

Revision of New Guinea *Copelatus* ERICHSON, 1832 (Insecta: Coleoptera: Dytiscidae): The running water species, Part I

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"To an ecologist, and to all biologists,
it is a happy hunting ground
of endless surprises
and unanswered questions".

J.L. GRESSIT 1982, talking about New Guinea.

Abstract

Copelatus (*Papuadytes*), new subgenus, is erected to receive the New Guinea running water species of the genus *Copelatus* ERICHSON, 1832. *Copelatus atratus* BALFOUR-BROWNE, 1939 and *C. nomax* BALFOUR-BROWNE, 1939 were assigned to that subgenus here. Thirty-one new *Papuadytes* species are described: *Copelatus aipo* sp.n., *C. aipomek* sp.n., *C. ascendens* sp.n., *C. astrophallus* sp.n., *C. bacchusi* sp.n., *C. broschii* sp.n., *C. casuarinus* BALKE & HENDRICH sp.n., *C. damantiensis* sp.n., *C. danae* sp.n., *C. erteldi* sp.n., *C. formosus* sp.n., *C. fume* sp.n., *C. heidiae* sp.n., *C. inornatus* sp.n., *C. jaseminae* sp.n., *C. karmurensis* sp.n., *C. ketembang* sp.n., *C. larsoni* sp.n., *C. manfredi* sp.n., *C. me* sp.n., *C. miriae* sp.n., *C. monae* sp.n., *C. patepensis* sp.n., *C. rivulus* sp.n. (type species), *C. rufus* sp.n., *C. sanctimontis* sp.n., *C. speciosus* BALKE & HENDRICH sp.n., *C. takime* sp.n., *C. talaki* sp.n., *C. tarmluensis* sp.n., *C. ullrichi* sp.n. Important characters are illustrated. What is known on the species ecology is summarized.

Key words: Dytiscidae, genus *Copelatus*, *Papuadytes*, revision, new species, new subgenus, New Guinea.

Zusammenfassung

Für die Fließwasserarten auf Neu Guinea der Gattung *Copelatus* ERICHSON, 1832 wird die neue Untergattung *Papuadytes* errichtet. Die bereits bekannten Arten *Copelatus atratus* BALFOUR-BROWNE, 1939 und *C. nomax* BALFOUR-BROWNE, 1939 werden hier in diese Untergattung gestellt. Einunddreißig neue *Papuadytes*-Arten werden beschrieben: *Copelatus aipo* sp.n., *C. aipomek* sp.n., *C. ascendens* sp.n., *C. astrophallus* sp.n., *C. bacchusi* sp.n., *C. broschii* sp.n., *C. casuarinus* BALKE & HENDRICH sp.n., *C. damantiensis* sp.n., *C. danae* sp.n., *C. erteldi* sp.n., *C. formosus* sp.n., *C. fume* sp.n., *C. heidiae* sp.n., *C. inornatus* sp.n., *C. jaseminae* sp.n., *C. karmurensis* sp.n., *C. ketembang* sp.n., *C. larsoni* sp.n., *C. manfredi* sp.n., *C. me* sp.n., *C. miriae* sp.n., *C. monae* sp.n., *C. patepensis* sp.n., *C. rivulus* sp.n. (Typusart), *C. rufus* sp.n., *C. sanctimontis* sp.n., *C. speciosus* BALKE & HENDRICH sp.n., *C. takime* sp.n., *C. talaki* sp.n., *C. tarmluensis* sp.n., *C. ullrichi* sp.n. Alle wichtigen Strukturen werden abgebildet. Es wird zusammengefaßt, was derzeit zur Ökologie der Arten bekannt ist.

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Introduction

At present, 18 species of *Copelatus* are known from mainland New Guinea, islands offshore, and the Bismarck Archipelago (GUIGNOT 1956, GUÉORGUIEV 1968, 1978, GUÉORGUIEV & ROCCHI 1993). Several expeditions I carried out in New Guinea and a subsequent screening of museum collections revealed a large number of additional species. This had to be expected as the Copelatinae, especially the genus *Copelatus*, are one of the most species-rich groups of Dytiscidae in areas under tropical and subtropical climates. Some 500 species of Copelatinae have been named; and the discovery of numerous new species is fully being expected.

This is the first part of a revision dealing with New Guinean *Copelatus*. It treats a morphologically and ecologically rather distinct group of species; i.e. small beetles which 1.) always lack elytral striae and / or striae, 2.) have a symmetrical median lobe of aedeagus in dorsal / ventral view and 3.) are always associated with running water. I here erect *Papuadytes*, new subgenus of *Copelatus*, for taxonomic purposes. Monophyly of this subgenus will be shown in a cladistic analysis within part II. of the revision of rheobiotic New Guinea *Copelatus*.

Materials and Methods

This study is based on some 1500 individuals. Besides in the collections mentioned in the text, by 1999 reference specimens will be deposited in the Zoological Museum of Bogor (Indonesia) and the PUSPPENSAT-IRJA reference collection, Nabire, Irian Jaya, Indonesia.

Collections

BMNH - The Natural History Museum (formerly British Museum, Natural History), London, UK. (Mr S.J. Hine)

cGW - Collection of Prof. Dr Günther Wewalka, Vienna, Austria

cHF - Collection of Dr Hans Fery, Berlin, Germany

cLH - Collection of Lars Hendrich, Berlin, Germany

cMB - Author's collection

MCSN - Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy. (Dr. R. Poggi)

MHNG - Muséum d'Histoire Naturelle, Geneva, Switzerland. (Dr. I. Löbl)

NMW - Naturhistorisches Museum Wien, Austria. (Dr. M.A. Jäch)

Measurements were taken with the beetle in a horizontal position using a Wild M8 binocular with an ocular micrometer (12 mm with 0.1 mm steps) at 25 x.

I prefer to provide the total length minus head (Tl-h) because the total length including the head strongly depends on the head's actual orientation. Tl-h is about 90 - 96 % of the total length.

Illustrations of the genitalia, tarsomeres and prosternal processes were traced from SEMs taken with a Philips SEM 515 at 120 x. Drawings of the antennae were made with a drawing tube attached to a Leitz Laborlux K, 63 x.

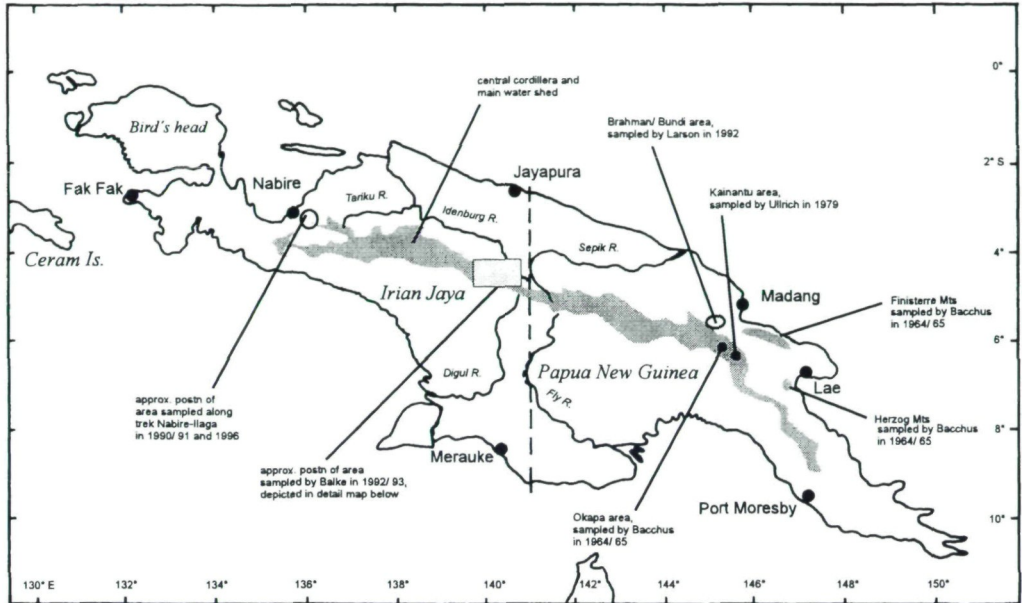


Fig. 1: Approximate position of locations from which specimens were sampled so far. Most smaller ranges omitted.

When referring to the ventral aspect of the median lobe of aedeagus the orientation during copulation is considered.

Abbreviations

Morphology: Lp - length of pronotum medially; MesoT - mesotarsomere; ProT - protarsomere; Tl-h - total length of beetle minus head; TW - total width of beetle; Wpb - width of pronotum basally.

Others: a.s.l. - above sea level; IR 90#11, IR 92#11 etc. - codes of sampling sites for which a separate checklist is available (from author or NMW); PNG - Papua New Guinea.

Geographical localization of sampling sites

Two maps are here provided for orientation (Figs. 1, 2). Different sources were consulted to locate stations sampled:

Irian Jaya

- The Nabire area explored by L. Hendrich and myself in 1990/91, and re-visited by me in 1996, can hardly be located on available maps. The sites are all situated along the road from Nabire to Ilaga, which is still under construction. I provide the kilometre distance from Nabire as indicated on tables along the road for the stations sampled. In some cases, I was able to locate positions with a GPS satellite navigation device, at least 3 satellites being used (3 D mode).

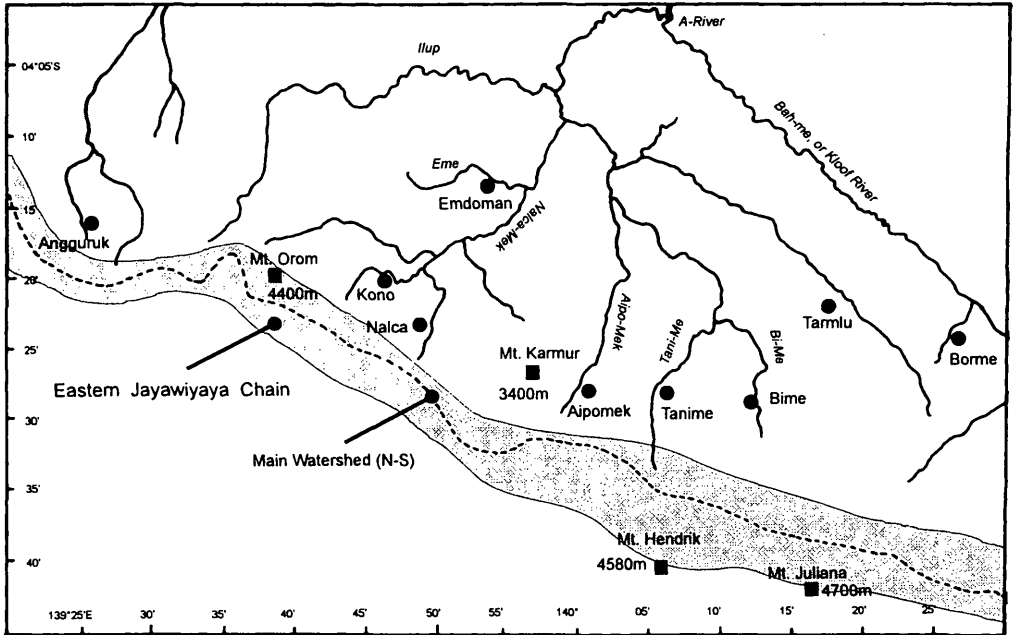


Fig. 2: Detail map of E central WNG depicting the area sampled by Balke in 1992/93, roughly marked as grey rectangle on Fig. 1.

- The area I visited in 1992/93 is covered by a Landsat-1-scenes based map provided by HELMCKE & al. (1983), which is probably the best map available at the moment (map Eastern Jayawijaya and Western Sepik regions). I have redrawn the area sampled for better orientation (Fig. 2).

PNG

- Stations visited by M. Bacchus were, when possible, located on Tactical Pilotage Charts (TPC) M-13B, M-13C, and M-14D. The same is true for the areas visited by W. Ullrich, and D.J. Larson. These maps are available from large bookstores.

I was unable to locate PNG: Mafulu (type locality of *C. nomax*) and PNG: Sepik Province: Selminum tem (sp. 4, see appendix).

Taxonomy

I here mainly provide a detailed description of those characters which are present in all the species studied. Species descriptions are thus rather short and contain characters of diagnostic value only. The group studied here is rather homogenous, so that the male genitalia need to be examined for reliable species identification in most cases. Often, females cannot be assigned to species.

***Papuadytes* subgen.n.**

Type species: *Copelatus (Papuadytes) rivulus*, sp.n., by present designation.

Diagnosis: Body elongate oval, unicolorous, reddish to dark brown or castaneous. Dorsal surface without striae and / or strioles. Median lobe of aedeagus of male symmetrical in most species (exception: *C. astrophallus*). Pro- and mesotarsomeres of male not dilated (exception: *C. ullrichi*). Always associated with running water.

Preimaginal stages: unknown.

Size of beetles: Tl-h: 3.12 - 5.92 mm. Refer to Table 1 for more measurements.

Head: Clypeus slightly concave anteriorly, not beaded. Frons with two short rows of setiferous punctures present laterally on level of front edge of eyes. A distinct row of punctures visible alongside of lateral and anterior margin of the eyes. Surface covered with small regular meshes. These are rather more deeply incised posteriorly behind level of middle of eyes, and especially laterally behind posterior margin of eyes. Puncturation visible. Punctures are not evenly distributed but generally more numerous on posterior portion than anteriorly. Punctures absent laterally behind posterior margin of eyes. Colour ferruginous to castaneous brown, somewhat darker behind the eyes.

Mentum distinctly microreticulate, anterior margin beaded medially; medially between the labial palps with anterior margin slightly to distinctly concave and distinctly beaded (Fig. 7).

Labium in ventral view with anterior margin gently rounded to somewhat tectiform, densely setose along anterior margin except for lateral angles; medio-laterally with few setae on both sides; medially convex and microreticulate, smooth and concave laterally (Fig. 7). Dorsally with anterior margin spiny, and lateral margins densely setose.

Labrum strongly concave medially (Fig. 7). Dorso-medially densely setose; ventro-medially with a field of spines anteriorly and densely setose posteriorly; ventro-laterally with few spines.

Mandibles stout, triangular, slightly elongate. Inner margins densely setose ventrally; subapically also with an isolated setal field. For shape see Fig. 7.

Lacinia with deeply impressed meshes medio-basally, medio-anteriorly densely covered with small spiny scale-like structures. Surface otherwise smooth. Basally with numerous short, stout setae (some 10 - 20). Inner margin densely setose, setae all long and more or less stout. Apically with a second, inner, setal row (Fig. 7).

Antenna eleven-jointed. Antennomeres long and slender and/or globular. Some antennomeres may be greatly enlarged in the male, but females with slightly enlarged antennomeres also occur. In some species, male and female antennae are equal in size and shape, but sexual dimorphism with at least some male antennomeres being larger than corresponding female joints is common. Refer to Figures 8 - 16 and species descriptions for detailed information.

Pronotum: Distinct lateral bead present in most species, but obsolescent or reduced in some. Refer to systematic analysis for detailed information. Widest at base or almost at base, continuously narrowing towards anterior margin. Anterior angle acute, posterior

Taxon	n	TL-h (mean)	TW (mean)	Lp (mean)	Wpb (mean)
<i>aipo</i>	10	4.12-4.48 (4.29)	2.20-2.44 (2.32)	0.64-0.72 (0.68)	1.92-2.12 (2.02)
	1	4.12-4.32 (4.23)	2.28-2.32 (2.30)	0.64-0.68 (0.65)	2.00-2.08 (2.03)
<i>aipomek</i>	4	4.00-4.16 (4.07)	2.16-2.24 (2.20)	0.64-0.68 (0.67)	1.96-2.04 (1.97)
	1	3.92	2.16	0.64	2.04
<i>ascendens</i>	5	5.52-5.76 (5.60)	2.80-2.92 (2.86)	0.80-0.84 (0.83)	2.40-2.48 (2.45)
	4	5.32-5.60 (5.40)	2.68-2.96 (2.85)	0.76-0.80 (0.79)	2.24-2.48 (2.39)
<i>astrophallus</i>	5	3.76-3.88 (3.81)	2.02-2.12 (2.08)	0.60-0.68 (0.63)	1.80-1.92 (1.87)
	2	3.68-3.80	2.04	0.60-0.64	1.80-1.84
<i>atratus</i>	3	4.15-4.40 (4.34)	2.25-2.40 (2.35)	?	1.90-2.10 (2.01)
	1	4.4	2.4	?	2.1
<i>bacchusi</i>	2	3.40-3.64	1.92-2.08	0.56-0.60	1.68-1.80
	4	3.44-3.64 (3.53)	1.96-2.00 (1.97)	0.56-0.60 (0.57)	1.68-1.80 (1.71)
<i>broschii</i>	3	3.48-3.56 (3.52)	1.84-1.88 (1.86)	0.60	1.68-1.72 (1.71)
	1	3.40	1.84	0.60	1.70
<i>casuarinus</i>	3	3.80-4.08 (3.92)	2.12-2.24 (2.18)	0.68-0.72 (0.70)	1.84-1.88 (1.86)
	0	?	?	?	?
<i>damantinensis</i>	5	3.88-4.36 (4.08)	2.08-2.32 (2.22)	0.60-0.72 (0.67)	1.80-2.04 (1.93)
	Stn 38	5	4.06-4.24 (4.16)	2.20-2.36 (2.27)	0.66-0.68 (0.67)
	5	4.16-4.36 (4.30)	2.28-2.36 (2.32)	0.64-0.70 (0.68)	1.96-2.04 (2.01)
	5	4.24-4.44 (4.34)	2.28-2.40 (2.32)	0.64-0.70 (0.68)	1.96-2.04 (1.99)
	5	3.92-4.48 (4.22)	2.08-2.40 (2.30)	0.60-0.72 (0.65)	1.84-2.08 (1.99)
	1	4.36	2.36	0.68	2.04
<i>danae</i>	5	3.40-3.68 (3.58)	1.84-2.00 (1.93)	0.52-0.60 (0.56)	1.68-1.74 (1.71)
	5	3.60-3.76 (3.64)	1.84-2.04 (1.92)	0.60	1.68-1.76 (1.74)
<i>erteldi</i>	10	3.40-3.68 (3.58)	1.88-2.08 (1.98)	0.60-0.64 (0.62)	1.68-1.84 (1.77)
	10	3.48-3.60 (3.54)	1.92-2.00 (1.95)	0.56-0.62 (0.59)	1.68-1.76 (1.72)
<i>formosus</i>	6	4.64-4.96 (4.86)	2.48-2.56 (2.52)	0.68-0.80 (0.77)	2.12-2.20 (2.18)
	2	4.68	2.50	0.68-0.72	2.08-2.12
<i>fume</i>	7	3.88-4.48 (4.15)	2.08-2.44 (2.26)	0.60-0.72 (0.68)	1.84-2.08 (1.98)
	6	3.96-4.28 (4.07)	2.04-2.32 (2.23)	0.64-0.76 (0.69)	1.84-2.00 (1.93)
<i>heidiae</i>	8	4.36-4.88 (4.68)	2.32-2.68 (2.51)	0.68-0.76 (0.72)	2.04-2.32 (2.20)
	1	4.44	2.32	0.68	2.00
<i>inornatus</i>	5	3.92-4.04 (3.98)	2.08-2.12 (2.10)	0.64-0.68 (0.65)	1.84-1.88 (1.87)
	3	3.92-4.08 (4.02)	2.08-2.12 (2.10)	0.60-0.68 (0.64)	1.88-1.92 (1.90)
<i>jaseminae</i>	3	3.80-3.88 (3.83)	2.04-2.16 (2.11)	0.60-0.64 (0.62)	1.84-1.88 (1.87)
	2	3.84-4.00	2.08-2.24	0.62-0.64	1.70-1.96

Table 1: *Papuadytes* spp., measurements, upper line males, lower females.

angle rounded. Anterior margin convex, gently rounded. Pronotal base almost straight sided. No striae or striae present (Fig. 3). Surface with meshes and puncturation as on elytron, puncturation generally more dense laterally than on disc. Margins with a row to dense band of large punctures, distinctly interrupted baso-medially and somewhat discontinuous baso-laterally. Laterally-submarginally more or less depressed.

Elytron: Strioles and striae absent (Fig. 3). Surface covered with small regular meshes, which are only weakly impressed in most species, elytra then shiny. The meshes are more deeply incised in few species, which thus appear dull. Puncturation visible (Figs. 4 - 6). The punctures are almost evenly distributed, and the density of puncturation varies from sparse and rather fine (majority of species) to dense and coarse within the genus. The diameter of punctures is distinctly smaller than that of the meshes in general; but in a few species, diameter of punctures equals that of meshes. Surface with a discal, a median, a lateral, and a marginal row of large setiferous punctures that join apically.

Taxon	n	TL-h (mean)	TW (mean)	Lp (mean)	Wpb (mean)
<i>karmurensis</i>	8	5.00-5.28 (5.13)	2.56-2.88 (2.73)	0.80-0.88 (0.84)	2.36-2.48 (2.40)
IR92#10	8	4.64-5.16 (5.00)	2.52-2.84 (2.69)	0.68-0.88 (0.80)	2.20-2.44 (2.31)
IR92#44	3	5.04-5.30 (5.14)	2.68	0.76-0.90 (0.85)	1.96-2.48 (2.43)
	4	4.60-5.32 (5.11)	2.48-2.76 (2.70)	0.72-0.88 (0.80)	2.20-2.44 (2.31)
<i>ketembang</i>	4	3.92-4.00 (3.96)	2.08-2.16 (2.12)	0.60-0.64 (0.62)	1.88-1.92 (1.90)
	2	4.12-4.24 (4.18)	2.24-2.28 (2.26)	0.68	1.92-2.00 (1.96)
<i>larsoni</i>	3	3.44-3.48 (3.47)	1.88-1.92 (1.91)	0.56-0.60 (0.58)	1.68-1.72 (1.70)
	3	3.52-3.56 (3.54)	1.92	0.56-0.60 (0.58)	1.68
<i>manfredi</i>	3	3.68-3.96 (3.81)	1.96-2.12 (2.05)	0.68	1.80-1.92 (1.87)
	8	3.56-3.96 (3.74)	1.96-2.12 (2.01)	0.60-0.72 (0.64)	1.80-1.96 (1.85)
<i>me</i>	8	4.20-4.60 (4.40)	2.20-2.48 (2.35)	0.72-0.84 (0.76)	2.00-2.12 (2.08)
	0	?	?	?	?
<i>miriae</i>	2	4.20-4.36	2.28-2.36	0.64-0.72	2.00
	2	4.16-4.24	2.28-2.32	0.64	1.96-2.04
<i>monae</i>	5	3.76-3.92 (3.90)	2.00-2.16 (2.09)	0.60-0.66 (0.63)	1.76-1.88 (1.84)
	4	3.76-4.00 (3.88)	1.96-2.16 (2.08)	0.60-0.64 (0.63)	1.76-1.88 (1.83)
<i>nomax</i>	0	?	?	?	?
	1	3.65	2.00	?	1.75
<i>patepensis</i>	4	4.00-4.16 (4.10)	2.20-2.28 (2.25)	0.64-0.68 (0.66)	1.88-2.00 (1.96)
	0	?	?	?	?
<i>rivulus</i>	11	3.92-4.32 (4.16)	2.08-2.32 (2.21)	0.64-0.70 (0.66)	1.84-2.00 (1.90)
	8	3.96-4.28 (4.07)	2.04-2.28 (2.17)	0.60-0.68 (0.66)	1.76-1.96 (1.86)
<i>rufus</i>	4	3.48-3.52 (3.50)	1.92-2.04 (1.97)	0.60-0.64 (0.62)	1.76-1.84 (1.79)
	0	?	?	?	?
<i>sanctimontis</i>	10	4.00-4.28 (4.12)	2.00-2.24 (2.16)	0.60-0.68 (0.65)	1.84-1.96 (1.91)
	0	?	?	?	?
<i>speciosus</i>	10	4.32-4.76 (4.49)	2.40-2.69 (2.46)	0.76-0.86 (0.80)	2.20-2.36 (2.27)
	19	3.92-4.44 (4.15)	2.16-2.52 (2.31)	0.64-0.80 (0.71)	1.96-2.24 (2.08)
<i>takime</i>	8	4.12-4.44 (4.30)	2.32-2.40 (2.35)	0.64-0.68 (0.66)	1.92-2.08 (2.01)
	3	4.04-4.44 (4.28)	2.18-2.48 (2.35)	0.68-0.72 (0.69)	1.92-2.12 (2.02)
<i>talaki</i>	1	3.32	1.80	0.60	1.64
	3	3.40-3.44 (3.42)	1.80-1.88 (1.85)	0.60-0.64 (0.642)	1.64-1.68 (1.65)
<i>tarmluensis</i>	6	3.80-4.16 (3.98)	2.08-2.20 (2.14)	0.60-0.68 (0.64)	1.80-1.96 (1.89)
	0	?	?	?	?
<i>ullrichi</i>	6	5.32-5.92 (5.46)	2.76-2.84 (2.81)	0.80-0.88 (0.85)	2.36-2.52 (2.41)
	1	5.36	2.80	0.80	2.40

Table 1: continued.

Unicolourous, castaneous brown to dark brown or blackish, sometimes ferrugineous. Elytral epipleura broad anteriorly, strongly narrowing at about level of sternite 2, thus rather narrow posteriorly.

Flight wings: Well-developed. The wing venation (Fig. 17) reflects the ground pattern of the Dytiscidae (see also F. BALFOUR-BROWNE 1943), which is also present in other Copelatinae species examined (*Copelatus haemorrhoidalis* (F.), *C. uludanuanus* BALKE & HENDRICH, 1995, and *Lacconectus* sp.).

Prosternum: Ridge gently rounded, but in two species sharp. Ridge with distinct lateral extensions anteriorly in some species, only somewhat thickened in others. Prosternal process lanceolate, distinctly beaded, with a slight longitudinal convexity (Fig. 24). Distinctly concave only in *C. formosus* (Fig. 23). Prosternal process with few short setae laterally; numerous long setae present in *C. speciosus*; *C. formosus* lacks setae.

Metasternum: Surface sculpture of somewhat diagonal-transverse orientated meshes. Metasternal wings tongue-shaped, rather slender.

Metacoxa: Surface sculpture of diagonal-longitudinal orientated meshes, numerous striae of same orientation, few diagonal-transverse shallow rugae, and generally few small punctures. Puncturation moderately dense in some species.

Metacoxal process: Posterior margin of lobe distinctly incised.

Metacoxal line: Distinct, slightly diverging and somewhat obsolete in some species anteriorly.

Sternites: The sternites (Figs. 19 - 21) are microreticulate and have diagonal or longitudinal, sometimes transversal, lateral striae of varying number. Striae are generally less numerous in females, where they are sometimes absent from sternite 6.

Sternite 7 gently rounded posteriorly in most species, but slightly concave to distinctly incised in a few species. A diagonal row of setiferous punctures present on either side postero-laterally. Few to many lateral striae present in male, not present in females of most species, but sometimes 1 - 2 striae present which may however also vary intraspecifically; orientation of striae generally diagonal. Surface sculpture of regular meshes, meshes diagonal between striae, and transverse laterally at base. Fine to dense puncturation present; maximum diameter of punctures more or less equal to diameter of meshes.

Protibia: Anterior margin somewhat serrate. Antero-laterally with a dense comb of short and stout setae, venter antero-laterally with 2 long setae sub-distally and 1 - 3 long setae sub-basally, some 6 - 10 short and stout setae ventrally, distally with acute spurs of different length except for ventro-posterior part. Protibia dorsally with numerous short setae, forming a sparse to comparably dense row postero-laterally.

Metatarsus: A dorsal and a ventral row of long natatorial setae are present in both sexes. Posterior angles of metatarsomeres 1 - 4 are straight. Protarsal claws slightly curved, subequal in length.

Male: Protibiae with inner margin straight, not sinuate basally (Fig. 18). Male ProT (Fig. 22) and MesoT 1 - 3 not strongly laterally expanded but stouter than in female and appearing somewhat globular (exception: *C. ullrichi*, slightly expanded, Fig. 29). ProT 4 and MesoT 4 cylindrical, narrow (exception: *C. ullrichi*, slightly expanded, Fig. 29). ProT and MesoT 5 long and narrow (exceptions: *C. aipo*, *C. karmurensis*, sp. 6, sp. 7: rather stout, Figs. 25, 28). Four rows of stalked adhesive discs present ventrally on these tarsomeres. Number per row and tarsomere to which the stalks are attached is: 3 (1)/ 4(1)/ 4(2)/ 4(3). Insertions of stalks covered by scale-like, flat protrusion of tarsomere. ProT 1 bears 1 - 2 setae baso-ventrally. ProT 2, 3 bear 4 short setae ventro-medially. Each of ProT 1 - 3 bears 2 - 3 long setae on either side laterally. ProT 4 bears a hook on the anterior angle (hook indistinct: *C. aipo*-group) which is associated with a stout curved and a shorter seta laterally (Fig. 22), at the base of the hook 1 up to some 10 setae are situated which vary from rather short to long; posto-disto-laterally, a stout curved and a short seta are present, with 1 to 6 setae being present near the insertion of the curved seta. ProT 5 in most species densely setose ventrally, with but a few short and stout setae in some species, and with few very stout setae in others. Structure of ProT 5 is in detail described for each species below.

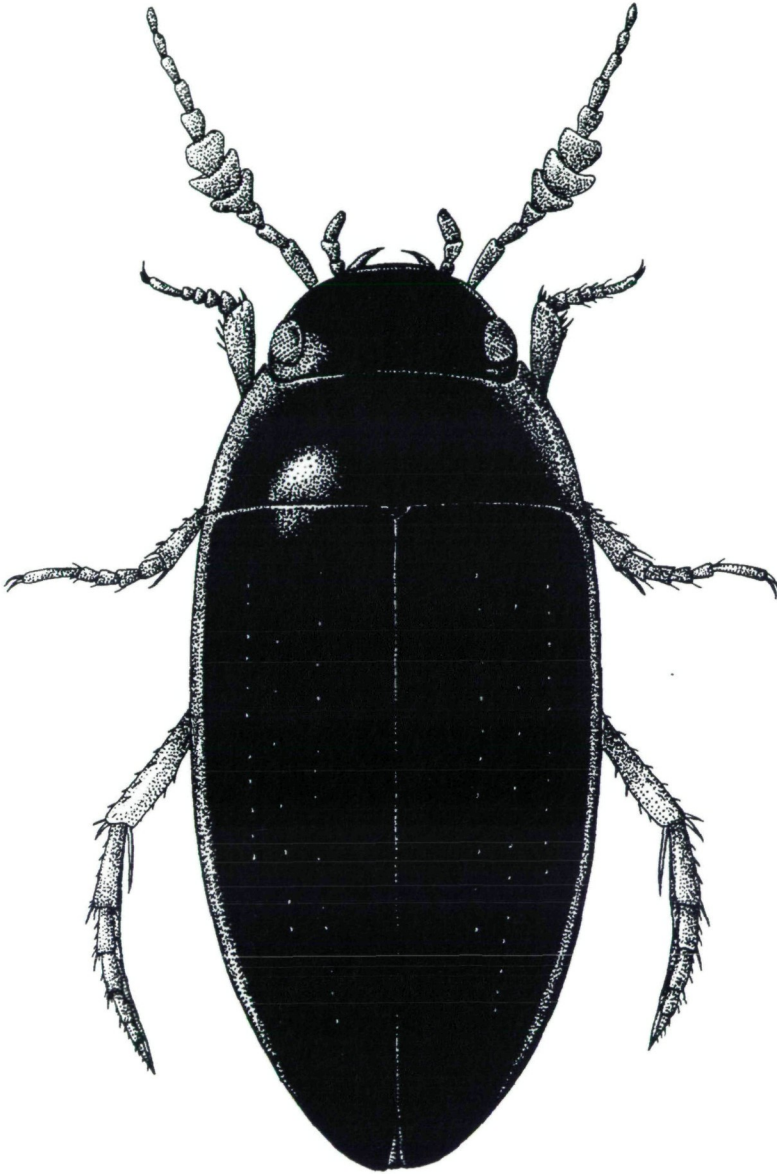
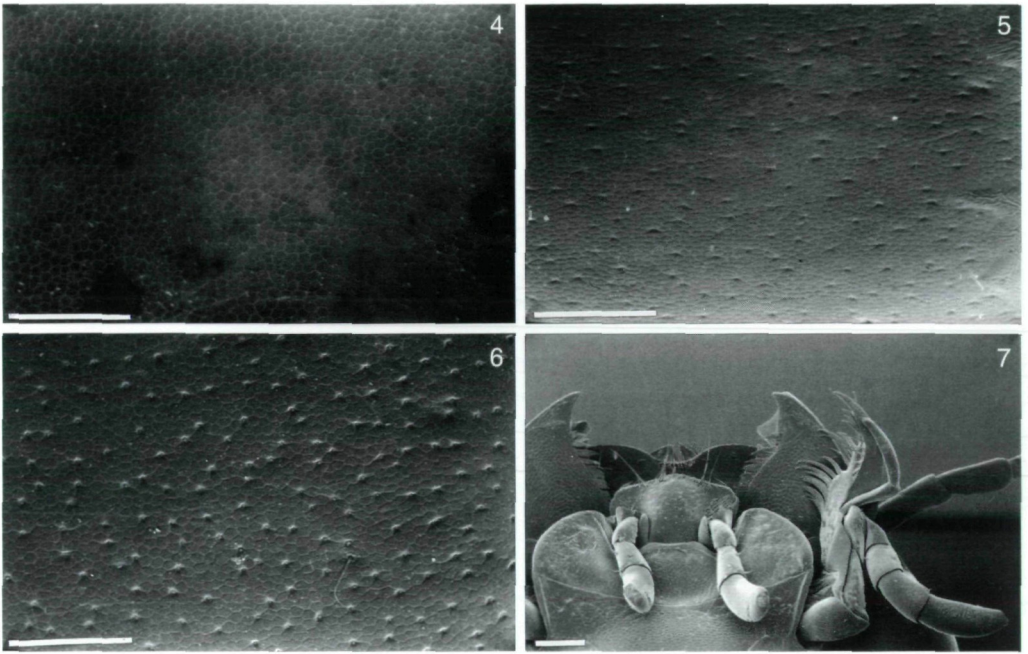


Fig. 3: Habitus of *C. speciosus*, length of beetle 4.8 mm.

Mesotarsus of same general structure and setation, but lacking hook on MesoT 4; MesoT 4 always with one short and stout seta sub-distally on anterior and posterior side; laterally with 3 to some 10 stout setae anteriorly and 2 - 4 such setae posteriorly. MesoT 5 with a row of short to moderately long setae sub-anteriorly.

Median lobe of aedeagus (Figs. 40 - 95) almost symmetrical in dorsal/ventral view, comparably little modified (exception: structurally strongly altered in *C. astrophallus*,



Figs. 4 - 7: (4 - 6) Surface sculpture on elytral disc of *Papuadytes* spp., (4) illustrating sparse and fine puncturation, (5) moderately dense and coarse puncturation, (6) dense and rather coarse puncturation. (7) *Papuadytes rivulus* sp.n., head, ventral view. Scale bar is 0.1 mm.

Fig. 64). Median lobe of aedeagus always with an open rim dorsally, which may be rather deep, reaching the tip; or rather shallow becoming more and more shallow anteriorly, rim thus not reaching the tip. The internal sac is visible basally, two sclerites that perhaps help to expand/ inflate the internal sac are distinctly visible.

Left and right paramere of almost equal shape, comparably weakly sclerotized. Long setae are present at least apically (Figs. 32 - 35, 37 - 39); except for *C. formosus* and *C. ullrichi* where only few very short setae are present (Fig 36). The distal setiferous stylus is comparably large and well visible in all species.

Female: ProT and MesoT 1 - 4 cylindrical, narrow. ProT and MesoT 5 long and narrow. ProT 1 - 4 with short, stout setae antero-laterally, ProT 5 with a row short, stout setae anteriorly. MesoT 5 of same general structure and setation.

Gonocoxae long and cylindrical as in other Copelatinae (see e.g. BRANCUCCI 1986).

Aggregate distribution: New Guinea.

Generalized habitat information: Always associated with running water: small streams, springs, backflows and pools on river banks.

Checklist and distribution of the species

The *C. aipo* group

- | | |
|--|------------------------------|
| 1. <i>Copelatus (Papuadytes) aipo</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 2. <i>Copelatus (Papuadytes) karmurensis</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 3. <i>Copelatus (Papuadytes) manfredi</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 4. <i>Copelatus (Papuadytes) me</i> sp.n. | Irian Jaya: Jayawijaya Prov. |

The *C. rivulus* group

- | | |
|---|------------------------------|
| 5. <i>Copelatus (Papuadytes) damantiensis</i> sp.n. | PNG: Madang Prov. |
| 6. <i>Copelatus (Papuadytes) inornatus</i> sp.n. | PNG: Madang Prov. |
| 7. <i>Copelatus (Papuadytes) patepensis</i> sp.n. | PNG: Morobe Prov. |
| 8. <i>Copelatus (Papuadytes) rivulus</i> sp.n. | Irian Jaya: Jayawijaya Prov. |

The *C. ullrichi* group

- | | |
|--|------------------------------|
| 9. <i>Copelatus (Papuadytes) formosus</i> sp.n. | PNG: Eastern Highlands Prov. |
| 10. <i>Copelatus (Papuadytes) ullrichi</i> sp.n. | PNG: Eastern Highlands Prov. |

Other species

- | | |
|--|---------------------------------|
| 11. <i>Copelatus (Papuadytes) aipomek</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 12. <i>Copelatus (Papuadytes) ascendens</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 13. <i>Copelatus (Papuadytes) astrophallus</i> sp.n. | PNG: Madang Prov. |
| 14. <i>Copelatus (Papuadytes) atratus</i>
J. BALFOUR-BROWNE, 1939 | PNG: Northern Prov. |
| 15. <i>Copelatus (Papuadytes) bacchusi</i> sp.n. | PNG: Madang Prov. |
| 16. <i>Copelatus (Papuadytes) broschii</i> sp.n. | PNG: Madang Prov. |
| 17. <i>Copelatus (Papuadytes) casuarinus</i> sp.n. | Irian Jaya: Nabire-Paniai Prov. |
| 18. <i>Copelatus (Papuadytes) danae</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 19. <i>Copelatus (Papuadytes) erteldi</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 20. <i>Copelatus (Papuadytes) fume</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 21. <i>Copelatus (Papuadytes) heidiae</i> sp.n. | PNG: Morobe Prov. |
| 22. <i>Copelatus (Papuadytes) jaseminae</i> sp.n. | PNG: Morobe Prov. |
| 23. <i>Copelatus (Papuadytes) ketembang</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 24. <i>Copelatus (Papuadytes) larsoni</i> sp.n. | PNG: Madang Prov. |
| 25. <i>Copelatus (Papuadytes) miriae</i> sp.n. | PNG: Morobe Prov. |
| 26. <i>Copelatus (Papuadytes) monae</i> sp.n. | PNG: Morobe Prov. |
| 27. <i>Copelatus (Papuadytes) nomax</i>
J. BALFOUR-BROWNE, 1939 | PNG: not located |
| 28. <i>Copelatus (Papuadytes) rufus</i> sp.n. | PNG: Morobe Prov. |
| 29. <i>Copelatus (Papuadytes) sanctimontis</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 30. <i>Copelatus (Papuadytes) speciosus</i> sp.n. | Irian Jaya: Nabire-Paniai Prov. |
| 31. <i>Copelatus (Papuadytes) takime</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 32. <i>Copelatus (Papuadytes) talaki</i> sp.n. | Irian Jaya: Jayawijaya Prov. |
| 33. <i>Copelatus (Papuadytes) tarmluensis</i> sp.n. | Irian Jaya: Jayawijaya Prov. |

Species account

The *Copelatus aipo* group

This group currently contains four species which are characterized as follows: ProT 5 of male distinctly modified in lateral view (Figs. 25 - 28) and shape of paramere as in Figs. 32 - 35.

Copelatus (Papuadytes) aipo sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Aipomek-Wamena, 1800 m, 2.IX.1992, IR 92#34, M. Balke leg. (NMW). **Paratypes** (93 exs.): 17 ♂♂, 9 ♀♀, same label data as holotype; 3 ♂♂, 3 ♀♀, Tanime-Aipomek, 1500 m, 21.VIII.1992, IR 92#19; 6 ♂♂, 10 ♀♀, Aipomek-Tanime, 2500 m, 1.IX.1992, IR 92#31; 10 ♂♂, 11 ♀♀, Aipomek-Tanime, 2000 m, 1.IX.1992, IR 92#33; 12 ♂♂, 12 ♀♀, Bime, 2000 m, 10.IX.1993, IR 93#10. All specimens from Irian Jaya, Jayawijaya Province, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Trek from Aipomek to Wamena, close to Aipomek, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 4.12 - 4.48 mm. Puncturation of pronotum and elytron moderately dense, beetle dull, male antenna (Fig. 8a) with antennomeres 3 - 6 distinctly enlarged, male ProT 5 distinctly modified in lateral view (Fig. 25).

Description: Surface sculpture: Head densely punctate posteriorly. Pronotum and elytron with moderately dense puncturation, meshes rather deeply impressed, beetle thus dull. Venter with few punctures.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, distinct lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook reduced. ProT 5 (Fig. 25) concave ventrally and distinctly modified in lateral view, some ventral setae strongly enlarged and shifted to base. Antenna (Fig. 8a) with antennomeres 3 - 6 strongly enlarged, 2 and 7 - 10. somewhat enlarged. Antennomeres 3 - 8 with deeply impressed polygonal meshes, these weakly impressed on 9 - 10, not rugose. Sternite 7 with numerous lateral striae (10 or more). Median lobe of aedeagus Fig. 54, lateral view as in Fig. 40; paramere (Fig. 32).

Female: Antennomeres stout (Fig. 8b).

Etymology: The name refers to the indigenous people of the western part of the type area who call themselves Aipo.

Distribution: So far known from the Bime-Tanime-Aipomek areas, which are the northern foothills of the Oranje and Speelman Mountain ranges.

Copelatus (Papuadytes) karmurensis sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Aipomek-Diruemna, 2600 m, 3.IX.1992, IR 92#35, M. Balke leg. (NMW). **Paratypes** (66 exs.): 11 ♂♂, 16 ♀♀, same label data as holotype; 1 ♂, 3 ♀♀, Diruemna-Nalca, 1500 m, 4.IX.1992, IR 92#36; 7 ♂♂, 8 ♀♀, Kono-Angguruk, 2500 m, 9.IX.1992, IR 92#44; 12 ♂♂, 3 ♀♀, Aipomek-Diruemna, 2600 m, 26.IX.1993, IR 93#22; 2 ♂♂, 3 ♀♀, Kono-Angguruk, 2500 m, 5.X.1993, IR 93#29. All specimens from Irian Jaya, Jayawijaya Province, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Trek from Aipomek to Diruemna, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: TL-h 4.6 - 5.3 mm. Puncturation of pronotum and elytron dense: moderately coarse on pronotum but finer on elytron, beetle dull, male antenna (Fig. 9a) stout with antennomeres 3 - 4 being distinctly modified, male ProT 5 strongly modified in lateral view (Fig. 26).

Description: Surface sculpture: Head very densely and coarsely punctate posteriorly. Pronotum and elytron with dense puncturation, coarse on pronotum except for disc, finer on elytron. Meshes moderately deeply impressed, beetle thus dull. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, distinct lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae (Fig. 24). Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook reduced. ProT 5 (Fig. 26) concave ventrally and distinctly modified, some setae strongly enlarged and shifted to base. Antenna (Fig. 9a) with antennomeres 3 - 4 strongly enlarged, 5 - 7 distinctly enlarged, somewhat globular, 2 and 8 - 10 somewhat more stout than in female; ventrally with deeply impressed meshes. Sternite 7 with numerous lateral striae (some 15 - 20). Median lobe of aedeagus Figs. 40, 55; paramere Fig. 33.

Female: Antennomeres 2 - 6 moderately stout, the others long and slender (Fig. 9b).

Etymology: The name refers to the type locality area which is the western slope of Mt. Karmur, Mark Coen Range.

Distribution: The range of this species spans the western slopes of Mt. Karmur (Mark Coen Range), the Nalca area, and the north-eastern slopes of the Valentijn Range.

Copelatus (Papuadytes) manfredi sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Borme, 1800 m, 14.VIII.1992, IR 92#12, 12A, M. Balke leg. (NMW). Paratypes (17 exs.): 4 ♂♂, 13 ♀♀, same label data as holotype (cGW, cMB, NMW).

Locus typicus: Borme, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: TL-h 3.56 - 3.96 mm. Puncturation of pronotum and elytron rather coarse and dense, beetle shiny, male antenna simple but more stout than in female (Fig. 10a), male ProT 5 slightly modified in lateral view (Fig. 27).

Description: Surface sculpture. Head densely punctate posteriorly. Pronotum and elytron with dense and coarse puncturation, elytral puncturation coarser and denser laterally and along suture than discally. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small but distinct. ProT 5 (Fig. 27) concave ventrally and distinctly modified, some ventral setae strongly enlarged and shifted to base.

Antenna (Fig. 10a) with antennomeres 3 - 9 somewhat stouter than in female. Sternite 7 with numerous lateral striae (some 10-15). Median lobe of aedeagus: ventral view as in Fig. 54, lateral view as in Fig. 40, but smaller, respectively; paramere Fig. 34.

Female: Antenna moderately stout (Fig. 10b).

Etymology: Named for my friend and colleague Manfred A. "Torty" Jäch, Vienna, who is one of the most enthusiastic water beetlers this world has ever seen.

Distribution: Known from the Borne area only.

Copelatus (Papuadytes) me sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Borne, 1900 m, 14. & 17. VIII. 1992, IR 92#11, M. Balke leg. (NMW). **Paratypes** (29 exs.): 16 ♂♂, same label data as holotype (cMB, NMW); 12 ♂♂, Borne, 1800 m, 16. VIII. 1992, IR 92#12, 12A, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Borne, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 4.20 - 4.60 mm. Puncturation of pronotum and elytron moderately dense but fine, beetle shiny, male antenna (Fig. 11) with some antennomeres slightly enlarged, male ProT 5 distinctly modified in lateral view (Fig. 28).

Description: Surface sculpture. Head densely punctate posteriorly. Pronotum and elytron with moderately dense but fine puncturation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, indistinct lateral extensions present anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small but distinct. ProT 5 (Fig. 28) concave ventrally and distinctly modified, some ventral setae strongly enlarged and shifted to base. Antenna (Fig. 11) with antennomeres 3 - 6 distinctly enlarged, 2 and 7 - 10 somewhat enlarged. Sternite 7 with numerous lateral striae (10 or more). Median lobe of aedeagus: ventral view as in Fig. 54, lateral view as in Fig. 40; paramere Fig. 35.

Female: Unknown.

Etymology: "Me" means water in the language of the Ketembang people that inhabit the type area.

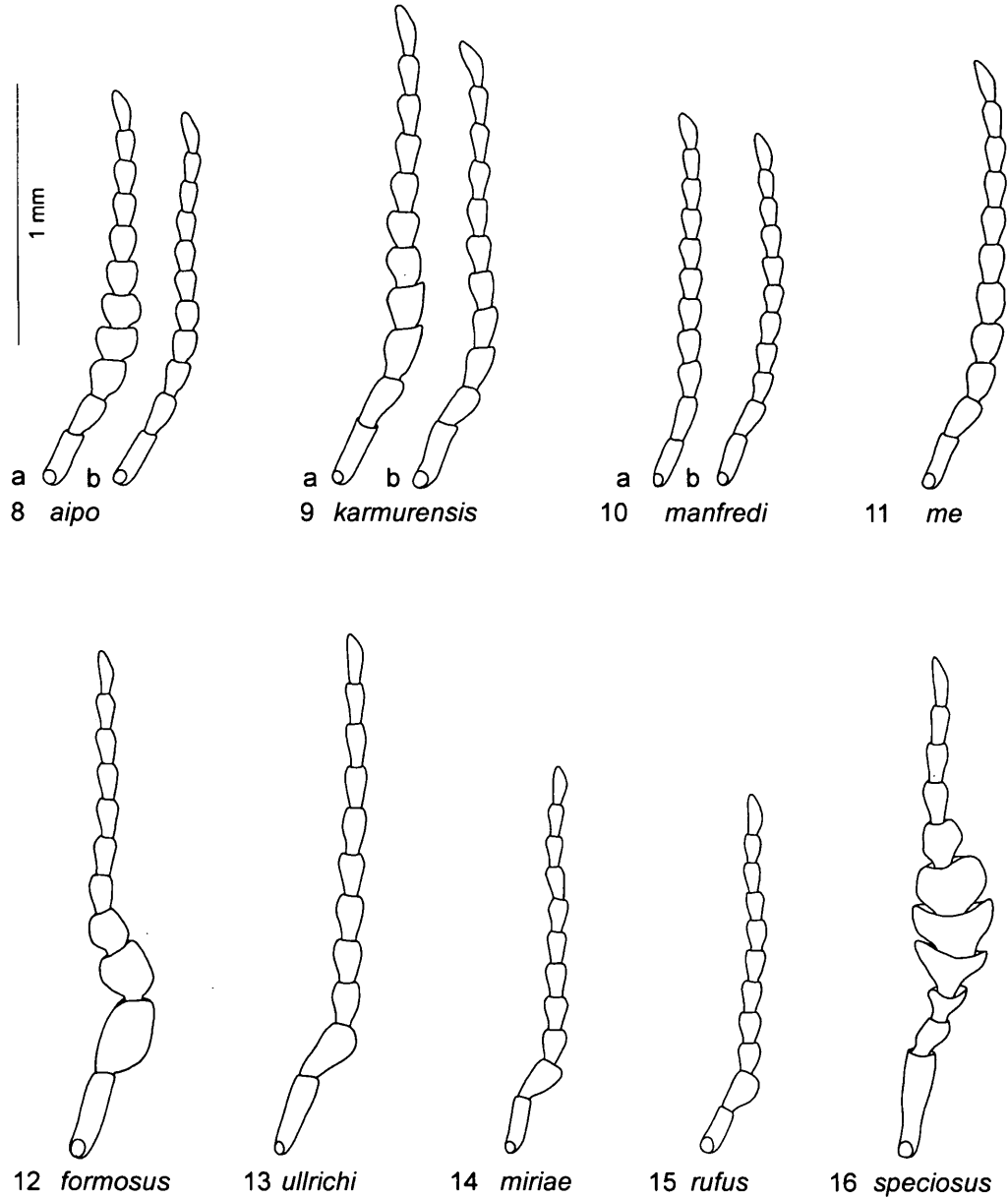
Distribution: Only known from the Borne area, southern foothills of the Boendermaker Range.

The *Copelatus rivulus* group

I have assigned four species to this group which is characterized by the highly similar median lobes of the aedeagus in all of the species (Figs. 41, 42, 56 - 59).

Copelatus (Papuadytes) damantiensis sp.n.

Holotype ♂: PNG, Madang Province, Finisterre Range, Damanti, 1180 m, 2. - 11. X. 1964, Stn. 387, M.E. Bacchus leg. (BMNH). **Paratypes** (225 exs.): 2 ♂♂, 12 ♀♀, PNG, Madang Province, Finisterre Range,

Figs. 8 - 16: *Papuadytes* spp., antennae.

Damanti, 1180 m, 2. - 11.X.1964, Stn. 37; 16 ♂♂, 16 ♀♀, same but Stn. 38; 13 ♂♂, 25 ♀♀, same but Stn. 39; 14 ♂♂, 7 ♀♀, same but Stn. 49; 9 ♂♂, 8 ♀♀, same but Budemu, 1300 m, 15. - 24.X.1964, Stn. 61; 5 ♂♂, 2 ♀♀, same but Stn. 62; 8 ♂♂, 9 ♀♀, same but Stn. 73; 11 ♂♂, 5 ♀♀, same but 74; 6 ♂♂, 8 ♀♀, same but Moro, 1800 m, 30.X. - 15.XI.1964, Stn. 78; 12 ♂♂, 18 ♀♀, same but Stn. 82; 5 ♂♂, 2 ♀♀, same but Stn. 83; 3 ♂♂, 3 ♀♀, same but Stn. 89; 5 ♂♂, 1 ♀, PNG, Madang Province, Finisterre Range, Sewe, 1760 m, 15.XI.1964, Stn. 95. All specimens M.E. Bacchus leg. (BMNH, cMB, NMW).

Locus typicus: Damanti, Madang Province, PNG.

Diagnosis: Tl-h 3.88 - 4.48 mm. Punctuation of pronotum and elytron rather sparse and fine, beetle shiny, male antenna and ProT 5 simple.

Description: Surface sculpture. Head with moderately dense but fine punctuation posteriorly. Pronotal and elytral punctuation faint. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, small lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a double row of long setae, posteriorly but a few short setae present. Antennomeres all long and slender as in female, not dilated. Sternite 7 with few lateral striae (some 3 - 6). Median lobe of aedeagus Fig. 56, lateral view as in Fig. 42, but slightly larger, paramere shape as in Fig. 37.

Female: Antennomeres all long and slender.

Etymology: Named after the village where the holotype was collected.

Distribution: Known from the Finisterre Range of PNG only.

Copelatus (Papudytes) inornatus sp.n.

Holotype ♂: PNG, Madang Province, Brahman Bundi Trek, stream, [?500 m], 22.vl.1991, D.J. Larson (CDL). **Paratypes** (20 exs.): 9 ♂♂, 11 ♀♀, same label data as holotype (cMB, cDL, NMW).

Locus typicus: Trek between Brahman and Bundi, Madang Province, PNG.

Diagnosis: Tl-h 3.92 - 4.08 mm. Punctuation on pronotum and elytron sparse and fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head moderately densely and finely punctate posteriorly. Pronotum and elytron with sparse and fine punctuation. Meshes rather deeply impressed, beetle thus shiny. Venter with few punctures only.

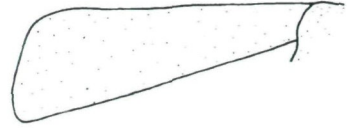
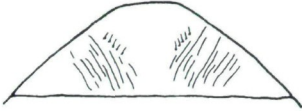
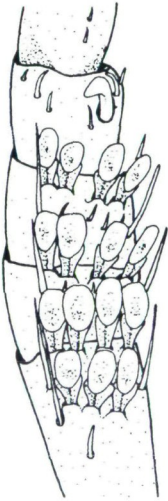
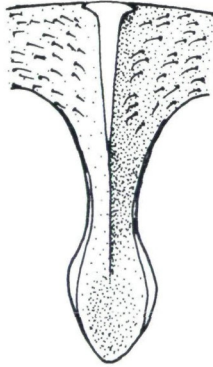
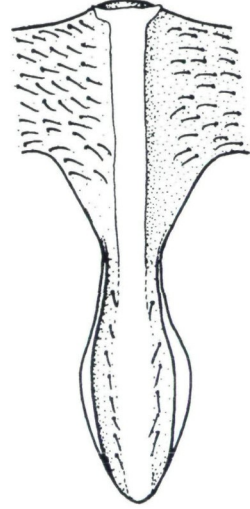
Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded to slightly truncate apically.

Male: ProT 4 with small antero-lateral hook small. ProT 5 simple, venter anteriorly with a dense band of long setae, posteriorly with a row of long setae. Antenna simple, antennomeres long and slender as in female. Sternite 7 with few lateral striae (some 3 - 5). Median lobe of aedeagus Figs. 41, 57; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Named for the fact that this species, like many others of this group, does not exhibit any conspicuous structural features.

Distribution: Known from the Brahman-Bundi area only.

17 *speciosus*18 *speciosus*19 *speciosus*
male20 *speciosus*
female21 *formosus*
male22 *rivulus*23 *formosus*24 *karmurensis*

Figs. 17 - 24: *Papuadytes* spp., (17) structures, flight wing, (18) protibiae of male, (19 - 21) sternite 7, (22) ProT 1 - 5, (23 - 24) prosternal process.

Copelatus (Papuadytes) patepensis sp.n.

Holotype ♂: PNG, Morobe Province, Lae-Bulolo Rd., Patep Creek, [?500 m], 28.XII.1964, Stn. 126, M.E. Bacchus (BMNH). **Paratypes** (5 exs.): 4 ♂♂, 1 ♀, same label data as holotype (BMNH, cMB, NMW).

Locus typicus: Patep Creek, Morobe Province, PNG.

Diagnosis: Tl-h 4.00 - 4.16 mm. Puncturation of pronotum and elytron sparse and fine, especially on elytron, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head moderately densely but rather fine punctate posteriorly. Pronotum and elytron with sparse and fine dense puncturation, which is hardly visible on elytron. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, distinctly lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 slightly truncate apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, venter anteriorly with a double row of long setae, posteriorly with some 4 shorter setae. Antenna simple, antennomeres long and slender as in female. Sternite 7 with few lateral striae (3 - 6). Median lobe of aedeagus Fig. 58, lateral view as in Fig. 42 but smaller; paramere as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Named for the creek from which this species was collected, i.e. Patep Creek.

Distribution: Known from the type locality only.

Copelatus (Papuadytes) rivulus sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Borme, 900 m, 12.VIII.1992, IR 92#8, M. Balke leg. (NMW). **Paratypes** (542 exs.): 25 ♂♂, 18 ♀♀, Borme, 900 m, 12.VIII.1992, IR 92#8; 16 ♂♂, 15 ♀♀, Borme, 1000 m, 15.VIII.1992, IR 92#14; 11 ♂♂, 6 ♀♀, Borme, 1000 m, 16.VIII.1992, IR 92#15; 7 ♂♂, 6 ♀♀, Borme, 900 m, 18.VIII.1992, IR 92#16; 3 ♂♂, 5 ♀♀, Diruemna-Nalca, 1500 m, 4.IX.1992, IR 92#36; 40 ♂♂, 30 ♀♀, Nalca, 1700 - 1800 m, 6.IX.1992, IR 92#38; 3 ♂♂, 1 ♀, Kono, 1800 m, 17.IX.1992, IR 92#41; 52 ♂♂, 46 ♀♀, Angguruk, 1400 m, 12.IX.1992, IR 92#48; 7 ♂♂, 5 ♀♀, Borme, 950 m, 3.IX.1993, IR 93#2; 1 ♂, Tarmalu, 1300 - 1500 m, 6.IX.1993, IR 93#4-6; 53 ♂♂, 53 ♀♀, Bime, 1400 m, 11.IX.1993, IR 93#12; 57 ♂♂, 35 ♀♀, Bime, 1400 m, 22.IX.1993, IR 93#16; 2 ♂♂, 3 ♀♀, Emdoman, 1150 m, 28.IX.1993, IR 93#23; 6 ♂♂, 5 ♀♀, Emdoman, 800 m, 29.IX.1993, IR 93#24; 2 ♂♂, Emdoman, 800 - 1000 m, 29.IX.1993, IR 93#25; 23 ♂♂, Okloma, 1500 m, 1.X.1993, IR 93#28; 5 ♂♂, 1 ♀, Angguruk, 1350 m, 8.X.1993, IR 93#32; All specimens from Irian Jaya, Jayawijaya Province, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Borme, Jayawijaya Province, Irian Jaya, Indonesia.

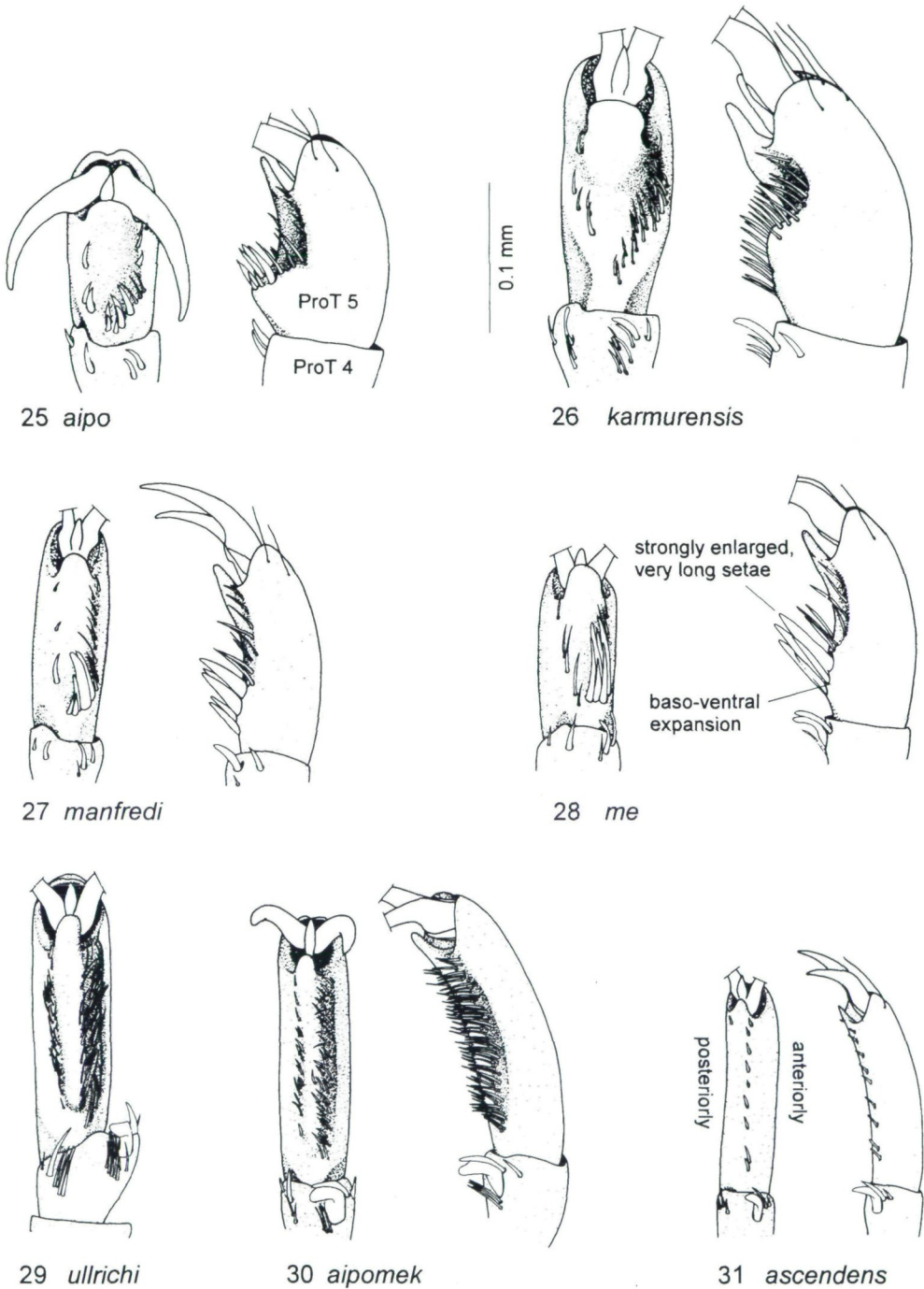
Diagnosis: T1-h 3.92 - 4.32 mm. Puncturation of pronotum and elytron rather sparse and fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head with moderately dense but fine puncturation posteriorly. Pronotal and elytral puncturation faint. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, small lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a double row of long setae, posteriorly but a few short setae present. Antennomeres all long and slender as in female, not dilated. Sternite 7 with few lateral striae (some 3 - 6). Median lobe of aedeagus Figs. 42, 59; paramere shape as in Fig. 37.

Female: Antennomeres all long and slender.



Figs. 25 - 31: *Papuadytes* spp., structure of ProT 4 and 5, ventral and lateral view.

Etymology: The Latin word means „brook,, and refers to the species' habitat which, taken all the species in aggregate, is also characteristic for the subgenus.

Distribution: A species being widely distributed along the northern slope of the eastern Jayawijaya Range. Its range spans the entire area between Borne in the east and Angguruk in the west.

The *Copelatus ullrichi* group

Two species are included here, which share: 1.) parameres without long setae (Fig. 36), and 2.) median lobe of aedeagus with a ventral notch apically (Figs. 60, 61).

***Copelatus (Papuadytes) formosus* sp.n.**

Holotype ♂: PNG, Eastern Highlands Province, Kainantu area, Onerunka, VI.1979, 1600 m, W. Ullrich leg. (MHNG). **Paratypes** (7 exs.): 5 ♂♂, 2 ♀♀, same locality but some collected in VI., and XI.1979 (cMB, MHNG).

Locus typicus: Onerunka, Eastern Highlands Province, PNG.

Diagnosis: TL-h 4.64 - 4.96 mm. Punctuation of pronotum and elytron dense and coarse, beetle dull, male antenna modified (Fig. 12): antennomere 2 - 3 very strongly enlarged, 4 strongly enlarged, male ProT 5 simple. Prosternum with very sharp ridge, prosternal process roundish-lanceolate and distinctly concave (Fig. 23).

Description: Surface sculpture. Head densely and coarsely punctate posteriorly. Pronotum and elytron with dense and coarse punctuation. Meshes rather deeply impressed, beetle thus dull. Venter with numerous punctures.

Structures: Pronotum with distinct lateral bead. Prosternum with very sharp ridge, not modified anteriorly. Prosternal process roundish-lanceolate, beaded, distinctly concave (!) and without setae (Fig. 23). Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 slightly concave ventrally, venter anteriorly with a dense band of long setae, posteriorly with a row of long setae. Antenna (Fig. 12) with antennomeres 2 - 3 very strongly enlarged, 4 strongly enlarged, the others almost as in female. Sternite 7 (Fig. 21) with numerous lateral striae (some 10 - 18). Median lobe of aedeagus Figs. 43, 60). Paramere with but a few short setae distally (as in Fig. 36).

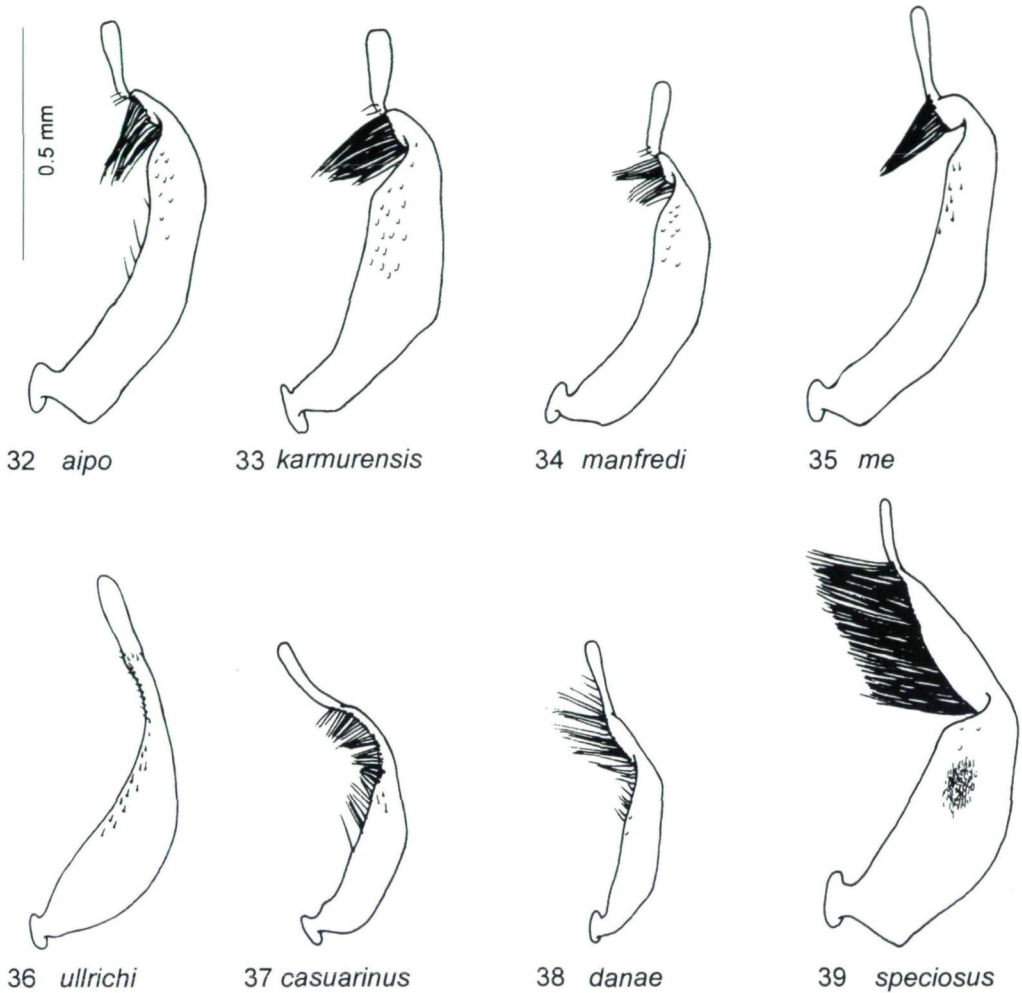
Female: Antennomeres moderately long and slender.

Etymology: "formosus" - Latin for well-shaped, the name refers to the beautifully developed male antenna.

Distribution: Only known from the type locality.

***Copelatus (Papuadytes) ullrichi* sp.n.**

Holotype ♂: PNG, Eastern Highlands Province, Kainantu area, Onerunka, 14.V.1979, 1600 m, W. Ullrich leg. (MHNG). **Paratypes** (7 exs.): 5 ♂♂, 2 ♀♀, same locality but some collected VI.1979 (cMB, MHNG).

Figs. 32 - 39: *Papuadytes* spp., parameres.

Locus typicus: Onerunka, Eastern Highlands Province, PNG.

Diagnosis: TL-h 5.32 - 5.92 mm. Puncturation of pronotum and elytron dense and moderately coarse, beetle dull, male antenna (Fig. 13) modified: antennomere 2 distinctly enlarged, the others as in female, male ProT 5 simple.

Description: Surface sculpture. Head densely and coarsely punctate posteriorly. Pronotum and elytron with dense and moderately coarse puncturation, somewhat finer on pronotal disc. Meshes rather deeply impressed, beetle thus dull. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, with small lateral extensions anteriorly. Prosternal process lanceolate, rather narrow, beaded, slightly convex and with few setae. Sternite 7 slightly truncate apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 slightly concave ventrally, venter anteriorly and posteriorly with dense bands of long setae respectively. Antenna (Fig. 13) with antennomere 2 distinctly enlarged and rugose ventrally, remaining antennomeres as in female. Sternite 7 with numerous lateral striae (some 10 -15). Median lobe of aedeagus Figs. 44, 61. Paramere with but a few short setae distally (Fig. 36).

Female: Antennomere 2 comparably long, remaining joints rather stout.

Etymology: Named for Mr. W. Ullrich, who discovered this species.

Distribution: Only known from the type locality.

Other species

Copelatus (Papuadytes) aipomek sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Aipomek, 1800 m, 31.VIII.1992, IR 92#30, M. Balke leg. (NMW). **Paratypes** (4 exs.): 3 ♂♂, 1 ♀, same label data as holotype (cMB, NMW).

Locus typicus: Aipomek, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 3.92 - 4.16 mm. Punctuation of pronotum and elytron sparse and fine, beetle shiny, male antenna and male ProT 5 slightly convex in lateral view, densely setose (Fig. 30).

Description: Surface sculpture. Head sparsely and moderately coarsely punctate posteriorly. Pronotum and elytron with sparse and fine punctuation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, small lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 (Fig. 30) slightly concave ventrally, venter anteriorly and posteriorly with dense bands of long setae. Antennomeres long and slender as in female. Sternite 7 with few lateral striae (10 or less). Median lobe of aedeagus Fig. 62, lateral view as in Fig. 40 but smaller, paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

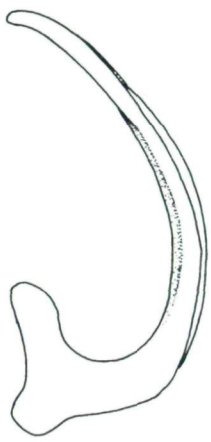
Etymology: This species was discovered at the edge of the Aipo River the native name of which is Aipo-mek (mek = water, river, in the Aipo-language).

Distribution: Known from the type locality only.

Copelatus (Papuadytes) ascendens sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Aipomek-Diruemna, 2600 m, 3.IX.1992, IR 92#35, M. Balke leg. (NMW). **Paratypes** (18 exs.): 4 ♂♂, 2 ♀♀, Aipomek-Diruemna, 2600 m, 3.IX.1992, IR 92#35; 2 ♂♂, 1 ♀, Kono-Angguruk, 2500 m, 9.IX.1992, IR 92#44; 5 ♂♂, 4 ♀♀, Aipomek-Diruemna, 2600 m, 26.IX.1993, IR 93#22. All specimens from Irian Jaya, Jayawijaya Province, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Trek between Aipomek and Diruemna, Jayawijaya Province, Irian Jaya, Indonesia.



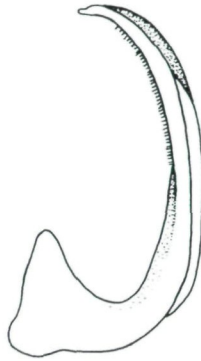
40 *karmurensis*



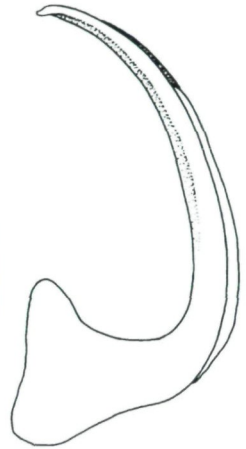
41 *inornatus*



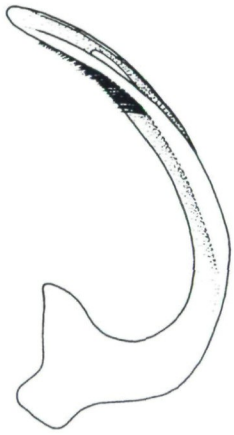
42 *rivulus*



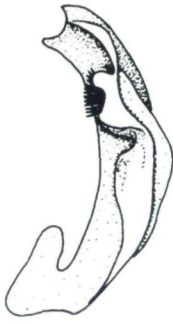
43 *formosus*



44 *ullrichi*



45 *ascendens*



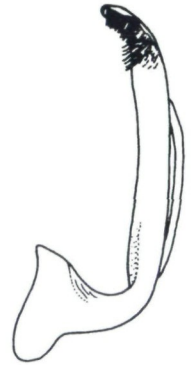
46 *astrophallus*



47 *atratus*



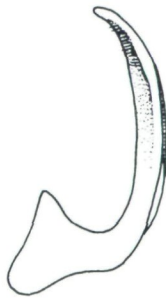
48 *bacchusi*



49 *broschii*



50 *casuarinus*



51 *danae*



52 *erteldi*



53 *fume*

0.5 mm

Figs. 40 - 53: *Papuadytes* spp., median lobes of aedeagus in lateral view.

Diagnosis: Tl-h 5.32 - 5.76 mm. Body rather long and slender, puncturation of pronotum and elytron moderately dense: coarser on pronotum, rather fine on elytron, beetle dull, male antenna simple and rather slender, male ProT 5 simple.

Description: Surface sculpture. Head densely and coarsely punctate posteriorly. Pronotum and elytron with moderately dense puncturation, coarser on pronotum, especially laterally, fine on elytron. Meshes moderately deeply impressed, beetle thus dull. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, distinct lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a sparse row of short setae, posteriorly only some 2 - 3 short setae present (Fig. 31). Antenna simple, antennomeres long and slender as in female. Sternite 7 with numerous lateral striae (some 15). Median lobe of aedeagus Figs. 45, 63; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Latin for ascending, for this species is only known from rather high elevations.

Distribution: At present known from the western slopes of Mt. Karmur (Mark Coen Range), and the north-eastern slopes of the Valentijn Range.

Copelatus (Papuadytes) astrophallus sp.n.

Holotype ♂: PNG, Madang Province, 1 - 3 km SE Brahman, [?200 m], 21.VI.1991, D.J. Larson leg. (cDL).

Paratypes (18 exs.): 9 ♂♂, 9 ♀♀, same label data as holotype (cDL, cMB, NMW).

Locus typicus: Brahman area, Madang Province, PNG.

Diagnosis: Tl-h 3.68 - 3.88 mm. Puncturation of pronotum and elytron dense and distinct, beetle dull, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head densely and moderately coarsely punctate posteriorly. Pronotum and elytron with dense and distinct puncturation. Meshes rather deeply impressed, beetle thus appearing dull. Venter with few punctures only.

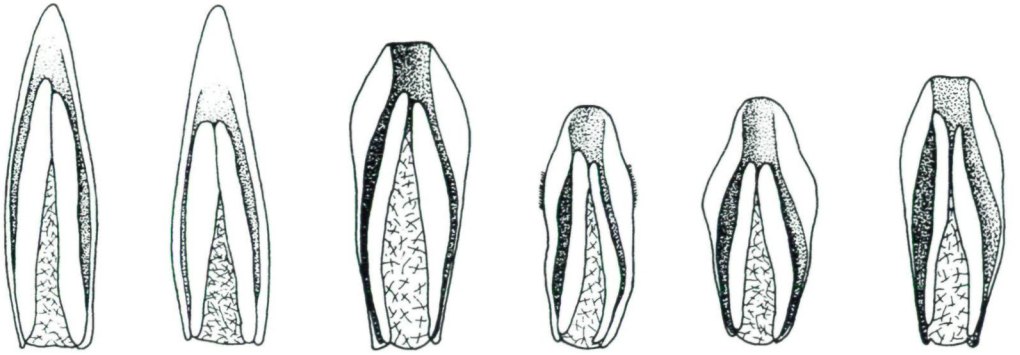
Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small. ProT 5 simple, venter slightly concave, anteriorly with a dense band of long setae, posteriorly with a row of long setae. Antenna modified, antennomeres 3 - 5 distinctly enlarged. Sternite 7 with numerous long and deeply incised lateral striae (some 18 - 20). Median lobe of aedeagus Figs. 46, 64; paramere shape as in Fig. 37, but broader at basal 2/3 and rather gently narrowing anteriorly.

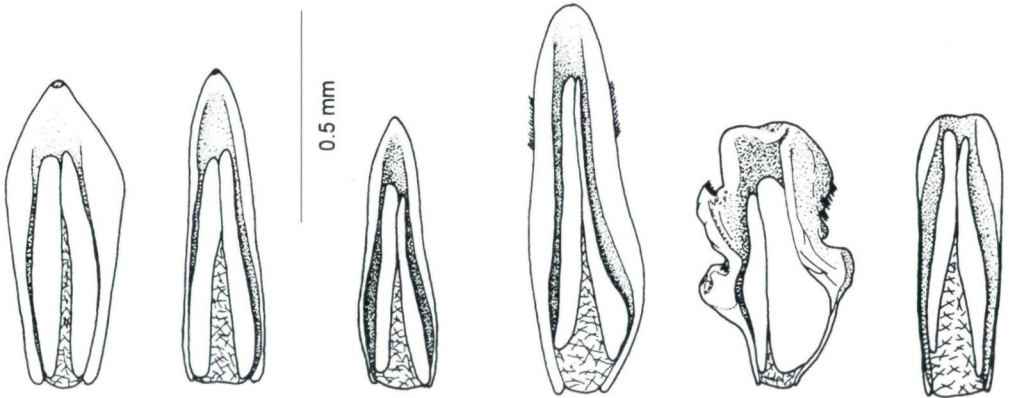
Female: Antennomeres long and slender.

Etymology: The name refers to the extraordinarily modified median lobe of aedeagus, which really appears as from another world in contrast to the simple median lobes of all the other species.

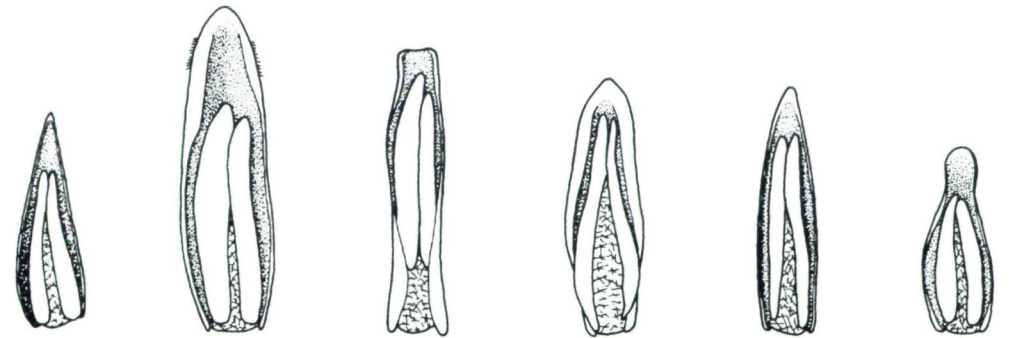
Distribution: Known from the type locality only.



54 *aipo* 55 *karmurensis* 56 *damantiensis* 57 *inornatus* 58 *patepensis* 59 *rivulus*



60 *formosus* 61 *ullrichi* 62 *aipomek* 63 *ascendens* 64 *astrophallus* 65 *atratus*



66 *bacchusi* 67 *broschii* 68 *casuarinus* 69 *danae* 70 *erteldi* 71 *fume*

Figs. 54 - 71: *Papuadytes* spp., median lobes of aedeagus in ventral view.

***Copelatus (Papuadytes) atratus* BALFOUR-BROWNE, 1939**

Copelatus atratus J. BALFOUR-BROWNE, 1939: 66.

Copelatus atratus J. BALFOUR-BROWNE: GUIGNOT 1956: 55 (cat.); GUÉORGUIEV 1968: 32 (cat.), 1978: 269 (key); GUÉORGUIEV & ROCCHI 1993: 161 (cat.).

Holotype ♂: PNG: Kokoda [147°44'E 8°53'S], 400 m, [1933?], L.E. Cheesman leg. (BMNH). **Paratypes** (5 exs.): 4 ♂♂, 1 ♀, same label data as holotype (BMNH).

Locus typicus: Kokoda, Northern Province, PNG.

Note: I did not re-describe the types in detail when I had them on loan from BMNH years ago. As it has not again been available despite of several subsequent requests, only a brief diagnosis can be provided here.

Diagnosis: Tl-h 4.15 - 4.40 mm. Microreticulation of dorsal surface weakly impressed, beetle thus shiny, puncturation of pronotum sparse and fine, faint on elytron. Male antenna and ProT 5 simple.

Male: Antennomeres not enlarged, as in female. Median lobe of aedeagus Figs. 47, 65; paramere shape as in Fig. 37.

Distribution: Only known from the type area.

***Copelatus (Papuadytes) bacchusi* sp.n.**

Holotype ♂: PNG, Madang Province, Finisterre Range, Damanti, 1180 m, 2. - 11.X.1964, Stn. 39, M.E. Bacchus leg. (BMNH). **Paratypes** (8 exs.): 1 ♀, same label data as holotype; 1 ♂, 1 ♀, same but Stn. 49; 1 ♂, 4 ♀♀, same but Budemu, 1300 m, 15. - 24.X.1964, Stn. 74. All M.E. Bacchus leg. (cMB, BMNH).

Locus typicus: Damanti, Madang Province, PNG.

Diagnosis: Tl-h 3.40 - 3.64 mm. Puncturation of pronotum and elytron moderately dense but fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head densely and moderately coarse punctate posteriorly. Pronotum and elytron with moderately dense but fine puncturation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

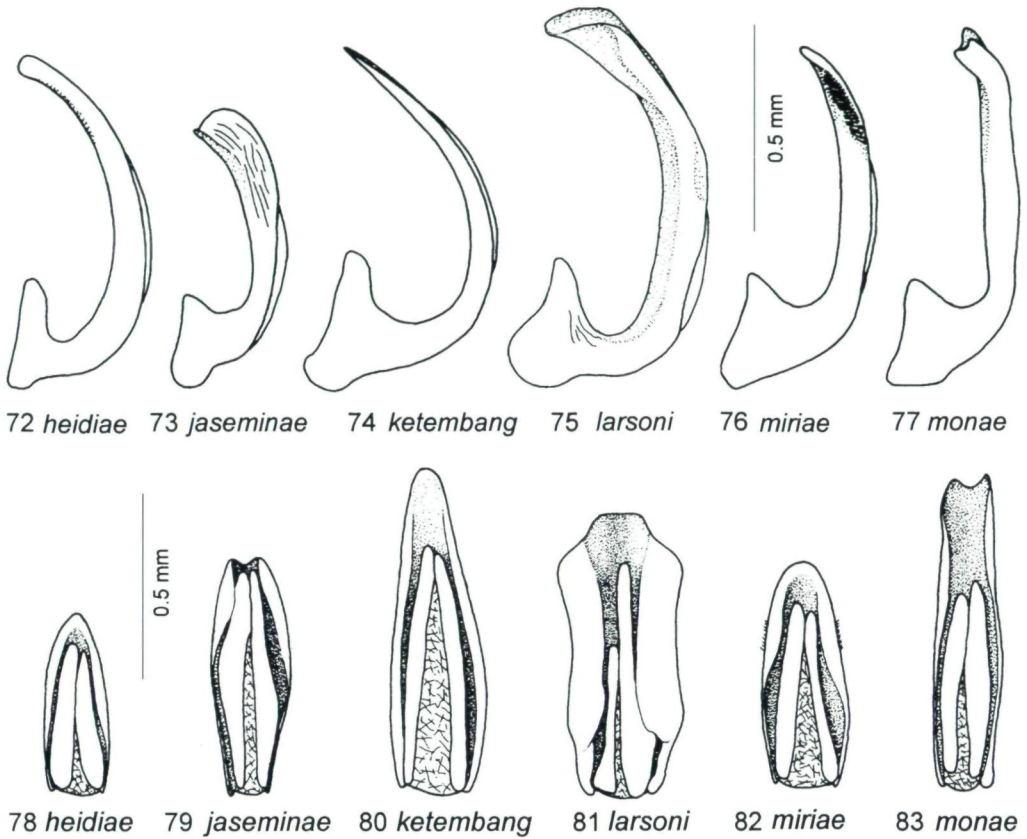
Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate and rather narrow, beaded, rather flat and with few setae. Sternite 7 rounded apically.

Male: ProT 4 with antero-lateral hook small. ProT 5 simple, on venter anteriorly a dense band of long setae, posteriorly a row of short setae present. Antenna simple, antennomeres moderately long and slender, as in female. Sternite 7 with few lateral striae (some 4 - 8). Median lobe of aedeagus Figs. 48, 66; paramere shape as in Fig. 37.

Female: Antennomeres moderately long and slender.

Etymology: Named for the collector of this species, Mick Bacchus, formerly BMNH.

Distribution: Only known from the Finisterre Range.



Figs. 72 - 83: *Papudytes* spp., (72 - 77) median lobes of aedeagus in lateral and (78 - 83) in ventral view.

Copelatus (Papudytes) broschii sp.n.

Holotype ♂: PNG, Madang Province, Finisterre Range, Moro, 1800 m, 30.X. - 15.XI.1964, Stn. 82, M.E. Bacchus leg. (BMNH). **Paratypes** (6 exs.): 4 ♂♂, 1 ♀, same label data as holotype (BMNH, cMB, NMW); 1 ♂, PNG, Madang, Bundi [2000 m ?], D.J. Larson leg. (cDL).

Locus typicus: Moro, Madang Province, PNG.

Diagnosis: Tl-h 3.40 - 3.56 mm. Puncturation of pronotum and elytron moderately dense and fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head densely and coarsely punctate posteriorly. Pronotum and elytron with moderately dense and fine puncturation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, small lateral extensions visible anteriorly. Prosternal process lanceolate, rather slender, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, venter anteriorly with a sparse row of long setae, posteriorly only one seta subapically. Antenna simple, antennomeres stout as in female. Sternite 7 with few lateral striae (some 3 - 5). Median lobe of aedeagus Figs. 49, 67; paramere shape as in Fig. 37.

Female: Antenna stout.

Etymology: Named for Michael "Broschi" Broschkowski, Berlin, the best buddy ever.

Distribution: Known from the Finisterre Range and the Ramu Valley basin of PNG.

Copelatus (Papuadytes) casuarinus BALKE & HENDRICH, sp.n.

Holotype ♂: Irian Jaya, trek Nabire-Ilaga, KM 62, 250 m, 24.VII.1991, IR 91#23, M. Balke & L. Hendrich leg. (NMW). **Paratypes** (27 exs.): 27 ♂♂, same label data as holotype and 1996-98 (cGW, cMB, cLH, NMW).

Locus typicus: Road Nabire to Ilaga, KM 62 (03°30'936"S 135°42'945"E), Nabire-Paniai Province, Irian Jaya, Indonesien.

Diagnosis: Tl-h 3.80 - 4.08 mm. Puncturation of pronotum and elytron moderately dense but very fine, beetle somewhat dull, male antenna and male ProT 5 simple. Pronotum not beaded laterally.

Description: Surface sculpture. Head moderately densely and coarsely punctate posteriorly. Pronotum and elytron with moderately dense but very fine puncturation, coarser only laterally on pronotum. Meshes comparably deeply impressed, beetle thus somewhat dull. Venter with few punctures only.

Structures: Pronotum without lateral bead. Prosternum with distinct ridge, slightly modified anteriorly, but no lateral extensions obvious. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 slightly concave ventrally, on venter anteriorly with a dense band of long setae, posteriorly a row of shorter setae. Antenna simple, antennomeres moderately long and slender. Sternite 7 with few lateral striae (some 3 - 6). Median lobe of aedeagus Figs. 50, 68; paramere shape Fig. 37.

Female: Unknown.

Etymology: In memory of the nasty young Casuary bird which was one of my favourite pets during a 1996 stay in the type area.

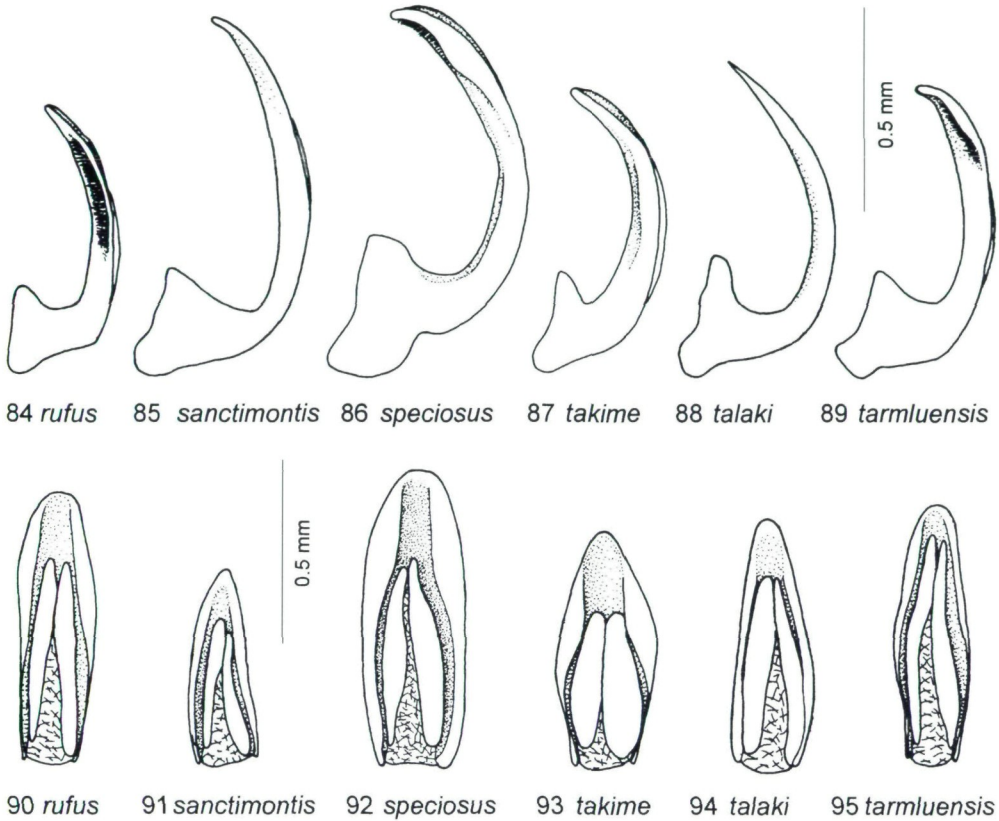
Distribution: So far sampled from the type locality only.

Copelatus (Papuadytes) danae sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Bime-Tanime, 1500 m, 21.VIII.1992, IR 92#18, M. Balke leg. (NMW). **Paratypes** (11 exs.): 6 ♂♂, 5 ♀♀, same label data as holotype (cGW, cMB, NMW).

Locus typicus: Between Bime and Tanime, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 3.40 - 3.76 mm. Puncturation of pronotum and elytron sparse and fine, beetle shiny, male antenna and male ProT 5 simple.



Figs. 84 - 95: *Papuadytes* spp., (84 - 89) median lobes of aedeagus in lateral and (90 - 95) in ventral view.

Description: Surface sculpture. Head moderately densely punctate posteriorly. Pronotum and elytron with sparse and fine puncturation, faint on elytron. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, anteriorly somewhat enlarged laterally. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small and indistinct. ProT 5 simple, on venter anteriorly a band of long setae, posteriorly some 5 - 6 short setae present. Antenna simple, antennomeres long and slender, as in female. Sternite 7 with few lateral striae (some 4 - 10). Median lobe of aedeagus Figs. 51, 69; paramere shape Fig. 38.

Female: Antennomeres long and slender.

Etymology: For Dana.

Distribution: Only known from the type locality.

Copelatus (Papuadytes) erteldi sp.n.

Holotype male: Irian Jaya, Jayawijaya Province, Borme, 1900 m, 14. & 17.VIII.1992, IR 92#11, M. Balke leg. (NMW). **Paratypes** (101 exs.): 1 ♀, Borme, 1000 m, 12. & 18.VIII.1992, IR 92#7; 10 ♂♂, 1 ♀, Borme, 1900 m, 14. & 17.VIII.1992, IR 92#11; 43 ♂♂, 46 ♀♀, Borme, 1800 m, 14.VIII.1992, IR 92#12, 12A; All specimens from Irian Jaya, Jayawijaya Province, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Borme, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 3.40 - 3.68 mm. Punctuation of pronotum and elytron rather sparse and fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head with moderately dense but fine punctuation posteriorly. Pronotal and elytral punctuation faint. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, small and indistinct lateral extensions present anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small. ProT 5 simple, on venter anteriorly a band of long setae, posteriorly only few (2 - 4) setae present. Antenna simple, as in female. Sternite 7 with few lateral striae (1 - 5). Median lobe of aedeagus Figs. 52, 70; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Named for Christian Erteld, Berlin, who always was a good room mate, teacher, medicine man and friend at the Free University Berlin during all the years spent in the lab.

Distribution: Known from the Borme area only.

Copelatus (Papuadytes) fume sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Borme, 1800 m, 14.VIII.1992, IR 92#12, 12A, M. Balke leg. (NMW). **Paratypes** (13 exs.): 13 ♂♂, same label data as holotype (cGW, cMB, NMW).

Locus typicus: Borme, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 3.88 - 4.48 mm. Punctuation of pronotum and elytron moderately dense but fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head moderately dense but finely punctate posteriorly. Pronotum and elytron with moderately dense but fine punctuation, which is denser on pronotum. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum without lateral bead. Prosternum with distinct ridge, small lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a dense row of long setae, posteriorly a sparse row of short setae (some 4) present. Antenna with antennomeres simple, as in female. Sternite 7 with some 8 - 10 lateral striae. Median lobe of aedeagus Figs. 53, 71; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Derived from the Ketembang words for spring, fu-me, for the species was collected near a small spring.

Distribution: Known from the Borme area only.

Copelatus (Papuadytes) heidiae sp.n.

Holotype ♂: PNG, Morobe Province, Herzog Range, Vagau, 1300 m, 4. - 17.I.1965, Stn. 150, M.E. Bacchus leg. (BMNH). **Paratypes** (14 exs.): 10 ♂♂, 2 ♀♀, same label data as holotype; 2 ♀♀, same but Stn. 149A. (BMNH, cMB, NMW).

Locus typicus: Vagau, Herzog Range, Morobe Province, PNG.

Diagnosis: Tl-h 4.36 - 4.88 mm. Puncturation of pronotum and elytron dense and coarse, beetle somewhat dull, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head densely and coarse punctate posteriorly. Pronotum and elytron with dense and coarse puncturation. Meshes comparably deeply impressed, beetle thus somewhat dull. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, small lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly ridged and with few setae. Sternite 7 rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 slightly concave ventrally, on venter anteriorly a band of long setae, posteriorly a row of long setae present. Antenna simple, antennomeres long and slender, as in female. Sternite 7 with numerous lateral striae (some 15 - 20). Median lobe of aedeagus Figs. 72, 78; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Named for Heidi Riens (Berlin).

Distribution: Only known from the Herzog Range.

Copelatus (Papuadytes) jaseminae sp.n.

Holotype ♂: PNG, Morobe Province, Herzog Range, Vagau, 1300 m, 4. - 17.I.1965, Stn. 150, M.E. Bacchus leg. (BMNH). **Paratypes** (6 exs.): 3 ♂♂, 3 ♀♀, same label data as holotype (BMNH, cMB, NMW).

Locus typicus: Vagau, Herzog Range, Morobe Province, PNG.

Diagnosis: Tl-h 3.80 - 4.00 mm. Puncturation of pronotum and elytron moderately dense and fine especially on elytron, beetle dull, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head very densely punctate posteriorly. Pronotum and elytron with fairly dense puncturation. Meshes rather deeply impressed, beetle thus dull. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, straight in lateral view, somewhat modified anteriorly but no lateral extensions obvious. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook indistinct. ProT 5 concave ventrally, venter anteriorly with a dense band of long setae, posteriorly a row of long setae. Antenna simple, antennomeres long and slender as in female. Sternite 7 with only 1 - 3 short lateral striae. Median lobe of aedeagus Figs. 73, 79; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: For Jasemin, remembering the days in Cairo.

Distribution: Only known from the Herzog Range.

Copelatus (Papuadytes) ketembang sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Borme, 900 m, 18.VIII.1992, IR 92#17, M. Balke leg. (NMW). **Paratypes** (65 exs.): 4 ♂, Borme, 1900 m, 14. & 17.VIII.1992, IR 92#11; 16 ♂♂, 30 ♀♀, Borme, 900m, 18.VIII.1992, IR 92#17; 5 ♂♂, 4 ♀♀, Kono, 1800 m, 7.IX.1992, IR 92#41; 5 ♂♂, Tarmalu, 1500 m, 6.IX.1993, IR 93#4-6; 1 ♂, Okloma, 1500 m, 1.X.1993, IR 93#28; All specimens from Irian Jaya, Jayawijaya Province, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Borme, Jayawijaya Province, Irian Jaya, Indonesien.

Diagnosis: Tl-h 3.92 - 4.24 mm. Puncturation of pronotum and elytron moderately dense but fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head moderately densely punctate posteriorly. Pronotum and elytron with moderately sparse and fine puncturation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small. ProT 5 on venter anteriorly with a row of short setae, posteriorly a sparse row of short setae. Antenna with antennomeres being simple as in female. Sternite 7 with numerous (10 or more) lateral striae. Median lobe of aedeagus Figs. 74, 80; paramere as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Named for the native community that inhabits the Borme area, i.e. the Ketembang people who are part of the linguistic Me-group.

Distribution: Known from the Borme area as far west as Kono.

Copelatus (Papuadytes) larsoni sp.n.

Holotype male PNG, Madang Province, Baiteta [? 500 m], 13.III.1991, D.J. Larson leg. (cDL). **Paratypes** (7 exs.): same label data as holotype (cDL, cMB, NMW).

Locus typicus: Baiteta, Madang Province, PNG.

Diagnosis: 3.44 - 3.56 mm. Puncturation on pronotum and elytron sparse and fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head densely and fine punctate posteriorly. Pronotum and elytron with sparse and fine puncturation, faint on elytron. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with indistinct to obsolescent lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small. ProT 5 simple, venter anteriorly with a sparse row of long setae, some 4 - 5 short setae posteriorly. Antenna simple, antennomeres long and slender as in female. Sternite 7 with some 10 - 14 lateral striae. Median lobe of aedeagus Figs. 75, 81; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Named for the most enthusiastic water beetler David Larson (St. John's, Canada), who discovered this species.

Distribution: Only known from the locality.

Copelatus (Papuadytes) miriae sp.n.

Holotype ♂: PNG, Morobe Province, Herzog Range, Vagau, 1300 m, 4. - 17.I.1965, Stn. 137, M.E. Bacchus leg. (BMNH). **Paratypes** (5 exs.): 3 ♂♂, 2 ♀♀, same label data as holotype (BMNH, cMB, NMW).

Locus typicus: Vagau, Herzog Range, Morobe Province, PNG.

Diagnosis: Tl-h 4.16 - 4.36 mm. Puncturation of pronotum and elytron moderately dense but fine, beetle shiny, male antenna modified: antennomere 2 enlarged (Fig. 14), male ProT 5 simple.

Description: Surface sculpture. Head dense and coarse punctate posteriorly. Pronotum and elytron with moderately dense but fine puncturation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, somewhat modified anteriorly but no lateral extensions obvious. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a band of long setae, posteriorly a row of long setae present. Antenna (Fig. 14) with antennomere 2 enlarged, rugose ventrally, antennomeres 3 - 9 stout or slightly enlarged. Sternite 7 with few lateral striae (some 3 - 5). Median lobe of aedeagus Figs. 76, 82; paramere shape as in Fig. 37.

Female: Antennomeres moderately stout.

Etymology: For Miriam "Miri" Vogelbusch, Berlin.

Distribution: Only known from the Herzog Range.

Copelatus (Papuadytes) monae sp.n.

Holotype ♂: PNG, Morobe Province, Herzog Range, Vagau, 1300 m, 4. - 17.I.1965, Stn. 139, M.E. Bacchus leg. (BMNH). **Paratypes** (9 exs.): 1 ♂, same label data as holotype; 4 ♂♂, 4 ♀♀, same but Stn. 149A. All M.E. Bacchus leg. (BMNH, cMB, NMW).

Locus typicus: Vagau, Herzog Range, Morobe Province, PNG.

Diagnosis: Tl-h 3.76 - 4.00 mm. Punctuation of pronotum and elytron very sparse and fine: hardly visible on elytron, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head moderately dense and coarse punctate posteriorly. Pronotum and elytron with very sparse and fine punctuation which is hardly visible on elytron. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, distinctly lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a row of long setae, posteriorly only 2 - 3 short setae present. Antenna simple, antennomeres long and slender. Sternite 7 with few lateral striae (1 - 5). Median lobe of aedeagus Figs. 77, 83; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: For Mona, Berlin.

Distribution: Only known from the Herzog Range.

***Copelatus (Papudytes) nomax* BALFOUR-BROWNE, 1939,
species minus cognitus**

Copelatus nomax J. BALFOUR-BROWNE, 1939: 65-66.

Copelatus nomax J. BALFOUR-BROWNE: GUIGNOT 1956: 55 (cat.);

GUÉORGUIEV 1968: 34 (cat.); GUÉORGUIEV & ROCCHI 1993: 160 (cat.).

Copelatus nomax J. BALFOUR-BROWNE sensu GUÉORGUIEV 1978: 268-269 (faun., key);
GUÉORGUIEV & ROCCHI 1993: 160 (cat.).

Holotype ♀: PNG, Mafulu [not located], 1300 m, 1.1934, L.E. Cheesman leg., B.M. 1934-321 (BMNH).

Locus typicus: Mafulu, PNG.

Notes: GUÉORGUIEV (1978) recorded this species from the western Sepik area of PNG. His identification is problematic, however. *Copelatus nomax* is known from the female holotype only which cannot be separated from females of numerous other species of the genus. The identity of *C. nomax* may only be elucidated when males originating from the type locality become available, if at all. I believe the specimens Guéorguiev had before him represent an undescribed species. It remains undescribed here for I only have a single male available for study (sp. 4 in the list of unnamed species below).

I have not completely re-described the holotype when I had it on loan from BMNH years ago. As it has not again been available despite of several subsequent requests, only a brief diagnosis can be provided here.

Diagnosis: Tl-h 3.65 mm. Microreticulation of dorsal surface weakly impressed, beetle thus shiny, punctuation of pronotum and elytron rather dense but fine.

Male: Unknown.

Distribution: Known from the type locality only.

Copelatus (Papuadytes) rufus sp.n.

Holotype ♂: PNG, Morobe Province, Herzog Range, Vagau, 1300 m, 4. - 17.I.1965, Stn. 150, M.E. Bacchus leg. (BMNH). **Paratypes** (5 exs.): 5 ♂♂, same label data as holotype (BMNH, cMB, NMW).

Locus typicus: Vagau, Herzog Range, Morobe Province, PNG.

Diagnosis: T1-h 3.48 - 3.52 mm. Slightly teneral beetle brightly ferruginous, reddish-brown when mature, punctuation of pronotum and elytron coarse and dense, beetle dull, male antenna modified: antennomere 2 distinctly enlarged, 3 - 6 slightly enlarged (Fig. 15), male ProT 5 simple.

Description: Surface sculpture. Head very densely and coarsely punctate posteriorly. Pronotum and elytron also with coarse and dense punctuation. Meshes rather deeply impressed, beetle thus dull. Venter with numerous punctures.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate, rather slender, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook small. ProT 5 simple, venter anteriorly with a sparse row of moderately long setae, posteriorly but 1 - 2 short setae present. Antenna with antennomere 2 distinctly enlarged, 3 - 6 stout (Fig. 15). Sternite 7 with few lateral striae (some 3 - 6). Median lobe of aedeagus Figs. 84, 90; paramere shape as in Fig. 37.

Female: Unknown.

Etymology: Named for the reddish colour of the specimens.

Distribution: Only known from the Herzog Range.

Copelatus (Papuadytes) sanctimontis sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Okloma, 1500 m, 1.X.1993, IR93#28, M. Balke leg. (NMW). **Paratypes** (12 exs.): 10 ♂♂, same label data as holotype; 1 ♂, Irian Jaya, Jayawijaya Province, Tarnlu, 1500 m, 6.IX.1993, IR93#4-6; 1♂, Irian Jaya, Jayawijaya Province, Bime, 1400 m, 22.IX.1993, IR93#16 (cGW, cMB, NMW).

Locus typicus: Okloma, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: T1-h 4.00 - 4.28 mm. Punctuation moderately dense and fine on pronotum, sparse and fine on elytron, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head rather sparsely and moderately coarse punctate posteriorly. Pronotum with moderately dense and fine punctuation, sparse and fine on elytron. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, small but distinct lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 slightly truncate apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, venter slightly concave, anteriorly and posteriorly with a dense row of long setae. Antenna simple, antennomeres long and slender. Sternite 7 with some 8 - 12 lateral striae. Median lobe of aedeagus Figs. 85, 91; paramere shape as in Fig. 37.

Female: Unknown.

Etymology: The holotype was collected at the foot of a mountain on top of which a church was dedicated during our stay there. The following colorful, extraordinary feast really made this an unforgettable place.

Distribution: Known so far from the Tarmlu-Bime-Okloma area.

Copelatus (Papuadytes) speciosus BALKE & HENDRICH, sp.n.

Holotype ♂: Irian Jaya, trek Nabire-Illaga, km 54 - 55, 700 - 850 m, 19. - 25.IX.1990, IR90#11, M. Balke & L. Hendrich leg. (NMW). **Paratypes** (147 exs.): 10 ♂♂, 19 ♀♀, same label data as holotype; 20 ♂♂, 28 ♀♀, same area but KM 59, ca. 750 m, 18.VII.1991, IR 91#20; 1 ♂, same area but KM 65, (approx. at 03°30'936"S 135°42'945"E), tributary of Kali Utowa, ca. 250 m, 18. - 19.VII.1991, IR 91#21; 6 ♀♀, same area but KM 62 (03°30'936"S 135°42'945"E), ca. 250 m, 24.VII.1991, IR 91#23; 26 ♂♂, 47 ♀♀, same area but KM 54, base-camp, ca. 750 m, 25.VII.1991, IR 91#24. All M. Balke & L. Hendrich leg. (cGW, cLH, cMB, NMW).

Locus typicus: Road Nabire to Illaga, km 54 - 55 (03°29'517"S 135°43'913"E), Mount Gamey, Nabire-Paniai Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 3.92 - 4.76 mm. Body somewhat stoutly ovate, puncturation of pronotum and elytron moderately dense but fine, beetle shiny, male antenna extremely modified: antennomeres 4 - 6 excessively large, 3 and 7 strongly enlarged, the others almost as in female (Fig. 16), male ProT 5 simple.

Description: Surface sculpture. Head densely and moderately coarsely punctate posteriorly. Pronotum and elytron with moderately dense but fine puncturation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum without lateral bead. Prosternum with distinct ridge, anteriorly somewhat modified but no lateral extensions visible. Prosternal process lanceolate, beaded, rather flat and with numerous long setae. Metasternum rather narrow. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a band of long setae present, setae lacking posteriorly. Antenna (Fig. 16) extremely modified: antennomeres 4 - 6 excessively large, 3 and 7 strongly enlarged, the others almost as in female. Antennomeres 3 - 7 ventrally rugose on posterior half and postero-laterally, 4 - 6 ventrally also with numerous small holes postero-laterally. Sternite 7 (Fig. 19) with numerous lateral striae (some 12 - 20). Median lobe of aedeagus Figs. 86, 92; paramere Fig. 39.

Female: Antenna moderately stout. Sternite 7 Fig. 20.

Etymology: "speciosus" (Latin) = the beautiful one, for this appears to be the most attractive and extraordinary known species of the genus.

Distribution: Known from the Mount Gamey area only.

Copelatus (Papuadytes) takime sp.n.

Holotype male: Irian Jaya, Jayawijaya Province, Bime, 1400 m, 11.IX.1993, IR 93#12, M. Balke leg. (NMW). **Paratypes** (61 exs.): 3 ♂♂, 3 ♀♀, Borme, 900 m, 18.VIII.1992, IR 92#17; 11 ♂♂, 14 ♀♀, same label data as holotype; 8 ♂♂, 4 ♀♀, Bime, 1400 m, 22.IX.1993, IR 93#16; 12 ♂♂, 6 ♀♀, Emdoman, 800 m, 29.IX.1993, IR 93#24. All specimens from Irian Jaya, Jayawijaya Province, M. Balke leg. (cGW, cMB, NMW).

Locus typicus: Bime, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 4.04 - 4.44 mm. Puncturation of pronotum and elytron dense but fine, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head moderately dense but fine punctate posteriorly. Pronotum and elytron with dense but fine puncturation, elytral puncturation somewhat coarser than on pronotum. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, distinct lateral extensions visible anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with antero-lateral hook large. ProT 5 simple, on venter anteriorly a dense row of long setae, posteriorly a sparse row of some 5 short setae present. Antennomeres long and slender, as in female. Sternite 7 with few lateral striae (only 1 - 3). Median lobe of aedeagus Figs. 87, 93; paramere shape as in Fig. 37.

Female: Antennomeres long and slender.

Etymology: Named for the river from which this species was collected, i.e. the River Taki, "me" means water, or river, in the native language that is spoken in the Borme area.

Distribution: Known from the Borme-Bime-Emdoman area of Irian Jaya.

Copelatus (Papuadytes) talaki sp.n.

Holotype ♂: Irian Jaya, Jayawijaya Province, Borme, 1200 m, 2.IX.1993, IR93#1, M. Balke leg. (NMW). Paratypes (3 exs.): 3 ♀♀, same label data as holotype (cMB, NMW).

Locus typicus: Borme, Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 3.32 - 3.44 mm. Puncturation on pronotum and elytron moderately dense and coarse, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head moderately dense and coarse punctate posteriorly. Pronotum and elytron with moderately dense and coarse puncturation. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, not modified anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 gently rounded apically.

Male: ProT 4 with small antero-lateral hook. ProT 5 simple, venter anteriorly and posteriorly with a sparse row of short setae. Antenna simple, antennomeres moderately long and slender, as in female. Sternite 7 with some 10 lateral striae. Median lobe of aedeagus Figs. 88, 94; paramere shape as in Fig. 37.

Female: Antennomeres moderately long and slender.

Etymology: Named for Talak, a most helpful Ketembang boy.

Distribution: Known from the type locality only.

***Copelatus (Papuadytes) tarmluensis* sp.n.**

Holotype ♂: Irian Jaya, Jayawijaya Province, Tarmlu, 1500 m, 6.IX.1993, IR93#4-6, M. Balke leg. (NMW). **Paratypes** (5 exs.): 5 ♂♂, same label data as holotype (cMB, NMW).

Locus typicus: Tarmlu [or Taramalou], Jayawijaya Province, Irian Jaya, Indonesia.

Diagnosis: Tl-h 3.80 - 4.16 mm. Puncturation moderately dense and fine on pronotum, sparse and fine on elytron, beetle shiny, male antenna and male ProT 5 simple.

Description: Surface sculpture. Head sparsely and moderately coarse punctate posteriorly. Pronotum with moderately dense and fine puncturation, sparse and fine on elytron. Meshes weakly impressed, beetle thus shiny. Venter with few punctures only.

Structures: Pronotum with distinct lateral bead. Prosternum with distinct ridge, indistinctly modified anteriorly. Prosternal process lanceolate, beaded, slightly convex and with few setae. Sternite 7 slightly truncate apically.

Male: ProT 4 with antero-lateral hook small. ProT 5 simple, venter anteriorly with a dense row of long setae, 2 - 4 short setae present posteriorly. Antenna simple, antennomeres long and slender. Sternite 7 with few lateral striae (some 4 - 8). Median lobe of aedeagus Figs. 89, 95; paramere shape as in Fig. 37.

Female: Unknown.

Etymology: Named for Tarmlu village close to the type locality.

Distribution: Known from the type locality only.

Unidentified material, and unnamed species

Numerous females could not be assigned to particular species with confidence. This is true in most cases when females are unknown for species mentioned above.

sp. 1.- 1 teneral ♂: PNG, Eastern Highlands Prov.: Kainantu area, Onerunka, 22.IV.1979, W. Ullrich leg. (MHNG).

sp. 2.- 1 ♂: PNG, Eastern Highlands Prov.: Wanatabe Valley, 1660 m, Stn. 177a, 5.II.1962, M.E. Bacchus leg. (BMNH).

sp. 3.- 1 ♂: PNG, Central Prov.: Sogeri Plateau near Port Moresby, Stn. 200B, 16.III.1965, M.E. Bacchus leg. (BMNH).

sp. 4.- 1 ♂: PNG, West Sepik prov.: Selminum tem, P. Beron leg. (NMW). This species was identified as *Copelatus nomax* by Guéorguiev in 1974 (see also GUÉORGUIEV 1978, and notes under *C. nomax* above).

sp. 10.- 1 ♂: PNG, Eastern Highlands Prov.: Igipinti, Korindaio river, 10.VI.1979, W. Ullrich leg. (MHNG).

The following three species belong to the *C. aipo*-group:

sp. 5.- 1 ♂: Irian Jaya, Jayawijaya Prov.: between Aipomek and Tanime (IR 92#17a), 2000 m, 20.VIII.1992, M. Balke leg. (NMW).

sp. 6.- 1 ♂: Irian Jaya, Jayawijaya Prov.: between Aipomek and Tanime (IR92#33), 2000 m, 1.IX.1992, M. Balke leg. (NMW).

sp. 7.- 1 ♂: Irian Jaya, Jayawijaya Prov.: Kono (IR92#43), 1800 m, 8.IX.1992, M. Balke leg. (NMW).

The following two species belong to the *C. rivulus*-group:

sp. 8.- 1 ♂: PNG, Morobe Prov.: Lae, Oomsia, Buang river, 15.VII.1979, W. Ullrich leg. (MHNG).

sp. 9.- 1 ♂, 1 ♀: PNG, Eastern Highlands Prov.: Kainantu, Onerunka, 22.IV. and 22.VI.1979, W. Ullrich leg. (MHNG).

Habitats

Most species were collected from first- or second order streams, some on river banks of small and rather slowly flowing closed lowland forest streams. Others were taken from small pools or backwaters on river banks of highland rivers (Figs. 96 - 99); or small waterholes in almost dried-out beds of low order foothill-forest streams. Not a single individual was collected from truly stagnant water.

Beetles usually hide under stones or even deeply in the gravel. This mode of life probably helps to avoid downstream drift of the beetles. I frequently observed that even the smallest, almost dried-out streamlets are heavily flushed during and after rain, which occurs almost daily in many areas sampled.

Comparably little is known about the actual habitats of the vast majority of species and which particular niches have been formed. This is due to the lack of long-term studies of entire stream systems.

The larvae of *Papuadytes* remain unknown despite considerable collecting efforts.

Taking all the sites examined in aggregate, hardness of water readings ranged from 2 - 19 °d, and the pH from 5.5 - 7.5. It is not yet, if at all, possible to predict occurrence of particular species based on these parameters.

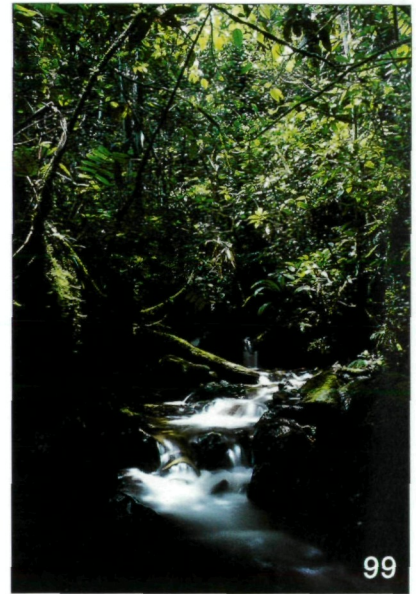
Papuadytes are absent from altitudes above 2600 m a.s.l. Also, no other water beetle species has so far been collected from running waters above this level in New Guinea. The vertical distribution of *Papuadytes* species is depicted in Fig. 100.

Acknowledgements

Words can surely not express the gratitude I owe to the people of New Guinea who made the fieldwork possible by helping in so many ways. Numerous westerners working in New Guinea were also helpful, i.e. by providing flights, accommodation, and food. I especially wish to thank my friends Mrs Wahyhuniati and Mr Philippe Hoyois for supporting fieldwork in the Nabire area, and several missionaries who, despite their own problems, were always willing to share what they owned.

My friends and colleagues, Mr L. Hendrich (Berlin, Germany) and Mr Alex Riedel (Munich, Germany), were the best travel companions one could wish for. Our missions would have failed without their good humour and their total willingness to always keep the faith, no matter how hard the times and how sopping wet our clothes were.

Thanks are due to numerous colleagues who supplied specimens and/or valuable informations: Dr. M. Brancucci (Basel, Switzerland), Dr. H. Fery (Berlin, Germany), Mr. S.J. Hine (London, U.K.), Dr. M.A. Jäch and Dr. H. Schönmann (Vienna, Austria), Prof. Dr. D.J. Larson (St. John's, Canada), Dr. I. Löbl (Geneva, Switzerland), Dr. A.N. Nilsson (Umea, Sweden), and Ing. F. Pederzani (Ravenna, Italy).



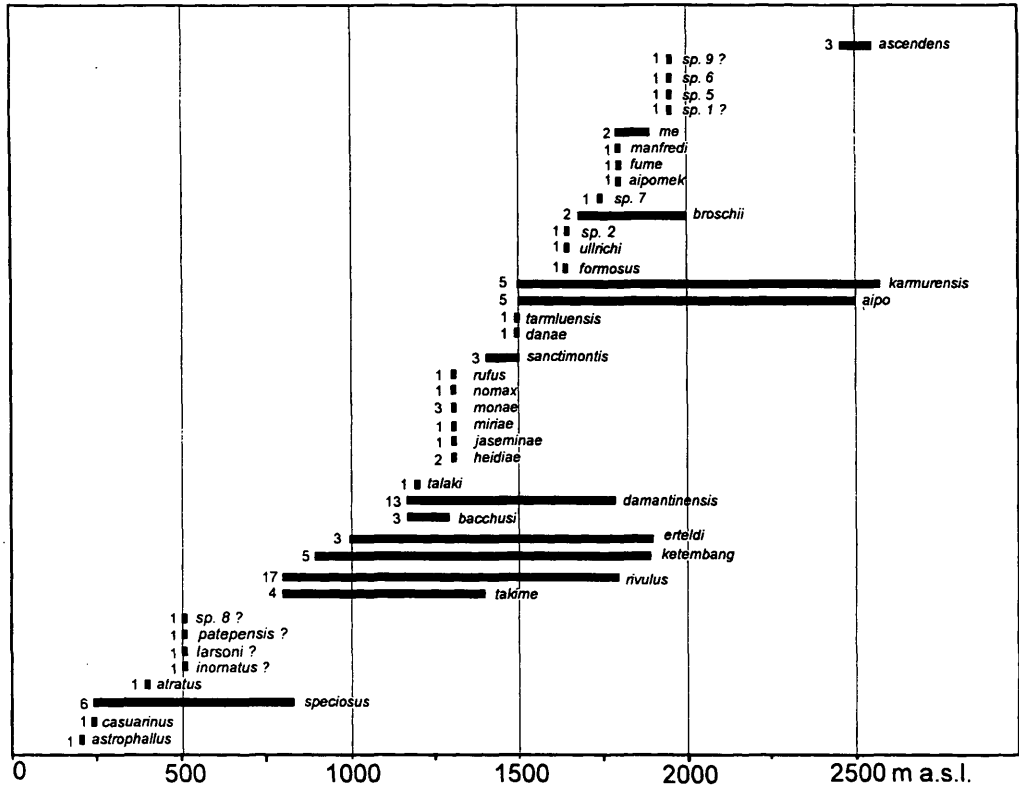
Figs. 96 - 99: *Papuadytes* spp., habitats, (96) of *P. aipo* at Bime, 2000 m, (97) of *P. ascendens* and *P. karmurensis* at Aipomek-Diruemna, 2600 m, (98) of *P. rivulus*, *P. sanctimontis* and *P. takime* at Bime, 1400 m, (99) of *P. speciosus* at Nabire, KM 54, 750 m.

This work benefitted from suggestions made by Prof. Dr. W. Sudhaus (Berlin, Germany), Dr. Stefan Richter (Berlin), Dr. Manfred A. Jäch (Vienna, Austria), Prof. Dr. G. Wewalka (Vienna, Austria) and Dr. Garth Foster (Ayrshire, Scotland, UK) who also corrected the English of my MS.

Thanks are due to the "Studienstiftung des deutschen Volkes" for financial support.

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Fig. 100: *Papuadytes* spp., vertical distribution.

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Jahr/Year: 1998

Band/Volume: [100B](#)

Autor(en)/Author(s): Balke Michael

Artikel/Article: [Revision of New Guinea Copelatus ERICHSON, 1832
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