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The species of *Microtrigonia* Förster (Anisoptera, Libellulidae)

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Abstract

Several errors and misinterpretations in available keys, diagnoses and descriptions of species in the libellulid genus *Microtrigonia* Förster are corrected. *M. marsupialis* Förster is known only from the holotype male, *M. petaurina* Lieftinck only from the holotype female, and the only species for which both sexes are known is *M. gomphoides* Lieftinck. A species recently collected in Papua New Guinea, *Microtrigonia curvata* sp. nov. (Holotype ♂ from Yukfon Creek, Hindenburg Range), is described, illustrated and discussed.

Key words

Dragonfly, Libellulidae, *Microtrigonia*, Hindenburg Range, Western Province, Papua New Guinea

Introduction

Microtrigonia Förster, 1903 is a genus of forest-dwelling libellulid dragonflies confined to the island of New Guinea. Three species are currently known, one described by Förster (1903) and two by Lieftinck (1933, 1949). The genus has received virtually no attention since the descriptions of these species more than 60 years ago so the recent collection in Papua New Guinea of an apparently undescribed species of *Microtrigonia* triggered a thorough review of the three known species. During these studies it became clear that a significant character of the type species was reported incorrectly in its original description, and that another correctly-given character was misinterpreted by Lieftinck (1933) and Michalski (2012) in their keys to the species. Here we correct these errors and misinterpretations, and describe the recently collected novelty.



Material and Methods

Descriptive terminology largely follows Watson & O'Farrell (1991). Colouration is given as detectable from the preserved material, supplemented with photographs of specimens taken in life. Measurements are given in millimeters (mm). All illustrations were done with the aid of a camera lucida and are not to scale. Coordinates are presented using the GPS datum WGS 84.

Abbreviations for depositories of type material:

RMNH	Rijksmuseum van Natuurlijke Historie, Leiden
SAMA	South Australian Museum, Adelaide
UMMZ	University of Michigan Museum of Zoology, Ann Arbor
ZMA	Zoölogisch Museum, Amsterdam

Genus *Microtrigonia* Förster

Microtrigonia Förster, 1903: 524 [Type species: *Microtrigonia marsupialis* Förster, 1903].

The generic diagnosis, extended by Ris (1919), is quite satisfactory except that there never is only a single Cu_q in the hind wing. Fortunately the holotype of the type species is not 'inaccessible' as mentioned by Lieftinck (1933) or 'lost' (Michalski 2012). It is in fair condition in UMMZ where the photos presented in Figs 1-5 were taken.

Characteristics clearly separating *Microtrigonia* from all other New Guinean genera: Medium-sized (hind wing 22-30 mm, abdomen 20-25 mm) brown/black and yellow libellulids with 8½-10½/7 antenodals and pterostigma supported by two cross-veins. Forewing: distal antenodal mostly complete, more rarely incomplete; costal side of triangle mostly broken, usually close to distal angle, more rarely unbroken; second Cu_q coinciding or nearly so with proximal angle of triangle; nodus beyond mid-point of wing. Hind wing: 2-3 Cu_q; anal area not greatly expanded, anal field with three rows of cells; anal loop elongate, not stocking-shaped, extending two cells beyond level of triangle.

Microtrigonia marsupialis Förster

Microtrigonia marsupialis Förster, 1903: 526 [Holotype ♂ North East Papua New Guinea, Huon Gulf, Gegagalu, Sattelberg; UZZM].

Part of the original diagnosis of *Microtrigonia*, then a monotypic genus, states: „Im Submedianraum die einzige normale Querader (ebenso im Hinterflügel, dessen Neben-



dreieck trapezförmig ist)“, which translated means, 'in the submedian space the only (one) normal cross-vein (same in hindwing the subtriangle of which is trapezi-form)'. This has caused some confusion because generally the proximal side of the subtriangle is counted as the second Cuq, and this explains why Lieftinck's (1933) and Michalski's (2012) keys to the identification of adult *Microtrigonia* are not working. In addition, the statement “Male type lost, not illustrated” in Michalski (2012) is incorrect.



Fig. 1. *Microtrigonia marsupialis* Förster, Holotype ♂, basal portion of wings, dorsal. Photo by M. O'Brien.

The holotype is located in UMMZ, it was illustrated in the original description and is illustrated here. Examination of the holotype reveals that, when referring to the hindwing subtriangle Förster (1903) considered the second hindwing Cuq of *M. marsupialis* to be part of the subtriangle and therefore did not include it as a Cuq. There are in fact two Cuq in the hindwings of the holotype of *M. marsupialis* (Fig. 1). *M. marsupialis* Förster, is known only from the male holotype.





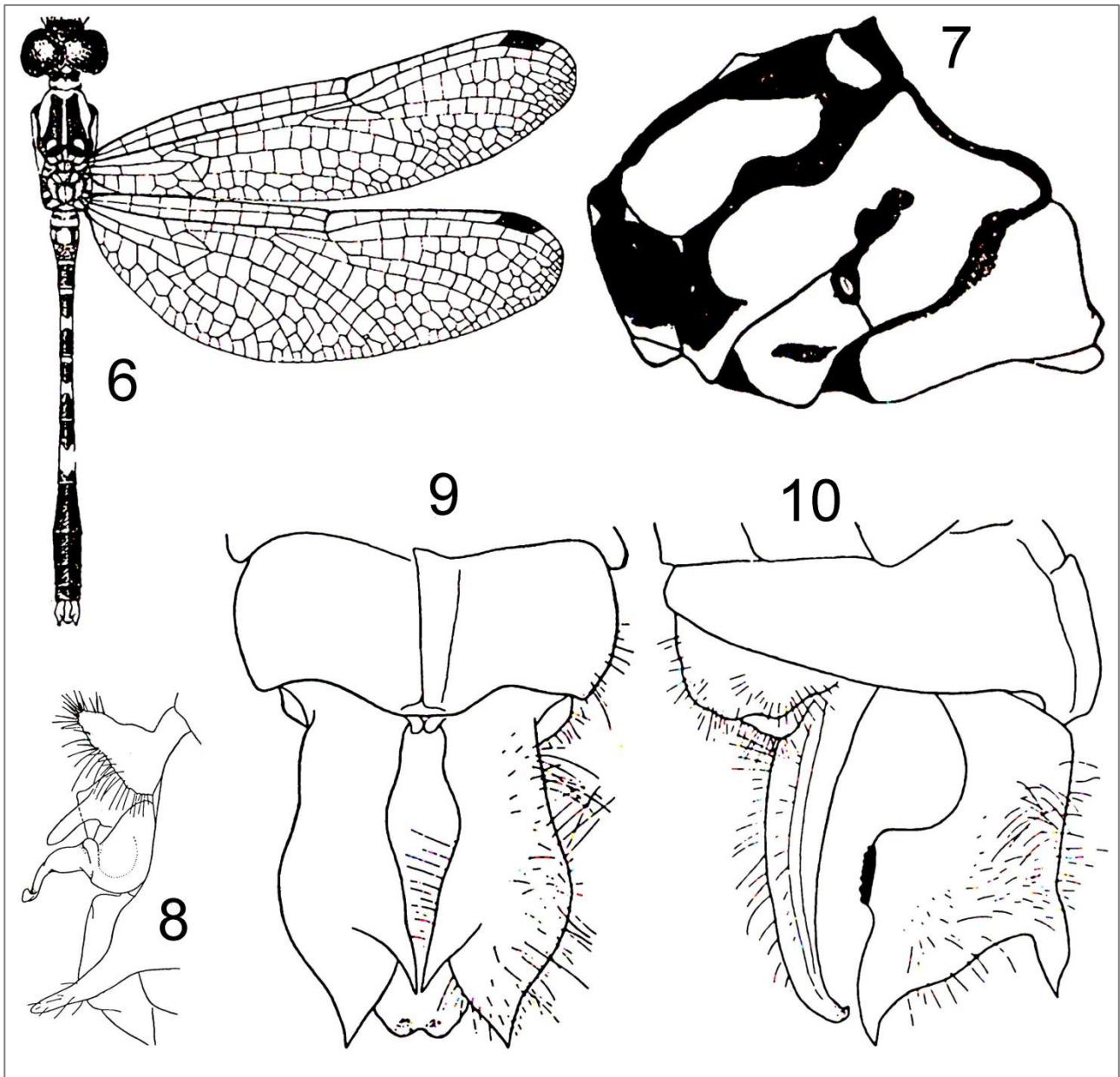
Figs 2-5. *Microtrigonia marsupialis* Förster, Holotype ♂: (2) synthorax, lateral; (3) secondary genitalia, lateral; (4, 5) anal appendages: (4) dorsal; (5) lateral. Photos by M. O'Brien.

***Microtrigonia gomphoides* Lieftinck**

Microtrigonia gomphoides Lieftinck, 1933: 36 [Lectotype ♂: N. New Guinea, Humboldt Bay area, foot of Cycloop Mts, 400 m, IV-VI-1931, W. Stueber; RMNH].

Microtrigonia gomphoides was based on a large series of both sexes from northern New Guinea. Both sexes were described in detail and habitus, synthorax, secondary genitalia and anal appendages of the male were illustrated (Lieftinck 1933, Michalski 2012).





Figs 6-10. *Microtrigonia gomphoides* Lieftinck, ♂: (6) right side, dorsal; (7) synthorax, lateral; (8) secondary genitalia, lateral; (9, 10) anal appendages: (9) dorsal; (10) lateral; all from Lieftinck (1933).

Microtrigonia petaurina Lieftinck

Microtrigonia petaurina Lieftinck, 1949: 8 [Holotype ♀: South West New Guinea, Lorentz River Territ., Bivak no. 3, 700 m, 06-XI-1909, H. A. Lorentz; formerly ZMA, now RMNH].

The unique specimen of *M. petaurina*, a female, was originally referred to *Microtrigonia marsupialis* Förster by Ris (1913). He (Ris 1913) stated that his identification was barely doubtful because the unique specimen completely agrees with the description of *M. marsupialis* except for two characters, the yellow cross-band in the 6th (instead of the 7th) abdominal segment and three (instead of one) Cu_q in the hind wing. In his subsequent diagnosis of *Microtrigonia* Ris (1919) specified one (in line with Förster (1903)) to





Figs 11-12. *Microtrigonia petaurina* Lieftinck, Holotype ♀: (11) head, frontal; (12) synthorax, lateral. Photos by V. Kalkman.



three Cuq in the hind wing and again listed the unique specimen as *M. marsupialis* commenting on the differences from this species that he mentioned earlier (Ris 1913). Lieftinck (1933), when describing *Microtrigonia gomphoides* from a large series, listed the same unique specimen under *Microtrigonia* 'species'. He stated that "this specimen is of high interest inasmuch as, while fully agreeing with the series of *gomphoides* in every respect, according exactly in the arrangement of colours, it differs by the cubital space of the hind wing being traversed by three cross-veins instead of two in all specimens from the northern part of the continent, and of only one in Förster's type of *marsupialis*" and "like *gomphoides* the seventh abdominal segment of this unique specimen is unicolorous brown, and hence it cannot be the female of *marsupialis*, which is still unknown." Accordingly he treated it as a distinct species without giving it a new name. Sixteen years later however, Lieftinck (1949) finally gave this unique female specimen the new name *petaurina*.

During our study of the holotype of *M. marsupialis* it became evident that the description of this species by Förster (1903) was misinterpreted by Ris (1913, 1919) and by Lieftinck (1933, 1949) and that *M. marsupialis* has in fact two Cuq in the hind wing. It also emerged that the original description of abdominal segment 7 by Förster (1903) is incorrect. Segment 7 is unicolorous brown and the yellow cross-band is in segment 6 as in all other *Microtrigonia* species including the one described as new in this paper.

Lieftinck's (1933) description, "agreeing with the series of *gomphoides* in every respect, according exactly in the arrangement of colours" comes a lot closer to the appearance of *M. petaurina* than Ris's (1919) "Thorax licht grünlichgelb; vorne jederseits ein rechteckiger, trüb brauner Fleck, der Mittellinie sehr genähert, vom Flügelsinus etwas weiter entfernt; seitlich eine schmale, die Schulternaht hinten begleitende braune Binde, sonst keine dunkeln Zeichnungen".

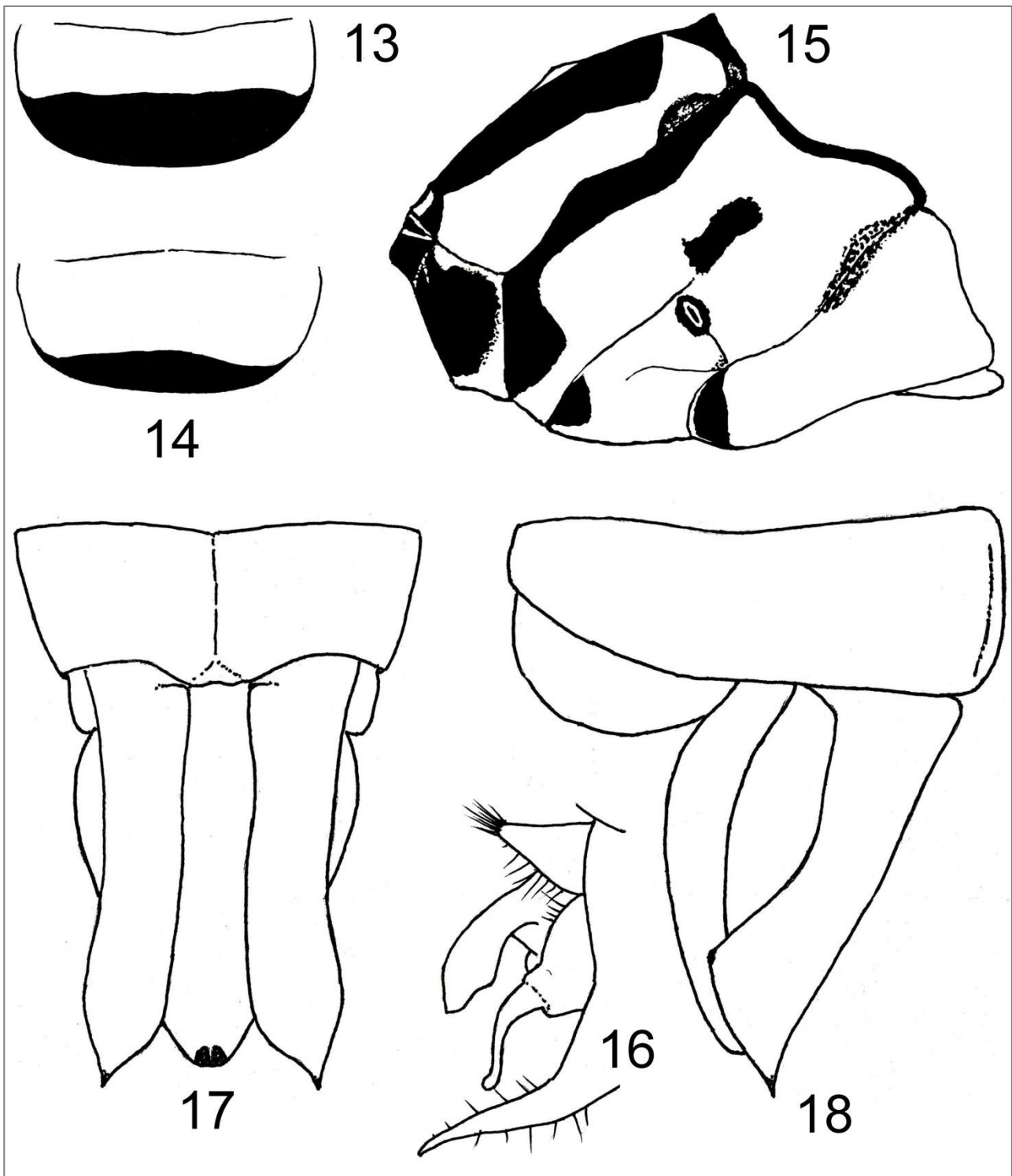
However from the photo (Fig. 12) of *M. petaurina* it emerges that there are more dark elements in the synthoracic pleura of *M. petaurina*. Most significant is that the dark patch along much of the dorsal half of the intersegmental suture also reaches and covers the surrounds of the metastigma and that the dark lining of the metapleural suture apparently does not include approximately its middle half.

Although this specimen is the only known specimen of the species and is clearly close to *M. gomphoides* we retain it as a distinct species until further material is available.

***Microtrigonia curvata* sp. nov.**

Material. - Holotype ♂ (SAMA 07-001307): Papua New Guinea, Yukfon Creek, (5°13.997'S, 141°13.326'E, 735 m asl), 08-II-2013, S.J. Richards (SAMA). Paratypes: Papua New Guinea: 1 ♂ (SAMA 07-001308), same data as holotype; 1 ♀ (SAMA 07-001309), Dablin Creek, (5°12.904'S, 141°13.907'E, 910 m asl), 10-II-2013, S.J. Richards (both SAMA).





Figs 13-18. *Microtrigonia curvata* sp. nov.: (13) ♂, labrum, frontal; (14): ♀, labrum, frontal; (15-18) ♂: (15) synthorax, lateral; (16) secondary genitalia, lateral; (17, 18) anal appendages: (17) dorsal; (18) lateral.

Etymology: Latin *curvatus* = curved, referring to the ventral outline of the penis (in profile).

Male. - Head. Labium pale greenish yellow, narrowly lined with black only along inner anterior corner of palps; face pale yellowish green with approximately ventral half of



labrum (Fig. 13) (line of delimitation almost straight or very widely curved) and dorsal half of anterior frons shiny black; apical portion of mandibles reddish brown to reddish



Figs 19-21. *Microtrigonia curvata* sp. nov., lateral: (19) ♂; (20) ♀; (21) ♂ in life. Photos 19 and 20 by G. Theischinger, photo 21 by S.J. Richards.



black; top of frons, antennae and vertex shiny black; occiput and dorsal portion of postgenae brown, more ventral portion, particularly along lateral margins, greenish yellow.

Thorax - (Figs 15, 16). Prothorax and cervical sclerites pale yellow merging into greyish brown to nearly black, all without marked definition. Synthorax: spiracular dorsum medially broadly pale greenish yellow, laterally black; middorsal carina yellow; antearlar ridge and sinus black; mesepisternum medially black, laterally largely pale greenish yellow (pale patch bottle-necked but not subdivided); other pleura pale greenish yellow lined rather narrowly with black as follows: along all of mesopleural suture, at antero-ventral corner of metakatepisternum and on metepimeron along ventral 1/3 of metapleural suture; less distinctly blackened along dorsal 1/2 of metapleural suture and along intersegmental suture some distance dorsal and slightly anterior of metastigma which may or may not be margined black; most of mesokatepisternum and subalar ridge also black or at least markedly darkened; most of terga pale green; postcoxae and poststernum pale greenish yellow. Legs with coxae, trochanters and inner face of femora pale greenish yellow, lower face of femora black and outer face of femora strongly darkened (almost black) in fore and middle leg, barely darkened (greyish yellow) in hind leg; tibiae inside black otherwise yellow; tarsi largely black, only top and sides of second segment dirty greyish to brownish yellow (least brightened in foreleg); claws with base black merging into brown more apically; all spines and similar structures black. Wings with membrane clear and venation and pterostigma black; pterostigma short, overlying two crossveins; antenodals $8\frac{1}{2}$ - $10\frac{1}{2}$ /7, postnodals 6/5-6; 2 hindwing Cuq; anal loop made up of nine cells; costal side of all discoidal cells broken.

Abdomen - (Figs 18, 21). Dark and pale, variably sharply defined. Basically S1-10 black with rings of greenish yellow as follows: 1 largely green; 2 with posterior ring; 3-4 with narrow anterior and much wider median ring; 5 and 6 with median ring only, that in 6 very wide, and only lateral section of anterior ring detectable; 7 with semicircular ventral patch at mid-length. Sternites 1-6 black and yellow, sternites 7-9 black, bipartite sternite 11 dirty greyish yellow. Secondary genitalia largely yellow, with ventral edge of penis tip rather evenly curved, adjacent ventral process of tergum 2 slim, pointed, very slightly S-curved backward. Anal appendages yellow, superiors hardly longer than inferior; tips and corners blackened, the subapical ventral corner of superiors seemingly armed with only one or two tooth-like structures.

Dimensions. Hind wing 25.6-26.0 mm; abdomen plus appendages 23.2-23.5 mm.

Female - Head (Fig. 20). Much as in male but less than ventral 1/3 of labrum (Fig. 14) black (line of delimitation widely curved) and dark area of frons at most brown.

Thorax - (Fig. 20). Much as in male but outside of fore and middle femora less strongly darkened; wings with $9\frac{1}{2}$ /7 antenodals and 7/6-7 postnodals; anal loop made up of 13 cells.

Abdomen - (Fig. 20). Much as in male but pattern markedly less distinct with pale rings ill-defined and even lateral bits of anterior/posterior pale rings hardly detectable.



Measurements. Hind wing 29.9 mm; abdomen 24.2 mm.

Habitat - All specimens of this species were perched in the sun on low foliage adjacent to, or hanging over, two very steep, torrential rocky mountain streams in foothill rain-forest (700-920 m above sea level) on the southern slopes of the Hindenburg Range, Western Province, Papua New Guinea.

Comparison with other species

Microtrigonia curvata sp. n. can be distinguished from all congeners, including *M. petaurina* (which is unfortunately known only from the female), by a shorter dark element along the interpleural suture that does not reach or cover the surrounds of the metastigma. This character appears to be consistent within the species, for which three individuals are known. It further differs from *M. gomphoides* in the shape of the male anal appendages which are shallow and simple (vs deep and bifid in *gomphoides*). Although the new species (Fig. 16) is similar to *M. marsupialis* (Fig. 3) and *M. gomphoides* (Fig.8) in the general shape of the elements of the secondary genitalia, it differs in details like the simply curved rather wide-tipped penis (vs double-curved, less wide-tipped) and the long, slightly S-curved, rather sharply pointed (vs shorter, more straight, less sharply pointed) ventral process of tergum 2, and further differs from those species in the very short subapical ventral dark armed area on the more obtusely ending superior anal appendages.

Key to the species of *Microtrigonia* Förster

- 1 Dark patch along intersegmental suture not reaching or covering surrounds of metastigma (Figs 15, 19, 20, 21) ***curvata* sp. nov.**
 - Dark patch along intersegmental suture reaching and covering surrounds of metastigma (Figs 2, 7, 12) **2**
- 2 Species (known only from female) with three Cuq in hindwing ***M. petaurina***
 - Species (known from both sexes) with two Cuq in hindwing (Fig.1) **3**
- 3 Male anal appendages shallow and simple (Figs 4, 5) ***M. marsupialis***
 - Male anal appendages deep and bifid (Figs 9, 10) ***M. gomphoides***

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78	2010	Villanueva, Reagan, Philippinen	Stereomikroskop
79	2010	Villanueva, Reagan, Philippinen	Odonata of the Diomabok-Lake region south of Davao, The Philippines Follow-up
80	2011	Villanueva, Reagan, Philippinen	Odonata of the Catanduanes-Island, The Philippines
81	2012	Villanueva, Reagan, Philippinen	Odonata of Dinapigue, The Philippines
82	2012	Dow, Rory, UK/The Netherlands	Odonata of Kalimantan, Borneo, Malaysia
83	2012	Marinov, Milen, Christchurch	Odonata species diversity of the "Eua Island, Kingdom of Tonga"
84		Marinov, Milen, Christchurch	Odonata of Solomon Islands
85	2012	Villanueva, Reagan, Philippinen	Odonata from Talaingod, Davao del Norte, Mindanao Island, Philippines
86	2012	Do Manh, Cuong, Hanoi, Vietnam	Mau Son Mountain Odonata, Vietnam
87	2012/13	Villanueva, Reagan, Philippinen	Odonata fauna Mt. Lomot and Mt. Sumagaya, The Philippines
88	2013	Anna Rychla, Ukraine	Vorkommen der Arktischen Smaragdlibelle <i>Somatochlora arctica</i> (Zetterstedt, 1840) in Planregenmooren der polnischen Ostseeküste (<i>S. arctica</i> in bogs along the coast of Polish Baltic Sea)
89	2013	Vincent Kalkman/A.B. Orr, The Netherlands/Australia	Field guide New Guinea Zygoptera
90	2013	Oleg Kosterin, Russia	Progress study Cambodia 2013
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95	2013	Garrison, Rosser/von Ellenrieder, Natalia, Sacramento, USA	The genus <i>Argia</i> in Costa Rica
96	2013	Villanueva, Reagan, Philippinen	Odonata of Surigao del Sur, Philippines
97	2014	Dawn, Prosenjit, Kolkata, India	Rheophilous Odonata diversity of protected areas of Chhattisgarh, India
98	2014	Dow, Rory, UK/The Netherlands	Sarawak Odonata – documenting the status quo Odonata diversity prior logging"
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