NUMBER 90, 66 pages 8 December 2006

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OCCASIONAL PAPERS

FIJI ARTHROPODS VI

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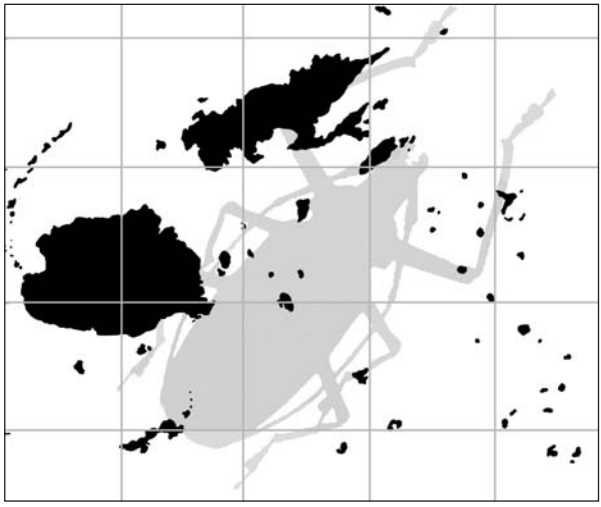

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ISSN 0893-1348

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FIJI ARTHROPODS

Editors' Preface

We are pleased to present the sixth issue of *Fiji Arthropods*, a series offering rapid publication and devoted to studies of terrestrial arthropods of the Fiji Group and nearby Pacific archipelagos. Most papers in this series will be the results of collecting and research on the Fijian fauna deriving from the NSF-funded "Terrestrial Arthropods of Fiji" project. Five co-PIs and 18 specialists (see Fiji Arthropods I, p. 18) form the core team of scientists who have agreed to publish new taxa that result from collecting during this survey. However, as space allows, we welcome papers from any scientist who is currently working on arthropod taxonomy in Fiji.

This issue contains results of discoveries of new species of Dolichopodidae (Diptera: Bickel), Muscidae (Diptera: Pont & Evenhuis), Formicidae (Hymenoptera: Sarnat) and Saldidae (Heteroptera: Polhemus & Polhemus) Manuscripts currently in press or in preparation on Empididae, Lauxaniidae, Keroplatidae, Mycetophilidae, Mythicomyiidae, Platypezidae, Limoniidae, Stratiomyidae, Asilidae, and Cerambycidae will appear in future issues.

The editors thank the Government of Fiji (especially the Ministries of Environment and Forestry), the National Science Foundation (DEB 0425970), and the Schlinger Foundation for their support of this project. Types of new species deriving from this study and voucher specimens will be deposited in the Fiji National Insect Collection, Suva.

All papers in this series are available free of charge as pdf files downloadable from the following url:

http://hbs.bishopmuseum.org/fiji/fiji-arthropods/

We encourage interested authors to contact us before submitting papers.

—Neal L. Evenhuis, Co-editor, neale@bishopmuseum.org
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Fiji Arthropods VI. Edited by Neal L. Evenhuis & Daniel J. Bickel. *Bishop Museum Occasional Papers* 90: 3–7 (2006).

A New Species of *Dichaetomyia* Malloch (Diptera: Muscidae) From the Fijian Islands[1,2]

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Abstract: *Dichaetomyia taveuniana*, **n.sp.**, from Taveuni Island is described and illustrated and compared with *Dichaetomyia elegans* Malloch from Viti Levu, Vanua Levu, and Ovalau islands.

INTRODUCTION

The genus *Dichaetomyia* Malloch is a large and evidently monophyletic genus of muscid flies, widespread throughout the Old World tropics and subtropics and currently containing just over 250 described species. Some 72 species were listed from the Australasian and Oceanian region (Pont, 1989). Since then, an additional Melanesian species has been described by Shinonaga (2004). Many of these species are known only from their original descriptions, but there are revisions of the Micronesian (Snyder, 1965) and Australian (Pont, 1969) species. Previous to this study, only two species were known from the Fiji Islands, *D. elegans* Malloch and *D. vicaria* (Walker).

The new species described here was found whilst sorting Malaise trap material from Viti Levu and Taveuni islands. The endemic and very striking *Dichaetomyia elegans* Malloch was found in some numbers from Viti Levu, but close study of the specimens from Taveuni showed that these belong to a different, closely related species that is described below as *Dichaetomyia taveuniana* new species.

Dichaetomyia elegans Malloch was described in detail by Malloch (1928: 468), and in the same year was also described as *Dichaetomyia prodigiosa* by Bezzi (1928: 176-179) in his monograph of the higher flies of the Fiji Islands. Bezzi's description also included some excellent illustrations of the male mid and hind legs and their remarkable ornamentation (Bezzi, 1928: fig. 52). The synonymy of *prodigiosa* with *elegans* was established by Malloch (1929: 170). As this species has been described and illustrated so well, our description below takes the form of a key couplet that enumerates the characters that distinguish *D. elegans* and the new species.

These two species are members of the *Dichaetomyia armata* group of species (Pont, 1969: 211), possessing a rather long scutellum that is setulose on the sides and along the ventral margin, meron setulose below spiracle, and lower katepisternal seta equidistant

1. Contribution No. 2006-039 to the NSF-Fiji Arthropod Survey.
2. Contribution No. 2006-043 to the Pacific Biological Survey.

from the upper two katepisternal setae. They are among the species of the group with 3 pairs of postsutural dorsocentral setae, and also have male frons with 2 pairs of reclinate orbital setae, inner postpronotal seta short, notopleuron with setulae around the base of the second seta, only 1 postsutural intra-alar seta, postalar wall with a few short setulae, and sternite 1 setulose.

MATERIAL AND METHODS

Specimens in this study derive primarily from collecting and trapping conducted by the FBA and NSF projects, types and voucher specimens of which will be deposited in the Fiji National Insect Collection, Suva (FNIC). Where series numbers permit, paratypes and duplicates are deposited in the Bishop Museum, Honolulu (BPBM) and the Natural History Museum, London (BMNH).

SYSTEMATICS

Dichaetomyia taveuniana Pont & Evenhuis, **new species**

Diagnosis. Males and females of *D. taveuniana* and *D. elegans* can be easily distinguished by the colour of the central scutal vitta and by the wing colour. Males can be distinguished by a number of secondary sexual characters in the mid and hind leg ornamentation, as detailed in the following key couplet:

Central part of scutum, between the broad black paramedian vittae, orange-yellow in ground-colour (Fig. 1). Wing (Fig. 3) tinged with orange in basal half, conspicuously dark smoky in apical half. ♂: mid femur with the long fine posterior to posteroventral setae continued from base almost to apex of femur; mid tarsus with the posterior hairs on tarsomeres 1 and 2 curled only at tips; hind femur with the anterodorsal row of setae complete, with the anterior row of setae becoming longer and more anteroventral in apical half and the 4-5 short anteroventrals after the last strong seta curved downwards as normal; hind femur on posteroventral surface with the median group of short setae consisting of 7 setae in a single row; hind tibia (Fig. 5) with the dorsal to anterodorsal hairs that cover the whole length longer and denser, and the anterodorsal hairs on tarsomere 1 long and fine, longer than the tarsal depth, apical half of hind tibia and tarsomere 1 also with long posterodorsal hairs; ventral process at middle of hind tibia with the spoon-shaped piece shorter and broader, and the inner piece shorter and square-ended. [The holotype ♀ of *elegans* Malloch and the lectotype ♂ of *prodigiosa* Bezzi are in the BMNH and have been studied by the senior author during preparation of this paper.] (Viti Levu, Vanua Levu, Ovalau) ..... …….……..…….. **Dichaetomyia elegans** Malloch

Central part of scutum, between the broad black paramedian vittae, black in ground-colour (Fig. 2). Wing (Fig. 4) uniformly dark smoky. ♂: mid femur with the long fine posterior to posteroventral setae confined to basal two-fifths of femur; mid tarsus

Figures 1–2. *Dichaetomyia* thoraxes, dorsal view showing medial patterning. **1**. *D. elegans*. **2**. *D. taveuniana*, sp. nov.

with the posterior hairs on tarsomeres 1 and 2 curled along their whole lengths; hind femur with the anterodorsal row absent, the anterodorsal to anteroventral surfaces in basal half covered with dense setae and setulae, the 6 short anteroventrals after the last strong seta upcurved, not downcurved; hind femur on posteroventral surface with the median group of short setae consisting of 12 setae, more extensive and not uniserial; hind tibia (Fig. 6) with the dorsal to anterodorsal hairs that cover the whole length shorter and sparser, and the anterodorsal hairs on tarsomere 1 inconspicuous and not as long as tarsal depth, apical half of hind tibia and tarsomere 1 without any posterodorsal hairs; ventral process at middle of hind tibia with the spoon-shaped piece longer and narrower, and the inner piece longer and smoothly rounded at tip. Taveuni ..... **Dichaetomyia taveuniana** Pont & Evenhuis, **n.sp.**

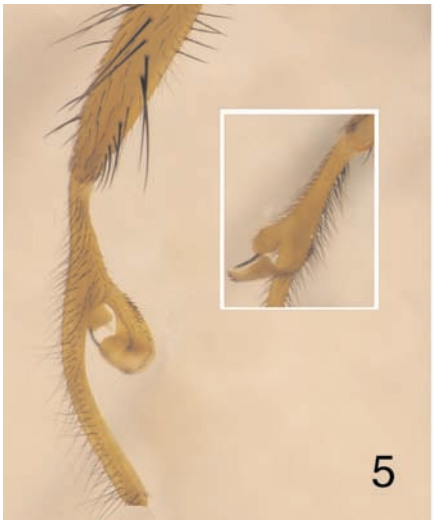
Types. *Holotype* ♂ and 26♂,55♀ *paratypes* from: FIJI: **Taveuni**: Devo Peak, 5.3 km SE Tavuki Village, 1064 m, 28 Jan–11 Feb 2005, 16°50'27.4"S, 179°59'4.1"W, Malaise, P. Vodo [FBA 515573–515654]. *Other paratypes*: FIJI: **Taveuni**: 14♂ 16♀, Devo Peak, 5.3 km SE Tavuki Village, 1064 m, 29 Nov 2004–14 Jan 2005, 16°50’27.4”S, 179°59'4.1"W, Malaise, B. Soroalau [FBA 515720–515749]; 2♀, same data except, 1–28 Jan 2005, Malaise, [FBA 515655-515656]; 1♂, 3.2 km NW Lavena Village, Mt. Koronibuabua, 16°51'17"S, 179°53'29.9"W, 235 m, 4–25 Mar 2005, Malaise, B. Soroalau [FBA 515657]; 1♂, 1–28 Jan 2005, Malaise, B. Soroalau [FBA 515658]; 18♂, 22♀, Devo Peak, 5.3 km SE Tavuki Village, 28 Jan–11 Feb 2005, Malaise, B. Soroalau [FBA 515659-515698]; 6♂, 15♀, Devo Peak, Tavuki Village, 892 m, 28 Jan–11 Feb 2005, Malaise, B. Soroalau [FBA 515699-515719]. Holotype will be deposited in FNIC. Paratypes in FNIC, BPBM, and BMNH.

Figures 3–4. *Dichaetomyia* wings. **3**. *D. elegans*. **4**. *D. taveuniana*, sp. nov.

Etymology. Named for its geographic occurrence on the island of Taveuni.
Distribution. Restricted to the Fijian island of Taveuni.

ACKNOWLEDGMENTS

This study was funded in part by the Schlinger Foundation and the National Science Foundation grant DEB 0425790 for the project "Fiji Arthropod Survey". We thank Evert I. Schlinger and Leah Brorstrom, and the staff of Wildlife Conservation Society, Suva, the Ministry of Environment, Suva, the Ministry of Forestry, Colo-i-Suva, and the University of the South Pacific, Laucala Bay for their support of the project, help in collecting specimens, and making the specimens available for study.



Figures 5–6. *Dichaeotmyia* male hind tibia showing modifications. **5**. *D. elegans*, left hind tibia and apex of femur, lateral view; inset: right hind tibia, mesal view. **6**. *D. taveuniana*, sp. nov., left hind tibia and femur.

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Fiji Arthropods VI. Edited by Neal L. Evenhuis & Daniel J. Bickel. *Bishop Museum Occasional Papers* 90: 9–42 (2006).

Lordomyrma (Hymenoptera: Formicidae) of the Fiji Islands[1]

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Abstract: This revision treats the members of the ant genus *Lordomyrma* (Formicidae: Myrmicinae) occurring in Fiji. Ten species are recognized, of which four are new: *L. curvata* **sp. n.**, *L. desupra* **sp. n.**, *L. levifrons* (Mann) **stat. n.**, *L. polita* (Mann) **stat. n.**, *L. rugosa* (Mann), *L. sukuna* **sp. n.**, *L. stoneri* (Mann) **stat. n.**, *L. striatella* (Mann), *L. tortuosa* (Mann), and *L. vuda* **sp. n.** Descriptions of each species are provided, along with distribution maps and a key for the identification of workers. Additional figures and identification tools are available on Antweb <http://www.antweb.org/fiji.jsp>. A preliminary comparison with *Lordomyrma* from Australia, New Guinea, and New Caledonia is followed by a discussion of the distribution of species within Fiji and an outline of future research directions pertaining to the taxonomy, biogeography and conservation of the Fijian species.

BACKGROUND

The genus *Lordomyrma* (Formicidae: Myrmicinae) Emery is comprised of relatively uncommon and often elegantly sculptured ants occurring in the Australian and Oriental regions. Species have been described from Japan, New Guinea, eastern Australia, New Caledonia, the Solomon Islands and Fiji (Bolton 1995), with additional undescribed species being reported from Borneo (Brühl *et al.* 1998). Of the 24 currently recognized species in the genus (including those described here), ten are endemic to the Fijian archipelago. Although museum holdings reveal many undescribed species from other areas, particularly New Guinea and New Caledonia (R.W. Taylor, pers. comm.) the diversity of *Lordomyrma* species in Fiji is substantial. Despite its remote location in the South Pacific and its small geographic area, the Fiji archipelago supports a diverse ant fauna. In a recent review of Fiji's ants, Ward & Wetterer (2006) listed 32 genera and 138 described species and subspecies, including 91 archipelago endemics, 22 Pacific-wide natives, and 25 exotics.

Within the Fiji archipelago, the genus has been collected from the two largest islands (Viti Levu and Vanua Levu) and from a handful of mid-sized islands, including Koro, Taveuni, Ovalau and Kadavu. Little is known about the biology of the Fijian *Lordomyrma* beyond their association with undisturbed mesic forests, maintenance of small inconspicuous colonies in soil and rotting logs, and their collection from the leaf litter and, to a lesser extent, the forest canopy.

The first Fijian *Lordomyrma* were described by Mann (1921) as three species (*L. rugosa*, *L. striatella*, *L. tortuosa*) and two subspecies (*L. tortuosa levifrons*, *L. tortuosa polita*) all belonging to the genus *Rogeria* Emery subgenus *Irogera* Emery. A third subspecies (*L. tortuosa stoneri*) was described several years later (Mann 1925). Brown (1953)

1. Contribution No. 2006-040 to the NSF-Fiji Arthropod Survey..

suggested that all the aforementioned Fijian taxa were members of the genus *Lordomyrma*, and Kugler (1994) formalized the combination in *Lordomyrma* in his revision of *Rogeria*.

Lordomyrma can be differentiated from other myrmicines by the following characters: (1) 12-merous antennae; (2) simple sting with straight apex; (3) triangular mandibles; (4) seven or more teeth and denticles that decrease in size from the apex; (5) well-developed propodeal spines; (6) bicarinate median portion of clypeus; (7) and elongate frontal carinae.

A suite of characteristics common to all Fijian species of *Lordomyrma* includes: (1) the presence of short, subdecumbent hairs on the eyes; (2) a broadly and deeply impressed metanotal groove; (3) propodeal spines of moderate length; (4) petiole node and postpetiole dorsum without dorsal spikes or teeth; (5) scapes that fail to reach the posterior margin of the head; and (6) generally stout, robust bodies.

MATERIALS AND METHODS

Sources of Material

Museum specimens reviewed in this study are from the collections of the NMNH (National Museum of Natural History, Washington, DC, USA) and the MCZ (Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA). Additional specimens were collected by standardized litter sifting conducted by the Wildlife Conservation Society during 2002–2005 with assistance from the NSF-Fiji Terrestrial Arthropod project and the Schlinger Fiji Bioinventory of Arthropods (FBA) (Evenhuis & Bickel 2005). The third significant source of material was hand collected by the author from January through August, 2006.

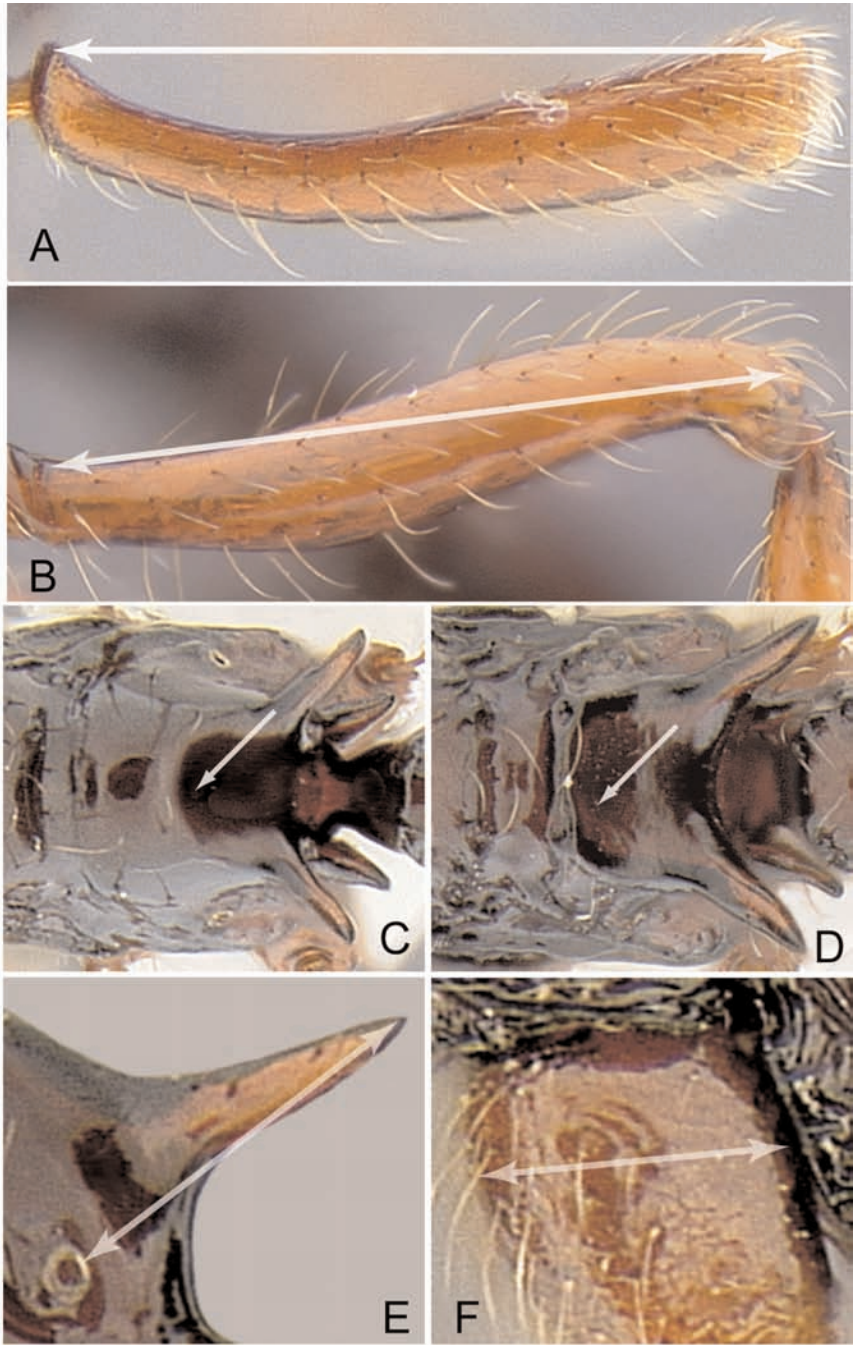
Holotypes and voucher specimens will be deposited in the Fiji National Insect Collection (FNIC), Suva. Where sufficient specimens allow, paratypes and positively identified specimens will be deposited in the ANIC (Australian National Insect Collection, CSIRO, Canberra, Australia), CAS (California Academy of Sciences, San Francisco, CA, USA), LACM (Natural History Museum of Los Angeles County, Los Angeles, CA, USA), BPBM (Bishop Museum, Honolulu, Hawai‘i), MCZ and NMNH. Additional identification tools, including images of type specimens, queens and males are available at http://www.antweb.org/fiji.jsp

Analysis of Morphology

A total of 254 specimens (240 workers, 7 males, 7 queens) from 72 collection series were examined in order to examine intraspecific and interspecific variation. All specimens were studied with respect to relative shape and size using a Leica MZ7.5 dissecting microscope at magnifications ranging from 6.3–50.0×. Series of standardized measurements were recorded to the nearest 0.001 mm at magnifications of 70× for 82 workers using the Auto-Montage Pro® software package (Syncroscopy) in combination with a JVC KY-F75U digital camera mounted on a Leica MZ16 dissecting scope. A list of measurements taken and indices used is presented in Table 1, and a table of measurements for all species is given in the Appendix. Effort was made to capture a maximum range of morphological variation by measuring at least ten workers from as many collection series as possible for each species. If a given species was represented by fewer than ten workers, all available workers were measured.

Table 1. Measurements and indices used for morphological analysis.

Measurement	Description	View
HW	*Head width*: maximum width of head not including the eyes.	Full face
HL	*Head length*: maximum length of head from the posterior margin to the tip of the anterior clypeal margin measured along the midline.	Full face
EL	*Eye length*: maximum diameter of compound eye.	Oblique lateral
SL	*Scape length*: length of first antennal segment excluding the radicle.	Dorsal (Fig. 1A)
MFL	*Metafemur length*: length of metafemur measured along its long axis.	Posterior or anterior (Fig. 1B)
TL	*Total length*: maximum length of specimen measured from the tip of the mandibles to the tip of the gaster, not including sting.	Lateral
MH	*Metanotal hair length*: length of longest hair present on mesonotum.	Lateral
PSL	*Propodeal spine length*: maximum length of propodeal spine measured from the middle of propodeal spiracle to the tip of the spine.	Lateral (Fig. 1C)
PCW	*Procoxa width*: maximum width of procoxa measured parallel to dorsal margin.	Lateral (Fig. 1D)
PH	*Petiole height*: maximum height of petiole measured from base to summit of node at right angles to the petiole length.	Lateral
PW	*Pronotum width*: maximum width of pronotum measured at the dorsolateral margins.	Dorsal
DPW	*Dorsal petiole width*: maximum width of petiole.	Dorsal
CI	*Cephalic index:* HW/HL	
SI	*Scape index*: SI/HW	
MHI	*Metanotal hair length index*: MH/PCW	
REL	*Relative eye length index*: EL/HL	
PSLI	*Propodeal spine length index*: PSL/PCW	
MFLI	*Metafemur length index*: HFL/HW	
DPWI	*Dorsal petiole width index*: PW/PCW	


A
B
C
D
E
F

RESULTS

This study recognizes 10 species (four new) of *Lordomyrma* occurring on the Fiji Islands.

L. curvata Sarnat, **sp**. **n**.
L. desupra Sarnat, **sp**. **n**.
L. levifrons (Mann, 1921: 453) **stat**. **n**.
L. polita (Mann, 1921: 453) **stat**. **n**.
L. rugosa (Mann, 1921:456)
L. stoneri (Mann, 1925: 5) **stat**. **n**.
L. striatella (Mann, 1921: 454)
L. sukuna Sarnat, **sp**. **n**.
L. tortuosa (Mann, 1921:452)
L. vuda Sarnat, **sp**. **n**.

KEY TO SPECIES OF *LORDOMYRMA* OF THE FIJI ISLANDS BASED ON THE WORKER CASTE

1. In dorsal view, dorsal face of the propodeum gently sloping and continuously smooth, unbroken by a transverse carinate ridge or ridges between metanotal groove and insertion of propodeal spines (Fig. 1E); in larger workers promesonotum massive and spherical, produced well above the level of head and propodeum (Figs. 15, 21); moderate sized to large workers (HW 0.73–0.90); propodeal spines of moderate length (PSLI 0.90–1.26) 2
–. In dorsal view, dorsal face of the propodeum with a transverse carinate ridge or ridges between metanotal groove and insertion of propodeal spines (Fig. 1F); promesonotal shape, workers size and propodeal spines of variable length (HW 0.59–0.89, PSLI 0.76–1.31) 5

2. Frontal carinae becoming confluent with well developed, arcuate carinae posterior to the eye; carinae present mesad of, and paralleling, frontal carinae (Fig. 18); propodeal spines straight (Fig. 19); large species (HW 0.82–0.90) .....…..... ..... **tortuosa** (Mann)
–. Frontal carinae terminating before or just behind posterior level of eye; carinae posterior to eye short and poorly developed to absent; in full face view, carinae absent mesad of frontal carinae (Figs. 4, 12, 20); propodeal spines straight, downcurved or upcurved; medium to large species 3

3. Propodeal spines robust and strongly upcurved (Fig. 13); reddish brown species .... **stoneri** (Mann)
–. Propodeal spines downcurved to straight but never upcurved (Figs. 5, 21); reddish brown to dark brown 4

Figure 1. Worker morphology illustrating various measurements and characters of the worker caste. **A**, scape length (SL) in dorsal view; **B**, hind femur length (FL) in anterior view; **C**, propodeal spine length (PSL) in lateral view; **D**, procoxae width (PCW) in lateral view; **E**, dorsal face of the propodeum in dorsal view (transverse carina absent); **F**, dorsal face of the propodeum in dorsal view (transverse carina present).

4. Propodeal spines weakly produced, straight to downcurved (Fig. 5); propodeal dorsum steeply sloped; apical face of petiole sloping posteriorly with rounded apex; weak sculpturing present behind eye; smaller reddish brown species (HW 0.73–0.83; *n = 10*) ..... **desupra** Sarnat, **n**. **sp**.

–. Propodeal spines strongly produced, downcurved (Fig. 21); propodeal dorsum shallowly sloped; apical face of petiole vertical with weakly peaked apex; sculpturing absent behind eye; larger dark brown species (HW 0.87–0.90; *n = 6*) .... **vuda** Sarnat, **n**. **sp**.

5. In profile, propodeal spines strongly produced, length greater than width of procoxa (PSLI > 1.10); petiole more robust (DPWI 0.90–1.10), with a gently sloping posterior face (Figs. 3, 7, 9, 11) and overlain by a coarse rugoreticulum; antennal scrobes broad and weakly defined, or if well defined, then also possessing upturned propodeal spines 6

–. In profile, propodeal spines weakly produced, straight to downcurved, shorter than or equal to width of procoxa (PSLI < 1.05); petiole more slender (DPWI 0.81–0.99), subtriangular with a steeply sloping posterior face and overlain by a fine rugoreticulum (Figs. 15, 17); antennal scrobes narrow and more deeply impressed 9

6. Entire face densely rugose between frontal carinae, rugoreticulate laterally and posteriorly (Fig. 10); procoxa with well defined transverse striae (Fig. 11); eyes small (REL 0.19–0.22; *n = 10*) ..... **rugosa** (Mann)

–. Median portion of face smooth with scattered foveolae (Figs. 2, 6, 8), if carinae are present they are restricted to the area immediately mesad of the frontal carinae; procoxa without well developed transverse striae; eyes moderate to large (0.21–0.27) 7

7. Posterior corners of the head overlain by rugoreticulum (Fig. 2); frontal carinae becoming confluent with rugoreticulum posterior to the eye forming a broad, well defined antennal scrobe; propodeal spines upcurved (Fig. 3); small species (HW < 0.63; *n = 3*) ..... **curvata** Sarnat, **n**. **sp**.

–. Posterior corners of the head either smooth or with a few weak carinae, but never overlain by rugoreticulum (Fig. 6, 8); frontal carinae terminating before reaching any carinae posterior to eye and never forming a well-defined antennal scrobe; propodeal spines straight (Fig. 7, 9); larger species (HW > 0.63, *n = 11*) 8

8. Longest hairs on promesonotum, petiole, postpetiole and gaster exceeding length of eye (MHI = 1.29; *n = 1*) (Fig. 7); series of strong carinae present between eyes and ventrolateral margin of face; large species (HW 0.89; *n = 1*) ..... **levifrons** (Mann)

–. Hairs on promesonotum, petiole, postpetiole and gaster shorter than length of eye (MHI < 0.80, *n = 10*) (Fig. 9); strong carinae absent between eyes and ventrolateral margin of face; smaller species (HW 0.64–0.76, *n = 10*) ..... **polita** (Mann)

9. In full face view, median region of head between frontal carinae filled with fine and tightly packed longitudinal striae (Fig. 14); sides and dorsum of pronotum rugose to rugulose (Fig. 15) ..... **striatella** (Mann)

–. In full face view, median region of head between frontal carinae smooth and shining with scattered foveolae (Fig. 16); sides and dorsum of pronotum smooth, without striae or rugae (Fig. 17) ..... **sukuna** Sarnat, **n**. **sp**.

SYNOPSIS OF THE GENUS *LORDOMYRMA* OF THE FIJI ISLANDS

The worker caste of all Fijian species of *Lordomyrma* can be recognized by the following features:

In full face view, head subquadrate, broadest width occurring just posterior to eyes. Mandibles triangular, with sparse setigerous foveolae; masticatory margin with four strong teeth apically and three to five denticles basally, all decreasing in size. Anterior margin of clypeus entire and evenly convex. Frontal lobes moderately broad and flat. Antenna 12-merous with terminal three segments forming a distinct club that is as long as the rest of the funiculi combined; scapes short and curved, not surpassing posterior margin of head. Eyes weakly convex with short curved hairs between ommatidia; situated in front of midline. In profile, ventrolateral margin of head delineated by a carina originating at posterior margin and terminating at level of eye. Promesonotum longer than broad; in profile round and convex; suture between the two segments absent; without projecting humeri. Metanotal groove broad and strongly impressed. In profile, propodeum with dorsal and declivitous faces concave; armed with one pair of spines. Petiole with a short peduncle and a high node. Gaster of moderate size, armed with a simple sting.

Lordomyrma curvata Sarnat, **sp**. **n**.

(Figs. 2, 3)

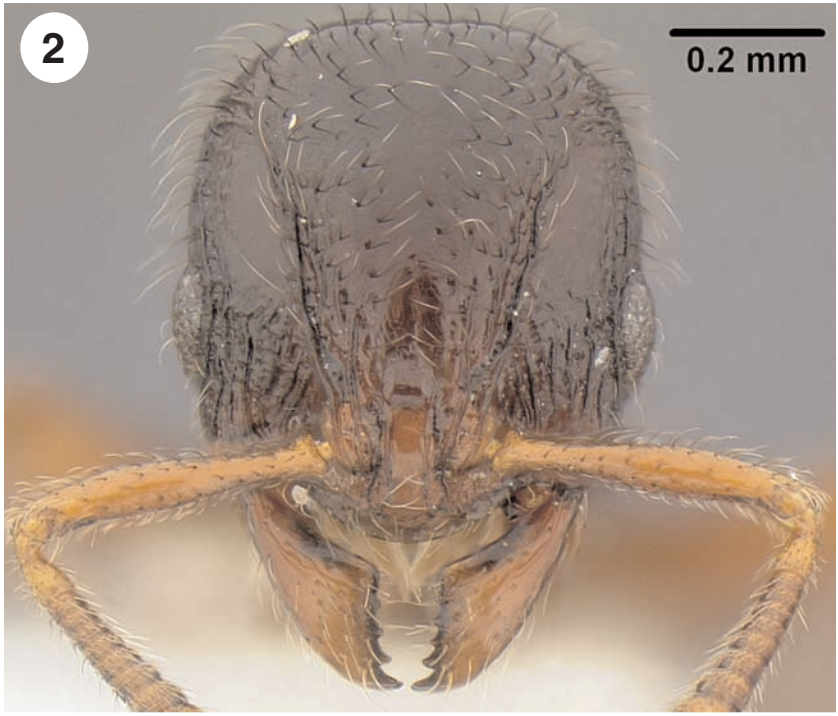
Description. *Worker*. TL 3.32–3.86, HL 0.72–0.73, HW 0.59–0.62, CI 0.83–0.86, SI 0.71–0.73, REL 0.22–0.25, PSLI 1.25–1.30, MFLI 0.93–0.97, DPWI 1.05–1.10 (3 measured).

A small reddish brown species with long upcurved spines, long hair and a broad well-defined antennal scrobe. In full face view, posterior margin of head evenly convex with rounded corners. Clypeus with one pair of carinae extending from posterior margin to anterior margin. Frontal carinae distinct, extending posteriorly behind eyes and curving back anteriorly to form both the upper and lower margins of the antennal scrobes. Eyes relatively large. In lateral view promesonotum modestly sized, convex. Propodeal spines acute, upcurved and divergent, one and one third times as long as width of procoxa in lateral view as measured from propodeal spiracle. Propodeal lobes strong, long and upturned. Petiole robustly built; in lateral view anterior face of node concave and steeply sloped, posterior face convex and gently sloped. Postpetiole with anterior and dorsal faces both evenly convex, apex occurring near midline, anterodorsally compressed. Mandibles smooth and shining with sparse setigerous foveolae. Middorsum of head smooth and shining with scattered setigerous foveolae; carinae present mesad of frontal carinae. Frontal lobes with one pair of carinae in addition to the frontal carinae. In oblique lateral view, rugoreticulum behind, above and below the eye; posterior corners of head rugoreticulate. Promesonotum smooth and shining with a few weak rugae on sides; smooth and shining on dorsum with scattered smaller foveolae laterally and larger foveolae near apex. In dorsal view, propodeum smooth and shining with a distinct transverse carina proximal to the metanotal groove; declivitous face smooth and shining. Sides of mesonotum, metapleuron and propodeum overlain by coarse, widely spaced and occasionally intersecting rugae. Petiole and postpetiole coarsely rugoreticulate. All dorsal surfaces with acuminate yellowish hairs, the longest of which exceed the length of the eye. Head, mesosoma and gaster reddish brown, appendages lighter.

Type Material. *Holotype*. Worker, FIJI: **Vanua Levu**: Kasavu Village, 16°42'S 179°39'E, 300 m, 28.viii.2003 (A. Rakabula) (FNIC). *Paratype*. 1 worker, same data as holotype (NMNH). Holotype will be deposited in FNIC.

Other Material Examined. FIJI: **Vanua Levu**: nr. Nakanakana Village, 16°37'S 179°50'E, 300 m, 28.viii.2003, from sifted litter (A. Rakabula); Ndreketi Village, 25.x.1977 (G. Kuschel).

Discussion. One of the smallest species of Fijian *Lordomyrma*, in general appear-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ance *L. curvata* is most similar to *L. levifrons* and *L. polita*. Like these species it has relatively large eyes, long propodeal spines and lobes, and a reddish brown integument. Two characters that separate *curvata* from the aforementioned species are the upturned shape of the propodeal spines and the well-developed rugoreticulum present posterior to the eyes. While *L. rugosa* and *L. striatella* both possess rugoreticulate occipital corners, only in *L. curvata* are the antennal scrobes and area between the frontal carinae covered by a smooth and shining surface. The only other species that possesses strongly upcurved spines is *L. stoneri*, from which *L. curvata* can be readily differentiated by the rugoreticulate posterior corners of the head and substantially smaller size.

Distribution and Biology. The three known collections of *L. curvata* are restricted to the island of Vanua Levu, two of which were taken by litter sifting. Thus far, *L. curvata* is the only species of *Lordomyrma* that is endemic to Vanua Levu.

Lordomyrma desupra, sp. n.
(Figs. 4, 5)

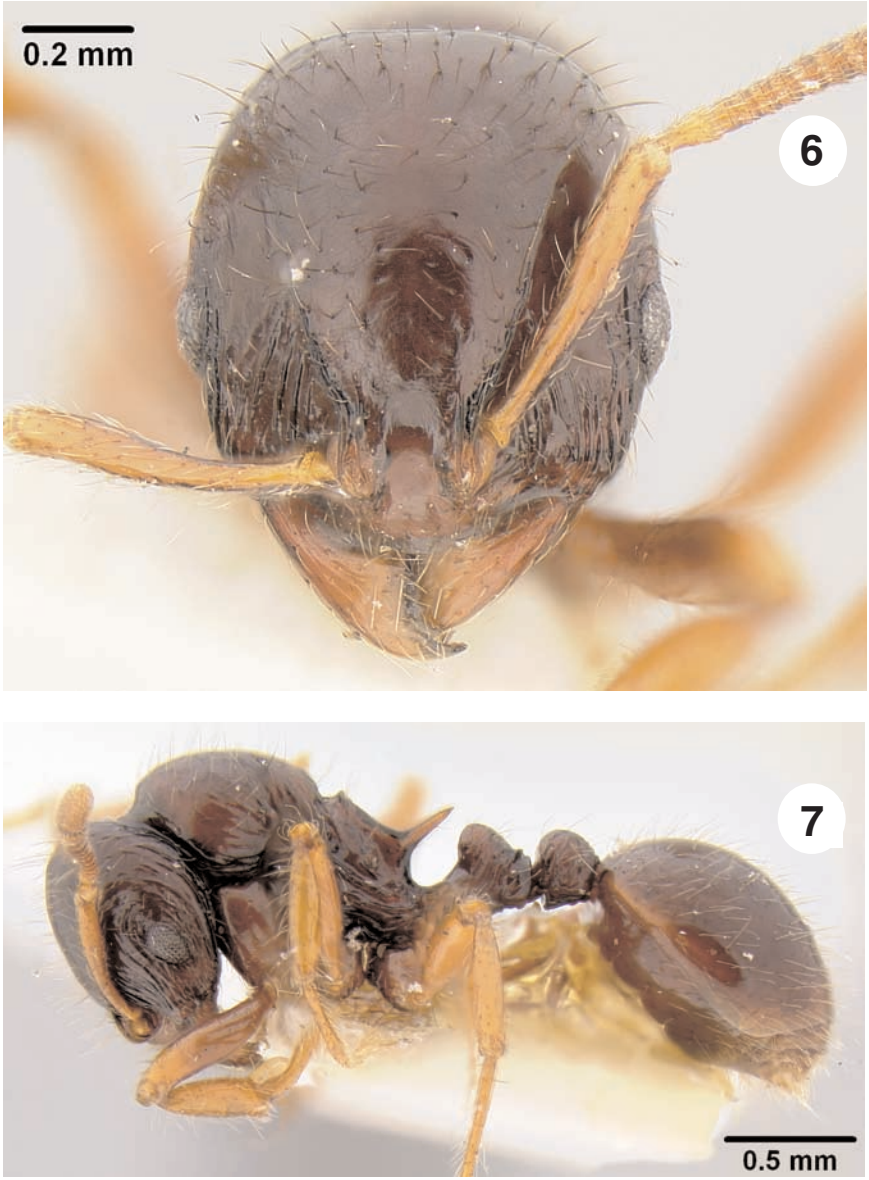
Description. *Worker*. TL 3.55–4.18, HL 0.81–0.93, HW 0.73–0.83, CI 0.87–0.92, SI 0.71–0.76, REL 0.21–0.25, PSLI 0.92–1.12, MFLI 0.99–1.08, DPWI 0.85–1.00 (10 measured).

A medium to large reddish brown species with a large to massive promesonotum, straight to downcurved propodeal spines of modest length and reduced sculpturing on face and body. Posterior margin of head evenly convex with rounded corners. Clypeus bearing one pair of weak carinae. Frontal carinae weakly carinate, terminating just posterior to level of eye. Antennal scrobe weakly impressed. Eyes of moderate size. In lateral view (for larger workers), promesonotum massive, strongly convex, and bulging above the head and propodeum. Propodeal spines triangular, straight to slightly downcurved and of moderate length. Propodeal lobes triangular and of variable size. Petiole robustly built; anterior face strongly sloped and weakly concave; dorsal face more gently sloping and weakly convex; the rounded apex occurring at the anterior angle of node. Postpetiole with anterior and dorsal faces evenly convex, apex occurring at midline. Mandibles smooth and shining with sparse setigerous foveolae. Middorsum of head smooth and shining with scattered setigerous foveolae; several carinae mesad of and parallel to frontal carinae; terminating just after posterior level of eyes. Frontal lobes with one to two pairs of longitudinal carinae in addition to the frontal carinae. In oblique lateral view, scattered, weak and short carinae surrounding eyes. Promesonotum smooth and shining with scattered piligerous foveolae. Sides of mesonotum, metapleuron, and propodeum overlain by coarse, widely spaced and occasionally intersecting rugae. In dorsal view, propodeum smooth and shining, without a transverse carina proximal to the metanotal groove; declivitous face smooth and shining. Petiole with smooth and shining anterior face, banded by coarse transverse rugae that cross the ventral face. Postpetiole coarsely rugoreticulate. All shining surfaces laced with a delicate network of light etchings. All dorsal surfaces with an abundance of suberect to erect acuminate yellowish hairs, the longest of which equal or exceed the length of the eye. Head, mesosoma and gaster reddish brown, appendages lighter.

Type Material. *Holotype*. Worker, FIJI: **Viti Levu**: Monasavu Rd., 1.75 km SE Waimoque Settlement, 17°40'13"S 177°59'38"E, 850 m, 28.viii.2006 (E.M. Sarnat #2361) (FNIC). *Paratypes*. 15 workers, same data as holotype (ANIC, CASC, LACM, MCZC, BPBM, NMNH). Holotype will be deposited in FNIC.

Figures 2–3. *Lordomyrma curvata*. **2**. head. **3**. profile.

Figures 4–5. *Lordommyrma desupra.* **4.** head. **5**. profile.



Figures 6–7. *Lordomyrma levifrons*. **6**. head. **7**. profile.

Other Material Examined. FIJI: **Viti Levu**: 1.6 km NW Monasavu Dam 17°45'00"S 178°02'07"E, 800 m, 14.vii.2005, canopy fogging (H. Waqa); 4 km NE Monasavu Dam 17°44'05"S 178°04'46"E, 600 m, 13.vii.2005, canopy fogging (H. Waqa); 1 km NNE Vaturu Dam 17°44'36"S 177°40'09"E, 575 m, 27.vi.2005, on log (E.M. Sarnat #2190.02).

Discussion. *Lordomyrma desupra* lacks a transverse carina between the propodeal dorsum posterior to the metanotal groove and and possesses a robustly produced promesonotum that, in larger workers, bulges above the level of its head and propodeum. Of the three other species that share these characters, *L. desupra* can be distinguished from *L. tortuosa* by its weaker facial sculpture, from *L. stoneri* by its smaller, more slender appearance and straight propodeal spines, and from *L. vuda* by its facial sculpture, weaker propodeal spines, smaller size and lighter color.

Lordomyrma desupra shows a wider variation in the size of workers than normally encountered within the Fijian *Lordomyrma*. In smaller workers, the size of the promesontum and propodeal spines is markedly smaller.

Distribution and Biology. Thus far, *L. desupra* has only been collected from the higher elevations of several mountain ranges in northern Viti Levu. Although the single small worker from the Vaturu Dam area was collected on a log, both large and small workers were abundant in the forest canopy of the Monasavu area where they were captured using fogging methods. The collection of the species from *Hydnophytum* ant-plants and from canopy fogging, together with its absence from sifted litter collections, suggests *L. desupra* is a component of Fiji's arboreal ant fauna.

Lordomyrma levifrons (Mann) **stat**. **n**.
(Figs. 6, 7)

Rogeria tortuosa subp. *levifrons* Mann, 1921: 453.

Description. *Worker*. TL 4.31, HL 0.99, HW 0.89, CI 0.90, SI 0.73, REL 0.21, PSLI 1.31, MFLI 1.01, DPWI 0.90 (1 measured).

A large reddish brown species with long straight spines and reduced sculpturing. In full face view, posterior margin of head evenly convex with rounded corners. Clypeus smooth and shining, only light traces of a pair of weak carinae terminating before reaching anterior border. Frontal carinae weakly carinate, terminating just after posterior level of eye. Antennal scrobe weakly impressed. Eyes of moderate size. In lateral view promesonotum large, moderately convex. Propodeal spines acute and straight, one and one third as long as width of procoxa in lateral view. Propodeal lobes strong, long and upturned. Petiole robustly built; in lateral view anterior face of node nearly vertical, posterior face more gently sloped, apex at anterior angle. Postpetiole with anterior and dorsal faces evenly convex, apex occurring at midline. Mandibles smooth and shining with sparse, setigerous foveolae. Middorsum of head smooth and shining with scattered setigerous foveolae; no carinae mesad of frontal carinae. Frontal lobes with one pair of strong carinae in addition to the frontal carinae. Arcuate carinae above and below eye, mostly smooth behind eye, longitudinal carinae between eye and mandiblular insertion; posterior corners of head smooth and shining with a few punctures margined by elevated sides; carinae absent. Promesonotum smooth and shining with a few weak carinae on sides and a few striations on dorsum. In dorsal view, propodeum smooth and shining, with a distinct transverse carina proximal to the metanotal groove; declivitous face smooth and shining. Petiole and postpetiole coarsely rugoreticulate. Gaster smooth and shining. All dorsal surfaces with an abundance of suberect to erect acuminate yellowish hairs, the longest of which equal or exceed the length of the eye. Head and mesosoma reddish brown, gaster and appendages lighter.

Type Material Syntype, worker, Nadarivatu, Fiji (W.M. Mann) (NMNH) (examined).

Other Material Examined. FIJI*:* **Viti Levu**: Waiyanitu (W.M. Mann); Vesari (W.M. Mann).; Saiaro (W.M. Mann).

Discussion. This large, robust, long-spined ant is known only from Mann's collections and is the only species of *Lordomyrma* he described that has not been rediscoverd since. Although the promesonotum is strongly produced in this species, and the petiole has a steep anterior face, it can be differentiated from *L. desupra, L. stoneri*, *L. tortuosa*, and *L. vuda* by the transverse carina posterior to the metanotal groove. *Lordomyrma levifrons* is distinguished from the other species with long propodeal spines, *L. polita*, by the long, fine-tipped hairs present on its face, mesosoma, petiole, and gaster.

Distribution and Biology. Collected only from the mountains of Viti Levu, little is known about the biology of *L. levifrons*.

Lordomyrma polita (Mann), **stat**. **n**.
(Figs. 8, 9)

Rogeria tortuosa subp. *polita* Mann, 1921: 453.

Description. *Worker*. TL 3.32–3.86, HL 0.74–0.87, HW 0.64–0.76, CI 0.86–0.91, SI 0.75–0.79, REL 0.22–0.27, PSLI 1.13–1.46, MFLI 0.97–1.05, DPWI 0.91–1.09 (11 measured).

A medium-sized reddish brown species with long straight propodeal spines, short hair, shallowly impressed antennal scrobes, reduced facial sculpture and a robust petiole. In full face view, posterior margin of head evenly convex to slightly concave medially with rounded corners. Clypeus without strong carinae. Frontal carinae weakly carinate, terminating just posterior to level of eye. Antennal scrobe weakly impressed. Eyes relatively large. In profile, promesonotum modestly sized, convex. Propodeal spines acute, straight and divergent; when measured from spiracle in profile, one to one and a half times as long as width of procoxa. Propodeal lobes strong, long and upturned. Petiole robustly built; in profile anterior face of node concave and steeply sloped, posterior face convex and gently sloped, flat dorsally. Postpetiole with anterior and dorsal faces both evenly convex, apex occurring near midline. Mandibles triangular, smooth and shining with sparse setigerous foveolae. Middorsum of head smooth and shining with scattered setigerous foveolae; carinae mesad of frontal carinae. Frontal lobes with one to two pair of carinae in addition to the frontal carinae. In oblique lateral view, scattered punctures behind the eye, a few weak carinae above, below and in front of the eye; posterior corners of head with a few weak transverse carinae and punctures with elevated margins. Promesonotum varying from smooth and shining with a few weak carinae on sides and a few striations on dorsum to being overlain by thick, widely spaced rugae on sides and dorsum. In dorsal view, propodeum smooth and shining with a distinct transverse carina posterior to the metanotal groove; declivitous face smooth and shining. Sides of mesonotum, metapleuron, and propodeum overlain by coarse, widely spaced and occasionally intersecting rugae. Petiole and postpetiole coarsely rugoreticulate. Gaster smooth and shining. All dorsal surfaces with short and stout suberect to erect acuminate yellowish hairs, the longest of which are shorter than the length of the eye. Head and mesosoma reddish brown, gaster and appendages lighter.

Type Material. Syntypes, workers, 1 dealate queen, Nadarivatu, Fiji (W.M. Mann) (NMNH, MCZC) (examined).

Other Material Examined. FIJI: **Koro**: Mt. Nabukala, 5 km WSW Nasau Village, 17°18'45"S 179°23'17"E, 520 m, 15.iii.2005, nesting between epiphyte roots and tree trunk (E.M. Sarnat #1909, J. A. Schreiber). **Vanua Levu**: Mt. Vatudiri, 3km NW Waisali Village, 16°37'42"S 179°12'29"E, 641 m, 2.ix.2006, in dead tree fern (E.M. Sarnat #2389). **Viti Levu**: Navai forest, forestry camp, 11.vii.1997, in log (J. K. Wetterer #76, #94, #95); Koroyanitu National Park, Savione Falls, 2 km ESE Abaca Village, 17°40'34"S 177°33'01"E, 650 m,

Figures 8–9. *Lordomyrma polita*. **8**. head. **9**. profile.

25.viii.2006, in log (E.M. Sarnat #2341); 1 km NNE Vaturu Dam, 17°44'36"S 177°40'09"E, 575 m, on log (E.M. Sarnat #2190).

Discussion. *Lordomyrma polita* is readily discernable from the other long-spined Fijian species, *L. levifrons*, by its short hairs. There exists considerable variation with respect to sculpture of the promesonotum among specimens of *L. polita* as currently defined. Whereas the type specimens from Nadarivatu together with a series collected from nearby Navai tend towards a more sculptured promesonotum and face, and a flatter petiole node, the series collected from the islands of Koro and Vanua Levu tend a smoother promesonotum and face, and a more rounded petiole node. Additionally, a male specimen from the Navai series has a smooth and shining metapleuron while that of the Koro male specimen is finely punctate. The single specimen collected from the Vuda province of Viti Levu appears intermediate between the Nadarivatu/Navai series and the Koro/Vanua Levu series. The allopatric pattern of these morphological traits does not allow for confident separation of species, thus all of the aforementioned series are considered here as belonging to a single species.

Distribution and Biology. Thus far, *L. polita* is known from the highlands surrounding Mt. Tomaniivi, the drier western forest near Vaturu Dam, the interior of Vanua Levu, and the island of Koro. This species has been observed nesting in logs in the Navai area and Vanua Levu, and nesting between epiphyte roots and a tree trunk on the island of Koro.

Lordomyrma rugosa (Mann)

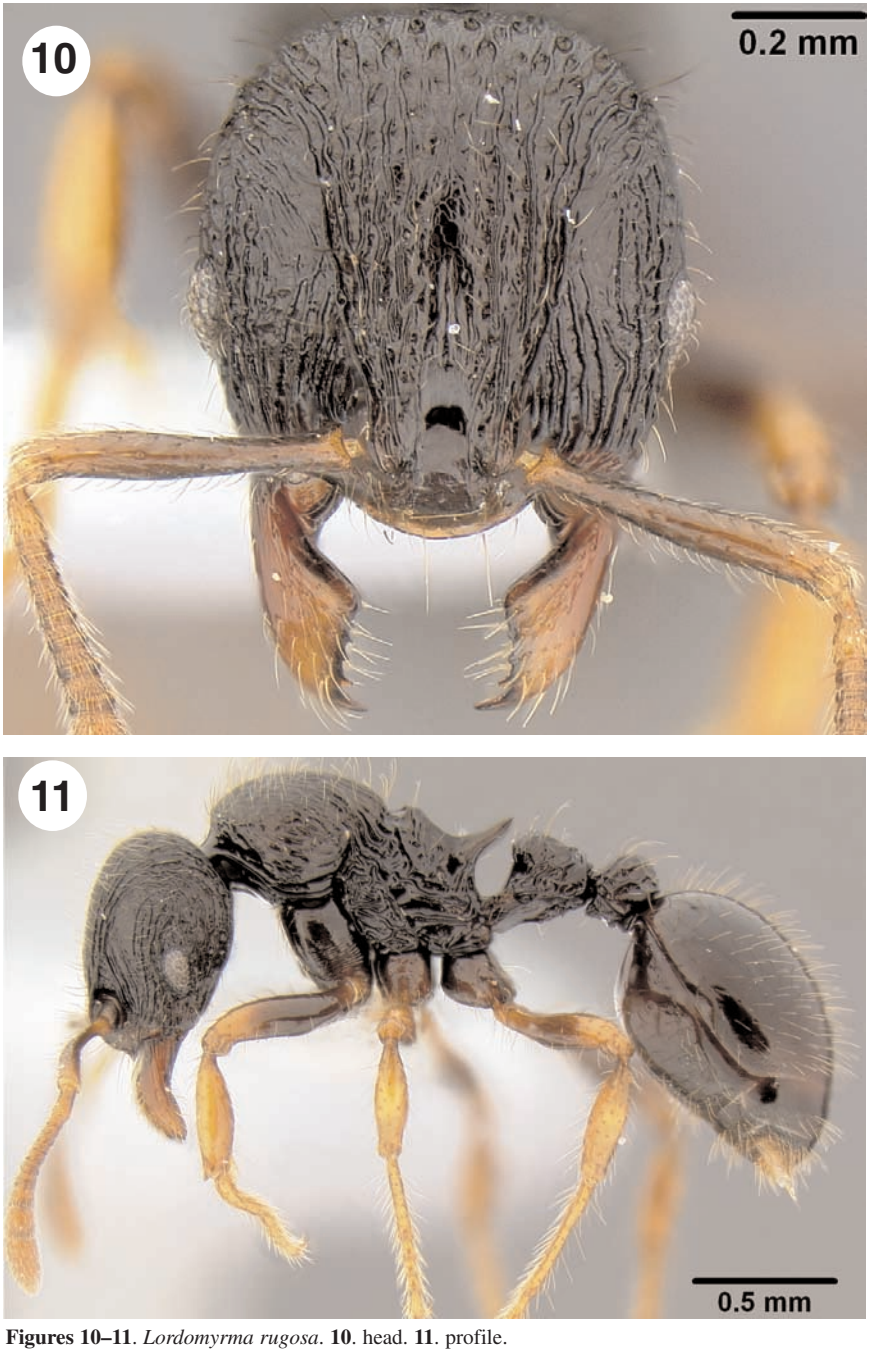
(Figs. 10, 11)

Rogeria rugosa Mann, 1921: 455.

Description. *Worker*. TL 3.36–3.77, HL 0.77–0.85, HW 0.71–0.76, CI 0.86–0.94, SI 0.68–0.72, REL 0.19–0.22, PSLI 1.28–1.48, MFLI 0.92–1.00, DPWI 0.98–1.10 (10 measured).

A medium-sized dark brown species with a rugose face and mesosoma, long upturned propodeal spines, small eyes and striated procoxae. In full face view, posterior margin of head evenly convex with rounded corners. Clypeus without strong carinae. Frontal carinae strongly produced, extending beyond posterior level of eye before integrating into dorsolateral rugoreticulum. Antennal scrobe lightly impressed, filled with dense arcuate rugoreticulum. Eyes relatively small. In profile promesonotum modestly sized, convex. Propodeal spines strong, slightly upturned distally and divergent; in profile when measuring from propodeal spiracle one and one third to one and one half times as long as width of procoxa. Propodeal lobes strong, long and upturned. Petiole robustly built; in lateral view anterior face of node weakly concave and gently sloped, posterior face convex and gently sloped, apex occurring at anterior angle of node. Postpetiole with anterior and dorsal faces evenly convex, apex occurring anterior to midline. Mandibles striate with sparse, setigerous foveolae. Middorsum of head overlain by a thick, widely spaced rugoreticulum. In oblique lateral view, face packed with dense rugoreticulum. Frontal lobes with one pair of carinae in addition to the frontal carinae. Promesonotum packed with dense rugoreticulum. In dorsal view, propodeum smooth and shining with a distinct transverse carina proximal to the metanotal groove; declivitous face with transverse carinae between propodeal spines. Procoxae transversely striate. Sides of mesonotum, metapleuron and propodeum overlain by coarse, widely spaced and intersecting rugae. Petiole and postpetiole coarsely rugoreticulate. Gaster smooth and shining. All dorsal surfaces with a suberect to erect acuminate yellowish hairs, the longest of which are longer than the length of the eye. Head, mesosoma and gaster dark reddish brown, appendages lighter.

Type Material. Syntypes, 1 dealate queen, workers, Nadarivatu, [Viti Levu] Fiji (W.M. Mann) (MCZC, NMNH) (examined).



Figures 10–11. *Lordomyrma rugosa*. **10**. head. **11**. profile.

Other Material Examined. FIJI: **Viti Levu**: Monasavu Rd., 1.75 km SE Waimoque Settlement, 17°40'13"S 177°59'38"E, 850 m, 28.viii.2006 (E.M. Sarnat #2367); Mt. Tomaniivi, 2.4 km E Navai Village, 17°37'06"S 178°00'30"E, 930 m, 1.ii.2005, secondary/primary forest ground foraging (E.M. Sarnat #1771, #1773, #1793); Mt. Tomaniivi, 2.4 km E Navai Village, 17°37'05"S 178°00'33"E , 930 m, 1.ii.2005, mid-elevation rainforest, nesting in soil (E.M. Sarnat #2147).

Discussion. *Lordomyrma rugosa* is one of the most distinctive species of *Lordomyrma* in Fiji. Like *L. levifrons*, *L. polita* and *L. curvata*, this species possesses long propodeal spines, well developed, upturned propodeal lobes, and a robust petiole. It differs from the general appearance of the aforementioned species in its small eyes, darker coloration, and the heavy rugoreticulum covering all surfaces of its face. The only other Fijian congener with such strong facial sculpturing is *L. striatella*, from which *L. rugosa* can be distinguished by its larger size, coarser sculpture, rugoreticulate antennal scrobes, longer propodeal spines and lobes, and more robust petiole. Additionally, *L. rugosa* is the only known species of all Fijian *Lordomyrma* to bear strong striations on its mandibles and procoxae .

Distribution and Biology. *Lordomyrma rugosa* is known only from the Nadarivatu, Mt. Tomaniivi area. Mann (1921) notes that the colonies are small and live beneath stones or in the ground, and that the workers are slow moving. I collected 66 workers and four males from a nest that was excavated in a clay soil with a 1mm entrance in the bare soil, and additional workers were observed on stones in another locality.

***Lordomyrma stoneri* (Mann), stat. n.**

(Figs. 12, 13)

Rogeria tortuosa subp. *stoneri* Mann, 1925: 5.

Description. *Worker*. TL 4.21–5.52, HL 0.95–1.00, HW 0.82–0.89, CI 0.85–0.87, SI 0.72–0.76, REL 0.18–0.24, PSLI 0.96–1.11, MFLI 0.91–1.07, DPWI 1.00–1.07 (8 measured). A large shiny reddish brown species with a massive promesonotum, strong upcurved spines, and reduced sculpturing on face and body. In full face view, posterior margin of head evenly convex with rounded corners. Clypeus bearing one pair of weak carinae. Frontal carinae weakly carinate, terminating just after posterior level of eye. Antennal scrobe weakly impressed. Eyes of moderate size. In profile promesonotum massive, strongly convex, and bulging above the head and propodeum. Propodeal spines strong, triangular, divergent, and roughly as long as width of procoxae in profile when measured from, propodeal spiracle. Propodeal lobes of moderate size, triangular, stout. Petiole robustly built; anterior face strongly sloped and weakly concave; dorsal face more gently sloping and weakly convex; the rounded apex occurring at the anterior angle of node. Postpetiole with anterior and dorsal faces both evenly convex, apex occurring at midline. Mandibles smooth and shining with sparse, setigerous foveolae. Middorsum of head smooth and shining with scattered setigerous foveolae; several carinae mesad of frontal carinae; terminating just after posterior level of eyes. Frontal lobes with two pair of strong carinae in addition to the frontal carinae. In oblique lateral view, widely separated and weakly produced arcuate carinae above and below eye, mostly smooth and shining behind and in front of eyes. Promesonotum smooth and shining with scattered piligerous foveolae. Sides of mesonotum, metapleuron and propodeum overlain by coarse, widely spaced and occasionally intersecting rugae. In dorsal view, propodeum smooth and shining, without a transverse carina posterior to the metanotal groove; declivitous face smooth and shining. Petiole with smooth and shining anterior face, banded by coarse transverse rugae that cross the ventral face. Postpetiole coarsely rugoreticulate. Gaster smooth and shining. All shining surfaces laced with a delicate network of light etchings. All dorsal surfaces with an abundance of suberect to erect acuminate yellowish hairs, the


12
0.2 mm


13
0.5 mm

longest of which equal or exceed the longest diameter of the eye. Head and mesosoma reddish brown, gaster and appendages lighter.

Type Material. Syntype, worker, Tamavua, Fiji (W.M. Mann) (NMNH) (examined).

Other Material Examined. FIJI: **Viti Levu**: Nakobalevu, 1.5 km NE Colo-i-Suva Village, 18°03'03"S 178°25'25"E, 340 m, 28.vii.2003, sifted litter (A. Rakabula); Tholo-I-Suva [= Colo-i-Suva], xii.1950 (N.L.H. Krauss); 4 km NE Monasavu Dam, 17°44'05"S 178°04'46"E, 600 m, 13.vii.2005, canopy fogging (Hilda Waqa); Waivudawa, 6 km NW Lami Town, 18°03'48"S 178°25'57"E, 300 m, 24.v.2002, sifted litter (M. Tokota'a).

Discussion. One of the larger species of *Lordomyrma* in Fiji, *L. stoneri* has an attractive and shining reddish brown integument and strong, upturned spines. The species lacks a carinate anterior margin on the dorsal face of its propodeum and all examined specimens possess a robustly produced promesonotum that bulges above the level of its head and propodeum. Of the other three Fijian species that possess these characters, *L. stoneri* can be distinguished from *L. tortuosa* by its weaker face sculpture, and from *L. desupra* and *L. vuda* by its strongly upturned propodeal spines. The only other species that has strongly upturned spines is *L. curvata*, which is almost half the size of *L. stoneri*, has a strongly carinate anterior margin of the dorsal face of its propodeum, and has a strong rugoreticulum on the posterolateral corners of its head.

Distribution and Biology. *Lordomyrma stoneri* appears to be constricted to a narrow range of mountains in southeastern Viti Levu, close to Suva. Little is known about the biology of this species, but it has been collected by litter sifting.

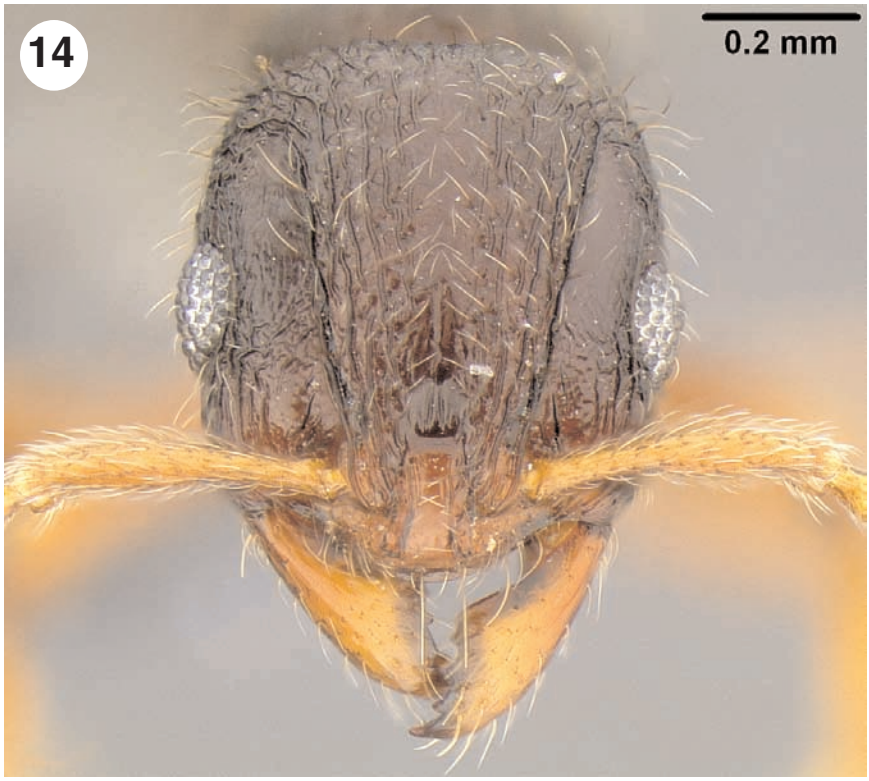
Lordomyrma striatella (Mann)

(Figs. 14, 15)

Rogeria striatella Mann, 1921: 454.

Description. *Worker*. TL 3.16–3.33, HL 0.71–0.75, HW 0.59–0.63, CI 0.83–0.88, SI 0.72–0.79, REL 0.21–0.26, PSLI 0.82–1.00, MFLI 0.93–0.99, DPWI 0.92–1.01 (10 measured). A small dark reddish brown species with fine rugulae overlaying nearly all surfaces of the head, mesosoma, petiole and postpetiole; strongly defined antennal scrobes, short weakly downcurved propodeal spines, long hair and subtriangular petiole. In full face view, posterior margin of head evenly convex with rounded corners. Clypeus with one pair of well-defined carinae. Frontal with one pair of carinae in addition to the frontal carinae. Frontal carinae strongly produced, extending beyond posterior level of eye before integrating with dorsolateral rugoreticulum. Antennal scrobe narrow and well defined; bordered above by frontal carinae and below by thin carinae above eye; smooth and shining with a fine rugoreticulum between eye and antenna insertion. Eyes of moderate size. In profile, promesonotum relatively low, convex. Propodeal spines acute, slightly downcurved and divergent, in profile when measured from propodeal spiracles equal or shorter than the width of procoxa. Propodeal lobes weak triangles. Petiole slender and subtriangular with steep anterior and dorsal faces. Postpetiole taller than long, smaller than petiole, apex occurring anterior to midline. Mandibles smooth and shining with sparse, setigerous foveolae. Middorsum of head with tightly packed rugulae between frontal carinae except for a thin smooth median strip. Posterior margin of head including corners finely rugoreticulate. In oblique lateral view, sculpture surrounding eye rugoreticulate above, behind, and below; longitudinal carinae in front. Pronotum with rugoreticulate sides and dorsum; mesonotum mostly smooth dorsally. In dorsal view, propodeum smooth and shining with a distinct transverse carina proximal to the metanotal groove

Figures 12–13. *Lordomyrma stoneri*. **12**. head. **13**. profile.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15
0.5 mm

and transverse striations in between propodeal spines. Sides of mesonotum, metapleuron and propodeum overlain by fine, closely-spaced rugoreticulum. Procoxa with weak shallow impressions. Petiole and postpetiole finely rugoreticulate. Gaster smooth and shining dorsally and scalloped by shallow impressions basiventrally. All dorsal surfaces with long suberect to erect acuminate yellowish hairs, the longest of which are roughly equal to the length of the eye. Head, mesosoma and gaster dark reddish brown; appendages lighter.

Type Material. Syntypes, workers, Vanua Ava, Kadavu, Fiji (W.M. Mann) (NMNH) (examined).

Other Material Examined. FIJI: **Beqa**: Mt. Korovou, 1.5km WNW Dukuibeqa Village, 250–400 m, 23.v.2005, 18°24'32"S 178°07'10"E (E.P. Economo #93, #94)**;** Mt. Korovou, 1.5 km WNW Dukuibeqa Village, 250–400 m, 23.v.2005, 18°24'32"S 178°07'10"E (E.P. Economo #93). **Ovalau**: 1.2 km NNW Draiba Village 17°41'S 178°49'E, 300 m, 24.vi.2003, sifted litter (A. Rakabula). **Viti Levu**: Nasoqo (W.M. Mann); 4.8 km NE Galoa Village 18°13'S 178°00'E, 300 m, 9.vi.2003, sifted litter (A. Rakabula); 7.5 km NE Vunisea Village 17°29'S 178°08'E, 300 m, 14.vii.2003, sifted litter (A. Rakabula).

Discussion. *Lordomyrma striatella* is a close relative of *L. sukuna*. Together, they are characterized by a narrow well developed antennal scrobe, a slender subtriangular petiole, striations on the propodeal declivity between the insertion of the spines, relatively short propodeal spines, weakly produced propodeal lobes, fine rugoreticulate sculpturing, long hairs on the dorsal surfaces, and dark coloration. *Lordomyrma striatella* can be easily separated from *L. sukuna* by the thin longitudinal striae running the length of its face within the bounds of the frontal carinae. While *L. rugosa* also has strong sculpturing between its frontal carinae, *L. striatella* can be distinguished by its more strongly developed and smooth antennal scrobe, more triangular petiole, smaller and more slender appearance, and weaker propodeal spines and lobes.

Distribution and biology. This species is recorded from collections scattered across Viti Levu, Ovalau, Beqa Island, and Kadavu. Many of the collections have been made from the leaf litter, and Mann reports them as being abundant from Kadavu where he found them nesting beneath stones. No collections of this species have been from above 400 m.

Lordomyrma sukuna Sarnat, **sp**. **n**.
(Figs. 16, 17)

Description. *Worker*. TL 3.48–4.14, HL 0.78–0.91, HW 0.65–0.75, CI 0.81–0.85, SI 0.78–0.87, REL 0.20–0.25, PSLI 0.76–1.02, MFLI 1.02–1.13, DPWI 0.81–0.95 (19 measured). A medium-sized black species with long hair, a slender petiole, short propodeal spines and reduced facial sculpture. In full face view, posterior margin of head evenly convex to slightly concave medially with rounded corners. Clypeus with one pair of carinae. Frontal carinae weakly carinate, terminating just after posterior level of eye. Antennal scrobe narrow and well defined; bordered above by frontal carinae and below by thin carinae above eye; smooth and shining with a few weak carinae near antenna insertion. Eyes of moderate size. In profile promesonotum modestly sized, convex. Propodeal spines acute, straight to slightly downcurved and divergent, in profile when measured from propodeal spiracles equal or shorter than the width of procoxa. Propodeal lobes variably sized and upturned. Petiole slender and subtriangular with steep anterior and dorsal faces. Postpetiole taller than long, smaller than petiole, apex occurring anterior to midline. Mandibles smooth and shining with sparse setigerous foveolae. Middorsum of head smooth and shining with scattered setigerous foveolae; varies from several carinae to no carinae mesad of the frontal carinae. Frontal lobes with

Figures 14–15. *Lordomyrma striatella*. **14**. head. **15**. profile.

Figures 16–17. *Lordomyrma sukuna*. **16**. head. **17**. profile.

one to two pair of carinae in addition to the frontal carinae. Sculpture surrounding eye varying from smooth and shining to patches of well developed rugoreticulum. Promesonotum smooth and shining, short longitudinal rugae present posteriorly and anteriorly. In dorsal view, propodeum smooth and shining, with a distinct transverse carina proximal to the metanotal groove. Sides of mesonotum, metapleuron, and propodeum overlain by fine, closely spaced, crenulate rugae. Petiole and postpetiole finely rugoreticulate. Gaster smooth and shining. All dorsal surfaces with very long suberect to erect acuminate yellowish hairs, the longest of which are longer than the length of the eye. Head, mesosoma and gaster black; appendages lighter.

Type Material. *Holotype*. Worker, FIJI: **Viti Levu**: Mt. Naqaranibuluti 1.3 km W Emperor Gold Mine Rest House, 17°34'10"S 177°58'20"E, 1050 m, 24.vi.2005, nesting under stone (E.M. Sarnat #2143) (FNIC). *Paratypes*. 15 workers, same data as holotype (ANIC, CASC, BPBM, LACM, MCZC, NMNH). Holotype will be deposited in FNIC.

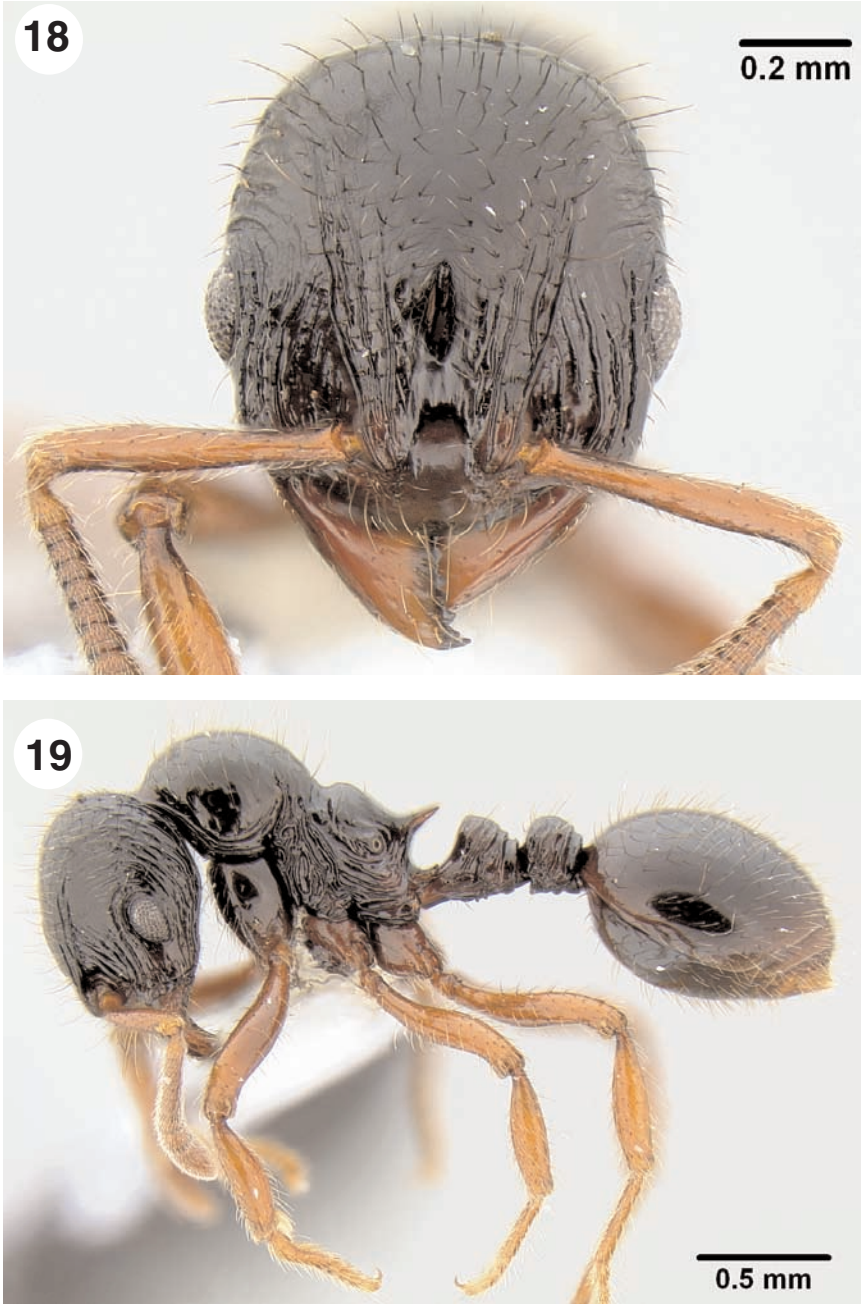
Other Material Examined. FIJI: **Ovalau**: nr. Draiba Village 17°41'S 178°49'E, 300 m, 24.vi.2003, sifted litter (A. Rakabula). **Taveuni**: Qacavulo Point 16°53'S 179°57'E, 300 m, 26.ix.2003, sifted litter (M. Tokotaa & A. Caginitoba). **Viti Levu**: Mt. Tomaniivi, 2.4 km E Navai Village, 17°37'05"S 178°00'33"E, 950 m, 24.vi.2005, ground foraging (E.M. Sarnat #2148); Navai Forestry Camp, 11.vii.1997, in log (J.K. Wetterer #73).

Discussion. *Lordomyrma sukuna* can be distinguished from *L. striatella* by the lack of sculpturing on its face and pronotum. There is considerable variation within the material described here as *L. sukuna*. The most morphologically distinct specimens are the type series collected from Mt. Naqaranibuluti and a series collected from nearby Mt. Tomaniivi, both of which possess a larger size and a less sculptured face than specimens from other localities. This observation is counter to the general pattern in which sculpture tends to increase with size for individuals within a population.

Additionally, the geographic distribution of the morphological differences is counter to what one might expect. Despite being taken from the same mountain range as the two aforementioned series, the specimens from the Navai Foresty Camp share greater morphological similarity with the singletons collected from the islands of Ovalau and Taveuni. Furthermore, the Navai and Ovalau specimens exhibit sparse, short transverse carinae behind their eyes and no carinae mesad of the frontal carinae, whereas the Taveuni specimen exhibits a strongly developed network of carinae behind their eyes and posterior in addition to the presence of carinae immediately mesad of the frontal carinae. To further confuse matters, the Ovalau and Taveuni specimens were taken at a relatively low elevation of 300 m, whereas all of the Viti Levu series were taken from the tallest mountain range in the archipelago. Although no elevation is recorded for the Navai series, it is unlikely to be taken from below 700 m, and the other two series were collected from 950 m and 1050 m.

Considering the variability in facial sculpture observed among the Navai, Ovalau and Taveuni specimens, the unreliability of size as a discriminating character and the failure of morphometric bivariate regressions assign clear separations, I have decided to treat all of the series as belonging to a single species. Further elucidation of the morphological variability and its peculiar geographic distribution will depend upon additional evidence, such as future collections and genetic analysis.

Distribution and Biology. The Viti Levu specimens from the Navai region were taken from logs and under stones while the Ovalau and Taveuni specimens were collected from sifted litter, suggesting these ants are components of the ground fauna. The type series is from a colony collection of 30 workers that was made from a nest in soil beneath a stone, identifiable by excavated earth adjacent to the entrance.



Figures 18–19. *Lordomyrma tortuosa*. **18**. head. **19**. profile.

Lordomyrma tortuosa (Mann)
(Figs. 18, 19)

Rogeria tortuosa Mann, 1921: 452, fig 18.

Description. *Worker*. TL 4.15–4.53, HL 0.93–1.01, HW 0.82–0.90, CI 0.87–0.91, SI 0.69–0.76, REL 0.18–0.24, PSLI 0.96–1.11, MFLI 0.94–1.02, DPWI 1.00–1.11 (10 measured).

A large-sized shiny, reddish brown species with massive promesonotum, modestly-sized straight propodeal spines and strong arcuate carinae on face. In full face view, posterior margin of head evenly convex with gently rounded corners. Clypeus bearing one pair of weak carinae. Frontal carinae strong, becoming confluent with series of arcuate carinae present between eye and posterior corners of head, forming dorsal margin of a broad, poorly defined scrobe. Eyes of moderate size. In profile, shape of promesonotum massive, strongly convex, and bulging above the head and propodeum. Propodeal spines strong, triangular, straight, divergent; in profile when measured from propodeal spiracle roughly equal to the width of the procoxae. Propodeal lobes of moderate size, triangular, stout. Petiole robustly built; anterior face strongly sloped and weakly concave; dorsal face more gently sloping and weakly convex; the rounded apex occurring at the anterior angle. Postpetiole with anterior and dorsal faces evenly convex, apex occurring at midline. Mandibles smooth and shining with scattered setigerous foveolae. Middorsum of head smooth and shining with scattered foveolae; several carinae mesad of frontal carinae, extending continuously or with interruptions from frontal lobes posteriorly to behind the eyes. Frontal lobes with one pair of strong carinae in addition to the frontal carinae. In oblique lateral view, widely separated and strongly elevated arcuate carinae overlaying all dorsal surfaces of head from frontal carinae to ventrolateral carina and from posterior corners to antennal insertions. Promesonotum smooth and shining with scattered foveolae. Procoxae smooth and shining. Sides of mesonotum, metapleuron, and propodeum overlain by coarse, widely-spaced and occasionally intersecting rugae. In dorsal view, dorsal face of propodeum smooth and shining, the anterior margin without a transverse carina posterior to metanotal groove; declivitous face smooth and shining. Petiole with smooth and shining anterior face, banded by coarse transverse rugae that reach the ventral face. Postpetiole coarsely rugoreticulate. Gaster smooth and shining. All dorsal surfaces with an abundance of suberect to erect acuminate hairs, the longest of which equal or exceed the length of the eye. Head, mesosoma and gaster reddish brown with lighter appendages.

Type Material. Syntypes, workers, Ovalau, Fiji (W.M. Mann) (MCZC, NMNH).

Other Material Examined. FIJI: **Kadavu**: Mt. Washington, 1.4 km SSW Lomaji Village, 19°07'06"S 177°59'25"E, 700 m, 5.ix.2006, ground foraging (E.M. Sarnat #2406). **Koro**: Mt. Kuitarua, 2.7 km NW Nasau Village, 17°17'41"S 179°24'39"E, 465m, 12.iii.2005, in leaf litter (E.M. Sarnat #1861, #1862.08); Mt. Kuitarua, 3 km WNW Nasau Village, 17°17'42"S 179°24'30"E, 420 m, 13.iii.2005, nesting in large wet log (E.M. Sarnat #1885); Mt. Kuitarua, 3.1 km WNW Nasau Village, 17°17'43"S 179°26'11"E, 440 m, 20.vi.2005, in dead tree fern (E.M. Sarnat #2100); Mt. Kuitarua, 3.7km NW Nasau Village, 17°17'27"S 179°24'11"E, 470 m, 20.vi.2005, on log (E.M. Sarnat #2086.01, #2086.02); Mt. Nabukala, 4.7 km WSW Nasau Village, 17°18'44"S 179°23'26"E, 500 m, 15.iii.2005, foraging under bark of fallen tree (E.M. Sarnat #1897). **Taveuni**: Road to Des Voeux [Devo] Peak, 16°50'S 179°59'W, 700 m, 26.iv.1997 (L.S. Farley); Tavoro Falls, 1.4km WSW Korovou Village 16°49'47"S 179°53'23"W, 100 m, 18.vi.2005, foraging on stone (E.M. Sarnat #2053 & J.A. Schreiber); Tavoro Falls, 2 km WSW Korovou Village, 16°49'47"S 179°53'23"W, 160 m, 18.vi.2005 (E.M. Sarnat #2061, #2064.02, #2066.02). **Viti Levu**: 5.5 km NNW Nadakuni Village, 17°55'S 178°16'E, 300 m, 7.v.2003, sifted litter (A. Tabutabu & A. Caginitoba); Nakobalevu, 1.5 km NE Colo-i-Suva Village, 18°03'S 178°25'E, 340 m, 29.vi.2002, sifted litter (M. Tokota'a); Nakobalevu, 1.5 km NE Colo-i-Suva Village, 18°03'S 178°25'E, 340 m, 8.iv.2003 (M. Tokota'a); Nakobalevu, 1.5 km NE Colo-i-Suva Village,

18°03'S 178°25'E, 340 m, 24.iv.2003, sifted litter (M. Tokota'a & S. R. Prasad); Nakobalevu, 1.5 km NE Colo-i-Suva Village, 18°03'S 178°25'E, 340 m, 28.vii.2003, sifted litter (A. Rakabula); Nakobalevu, 1.5 km NE Colo-i-Suva Village, 18°03'S 178°25'E, 340 m, 28.vii.2003, sifted litter (A. Rakabula); Mt. Korobaba, near Lami Town, 18°01'S 178°21'E, 300 m, 10.ii.2003, sifted litter (A. Tabutabu); Mt. Korobaba, near Lami Town, 18°01'S 178°21'E, 300 m, 6.viii.2003, sifted litter (M. Tokota'a); 2.7 km NE Naikorokoro Village, 18°05'S 178°19'E, 300 m, 29.vii.2003, sifted litter (A. Rakabula); Abaca Village, 17°40'S 177°21'E, 704m, 7.vi.2004 (D. F. Ward); Vaturu Dam, 17°45'S 177°35'E, 484 m, 7.vii.2004 (D. F. Ward). **Vanua Levu**: 2 km NNW Kasavu Village, 16°42'S 179°39'E, 300 m, 28.viii.2003, sifted litter (A. Rakabula); Mt. Vatudiri, 3km NW Waisali Village, 16°37'42"S 179°12'29"E, 641m, 2.ix.2006, in dead tree fern (E.M. Sarnat #2393); 2 km NW Nakanakana Village, 16°37'S 179°50'E, 300 m, 27.viii.2003, sifted litter (A. Rakabula); 3.5 km NW Vuya Village 16°59'S 178°43'E, 300 m, 28.xi.2004, sifted litter (A. Rakabula); Lasema (W.M. Mann); Ndreketi 25.x.1977 (G. Kuschel); Suene (W.M. Mann).

Discussion. *Lordomyrma tortuosa*, together with *L. desupra, L. stoneri* and *L. vuda* lacks a transverse carina on the dorsal face of its propodeum posterior to the metanotal groove and possesses a robust promesonotum that bulges above the level of its head and propodeum. It can be readily distinguished from these three by the frontal carinae that join with the arcuate carinae posterior of the eye, and the presence of longitudinal carinae that run immediately inward from the frontal carinae. Although the number and strength of these carinae vary, the variation does not appear to follow a distinguishable geographic pattern.

Distribution and Biology. With many records from 8 of the archipelago's islands, *L. tortuosa* is far and away the most geographically widespread of *Lordomyrma* species occurring in Fiji. The species is often collected from leaf litter, and nests of small colonies have been found in logs and under stones. Additionally, *L. tortuosa* appears to be restricted to the lower elevations of the islands, with only two of the aforementioned 32 records being recorded from above 500 m. Mann (1921) notes that he often found workers of this species foraging on mossy stones in ravines, and I have also observed workers gleaning the surfaces of stones on the banks of rivers.

Lordomyrma vuda Sarnat, **sp**. **n**.
(Figs. 20, 21)

Description. *Worker*. TL 4.65–4.84, HL 1.01–1.05, HW 0.87–0.90, CI 0.83–0.87, SI 0.84–0.89, REL 0.20–0.23, PSLI 1.19–1.26, MFLI 1.19–1.24, DPWI 0.94–1.02 (6 measured).
A large dark brown species with sparse facial sculpture, long appendages, and strongly produced downcurved propodeal spines. In full face view, posterior margin of head evenly convex with gently rounded corners. Clypeus bearing one pair of weak carinae. Frontal carinae weak, terminating before to just after posterior level of eye. Antennal scrobe weakly impressed. Eyes of moderate size. In profile, shape of promesonotum massive, strongly convex, and bulging above the head and propodeum in larger workers; less robust in smaller workers. Propodeal spines strong, triangular, downcurved, divergent; in profile when measured from propodeal spiracle, surpassing width of the procoxae. Propodeal lobes of strongly produced, upturned. Petiole robustly built; anterior sloping steeply to a vertical face; dorsal face gently sloping and weakly convex; slightly peaked apex occurring at the anterior angle. Postpetiole with anterior dorsal faces evenly convex, apex occurring in front of midline. Mandibles smooth and shining with scattered setigerous foveolae. Middorsum of head smooth and shining with scattered fove-

olae; carinae absent mesad of frontal carinae. Frontal lobes with several pair of strong carinae in addition to the frontal carinae. In oblique lateral view, a few weak carinae above eye; smooth behind, below and in front of eye. Promesonotum smooth and shining with scattered foveolae. Procoxae smooth and shining. Sides of mesonotum, metapleuron, and propodeum overlain by coarse, widely spaced and occasionally intersecting rugae. In dorsal view, dorsal face of propodeum smooth and shining, the anterior margin without a transverse carina posterior to the metanotal groove; declivitous face smooth and shining. Petiole with smooth and shining anterior face, banded by coarse transverse rugae that reach the ventral face. Postpetiole coarsely rugoreticulate. Gaster smooth and shining. All dorsal surfaces with an abundance of suberect to erect acuminate hairs, the longest of which equal or exceed the length of the eye. Head, mesosoma and gaster reddish brown with lighter appendages.

Type Material. *Holotype*. Worker, FIJI: **Viti Levu**: Koroyanitu National Park, Savione Falls, 2 km ESE Abaca Village, 17°40'33.6"S 177°33'00.5"E, 650 m, 25.viii.2006, rainforest/river edge, on stone (E.M. Sarnat #2335) (FNIC). *Paratypes*. 5 workers, same data as holotype (ANIC, MCZC, BPBM, NMNH). Holotype will be deposited in FNIC.

Other Material Examined. FIJI: **Viti Levu**: Koroyanitu NP, Mt. Batilamu, 2 km SE Abaca Village, 17°40'45.8"S 177°32'34.2"E, 840 m, 24.viii.2006, on stone (E.M. Sarnat #2323).

Discussion. *Lordomyrma vuda*, is the largest species in the genus thus far collected from Fiji. Like *L. desupra*, *L. stoneri* and *L. tortuosa*, it lacks a transverse carinate margin posterior to the metanotal groove on the dorsal face of its propodeum. Like *L. desupra* and *L. stoneri*, it lacks a developed facial sculpture and the presence of longitudinal carinae that run inward from, and parallel to, the frontal carinae. The downcurved spines of *L. vuda* distinguish the species from *L. stoneri*. *Lordomyrma vuda* can be distinguished from *L. desupra* by the more vertical, peaked appearance of its petiole node, the more robust propodeal spines, the more shallowly sloped propodeal dorsum, its larger size and darker coloration.

The similar morphologies of *L. desupra*, *L. stoneri* and *L. tortuosa* suggest a closely related group of species into which *L. vuda* does not comfortably fit. The robust propodeal spines, shallow slope of propodeal dorsum, and dark color combine with the petiole shape and sculpture to give *L. vuda* a appearance distinct. It will be interesting to learn from future phylogenetic work the relationships between *L. vuda* and the other Fijian *Lordomyrma*.

Distribution and Biology. Thus far, *L. vuda* has only been collected from two nearby localities in western Viti Levu's Vuda Province. Both collections were made from workers foraging on stones, with one locality being adjacent to a river. So far, *L. vuda* is the only species of the genus that appears to be restricted to the drier, leeward mountain ranges of western Viti Levu.

DISCUSSION

Distribution of *Lordomyrma* in Fiji

Lordomyrma is a relatively rare and inconspicuous member of the Fijian ant fauna. Although litter sifting has proved an effective method for capturing *Lordomyrma* species, their small, dispersed and inconspicuous nests combine with a small, slow-moving and well-camouflaged worker caste to make detection of these ants difficult in the field. Despite the wide coverage of the litter sifting transects and hand collecting localities (Fig. 22), the low abundances of individuals captured suggest that the distributions reported in this study may represent a limited picture of actual species ranges. Of the ten islands and island groups sampled in the recent surveys, *Lordomyrma* species were found on eight

Figures 20–21. *Lordomyrma vuda*. **20**. head. **21**. profile.

Table 2. Distribution of *Lordomyrma* of the Fiji Islands

Species	VL	VN	TV	KV	KR	LA	BQ
L. curvata	–	x	–	–	–	–	–
L. desupra	x	–	–	–	–	–	–
L. levifrons	x	–	–	–	–	–	–
L. longiseta	x	–	x	–	–	x	–
L. polita	x	–	–	–	x	–	–
L. rugosa	x	–	–	–	–	–	–
L. stoneri	x	–	–	–	–	–	x
L. striatella	x	–	–	x	–	x	–
L. sukuna	x	–	–	–	–	–	x
L. tortuosa	x	x	x	x	x	x	–

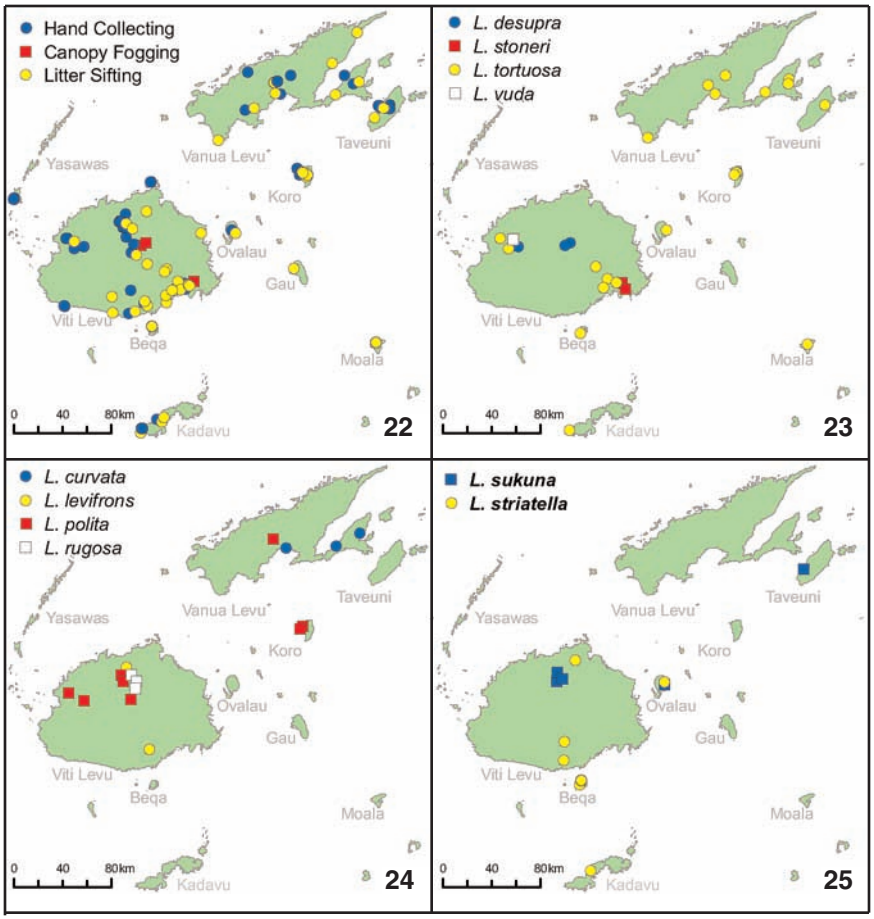
VL = Viti Levu, VN = Vanua Levu, TV = Taveuni, KV = Kadavu, KR = Koro, LA = Ovalau; BQ = Beqa

(Figs. 23–25). The recent collection of *L. tortuosa* from the island of Moala represents the most remote population of the genus in the archipelago. While it remains possible that *Lordomyrma* is also established on the Yasawa island chain in western Fiji and the Lau island group in eastern Fiji, the lack of sizeable, mesic and undisturbed forests in these regions limits the chances of their discovery. However, the larger island of Gau in the Lomaiviti province does appear to have suitable habitat for *Lordomyrma*, and the lack of records from that island is more likely the result of poor sampling than range limitation.

Although *L. tortuosa* is known from all eight islands on which *Lordomyrma* is recorded, the distributions of the other Fijian *Lordomyrma* tend to be more geographically restricted (Table 2, Figs. 23–25). For example, five species (*L. desupra*, *L. levifrons*, *L. rugosa*, *L. stoneri, L. vuda*) are recorded only from Viti Levu and one species (*L. curvata*) is known only from Vanua Levu. Another pattern revealed from the distribution records is that nine out of the ten species occur on Viti Levu. While Vanua Levu (5,535 km^2) is approximately half the area of Viti Levu (10,388 km^2), only three species have been recorded from the island. Although there may be compelling biogeographic explanations for this pattern, it must also be noted that Viti Levu is the better sampled of the two big islands.

Comparison with other Pacific Taxa

Lordomyrma material from Australia, Papua New Guinea and New Caledonia was examined to determine possible relationships with the Fijian fauna. Although preliminary comparisons of the Fijian taxa with that of neighbouring Pacific regions suggest that the archipelago may have been colonized by more than one lineage of *Lordomyrma*, a more thorough phylogenetic study is needed before conclusive results can be reported. Of the limited material examined, there exists a group of species, including *L. leae* Wheeler from Lord Howe Island, *L. punctiventris* Wheeler from eastern Australia, and *Lordomyrma azumai* Santschi from Japan, that bears close resemblance to the Fijian species *L. striatella* and *L. sukuna*. The most striking similarities among these species include (*a*) the presence of transverse striae crossing the dorsal face of the propodeum between the insertions of the propodeal spines, (*b*) a subtriangular shaped, slender petiole with straight and steep anterior and posterior faces in lateral view, (*c*) narrow, well-defined and strongly impressed antennal



Figures 22–25. Localities sampled from 2002–2006 and distribution of *Lordomyrma* species in the Fiji Islands. Overlapping symbols are offset where multiple species are recorded from identical localities.

scrobes, (*d)* sculpture marked by a fine and strongly produced rugoreticulum, and (*e*) long and abundant erect or suberect hairs on most surfaces of the body.

The remaining Fijian species, however, have no close analogues to the species examined from Australia, and tend to share more characteristics with material examined from New Guinea. Shared characteristics include: (*a*) a more robustly produced promesonotum; (*b*) shallow, broader and more weakly defined antennal scrobes; and (*c*) a petiole with a more steeply sloping anterior face and more gently sloping posterior face in profile.

None of the material examined from New Caledonia closely resembled the Fijian fauna, however, there is reported to be a considerable amount of diversity that has yet to receive thorough examination (R.W. Taylor, pers. comm.). One unidentified species

examined from New Caledonia appears to be allied to a group of very small ants with representatives in Australia and New Guinea that is characterized by: (*a*) a dense pelt of short erect hairs; (*b*) a nearly flat mesosomal dorsum; (*c*) the absence or near absence of antennal scrobes; and (*d*) a dense rugoreticulum overlaying the face and much of the mesosoma. A greater diversity of the New Caledonia *Lordomyrma*, including *L. caledonica* Andrea, is unique to the island and appears to constitute an endemic radiation with the following characteristics in common: (*a*) the absence of dorsoventral carinae on the head; (*b*) relatively long scapes that reach or surpass the posterior corners of the head; and (*c*) a deeply impressed metanotal groove.

Future directions for the study of *Lordomyrma*

Taxonomy

While the present taxonomic treatment is limited to the Fijian species, a global revision is required to reassess the generic concept with respect to several genera that have been synonomized with *Lordomyrma* and a body of undescribed material that closely resembles *Lordomyrma*. *Promeranoplus* Emery and *Prodicroaspis* Emery were described by Emery (1914) from New Caledonia and stood as monotypic genera before Bolton (1994) synonomized them with *Lordomyrma*. Although the descriptions provided by Emery are insufficient to elucidate the relationships between these species and the other species of *Lordomyrma*, both possess features, such as the bilobed prominence produced between the expansively broad and flat frontal lobes of *Lordomyrma sarasini* (= *Promeranoplus sarasini*) and the bispinose petiole of *L. sarasini* (= *Prodicroaspis sarasini*), that are otherwise unique to the genus. There also exist a number of undescribed specimens from the Philippines, Borneo, Australia and New Guinea that possess characters diagnostic of *Lordomyrma*, but differ substantially from the described species. If the generic concept is expanded, other members of the tribe Stenammini, such as the New Guinean *Ancyridris* Wheeler and Afrotropical *Cyphoidris* Weber, will also deserve examination.

Biogeography

The rich diversity, species turnover and relatively restricted distributions of *Lordomyrma* in Fiji, and the Pacific in general, make the genus a strong candidate for elucidating biogeographic patterns and processes within the archipelago and between the archipelago and other Pacific regions. One pattern made clear by the collection records is the disproportionate number of species that occur on Viti Levu. In addition to being the largest and tallest of Fiji's islands, Viti Levu is also the oldest and most geologically unique. Viti Levu is believed to be a fragmented remnant of the ancient Vitiaz island arc, and may predate the other large Fijian islands by over 30 million years (Nakano *et al.* 1977; Rodda & Kroenke 1984; Whelan *et al.* 1985; Rodda 1994; Kroenke 1996; Stratford & Rodda 2000).

Another interesting pattern revealed by the distribution of *Lordomyrma* species in Fiji is the relatively rich diversity recorded from the island of Ovalau. Despite the relatively small size of Ovalau, it is tied with the much larger Vanua Levu as the second most diverse island with respect to *Lordomyrma,* hosting at least three species. However, all three of these species are also found on nearby Viti Levu. Although it is possible that individuals dispersed from Viti Levu to Ovalau over water, it is also believed that Viti Levu was connected to Ovalau by dry land during the last glacial maxima (Nakano, Silveira Neto, Batista, Yokoyama, Degaspari and Marichi 1977; Haq *et al.* 1987; Mestertongibbons & Dugatkin 1992; Rodda 1994), thus allowing for the potential of populations crossing from one island to the other.

Determining the biogeographic origins of the Fijian *Lordomyrma* may help to illuminate broader questions of the origins of the archipelago's other entomofauna. Little is known about the origin of Fiji's terrestrial arthropods. Although the islands boast high levels of endemism, the radiations appear to be older and more modest than the stunning lineage diversifications that have occurred relatively recently on other remote Polynesian archipelagos, such as Hawaii or the Marquesas. *Lordomyrma* is a distinctly western Pacific genus with strong representation in many of the major Pacific areas surrounding Fiji, and a biogeographic study of the genus has the potential to reveal interesting patterns concerning the colonization of the region.

More thorough sampling and a well-resolved phylogenetic tree will allow for rigorous testing of biogeographic hypotheses concerning the origin of the Fijian *Lordomyrma*. While Viti Levu, Taveuni and Koro have been relatively well collected, Kadavu and the interior of Vanua Levu have received less attention. Additionally, Gau and the islands of Moala and Matuku require at least a cursory sampling before a relatively complete census of the Fijian *Lordomyrma* can be expected. A well-resolved phylogenetic tree, incorporating relevant extralimital species, will allow for the analysis of biogeographic pattern using sister-group relationships. Clearer understanding of these relationships may be crucial for answering questions on the archipelago scale, such as the effects of sea level change on current distributions, as well as on the southwest Pacific scale, such as the origin or origins of the Fijian fauna.

Conservation

The conservation of the Fijian *Lordomyrma* is ultimately tied to the conservation of the mature, mesic and undisturbed forests of the archipelago. The high correlation between the distribution of these habitats and the presence of *Lordomyrma* suggests that these ants are restricted to Fiji's increasingly threatened native mesic forests. If *Lordomyrma* is to be used in conjunction with other taxa as a surrogate for conservation value it will be important to quantify the association between its presence and that of realistic correlates such as general ant diversity, ground arthropod diversity and forest characteristics. Furthermore, standardized and periodic censuses of the genus may help to monitor the effects that environmental changes, such as the spread of invasive species, habitat degradation and climate change, have on Fiji's native ground dwelling arthropods.

ACKNOWLEDGMENTS

Thank you to the NSF Terrestrial Arthropod Survey, Hilda Waqa, Darren Ward, James Wetterer, Evert Schlinger and Leah Brorstrom for providing specimens from the Fiji Terrestrial Arthropod Survey. Vinaka vakalevu to David Olson and the Wildlife Conservation Society staff for logistical support and field collections. Thank you to Phil Ward for advice on the manuscript; Ted Shultz, Eugenia Okonski and Stefan Cover for assisting with museum material; Matthew Martinez for curation assistance, Jasmine Joseph for imaging assistance and Aaron King for mapping assistance. This research was supported by the Ernst Mayr Grant, the Pacific Rim Research Program and the National Science Foundation DEB-0425970 "Fiji Terrestrial arthropod Survey". The Government of Fiji (Ministries of Environment and Forestry) are thanked for their support.

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APPENDIX

Measurements for each of the 10 species of *Lordomyrma* described from Fiji. (n) = number of individuals measured. Measurement abbreviations are described in Table 1.

	L. curvata	*L. desupra*	*L. levifrons*	*L. polita*	*L. rugosa*	*L. stoneri*	*L. striatella*	*L. sukuna*	*L. tortuosa*	*L. vuda*
(n)	**3**	**10**	**1**	**11**	**10**	**8**	**10**	**16**	**10**	**6**
TL	3.12-3.26	3.55-4.18	4.31	3.32-3.86	3.36-3.77	4.21-4.52	3.16-3.33	3.48-4.14	4.15-4.53	4.65-4.84
HL	0.72-0.73	0.81-0.93	0.99	0.74-0.87	0.77-0.85	0.95-1.00	0.71-0.75	0.78-0.91	0.93-1.01	1.01-1.05
HW	0.59-0.62	0.73-0.83	0.89	0.64-0.76	0.71-0.76	0.82-0.89	0.59-0.63	0.65-0.75	0.82-0.90	0.87-0.90
SL	0.42-0.45	0.53-0.62	0.65	0.50-0.58	0.50-0.54	0.61-0.64	0.45-0.49	0.51-0.62	0.58-0.64	0.75-0.78
EL	0.16-0.18	0.17-0.23	0.21	0.17-0.22	0.15-0.18	0.20-0.23	0.15-0.19	0.17-0.22	0.18-0.23	0.20-0.23
EW	0.09-0.10	0.11-0.15	0.13	0.10-0.14	0.09-0.12	0.12-0.15	0.11-0.12	0.11-0.15	0.11-0.16	0.14-0.16
CW	0.19-0.20	0.25-0.28	0.29	0.22-0.27	0.23-0.26	0.26-0.28	0.21-0.23	0.23-0.28	0.27-0.28	0.29-0.31
MFL	0.56-0.60	0.75-0.83	0.90	0.64-0.80	0.68-0.73	0.81-0.92	0.56-0.62	0.67-0.83	0.79-0.87	1.04-1.08
PW	0.50-0.54	0.57-0.68	0.70	0.53-0.69	0.57-0.63	0.66-0.74	0.46-0.50	0.51-0.59	0.68-0.75	0.70-0.71
DPW	0.21-0.22	0.22-0.26	0.26	0.20-0.25	0.24-0.26	0.27-0.30	0.20-0.22	0.21-0.24	0.26-0.30	0.28-0.31
PH	0.25	0.28-0.31	0.38	0.26-0.31	0.30-0.32	0.34-0.37	0.28-0.29	0.27-0.31	0.28-0.37	0.38-0.41
MH	0.12-0.14	0.16-0.18	0.27	0.10-0.15	0.17-0.18	0.18-0.21	0.18-0.24	0.20-0.26	-	0.19-0.28
PSL	0.24-0.26	0.23-0.29	0.38	0.25-0.35	0.29-0.34	0.25-0.31	0.19-0.22	0.19-0.26	0.21-0.30	0.35-0.38
CI	0.83-0.86	0.87-0.92	0.90	0.86-0.91	0.86-0.94	0.85-0.87	0.83-0.88	0.81-0.85	0.87-0.91	0.83-0.87
SI	0.71-0.73	0.71-0.76	0.73	0.75-0.79	0.68-0.72	0.72-0.76	0.72-0.79	0.78-0.87	0.69-0.76	0.84-0.89
MHI	0.75-0.78	0.70-1.00	1.29	0.48-0.75	0.98-1.12	0.86-1.05	0.97-1.05	1.20-1.41	-	0.66-0.93
REL	0.22-0.25	0.21-0.25	0.21	0.22-0.27	0.19-0.22	0.20-0.23	0.21-0.26	0.20-0.25	0.18-0.24	0.20-0.23
PSLI	1.25-1.30	0.92-1.12	1.31	1.13-1.46	1.28-1.48	0.96-1.11	0.82-1.00	0.76-1.02	0.96-1.11	1.21-1.26
MFLI	0.93-0.97	0.99-1.08	1.01	0.97-1.05	0.92-1.00	0.91-1.07	0.93-0.99	1.02-1.13	0.94-1.02	1.19-1.24
DPWI	1.05-1.10	0.85-1.00	0.90	0.91-1.09	0.98-1.10	1.00-1.07	0.92-1.01	0.85-0.92	1.00-1.11	0.94-1.02

Fiji Arthropods VI. Edited by Neal L. Evenhuis & Daniel J. Bickel. *Bishop Museum Occasional Papers* 90: 43–50 (2006).

A New Fijian Species of *Saldula* Van Duzee (Heteroptera: Saldidae) from the Interior of Viti Levu[1,2]

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Abstract. A new species of shore bug, *Saldula gilloglyi,* **n**. **sp**., is described from the interior plateaus of Viti Levu island, Fiji. This new species is compared to the Fijian endemic *Saldula inoana* Drake, which also occurs on Viti Levu, and a key is provided to separate the two species. Illustrations of the male genitalia of *S. gilloglyi* and *S. inoana* are provided.

INTRODUCTION

Saldidae have been among the most successful families in the semi-aquatic Heteroptera in regard to colonizing remote island groups in the Pacific region. Endemic *Saldula* Van Duzee species have now been described from Hawai'i (8 species), the Society Islands (1 species), Samoa (1 species), the Solomon Islands (2 species), and Guam (2 species). Up to the present, only a single endemic *Saldula* species, *S. inoana* Drake, has been known from the Fijian Islands; in this paper we describe a second species, *Saldula gilloglyi*, from the mountains of Viti Levu.

Overall, the species diversity of Saldidae in the Pacific region is still underappreciated in the literature. We now have additional freshwater and arboreal species in our collections awaiting description from the Marquesas, the Tuamotu Archipelago, Pohnpei, New Caledonia, Manus Island (Admiralty Islands), and Hawai'i, as well as new marine species in the genus *Salduncula* from Palau, Pohnpei, Timor, and Australia plus the Solomon Islands. We also consider it likely that further collecting in remote areas of Fiji, the Solomon Islands, and Vanuatu, particularly on rheocrene habitats, will produce additional endemic saldid species.

Several very widespread species, originally described from Africa and later found in tropical Asia, have also reached remote Pacific islands, notably *Micracanthia ornatula* (Reuter) and *Saldula niveolimbata* (Reuter), and can be expected on open shores of streams or ponds anywhere in the western Pacific. *Saldula palauana* Drake, once thought to be endemic on Palau, has now been found on Guam, Pohnpei, Ulithi Atoll and Yap: this species is closely related to *Micracanthia ornatula* (formerly held in *Saldula*), and may eventually prove to be synonymous. A basic detailed survey of the saldid fauna of the myriad Pacific islands is far from complete, and presents a significant challenge.

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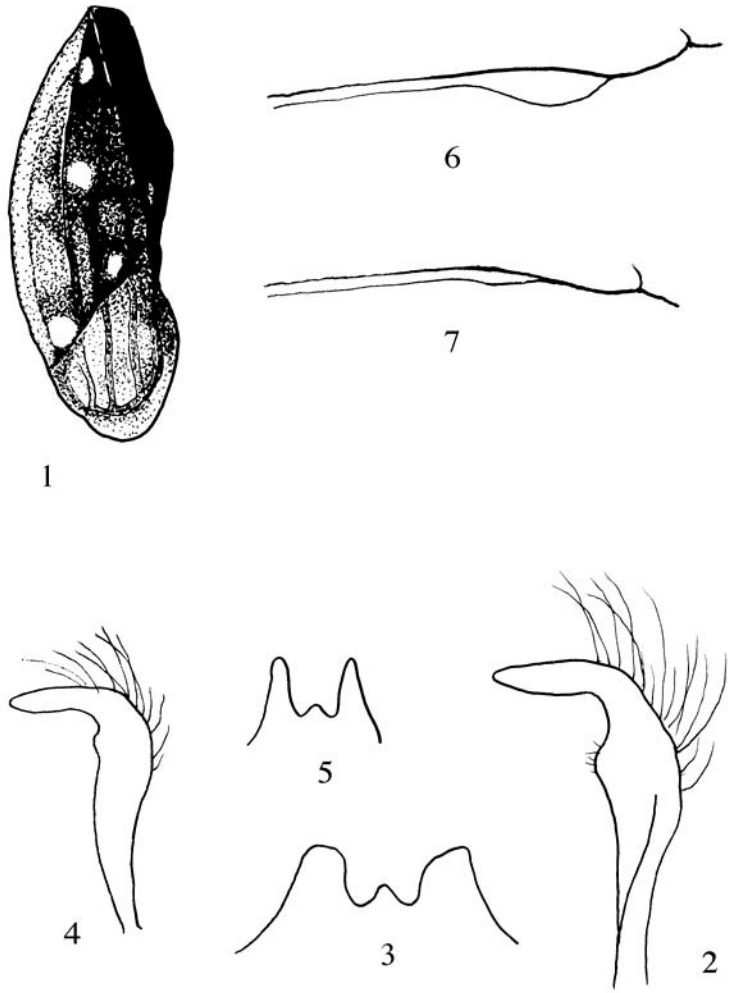
1. Contribution No. 2006-042 to the NSF-Fiji Arthropod Survey.
2. Contribution No. 2006-044 to the Pacific Biological Survey.



Figures 1–7. Fijian *Saldula* species, structural details. **1.** *Saldula gilloglyi*, left hemelytron. **2.** *Saldula gilloglyi*, left male paramere. **3.** *Saldula gilloglyi*, parandria. **4.** *Saldula inoana*, left male paramere. **5.** *Saldula inoana*, parandria. **6.** *Saldula gilloglyi*, costal margin and hypocostal ridge, lateral view. **7.** *Saldula inoana*, costal margin and hypocostal ridge, lateral view.

MATERIALS AND METHODS

All measurements and morphological terminology follow Chapter IV on morphology by Polhemus (1985). All measurements in the following descriptions are given in millimeters. Type repository codons are defined in the Acknowledgments section. CL numbers in the Material Examined sections refer to collection locality numbers used by the authors to cross reference specimens, field notes, and habitat photographs.

Most of the material upon which this study was based, approximately 110 specimens including immatures, was collected by the authors, with the notable exception of certain specimens collected earlier by Alan Gillogly and donated to the J.T. Polhemus Collection (JTPC), which will eventually be placed in the U.S. National Museum of Natural History (USNM). Specimens deriving from the Fiji National Insect Collection (FNIC), Suva, as part of the NSF-funded Fiji Arthropod Survey will be returned there, with duplicate exemplars placed in the Bishop Museum, Honolulu (BPBM), JTPC, and USNM.

Color, eunomy, and measurements were taken from dry mounted specimens, because observations of setae and coloration from alcohol specimens may be not always be accurate.

SYSTEMATICS

Key to the Saldidae of Viti Levu

1. Second antennal segment much longer than third (ratio 1.54–1.65); ground color brown; pronotal margin without short brown streak near each humerus; claval subapical spot, when present, diffuse (Fig. 1); female hypocostal ridge produced ventrally at embolar modification (Fig. 6) …..... ..... **gilloglyi** Polhemus & Polhemus, **n**. **sp**.

–. Second antennal segment slightly longer than third (ratio 1.12–1.30); ground color blackish brown; pronotal margin with short brown streak near each humerus; claval subapical spot, when present, bright white, distinct; female hypocostal ridge not produced ventrally at embolar modification (Fig. 7).... **inoana** Drake

Saldula gilloglyi J. Polhemus & D. Polhemus, **new species**
(Figs. 1–3, 6)

Description. Macropterous male: Ground color blackish brown; head, pronotum, scutellum, shining; hemelytra light brown to brown, with soft brown and bright white markings; clavus uniformly pruinose blackish brown, with one poorly developed elongate brownish yellow spot distally; endocorium with two white spots along outer margin, one basal, one at middle, plus one white medial spot distally, also with large soft brown areas not strongly contrasting with ground color; exocorium mostly light colored on basal angle, one small diffuse white spot at middle, another bright white spot distally; embolium broadly yellowish, continuing along membrane, interrupted by black at embolar fracture. Legs leucine to testaceous. Thoracic venter black, acetabula broadly margined with testaceous. Abdominal venter brown, basal segments yellowish along posterior margin; antennae testaceous, withour long setae. Dorsum clothed with moderate length recumbent golden pubescence, very noticeable on clavus, short and sparse on hemelytra.

Structural characteristics: Head short, about 1.5 x wider than long in middle; head with moderate length setae in addition to usual three pairs of trichobothria; eyes large, strongly exserted; ocelli prominent, scarcely raised, each flanked by a prominent yellowish spot reaching eye margin; postclypeus not tumid; frons with a shallow median furrow between median pair of trichobothria. Antennae long, all segments slender, without long setae. Pronotum short, broad, lateral margins slightly concave, callus tumid, almost campanulate. Legs relatively slender, clothed with usual spines and short setae, tibia straight.

Measurements. Total length, 3.72 mm; width (across hemelytra) 1.78 mm. Head length, 0.61; width, 1.15; interocular space, 0.25. Pronotum length, 0.61; posterior width, 1.30; anterior width,

Figure 8. Waterfalls on the interior plateaus of Viti Levu, such as this one near the Monasavu Dam hydroelectric plant headquarters (CL 7363), provide preferred habitat for *S. gilloglyi* and *S. inoana*. Both species occurred syntopically at this locality, on the wet bedrock ledges at the left of the picture.

0.72; collar width, 0.58; callus length, 0.32; posterior lobe length, 0.20. Scutellum length, 0.79; width, 0.83. Hemelytra corium length, 2.05; clavus length, 1.22; claval commissure length, 0.61; distance apex claval commissure-apex membrane, 1.08. Metafemur length,1.40; metatibia length, 1.87. Antennal segments, length I–IV; 0.43: 0.94: 0.58: 0.58.

Genitalia as in Fig. 2–3.

Macropterous female. Similar to male except larger; ventral abdominal sternum VII (subgenital plate) leucine on caudal half; hemelytral hypocostal ridge produced ventrally at embolar modfication (fig. 6). Total length 4.55; width (across hemelytra), 1.78.

Types. *Holotype*, macropterous male: FIJI: **Viti Levu**: 2 mi (3.2 km) E. Nandarivatu, 12-XII-1970, A. Gillogly (USNM). *Paratypes* as follows (all collected by J.T. and D.A. Polhemus unless otherwise noted): FIJI: **Viti Levu**: 2 males, 3 females, same data as holotype, A. Gillogly (JTPC); 7 males, 4 females, Rairaimatuku Plateau, waterfall and rocky stream nr. Monasavu Dam headquarters, 790 m [2590 ft], 17°44'32.3"S, 178°03'16.3"E, water temp. 23 °C, 2 Feb 2005, CL 7363, D.A. Polhemus; 1 male, 1 female, rheocrenes on steep bedrock faces along Tavua–Nadarivatu road, ca. 4 km N. of Nadarivatu between culverts 19/8 and 19/10, 580 m [1900 ft], 17°33'45.9"S, 177°57'09.2"E, water temp. 23.5 °C, 26 Mar 2005, CL 7366; 2 females, roadside waterfall and rocky stream 0.4 km N. of Waikumbakumba on Tavua–Nadarivatu road, 220 m [720 ft], 17°32'28.9"S, 177°56'20.6"E, water temp. 26 °C, 3 February 2005, CL 7368, D.A. Polhemus; 1 female, Evans Range, small stream and cascade 13.5 km E. of Nagado on Vaturu Dam road, 415 m [1360 ft], 17°45'44.2"S, 177°39'59.1"E, water temp. 25 °C, 27 Mar 2005, CL 7405. Paratypes deposited in FNIC, USNM, BPBM, and JTPC.

Remarks. *Saldula gilloglyi* may be easily separated from the only other known Fijian saldid, *Saldula inoana* Drake, by the characters given in the key, combined with the differences in the male genitalia; see Figs. 2–5. The hemelytra of both of the Fijian species have a secondary hypocostal ridge (hcr), the filum gonopori of the male genitalia is coiled 1–1/2 times, and the immatures possess a larval organ in *S. inoana* (this character state cannot be evaluated for *S. gilloglyi* because no immatures are available). These characters place both species in one of the tropical clades currently held in the genus *Saldula*.

Ecological Notes. *Saldula gilloglyi* occurs on wet bedrock faces and damp boulders, frequently in association with cascades and waterfalls (Fig. 8). It is often found syntopically with *S. inoana* in such situations, but based on current collections is more localized in its occurrence. The records of this species to date are all from elevations between 220–790 m in the northern half of Viti Levu (Rairaimatuku Plateau and Koroyanitu Range), with no collections from the Namosi Highlands of the south.

Etymology. This species is dedicated to Dr. Alan Gillogly in recognition of his tireless efforts to provide material from many countries for our research.

Saldula inoana Drake
(Figs. 4–5, 7)

Saldula inoana Drake, 1961: 299.

Description. Macropterous male: Ground color blackish brown; head, pronotum, scutellum, faintly shining; hemelytra with soft brown and bright white markings; clavus uniformly pruinose blackish brown, without or with one elongate brownish spot distally; endocorium with two white spots along outer margin, one basal, one at middle, plus one white medial spot distally, distal third with two large soft brown areas; exocorium mostly white on basal angle, one large white spot at middle, another distally, connected by a broad brown streak along inner margin; embolium broadly yellowish, continu-

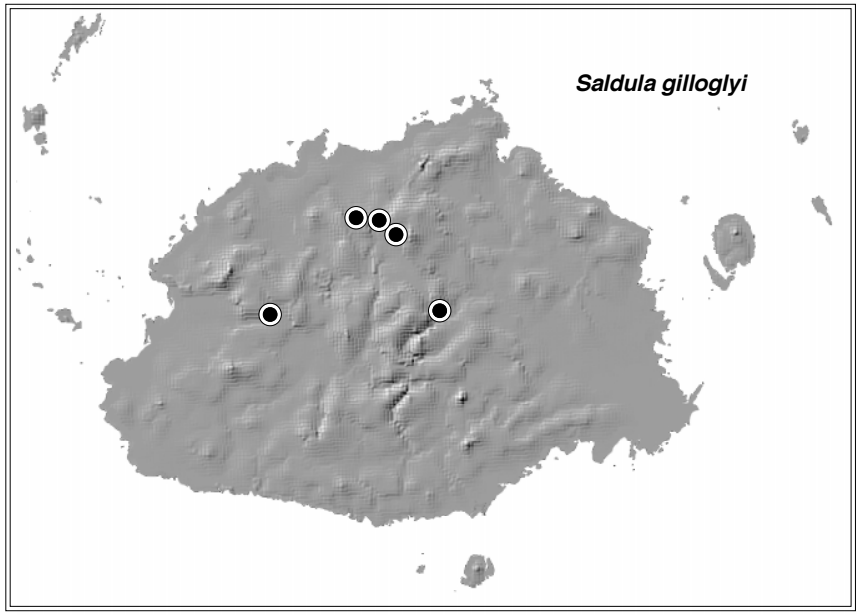


Figure 9. Distribution of *Saldula gilloglyi* on Viti Levu.

ing along membrane, interrupted by black at embolar fracture (see figure 7 in Drake, 1961). Legs leucine to testaceous, darker dorsally. Thoracic venter black, acetabula broadly margined with leucine. Abdominal venter blackish brown, basal segments brown along posterior margin; antennae dark brown, first segment lighter, fourth segment brownish to yellowish distally. Dorsum clothed with moderate length recumbent golden pubescence, darker caudad.

Structural characteristics: Head short, almost twice as wide as long in middle; head with moderate length setae in addition to usual three pairs of trichobothria; eyes large, strongly exserted; ocelli prominent, scarcely raised, each flanked by a prominent yellowish spot reaching eye margin; postclypeus not tumid; frons weakly sulcate longitudinally between median pair of trichobothria. Antennae moderately long, all segments slender, without long setae. Pronotum short, broad, lateral margins slightly concave. Legs relatively slender, clothed with usual spines and short setae, tibia straight, except hind tibia slightly curved.

Measurements. Total length, 3.72 mm; width (across hemelytra) 1.66 mm. Head length, 0.55; width, 0.92; interocular space, 0.22. Pronotum length, 0.55; posterior width, 1.28; anterior width, 0.67; collar width, 0.55; callus length, 0.29; posterior lobe length, 0.18. Scutellum length, 0.83; width, 0.90. Hemelytra corium length, 2.60; clavus length, 1.30; claval commissure length, 0.55; distance apex claval commissure-apex membrane, 1.28. Metafemur length,1.33; metatibia length, 1.83. Antennal segments, length I–IV; 0.39: 0.83: 0.61: 0.67.

Genitalia as in figures 4–5.

Macropterous female. Similar to male except larger and ventral abdominal sterna broadly marked with leucine to yellowish medially, less so laterally; ventral abdominal sternum VII (subgenital plate) leuteous on caudal half; hemelytral hypocostal ridge not produced ventrally at coupling point (fig. 7). Total length 4.33; width (across hemelytra), 1.94.

Material Examined. (all macropterous; all collected by J.T. and D.A. Polhemus unless otherwise noted): FIJI: **Viti Levu**: 1 male, 2 mi (3.2 km) E. Nandarivatu, 12-XII-1970, A.

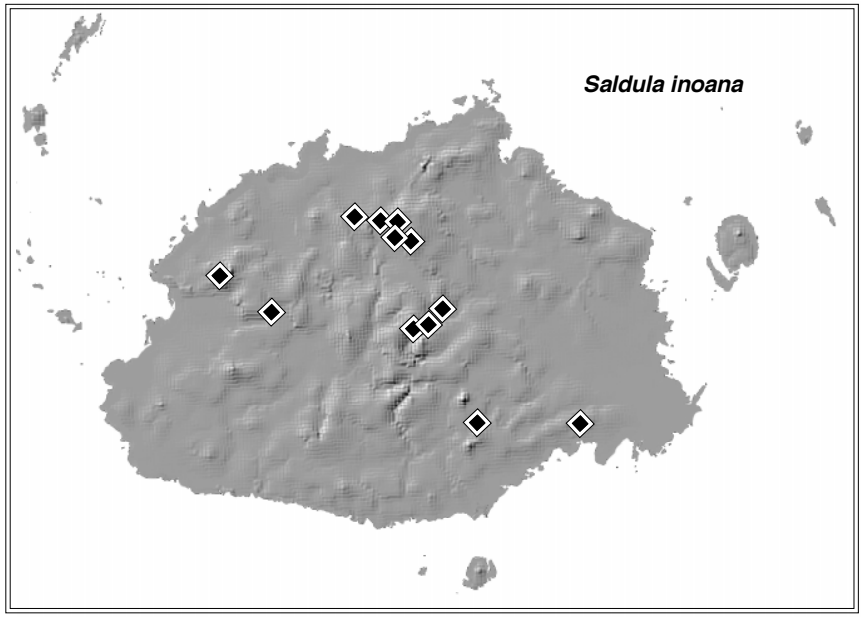


Figure 10. Distribution of *Saldula inoana* on Viti Levu.

Gillogly (JTPC); 11 males, 11 females, Rairaimatuku Plateau, waterfall and rocky stream nr. Monasavu Dam headquarters, 790 m [2950 ft], 17°44'32.3"S, 178°03'16.3"E, water temp. 23 °C, 2 Feb 2005, CL 7363, D.A. Polhemus; 2 males, 1 female, rheocrenes on steep rock faces along Tavua–Nadarivatu road, ca. 4 km N. of Nadarivatu between culverts 19/8 and 19/10, 580 m [1900 ft], 17°33'45.9"S, 177°57'09.2"E., water temp. 23.5 °C, 26 Mar 2005, CL 7366; 2 females, roadside waterfall and rocky stream 0.4 km N. of Waikumbakumba on Tavua–Nadarivatu road, 220 m [720 ft], 17°32'28.9"S, 177°56'20.6"E, water temp. 26 °C, 3 Feb 2005, CL 7368, D.A. Polhemus; 3 males, 1 female, Evans Range, small stream and cascade 13.5 km E. of Nagado on Vaturu Dam road, 415 m [1360 ft], 17°45'44.2"S, 177°39'59.1"E, water temp. 25 °C, 27 Mar 2005, CL 7405; 23 males, 14 females, headwaters of Veisari River, W. of Suva, first streamlet on road to Waivudawa, 260 m [850 ft], 18°04'27.5"S, 178°21'50.3"E, water temp. 24 °C, 23 Jan 2005, CL 7356, D. A. Polhemus; 16 males, 6 females, Nadrau Plateau, upper Wainikasau Creek above hydro intake, 9.5 km SW of Monasavu Dam hydro plant HQ, 750 m [2460 ft], 17°49'32.0"S, 178°01'41.3"E, water temp. 18 °C, 11 Aug 2005, 1030–1230 hrs, CL 7348; 7 males, 2 females, Nadrau Plateau, upper Nabilabila Creek and tributaries above hydro intake, 7.5 km SW of Monasavu Dam hydro plant HQ, 760 m [2490 ft], 17°48'33.7"S, 178°02'28.4"E, water temp. 19.5 °C, 11 Aug 2005, 13:30–15:45 hrs., CL 7364, ; 20 males, 12 females, Nadala Creek, 3.2 km SE of Nadarivatu, 700 m [2295 ft], 17°35'38.3"S, 177°58'00.8"E, water temp. 19.5 °C, 10 Aug 2005, 1400–1445 hrs., CL 7437; 4 males, 4 females, Governor's Pool, on slopes of Mt. Lomalagi, nr. Nadarivatu, 790 m [2590 ft], 17°33'43.9"S, 177°57'49.8"E, water temp. 19 °C, 10 Aug 2005, 1200–1330 hrs, CL 7436; 11 males, 3 females, trib. to Waidina River

at Namosi Road, 3 km S. of Narukunmbua, 355 m [1165 ft], 18°03'25.0"S, 178°09'25.4"E, water temp. 20.5 °C, 9 Aug 2005, 1200–1300 hrs, CL 7433; 2 males, 2 females, Mount Evans Range, trib. to rocky river at Abaca, 450 m [1475 m.], 17°40'02.0"S, 177°32'06.5"E, water temp. 24 °C, 26 Mar 2005, CL 7403 (deposited in FNIC, USNM, BPBM, JTPC).

Ecological Notes. Similar to *S. gilloglyi* discussed previously, *S. inoana* occurs in association with seep rhoecrenes and waterfall mist zones (Fig. 8) in the uplands of Viti Levu. *Saldula inoana* has been recorded from most major mountain areas of Viti Levu, including the Nadrau and Rairaimatuku plateaus, the Koroyanitu Range, and the Namosi Highlands, at elevations ranging from 220–790 m.

ACKNOWLEDGMENTS

We thank David Olson and Moala Tokota'a for logistical assistance and field support on Viti Levu, and Alan Gillogly for the donation of specimens long ago. This project was supported by grant DEB-0425970 from the National Science Foundation, and the Schlinger Foundation. The Fiji Government (Ministries of Environment and Forestry) and the Wildlife Conservation Society, Suva Office are thanked for their support of the project. In addition, JTP completed this research as an adjunct faculty member in the Bioagricultural Sciences Department at Colorado State University.

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The *Amblypsilopus pulvillatus* Species Group (Diptera: Dolichopodidae: Sciapodinae), a Radiation in the Western Pacific[1]

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Abstract. The *Amblypsilopus pulvillatus* species group (Diptera: Dolichopodidae: Sciapodinae) comprises nine species from western Pacific archipelagoes comprising Fiji: *A. pulvillatus* (Bezzi), *A. volivoli* n. sp., *A. bezzii* **n. sp.**, *A. waiseai* **n. sp.**, & *A. maulevu* **n. sp.**; Vanuatu: *A. ambrym* **n. sp.** and A. *lenakel* ***n*. sp.**; Tonga: *A. eupulvillatus* (Parent); and Samoa: *A. upolu* **n. sp.** All species have the male secondary sexual character of a modified tarsus I, with the anterior claw enlarged, the posterior claw reduced or absent, and the pulvilli usually enlarged. As well, the phallus is unusually broad and both sexes have a white basoventrally seta on femur I. A species cladogram is presented. The *pulvillatus* group evolved in Fiji and Vanuatu, probably when the two ancestral archipelagoes were almost adjacent as part of the Vitiaz Arc, some 6–8 Mya. Species in *pulvillatus* group now show a vicariant distribution, a result of the breakup and rifting of the Vitiaz Arc, although the Samoan and Tongan species may be the result of dispersal.

INTRODUCTION

In 1928, both Parent and Bezzi described a new species of Sciapodinae from Tonga and Fiji, respectively. Each species had the leg I pulvilli and one claw greatly enlarged, a tarsal modification so impressive that they independently gave their species similar names, *Condylostylus eupulvillatus* Parent and *Condylostylus pulvillatus* Bezzi. Although the two species have since been referred to *Amblypsilopus*, they remain valid and are part of a larger group of nine species that occurs from Vanuatu to Samoa. This western Pacific radiation is described below. This paper is the third in a series on the Sciapodinae of Fiji and the western Pacific.

MATERIALS AND METHODS

This study is based on material from the following collections: Natural History Museum, London (BMNH), Bishop Museum, Honolulu (BPBM), Fiji National Insect Collection (FNIC) (currently held in trust at the Bishop Museum), and the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), and Zoologische Institut und Zoologisches Museum von Hamburg (ZMUH).

The left lateral view of the hypopygium or male genital capsule is illustrated for all species. 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 Bickel (1994). The CuAx ratio is the length of the m-

1. Contribution No. 2006-041 to the NSF-Fiji Arthropod Survey.

cu crossvein/ distal section CuA. 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 should be regarded as representative ratios and not measurements. The ratios for each leg are given in the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5. The following abbreviations and terms are used: FSSC = Female secondary sexual character(s), non-genitalic characters found only on the female body; MSSC = Male secondary sexual character(s), non-genitalic characters found only on the male body; I, II, III = pro- , meso-, metathoracic legs, respectively; C = coxa; T = tibia; F = femur; ac = acrostichal setae; ad = anterodorsal; av = anteroventral; dc = dorsocentral setae; dv = dorsoventral; pd = posterodorsal; pv = posteroventral; t = tarsus; t_{1-5} = tarsomeres 1 to 5. On the figures, arrows are used to indicate diagnostic features.

SYSTEMATICS

Genus *AMBLYPSILOPUS* Bigot

Amblypsilopus is a large and complex genus that acts as a "holding taxon" for many small and often delicate Sciapodinae found primarily in the world's moist tropical zone, with extensions into temperate regions. The Australian fauna comprises 84 described species and is the best documented; and many Australian species groups, such as the *triscuticatus* group, are widespread in the Melanesian archipelago. Although *Amblypsilopus* itself is poorly defined and probably polyphyletic, good monophyletic species groups based on male genitalic and secondary sexual characters can be used for systematic study (discussion in Bickel 1994). The *pulvillatus* group is one of these.

The *Amblypsilopus pulvillatus* group

Diagnosis. Vertical seta on male lateral frons curved, almost bent and relatively short, and stronger in females; upper face of males slightly bulging, and flat in females; femur I in both sexes with white ventral seta in basal quarter; leg I male tarsomere 5 with anterior claw enlarged, and pulvilli usually enlarged, and posterior claw reduced in size/ absent; phallus broad near dorsal angle, more than three times width of phallus at apex.

Remarks. The *pulvillatus* group comprises the following western Pacific species numbers: Fiji (5 spp.), Vanuatu (2 spp.), Tonga (1 sp.) and Samoa (1 sp.). I have not seen specimens of this group from the rather well-collected New Caledonia (Bickel 2002) or the much more poorly known Solomon Islands.

All species were collected in lowlands below 100 m, in habitats that include coastal forest on stabilized dunes, lowland rainforest, and plantations. Three species, *A. pulvillatus*, *A. bezzii,* and *A. volivoli* are sympatric at Sigatoka Sand Dunes, and the first two species are often abundant in Malaise trap catches from this site.

KEY TO MALES OF THE *AMBLYPSILOPUS PULVILLATUS* SPECIES GROUP

1. It_5 with pulvilli not enlarged, subequal to those of legs II & III; anterior tarsal claw distinctly enlarged, and posterior claw short; hypopygium (Fig. 1a) with L-shaped cercus; coxa I, all femora and tibiae yellow; halter yellow (Vanuatu) .. .. **ambrym** Bickel, **n. sp.**

–. It_5 with enlarged pulvilli, distinctly larger than pulvilli of legs II and III; other features various 2

2. It_5 with pulvilli slightly enlarged, and with anterior claw enlarged and curved around tarsus (Figs 3a, b); coxa I and remainder of legs mostly yellow; cerci elongate and narrow (Figs 1b, c) 3
–. It_5 with pulvilli at least half length of tarsomere, anterior claw variously enlarged, but not curving around tarsus; leg color and cercus various 4

3. Hypopygium (Fig. 1b): surstylus with strong subapical seta; cercus narrow, digitiform, with rather sparse setae; lateral scutellar setae absent. (Fiji) .... **maulevu** Bickel, **n**. **sp**.
–. Hypopygium (Fig. 1c): surstylus with short setae; cercus with distinct basal mound; lateral scutellar setae reduced to short weak hairs (Samoa) ..... **upolu** Bickel, **n**. **sp**.

4. Coxa I, all trochanters, femora, tibiae mostly yellow 5
–. Coxa I, all trochanters, and at least part of some femora dark brown / black 7

5. Leg I basitarsus with some curved ventral setae; It_5 (Fig. 1e) with anterior claw enlarged but shorter than pulvilli, cercus (Fig. 1d) expanded basally and tapering distally, and with abundant strong ventral setae (Fiji) ..... **waiseai** Bickel, **n**. **sp**.
–. Leg I basitarsus bare of setae; It_5 with anterior claw enlarged and as long as pulvilli; cercus with distinct basoventral projection 6

6. TI with posterior row of fine slanted yellow hairs along entire length; It_5 (Fig. 3d) with pulvilli enlarged, as long as half tarsomere length; hypopygium (Fig. 2e) cercus with short subtriangular jection, and with ventral lobate projection near base (Vanuatu) ..... **lenakel** Bickel, **n**. **sp**.
–. TI bare of major setae, and without posterior row of hairs; It_5 (Fig. 3e) with pulvilli enlarged, as long as tarsomere, hypopygium (Fig. 2d); cercus elongate, and with ventral setose thumblike projection at 1/3 (Fiji) ..... **bezzii** Bickel, **n**. **sp**.

7. Femur I dark brown to 2/5; distal FI, and all FII and FIII yellow; TI with short dorsal at 1/6, and without fine posterior hairs; It_5 (Fig. 3c) with anterior claw greatly enlarged and curved, and with distinct tooth midway along inner surface; hypopygium (Fig. 2c); cercus elongate and setose, with distinct ventral digitiform projection at 1/3; palp yellowish with black setae (Fiji) ..... **volivoli** Bickel, **n**.**sp**.
–. Femora I and II dark brown to 1/2, and FIII dark brown; TI with major setae, but with posterior row of fine hairs; It_5 with inner surface of enlarged claw smooth; hypopygium various; palp black with black setae 8

8. Hypopygium (Fig. 2a) cercus with large clavate ventral projection bearing strong setae, and with two distal digitiform arms; surstylus with strong subapical seta; It_1 covered with short, almost erect setae; It_5 (Fig. 3f) with anterior claw enlarged and posterior claw reduced to short stub (Tonga) ..... **eupulvillatus** Parent
–. Hypopygium (Fig. 2b) with clavate cercus, and with only stub of distal digitiform arm; surstylus with only short setae; It_1 covered with short normal vestiture; It_5 (Fig. 3g) with anterior claw enlarged, posterior claw not evident (Fiji) ... **pulvillatus** (Bezzi)

SPECIES DESCRIPTIONS

All species have the following characters, which will not be repeated in individual descriptions unless needing clarification.

Head: vertex and frons shining metallic blue-green; strong postvertical seta and diverging ocellar setae present; vertex well excavated; vertical seta on male lateral frons curved, almost bent and relatively short, and stronger in females; upper face of males slightly bulging, and flat in females; face and clypeus metallic blue green with some grey pruinosity; slightly wider in females than males; clypeus not strongly narrowed; palp usually yellow with black setae; proboscis yellow; antenna brownish to black; scape short; pedicel with short setae; first flagellomere short, subtriangular; arista dorsal, and as long as head height, and simple; ventral postcranium with white setae.

Thorax: metallic green with bronze reflections; setae black; 3 irregular pairs of long ac; males with 2 strong posterior dc and 2 or 3 weak hair like dc anteriad (MSSC), females with 4 strong dc; lateral scutellar setae reduced to short weak hairs (less than one fifth length of medians), or absent.

Legs: femur I with white ventral seta in basal quarter; leg I male tarsomere 5 with anterior claw enlarged; male legs II & III and all female legs with short subequal paired claws.

Abdomen: terga 1–6 metallic green bronze, with matt brown areas over tergal overlap, with black marginal setae and short black vestiture; hypandrial arm and phallus both elongate, with phallus extending slightly beyond apex of arm; phallus broad near dorsal angle; epandrial lobe short with strong apical and subapical bristles.

Amblypsilopus ambrym Bickel **n. sp.**

(Fig. 1a)

Description. **Male**: length 4.2–4.4 mm; wing: 4.3–4.4 × 1.2 mm.

Head: antenna brownish.

Thorax: lateral scutellar setae absent.

Legs: CI, all trochanters, femora, tibiae yellow; tarsi I and II yellow, although distal tarsomeres infuscated; tarsus III brownish; coxae II and III brown; CI and CII with white anterior hairs and a few stronger distal setae; CIII with 2 white lateral setae; I: 5.0; 5.6; 5.0/ 0.8/ 0.5/ 0.4/ 0.5; FI with 3–4 white ventral setae in basal third, with stronger and longer seta at 1/5; TI bare of major setae; It_1 very long, and slightly shorter than TI, and with pale curved ventral seta at 4/5 (MSSC); It_5 with pulvilli normal, not enlarged, and anterior claw slightly enlarged, as long as pulvilli, with posterior claw short (MSSC); II: 5.0; 6.5; 5.0/ 1.5/ 1.0/ 0.5/ 0.4; FII with some short white ventral hairs; TII with short ad only at 1/6, and with subapical ad and av setae; III: 6.2; 9.0; 4.3/ 1.8/ 1.3/ 0.7/ 0.4; FIII with very short white ventral hairs; TIII bare of major setae, but with some short dorsal and anterior setae.

Wing: hyaline; dm-cu slight flexed, and joining vein M and $CuAx_1$ at angle; CuAx ratio 2.1; lower calypter yellow with fan of yellowish setae; halter yellow with pale yellow club.

Abdomen: hypopygium (Fig. 1a) brown with brownish cercus; epandrium subrectangular with strong and weaker ventral setae; surstylus lobate with setae as figured; cercus L-shaped, with short distal projection at bend, and setose, especially medially and apically.

Female: similar to male, except lack MSSC, and as noted: vertex and frons metallic blue-green, with some grey pruinosity; vertical seta strong and curved; face flat; antenna brownish, not distinctly black; 3 pairs of long ac; 4 strong dc present; leg coloration and podomere rations similar; FI also with only short ventral hairs and single strong longer white av seta at 1/5; TI with ad seta at 1/5, and without posterior row of fine hairs; It_1 without curved seta; It_5 with 2 short subequal claws; TIII with ad seta at 1/6.

Types. Holotype ♂ (BPBM 16,670), paratypes 2♂, 2♀, VANUATU: **Malakula**: Lakatoro, 29.ix.1967, Malaise trap, J. & M. Sedlacek; paratypes, 2♂ same data but 22–30.ix.1967; 1♂, same but ii.1973 (BPBM). paratypes 1♂,1♀, Atchin Island, vii.1929, L.E. Cheesman; 1♂, Malua Bay, vii.1929, L.E. Cheesman (BMNH). Holotype in BPBM.

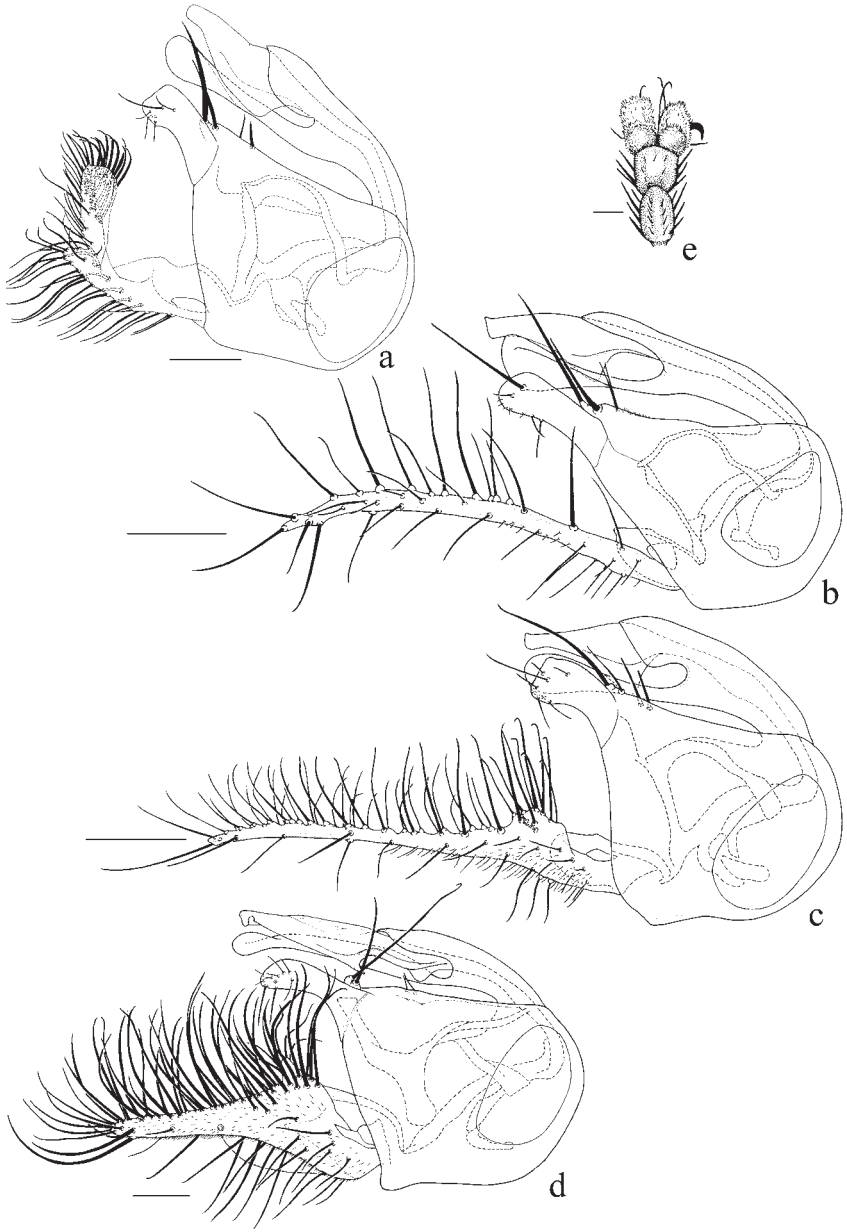

Figure 1. Male hypopygium, left lateral: **a**, *Amblypsilopus ambrym*. **b**, *A. maulevu*. **c**, *A. upolu*. **d**, *A. waiseai.* **e**, male tarsomeres 3–5, leg I, *A. waiseai*. Scale line = 0.1 mm.

Additional Material. VANUATU: **Ambrym**: 2♂,1♀, (no locale), 22.viii–4.ix.1967, Sedlacek (BPBM). **Pentacost**: 1♂, Batnavni, 0–100 m, 3.ix.1979, on *Acacia simplex,* Gagné (BPBM).

Remarks. *Amblypsilopus ambrym* is known from the Vanuatu islands of Ambrym, Malakula, and Pentacost.

Etymology. The specific epithet *ambrym* is a place name of indigenous origin and is treated here as a noun in apposition.

Amblypsilopus waiseai Bickel **n. sp.**
(Fig. 1d, e)

Description. **Male**: length 5.2 mm; wing: 4.7 × 1.4 mm.

Head: antenna black.

Thorax: lateral scutellar setae absent.

Legs: (leg II absent on specimen) CI, all trochanters, femora and tibiae I and III yellow; tarsi I yellow, although distal tarsomeres infuscated; tarsus III brownish; coxae II and III brown; CI and CII with white anterior hairs and a few stronger distal setae; CIII with group of 5 white lateral setae; I: 6.0; 5.3; 4.3/ 1.2/ 0.8/ 0.4/ 0.4; FI with 2 long subequal white ventral setae, at 1/4 and 1/3; TI with short black dorsal seta at 1/5; It_1 with black curved ventral setae at 1/5 and 1/3, and with 3 shorter curved ventral distad (MSSC); It_5 (Fig. 1e) with pulvilli much larger than those on leg III, and anterior claw enlarged, with posterior claw short (MSSC); leg II missing; III: 7.5; 11.5; 5.8/ 2.5/ 1.6/ 0.8/ 0.4; FIII ventrally bare; TIII with ad seta at 1/6, and some short dorsal and anterior setae.

Wing: hyaline; dm-cu slightly curved, and joining vein M and $CuAx_1$ at angle; CuAx ratio 2.5; lower calypter yellow with fan of yellowish setae; halter yellow with pale yellow club.

Abdomen: hypopygium (Fig. 1d) dark brown with dark brown cercus; epandrium subrectangular with 2 weak ventral setae; phallus not as wide as in other species; surstylus lobate with setae as figured; cercus expanded basally and tapering distally, with abundant strong ventral setae.

Female: unknown.

Types. Holotype ♂, FIJI: **Viti Levu**: 2 km SE Nabukavesi Village (Ocean Pacific Resort) 18.172°S 178.258°E, 40 m, coastal lowland moist forest, 2–11.xi.2005, I. Buaserau (FBA 511521). Holotype to be deposited in FNIC.

Remarks. *Amblypsilopus waiseai* is known from the coastal forest on the southern margin of Viti Levu. Male leg I has the anterior claw is distinctly enlarged, and the pulvilli also enlarged. The male phallus in this species is not as broad as in other species of the group.

Etymology. *Amblypsilopus waiseai* is named in honor of Waisea Naisilisili, who lives near the collection site and who assisted with survey work at the Wildlife Conservation Society, Suva.

Amblypsilopus maulevu Bickel **n. sp.**
(Figs. 1b, 3a, b)

Description. **Male**: length 3.3 mm; wing: 2.7 × 0.9 mm.

Head: antenna black.

Thorax: lateral scutellar setae absent.

Legs: CI brown at very base, but otherwise yellow; coxae and trochanters II and III dark brown; trochanter I, all femora, tibiae and tarsi yellow, but with distal tarsomeres infuscated; CI and CII with white anterior hairs and a few stronger distal setae; CIII with white lateral seta; I: 3.5; 3.4; 2.8/ 0.7/ 0.4/ 0.3/ 0.5; FI with some white ventral hairs to 1/2, and with single strong longer white av seta at

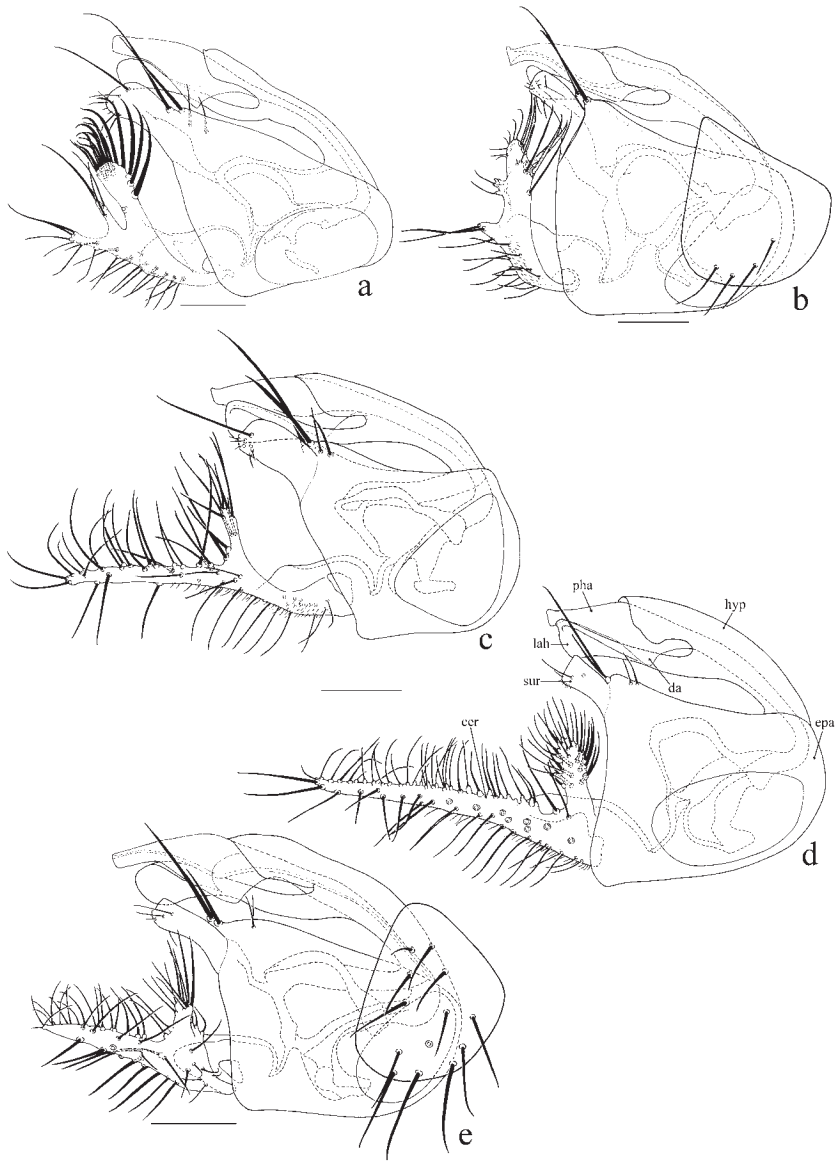

Figure 2. Male hypopygium, left lateral: **a**, *Amblypsilopus eupulvillatus*. **b**, *A. pulvillatus*. **c**, *A. volivoli*. **d**, *A. bezzii*. **e**, *A. lenakel*. Legend: cer, cercus; da, dorsal angle of phallus; epa, epandrium; hyp, hypandrium; lah, lateral arm of hypandrium; pha, phallus; sur, surstylus. Scale line = 0.1 mm.

1/5; TI bare of major setae; $It_{4–5}$ with some long dorsal, anterior and posterior setae (MSSC); It_5 (Fig 3a, b) slightly flattened, with ventral pad-like surface, both pulvilli slightly enlarged, and with anterior claw only greatly enlarged and curved around tarsus, with smooth inner margin, and with short appressed posterior claw (MSSC); II: 4.0; 4.5; 3.8/ 1.2/ 0.8/ 0.3/ 0.3; FII with 4–5 short black ventral setae in distal third; TII with ad seta only at 1/6 and with subapical ad and av setae;
III: 5.0; 6.3; 2.7/ 1.4/ 1.0/ 0.5/ 0.3; FIII with very short white ventral hairs; TIII with ad at 1/5, with some short dorsal setae spaced along length.

Wing: hyaline; dm-cu slight flexed, and joining vein M and $CuAx_1$ at angle; CuAx ratio 1.9; lower calypter yellow with fan of white setae; halter with brownish stalk and pale yellow club.

Abdomen: hypopygium (Fig. 1b) brown with yellowish cercus; epandrium subtriangular with 2 strong adjacent ventral setae; surstylus lobate with strong subapical seta; cercus narrow, digitiform, with rather sparse setae as figured.

Female: unknown.

Types. Holotype ♂ (BPBM 16,671), paratype ♂, FIJI: **Vanua Balavu**: Maulevu, 0–10 m, 14.ii.1970, N.L.H. Krauss (BPBM). Holotype in BPBM.

Remarks. *Amblypsilopus maulevu* is known only from Vanua Balavu, the largest island in the northern Lau group, Fiji.

Etymology. The specific epithet *maulevu* is a place name of indigenous origin and is treated here as a noun in apposition.

Amblypsilopus upolu Bickel, **n**. **sp**.
(Fig. 1c)

Description. **Male**: length 3.4 mm; wing: 3.0 × 1.2 mm.

Head: antenna black.

Thorax: lateral scutellar setae reduced to short weak hairs.

Legs: CI with very base brown/ metallic green, but otherwise yellow; CII and CIII dark brown; trochanters, femora and remainder of legs yellow although distalmost tarsomeres infuscated; CI and CII with white anterior hairs and a few stronger distal setae; CIII with white lateral seta; all femora with weak white ventral hairs; I: 4.2; 3.8; 3.0/ 0.7/ 0.4/ 0.3/ 0.5; FI with white ventral hairs, and with strong ventral at 1/6; TI bare of major setae, but with some short subapical setae; $It_{2–5}$ with some dorsal, anterior and posterior setae (MSSC); It_5 slightly flattened, with ventral pad-like surface, both pulvilli slightly enlarged, and with anterior claw only greatly enlarged and curved around tarsus, and with short posterior claw (MSSC); II: 4.6; 5.0; 4.0/ 1.3/ 0.8/ 0.3/ 0.3; TII with ad seta at 1/6, and short pd setae at 1/3, and 2/5, and with strong subapical ad and av setae; III: 5.3; 7.5; 3.1/ 1.7/ 1.2/ 0.6/ 0.4; TIII with strong dorsal at 1/8, with some short dorsal setae spaced along length.

Wing: hyaline; CuAx ratio 1.85; lower calypter brownish with fan of black setae; halter yellow.

Abdomen: hypopygium (Fig. 1c) brown with yellowish cercus; epandrium subrectangular with 2 strong ventral setae; surstylus lobate with setae as figured; cercus narrow, digitiform and setose, and with distinct basal mound with cluster of setae as figured.

Female: unknown.

Types. Holotype ♂ (16,672), SAMOA: **Upolu**: Apia, 16.x.1968, B. Hocking (ex collection C.E.Dyte). Holotype in BPBM.

Remarks. *Amblypsilopus upolu* is known only from the Samoan island of Upolu.

Etymology. The specific epithet *upolu* is a place name of indigenous origin and is treated here as a noun in apposition.

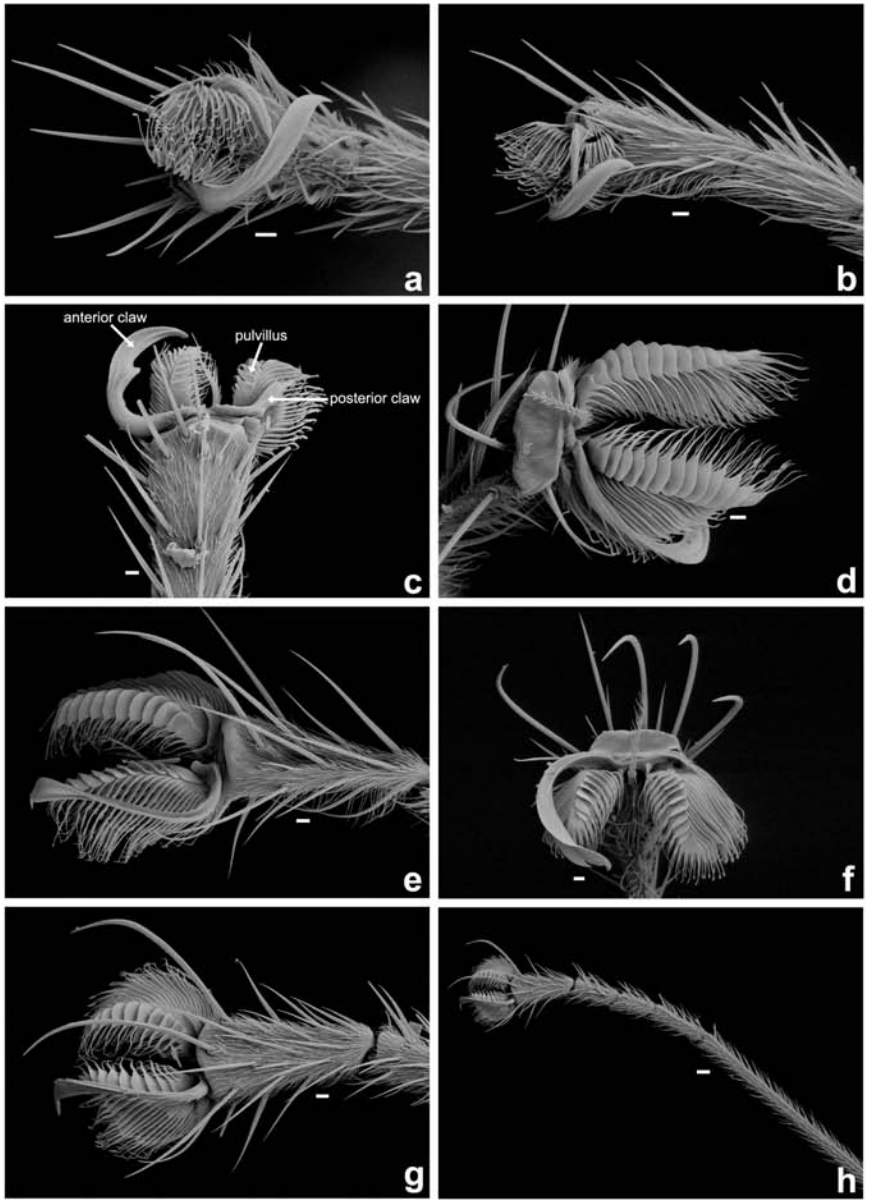

Figure 3. SEMs of male tarsomere 5, leg I: **a**, *Amblypsilopus maulevu*, ventral; **b**. same but posterior. **c**, *A. volivoli,* dorsal. **d**, *A. lenakel,* dorsal. **e**, *A. bezzii*, dorsal. **f**, *A. eupulvillatus*, basal. **g**, *A. pulvillatus,* dorsal. SEM of male tarsus I: **h**, *A. pulvillatus,* dorsal. Scale line = 10 µm.

Amblypsilopus volivoli Bickel **n. sp.**
(Figs. 2c, 3c)

Description. **Male**: length 4.4 –4.5 mm; wing: 4.0 × 1.3 mm.

Head: antenna black.

Thorax: lateral scutellar setae absent.

Legs: coxae and trochanters black with dusting of grey pruinosity; FI black to 2/5; distal FI, all FII and FIII, basal TIII, and tarsi I and II yellow; distal TIII and tarsus III dark brown; CI and CII with white anterior hairs and a few stronger distal setae; CIII with white lateral seta and some shorter white hairs; I: 3.8; 3.6; 3.4/ 0.6/ 0.3/ 0.2/ 0.6; FI with some white ventral hairs to 1/2, and with strong longer white av seta at 1/4; TI with short dorsal at 1/6, and short subapical setae; $It_{2–5}$ with some dorsal, anterior and posterior setae (MSSC); It_5 (Fig. 3c) slightly flattened with fine ventral hair s; both pulvilli enlarged, but less than half length of tarsomere 5, with distinctive plate like structure; anterior claw only greatly enlarged and curved, and with distinct tooth midway along inner surface, and posterior claw reduced to stub (MSSC); II: 4.5; 5.7; 5.5/ 1.3/ 1.0/ 0.3/ 0.3; FII with some short white ventral hairs; TII with ad-pd setal pair at 1/6 and short pd seta at 3/5, and with strong subapical ad and av setae; III: 5.0; 8.5; 4.3/ 1.7/ 1.2/ 0.7/ 0.4; FIII with white ventral hairs in basal half; TIII with strong ad seta at 1/8, with some short dorsal setae spaced along length.

Wing: hyaline; dm-cu slight flexed, and joining vein M and $CuAx_1$ at angle; CuAx ratio 2.0; lower calypter brownish with fan of black setae; halter with brownish stalk and pale yellow club.

Abdomen: hypopygium (Fig. 2c) brown with brownish cercus; epandrium subrectangular with 2 ventral setae near epandrial lobe; surstylus lobate with strong subapical seta; cercus elongate and setose, and with distinct ventral digitiform projection at 1/3, with setae as figured.

Female: unknown.

Types. Holotype ♂, FIJI: **Viti Levu**: Sigatoka Prov., Sigatoka Sand Dunes NP, Malaise, coastal forest, 55 m, 1–13.xii.2002, T. Ratawa (FBA 025514); paratypes, 1♂, same but 12.ii–12.iii.2003 (FBA 024557); 1♂, same but 11.vi–9.vii.2003 (FBA 030974); 1♂, same but 31.i–12.ii.2003 (FBA 024954); 1♂, same but 0.8 km SSW of Volivoli Village, 25 m, 27.viii–13.ix.2004, G. Niusoria (FBA 503336) (BPBM). Holotype will be deposited in FNIC.

Additional Material. FIJI: **Taveuni**: 3♂,1♀, Cakaudrove Prov., 3.2 km NW Lavena Village, Mt. Koronibuanibua, 235 m, 16.855°S 179.892°W, 5–17.vi.2004, Malaise trap, lowland rainforest Schlinger & Tokota'a (FBA 123540, 123550) (BPBM).

Remarks. *Amblypsilopus volivoli* is known from coastal dune forest in southern Viti Levu, and from lowland rainforest on Taveuni. On the Sigatoka Sand Dunes it is sympatric with two other species in the *pulvillatus* group, *A. bezzii* and *A. pulvillatus* itself.

Etymology. The specific epithet *volivoli* is a place name of indigenous origin and a noun in apposition.

Amblypsilopus bezzii Bickel **n. sp.**
(Figs. 2d, 3e)

Description. **Male**: length 3.2–3.4 mm; wing: 3.7 × 1.1 mm.

Head: antenna black.

Thorax: scutellar setae reduced to short weak hairs.

Legs: CI with very base brown/ metallic green, but otherwise yellow; CII and CIII dark brown; trochanters, femora and remainder of legs yellow although distalmost tarsomeres infuscated; CI and CII with white anterior hairs and some stronger white distal setae; CIII with white lateral seta, subtended by white hairs; I: 4.4; 4.3; 3.2/ 0.6/ 0.4/ 0.4/ 0.7; FI with short 5–6 short white ventral hairs to 1/2, and with single strong longer white av seta at 1/6; TI bare of major setae, and without posterior row of fine hairs; $It_{1–4}$ with short hairs; It_5 (Fig. 3e) with some long dorsal, anterior and posteri-

or setae; $It_{4–5}$ slightly flattened with fine ventral hair; pulvilli enlarged, as long as It_5, and with distinctive plate like structure; anterior claw only enlarged and longer than pulvilli, and posterior claw reduced to stub (MSSC); II: 4.5; 5.7; 4.6/ 1.3/ 1.0/ 0.4/ 0.3; FII with some white ventral hairs; TII with ad seta at 1/6, and with strong subapical ad and av setae; III: 5.6; 8.0; 3.6/ 15/ 1.1/ 0.6/ 0.4; TIII bare of major setae but with some short dorsal setae spaced along length.

Wing: hyaline; dm-cu slight flexed, and joining vein M and $CuAx_1$ at angle; CuAx ratio 2.1; lower calypter yellow with fan of yellowish setae; halter with yellowish stalk and pale yellow club.

Abdomen: hypopygium (Fig. 2d) brown with brownish cercus; epandrium subrectangular with 2 subequal ventral setae; surstylus lobate with short setae; cercus elongate and setose, and with setose with ventral thumblike projection at 1/3.

Female: similar to male, except lack MSSC, and as noted: antenna brownish, not distinctly black; leg coloration and podomere rations similar; FI also with single strong longer white av seta at 1/6; TI with ad seta at 1/5, and without posterior row of fine hairs; $It_{1–4}$ with normal vestiture; It_5 unmodified; lower calypter also with fan of yellowish setae; TIII with black ad seta at 1/6.

Types. Holotype ♂, paratypes, 4♂, FIJI: **Viti Levu**: Sigatoka Sand Dunes NP, Malaise, coastal forest, 55 m, 22.xii.2002–3.i.2003, T. Ratawa (holotype, FBA 045658, paratypes FBA 045654–045657); paratypes: 12♂,1♀, same but 14.xii–22.xii.2002 (FBA 001353, 0016004); 2♂, same but 24.xi–15.xii2003 (FBA 062508– 062509), 1♂,1♀ same but 12.ii–12.iii.2003 (FBA 024558–024559); 1♂, same but 6–17.iv.2004 (FBA 063833) (BPBM). Holotype will be deposited in FNIC.

Additional Material. FIJI: **Ovalau**: 1♂, Levuka, 0–100 m, xi.1975, N.L.H. Krauss; 1♂, 6♀, Vatukalo, 0–20 m, 30.xii.1969, Krauss. **Taveuni**: 1♂, Waiyevo, 0–100 m, i.1972, Krauss (BPBM).

Remarks. *Amblypsilopus bezzii* is known from lowland sites along the southern coast of Viti Levu, Ovalau, and Taveuni.

Etymology. The specific epithet *bezzii* is a patronym in honor of the Italian dipterist Mario Bezzi for his 1928 monograph *Diptera Brachycera and Athericera of the Fiji Islands*.

Amblypsilopus lenakel Bickel **n. sp.**
(Figs. 2e, 3d)

Description. **Male**: length 3.9–4.0 mm (2.7 mm from Epi); wing: 3.6 × 1.3 mm (2.9 × 0.8 mm from Epi).

Head: antenna black.

Thorax: lateral scutellar setae as short weak hairs.

Legs: CI, all trochanters, femora, tibiae and tarsi yellow, although distal tarsomeres infuscated; coxae II and III dark brown; CI and CII with white anterior hairs and a few stronger distal setae; CIII with white lateral seta; I: 4.7; 4.3; 3.3/ 0.6/ 0.4/ 0.3/ 0.5; FI with short 5–6 short white ventral hairs to 1/2, and with single strong longer white av seta at 1/8; TI bare of major setae, but with posterior row of fine slanted yellow hairs along entire length (MSSC); $It_{1–4}$ with short erect hairs; It_5 (Fig. 3d) with some long dorsal, anterior and posterior setae, and slightly flattened, but without ventral pile; pulvilli enlarged, slightly longer than half tarsomere length, and with distinctive plate like structure; anterior claw only greatly enlarged and curved, not toothed, and posterior claw reduced to stub (MSSC); II: 4.7; 5.8; 4.7/ 1.3/ 1.1/ 0.3/ 0.3; FII with some short white ventral hairs; TII with offset ad–pd setal pair at 1/6, short pd and short anterior at 3/5 and with subapical ad and av setae; III: 6.4; 8.3; 3.5/ 1.8/ 1.0/ 0.7/ 0.4; FIII with very short white ventral hairs; TIII with ad at 1/6, with some short dorsal setae spaced along length.

Wing: hyaline; dm-cu slight flexed, and joining vein M and $CuAx_1$ at angle; CuAx ratio 2.1; lower calypter yellow with fan of yellowish setae; halter yellow with pale yellow club.

Abdomen: hypopygium (Fig. 2e) brown with brownish cercus; epandrium subrectangular with 2 adjoined ventral setae; surstylus lobate with setae as figured; cercus short subtriangular, and with ventral lobate projection at 1/3, and with setae as figured.

Female: similar to male, except lack MSSC, and as noted: antenna brownish, not distinctly black; leg coloration and podomere rations similar; FI also with short 5–6 short white ventral hairs to 1/2, and with single strong longer white av seta at 1/8; TI with ad seta at 1/5, and without posterior row of fine hairs; It_{1-4} with normal vestiture; It_5 unmodified; lower calypter also with fan of yellowish setae.

Types. Holotype ♂ (16,673), paratypes 2♂,2♀, VANUATU: **Tanna**: Lenakel, 0–200 m, i.1981, N.L.H. Krauss (BPBM Acc. # 1981.131). paratypes: 2♂,1♀, same but ii.1981; 1♂, 3♀, same but iii.1980; 2♂, same but xi.1978, 1♂,3♀, same but iii.1970, 1♂, same but i.1973 (BPBM).

Additional Material. VANUATU: **Ambrym**: 0–100 m, xii.1984, Krauss (BPBM); Olal Catholic Mission, 2.i.1989, Lachlan (AMS). **Anatom**: (♀ only), Anelgaohat, 0–200 m, i.1986, Krauss (BPBM). **Efate**: Port Vila, ii.1959, Krauss. **Epi**: Lowekewou, 0–100 m, 31.viii.1979, Gagné, et al. (BPBM); **Erromango**: Dillon Bay, 0–100 m, ii.1981, xii.1985, Krauss (BPBM); **Tanna**: White Grass, 0–100 m, xii.1985, Krauss; Port Resolution, 0–100 m, 6.iii.1970, Krauss; Yanema, 6.iii.1970, Krauss; 2 km S of Ipeukeul, 300 m, 23.viii.1979, Gagné (BPBM).

Remarks. *Amblypsilopus lenakel* is known from the Vanuatu islands of Tanna, Ambrym, Epi, Erromango, and Efate. The specimens from Epi are distinctly smaller (wing length 2.9 mm) than those from Tanna (wing length 3.6 mm) but in all other respects are similar.

Etymology. The specific epithet *lenakel* is a place name of indigenous origin and is treated here as a noun in apposition.

Amblypsilopus eupulvillatus (Parent)
(Figs 2a, 3f)

Condylostylus eupulvillatus Parent, 1928: 194.

Description. **Male**: length 4.1 mm; wing: 3.7 × 1.2 mm.

Head: palp brown with black setae; antenna black.

Thorax: lateral scutellar setae as short weak hairs.

Legs: all coxae, trochanters, FI and FII to 5/6 and all FIII dark brown; distal sixth of FI and FII, and all tibiae and tarsi yellowish, with distal tarsomeres infuscated; CI and CII with whitish pruinosity, white anterior hairs and a few stronger white distal setae; CIII with group of white lateral seta; I: 4.6; 4.5; 4.0/ 0.4/ 0.3/ 0.4/ 0.5; FI with some white ventral hairs to 1/2, and with single longer white ventral seta at 1/5; TI bare of major setae, but with pv row of short pale slanted weak setae (MSSC); It_1 covered with short, almost erect setae (MSSC); It_4 with some longer dorsal setae and fine whitish erect ventral pile (MSSC); It_5 (Fig. 3f) with some long dorsal, anterior and posterior setae; It_{4-5} slightly flattened with fine ventral hair; both pulvilli enlarged, as long as tarsomere 5, and with distinctive plate like structure; anterior claw only greatly enlarged and longer than pulvilli, and posterior claw reduced to stub (MSSC); II: 4.7; 6.4; 4.7/ 1.4/ 0.8/ 0.4/ 0.4; FII with some short white ventral hairs; TII with ad seta at 1/6, short pd at 3/5 and short anterior at 2/3, and with subapical ad and av setae; III: 6.2; 8.5; 3.4/ 1.7/ 1.2/ 0.7/ 0.4; FIII with very short white ventral hairs; TIII bare of major setae.

Wing: with faint smoky wash; dm-cu slight flexed, and joining vein M and $CuAx_1$ at angle; CuAx ratio 1.8; lower calypter brown with fan of brown setae; halter brownish.

Abdomen: hypopygium (Fig. 2a) brown with brown cercus; epandrium subtriangular with 2 long ventral setae; surstylus lobate with strong subapical seta; cercus with large clavate ventral projection bearing strong setae, and with two shorter distal digitiform arms, with setae as figured.

Female: similar to male, except lack MSSC, and as noted: coxa I, trochanters, femora, tibiae, and basal tarsomeres distinctly yellow; FI also with short 5–6 short white ventral hairs and with longer white seta at 1/6; TI with ad seta at 1/5, and without posterior row of fine hairs; It_{1-4} with normal vestiture; It_5 unmodified; TIII with ad at 1/6; lower calypter also with fan of yellowish setae; halter yellow.

Types. Parent described *Condylostylus eupulvillatus* from Tonga (ZMUH, types de–stroyed). Bickel (1994) designated a male neotype, from Tonga, Tongatapu, Nukualofa, 25.x.1945, D.G. Hall (USNM).

Additional Material. TONGA: **Tongatapu**: 13♂,3♀: Nukualofa, 0–100 m, x.1968, ii, iii, viii, x, xi,1969, ii.1972, Krauss; Haatafu, 0–50 m, 29.x.1969, Krauss; Kolovai, 0–20 m, 29.i.1979, Krauss (BPBM).

Remarks. *Amblypsilopus eupulvillatus* is known only from the low coralline island of Tongatapu, Tonga. All associated females have a distinctly different leg color to males, with coxa I and the remainder of the legs yellow.

Amblypsilopus pulvillatus (Bezzi)

(Figs. 2b, 3g, 3h)

Condylostylus pulvillatus Bezzi, 1928: 68.

Description. **Male**: length 3.3–3.4 mm; wing: 3.6 × 1.3 mm.

Head: palp brown with black setae; antenna black.

Thorax: lateral scutellar setae absent.

Legs: all coxae, trochanters, FI and FII to 4/5 and all FIII dark brown; distal fifth of FI and FII, and TI, TII, and tarsi I and II yellow, with distal tarsomeres infuscated; TIII yellowish, becoming infuscated distally, with all tarsus III dark brown; CI and CII with white anterior hairs and a few stronger distal setae; CIII with white lateral seta and some weaker whitish setae; I: 4.3; 3.8; 3.0/ 0.6/ 0.4/ 0.5/ 0.7; FI with short 5–6 short white ventral hairs to 1/2, and with single longer white av seta at 1/6; TI bare of major setae, but with posterior row of fine slanted yellow hairs along entire length (MSSC); $It_{1–4}$ (Fig. 3h) with short vestiture; $It_{4–5}$ slightly flattened with fine ventral hair; It_5 (Fig. 3g) with some long dorsal, anterior and posterior setae; both pulvilli enlarged, as long as tarsomere 5, and with distinctive plate like structure; anterior claw only greatly enlarged and longer than pulvilli, and posterior claw totally absent (MSSC); II: 4.4; 5.2; 3.6/ 1.4/ 0.8/ 0.3/ 0.3; FII with some short white ventral hairs; TII with offset ad–pd setal pair at 1/6, short anterior at 3/5 and with subapical ad and av setae; III: 5.5; 7.5; 3.3/ 1.6/ 1.0/ 0.6/ 0.4; FIII with very short white ventral hairs; TIII bare of major setae.

Wing: slightly smoky; dm-cu slight flexed, and joining vein M and $CuAx_1$ at angle; CuAx ratio 2.0; lower calypter brown with fan of mostly yellowish setae mixed with some black setae; halter with brownish stalk and with yellow club.

Abdomen: terga 1–6 metallic green bronze, with matt brown areas over tergal overlap, with black marginal setae and short black vestiture; hypopygium (Fig. 2b) brown with brown cercus; epandrium subrectangular without ventral setae; surstylus lobate; cercus clavate and bearing strong setae, and with two short stubs of digitiform arms.

Female: similar to male, except lack MSSC, and as noted: coxa I, trochanters, femora, tibiae, and basal tarsomeres distinctly yellow; FI also with 5–6 short white ventral hairs and with longer white seta at 1/6; TI with ad seta at 1/5, and without posterior row of fine hairs; $It_{1–4}$ with normal vestiture; It_5 unmodified; TIII with ad at 1/6; wing hyaline; lower calypter also with mixed yellowish and black setae; halter entirely pale yellow.

Types. Bezzi described *Condylostylus pulvillatus* from a pair taken at Rarawai, Vanua Levu (BMNH, examined). The figure (Bezzi's fig. 21) associated with the description mistakenly shows tarsus I with two enlarged claws, whereas only one claw (anterior) is enlarged, as noted in Bezzi's text.

Additional Material. FIJI: **Viti Levu**: Sigatoka Prov., Sigatoka Sand Dunes NP, Malaise, coastal forest, 55 m, T. Ratawa & G. Niusoria: 22.ix–8.x.2002 (FBA 001207), 14.xii– 22.xii.2002 (FBA 001374), 1.xii–13.xii.2002 (FBA 025517), 11.vi–9.vii.2003 (FBA 030973), 15.xii.2003–13.iii.2004 (FBA 061088) (BPBM).

Remarks. *Amblypsilopus pulvillatus* is known from the southern coast of Viti Levu near Sigatoka, and near Labasa, Vanua Levu. All associated females have a distinctly different leg color to males, with coxa I and the remainder of the legs yellow.

PHYLOGENETIC ANALYSIS AND BIOGEOGRAPHY OF THE *AMBLYPSILOPUS PULVILLATUS* GROUP

The phylogenetic relationships among species in the *pulvillatus* group is proposed in Fig.4, using the character states discussed below. Most of the characters used in the analysis are the same characters used to define the species, male secondary sexual characters (MSSC) and genitalic structure. These characters are purportedly used for mate recognition, and are often developed *de novo* from other states, which for practical purposes in the absence of a definable sister taxon, are here considered unmodified.

The principal MSSC in the *pulvillatus* group is the modification of the fifth tarsal segment of male leg I, a suite of three sets of characters (4, 5, and 6 below): enlargement of the anterior claw, the enlargement of the pulvilli, and the reduction/ loss of the posterior claw. These characters are not necessarily independent of each other, and multiple character states as listed for some characters do not necessarily represent a progression series.

The characters are presented in the following format: character state: plesiomorphic/ apomorphic.

1. Male leg color: coxa I and all femora yellow / coxa I black and femora at least partially black. Most *Amblypsilopus* species have yellow legs in both sexes. In some cases leg color dimorphism is developed in males and is regarded as a MSSC. All male of species with black coxa I and mostly black femora have conspecific females with coxa I and all femora yellow.
2. Femur I ventral setation: ventrally bare or with scattered pale hairs / with ventral white seta in basal quarter, both sexes. This white basoventral seta on femur I is a diagnostic synapomorphy in both sexes of all *pulvillatus* group species. Other *Amblypsilopus* species I have seen have various ventral setation on femur I.
3. Male tibia I: posteriorly bare / with row of fine hairs along length (MSSC).
4. Male anterior claw on leg I: unmodified, subequal to claws on other legs/ a. slightly enlarged with respect to posterior claw/ b. greatly enlarged, more than half length of tarsomere 5.
5. Male posterior claw on leg I: unmodified, subequal to claws on other legs/ a. reduced in size to short basal plate / b. totally absent.
6. Male pulvilli on leg I: unmodified, subequal to claws on other legs/ a. slightly enlarged with respect to pulvilli on other legs/ b. greatly enlarged, more than half length of tarsomere 5.
7. Male cercus: lobate with projections/ elongate and digitiform, without projections.
8. Male phallus dorsal angle: not more than 2 times as wide as apex of phallus/ wide, more than 3 times as wide as apex of phallus (e.g. Fig. 2d). The phallus on almost all Sciapodinae has a distinct dorsal angular projection just beyond mid length which usually not greatly produced, whereas in all members of the *pulvillatus* group except *A. waiseai* it is remarkably wide, and I regard this as derived.

The *pulvillatus* group is defined by strong apomorphy 2, the white basoventral seta on FI, and 4a, the enlargement of the anterior claw. The sister taxon to this group is probably some undescribed assemblage of species from Melanesia, as the genus is rich in the Papuan– Melanesian region. *Ambylpsilopus waiseai* from Viti Levu, has an unmodified phallus, whereas all other members of the group have a broad phallus, and has only slight modification of the male tarsus I. *A. ambrym* from Vanuatu has a broad phallus but also

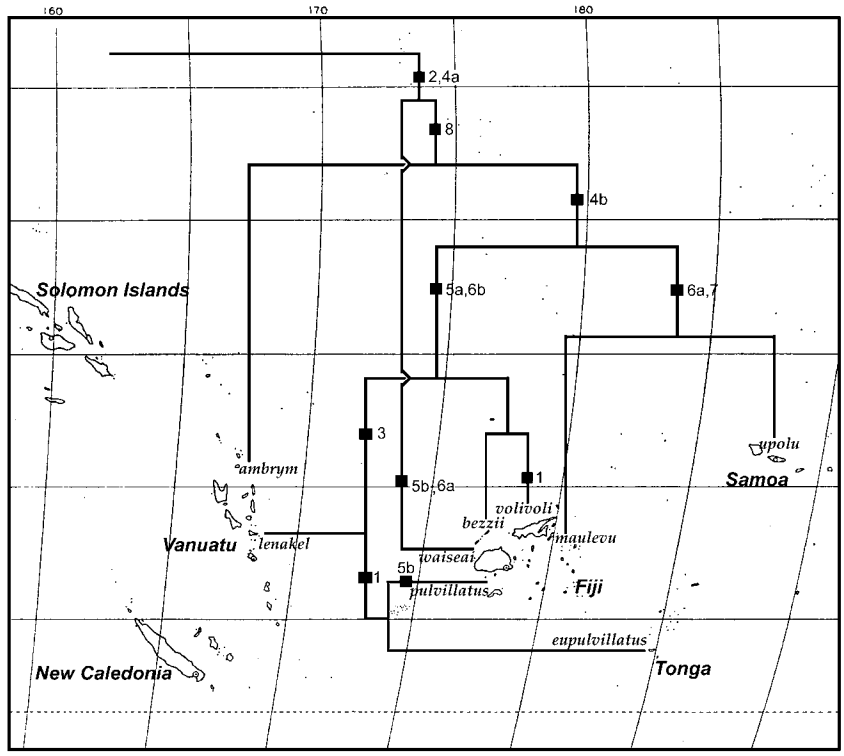

Figure 4. Cladogram and distribution map of the *Amblypsilopus pulvillatus* group. Black squares indicate apomorphies and numbers refer to characters discussed in the text.

has only slight modification of the male tarsus I. A sister pair from single sites on Samoa, *A. upolu,* and the northern Lau island of Vanua Balavu, *A. maulevu,* have similar digitiform cerci and leg I modifications. This pair suggests possible dispersal from a common ancestor. The main *pulvillatus* group assemblage all have the male tarsus I strongly modified. Apomorphy 1, the black male coxa I and femora, is shown as appearing twice, in *A. volivoli* and in the pair *A. eupulvillatus* + *A pulvillatus*, as I regard character 3, the posterior row of hairs on male tibia I to be a more robust character that unites the clade *A. lenakel* + *A. eupulvillatus* + *A. pulvillatus.*

The distribution of *pulvillatus* group species (Fig. 4) suggests a primary Fiji–Vanuatu radiation. The two most plesiomorphic species are *Amblypsilopus ambrym* from Vanuatu and *A. waiseai* from Fiji, while *A. lenakel*, the second Vanuatu species, branched within a predominately Fijian radiation. This suggests physical proximity of Fiji and Vanuatu, as was the case some 6–8 Mya when as part of the old Vitiaz Arc, Viti Levu (Fiji) and Malakula (Vanuatu) were within 100 km of each other (Dickinson 2002). Since that time, Fiji has rifted and rotated and is now some 800 km away from Vanuatu. The Tongan species *A. eupulvillatus*, the sister species of the Fijian *A. pulvillatus*, could have evolved in the southern part of the ancestral Vitiaz Arc thus be a vicariant species, or it might have

dispersed from Fiji. The Samoan *A, upolu,* to the east of the Tongan Trench and away from the Vitiaz complex, is likely to have dispersed to Samoa from a common ancestor with its Lauan sister species, *A.maulevu.*

In summary, the *pulvillatus* group evolved in Fiji and Vanuatu, probably when the two archipelagoes were in close proximity as part of the Vitiaz Arc, some 6–8 Mya. This radiation possibly involved species on the ancestral Lau and Tonga ridges. As the result of the breakup and rifting of the old Vitiaz Arc, species now show a vicariant distribution, although the Samoan and Tongan species may be the result of dispersal.

ACKNOWLEDGMENTS

I thank the following curators for facilitating the loan of specimens in their care: N. Evenhuis and A. Ramsdale (BPBM); N. Woodley (USNM), D. Notton (BMNH), and Leah Brorstrom of the Schlinger Laboratory. The map in Fig. 4 is modified from the Goode Base Map series. Field collection in Fiji was supported by the National Science Foundation project "Terrestrial Arthropod Survey of Fiji" (DEB-0425790) and the Schlinger Foundation. The Fiji Government (Ministries of Environment and Forestry) and the Wildlife Conservation Society, Suva are thanked for their support. Hannah Finlay drew the figures and Sue Lindsay produced the scanning electron micrographs.

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FIJI ARTHROPODS VI

(edited by N.L. Evenhuis & D.J. Bickel)

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