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Phrudoneura (Diptera: Dolichopodidae) from Australia and Melanesia

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Abstract

The genus *Phrudoneura* Meuffels & Grootaert (Diptera: Dolichopodidae) from Australia, New Guinea, the Solomon Islands, and New Caledonia is revised, and four new species are described. *Phrudoneura collessi* **sp. nov.** occurs in tropical and subtropical Australia, and is named in honour of the Australian Dipterist, Don Colless. *Phrudoneura popondetta* **sp. nov.** is from lowland Papua New Guinea, and *P. abbreviata* Meuffels & Grootaert, originally described from Papua New Guinea, is now recorded from tropical Australia and the Solomon Islands. The previously described fauna of New Caledonia of five species is reviewed and two new species are described, *P. adusta* and *P. hibernalis*. All species are keyed and illustrated. *Phrudoneura* is not placed in any established subfamily but is regarded as *incertae sedis*, perhaps having closest affinity with the Sympycninae.

Key words: Diptera, Dolichopodidae, *Phrudoneura*, Australia, New Caledonia, New Guinea, Solomon Islands, Donald Colless

Introduction

Males of the genus *Phrudoneura* are easily recognized in having a distinctly shorted vein M that ends in the membrane about half the distance between the dm-cu crossvein and the wing apex (e.g., Fig. 5d). Females, on the other hand, maintain a conservative facies with vein M extending to join the costa near the wing apex. Meuffels and Grootaert (1987) first described the genus (as a subgenus of *Sympycnus*) based on a single species, *P. abbreviata*, from Papua New Guinea. They subsequently described five additional species from New Caledonia (Meuffels & Grootaert 2002), based on collections at the MNHN. Since that time, a large quantity of New Caledonian material has accumulated, from intensive Malaise trapping by Evert Schlinger and associates (INHS, 1998–2001), trapping by G. Monteith & C. Burwell (QMB 2004–2005), and the collections of Max Moulds (AMS) and Bradley Sinclair (CNC). These, in addition to older collections from the BPBM and other institutions, were examined and are reviewed here.

Since this material provided two new species as well as new distributional records, the entire New Caledonian fauna is reviewed, with an updated key and habitus photos provided for all species. As well, additional new species from Australia and Papua New Guinea are described.

The new Australian species described here is dedicated to the memory of Don Colless. I first met Don in 1980 when, as a graduate student, I visited the ANIC to view its Dolichopodidae holdings. Don was most hospitable and said he was glad somebody wanted to work on the Australian Dolichopodidae because nobody had really looked at them since the time of Octave Parent (a productive Belgian worker who worked on the world fauna from the 1920s to 1940s), and that the ANIC had many drawers of unsorted material. Indeed, there were at least 20 drawers packed full of unsorted specimens, almost all beautifully mounted on minuten pins (characteristically with the head facing up). Most of these had been prepared by Don in the field from freshly caught material. There was abundant material from the Australia tropics gathered on numerous ANIC expeditions to northern Queensland and the Northern Territory, almost all undescribed and exciting to see. I also met his assistant Zenta Liepa, who was instrumental in building the wonderful ANIC Diptera collection. I saw Don on numerous subsequent occasions and I was always impressed by his extensive knowledge of the Australian Diptera fauna as a whole. He had a deep interest in systematic theory and was an unrepentant pheneticist. Don enjoyed taking contrarian stances, especially

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to what he considered mainstream dogma, and his frequent contributions and acerbic wit were well-known to readers of the online Taxacom forum. Vale Don.

Materials and methods

Species are defined primarily on the basis of male characters, especially the genitalia and male secondary sexual characters (MSSC). Drawings of genitalia were made with a camera lucida. In describing the hypopygium, 'dorsal' and 'ventral' refer to morphological position prior to genitalic rotation and flexion. Thus, in figures showing a lateral view of the hypopygium, the top of the page is morphologically ventral, while the bottom is dorsal.

Morphological terminology follows McAlpine (1981) and Cumming *et al*. (1995). Body length of males is measured from the base of the antennae to the tip of the seventh abdominal segment. Wing length is the distance from the wing base to apex, and wing width is measured from the junction of R_1 with the costa to the opposite side of the wing, perpendicular to the wing's long axis. The CuAx ratio is the length of the m-cu crossvein/distal section CuA_1. The position of features on elongate structures such as leg segments is given as a fraction of the total length, starting from the base. The relative lengths of the podomeres are representative ratios and not measurements, and are given for each leg in the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5. The following abbreviations and terms are used: MSSC = Male secondary sexual character(s); non-genitalic characters found only on the male body; I, II, III = pro-, meso-, metathoracic legs; C = coxa; T = tibia; F = femur; ac = acrostichal setae; ad = anterodorsal; av = anteroventral; dc = dorsocentral setae; dv = dorsoventral; hm = postpronotal setae; npl = notopleural setae; pa = postalar setae; pd = posterodorsal; pm = presutural supra-alar setae; ppl = proepisternal setae; pv = posteroventral; sa = postsutural supra-alar setae; sr = presutural intra-alar setae; t = tarsus; t_{1-5} = tarsomeres 1 to 5.

The following acronyms are used to represent institutions where specimens are deposited: (AMS)—Australian Museum, Sydney; (ANIC)—Australian National Insect Collection, CSIRO, Canberra; (BPBM)—Bernice Pauahi Bishop Museum, Honolulu; (BMNH)—the Natural History Museum, London; (CNC)—Canadian National Collection of Insects & Arachnids, Agriculture Canada, Ottawa; (INHS)—Illinois Natural History Survey, Champaign, Illinois; (IRSN)—Institut Royal des Sciences Naturelles de Belgique, Bruxelles; (MNHN)—Museum National d'Histoire Naturelle, Paris; (QMB)—Queensland Museum, Brisbane; (ZMUC)—Zoological Museum, University of Copenhagen.

Taxonomy

Genus *Phrudoneura* Meuffels & Grootaert

Phrudoneura Meuffels & Grootaert, 1987: 319. Type species: *Sympycnus (Phrudoneura) abbreviatus* Meuffels & Grootaert, 1987, by original designation.

Diagnosis. Body length ranges from 1.8–3.3 mm, but most species about 2.2–2.8. *General*: body colour variously yellow to dark brown.

Head: head almost circular in anterior view, but slightly wider than high; dorsal postcranium flat, and slightly concave dorsally; postorbitals uniseriate; pair converging postverticals present, positioned mediad of postorbital row; pair strong vertical and pair strong diverging ocellar setae present; both sexes with eyes widely separated by face and clypeus; clypeus not tectiform; male eye facets more or less uniform with tiny hairs between facets; palp with distinct apical seta; scape usually bare dorsally; first flagellomere enlarged subtriangular to subrectangular, and covered in microtrichia; arista arising dorsobasally on first flagellomere, with short hairs, and about as long as head height.

Thorax: posterior slope of mesonotum flattened but not depressed; ac biseriate, comprising 8–10 regular pairs; 5 dc present, slightly decreasing in size anteriorly; field of short setae present on anterior slope of thorax; 1 pa, 2 sa (anterior sa much shorter than posterior sa), 2 sr, 2 npl, 1 hm, 1 pm present; median scutellar seta strong, lateral scutellar present as weak seta, about one-fifth size of median; proepisternum with short black seta dorsally (usually not visible since covered by head), and with stronger black ventral seta above join with CI.

Legs: CI with short anterior setae and 3 longer distal setae; CII with short anterior setae and with two setae along distolateral ridge; CIII with strong lateral seta near 1/3, and trochanter III with short lateral seta; FI with short av and pv seta at 5/6; TI usually with ad-pd setal pair near 1/3, with ad seta stronger than pd seta, and with short ad setal serration from 1/3 to apex; FII and FIII with strong anterior subapical seta, and usually with short subapical av and / or pv seta; TII usually with three distinct ad-pd setal pairs; TIII with 3–4 distinct ad-pd setal pairs, and with two strong ventral setae; $IIIt_2$ distinctly longer than $IIIt_1$.

Wing: membrane hyaline; R_{2+3} ends in anterior margin at 5/6; R_{4+5} ends just anterior to apex; R_{4+5} and M diverging slightly from base; M without flexion ("*bosse alaire*") in both sexes; male vein M ends in membrane halfway between dm-cu crossvein and wing apex (MSSC); female vein M extends to margin usually just before wing apex, and sometimes very slightly bowed with respect to R_{4+5}; CuAx ratio near 0.5; anal angle weak.

Abdomen: hypopygium mostly withdrawn from view but capable of extension so well free of body; tergum 6 bare, narrow, hoodlike; segment 7 bare with longer tergum and shorter sternum; sternum 8 ovate with distinctive inverted V-shaped internal carina at base, and covering over left basal hypopygial foramen; epandrium subcircular in lateral view; ventral distal margin of epandrium with 3 pedunculate setae (= epandrial lobe setae), sometimes on raised ledge (e.g., Figs 1a, b) otherwise arising on the surface of the epandrium (Figs 3a, b); surstylus short, bearing various setae and often modified pinnate seta; subepandrial sclerite subrectangular with row of dorsal setae; cercus subtriangular; female oviscapt divided into two hemitergites, each with crest of four spinelike setae.

Remarks. Although *Phrudoneura* currently comprises only ten described Australasian species (treated here), it is also widespread across the tropical Orient. Meuffels and Grootaert (2002) noted undescribed species from West Papua (Indonesia), Thailand, and peninsular Malaysia, and I have seen additional undescribed species based on males from Sarawak (BMNH), Vietnam (BPBM), and poorly preserved males from the Papua New Guinea Highlands (Telefomin at 1450 m, and Mt Missim at 1300 m, BPBM).

Thus, Phrudoneura appears to be a widespread Oriental and Australasian genus, although the Oriental fauna remains undescribed. The genus appears to have its eastern limit in the Solomon Islands and New Caledonia, and it was not found in the intensively sampled rainforests of Fiji.

Phrudoneura is a prominent element in the New Caledonia fauna, where it is both diverse and commonly collected. Most of the collection sites in New Caledonia appear to be rainforest, and some of the species appear to be active even in the winter months. By contrast, the genus appears to be less commonly collected in Australia, and in addition to rainforest habitats, the gensu has also been collected in mangroves, along creeks in the arid zone, and in marshland.

Phrudoneura shows some similaritiy to the subfamily Sympycninae based on the following characters: posterior mesonotum not strongly flattened, dorsal postcranium flat or slightly convex, femora II and/ or III with distinct anterior preapical seta, reduced anal angle, and tibia I often with ad row of short setae (serration) on distal half; hypopygium usually held encapsulated by pre-abdomen (athough see discussion below). However additional morphological characters related to the taxonomic placement of *Phrudoneura* need to be discussed:

1. The head of *Phrudoneura* is subcircular in anterior view, and slightly wider than high. In contrast, most Sympycninae have the head usually ovate in anterior view, distinctly higher than wide. Also, most male Sympycninae have a distinctly narrowed face with enlarged anterior enlarged facets, while male *Phrudoneura* have a wide, parallel-sided face.

2. As noted before, males have vein M shortened and ending in the membrane halfway between the dm-cu crossvein and the wing apex (MSSC), while females have vein M reaching the wing margin just behind the apex. This is the best diagnostic generic character for male *Phrudoneura*.

3. In both sexes, vein M is perfectly straight and lacks a distinct flexion (or *bosse alaire*) anywhere along its length. This is important because most other Sympycninae have such as distinct flexion with associated depression in the membrane usually postioned midway between crossvein dm-cu and the wing apex.

4. In most Sympycninae, segment 7 is short and not pedunculate. However in *Phrudoneura*, tergite 6 and segement 7 are bare, and segment 7 forms a short peduncle for the hypopygium. Therefore, although the hypopyium is usually held retracted or encapsulated by segment 5, it can also be projected outwards with the peduncle. This peduncle suggests affinity with the rather loosely defined agglomeration of genera known as the Peloropeodinae, some of which also have a short hypopygial peduncle.

5. Male sternite 8 (the hypopygial cap) usually has a V-shaped internal sclerotization, evident in cleared specimens (e.g., Figs 1b, 3a–c). This is similar to sclerotization of sternite 8 in *Acropsilus* Mik (see figures in Bickel, 1998), and in the genus *Nepalomyia* Hollis.

6. The epandrium is subcircular in lateral view, while most genera in the Sympycninae have a more rectangular epandrium.

7. The curved ventral margin of the epandrium has a row of three usually pedunculate setae, and these are often on a slightly raised projection. I believe this genitalic character is diagnostic for the genus Phrudoneura. The basal two setae are strong and are probably homologous with the two setae found on the epandrial lobe in many dolichopodid genera. The shorter distal seta may be homologous to a short seta often found near the base of the epandrial lobe in other dolichopodid genera.

8. The surstylus is usually short, bearing short arms with modified setae.

9. A distinct subepandrial sclerite, usually subrectangular with some dorsal setae, is present in many species (Figs 1a-b) just ventrad of the two cerci.

10. The female oviscapt is divided into two hemitergites, each with a crest of four spine-like setae or acanthophorites. This is a common pattern in the Sympycninae as well as other Dolichopodidae.

Phrudoneura is perhaps close to to the Sympycninae, but it is somewhat distant from the main polythethic genus *Sympycnus* Loew based on characters 1, 3, 4, 5, 6 and 7, discussed above. Indeed, some characters (4 and 5 above) would suggest a possible relationship with *Acropsilus* Mik (see further discussion in Bickel, 1988). In light of this, rather than place *Phrudoneura i*n the Sympycninae and further dilute the definition of the subfamily, I regard the genus as *incertae sedis* within the Dolichopodidae.

The shortened male vein M is a distinctive and readily recognized autapomorphy for the genus *Phrudoneura*. One would assume an ancestral or sister taxon would have the plesiomorphic state of a complete male vein M. As well, males of species within the *Phrudoneura* clade might not display this apomorphic character, and revert to the plesiomorphic state of a complete vein M. So how might one recognized closely related taxa with a complete vein M? The male genitalic structure as represented by characters 4–8 above might provide additional strong evidence of relationship.

At the basic taxonomic level, most species within *Phrudoneura* are dull coloured and lack distinctive MSSC (especially leg MSSC found in many Sympycninae), and therefore delimitation of species groups within the genus might prove difficult.

Phrudoneura includes the following described species:

abbreviata Meuffels & Grootaert 1987: 321. (Sympycnus, in subgenus Phrudoneura). Papua New Guinea; Australia (NT, Qld), Solomon Islands.
adusta **sp. nov.** New Caledonia.
collessi **sp. nov.** Australia (WA, NSW, Qld)
hibernalis **sp. nov.** New Caledonia.
maculata Meuffels & Grootaert, 2002: 72. New Caledonia.
matilei Meuffels & Grootaert, 2002: 73. New Caledonia.
obscura Meuffels & Grootaert, 2002: 75. New Caledonia.
parva Meuffels & Grootaert, 2002: 76. New Caledonia.
picta Meuffels & Grootaert, 2002: 74. New Caledonia.
popondetta **sp. nov.** Papua New Guinea.

Key to male *Phrudoneura* from Australia and Melanesia

Phrudoneura males are readily recognized by their abbreviated vein M, which ends in the membrane well before reaching the wing margin. This key to *Phrudoneura* should suffice for the species under consideration. However, there are undescribed species in the Papuan region where confirmation will require more care.

1	Thorax and abdomen mostly dark brown	2
-	Thorax and abdomen with significant areas of yellow cuticle	4
2	Coxae II and III mostly yellow; basal two thirds of FIII yellow; lower postorbitals yellow; surstylus short with pinnate modified seta and other setae as figured; cercus setose, subtriangular (Figs 1b, 4b) (Australia)	*P. collessi* **sp. nov.**
-	Coxae II and III, and FIII mostly dark brown; postorbitals entirely black.	3

3 Scape with distinct setae on distal dorsal surface; all coxae brown; FI mostly brown; halter brown (Figs 4c–f) (Papua New Guinea) . . . . . *P. popondetta* **sp. nov.**
- Scape dorsally bare; CI yellowish; FI yellow; halter yellow (Fig. 5b) (New Caledonia). . . . . *P. obscura*
4 Femur III entirely yellow 5
- Femur III basally yellow with distal brown maculation 6
5 Notopleuron with shining ivory-coloured pruinosity, and just ventrad with broad dark brown stripe across pleura; thorax with brown, black and yellow pattern, and abdomen dark brown and yellow (Figs 6a-b) (New Caledonia). . . . . *P. maculata*
- Notopleuron without ivory-coloured pruinosity, mesonotum, scutellum and pleura almost entirely yellow; abdomen basally yellow with terga 5 and 6 brownish (Fig. 5a) (New Caledonia). . . . . *P. picta*
6 Ventral postorbital setae distinctly pale yellow; antenna mostly yellow; thorax mostly yellow with posterior mesonotum and scutellum brown metallic blue-green reflections; surstylus prolonged with curved setae as figured; cercus setose, elongate subtriangular (Figs 1a, 4a) (New Guinea, Solomon Is, Australia) . . . . . *P. abbreviata*
- Postorbitals entirely black or brownish; antenna with some brown colour; thorax variously coloured 7
7 Abdomen with distinct pattern, terga 2–4 mostly dark brown with pale yellow anterior and posterior margins, with tergum 5 dark brown; cercus digitiform and elongate, extending beyond hypopygium; halter club infuscated (Fig. 5d) (New Caledonia) . . . . . *P. matilei*
- Abdomen without such pattern, terga usually unicolorous; cercus shorter, curved or subtriangular; halter club yellow 8
8 Hypopygium and associated abdominal segments 7 and 8 entirely pale yellow; abdominal terga 1–5 dark brown with tergum 4 yellowish laterally; apical half of FIII dark brown (Fig. 5c) (New Caledonia) . . . . . *P. parva*
- Hypopygium mostly brown with only cercus yellow; abdominal tergal colour various; apical third of FIII dark brown 9
9 TII with posterior row of six short erect setae spaced along length; tergum 1 and the basal half of tergum 2 yellow, remaining terga dark brown (Figs 3a, 6d) (New Caledonia) . . . . . *P. hibernalis* **sp. nov.**
- TII without posterior row of erect setae; all abdominal terga dark brown; (Figs 3b, 6c) (New Caledonia) . . . *P. adusta* **sp. nov.**

I. *Phrudoneura* from Australia, New Guinea and Solomon Islands

Phrudoneura abbreviata Meuffels & Grootaert

(Figs 1a, 2, 4a)

Sympycnus (Phrudoneura) abbreviatus Meuffels & Grootaert, 1987: 321.
Phrudoneura abbreviata: (Meuffels & Grootaert, 1997: 289)

Type material. *Phrudoneura abbreviata* was described from specimens (IRSN, not seen) collected in June 1982, in Madang Province, Papua New Guinea.

Additional material. AUSTRALIA: **Northern Territory:** ♂, 3 ♀, Baroalba Creek Springs, 19 km NE by E of Mt Cahill, 13.VI.1973, Colless; ♂, 16 km E by N of Mt Cahill, 16.XI.1972, Colless (ANIC); ♂, Palmerston, Yarawonga Ck, 15.I.1985, Liehne (AMS); ♂, Berry Springs, monsoon vine thicket, Malaise trap, 30.X.-4.XI.1991 (AMS). **Queensland:** 5 ♂ 8 ♀, Bramston Beach, nr. Innisfail, 30.IV.1967, rainforest fringe, Colless; ♀, Moses Ck, 4 km N by E of Mt Finnigan, 16.X.1980, Colless; ♂, 1.1 km ENE of Mt Tozer, 12°43'S 143°18'E, 11–16.VII.1986, Malaise, Colless; ♀, Mt Webb NP, 3 km NE of Mt Webb, 15.03°S 45.09°E, 2.X.1980, Colless; ♂, ♀, Bamboo Ck N of Mossman, 25.IV.1967, Colless; ♂, 10 miles S of Daintree, 25.IV.1967, Colless; ♀, 12 km SE of Daintree, 22.XI.1981, Colless (all ANIC); 3 ♂, 4 ♀, Torres Strait, Badu Island, 10.1°S 142.1°E, 1–4.VII.2008, T. Nona; ♂, ♀, Mareeba Wetlands, 12°56'33''S 145°21'38"S, 406 m, 25–26.III.2007, marsh, yellow pan trap, Bickel (both AMS); Bamaga, 10.53°S 142.24°E, 5–12.XII.1986, Malaise trap, Houston & Sadler (QDPI). PAPUA NEW GUINEA: Louisiade Arch, **Misima:** ♂, Bwagaoia, 0–10 m, 3–4.III.1972, Gagne (BPBM). SOLOMON ISLANDS: **Rennell:** ♂, Niupan, 28.VIII.1962, Noona Dan (ZMUC); ♀, Hutuna, 18.III.-3.IV.1965, Wolff (ZMUC); New Georgia Group, **Kolombangara**: ♂, Gizo, 0–140 m, XII.1980, Krauss; ♂, Iriri, 10 m, 4.VII.1964, Krauss; **Guadalcanal**, Tadhimbko, 0–50 m, XII.1975, Krauss. **Santa Isabel:** ♂, SE Tatamba, 0–50 m, 31.VIII.1964, Straatmann (BPBM).

Remarks. *Phrudoneura abbreviata* occurs from the Solomon Islands though the Papuan region and into tropical Queensland and the Northern Territory (Fig. 2). This pattern of species distribution, from the Solomon Islands through New Guinea, along the Cape York Peninsula and across to Arnhem Land is found in a number of tropical Australasian species (e.g., see maps for various Sciapodinae and *Acropsilus* in Bickel 1994, 1998, respectively). Although most of the specimens were apparently collected in rainforest habitats, those from the Torres Strait and Northern Territory were collected in strongly monsoonal habitats, probably in vine thickets (gallery forest) along seasonal creeks. Also the species was also taken in inland marsh habitat near Mareeba, Queensland.

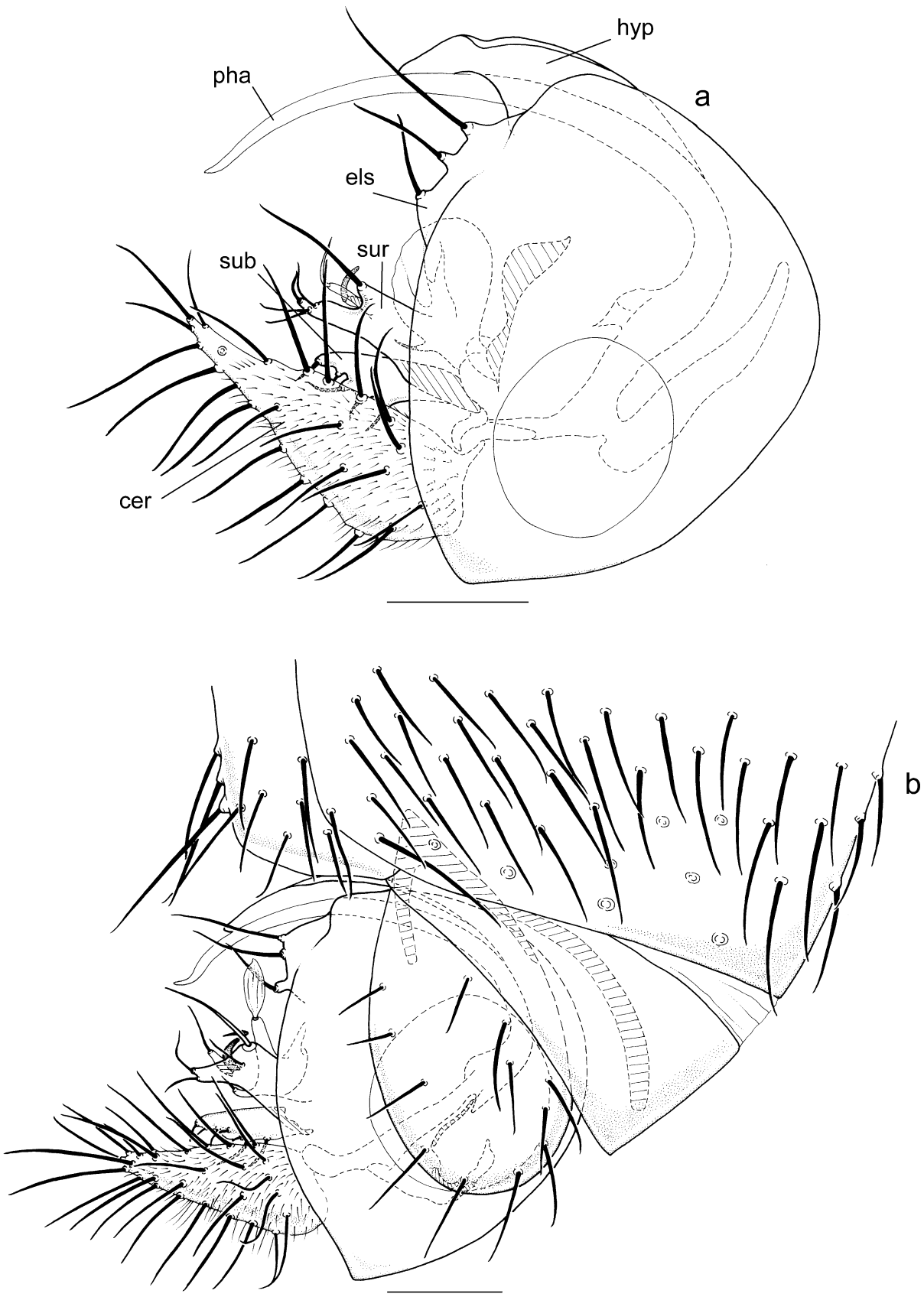

FIGURE 1. *Phrudoneura abbreviata* Meuffels & Grootaert; a. hypopygium, left lateral. *P. collessi* **sp. nov.**; b. male postabdomen, left lateral. Scale line = 0.1 mm. Legend: cer = cercus; els = epandrial lobe setae; hyp, hypandrium; pha = phallus; sub = subepandrial plate; sur = surstylus.

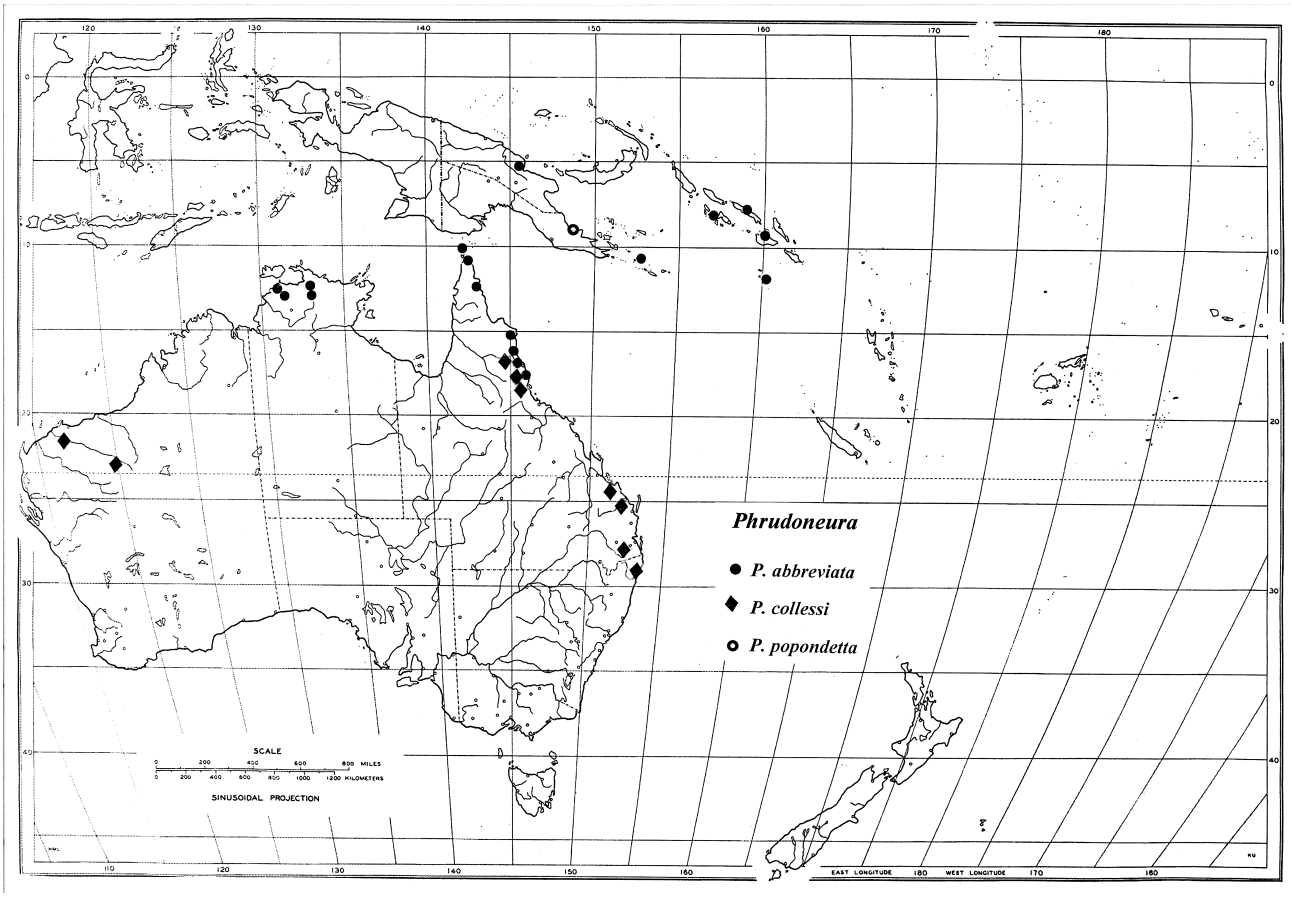

FIGURE 2. Distribution map for *Phrudoneura abbreviata*, *P. collessi* and *P. popondetta.*

***Phrudoneura collessi* Bickel, sp. nov.**
(Figs 1b, 2, 4b)

Type material. AUSTRALIA: **Western Australia**: **HOLOTYPE**: ♂, Millstream, 7.IV.1971, at light, D.H. Colless; **PARATYPES**: ♂, Millstream, 25.X.1970; ♂, ♀, Crossing Pool, Millstream, 21.X.1970, at light, D.H. Colless; 2 ♂, Millstream-Chichester NP, McKenzie Spring, 21°20' 18"S, 117°12'38"E, Malaise trap over spring, rocky ravine, 299 m, 7–12.V.2003, Lambkin, Yeates & Recsei (all ANIC).

Additional material. AUSTRALIA: **New South Wales**: 3 ♂, ♀, Brunswick Heads, VIII.1963, Haverstein (ANIC). **Queensland:** ♂, Bundaberg, 25.V.1972, Frauca; 2 ♂, Baldwin Swamp Faunal Res., nr. Bundaberg, 10.X.1972, Frauca; ♂, Ingham, 9.VIII.1969, Harley; ♂, Big Mitchell Ck, Mareeba-Molloy Rd, 4.V.1967, Colless; ♀, 7–14 miles W of Herberton, via Watsonville, 1.V.1967, Colless (all ANIC); 2 ♂, 5 miles W of Ravenshoe, 6.XII.1962, Ross & Cavagnaro (CAS); ♀, Gatton, 9–16.IX.1981, yellow pan trap, in potato crop (QDPI); ♀, Woodgate NP, Hoppy Larks Ck & Burrum River, 3.XII.1992, yellow pans nr mangroves, Bickel (AMS); **Western Australia**: ♂, ♀, Karijini Natl Park: Weano Gorge Rd: 22°21'16"S 118°15'11"E , Lambkin & Weir, Malaise over running creek above Hancock Gorge, 699 m, 15–20.V.2003 (ANIC 2130).

Description. Male: length: 2.1 mm; wing: 2.3 mm x 0.9 mm.

Head: head almost circular in anterior view, but slightly wider than high; dorsal postcranium flat, and slightly concave dorsally; vertex and frons dark brown and covered with grey pruinosity; postorbitals mostly pale yellow, but dorsalmost three postorbitals black; pair converging postvertical setae, positioned mediad of postorbital row; pair strong vertical and pair strong diverging ocellar setae present; male eyes distinctly separated by face and clypeus; eye facets more or less uniform; face-clypeus brown and covered with grey pruinosity, and with distal margin of clypeus yellowish; palp yellow with short black setae and distinct apical seta; proboscis brownish; antenna mostly brown, but variously with yellowish coloration on mediodistal margin of scape, and medioventral surface of pedicel and first flagellomere; scape dorsally bare; first flagellomere enlarged subtriangular, and covered

in microtrichia; arista arising dorsobasally on first flagellomere, with short hairs, and about as long as head height.

Thorax: dorsum and pleura mostly dark brown and covered with grey pruinosity; metepimeron yellow ventrally (above CIII), becoming brown dorsally; posterior slope of mesonotum not depressed; ac biseriate, with 8–9 regular pairs; 5 dc present, slightly decreasing in size anteriorly; field of short setae present anterior slope of thorax; 1 pa, 2 sa (with anterior sa much shorter than posterior sa), 2 sr, 2 npl, 1 hm, 1 pm present; median scutellar seta strong, lateral present as weak pale seta, about one-fifth size of median; proepisternum with short black seta dorsally (usually not visible since covered by head, and with stronger black ventral seta above join with CI.

Legs: CII brown laterally but yellow on anterior surface; CI and CIII and reminder of legs mostly yellow, but FIII with dark brown apical "knee", and distal tarsomeres infuscated; vestiture black; CI with short anterior setae and 3 longer distal setae; CII with short anterior setae and with two setae along distolateral ridge, with basal seta at 1/3 and stronger seta near ½; CIII with strong lateral seta near 1/3, and trochanter III with short lateral seta; I: 2.7/ 2.4/ 1.3; 0.6; 0.5; 0.4; 0.4; FI with short av and pv seta at 5/6, and with short subapical posterior seta; TI with ad-pd setal pair at 1/3, with ad seta stronger than pd seta, and with short ad setal serration from 1/3 to apex; II: 3.5/ 3.8/ 1.7; 1.0; 0.9; 0.5; 0.4; FII with strong anterior subapical seta, and with shorter av and pv seta at 7/8; TII with short ad-pd setal pair at 1/5, very strong ad-pd setal pairs at ¼ and ½, ventral seta at 3/8, and with subapical corona of long pd, dorsal ad av, and pv seta; tarsomeres IIt_{1-4} each with ring of short apical setae; III: 3.5; 4.6; 1.0/ 1.5/ 1.0/ 0.7/ 0.4; FIII with strong anterior subapical seta, and with shorter av seta at 5/6; TIII with 4 strong ad-pd setal pairs at 1/5, 2/5, 2/3, and subapically, and with strong ventral seta at ½ and shorter ventral at ¾, and with long apical av and pv setae; $IIIt_1$ with some short ventral hairs (MSSC); $IIIt_2$ distinctly longer than $IIIt_1$.

Wing: membrane hyaline; R_{2+3} ends in anterior margin at 5/6; R_{4+5} ends just anterior to apex; R_{4+5} and M diverging slightly from base; M ends in membrane halfway between dm-cu crossvein and wing apex (MSSC); anal angle weak; CuAx ratio near 0.6; lower calypter yellow with fan of brown setae; halter yellow.

Abdomen: terga 1 and 2 mostly yellowish, sometimes with dorsal infuscation; terga 2–5 mostly dark brown with yellow posterior margin; sterna 1–5 yellow; tergum 6 narrow, hoodlike; segment 7 with longer tergum and shorter sternum; sternum 8 ovate with distinctive inverted V-shaped internal carina at base, and covering left basal hypopygial foramen; hypopygium (Fig. 1b) mostly dark brown with pale yellow cercus; epandrium subcircular; hypandrium forming short hood over elongate curved phallus; ventral distal margin of epandrium with 3 pedunculate setae (= epandrial lobe setae) on raised ledge; surstylus short, bearing various setae and modified pinnate seta; subepandrial sclerite subrectangular, with row of dorsal setae; cercus subtriangular and highly setose.

Female. Similar to male except as noted: face and clypeus more widely separated; vein M reaching wing margin just behind apex, and without flexion or *bosse alaire*; oviscapt divided into two hemitergites, each with crest of four spine-like setae.

Remarks. *Phrudoneura collessi* has a rather unusual distribution, which is across northern Australia, but apparently south of the monsoonal belt (Fig. 2). It it is found in the Cairns district rainforests where it is possibly sympatric with *P. abbreviata*, then down along the Queensland coast to northernmost New South Wales, and with a strange disjunction in two locations along the Fortescue River drainage in the Pilbara region of Western Australia. This latter region, especially the Millstream type locality, appears to be a refugium and supports a richer and more unusual fauna than might be expected in such an arid region (this will be discussed further in a paper, in prep., on the Pilbara Dolichopodidae).

Phrudoneura collessi is probably the sister taxon of the more tropical *P. abbreviata*, as both share distinct yellow postorbital setae and similar hypopygia.

Phrudoneura popondetta **Bickel, sp. nov.**

(Figs 4c–f)

Type material. PAPUA NEW GUINEA: Popondetta Subdistrict: holotype, ♂, Siuipi, nr Sasembata, 1.XI.1963; paratype ♀, Buri, nr Sasembata, 30.X.1963, both D.K. McAlpine (AMS).

Description. Male: length: 2.2; wing: 2.5 x 1.1; (Fig. 4c); similar to *P. collessi* except as noted:

Head: vertex and frons dark brown, with little pruinosity; entire row of postorbitals black; face-clypeus entirely dark brown and covered with grey pruinosity; palp dark brown; proboscis brown; antenna entirely brown; scape with distinct setae on distal dorsal surface (Fig. 4d); first flagellomere subtriangular to subrectangular.

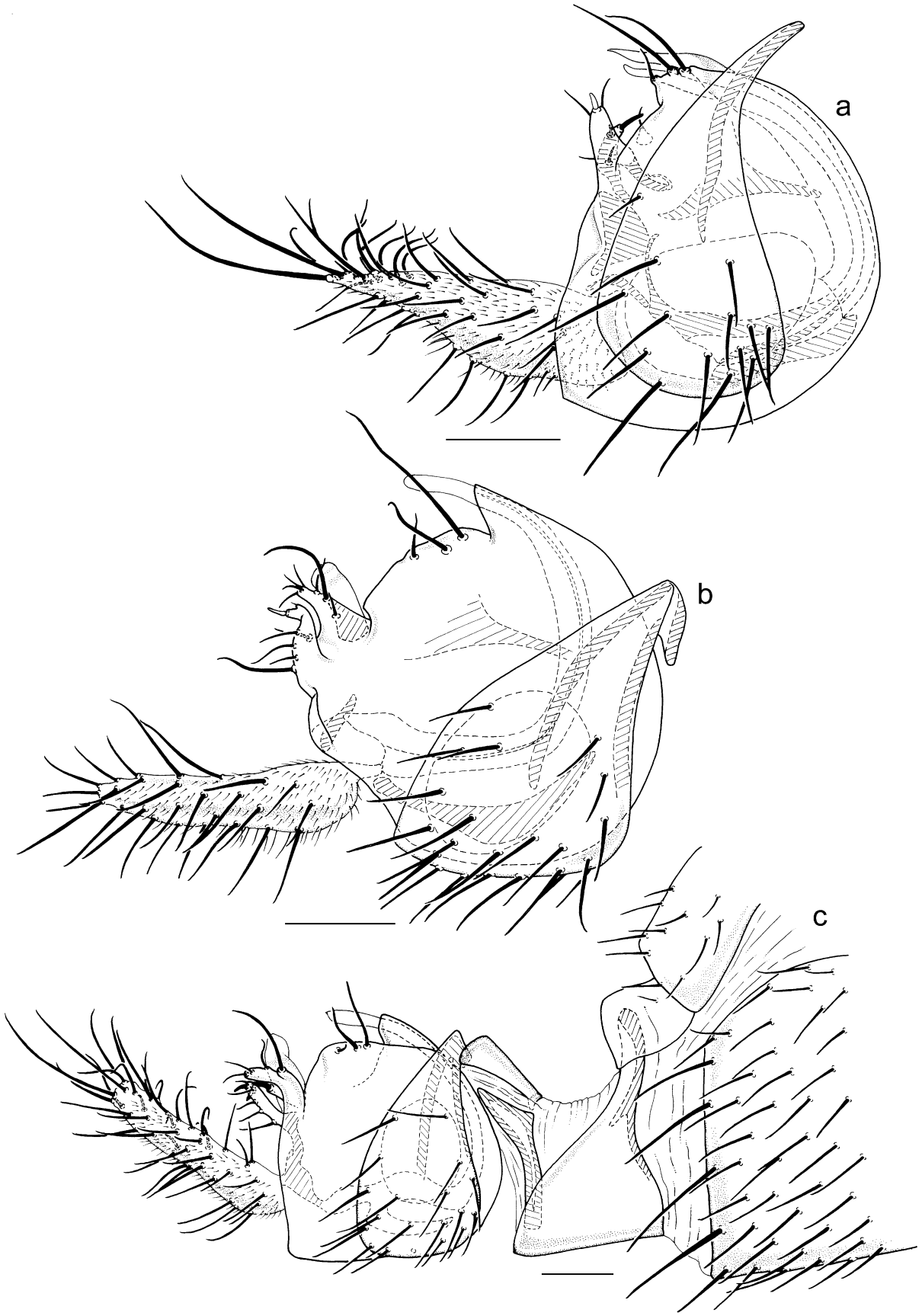

FIGURE 3. *Phrudoneura hibernalis* **sp. nov.**; a. hypopygium, left lateral. *P. adusta* **sp. nov.**; b. male postabdomen, left lateral. Scale line = 0.1 mm.

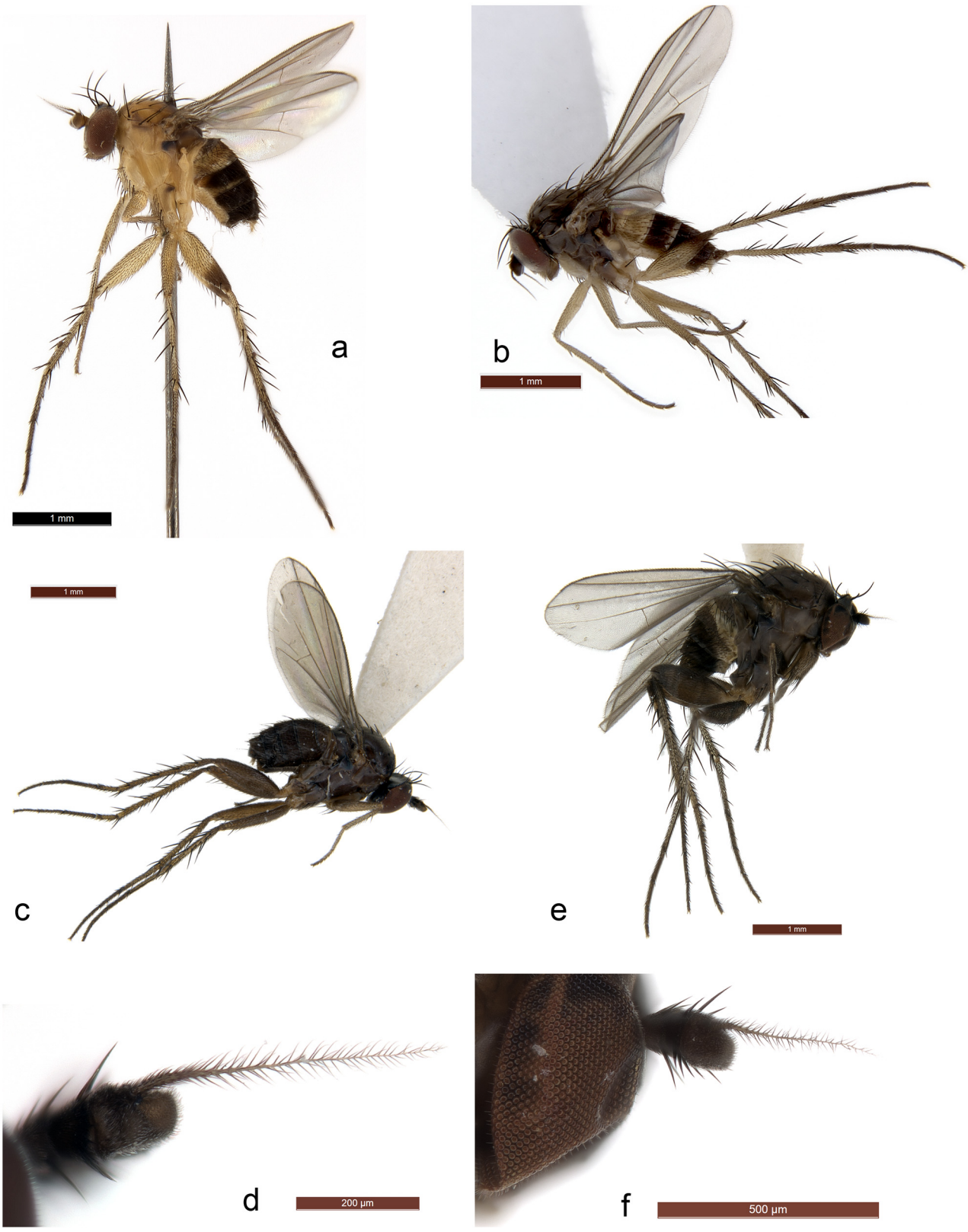

FIGURE 4. *Phrudoneura abbreviata* Meuffels & Grootaert; a. male habitus, left lateral. *P. collessi* **sp. nov.**; b. male habitus, left lateral. *P. popondetta* **sp. nov.**; c. male habitus, right lateral; d. male antenna, right lateral; e. female habitus, right lateral; f. female antenna, right lateral.

Thorax: dorsum and entire pleura, including metepimeron, dark chocolate brown with only light dusting of little pruinosity; lateral scutellar seta present as weak black seta, about one-fifth size of median seta.

Leg: all coxae brown, but trochanters distinctly yellow; FI mostly brown but yellow along ventral margin, with TI and basitarsus I yellow; FII and FIII dark brown with basal sixth of TII and TIII also brown; distal TII and TIII and basitarsi II and III yellow; distalmost tarsomeres of all legs infuscated; I: 3.0/ 2.2/ 1.2; 0.4; 0.3; 0.2; 0.4; setation similar; II: 3.7/ 3.9/ 2.2; 1.4; 0.8; 0.8; 0.4; FII similar, but with 2 av seta along distal sixth (MSSC); TII with similar setation but with additional av seta at 2/3 and 7/8; III: 3.6; 5.4; 1.1/ 1.7/ 1.1/ 0.8/ 0.4; FIII similar but with row three av setae along distal quarter (MSSC); TII with similar setation.

Wing: CuAx ratio 0.6; lower calypter brown with fan of black setae; halter dark brown.

Abdomen: entirely dark brown with black setation; hypopygium (not cleared) mostly hidden, but dark brown with short yellow digitiform cercus.

Female. (Fig. 4e); similar to male except lacking MSSC and as noted: face and clypeus wider; scape also with distinct setae on dorsal surface distally (Fig. 4f); FII with similar setation but with only one av seta along distal sixth; FIII similar but with row only two av setae along distal fifth; abdominal terga mostly dark brown, but tergum 1 and lateral margins of terga 2 and 3 yellow.

Remarks. *Phrudoneura popondetta* is known only from lowland rainforest in the Popondetta region of Oro Province, Papua New Guinea. It is distinguished by its overall chocolate brown thoracic and abdominal coloration, although females have yellow on the basal abdominal tergites. In sharing an overall dark brown colouration, short cercus, and subrectangular first flagellomere, *P. popondetta* is similar to *P. obscura* from New Caledonia.

Of particular note in *P. popondetta* are the dorsal setae on the distalmost surface of the antennal scape in both sexes (Figs 4d, 4f), a character not known in other species *Phrudoneura.* Although a species-level character in this genus, the presence of dorsal setae on the scape is considered to be of higher taxonomic significance elsewhere in the Dolichopodidae.

II. *Phrudoneura* from New Caledonia

The New Caledonian fauna was described by Meuffels and Grootaert (2002) and their paper should be consulted for detailed descriptions and figures. I have not seen the types but I was able to confidently identify the species using their paper.

Phrudoneura maculata Meuffels & Grootaert

(Figs 6a–b)

Phrudoneura maculata Meuffels & Grootaert, 2002: 72.

Type material. The male holotype and main type series were collected at Rivière Bleue, with female paratypes from Vallée de la Quinné and Col d'Amieu, New Caledonia (MNHN, not seen).

Additional material. NEW CALEDONIA: 6 ♂, 2 ♀, Mt Koghis, 500–550 m, Malaise trap, 27.X.1967, 15.II.1963, 30.XI.1963, Straatman (BPBM); ♀, Plateau de Dogny, 20.XI.1958, Straatman (BPBM); ♀, Pic du Pin, site 2, 22°14'S 166°50'E, 280 m, 25–26.XI.2004, Burwell & Wright, yellow pan (QMB 11789); 2 ♂, Pic du Grand Kaori, site 1, 22°17'S 166°53'E, 250m, rainforest, 22–23.XI.2004, yellow pans, Burwell &Wright, (QMB 11760); ♂, Prov. Sud, Mt Koghis, 750 m, 22°11'S 165°51'E, 29.XI.2000, Monteith, pyrethin spray on logs (QMB 9944); 2 ♂, Mt Mandjélia, summit, 20.397ºS, 164.528ºE, 780 m, yellow pans, 10–11.XII.2004, Monteith (QMB 11994); ♂, Forêt Nord 22°19'S 166°55'E, site 2, 2–3.XII.2004 Burwell & Wright (QMB 11826): 2 ♂, Mt Koghis, 800 m, 1–6.IX.1972, McAlpine CNC); ♂, Mt Koghis, 3500 m, 13–14.VII.1995, yellow pans, Sinclair (CNC); ♂, Rivière Bleue, 20–21.VII.1995, yellow pans, Sinclair (CNC); ♂, Chutes de Madelaine, 22.226ºS 66.854ºE, Malaise trap, 28.X.2000, Skevington (CNC); 2 ♂, 2 ♀, Col d'Amieu, Table Unio Rd., 18–19.VII.1995, 800 m, dry rainforest, yellow pans, Sinclair (CNC); 10 ♂, 4 ♀, Mt Panié, 300--500 m, 5.VI.1996, M. Moulds (AMS); ♀, Mt Panié trail, 360 m, 10–13.XII.1990, yellow pans, Bickel (AMS); 2 ♂, Prov. Nord, Aoupinié, 21º10'S 165º11'E, 714 m, yellow pan, 2–3.XI.2001, Moulds (AMS).

Remarks. *Phrudoneura maculata* is a distinctive species found throughout much of Grande Terre. Its colour pattern is somewhat variable, even at the same locale. The basic pattern (Fig. 6a) has the mesonotum mostly brown to dark brown a yellowish scutellum, a shining ivory-coloured pruinosity over the notopleuron, and just ventrad with a broad dark brown stripe across the pleura. In most specimens the distal abdominal terga 4–6 are yellow with the anterior terga mostly dark brown.

However, there is a distinct colour variation or yellow form (Fig. 6b) in the mountains of Province Nord, where the mesonotum is mostly yellowish with a dark brown ac stripe, the scutellum is yellow, but the pleura are similar to the widespread dark form. Here the abdomen is mostly yellow. This variation is found characteristically on Mt Mandjélia from 580 m to 720 m. On Mt Panié, the yellow form is found at 300 m and 700 m, while the more widespread dark form was found at 350 m and 500 m. Because of the variation in the colour patterns and the gradations between them, I regard all these variants as conspecific.

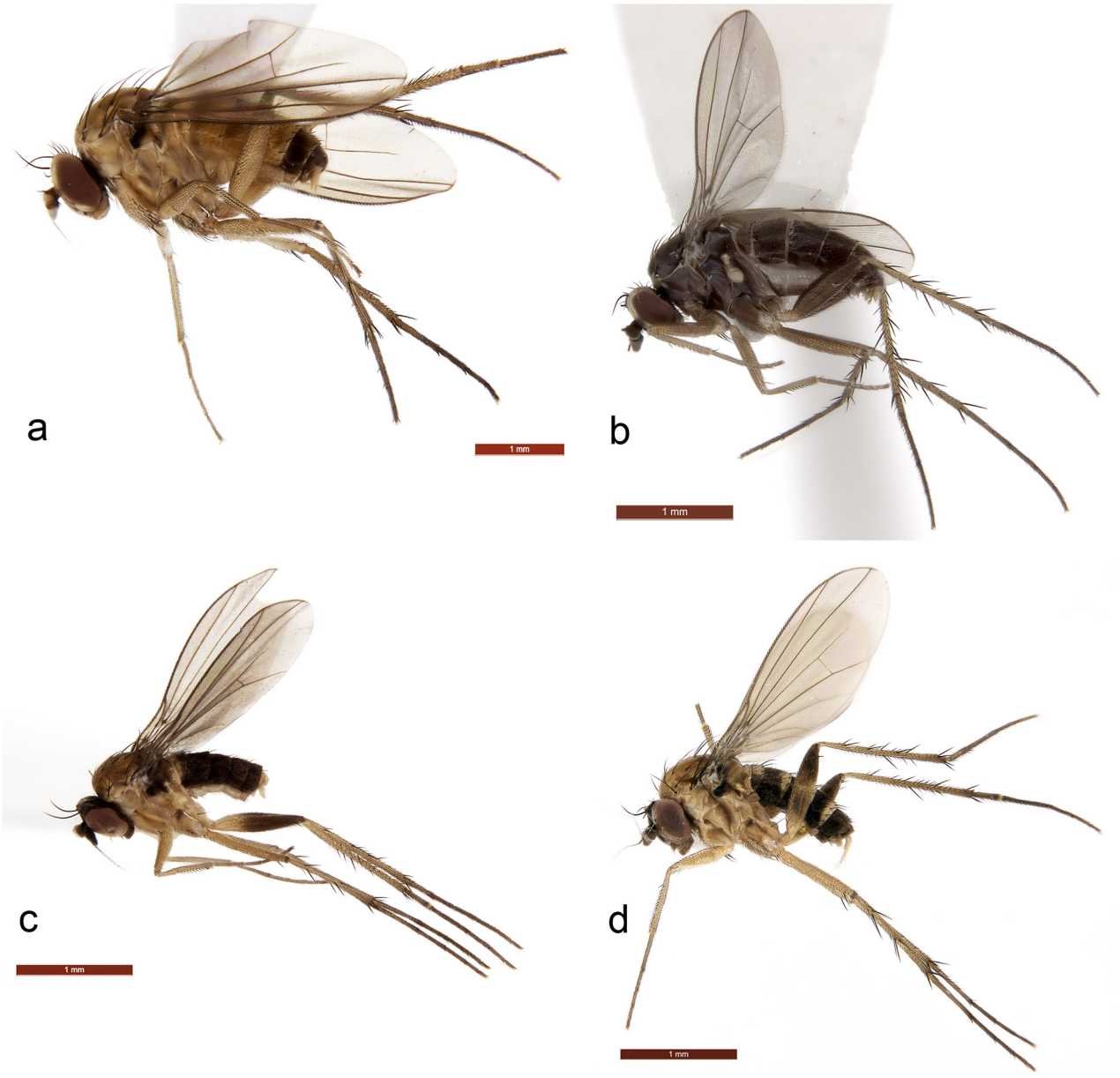

FIGURE 5. *Phrudoneura picta* Meuffels & Grootaert; a. male habitus, left lateral. *P. obscura* Meuffels & Grootaert; b. male habitus, left lateral. *P. parva* Meuffels & Grootaert; c. male habitus, left lateral. *P. matilei* Meuffels & Grootaert; d. male habitus, left lateral.

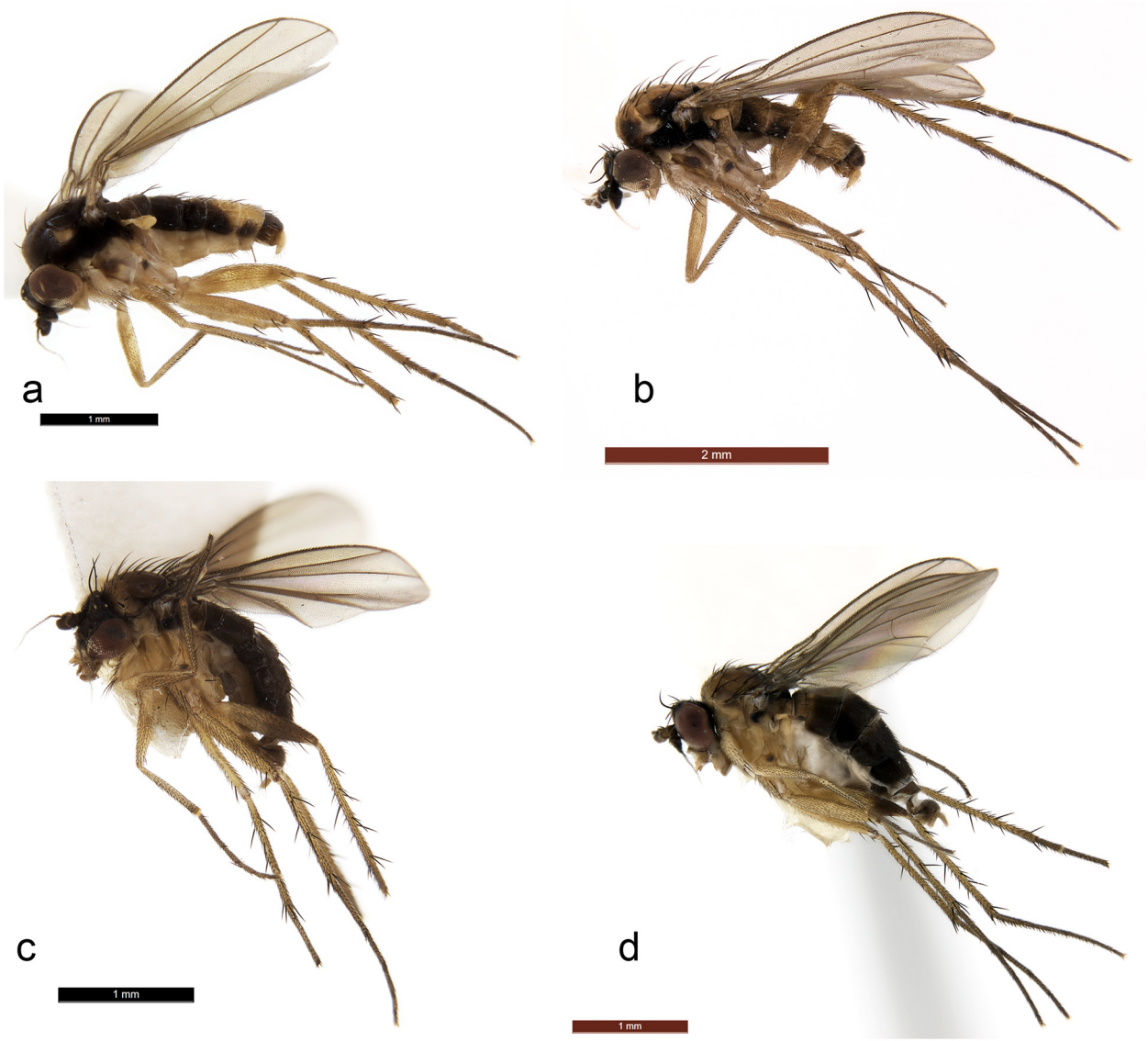

FIGURE 6. *Phrudoneura maculata* Meuffels & Grootaert; a. male habitus, left lateral; b. male habitus, left lateral (Mt Mandjélia colour variant). *P. adusta* **sp. nov.**; c. male habitus, left lateral. *P. hibernalis* **sp. nov.**; d. male habitus, left lateral.

Phrudoneura matilei **Meuffels & Grootaert**
(Fig. 5d)

Phrudoneura matilei Meuffels & Grootaert, 2002: 73.

Type material. The male holotype and paratypes of *Phrudoneura matilei* were collected at Mt Humboldt, with additional male paratypes from Rivière Bleue, New Caledonia (MNHN, not seen).

Additional material. NEW CALEDONIA: 2 ♂, Prov. Sud Valle De Ni, 21°59.591'S, 166°30.172'E, 18–23.XI.1998, 770 m; Malaise, Irwin & Webb (INHS); 2 ♂, 3 ♀, Prov. Nord, Mt Mandjélia, 5 km WSW Puébo, 20.397ºS 164.528ºE, Malaise trap, 780 m, 27.XI.-8.XII.2000, 8–15.XII.2000, Schlinger & Irwin (INHS); 6 ♂, Province, Sud. Mt Ouin, 20 km from base of road to Mt Dzumac, 22°1.7'S, 166°28'E, 860m, 29.X.-2.XII.2000, Malaise trap, Schlinger & Irwin (INHS); ♂, Prov. Sud, Mt Koghis, 17 km NNE Noumeá, 22.176°S 166.505°E, 550 m, Malaise, 24.XI.-11.XII.2000, Webb, Schlinger, & Irwin; 2 ♂, Mt Koghis, rainforest creek, 350 m, 13–14.VII.1995, yellow pans, Sinclair (CNC); 2 ♂, ♀, Pic du Pin, site 2, 22°14'S 166°50'E, 280 m, 25–26.XI.2004, Burwell & Wright, yellow pan (QMB 11789); ♂, Pic du Grand Kaori, site 1, 22°17'S, 166°53'E, 250m, rainforest,

22–23.XI.2004, yellow pans, Burwell & Wright, yellow pan (QMB 11760); Prov. Sud, Mt Do, summit, 1000 m, 21°45'S 166°00'E, 21.XI.2000, Monteith, pyrethin spray on logs (QMB 9919); ♂, Prov. Sud, Mt Koghis, 750 m, 22°11'S 165°51'E, 29.XI.2000, Monteith, pyrethin spray on logs (QMB 9944); Province Nord, 4 ♂, 6 ♀, Mt Panié, 700 m, 6.VI.1996, Moulds (AMS); 2 ♂, 4 ♀, Mt Panié trail, 740 m, 10–13.XII.1990, yellow pans trap, Bickel (AMS); ♂, Mt Panié trail, 360 m, 5–16.XII.1990, Malaise trap, Mission ORSTOM (MNHN); ♂, ♀, Prov. Sud, Rivière Bleue, 23.5 km NNW of Plum, 22.049ºS 166.654ºE, 213 m, 27.X.-15.XII.2000, Schlinger & Irwin (INHS); ♂, Province Nord, Koumac, 20.553°S, 165.291°E, 2–13.XI.2000, Malaise trap, Webb, Schlinger & Irwin (INHS); ♂, Col d'Amieu, 9.5 km from Forestry Hut, 600 m, 18–19.VII.1995, yellow pans, Sinclair (CNC).

Remarks. Phrudoneura matilei is a distinctive species found across most of Grande Terre. The dark brown and yellow banded pattern on the abdominal terga, the dark brown distal third of femur III in both sexes, and the pale yellow elongate digitiform male cercus are diagnostic for this species.

Phrudoneura obscura Meuffels & Grootaert
(Fig. 5b)

Phrudoneura obscura Meuffels & Grootaert, 2002: 75.

Type material. The male holotype and paratype type series of *Phrudoneura obscura* were collected at Rivière Bleue, New Caledonia (MNHN, not seen).

Additional material. NEW CALEDONIA: ♀, Col des Rousettes, 300–400 m, 29.I.1969, Krauss (BPBM); 17 ♂, 5 ♀, Pic du Pin, site 1, 22°15'S 166°49'E, 280m, 25. XI.-23.XII.2004, Burwell & Wright, Malaise trap (QMB, 11858, 11779); 8 ♂, ♀, Pic du Pin, site 2, 22°14'S 166°50'E, 280m, 25–26.XI.2004, Burwell & Wright, yellow pans (QMB, 11789, 11864); ♂, Pic du Grand Kaori, site 2, 22°17'S 166°53'E, 250m, rainforest, 22–23.XI.2004, yellow pans, Burwell &Wright (QMB, 11862); 4 ♂, ♀, Province Sud, Mt Koghis, 17 km NNE Noumeá, 22.176° S, 166.505° E. 550 m, Malaise, 1–5.XII.2000, Irwin, Schlinger, &Webb (INHS); Prov. Nord, Réserve specialé de faune de l'Aoupinié, 21.174ºS 165.312ºE, 650 m, Malaise trap, 12–30.XI.2000, 9–14.XIII.2000, Irwin & Boutin (INHS); ♂, Province Nord, Mt Mandjélia, 5 km WSW Puébo, 20.397º S, 164.528º E, 780 m; Malaise trap; 27.XI.-8.XII.2000, Schlinger & Irwin (INHS); 3♂, Pic d'Amoa, 20°.57'23"S, 165º17'26"E, 336 m, yellow pan, 10–11.XI.2001, T. Moulds (AMS); 6 ♂, 2 ♀, Rivière Bleue (P6), forêt dense, fogging, 20.I.1993, Chazeau et al. (MNHN); ♂, Mt Koghis, 350 m, 13–14.VII.1995, yellow pans, B. Sinclair (CNC);

Remarks. *Phrudoneura obscura*, as the specific epithet implies, is a dark coloured species, with a mostly dark brown thorax, abdomen, and femur III. The antennae, especially in the male are distinctly subrectangular. Most males have a wing length of 2.2–2.4 mm, but males from Réserve de l'Aoupinié are distinctly smaller, with a wing length of 1.9–2.0 mm.

Phrudoneura parva Meuffels & Grootaert
(Fig. 5c)

Phrudoneura parva Meuffels & Grootaert, 2002: 76.

Type material. The male holotype and paratypes of *Phrudoneura parva* were collected at Forét de la Thy, Caledonia (MNHN, not seen).

Additional material. NEW CALEDONIA: 6 ♂, 2 ♀, Mt Koghis, 500–550 m, Malaise trap, XII.1983, 26–30.I.1963, I.1969, 4.XII.1963, Krauss, Yashimoto & Straatman (BPBM); Mt Koghis, 17 km NNE Noumeá, 22.176°S 166.505°E, 550 m, Malaise, 18–23.XI.2000, Webb, Schlinger, & Irwin; 2 ♂, ♀, same but 24.XI.-11.XII.2000 ; 8 ♂, ♀, same but 13–16.XII.2000 (INHS); ♂, Col de la Pirogue, 300 m, 21.II.1983, Krauss (BPBM); ♂, 2 ♀, Yahoue, 100–200 m, I.1985, Krauss (BPBM), ♂, II.1978, Krauss (ZMUC); ♂, Nouméa, 0–200 m, I.1969, Krauss (BPBM); ♂, 2 ♀, on road between Thi & Nakety, I.1969, Krauss (BPBM); ♂, Prov. Nord, Réserve specialé de faune de l'Aoupinié, 21.174ºS 165.312ºE, 650 m, Malaise trap, 12–30.xi.2000, Schlinger, Irwin & Boutin (INHS); ♂, Mt Mou, west side, 7.5 km NW Paita, near Sanitorium, 20.XII.1991, Malaise trap along forest stream, Irwin & Webb (INHS); 2 ♂, ♀, Rivière Bleue (P6), forêt dense, fogging, 20.I.1993, Chazeau et al. (MNHN).

Remarks. *Phrudoneura parva* is known only from the southern half of Grande Terre, with Réserve de l'Aoupinié being the northernmost record. The hypopygium is entirely pale yellow, contrasting with the enclosing dark brown tergum 5.

Phrudoneura picta Meuffels & Grootaert
(Fig. 5a)

Phrudoneura picta Meuffels & Grootaert, 2002: 74.

Type material. The male holotype of *Phrudoneura picta* was collected at Rivière Bleue, New Caledonia (MNHN, not seen).

Additional material. NEW CALEDONIA: ♂, Province Sud, Col d'Amieu, 7.5 km NW Sarraméa; 21.585°S, 165.819°E, 300 m; 25.XI.-7.XII.2000, Malaise trap, Irwin, Schlinger, & Webb (INHS).

Remarks. *Phrudoneura picta* is rare in collections, and only two male specimens are known from Province Sud. The thorax and legs are almost entirely yellow apart from a dark brown spot on the mesepimeron.

Phrudoneura hibernalis Bickel, sp. nov.
(Figs 3a, 6d)

Type material. NEW CALEDONIA: Holotype ♂, paratypes 11♂, 16 ♂, Col d'Amieu, 9.5 km from Forestry Hut, 18–19.VII.1995, rainforest creek, yellow pan traps, B.J. Sinclair (holotype, 2 ♂ , 2 ♀, paratypes MNHN; paratypes also deposited CNC; BPBM, AMS).

Additional material. NEW CALEDONIA: 3 ♂, 3f, Province Sud, Col d'Amieu, 7.5 km NW Sarraméa; 21.585° S, 165.819° E, 300 m; 4–9.XI.2000, 7–20.XII.2000, Malaise trap, Irwin, Schlinger, Webb (INHS); 2 ♂, Province Nord, Réserve Spéciale de Faune de l'Aoupinié, 21.157º S, 165.323º E, 550 m; 12–30.XI.2000, 30.XI.-4.XII.2000, Malaise; Webb, Schlinger, & Irwin (INHS); ♂, Mandjélia, lower creek, 20º 24'S 164º31'E, 580 m, 5.I.2005, yellow pans, Monteith, #11952 (QMB).

Description: **Male** (Fig. 6d): length: 2.3; wing: 2.5 x 1.0.

Head: head almost circular in anterior view, but slightly wider than high; dorsal postcranium flat, and slightly concave dorsally; vertex and frons dark brown with little pruinosity; postorbitals entirely black; pair converging postverticals present, positioned mediad of postorbital row; pair strong vertical and pair strong diverging ocellar setae present; male eyes distinctly separated by face and clypeus; eye facets more or less uniform; face-clypeus brown and covered with grey pruinosity; palp yellow with short black setae, without strong apical seta; proboscis yellowish; antennal scape and pedicel yellowish, and first flagellomere mostly with only base yellow; scape dorsally bare; first flagellomere enlarged subrectangular, and covered in microtrichia; arista arising dorsobasally on first flagellomere, with short hairs, and about as long as head height.

Thorax: setae black; mesonotum anteriorly yellow, but with brown cuticle along ac band, and posterior half to quarter of mesonotum with brown cuticle, just anteriad of scutellum; scutellum and subscutellum mostly dark brown; pleura pale yellow but with brown marking under wing; ac biseriate with some 10 regular pairs; 5 dc present, slightly decreasing in size anteriorly, and field of short setae on anterior slope of thorax; 1 pa, 2 sa with anterior sa much shorter than posterior, 2 sr, 2 npl, 1 hm, 1 pm present; median scutellar seta strong, lateral seta about one-fifth size of median; proepisternum with short black seta dorsally, and with stronger black ventral seta above CI.

Legs: coxae and remainder of legs almost entirely yellow except for dark brown maculation posterobasally on CII, and distal third of FIII dark brown; CI with short anterior setae and 3 longer distal setae; CII with short anterior setae and with two setae along distolateral ridge, with basal seta at 1/3 and stronger seta near ½; CIII with strong lateral seta near 1/3, and trochanter III with short lateral seta; I: 3.0/ 2.4/ 1.4; 0.7; 0.6; 0.4; 0.4; FI with short av and pv seta at 5/6, and with short subapical posterior seta; TI with ad-pd setal pair at 1/3, with ad seta stronger than pd seta, and with short ad setal serration from 1/3 to apex; II: 3.5/ 4.2/ 1.9; 1.1; 0.9; 0.6; 0.3; FII with strong anterior subapical seta, and with shorter av and pv seta at 7/8; TII with short ad-pd setal pair at 1/5, very strong ad-pd setal

pairs at ¼ and ½, ventral seta at 3/8, with subapical corona of long pd, dorsal ad av, and pv seta, and with posterior row of six short erect setae spaced along length (MSSC); III: 3.6; 4.6; 0.9/ 1.7/ 1.1/ 0.6/ 0.4; FIII with strong anterior subapical seta, and with shorter av seta at 5/6; TIII with 4 strong ad-pd setal pairs at 1/5, 2/5, 2/3 (and pd setae offset), and subapically, with strong ventral seta at ½, shorter ventral at ¾, and with long apical av and pv setae; $IIIt_2$ distinctly longer than $IIIt_1$.

Wing: membrane hyaline; R_{2+3} joins costa at 5/6; R_{4+5} joins costa just anterior to apex; R_{4+5} and M diverging slightly from base; M without flexion or "bosse alaire"; M ends in membrane two-fifths distance between dm-cu crossvein and wing apex (MSSC); anal angle weak; CuAx ratio near 0.5; lower calypter yellow with fan of pale yellow setae; halter yellow with brownish club.

Abdomen: tergum 1 and the basal half of tergum 2 yellow; distal half of tergum 2 and remaining terga dark brown; sternum 8 ovate with distinctive inverted V-shaped internal carina at base, and covering left basal hypopygial foramen; hypopygium (Fig. 3a) mostly dark brown with pale yellow cercus; epandrium subcircular; ventral distal margin of epandrium with 3 pedunculate setae, not on raised ledge; surstylus with short arms bearing various modified setae; subepandrial sclerite subrectangular, with row of dorsal setae and toothlike apical seta; cercus digitiform and highly setose.

Female: similar to male except lacking MSSC and as noted: face and clypeus more widely separated, colour and legs setation similar; vein M joins margin just behind wing apex.

Remarks. The type series of *Phrudoneura hibernalis* was collected in the austral winter month of July. However this species is also known from specimens collected in the austral summer months elsewhere on New Caledonia, and it is apparently widespread on Grande Terre.

This species is close to *P. adusta* and has similar hypopygial morphology, in particular both species have the three distal epandrial setae projecting from the curvature of the epandrium, not on a cuticular ledge, and both have a subepandrial sclerite with a ventroapical toothlike seta. The specific epithet is derived from the Latin, and refers to this species being collected in the (austral) winter.

Phrudoneura adusta **Bickel, sp. nov.**

(Figs 3b, 6c)

Type material. NEW CALEDONIA: Holotype ♂, paratypes 10 ♂, 11 ♀, Ouenguip, 19 km W of Hienghène, 16–17.VII.1995, yellow pans nr. cascading creek, B.J. Sinclair (holotype, 2 ♂, 2 ♀, paratypes MNHN; paratypes also deposited CNC, BPBM, AMS).

Additional material. NEW CALEDONIA: 3 ♂, Prov. Nord, Mt Mandjélia, 5 km WSW Puébo, 20.397ºS 164.528ºE, Malaise trap, 780 m, 13–27.XI.2000, 27.XI.-8.XII.2000, 21.585° S, Schlinger & Irwin (INHS); ♂, N of Tipindje, in cave on beach, 11.III.1978, Schlinger (INHS); ♂, Mt Koghis, 17 km NNE Nouméa, 22º10.567'S 166º30.293'E, 550 m, 24.XI.-11.XII.2000, Malaise trap, Schlinger, Irwin & Webb (INHS).

Description: **Male** (Fig. 6c): length: 2.1; wing: 2.2 x 0.9; similar to *P. hibernalis* except as noted:

Head: antenna dark brown but with yellowish margin along base of first flagellomere near join with pedicel; first flagellomere also subrectangular.

Thorax: setae black; mesonotum mostly dark with only faint yellowish colour on anterior slope; setation similar.

Legs: coxae and remainder of legs almost entirely yellow except for dark brown maculation posterobasally on CII, and distal half of FIII brown; I: 2.6/ 2.2/ 1.3; 0.6; 0.6; 0.4; 0.4; setation similar; II: 3.2/ 3.5/ 1.8; 1.2; 0.7; 0.5; 0.3; setation similar, but TII without posterior row of six short erect spaced setae; III: 3.4; 4.4; 1.0/ 1.7/ 1.0/ 0.7/ 0.4; setation similar.

Wing: M ends in membrane one-third distance between dm-cu crossvein and wing apex (MSSC); anal angle weak; CuAx ratio 0.5.

Abdomen: entirely dark brown with sparse short black setae; sternum 8 ovate with distinctive inverted V-shaped internal carina at base, and covering left basal hypopygial foramen; hypopygium (Fig. 3a) mostly dark brown with pale yellow cercus; epandrium subcircular; ventral distal margin of epandrium with 3 pedunculate setae, not on raised ledge; surstylus with short arms bearing various modified setae; subepandrial sclerite digitiform, with row of dorsal setae and toothlike apical seta; cercus digitiform and highly setose.

Female: similar to male except lacking MSSC and as noted: face and clypeus more widely separated, colour and legs setation similar; vein M joins margin just behind wing apex.

Remarks. *Phrudoneura adusta* is widely distributed across Grande Terre. The specific epithet is from the Latin and relates to its dark colour. (Also see discussion under *P. hibernalis*).

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