



Two new genera of Phoridae (Diptera) from New Zealand

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Abstract

Two new genera, *Wharia* and *Minicosta*, are diagnosed and specimens of their included species, *W. willcocksorum* and *M. mollyae*, described. The relationships of both genera are unknown, although they do not belong in subfamily Metopininae. Modifications to the latest key to World phorid genera are given to allow identification of the new taxa.

Key words: Phoridae, Diptera, New Zealand, new genus, *Wharia*, *Minicosta*

Introduction

The phorid fly fauna of New Zealand is one of the most distinctive in the world. Originally monographed by Bridarolli (1937) and Schmitz (1939), it contains an extremely high proportion of endemic genera and species. Since Schmitz's work, however, relatively little has been published on this fauna (Borgmeier, 1967a, b; Brown & Oliver, 2007; Disney, 1994a, 2003).

One of us (HO) has been collecting phorid flies for many years, and together we plan to publish the results of this extensive field work. In particular, we will describe the newly discovered taxa that have come to light, including the two new genera described herein.

Methods

Specimens collected into alcohol were dried using the chemical HMDS (Brown, 1993). All specimens are deposited in the Natural History Museum of Los Angeles County (LACM) and New Zealand Arthropod Collection (NZAC).

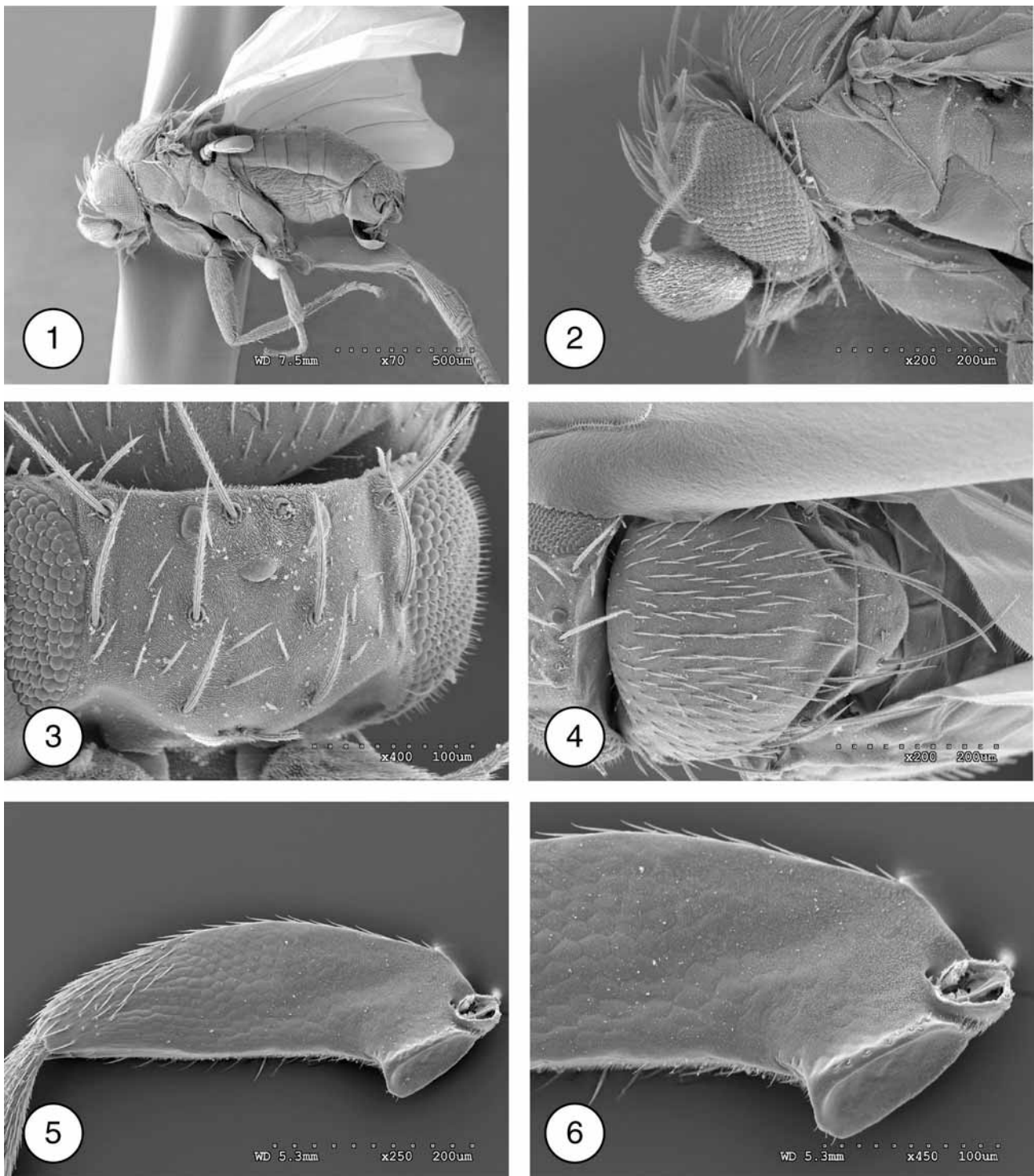
Systematics

Wharia n. gen.

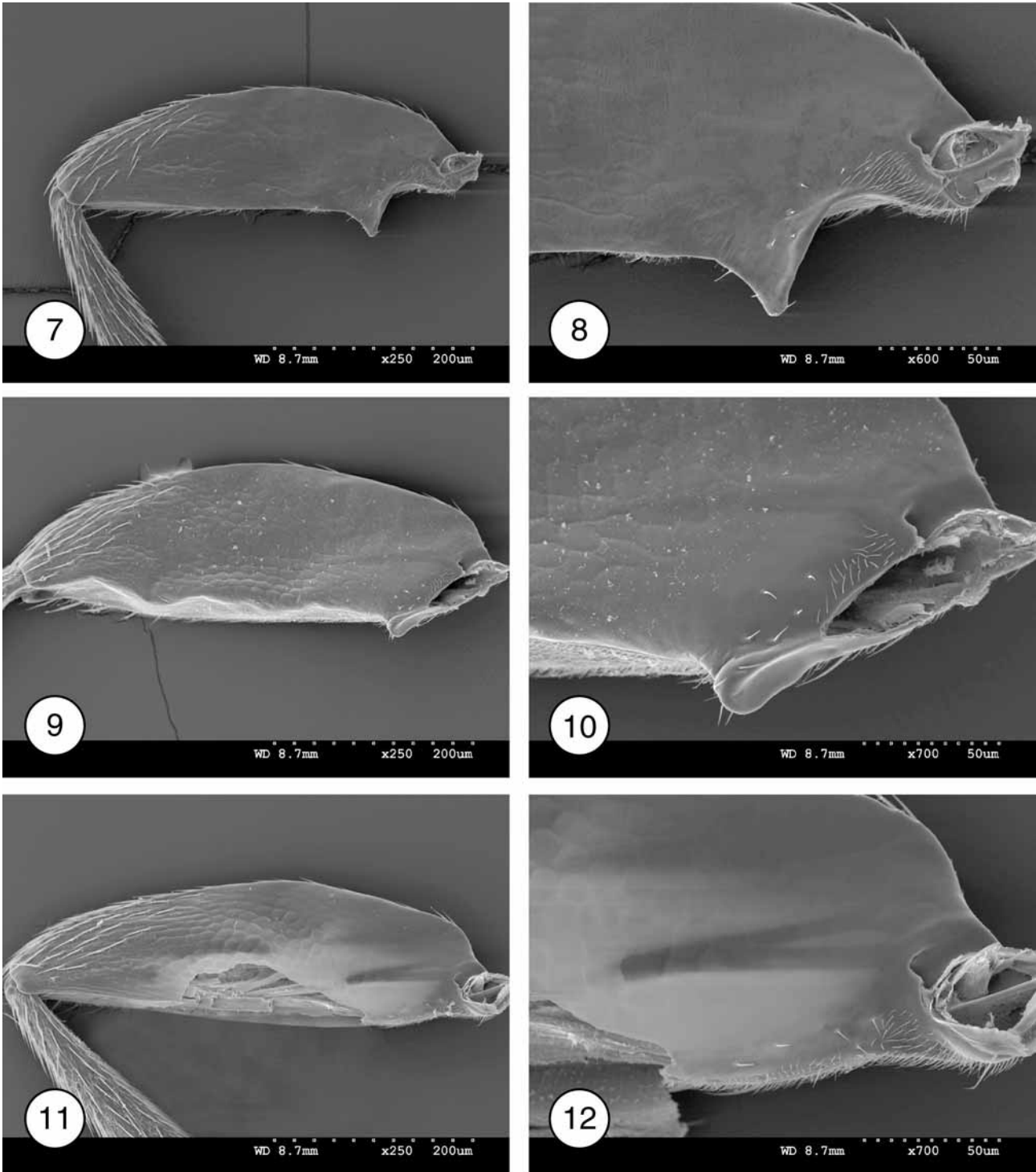
(Figs. 1–16)

Diagnosis. Frons lacking medial furrow except for small pit between supra-antennal setae (Fig. 13); one pair of reclinate supra-antennal setae present; ventral fronto-orbital setae absent (Figs. 3, 13). Anepisternum without furrows (= undivided), bare (Figs. 1–2). Scutellum with one large and one small seta (Fig. 4). Wing present in both sexes, vein R_{2+3} absent (Fig. 14). Wing vein Rs with one seta near base only. One alular seta

present. Midtibia with one anterodorsal and one dorsal seta near base, with one short anterodorsal seta near apex. Posterior face of hind femur often with rounded basal process covered by thin membrane (Figs. 5–10), although size varies greatly and absent in some specimens (Figs. 11–12). Hind tibia without dorsal, longitudinal setal palisade; with one anterodorsal seta near base and one near apex.

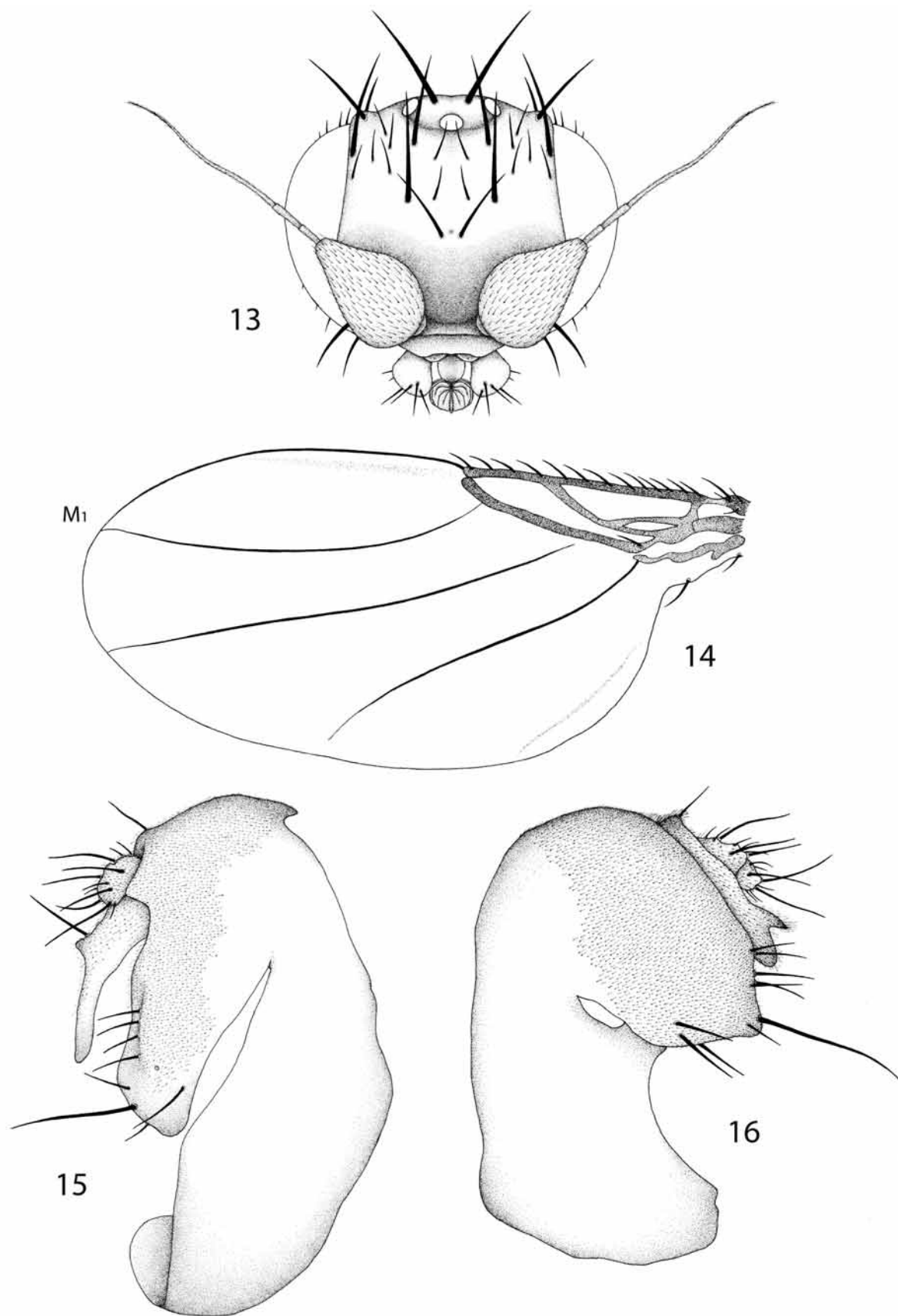


FIGURES 1–6. *Wharia willcocksorum* new species, specimen from Rotopounamu [LACM ENT 223564]. 1, habitus, left lateral. 2, head and thorax, left lateral. 3, head, anterior. 4, thorax, dorsal. 5, hind femur, posterior. 6, hind femur, posterior, basal area.



FIGURES 7–12. *Wharia willcocksorum* new species, hind femur, posterior, and hind femur, posterior, basal area. 7–8, specimen from Tree Trunk Gorge [LACM ENT 221624]. 9–10, specimen from Raglan [LACM ENT 223165]. 11–12, specimen from Desert Road at Oturere River [LACM ENT 221483].

Recognition. Based on the structure of the male genitalia, setation of the frons, and setation of the tibiae, this genus most closely resembles *Bothroprosopa* Schmitz, also known only from New Zealand. In his revision of phorid genera, Brown (1992) placed *Bothroprosopa* in his subfamily Hypocerinae, based in part on the strongly curved base of wing vein M_1 (Fig. 17), which is found throughout this group. Such a strongly curved vein is not found in *Wharia* (Fig. 14), whose placement among other phorid genera is unknown. We have



FIGURES 13–16. *Wharia willcocksorum* new species, male. 13, head, specimen from Rotopounamu [LACM ENT 223564]. 14, wing, specimen from Tree Trunk Gorge [LACM ENT 221624]. 15–16, male terminalia, right lateral and left lateral, specimen (molecular voucher) from Sandy Bay [LACM ENT 240024].

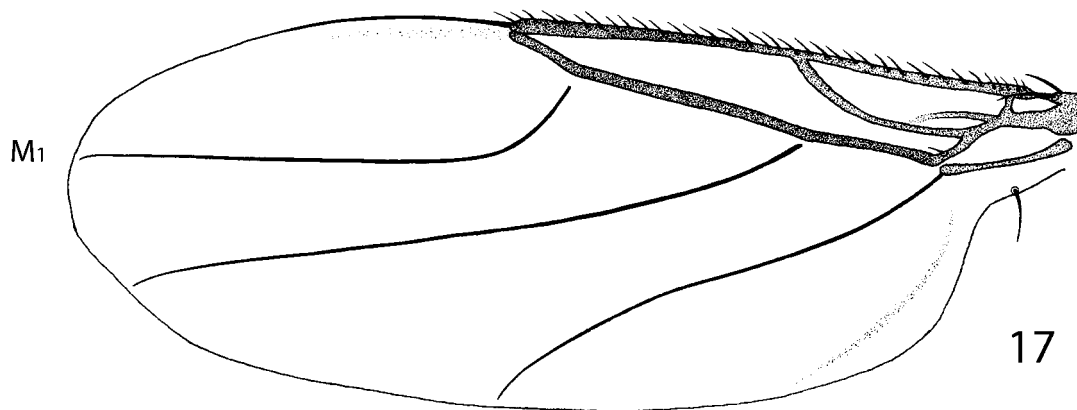


FIGURE 17. *Bothroprosopa mirifica* Schmitz, wing.

extracted DNA from *Wharia* specimens, however, and they will be included in the molecular phylogenetic analysis of phorid genera (B. Brown & P. Smith, in preparation).

In the latest keys to phorid genera (Disney, 1994), males of *Wharia* key to couplet 77 of the male key, which was revised by Brown & Kung (2004). They do not key correctly to *Tapantia* Brown & Kung, nor to lead 77A. To remedy this situation, we herein revise these couplets again:

76. Fork of vein 3 complete [=R₂₊₃ fully developed]..... *Triphleba* (part)
 - Inner branch of fork (R₂₊₃) partly to completely absent 77
77. At least left side, and often both sides of male terminalia posterodorsally elongate, forming surstylus-like lobe 77A
 - Both sides of male terminalia lacking surstylus-like lobes (although *Wharia* with median process)
 77B
- 77A. Restricted to New Zealand..... *Kierania*
 - Found in Holarctic and Neotropical Regions..... *Triphleba* (part)
- 77B. Cerci elongate, pointing dorsally; epandrium without posteromedial, ventrally-pointed, elongate process (Brown & Kung, 2004, figs. 3–4); costal setae short, numerous (Brown & Kung, 2004, fig. 2); posterior face of hind femur unmodified; Central America..... *Tapantia*
 - Cerci short; epandrium with elongate, posteromedial, ventrally-pointed process (Fig. 15); costal setae relatively longer and fewer (Fig. 14); posterior face of hind femur often with large, blunt, ventrobasal process (Figs. 5–10); New Zealand..... *Wharia*

Females of *Wharia* key to *Bothroprosopa* at couplet 152 in the female key of Disney (1994). They differ in having a shorter costa, less curved vein M₁, and a much shorter proboscis than in *Bothroprosopa*. The other new genus described in this paper also keys to this couplet, so we offer modification to the key that allow identification of both new genera in the Recognition section for *Minicosta* new genus.

Derivation of name. *Wharia* is an arbitrary combination of letters, although loosely based on the first two initials of the name of W. H. Robinson, who as been extremely helpful to both authors in the past. For Latinization purposes, we consider it feminine in gender.

***Wharia willcocksorum* n. sp.**

Description. Critical characters of the definition of this species are given in the Diagnosis for the genus. Other characters observed in specimens belonging to the species are as follows:

Body length 0.9–1.8 mm; color brown to dark brown.

Male: Frons blackish-brown; mean frontal width 0.55 head width, range 0.52–0.58. One pair of reclinate supra-antennal setae present. Ventral fronto-orbital setae absent; other normal frontal setae present (one pair each of dorsal and ventral interfrontal setae, dorsal fronto-orbital setae, inner vertical setae, and ocellar setae). Flagellomere 1 enlarged, oval; arista subapical. Scutum and pleuron dark brown. Legs, including coxae, lighter brown than rest of body. Wing venation as in Fig. 14; mean costal length 0.46 wing length, range 0.43–0.49; halter brown. Abdominal tergites brown. Male terminalia brown; both sides of epandrium with one long and several shorter setae; medially with elongate, ventrally-curved process below cerci (Figs. 15–16); hypandrial lobes large, especially right one, which curves medially under rest of terminalia (Fig. 15).

Female: Similar to male, but flagellomere 1 smaller, rounder. Abdominal tergite 1 relatively large, one-half length of tergite 2; tergites 2–6 gradually reduced posteriorly, without visible gland openings between tergites. Segments 1–6 lacking sternites. Abdomen posterior to segment 6 largely membranous, non-parasitic type. Tergite 7 absent, tergite 8 narrow, triangular (broader apically). Sternite 7 elongate, narrow strip, sternite 8 absent. Cerci present, unmodified.

Variation. The process at the base of the hind femur of male specimens is remarkably varied, if these specimens do indeed only represent a single species. The process ranges from a rounded posterior opening covered with thin membrane (Figs. 5–6), a similar rounded ventral opening (Figs. 7–8), a small, narrow opening, and no opening at all (Figs. 11–12). Above the opening is a distinctive row of setae that can be linear (Fig. 6) or otherwise organized (Figs. 8, 10, 12). The variation in structures is not geographically organized, and all of the morphs can be found in the Turangi area. Some specimens exist that are intermediate to the ones shown.

If these hind femoral structures are used to stimulate females during mating, as in the genus *Dohrniphora* Dahl (Brown & Kung, 2007), they are expected to be highly species specific (Eberhard, 1985). Thus, this variation could be evidence for a large number of cryptic species. At this time, however, we prefer to recognize a single, varied species, until further evidence (such as DNA sequences) can be brought to bear on the subject. The specimen we designated as the holotype has a hind leg similar to Figs. 5–6. We did not designate any other type material, so that in the future, if more species are recognized, their names will not be burdened with this synonym.

Derivation of specific epithet. Named for Irene and Colin Willcocks, who kindly allowed us to collect phorid specimens on their property.

Natural history. Unknown.

Holotype. ♂, NEW ZEALAND: North Island: Raglan, 37.83°S, 174.82°E, 5–8.ii.2006, B. Brown, H. Oliver, Malaise trap, 100 m [barcode: LACM ENT 223181] (NZAC).

Other (non-type) material examined. NEW ZEALAND: Chetwode Island: Te Karaho, 40.94°S, 174.08°E, 4♂, 11–17.ii.1988, C. A. Muir, swept from ferns. North Island: Kamai Forest Park, Wairongomai Valley, 37.87°S, 178.20°E, 1♂, 21.i.1988, A. Plant, sweeping; Raglan, 37.83°S, 174.82°E, 3♂, 2♀, 5–8.ii.2006, B. Brown, H. Oliver, Malaise trap, 100 m, 1♀, 8.ii.2006, B. Brown, in compost, 3♂, 8–21.ii.2006, B. Brown, H. Oliver, Malaise trap; Sandy Bay Community, Coromandel Peninsula, 1♂, 16–19.ii.2006, B. Brown, H. Oliver, Malaise trap (note: only some body parts preserved, rest of body used for molecular analysis); Tongariro National Park, Lake Rotopounamu, 39.02°S, 175.73°E, 3♂, 13.ii.2006, B. V. Brown, sweeping (note: only some body parts preserved for one specimen, rest of body used for molecular analysis); near Turangi, Desert Road at Oturere River, 39.18°S, 175.76°E, 2♂, 10–14.ii.2006, B. Brown, H. Oliver, Malaise trap, 850 m; near Turangi, Tree Trunk Gorge, 39.17°S, 175.81°E, 3♂, 12–14.ii.2006, B. Brown, H. Oliver, Malaise trap, 850 m; Waihi, Woodland Road, 37.47°S, 175.85°E, 1♂, 9–14.ii.2006, B. Brown, H. Oliver, Malaise trap, 100 m.

South Island: Home Range, 42.62°S, 172.45°E, 1♂, 7.xii.2000, 1♂, 1♀, 1.ii.2001, 1♂, 10.ii.2001, R. Didham, FIT, pasture, 64 m; Punga Cove, 44.60°S, 167.85°E, 2♂, 15–19.xi.1988, M. H. Bowie, pan trap; Rocklands, 45.67°S, 169.98°E, 4♂, 2♀, 2–16.i.1975, B. Barrett, pitfall trap, 432 m (LACM, NZAC).

***Minicosta* n. gen.**

(Figs. 18–28)

Diagnosis. Frons lacking medial furrow (Figs. 24–25). Supra-antennal setae absent. Dorsal and ventral fronto-orbital setae absent. Ventral interfrontal setae absent in male, medioclinate and with crossing tips in female. Flagellomere 1 in male greatly elongate, tapered; less so in female. Arista apical, three segmented. Anepisternum without furrows (= undivided), bare (Figs. 18–19). Scutellum with one large and one small seta (Fig. 21). Wing present in both sexes, costa short (about 0.30 wing length), vein R_{2+3} absent (Fig. 26). Wing vein R_s with one long seta near base only. One alular seta present. Midtibia with one anterodorsal and one dorsal seta near base, with one extremely short anterodorsal seta near apex. Posterior face of hind femur with line of four long ventral setae near base, heavily striate otherwise unmodified (Figs. 22–23). Hind tibia without dorsal, longitudinal setal palisade; with one anterodorsal seta near base.

Recognition. The relationships of *Minicosta* to other phorid genera are unknown, other than to state that it does not belong in the Metopininae. We have collected sequence data from this genus that will be used in a molecular phylogenetic analysis of the family (B. Brown & P. Smith, in preparation).

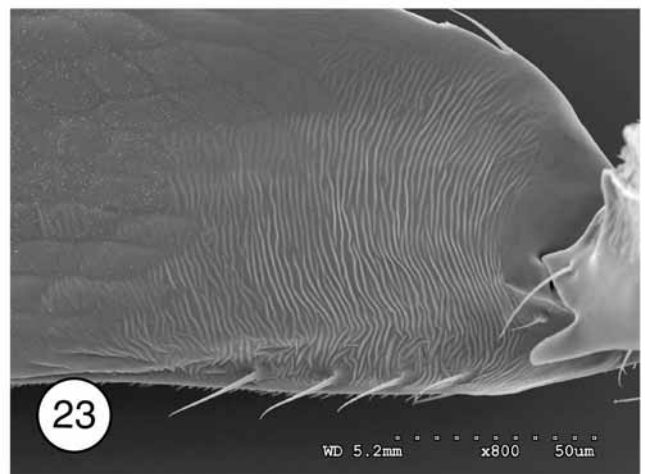
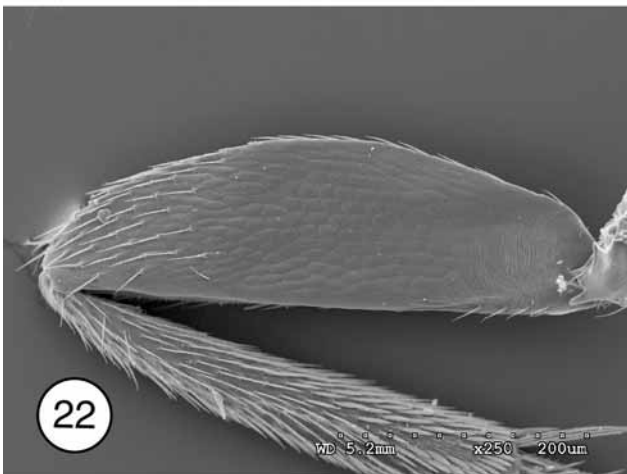
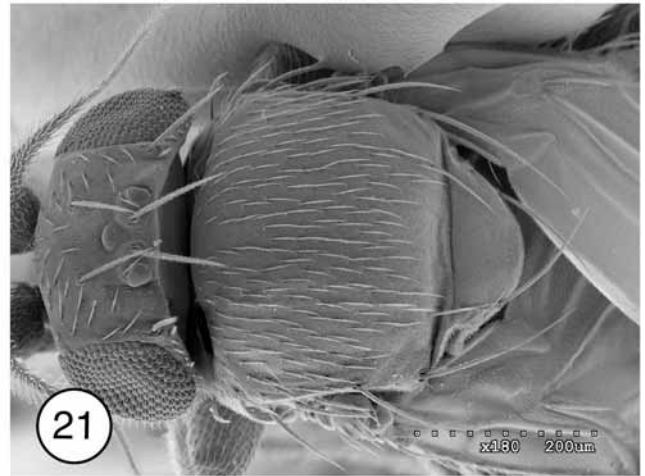
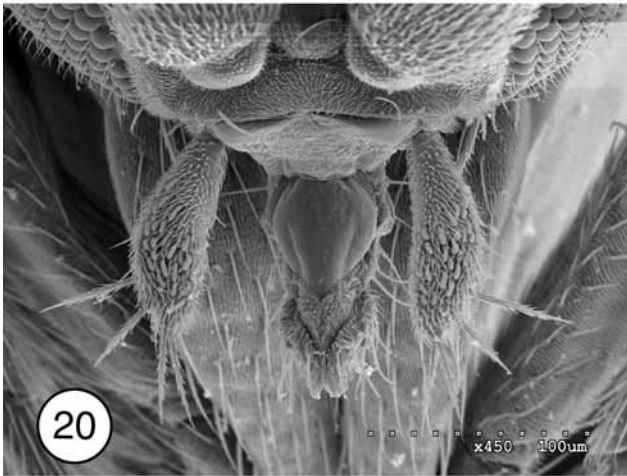
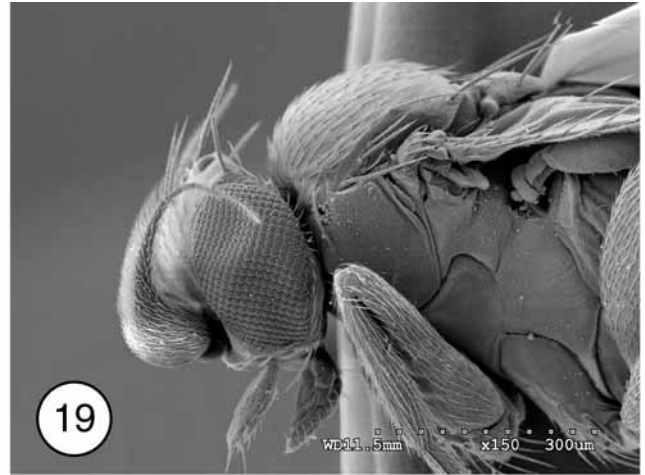
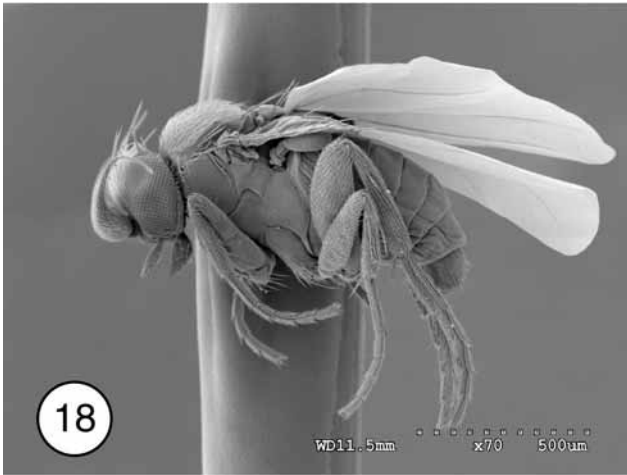
In the latest key to males of phorid genera (Disney, 1994), *Minicosta* keys to couplet 83, where it matches neither lead. We suggest the following modification:

- 83. Frons with only 6 large setae, with the pre-ocellar (= dorsal interfrontal), postero-lateral, (= inner vertical), and ocellar pairs present. Costa extremely short, 0.30 wing length.....*Minicosta*
- Frons with more frontal setae; costa not so reduced in length.....83A
- 83A. Arista dorsal, in preapical position. Subcosta well developed.....*Triphleba* (part)
- Arista apical. Subcosta weakly developed or absent.....*Xanionotum*

Females key to couplet 152 in Disney's (1994) female key, which should be modified as follows to allow recognition of both new genera:

- 152. With eight bristles on the frons between the two supra-antennals and ocelli (e.g., Disney, 1994, fig. 8.1a). Known from New Zealand (*Kieranina*) and the Holarctic Region (*Triphleba*)
..... *Kieranina* (part) and *Triphleba* (part)
- With six or fewer bristles on the frons between the two supra-antennals (when present) and ocelli, with at least the antero-laterals (= ventral fronto-orbital setae) being absent. Only known from New Zealand
..... 152A
- 152A. Costa extremely short, approximately 0.30 wing length (Fig. 26). Frons lacking supra-antennal, antero-lateral and medio-lateral setae. Antial setae medioclinate, crossing at tips (Fig. 25) *Minicosta*
- Costa approximately 0.48 wing length or longer. Frons with supra-antennal and medio-lateral setae present. Antial setae reclinate 152B
- 152B. Costa approximately 0.6 wing length; vein M_1 strongly anteriorly curved at base (Fig. 17); proboscis elongate, sclerotized labrum about two times length of palpus *Bothroprosopa*
- Costa approximately 0.48 wing length; vein M_1 only gently curved anteriorly (Fig. 14); proboscis short, labrum inconspicuous, subequal in length to palpus *Wharia*

Derivation of name. From Greek *minys* for short, referring to the length of the costal vein.

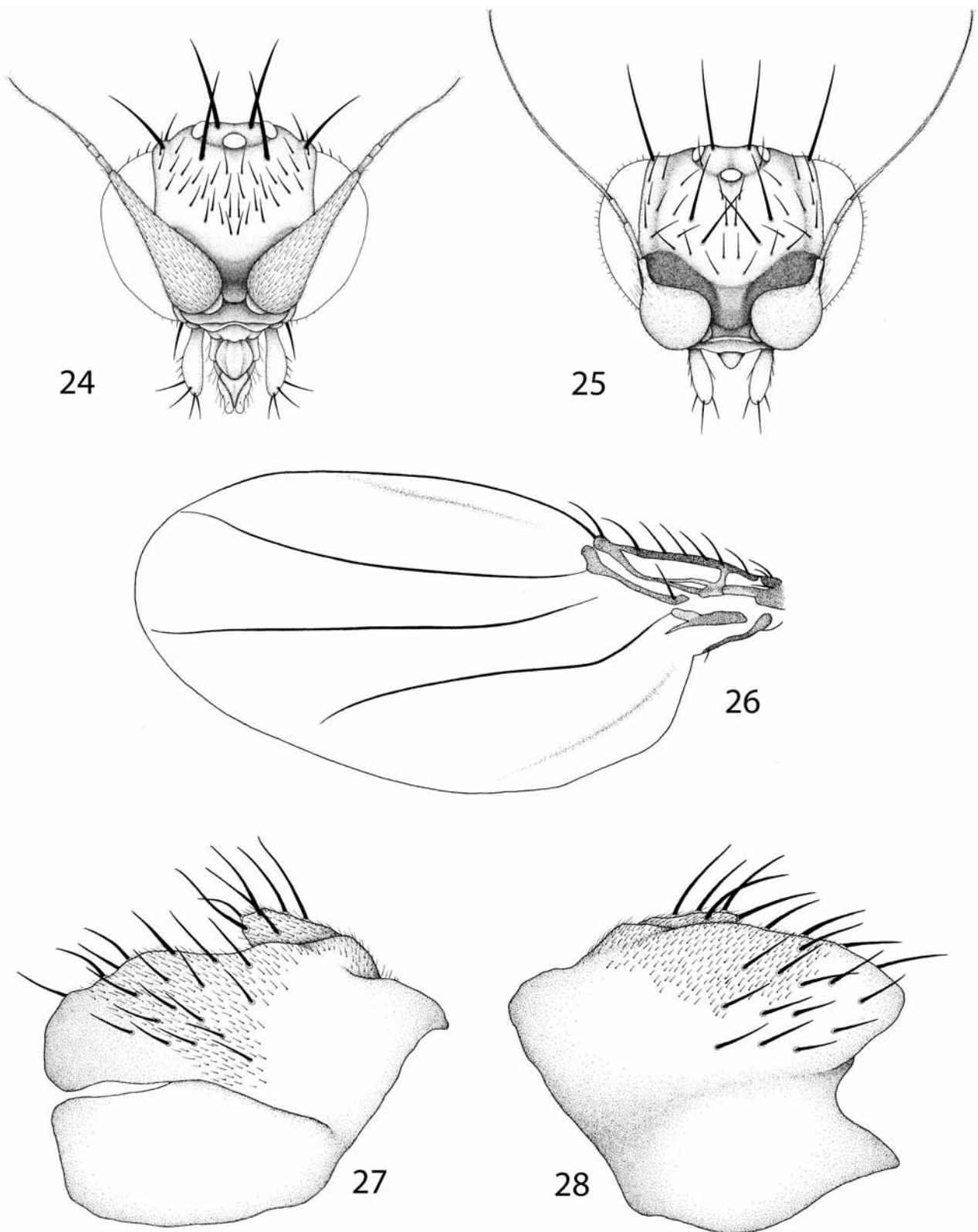


FIGURES 18–23. *Minicosta mollyae* new species, specimen from Desert Road [LACM ENT 221482]. 18, habitus, left lateral. 19, head and thorax, left lateral. 20, mouthparts, anterior. 21, thorax, dorsal. 22, hind femur, posterior. 23, hind femur, posterior, basal area.

***Minicosta mollyae* n. sp.**

Description. Critical characters of the definition of this species are given in the Diagnosis for the genus. Other characters observed in specimens belonging to the species are as follows:

Body length 0.9–1.2 mm; color brown to dark brown.



FIGURES 24–28. *Minicosta mollyae* new species. 24, male head, specimen from Desert Road [LACM ENT 221482]. 25, female head, specimen from Raglan [LACM ENT 221394]. 26, wing, specimen from Desert Road at Oturere River [LACM ENT 221484]. 27–28. Male terminalia, right lateral and left lateral, specimen (molecular voucher) from Roto-pounamu [LACM ENT 235657].

Male: Frons blackish-brown; mean frontal width 0.58 head width, range 0.57–0.59. Palpus with large sensilla dorsally (Fig. 20). Scutum and pleuron dark brown. Anepisternum without setae. Legs, including coxae, lighter brown than rest of body. Wing venation as in Fig. 25; mean costal length 0.31 wing length, range 0.30–0.32; halter brown. Abdominal tergites brown. Male terminalia brown, without large protruding lobes, structure as in Figs. 27–28.

Female: Similar to male, but flagellomere 1 smaller, rounder, only slightly pointed. Costa shorter, approximately 0.29 wing length. Abdominal tergite 1 relatively large, one-half length of tergite 2; tergites 2–6 gradually reduced posteriorly, without visible gland openings between tergites; tergite 6 equilateral triangle in shape. Segments 1–6 lacking sternites. Abdomen posterior to segment 6 largely membranous, non-parasitic type. Tergites and sternites not seen. Cerci present, unmodified.

Derivation of specific epithet. Named for Molly Oliver, the second author's wife.

Natural history. Unknown.

Holotype. ♂, NEW ZEALAND: North Island: near Turangi, Tree Trunk Gorge, 39.17°S, 175.81°E, 12–14.ii.2006, B. Brown, H. Oliver, Malaise trap, 850 m [barcode: LACM ENT 221509] (NZAC).

Paratypes. NEW ZEALAND: North Island: Raglan, 37.83°S, 174.82°E, 1♂, 3♀, 8–21.ii.2006, B. Brown, H. Oliver, Malaise trap; Tongariro National Park, Lake Rotopounamu, 39.02°S, 175.73°E, 2♂, 13.ii.2006, B. V. Brown, sweeping (note: only some body parts preserved for one specimen, rest of body used for molecular analysis); near Turangi, Desert Road at Oturere River, 39.18°S, 175.76°E, 6♂, 10–14.ii.2006, B. Brown, H. Oliver, Malaise trap, 850 m; near Turangi, Tree Trunk Gorge, 39.17°S, 175.81°E, 2♂, 2♀, 12–14.ii.2006, B. Brown, H. Oliver, Malaise trap, 850 m; Waihi, Woodland Road, 37.47°S, 175.85°E, 1♀, 9–14.ii.2006, B. Brown, H. Oliver, Malaise trap, 100 m. South Island: Brunner, Punakaiki, 1♂, 1♀, 29.xii–3.i.1984, L. Masner, Malaise trap, Nothophagus forest (LACM, NZAC).

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