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THE ODONATA OF SULAWESI AND ADJACENT ISLANDS. PARTS 1 AND 2

by

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Key words: Odonata; *Celebophlebia*; *Diplacina*; Taxonomy; Distribution; Sulawesi¹⁾; Indonesia.

One new species of the up to present monotypic genus *Celebophlebia* Lieftinck, *C. carolinae* spec. nov. from Sangihe, as well as all Sulawesi species of the genus *Diplacina* Brauer, including two new species and one new subspecies, viz., *D. militaris dumogae* subsp. nov., *D. torrenticola* spec. nov. and *D. sanguinolenta* spec. nov. are described. The relationship and distribution of all species included is discussed²⁾.

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PART 1

A new species of *Celebophlebia* Lieftinck from Sangihe Island, with some notes on the taxonomic status of the genus

INTRODUCTION

During their ornithological survey of Sangihe Island, between Sulawesi (Celebes) and Mindanao, mr. F.G. Rozendaal and mrs. C. Rozendaal-

¹⁾ Throughout this paper the terms Sulawesi and Celebes are both used in an interchangeable way. Where Celebes is used this refers to the notation on labels.

²⁾ Abbreviations used: CdR = L. Coomans de Ruiter; IRSN = Institut Royal des Sciences Naturelles de Belgique; MZB = Museum Zoologicum Bogoriense; RMNH = Rijksmuseum van Natuurlijke Historie, Leiden; SMF = Senckenberg Museum, Frankfurt am Main.

Kortekaas also made a small, but most interesting, collection of Odonata. One of their most unexpected findings was the male of an undescribed species of the up to present monotypic genus *Celebophlebia* Lieftinck, 1936. I take the opportunity to describe this new species, and to give additional distributional records of the only other representative of this remarkable genus, *C. dactylogastra* Lieftinck, 1936. I have also added some notes on the characters of this genus, as described by Lieftinck (1936).

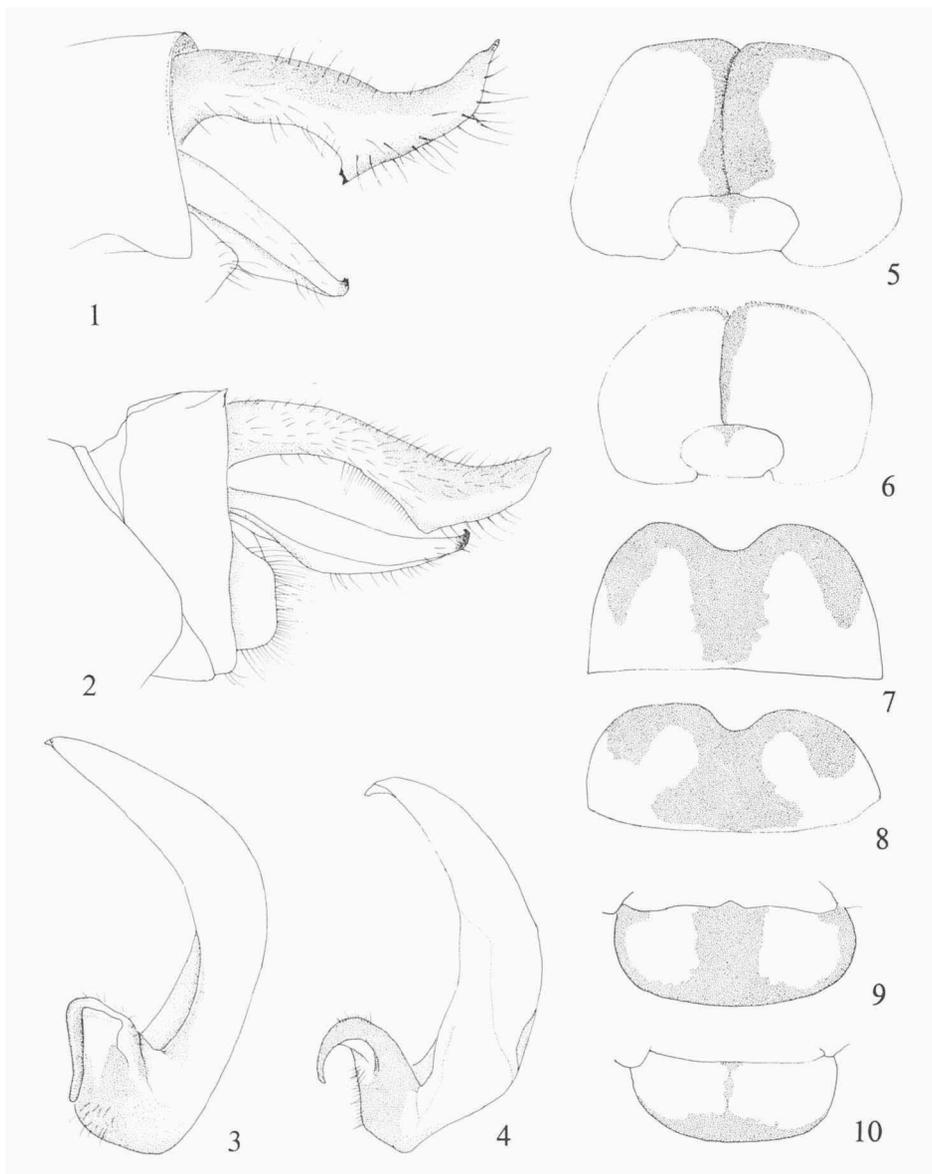
***Celebophlebia carolinae* spec. nov.**
(figs. 2, 4, 6, 8, 10, 11, 39)

Material. — Holotype male: Sangihe (Great Sangihe Island), Manganitu, beside tiny stream, 10 May 1985, 1 male (F.G. Rozendaal) in RMNH¹⁾.

Description (male). — Head. Labium (fig. 6) yellow, median lobe small with a small dark patch in the middle of the anterior border; anterior lobes yellow with a narrow dark stripe along the inner border (not vase-shaped as in *C. dactylogastra*). Labrum (fig. 10) yellow, with an indistinct dark axial stripe and a very narrow anterior stripe, which is somewhat wider in the middle. Frons (figs. 7, 8) yellowish-green with a trilobate dark marking, the median spot running from vertex downwards to fronto-clypeal suture, ca. two times as wide along the suture as in the centre of the frons, the lateral spots reaching only halfway between vertex and suture. Vertex black and glossy. Eyes brown. Occiput yellow with a small medio-longitudinal brown patch. Rear side of head glossy black with a yellow spot along the margin of the eye.

Thorax. Prothorax black and yellow; anterior lobe yellow coloured anteriorly, remaining part black; lateral lobes black with a reverse V-shaped yellow marking; posterior lobe erect, yellow with a basal dull black spot. Synthorax black with broad yellow stripes. Legs long and slender; coxae and trochanters yellow, remaining part medium to dark brown in fore and middle legs, ochreous in hind legs; all femora with long spines, the proximal spines hardly visible, the distal ones approximately as long as those on tibiae; only seven minute conical teeth along the inner margin of the posterior femora. Wings (fig. 11) in general closely alike *C. dactylogastra*. Nine Ax in fore wing, eight in hind wing, six or seven Px in both wings; no accessory bridge cross-vein (a remarkable feature in the Tetrathemistinae).

¹⁾ See appendix for coordinates of localities.



Figs. 1-10. *Celebophlebia*. — 1, Anal appendages in left lateral view, *C. dactylogastra* Lft.; 2, Idem, *C. carolinae* spec. nov.; 3, Right hamulus of *C. dactylogastra* Lft., ventral view; 4, Idem, *C. carolinae* spec. nov.; 5, Labium of *C. dactylogastra* Lft.; 6, Idem, *C. carolinae* spec. nov.; 7, Frons of *C. dactylogastra* Lft.; 8, Idem, *C. carolinae* spec. nov.; 9, Labrum of *C. dactylogastra* Lft.; 10, Idem, *C. carolinae* spec. nov. (see scale bar for figs. 1-4 and 5-10 respectively).

Abdomen. As in *C. dactylogastra*, with (brown)-black and yellow markings. Segment 1 dorsally black and laterally yellow; segment 2 with anterior two-thirds yellow with a narrow brown transversal stripe, which is interrupted in the middle, posterior third brown-black. Genital lobe brown-black. Hamulus very large (figs. 3, 4), outer branch yellow, inner branch black. Abdominal segments 7-10 without yellow markings; anal appendages (figs. 1, 2) relatively slender, yellow, but dorsal half of superior appendages greyish and pointed upwards, apex of inferior appendix black.

Measurements. Hindwing 23 mm; abdomen, including appendages, 22 mm.

Differential diagnosis. — Closely related to *Celebophlebia dactylogastra*, but may be distinguished (cf figs. 1-12) by its smaller size, the shape of the black markings on labium and frons, the shape of the inner branch of the hamulus (which is c. two times longer in *C. dactylogastra*), and the shape of the superior anal appendages, which have a more apparent ventral proliferation with two small conical teeth in *C. dactylogastra*.

Habitat. — Brook along forest edge.

Distribution. — Only known from the male holotype from Sangihe Island.

Etymology. — This beautiful species is called after Caroline Rozendaal, who makes so many efforts with her husband to investigate the fauna of Southeast Asia.

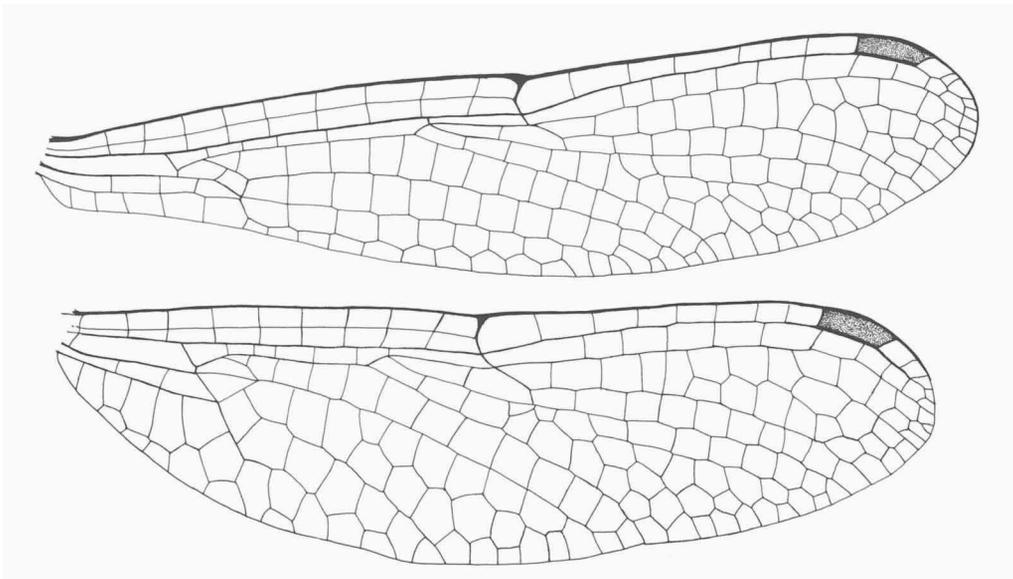


Fig. 11. *Celebophlebia carolinae* spec. nov. Wings. Natural size of wings 23 mm.

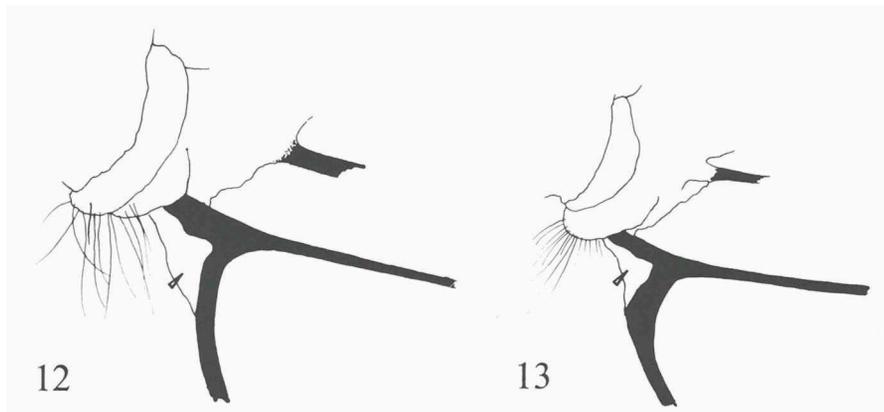
***Celebophlebia dactylogastra* Lief tinck**
(figs. 1, 3, 5, 7, 9, 12, 38)

Celebophlebia dactylogastra. — Lief tinck, 1936: 401-403, figs. 1-2.

This species was previously only known from the holotype. The following records may be added: W. Celebes, Mandar Gulf, Polewali, 23 Oct 1940 (J.J van der Starre) in RMNH; C. Celebes, Todjamboe, 800 m, 30 Apr 1941 (H. & E. Vonk) notes only. [This specimen is not in the RMNH collection; it was probably exchanged by Lief tinck, but its present deposition is unknown].

DISCUSSION

The taxonomic status of the genus *Celebophlebia* was extensively discussed by Lief tinck (1936). Before I give a re-evaluation of his arguments, I should like to emphasize that the supraspecific classification of the so-called primitive Libellulidae is poorly defined and understood. These libellulids are united in the Tetrathemistinae, a taxon defined by symplesiomorphies only (cf. Davies & Tobin, 1985). Since a full revision of the subfamilies of the Libellulidae goes far beyond the scope of this paper, I have to leave this problem for the future. It must, however, be considered as a serious handicap for a generic subdivision of the subfamily.



Figs. 12-13. Base of hind wing in libellulids. The triangular arrows indicate the membranula. Veins are drawn in black. — 12, *Celebophlebia dactylogastra* Lft., holotype, 13, *Nannophlebia amphyllis* Lft.

Lieftinck (1936) made a comparison with other genera in the Tetrathemistinae. *Celebophlebia* was considered by him as a very primitive member of the group, and closely related to *Nannophlebia* Selys and *Archaeophlebia* Ris. He also mentioned a remarkable character of *Celebophlebia*, viz., the absence of a membranula, which should have been replaced by a small tuft of hairs. After the re-examination of the holotype, deposited in the RMNH, as well as the specimen from Polewali mentioned above, I am, however, unable to confirm this observation. As in all Tetrathemistinae, the membranula in *Celebophlebia dactylogastra* is very small indeed, but not significantly differing from e.g. that in *Nannophlebia amphicyllis* Lieftinck (figs. 12 and 13), as well as from that in species of other genera in the subfamily examined by me. The tuft of setae, which can be found close to the junction of the Analis at the wing base, does not replace the membranula.

Summarizing it may be concluded that Lieftinck's (1936) statement that *Celebophlebia*, although related to *Nannophlebia*, is sufficiently different to justify a separate generic rank, can be confirmed. The precise place of *Celebophlebia* in the system of the Libellulidae must, however, remain uncertain as long as no general insight in the systematics of the whole family is available.

PART 2

The genus *Diplacina* Brauer on Sulawesi

INTRODUCTION

According to Lieftinck (1953: 153), the *Diplacina* fauna of Sulawesi (= Celebes) consists of at least three species, of which only one, *Diplacina militaris* Ris, was described at that time. Although Lieftinck also mentioned that he had a paper in preparation in which the new taxa would be described, he has apparently never finished this manuscript. Only some illustrations were found in the Lieftinck archives, now in our museum; these are based on material in the same museum.

During a stay on Sulawesi in 1985, joining Project Wallace in the Dumoga-Bone National Park, as well as during two reconnaissance trips in other parts of that island, I collected several series of specimens belonging to the genus *Diplacina*. The present publication includes the results of my study of both the former Lieftinck collection in the RMNH, as well as the specimens collected by myself.

***Diplacina militaris militaris* Ris (stat. nov.)**

(figs. 16-19, 21, 25, 39)

Diplacina bolivari militaris Ris, 1909: 99-100, fig. 70 (pro parte, excluding female from "Molukues").

Material examined. — Lectotype by present designation: One male in IRSN with labels "Celebes, Ribbe", and "D. Braueri c" [Ris' hand]; paralectotypes as given by Ris (1909: 99) in IRSN and SMF.

Other material: ninety-six males, eight females from the following localities on Sulawesi (arranged from north to south): N. Sulawesi: Sabang, Dampelas lake. C. Sulawesi: Between Pasui and Rante Lemo, 1000 m; Nanggala, Rantepao, 900 m; Paloppo; S. Baebunta; S. Tomoni; Margasoeka, Kalaena; Kulawi, Mamu 1000 m; Donggala, Palu area, Sopo river, 950 m; Idem, Marena river, 600 m; Loewoe, Todjamboe, 6-800 m; Idem, 900 m; SW. Sulawesi: Malino, 1000 m; Makassar-Malino, 220 m; S. Bone, Pakoetekang, 700 m; Saloe Tjimpang, 300 m; Polewali; Lompobattang area, Borong Rapao, ca. 850 m; Idem, Malino 1000-1100 m; Idem, affl. Berang River, 400 m; Malino, Desa Tomaona; Bantimurung area, Pattunuang Asue and Biseang Laboro, 275 m.

Outside Sulawesi: Banggai Is, P. Peleng.

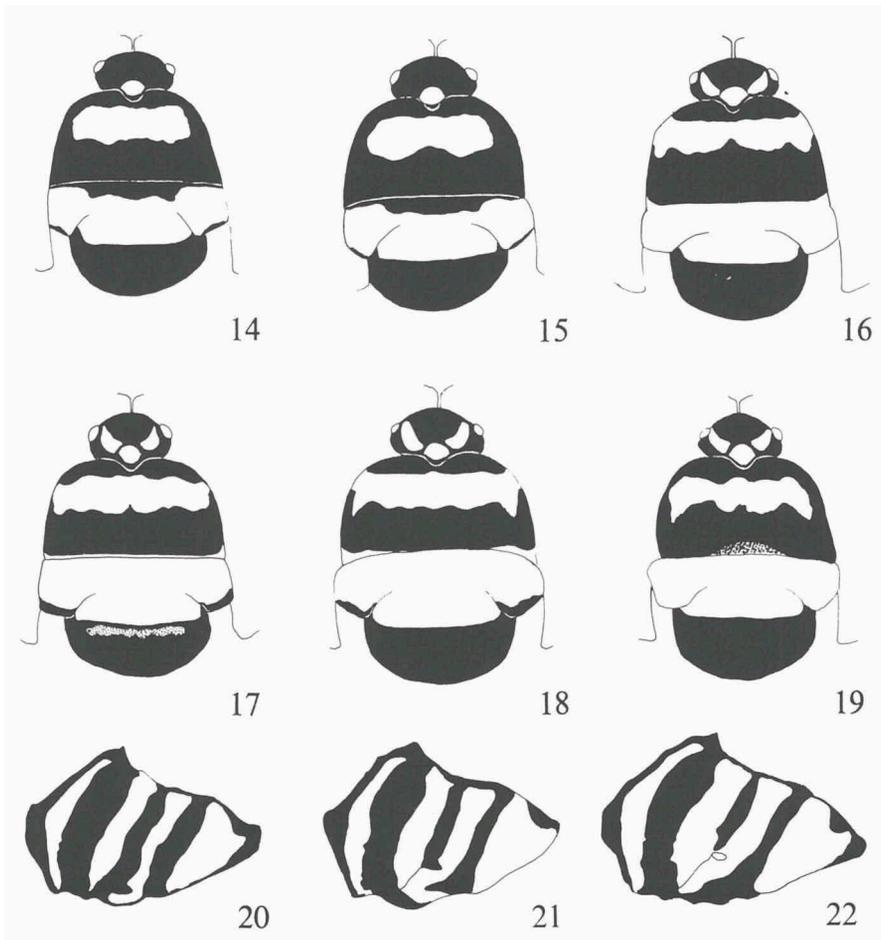
Description (male). — A medium-sized, black and creamish-white to yellowish coloured libellulid with slender abdomen.

Head. Labium black with two oblong creamish-white lateral spots (in very few specimens these spots are absent); labrum black; anteclypeus and postclypeus greyish white except for a very narrow, dark, latero-anterior marking of postclypeus and the outermost edges of anteclypeus (never with a dark stripe against the frontoclypeal suture); frons brown-black with a broad transversal creamish-white band, covering ca. two-fifths of the frons, the anterior transversal black band somewhat wider against the eyes, in some specimens even nearly reaching the posterior black band (but no specimens seen with a full connection between both markings); vertex black with a light coloured spot between median ocellus and each of the lateral ocelli; antennae black; occiput shiny black; rear-side of eyes creamish-white with black zig-zag band; whole face with rather long black setae.

Thorax. Antehumeral stripe large, running over mesinfraepisternum and mesepisternum up to ante-alar triangles, approximately one-third the width of mesepisternum; two broad, creamish to yellowish-white bands over mesepimeron and metepisternum, connected under metastigma; metepimeron creamish to yellowish white, except for the margin against the second lateral suture. Legs black, except the inner basal half of the fore femora, which are light coloured. Wings. Clear, but in older specimens brownish. Fore wing with 15-16 Ax, and 11-12 Px, hind wing with 12-13 Ax and 11-12 Px; Arculus stalked in both wings, but stalk very long in hind wing; costal side of triangle fractured in fore and hind wing, both triangles with cross-vein; origin of Arculus

in nearly all specimens just proximal to midway between Ax_2 and Ax_3 ; sub-triangle in hind wing not developed; discoidal field in fore wing commencing with two cells; $Bx(s)$ absent in nearly all specimens (if present, only in one of four wings); R_{spl} poorly developed; anal-loop foot-shaped, ca. 24 cells.

Abdomen. First to third segment light coloured (in living specimens quite bright creamish white), but segment 2 with a subtriangular black ring posteriorly; posterior side of segment 3 with significant black ring, dorsally



Figs. 14-22. *Diplacina* species of Sulawesi; 14-19, Head in frontal view ($\times 8$); 20-22, Thorax in left lateral view ($\times 4$). — 14, *D. militaris dumogae* subsp. nov., Dumoga-Bone National Park; 15, Idem, Panybie [near Gorontalo]; 16, *D. m. militaris* Ris, Palu: Dongi Dongi; 17, Idem, S. Baebunta; 18, Idem, Malino; 19, Idem, Malino, dark and atypical specimen; 20, *D. militaris dumogae* spec. nov., Dumoga-Bone National Park; 21, *D. m. militaris* Ris, Donggala; 22, Idem, Margasuka, Kalaena.

covering ca. one-third of segment; segments 4 to 10 fully black. Accessory genitalia. Lamina anterior black, plate-shaped with transverse indentation; hamulus (fig. 25) with outer branch a rounded, earlike structure, inner branch relatively short and acute, the tips curved outwards; genital lobe short, ca. 1.5 times as long as wide. Anal appendages (fig. 24) with superiors long and slender in dorsal view, the tips acute and curved outwards, ventrally with ca. 6-7 short teeth; inferior approximately as long as wide, the top shortly bifurcate, the outermost tips curved dorsad.

Female. — Appearance more sturdy by the shape of its abdomen. Thoracal markings somewhat more extensive; yellow rather than creamish-white coloured. Abdominal segments 3-8 with laterally, triangular to more or less oblong yellow markings, no light markings on segments 9-10.

Differential diagnosis. — See under *D. militaris dumogae* subspec. nov.

Habitat. — Rivers and streams between 200 and ca. 1000 m (Lompobattang area), also in semi-cultivated areas. The males can be found close to the water edge. They are usually sunning on boulders; very shy, but easier to capture when the sky is somewhat overcast.

Distribution (fig. 39). — In Sulawesi from the Sabang area (except from Toli Toli specimens collected by Fruhstorfer) southwards to the extreme southern part, also on the Banggai archipelago. The northern border of its distribution is somewhat uncertain; specimens from Toli Toli collected by Van der Starre clearly show the characters of *Diplacina militaris dumogae* subspec. nov., but specimens collected by Fruhstorfer (in Museum Senckenberg, Frankfurt) belong to *D. m. militaris*. I have, however, many doubts about the reliability of the labels "Toli Toli" of specimens collected by Fruhstorfer. There is circumstantial evidence that at least a part of these were collected elsewhere. In the Senckenberg Museum there is a large series of *Copera marginipes* Rambur labelled Toli Toli, and in the Rijksmuseum van Natuurlijke Historie (ex Museum of Zoology, Ann Arbor) we have a specimen of *Allophaea brunnea* (Selys) from the same locality. These specimens of both species mentioned were certainly collected outside Sulawesi; other specimens may have been collected in the vicinity of Bonthain (Lompobattang), where Fruhstorfer also stayed for quite some time.

***Diplacina militaris dumogae* subspec. nov.**

(figs. 14, 15, 20, 24, 39)

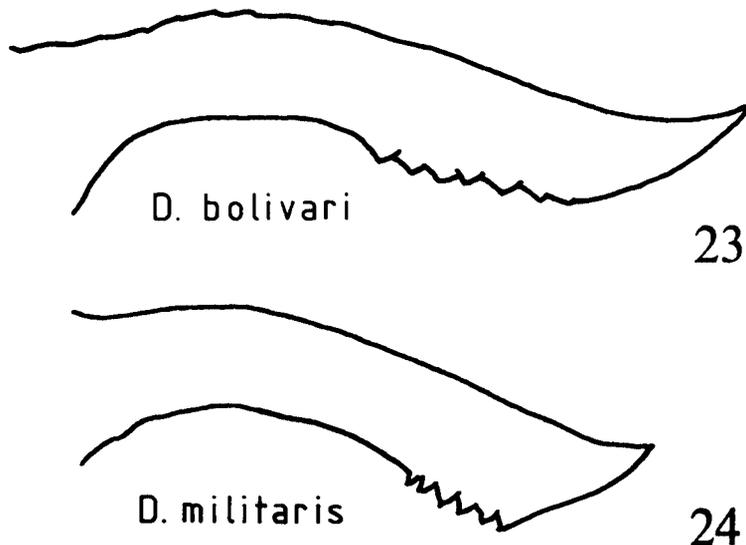
Type material. — Holotype male: N. Celebes/Minahassa/Pandu Manado/1.VIII.1940, 1 male (L. Coomans d[e] R[uiter]) in RMNH. Paratypes: (All specimens from Northern Sulawesi, ar-

ranged in chronological order): Mirabassa [error: = Minahassa], with labels "D. Braueri", "Type/Diplacina Bolivari militaris Ris" [incorrect, this specimen was not mentioned by Ris, 1909], 1 male (leg ?) in IRSN; Tondano, [before July 1933], 1 male (van Braekel); Tondano, Tonsea Lama, Sep 1938, 1 male (Van Braekel); Manado: Pandoe, 26 May 1940, 2 males (L. Coomans de Ruiter [= CdR]); Surroundings Airmadidi, 250 m asl, 9 July 1940, 1 male 1 female (CdR); Minahassa, Mapanget, 16 June 1940, 1 male (CdR); Minahassa, Tomohon, 14 July 1940, 3 males (CdR); Minahassa: Mapanget, 28 July 1940, 1 male 1 female (CdR); Manado: Pandu, 1 Aug 1940, 3 males (CdR); Minahassa, 600 m, 3 Sep 1940, 1 male (CdR); Minahassa: Kajoeroja, 100 m asl, 10 Nov 1941, 1 male (F. Dupont); Dumoga-Bone National Park: river Tumpah 200-540 m asl, 23 Apr-26 May 1985, 5 males 1 female (Van Tol) (2 males in MZB); Idem, Picnic site, 250 m, Stn 009, 5 Oct 1985, 1 male (R. Bosmans & J. Van Stalle) in IRSN; Idem, waterfall trail, 280 m, Stn. 094, 14 Nov 1985, 1 male (Idem) in IRSN.

Other material examined. — N. Sulawesi; several localities in the Gorontalo (Panybie, Ayer Pann., Bone, Limbotto), 4 males 4 females (Von Rosenberg); Idem, Gorontalo, hilly country near Kwandang, c. 200 m asl, 9 July 1940, 1 male (CdR); Idem, Toli Toli, 5 Dec 1940, 1 male 1 female (Van der Starre). All specimens in RMNH, except if given otherwise.

Description. — Structurally not different from *D. militaris militaris* Ris (see above), although usually much smaller.

Differential diagnosis. — Smaller than the nominal subspecies. The following characters separate *dumogae* from *militaris*: labium black, without yellow spots; basis of postclypeus with a brown-black marking against the frontoclypeal suture (cf. figs. 14, 15); light coloured marking on frons always sur-



Figs. 23-24. Anal appendages of *Diplacina* species in left lateral view. — 23, *D. bolivari* Selys, Ifuago, Philippine Islands; 24, *D. militaris dumogae* subsp. nov., Mapanget.

rounded by a broad black band, also against the eye (black frontal markings in *militaris* separated, only two specimens excepted); vertex black without light-coloured spots; yellowish bands over mesepimeron and metepisternum only seldom connected under metastigma (always connected in *militaris*). First and second abdominal segments yellow, third segment in living specimens dark red-brown, in preserved material ochreous; black posterior ring on third segment indistinct. Female also with red coloured abdominal segment 3.

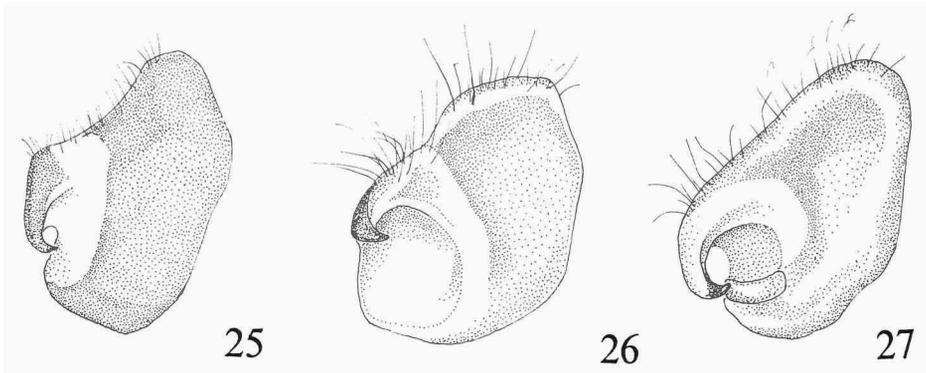
D. militaris closely resembles *D. bolivari* Selys in structural characters. The latter species is characterized by the shape of the superior appendages (cf. figs. 23 and 24); the ventral teeth of these appendages, which are placed irregularly in *D. bolivari* (more or less regularly in *D. militaris*); and finally by the shape of these teeth, which are more blunt in *D. bolivari* than in *D. militaris*. Other specific characters for *D. bolivari* are: labial side lobes yellow, with a broad black stripe against the inner margin, forming one stripe with the black median lobe; frons nearly wholly creamish white with black band against vertex and a quadrangular black spot against the eyes; vertex with yellow spots as in *D. militaris militaris*. Thoracal yellow stripes wider, stripe anterior to second lateral suture broken. Abdominal segment 3 dark red, segment 4-8 with oval, dark yellow, lateral spots. There is considerable variation in specimens from different parts of the Philippine Islands; further study is needed to judge whether these forms would deserve (sub)specific status.

Etymology. — Dumogae, after the Dumoga river. This river flows through the centre of the range of this subspecies and is one of the principal streams in the Dumoga-Bone National Park, studied during Project Wallace.

***Diplacina sanguinolenta* spec. nov.**

(figs. 27-32, 39)

Type material. — Holotype male: N. Celebes/Minahassa/Mapanget/28 July 1940/L. Coomans d[e] R[uiter], in RMNH. Paratypes (arranged from north to south within Sulawesi, then from outside this island): N. Celebes, same data as holotype, 1 male 1 female; N. Celebes, Minahassa, Mapanget, 3 Aug 1940, 1 female (L. Coomans de Ruyter [CdR]); E.N. Celebes, Balantak, Luwuk, Pagimana Rd, 26 Oct 1940, 1 male (CdR); C.N. Celebes, Luwu district, Masamba area, S. Tomoni, Kalaena, primary forest, 3 Apr. 1941, 2 males (juv.) (Maurenbrecher); C.W. Celebes, Palu valley, 4 July 1940, 2 males (CdR); C. Celebes, Masamba, Margasuka, Kalaena, 24 Sep 1940, 3 males (Maurenbrecher); C. Celebes, Masamba, Kantjiro, S. Tabaro, "Boschplas" [pool in forest]. 30 Sep 1940, 1 male (L.L.A. Maurenbrecher); S. Celebes, Takala-gebirge, "d. Rolle 1915", Ris coll. no. 17504, 1 male [broken, otherwise in perfect condition] in Museum Senckenberg; Banggai Is [= Kepulauan Banggai], P. Peleng, 5 Aug 1941, 2 males (J.J. van der Starre) all paratypes in RMNH, except if given otherwise.



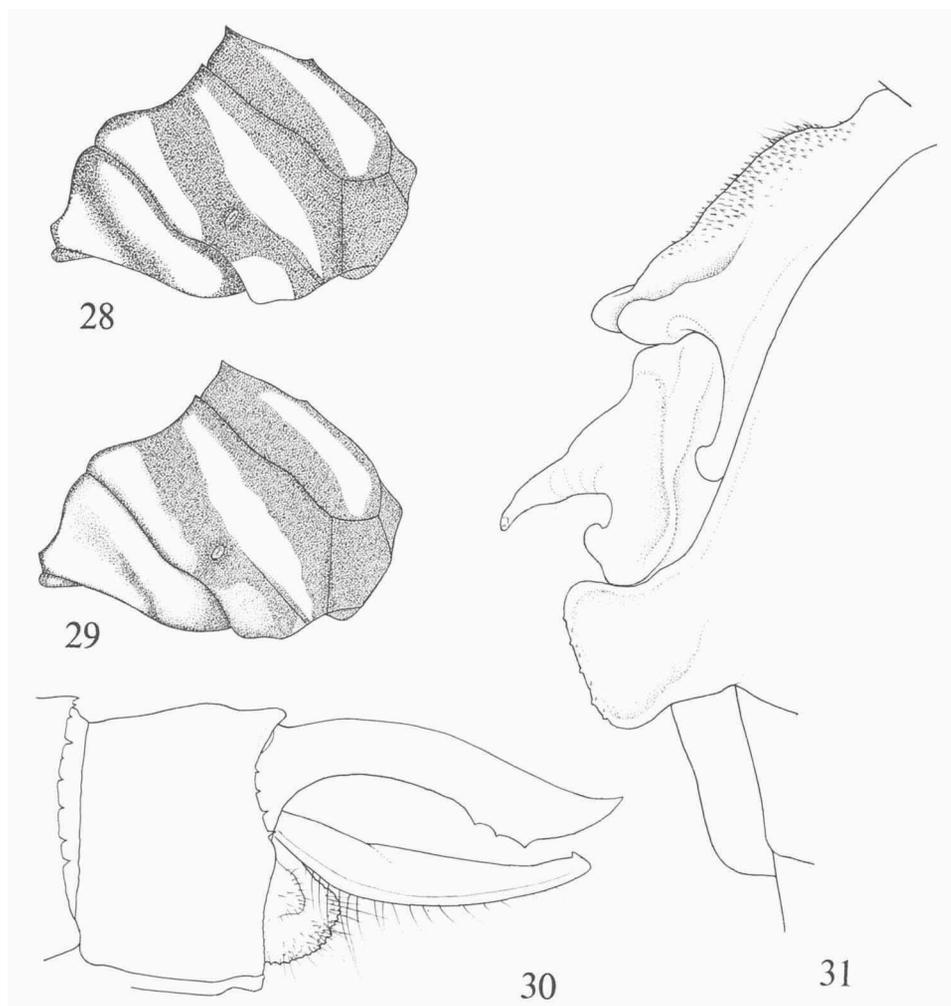
Figs. 25-27. Left hamuli of *Diplacina* species in ventral view. — 25. *D. m. militaris* Ris, Malino; 26, *D. torrenticola* spec. nov., Dumoga-Bone National Park; 27, *D. sanguinolenta* spec. nov., Margasuka.

Description (male). — Large, sturdy libellulid; the male with conspicuous bright red abdominal segments 2-4, sternites of abdominal segments 3-8 also bright red.

Head. Labium and labrum black, clypeus ochreous, but anterior border of postclypeus passing to brownish-black, frons brown-black with blue-green metallic sheen, colour latero-anteriorly passing to ochreous; vertex brown-black, also blue-green metallic. Occiput dark brown.

Thorax. Prothorax black, posterior lobe erect, hind margin somewhat concave with a fringe of long setae. Synthorax (figs. 28, 29) sturdily built, dark brown with creamish-white; antehumeral stripes broad; two light coloured stripes over mesepimeron and metepisternum, one from humeral suture passing ventrad along metinfraepisternum, the other, subtriangular, marking from dorsally towards the stigma, running close to the second lateral suture; metepimeron creamish-white with a diffuse, diagonal, brown band. Legs black. Wings (fig. 32). Ax in fore wing 13-16, in hind wing 12; Px in fore and hind wing 11-12. Arculus in fore wing commencing in the middle between Ax_2 and Ax_3 . Arculus stalked in fore and hind wing, costal side of triangle in fore and hind wing (just) fractured; t in hind wing with crossvein; supratriangle with crossvein; discoidal field in fore wing commencing with three cells, in hind wing with two cells; Bx(s) absent in fore and hind wing; Rspl well-defined, but inconspicuous in hind wing; anal loop in hind wing foot-shaped, ca. 25 cells.

Abdomen. Segment 1-3 inflated; segment 2, 3 and the anterior two-thirds of segment 4 bright red in preserved specimens (not seen in live by me); segment 1 and remaining part of abdomen brown-black; segment 2 with a more or less distinguishable, diffuse dark arrow-shaped marking.



Figs. 28-31. *Diplacina sanguinolenta* spec. nov. — 28, Thorax, right lateral view (Mapanget); 29, Idem (Loewoek); 30, Anal appendages male, left lateral view; 31, Accessory genitalia, left lateral view (Drawing by M.A. Lieftinck).

Accessory genitalia (fig. 31) built as in other Sulawesi *Diplacina* species; inner branch of hamulus relatively long with subacute tip curved 90° outwards; outer branch with extensive central depression, the inwards curved top of outer branch distinctly swollen; genital lobe somewhat longer than wide. Anal appendages (fig. 30) relatively slender, ventral side of superiors with three to four relatively large, subacute teeth. Inferior with bifid top, the acute tips curved dorsad.

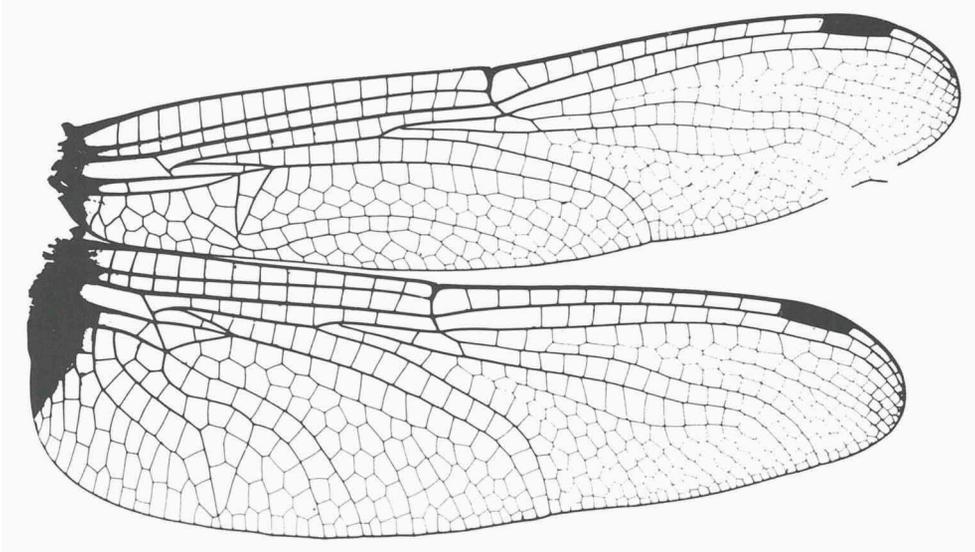


Fig. 32. Wings of *D. sanguinolenta* spec. nov., Palu Valley, 4 July 1940 (photo Dr. J. Belle).

Female. — According to notes by Coomans de Ruiter “especially the females are very nice, remarkable insects”.

Head and thorax as in the male, but thoracal stripes in preserved specimens more yellowish, according to Coomans de Ruiter in living specimens “with bright greenish-white bands”; eyes brown [CdR].

Abdomen. Segments 2-7 dark red (“red” in live), segment 1 and 8-10 brownish black; dorsal, ventral and lateral carinae of the red segments black, tergite 8 laterally broadened as “wings”.

Habitat. — According to a label by Maurenbrecher, and unpublished notes of Coomans de Ruiter in letters to M.A. Lieftinck and in a folio note book (kept in the archives of the Rijksmuseum van Natuurlijke Historie, Leiden), recorded along brooklets, along brooks in secondary forest as well as at a pool in forest. Coomans de Ruiter reports a rather common occurrence in the Palu area, but during my trip in the Lore Lindu National Park I have not seen this species. A large libellulid, probably referable to *D. sanguinolenta*, was seen by me at a small spring brook 2 km W. of Edward’s subcamp in the Dumoga Bone National Park. Unfortunately, it could not be captured.

Distribution. — Known from all parts of Sulawesi, as well as from the Banggai Islands (fig. 39).

Etymology. — Sanguinolenta, after the conspicuously scarlet coloured body. Name proposed by Dr. M.A. Lieftinck.

Diplacina torrenticola spec. nov.

(figs. 26, 33-39)

Diplacina bolivari militaris Ris, 1906: 99-100, pro parte (female from "Moluques" only).

Type material. — Holotype male: S. Celebes/Maros waterfalls/Bantimurung/8 Nov 1948/M.A. Lieftinck; in coll. RMNH, ex coll. Lieftinck.

Paratypes: N. Celebes (Minahassa) Pandu-Manado, 1 Aug 1940, 1 female (CdR); N. Sulawesi, Dumoga-Bone National Park: brooklet crossing Huntuk trail, 2 km W of Edward's subcamp, 640 m, 28 Apr 1985-A, 2 males (Van Tol) [1 male in MZB]; Idem, 5 June 1985-A, 1 male (Van Tol); N. Sulawesi, Kotamobagu, E of: small brooklet above PPA bungalow near Danau Mooat, 31 May 1985-A, 1 male (Van Tol); "N" Celebes, Palu, Kalawara, 17 Dec 1912-14 Feb 1913, 1 male 3 females (L. Martin) in SMF, with SMF nos. 17500-17503 [in green ink]; C.W. Sulawesi, Lore Lindu National Park: Palu, 50 km SE of: Dongi Dongi shelter, 7 Dec 1985, 1 female (C. van Achterberg); C. Celebes, Masamba: S. Tomoni near Kalaena, 18 Nov 1940, 1 male (L.L.A. Maurenbrecher); C. Celebes, Palopo, 100 km N of: Lambarese, 3 July 1966, 1 female (R. Straatman); W. Celebes, Polewali, 24 Sep 1940, 1 female (J.J. van der Starre). All paratypes in RMNH, except if stated otherwise.

Other material. — Moluques, 1 female (Lorquin) in IRSN [paralectotype of *Diplacina bolivari militaris* Ris; also with labels "*D. braueri*" and "*Diplacina nigrilabris* Selys"].

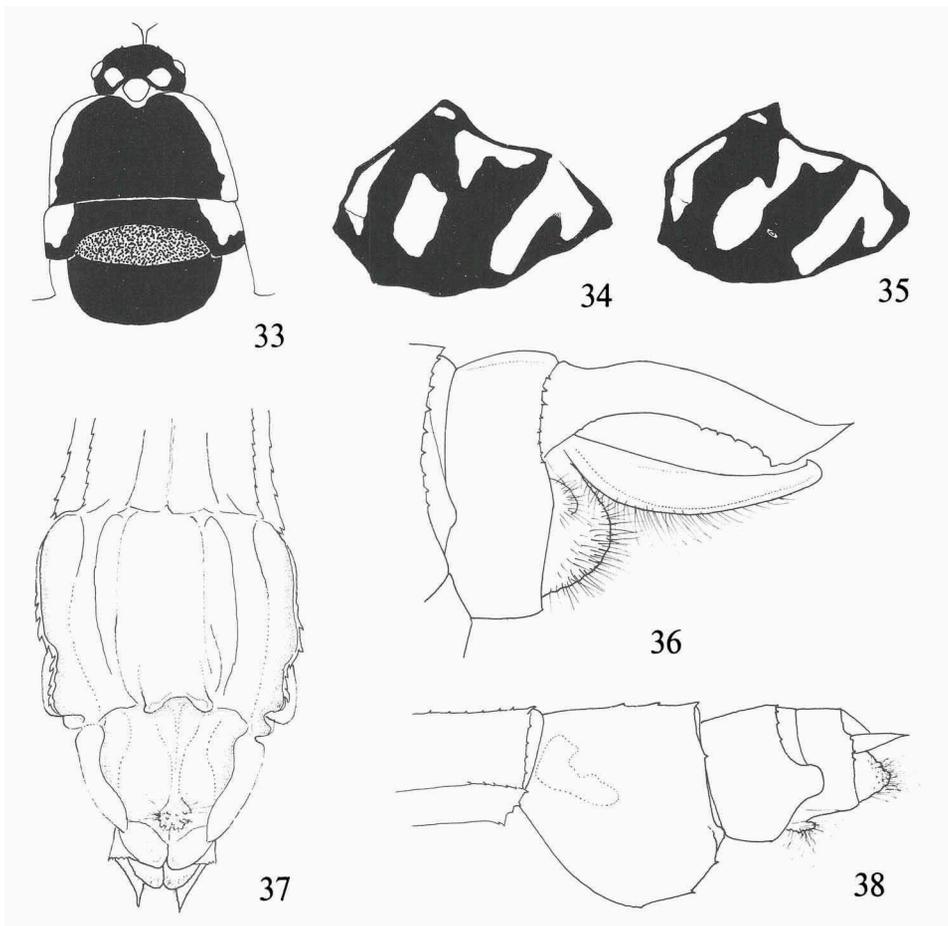
Description (male). — Habitus of *Diplacina militaris*.

Head (fig. 33). Labium and labrum black, both rather dull due to fine micropunctuation; postclypeus shiny black, in the outer corners against the frontoclypeal suture a subrectangular pale yellow marking; anterior border of anteclypeus brown, fading to creamish-white in the basal half. Frons black, blueish metallic with lateral borders for ca. 1/3 bright creamish-white with a central triangular black spot against the eye. Vertex shiny black with an indistinct cream-white oblong spot between the median ocellus and each of the lateral ocelli. Occiput shiny black, rear side with two whitish spots. Eyes brown.

Thorax (figs. 34-35). Base colour black, spots and markings bright creamish-white. Mesepisternum before antealar triangles with crescent shaped spot; antehumeral stripe over mesepisternum and mesinfraepisternum rather broad; on mesepimeron and metepisternum a rectangular marking before stigma, and also a subtriangular marking, with postero-ventral side curved inwards (these markings connected in other specimens, cf. figs. 34 and 35); metepimeron with large triangular marking, in some specimens with sharp ventral incurvation. Wings clear, somewhat darkened in older specimens, characters nearly the same as in *D. m. militaris*.

Abdomen. Segment 1 black with large lateral spots; segment 2 creamish white posteriorly; posterior half with broad dark triangular marking; segment 3 posteriorly with large black triangle, lateral side creamish white, segment 4-10 black with whitish side spots decreasing in size backwards (depending on

specimen no markings from segment 7 or 8), size of markings with considerable individual variation. Accessory genitalia: Lamina anterior black; inner branch of hamulus slender, curved backwards, the tips curved sharply outwards, posterior to the inner branch a relatively large, hardly sclerotized, scale-like structure, outer branch with a shallow longitudinal depression; genital lobe subquadrangular. Anal appendages (fig. 36): superiors with sharp top curved dorsad, ventral side with several short teeth, placed at some distance from each other; inferior rather broad with a somewhat concave top.



Figs. 33-38. *Diplacina torrenticola* spec. nov. — 33, Head in frontal view; 34, Thorax, left lateral view, holotype, Maros waterfalls, Bantimurung; 35, Idem, Dumoga-Bone National Park; 36, Anal appendages male, holotype; 37, Last abdominal segments, female, ventral view; 38, Idem, left lateral view.

Measurements (holotype). Hind wing 32 mm; abdomen (including anal appendages) 25 mm.

Female. — Markings on head and thorax approximately as in male; light coloured thoracal markings somewhat more extensive and more brightly coloured. Lateral spots on abdominal segments 3-8 larger than in the male; segment 2 fully yellow, except for a triangular black marking posteriorly; all

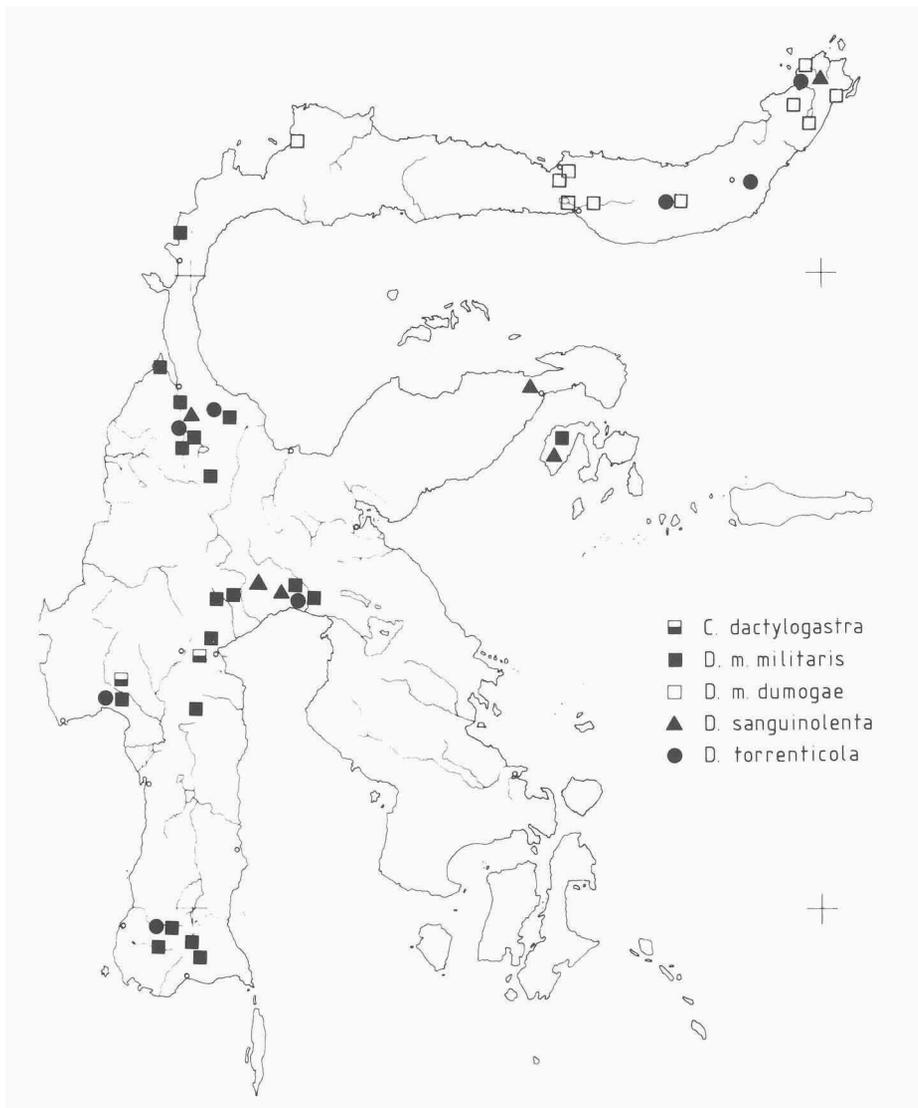


Fig. 39. Distribution of *Celebophlebia dactylogastra* and *Diplacina* species on Sulawesi.

segments with a black ring anteriorly; segment 8 with conspicuous, rounded, black lateral appendages ("wings") (figs. 37-38). Segment 9-10 black.

Differential diagnosis. — Structurally the females are readily distinguishable from its most nearly allied species, *D. militaris*, by the broadened terga of abdominal segment 8 (remining of species in the genus *Lyriothemis*). The male may be distinguished from *D. militaris* and the Philippine species by the shape of the hamulus, and the markings on head and thorax.

Habitat. — Inhabiting very small spring brooks in dense primary forest. The adult insects hardly come to the water, but perch at sunny patches a few metres high in the trees. They are very shy.

Distribution. — Widespread, although apparently uncommon on Sulawesi (fig. 39). The record from the "Moluccas" by Lorquin needs confirmation.

Etymology. — Torrenticola, a latin noun for "inhabitant of mountain streams". Name proposed by Dr. M.A. Liefstinck.

DISCUSSION

In a paper revising part of the genus *Diplacina*, Liefstinck (1953) has divided this genus into three "sections", viz. the *smaragdina*, the *nana*, and the *militaris* section. The distribution of the first section ranges from the Moluccas (Halmahera) eastward to the Bismarck Islands (New Britain). The second section consists, according to Liefstinck (1953), of the type species of this genus and "its three immediate allies, all from the Philippine Islands". The last section was considered to consist of "at least three quite distinct species, of which only one, *militaris* Ris, has yet been made known". This subdivision is different from that earlier proposed by Ris (1909: 94). Ris had argued that the genus falls apart in two groups, viz. a "*nana-smaragdina*" group and a "*bolivari*" group, particularly based on characters in wing venation. Although Liefstinck (1933) obviously agreed with Ris (1909), in his 1953 paper he did not give any reason for changing his opinion in this respect.

After a preliminary examination of the taxa involved, but leaving for the moment a study of related genera, it seems that Ris' subdivision is most soundly based. Table 1 summarizes the characters of the respective species-groups in *Diplacina*. These groups were prearranged according to the easily distinguishable (supposed) autapomorphies (see below). The "*smaragdina*" group consists of all Papuan species (now 17 species). The "*nana*" group includes *D. nana* and *D. lisa* Needham & Gyger. The latter species was included in this group based on the observation in Needham & Gyger (1941), that the triangles are free from cross-veins (although with a few aberrations), in com-

bination with a note in Liefstinck's copy of this publication, from which I understand that the cross-vein in the supratriangle is present in both forewings. Although I have not seen the latter species myself, it seems that both taxa share a relatively strongly developed innerbranch and a reduced outerbranch of the hamulus (cf. fig. 21 in Needham & Gyger, 1941). This can probably be considered as the derived character state. The "*sanguinolenta*" group consists of one species only, characterized by red coloration. The remaining species are united here in the "*bolivari*" group. The strikingly homogeneous structure of the hamulus may be a synapomorphy for the species of this group. The species of the "*bolivari*" group are structurally quite similar, and *D. bolivari* and *D. militaris* are nearly wholly alike in this respect, so that I am unable to follow the splitting into a Philippine and Sulawesi section, as was proposed by Liefstinck (1953). There seems to be no good reason to cluster *D. bolivari* with *D. nana* either.

The phylogeny of the groups in *Diplacina* could now be reconstructed as follows. The monophyly of the *nana* + *smaragdina* group is established by the reduction of the cross-vein in the triangle, and the reduced number of rows of cells proximal to the anal-loop as synapomorphies. The *smaragdina*-group may also be considered as a monophyletic taxon, based on the reduced cross-vein in the supra-triangle of the forewing and the green metallic coloration as autapomorphies. If it is true that *Diplacina* is a monophyletic taxon, three possible relationships have to be taken into account between the *nana* + *smaragdina* group, and the remaining species, (a) it is the sistergroup of the

	Group			
	<i>smaragdina</i>	<i>nana</i>	<i>bolivari</i>	<i>sanguinolenta</i>
Reduced cross-vein triangle	A	A	P	P
Reduced number of rows of cells proximal to anal-loop	A	A	P	P
Reduced cross-vein in supratriangle forewing	A	P	P	P
Green colour	A	P	P	P
Red colour	P	P	P	A

Table 1. Characters in groups in the genus *Diplacina*. A = apomorphic, P = plesiomorphic.

bolivari + *sanguinolenta* group, or (b) the *sanguinolenta*-group is the sistergroup of all other *Diplacina* species, or (c) the *bolivari* group is the sistergroup of all other *Diplacina* species. This question has to remain for the future, since I have not found a synapomorphy for any combination. Because I have not analyzed the related genera either, it may even be true that *Diplacina* will appear to be a polyphyletic taxon. This means that we are still in the same position as Ris (1909), who already sighed about *Diplacina*: "Es scheint ein archaischer Mischtypus, dessen Stellung in System uns viel Kopfzerbrechen machte".

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APPENDIX

Gazetteer

All localities on Sulawesi, except given otherwise.

1°25'N	124°59'E	Airmadidi
0°34'N	123°02'E	Aijer Pan[as] [leg. von Rosenberg]
2°34'S	120°16'E	Baebunta, see Sungai Baebunta
0°52'S	123°23'E	Balantak, distr. Luwuk
1°30'S	123°00'E	Banggai Is
5°02'S	119°40'E	Bantimurung
5°10'S	119°24'E	Berang river (= Djene Berang)
5°02'S	119°40'E	Biseang Labboro
0°33'N	123°08'E	Bone (leg. Von Rosenberg)
		Bone river, Pakoetekang (leg. Steup) [not found probably near Watampone]
5°23'S	120°02'E	Borong Rapao (= Borongroppoa)
0°11'N	119°49'E	Dampelas lake near Sabang
0°44'N	124°27'E	Danau Mooat (PPA bungalow)
1°13'S	120°11'E	Dongi Dongi shelter (15 km ENE of Danau Lindu)
0°34'N	123°54'E	Dumoga Bone National Park
0°35'N	123°50'E	Edward's subcamp, 2 km W of (Project Wallace)
0°33'N	123°05'E	Gorontalo
0°35'N	123°50'E	Huntut trail (see: Edward's subcamp)
1°25'N	125°00'E	Kajoeroja [approximate position; there are two villages with the name Kajoe rojah in the Minahassa, both SE of Manado]
2°27'S	120°49'E	Kalaena river [Masamba area], see Sungai Kalaena
1°10'S	119°55'E	Kalawara (Palu area)
		Kantjiro (Masamba area) [not found]
1°30'S	123°00'E	Kepulauan Banggai
0°46'N	124°21'E	Kotamobagu
1°27'S	119°59'E	Kulawi
0°52'N	122°55'E	Kwandang [= Kuandang]
		Lambarese ("100 km N of Palopo") [not found]
0°37'N	122°57'E	Limbotto [also Limbotol]
5°22'S	119°58'E	Lompobattang area
5°09'S	119°28'E	Makassar [= Ujung Pandang]
5°15'S	119°51'E	Malino
1°54'S	119°56'E	Mamu
3°34'N	125°31'E	Manganitu (Sangihe Is)
1°32'N	124°56'E	Mapanget, Minahassa
1°32'S	120°01'E	Marena shelter [20 km S of Danau Lindu]
1°32'S	120°00'E	Marena river [= Sungai Pebatug], see Sungai Marena
		Margasuka (Masamba area near Kalaena) [also as Margasoeka] [not found]
		Mirabassa, error pro Minahassa
5°00'S	119°34'E	Maros
2°32'S	120°20'E	Masamba
0°48'S	122°39'E	Pagimana
		Pakoetekang [not found]
3°00'S	120°12'E	Palopo [also as Paloppo]
0°54'S	119°52'E	Palu valley

1°33'N	124°49'E	Pandu (near Manado) [also as Pandoe]
0°35'N	122°55'E	Panybie
		Pasui [not found, see remark under Rante Lemo]
5°02'S	119°40'E	Pattunuang Asue [= Batunuangassue]
1°25'S	123°10'E	Peleng Island (Banggai Is)
3°25'S	119°20'E	Polewali, Mandar Gulf
2°59'S	119°54'E	Rantepao
		Rante Lemo [not found; vicinity of Poka Pindjang/Latimodjong Mts; see Flora Malesiana, 1(1): 501]
0°11'N	119°51'E	Sabang
		Saloe Tjimpang (leg. Steup) [not found, close to Pakoetekang, also not found]
1°13'S	120°11'E	Sopu river, see Sungai Sopu
2°34'S	120°16'E	Sungai Baebunta
5°10'S	119°24'E	Sungai Berang
0°33'N	123°08'E	Sungai Bone
1°33'S	120°00'E	Sungai Marena
1°13'S	120°11'E	Sungai Sopu
0°34'N	123°54'E	Sungai Tumpah
		Tabaro, or Sungai Tabaro (Masamba area) [not found]
		Takala mountains [not found, probably Takalar, 5°28'S/119°24'E or Takalala, 4°27'S/119°57'E]
2°56'S	120°06'E	Tojambu [also as Todjamboe]
1°02'N	120°49'E	Toli Toli
5°15'S	119°55'E	Tomaona (Desa E of Malino) [approximate position]
1°19'N	124°49'E	Tomohon
2°27'N	120°51'E	Tomoni
1°19'N	124°54'E	Tondano
1°19'N	124°55'E	Tonsea Lama
0°34'N	123°54'E	Tumpah river, see Sungai Tumpah (incl. Picnic site, waterfall trail) (Project Wallace)