>dorsonigra</i> (Martin, 1902)			x					Absent

Species number Species/subspecies	Sulawesi	Molluccas	Lesser Sundas, Java, Sumatra	New Guinea	Solomon Island (incl. Bougainville)	Australia	Figure male	Figure female	New Guinean species absent from key to the females
20 <i>eburnea</i> (Förster, 1897)		x					44	52	
21 <i>egregia</i> (Lieftinck, 1937)		x							
22 <i>emphyla</i> (Lieftinck, 1936)			x						
23 <i>erythroprocta</i> (Selys, 1886)				x				67	
24 <i>erythrura efasciata</i> (Lieftinck, 1949)				x				76	
<i>erythrura erythrura</i> (Lieftinck, 1932)				x			46	76	
25 <i>evelynae</i> (Lieftinck, 1960)				x			5		Absent
26 <i>exul</i> (Selys, 1886)		x							
27 <i>finisterrae finisterrae</i> (Förster, 1897)				x			48, 49	64	
<i>finisterrae satisbona</i> ssp. nov.				x			50	64	
28 <i>flavipennis</i> (Selys, 1886)	x								
29 <i>fonticola</i> (Lieftinck, 1932)				x			39	62	
30 <i>fraterna</i> (Lieftinck, 1933)						x			
31 <i>hiroakii</i> Sasamoto, 2007				x			19	70	
32 <i>insignis</i> (Selys, 1886)			x						
33 <i>interrupta</i> sp. nov.				x			43		Absent
34 <i>irene</i> (Lieftinck, 1949)				x			12	58	
35 <i>kaizei</i> sp. nov.				x			22	71	
36 <i>kalumburu</i> Watson & Theischinger, 1984						x			
37 <i>koolpinyah</i> Watson & Theischinger, 1984						x			
38 <i>koongarra</i> Watson & Theischinger, 1984						x			
39 <i>liveringa</i> Watson & Theischinger, 1984						x			

Species number Species/subspecies	Sulawesi	Molluccas	Lesser Sundas, Java, Sumatra	New Guinea	Solomon Island (incl. Bougainville)	Australia	Figure male	Figure female	New Guinean species absent from key to the females
40 <i>longicauda</i> sp. nov.				x			4		Absent
41 <i>lorentzi</i> (Lieftinck, 1938) = <i>nigrifrons</i> (Ris)				x			29		Absent
42 <i>manuscola</i> sp. nov.				x			27		Absent
43 <i>marina</i> (Ris, 1913)				x			45		Absent
44 <i>melanoxantha</i> (Lieftinck, 1949)				x			18	60	
45 <i>moluccensis</i> (Selys, 1886)		x							
46 <i>mouldsi</i> Theischinger, 2000						x			
47 <i>nigrifrons</i> (Ris, 1913)				x			28, 29	75	
48 <i>nigrofasciata</i> (Lieftinck, 1932)				x			30	74	
49 <i>parafonticola</i> sp. nov.				x			42	61	
50 <i>phoenissa</i> (Ris, 1929)		x							
51 <i>pilbara</i> Watson, 1969						x			
52 <i>plagiata</i> (Selys, 1886)				x			21		Absent
53 <i>plagioxantha</i> (Lieftinck, 1932)				x			20	65	
54 <i>pseudexul</i> (Ris, 1913)				x					
55 <i>pyroprocta</i> (Lieftinck, 1960)				x			10	55	
56 <i>rangifera</i> (Lieftinck, 1949)				x			14	63	
57 <i>rosea cruentata</i> (Lieftinck, 1932)				x			16, 17	72	Absent
<i>rosea rosea</i> (Ris, 1913)				x			15		
58 <i>rufipes</i> Theischinger & Kalkman, 2014				x			79	80	
59 <i>salomonis</i> (Selys, 1886)				x	x		34	69	
60 <i>selysi</i> (Förster, 1896)		x							
61 <i>silvicola</i> (Lieftinck, 1949)				x			38		Absent

Species number Species/subspecies	Sulawesi	Mollucas	Lesser Sundas, Java, Sumatra	New Guinea	Solomon Island (incl. Bougainville)	Australia	Figure male	Figure female	New Guinean species absent from key to the females
62 <i>smilodon</i> Theischinger & Richards, 2006				x			3		Absent
63 <i>solida</i> (Hagen, 1860)						x			
64 <i>solitaria</i> (Tillyard, 1906)						x			
65 <i>taracumbi</i> Watson & Theischinger, 1984						x			
66 <i>thalassina</i> (Lieftinck, 1949)				x			26	78	
67 <i>tricolorata</i> sp. nov.				x			37		Absent
68 <i>truncata</i> sp. nov.				x			32		Absent
69 <i>wallacei</i> (Selys, 1886)				x			9		
70 <i>xanthe</i> (Lieftinck, 1938)				x			13		Absent