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Revision of the *Microphorella acroptera* species group and establishment of the *Microphorella arcana* species group (Diptera: Dolichopodidae *sensu lato*: Parathalassiinae)

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Abstract

The *Microphorella acroptera* species group is revised and the *Microphorella arcana* species group is established. The *M. acroptera* species group includes *M. acroptera* Melander and *M. tubifera* Melander, plus the following 14 newly described species: *M. acuminata* **sp. nov.**, *M. bifida* **sp. nov.**, *M. compacta* **sp. nov.**, *M. convoluta* **sp. nov.**, *M. cornuta* **sp. nov.**, *M. elongata* **sp. nov.**, *M. maculata* **sp. nov.**, *M. paracroptera* **sp. nov.**, *M. serpentina* **sp. nov.**, *M. sinuosa* **sp. nov.**, *M. tenuis* **sp. nov.**, *M. tenuis* **sp. nov.**, *M. triangulata* **sp. nov.**, and *M. trochanterata* **sp. nov.**, *M. sinuosa* **sp. nov.**, *M. tenuis* **sp. nov.**, *M. tenuis* **sp. nov.**, and *M. trochanterata* **sp. nov.** Four distinct lineages within the *M. acroptera* species group are recognized. The *M. arcana* species group includes the following three newly described species: *M. arcana* **sp. nov.**, *M. gilaensis* **sp. nov.** and *M. ovata* **sp. nov.** Both species groups occur only in the western Nearctic Region. The *M. acroptera* species group is recorded from southeastern Alberta south to Washington, western Oregon and southern California, east to Nevada and northwestern Arizona. The *M. arcana* species group is known from California and central Arizona. The distribution of each species is mapped and a key to males of both species groups is provided, including an update to the Nearctic *Microphorella* species group key published by Cumming & Brooks (2022).

Key words: new species, identification keys, classification, morphology, Nearctic Region

Introduction

The empidoid genus *Microphorella* Becker (1909) belongs to the subfamily Parathalassiinae, which is one of the basal lineages of the Dolichopodidae *sensu lato* (Sinclair & Cumming 2006). In the Nearctic Region, this genus of tiny, riparian flies (wing length: 1.2–2.8 mm) can be distinguished from other parathalassiines by the following features: body and legs usually brownish or blackish, with mostly dark setae; gena weakly developed; palpus broadly or narrowly rounded apically, not triangular; thorax usually with 1 pair of scutellar setae; wing with anal lobe reduced, cell cua apically convex, vein CuA+CuP short to absent, costa without spine-like basal setae (Sinclair *et al.* 2023). Cumming & Brooks (2022) provided a key to the four Nearctic species groups of *Microphorella* known at that time, and two of the groups, namely the *M. chillcotti* species group and the *M. breviradia* species group were fully revised, respectively by Brooks & Cumming (2012) and Cumming & Brooks (2022). This third paper in the series treating the Nearctic species of *Microphorella*, revises the *M. accoptera* species group and newly establishes the *M. arcana* species group. A fourth paper revising the *M. chiragra* species group will be published at a later date.

Material & methods

Specimens examined in this study are housed in the following collections: California Academy of Sciences, San Francisco, USA (CAS); Carnegie Museum of Natural History, Pittsburgh, USA (CMNH); Canadian National

Collection of Insects, Ottawa, Canada (CNC); California State Collection of Arthropods, Sacramento, USA (CSCA); Cornell University Insect Collection, Ithaca, USA (CUIC); University of Guelph Insect Collection, Guelph, Canada (DEBU); Essig Museum of Entomology, University of California, Berkeley, USA (EMEC); Montana Entomology Collection, Montana State University, Bozeman, USA (MTEC); Bohart Museum of Entomology, University of California, Davis, USA (UCDC); Entomology Research Museum, University of California, Riverside, USA (UCRC); United States National Museum of Natural History, Washington D.C., USA (USNM).

Label data for primary types are cited verbatim. Labels are listed from the top label down with data from each label in quotation marks and separated by a semicolon. Lines of text on labels are delimited by a vertical line (|) and annotations are placed in square brackets, *i.e.*, [].

In cases where original specimen labels lack latitude and longitude data for a locality, coordinates were estimated by the authors and appear in square brackets following the locality name. Distribution maps were created with SimpleMappr (Shorthouse 2010).

Techniques for preparation and illustration of terminalia and specimen photography follow our previous papers (*e.g.*, Brooks & Cumming 2022, 2023; Cumming & Brooks 2022). Morphological terminology follows Cumming & Wood (2017) and homologies of the male terminalia follow our recent works such as Brooks & Cumming (2022, 2023) and Cumming & Brooks (2022).

Most of the specimens examined in this study were collected over 30 years ago and are too old to conveniently yield usable COI mitochondrial DNA sequences for assistance in species discrimination, unlike much of the material used in some of our previous revisions (*e.g.*, Brooks & Cumming 2017; Cumming & Brooks 2022). When successful DNA barcode sequences were obtained from a few recently collected specimens, these results, if applicable, are reported in the appropriate "Remarks" section for the species involved.

Update to Nearctic Microphorella species group key by Cumming & Brooks (2022)

The last couplet (couplet 3) of the "Key to the species groups of *Microphorella* in the Nearctic Region" provided by Cumming & Brooks (2022), is updated here so that members of the *M. acroptera* species group and the newly established *M. arcana* species group may be distinguished from those of the *M. chiragra* species group.

3 Male terminalia with setose hypandrium (see Cumming & Brooks 2022, fig. 30); male hindleg without tubercle on trochanter and lacking posterior patch of setae on femur; female abdominal tergite 5 without cluster of stout median setae, female abdominal tergite 6 usually with row of long, stout setae on posterior margin (see Cumming & Brooks 2022, figs 33, 34)..... Male terminalia with bare hypandrium (Figs 7, 18, 33, 35, 51, 76, 96); male hindleg with either tubercle on trochanter (e.g., Figs 8, 9, 66, 93, 94) or posterior patch of setae on femur (Figs 107, 109); female abdominal tergite 5 usually with cluster of stout median setae (Fig. 20), female abdominal tergite 6 without row of long, stout setae on posterior margin (females not Male hind trochanter with tubercle bearing spine-like seta (Figs 8, 9, 18, 21, 24, 48, 51, 66, 73, 77, 93, 94), if tubercle and seta 4 very small (as in M. maculata sp. nov.), then wing vein CuA+CuP modified as a spot (Fig. 89); male hind femur without patch of fine setae on posterior surface; male terminalia lacking ventral epandrial process on right epandrial lamella..... Male hind trochanter without tubercle; male wing vein CuA+CuP unmodified (Fig. 107); male hind femur with patch of fine setae on posterior surface (Figs 107, 109); male terminalia with ventral epandrial process present on right epandrial lamella

Microphorella acroptera species group

Diagnosis. The *Microphorella acroptera* species group can be distinguished from other Nearctic *Microphorella* species groups by the following suite of characters: clypeus separated from face by suture (except in *M. maculata* **sp. nov.**); mouthparts with sensory pit on palpus (sometimes difficult to see in non-macerated specimens); male hind trochanter with tubercle bearing spine-like seta (Figs 8, 9, 18, 21, 24, 48, 51, 66, 73, 77, 93, 94; very small in *M. maculata* **sp. nov.**); male hind femur without patch of fine setae on posterior surface; wing with moderately long R_1 vein that usually terminates beyond midpoint of wing (Figs 4, 17, 47, 88, 89, close to midpoint of wing in some specimens, Fig. 95); male abdominal sternite 5 with broad ventral projection (Figs 10, 46, 49–51, 66,

70); hypopygium (Figs 11–14, 25–31, 36–40, 41–45, 52–55, 67–69, 78–85, 90, 91, 97–99) with ventral edge of epandrium fused to hypandrium, but with margin mostly defined (margin partially indistinguishable in *M. maculata* **sp. nov.**); right epandrial lamella without ventral epandrial process; hypandrium bare; female abdomen (not known for *M. convoluta* **sp. nov.**, *M. maculata* **sp. nov.**, *M. subacroptera* **sp. nov.** and *M. trochanterata* **sp. nov.**) with tergite 5 usually bearing a cluster of stout medial setae (Fig. 20), tergite 6 with setae on posterior margin unmodified (*i.e.*, not forming prominent row of long, stout setae), syntergite 9+10 with acanthophorous spines and cercus narrow and pointed.

Distribution. The *M. acroptera* species group is known to occur from southeastern Alberta and northeastern Montana south to Washington, western Oregon and southern California, east to southwestern Nevada and northwestern Arizona (Figs 100–105). The majority of records are from California.



FIGURES 1–3. Collection localities and habitats of the *Microphorella acroptera* and *M. arcana* species groups. **1.** Santa Ana River, California. **2.** Jedediah Smith Redwoods State Park, California. **3.** Carson Slough, Ash Meadow National Wildlife Refuge, Nevada (photo by Justin Runyon).

Remarks. The *M. acroptera* species group is a morphologically heterogeneous assemblage but is considered to be monophyletic based on the possession of a tubercle on the hind trochanter of males (Cumming & Brooks 2019). The species group comprises four distinct lineages, which are characterized below. Members of this species group are rarely collected, particularly in long series and are relatively scarce in collections. Adults have been taken in various riparian habitats, from moist temperate rainforests to desert oasis habitats (Figs 1–3).

Included species. This group includes the following 16 described species: *M. acroptera* Melander, *M. acuminata* sp. nov., *M. bifida* sp. nov., *M. compacta* sp. nov., *M. convoluta* sp. nov., *M. cornuta* sp. nov., *M. elongata* sp. nov., *M. maculata* sp. nov., *M. paracroptera* sp. nov., *M. serpentina* sp. nov., *M. sinuosa* sp. nov., *M. subacroptera* sp. nov., *M. triangulata* sp. nov., *M. triangulata* sp. nov., *M. triangulata* sp. nov., *M. trichanterata* sp. nov. and *M. tubifera* Melander. One additional species is known (*Microphorella* sp. A, see below), but is not formally named and described on account of the poor condition of the unique male specimen.

Key to males of the Microphorella acroptera species group

1	Wing with vein CuA+CuP modified as a spot (Fig. 89); face and clypeus silvery (Fig. 87), face narrow at middle, clypeus projecting to lower eve level with rounded ventral margin; antennal postpedicel with elongate narrow apex (Fig. 87); lower
	postocular setae and coxal setae white (Figs 87, 86)
-	Wing without spot-like CuA+CuP vein (Fig. 95); face and clypeus brown or blackish, clypeus not projecting to lower eye level
	with truncate ventral margin; antennal postpedicel without elongate narrow apex (e.g., Figs 4, 6, 58, 72); body with all setae
	dark (e.g., Figs 64–66, 92)
2	Abdominal sternite 6 with narrow projecting process (Fig. 96); hind trochanter with tubercle large and rounded or disc-shaped
	(Figs 93, 94); hypandrium with knob-like or dome-like posterior protrusion (Figs 97, 98); cercus digitiform and curved medially,
	with long setae (Fig. 99)
-	Abdominal sternite 6 without narrow process; hind trochanter with tubercle cylindrical, clavate or rounded (Figs 8, 9, 18, 21,
	66); hypandrium without posterior protrusion (e.g., Figs 11, 12, 29, 30, 67, 68, 78–80); cerci not as above (e.g., Figs 31, 38, 43,
	55, 69, 82)
3	Hind tibia with dorsal row of about 5 long setae, shortening distally (Figs 92, 93); abdominal sternite 8 with greatly elongated
	setae on posterior margin (Figs 92, 96); hypandrium with narrow knob-like posterior protrusion (Figs 97, 98)
	<i>M. trochanterata</i> sp. nov.
-	Hind tibia without row of long setae; abdominal sternite 8 with setae on posterior margin not greatly elongated; hypandrium
	longer with broad dome-like posterior protrusion Microphorella sp. A
4	Antennal postpedicel long and triangular, longer than stylus (Fig. 58); hind basitarsus with short, spur-like basiventral seta (Fig.
	59) <i>M. triangulata</i> sp. nov.
-	Antennal postpedicel bulb-shaped, usually distinctly shorter than stylus (e.g., Figs 4, 34, 56, 65, 71, 72); hind basitarsus with
	or without spur-like basiventral seta
5	Halter pale yellow (Figs 23, 32, 34, 35); hind basitarsus without spur-like basiventral seta
-	Halter brown to blackish (e.g., Figs 4, 6, 56, 63, 72); hind basitarsus with or without spur-like basiventral seta
6	Hypopygium large compared to rest of abdomen (Figs 34, 35); hypandrium large and ovoid with anterior end broadly rounded
	(Figs 41, 42); phallus slightly inflated in middle portion, with U-shaped curve protruding posteriorly (Figs 41, 42, 44, 45)
-	Hypopygium smaller (Figs 32, 33); hypandrium with anterior end tapered and broadly conical (Figs 36, 37); phallus greatly
_	inflated in middle portion (Figs 39, 40), without protruding U-shaped curve (Figs 36, 37)
7	Hind trochanter with large clavate tubercle bearing blunt-tipped spine-like seta (Fig. 66); hypopygium distinctive (Figs 61, 66)
	with projecting posterior components prominent and pale yellow (<i>i.e.</i> , surstyli, postgonites, phallus); cercus large with pale
	yellow base and dark subtriangular apical lobe (Figs 60, 61, 66–69); face narrowing below to width of anterior ocellus, dark
	coppery brown (Fig. 63)
-	Hind trochanter with tubercle smaller, shorter and usually cylindrical (Figs 8, 9, 21, 24, 48, 51, 73, 77, although sometimes
	clavate in <i>M. bijida</i> sp. nov. , Fig. 18); hypopygium with cercus and most other projecting posterior components brownish;
0	Lind hegiterana with view anall, start hegiverted and like sets (Figs 22, 57)
0	Lind basitarsus with very small, stout, basiventral spur-like seta (Figs 22, 57)
-	Hind basilarsus without basily number of a lobular with small spine like sets (Fig. 21); earous with parrow, dersally projecting lobe
2	(Figs 20, 31); dorsal lobe of suretulus with 3 4 prensisetae (Figs 20, 30) on right and left sides of hypopygium; anical partian
	of nhallus (distal to inflated part) elongate with U-shaped curve protruding posteriorly (Figs 20, 30) M convolute spectral portion
_	Hind trachanter tubercle cylindrical with large spine-like sets (as in Fig. 8): cercus without narrow dorsally-projecting lobe
	(similar to Figs 11–12): dorsal lobe of surstylus with 1 well-developed prensiseta on right side only (Fig. 16): anical portion of
	nhallus (distal to inflated nart) shorter without protruding U-shaped curve (as in Figs 11–15) <i>M subacrontera</i> so nov
10	Thorax with acrostichal setae sparse and irregular, or absent; ventral epandrial process with hook-like tin (Fig. 11): right dorsal
	surstylar lobe thumb-like, bearing blade-like prensiseta laterally (Fig. 12)
-	Thorax with acrostichal setae well-developed and biserial; ventral epandrial process with variable tip (Figs 25, 51, 52, 54, 78,

	79, 81, 84, 85); right dorsal surstylar lobe broad and truncate, bearing 2 prominent prensisetae (Figs 26, 53), or short and broad,
	bearing 4 setae (Figs 80, 83)
11	Thorax dull, dark bronze pruinose in dorsal view; hypopygium large with prominent, bulbous hypandrium (Figs 18, 25, 26,
	51–53); cercus elongate (Figs 28, 55); left dorsal surstylus short and broad (Figs 25, 52)
-	Thorax blackish with blue tinge in dorsal view; hypopygium more compact with smaller, narrower hypandrium (Figs 74-81,
	83, 85); cercus small and short (Figs 78–85); left dorsal surstylus elongate and narrow (Figs 78, 79, 81, 84, 85)
12	Cercus with bifid lateral lobe (Fig. 28)
-	Cercus with undivided, digitiform lateral lobe (Fig. 55) M. sinuosa sp. nov.
13	Phallus greatly elongated and C-shaped with broadened apex (Figs 83, 84) M. elongata sp. nov.
-	Phallus shorter and J-shaped with narrow apex (Figs 78, 79, 81, 85)
14	Ventral epandrial process gradually tapered apically to narrow pointed tip (Fig. 78); left postgonite with long, thick apical
	projection (Fig. 78); phallus well-sclerotized with long ventral process arising basally and extending to full length of phallus
	(Fig. 78)
-	Ventral epandrial process not gradually tapered apically (Figs 79, 81, 85); left postgonite with apical projection short and
	narrow, or long and narrow (Figs 79, 81, 85); phallus robust or delicately sclerotized, with process shorter and arising near
	middle or preapically (Figs 79, 81, 85)
15	Left postgonite with short apical projection (Fig. 85); phallus with short, narrow, pointed process arising preapically and
	extending nearly to tip of phallus (Fig. 85) M. tenuis sp. nov.
-	Left postgonite with long apical projection (Figs 79, 81); phallus robust with short, thick process arising near mid-length that
	ends well before tip (Fig. 79), or thin and delicately sclerotized, with narrow pointed process extending nearly to phallic tip
	(Fig. 81)
16	Phallus thin and delicately sclerotized, with narrow pointed process arising preapically and extending nearly to phallic tip (Fig.
	81); tip of ventral epandrial process with digitiform dorsoapical process (Fig. 81); right postgonite not protruding below ventral
	lobe of surstylus and even with posterior epandrial margin
-	Phallus robust with short, thick process arising near mid-length that ends well before tip (Fig. 79); tip of ventral epandrial
	process emarginate, without digitiform dorsoapical process (Fig. 79); right postgonite protruding below ventral lobe of surstylus
	and extending beyond posterior epandrial margin (Fig. 80)

Microphorella acroptera lineage

This lineage includes the following nine species: *M. acroptera* Melander, *M. bifida* **sp. nov.**, *M. convoluta* **sp. nov.**, *M. paracroptera* **sp. nov.**, *M. serpentina* **sp. nov.**, *M. sinuosa* **sp. nov.**, *M. subacroptera* **sp. nov.**, *M. triangulata* **sp. nov.** and *M. tubifera* Melander. Males of these species possess a cylindrical, clavate or rounded tubercle on the hind trochanter, which bears a spine-like seta (Figs 8, 9, 18, 21, 23, 24, 48, 66), and also share a uniquely structured phallus, which is convoluted and tubular in the basal (internal) portion, inflated in the middle portion, and narrowed and tubular in the apical portion (Figs 13–15, 26, 27, 29, 30, 36, 37, 39, 40, 42, 44, 45, 53, 68). The distinct phallic structure is considered to be a synapomorphy of the lineage.

Microphorella acroptera Melander

(Figs 4-15, 100)

Microphorella acroptera Melander, 1928: 88.

Type material examined. HOLOTYPE \Diamond (Figs 4, 5) labelled: "Pullman Wash| 30 May 13"; "TYPE| Microphorella| acroptera| Mel." [red label]; "ALMelander| Collection| 1961" (USNM). **PARATYPES: USA: California:** *Alameda County*: Berkeley Hills, 11.iv.1908, E.T. Cresson Jr (2 \heartsuit , USNM) [apparently not conspecific with *M. acroptera*]. **Washington:** *Whitman County*: same data as holotype [46°43'53"N 117°10'47"W] (1 \heartsuit , USNM); same data as holotype except, 16.vi.1912 (1 \Diamond , 1 \heartsuit , USNM); same locality, date not included on label (1 \Diamond , USNM); Pullman, Lyle Grove, 3.vi.1919, A.L. Melander (1 \Diamond , USNM).

Other material examined. USA: California: *Contra Costa County*: Briones Reg. Park [37°57'N 122°08'W], Toyon Canyon, 25.v.1979, D.D. Wilder (1♂, 2♀, CAS); Russellmann Park, 2 mi. SE Clayton [37°54'N 121°54'W], 1200 ft, 20.v.1967, P.H. Arnaud, Jr (1♂, 8♀, USNM). *Del Norte County: ca* 4.5 mi. NE Gasquet, Eighteenmile Creek, 41°51'21"N 123°54'44"W, 31.V.2009, S.E. Brooks (1♂, CNC). *Los Angeles County*: BYA Harmony Pines Youth Camp, 34°23'21"N 117°42'53"W, 6–16.vi.2017, veg. along flowing creek, MT, J.H. Skevington (1♂, CNC). *Marin County*: Hicks Valley, Arroyo Sausal, W of Point Reyes-Petaluma Rd [38°07'N 122°42'W], 115 m,

18.v.1980, P.H. Arnaud, Jr (5♀, USNM); same data except, 14.iv.1984, flight trap in creek bed, 1345–1700 hours (1°) , USNM); same data except, 150 m, 12.iv.1987, two flight traps in shaded creek bed ca. 1230–1600 hours DST over water adjacent to Salix sp. (23, 19, USNM); same data except, 115 m, 1.iv.1990, #00191 (13, USNM); Liberty Gulch nr Alpine Lk. [37°57'N 122°37'W], 640–900 ft, 17.iv.1971, E. Schlinger (1♂, EMEC); Lily Lk. nr Alpine Lk. [37°57'N 122°38'W], 680-720 ft, 15.iv.1972, E. Schlinger (13, EMEC). Mendocino County: Angelo Coast Range Reserve [39°43'N 123°39'W], on sand below White House, 31.v.1986 (63, 149, EMEC); No. Cal. Coast Range Pres., 5 mi. N Branscomb [39°42'N 123°39'W], 27.v.1976, E. Rogers (1∂, EMEC); Hwy 128 W Yorkville [38°53'53"N 123°12'52"W], 11.vi.1988, J.A. Downes, 1765/5 (13, CNC). Monterey County: Paraiso Hot Springs, 13 km SW Soledad [36°19'N 121°22'W], 400m, 29.v.1977, P.H. Arnaud, Jr (1³, USNM). *Napa County*: 5.5 km NW Moskowite Corner, Capell Creek [38°29'N 122°14'W], 200 m, 12.vi.1977, P.H. Arnaud, Jr (13, CAS); Oakville [38°26'N 122°24'W], 180 ft, 25.iv.1971, P.H. Arnaud, Jr, M.M. Arnaud, flight trap in creek bed with flowing water (13, USNM). San Benito County: Cienega de los Paicines, San Benito River [36°43'N 121°18'W], 190 m, 22.vi.1980, P.H. Arnaud, Jr (1∂, USNM). San Luis Obispo County: S end of Soda Lake, 15 mi. SE Simmler [35°12'N 119°51'W], 2.iv.1969, H.B. Leech (13, CAS). San Mateo County: La Honda [37°19'N 122°16'W], 23.vii.1967, P.H. Arnaud, Jr (2, 3, USNM); same data except, 120 m, 11.vi.1971 (1, USNM); Redwood City [37°29'N 122°14'W], 29.iii.1952, P.H. Arnaud, Jr (2♂, 8♀, USNM); Stanford University, Jasper Ridge Biological Preserve [37°24'N 122°14'W], 9.v.1982, P.H. Arnaud, Jr (2♀, USNM); same data except, 22.iv.1990, #00222 (12♂, 5° , USNM); same data except, CNC1155821 (1 $^{\circ}$, USNM); same data except, 7.v.1995, M. & P.H. Arnaud, Jr, Field Note #01313 (2^Q, USNM); same data except, 17.iv.1988, P.H. Arnaud, Jr, Townes flight trap near creek bed (1Å, CAS). Santa Cruz County: Felton, St Cruz Mts [37°03'N 122°04'W], 300–500 ft, 15–19.v.1907, Bradley (3Å, USNM); Santa Cruz [36°58'N 122°01'W], 5.iv.1961, R. Brown (1³, CAS). Stanislaus County: Del Puerto Canyon, Frank Raines Park [37°25'N 121°22'W], 335 m, 16.v.1970, P.H. Arnaud, Jr (4♂, 2♀, CAS; 1♂, USNM); same data except, 17.v.1970 (1∂, 8♀, CAS; 1♀, USNM). Yolo County: W Sacramento, 4851 Lake Rd [38°34'N 121°34'W], 15.iv.1989, P.H. Arnaud, Jr (1∂, USNM). Oregon: Curry County: ca 7 mi. E Langlois Floras Crk, 42°54'58"N 124°20'37"W, 29.V.2009, S.E. Brooks, CNC DIPTERA # 105201 (1♂, CNC); same data except, CNC DIPTERA # 105202 (1², CNC).

Diagnosis. Males of this species can be distinguished from other members of the *M. acroptera* species group by the following combination of characters: acrostichal setae absent, or sparse and irregular; hind basitarsus without basiventral spur-like seta; halter brown (Figs 4, 6); hind trochanter with cylindrical tubercle (Figs 8, 9); face with sides subparallel; hypandrium large and bulbous (Figs 7, 11, 12); ventral epandrial process with hook-like tip (Fig. 11); right dorsal surstylar lobe thumb-like, bearing blade-like prensiseta laterally (Fig. 12).



FIGURES 4–5. Male holotype of *Microphorella acroptera* Melander. **4.** Habitus, with wing inset (see Fig. 95 for fully labelled wing). **5.** Labels.



FIGURES 6–10. Male habitus, hindleg and abdomen of *Microphorella acroptera* Melander. **6.** Habitus (Floras Creek, Oregon, CNC DIPTERA # 105201). **7.** Abdomen of same specimen, right lateral view. **8.** Hindleg of paratype, posterior view, arrow indicating trochanter tubercle. **9.** Hindleg, anterior view (male from Angelo Coast Range Reserve, California), arrow indicating trochanter tubercle. **10.** Macerated abdomen (CNC1155821), ventral view, arrow indicating process of sternite 5. Abbreviation: hypd—hypandrium.

Description. Male (Figs 4, 6–15): Wing length 1.9–2.4 mm. Head (Figs 4, 6): Mainly blackish-brown pruinose, dark bronze dorsally (concolourous with thorax), ventral part of frons, face and clypeus blackish-brown in anterior view; slightly narrower than thorax in dorsal view; ovoid in lateral view (higher than broad); slightly broader than high in anterior view; larger setae black, smaller setae brown. Ocellar triangle conspicuous. Occiput weakly concave on upper median part. Eyes covered with short ommatrichia; medial edge of eye with small emargination adjacent to antenna; ommatidia subequal in size. Frons about 2× broader than high, widening above. Face linear, about 2× broader than width of anterior ocellus. Face and clypeus blackish-brown with brownish-grey pruinosity, concolourous with ventral part of froms (in anterior view). Clypeus separated from face, small, barely broader than high, slightly widened ventrally, with truncate ventral margin. Setae of head well differentiated (larger dorsal setae similar in size to anterior dorsocentrals): 1 pair of inclinate fronto-orbitals arising slightly ventral to median ocellus; 1 pair of lateroclinate anterior ocellars; 1 pair of small posterior ocellars; 1 pair of inner verticals (sometimes referred to as postocellars); 2 pairs of outer verticals; postocular setae short and uniserial. Antenna (Figs 4, 6) inserted above middle of head in profile; scape short, funnel-shaped, dark brown; pedicel about 2× longer than scape, spheroidal with subapical circlet of setulae, dark brown; postpedicel about 3× longer than pedicel, about 2× longer than wide, bulb-shaped, blackish-brown, clothed in fine setulae; arista-like stylus apical, 1.6–2× length of postpedicel, blackishbrown, with minute hairs. Palpus dark brown, relatively small, narrowly ovate, about 2.5× longer than wide, with 1 long preapical seta. Proboscis brown, short, projecting ventrally. Gena narrow. Thorax (Figs 4, 6): Blackish-brown

to dark brown pruinose with faint metallic green tinge in lateral view, dorsum dull, dark bronze pruinose with reddish and dark green tinges at certain angles, setae black. Mesoscutum moderately arched, prescutellar depression present. Proepisternum with 2 tiny setae. Postpronotal lobe with a few small setae. Mesonotum longer than wide. Acrostichal setae absent, or sparse and irregularly biserial, usually ending near 2nd pair of dorsocentrals, rarely extending to prescutellar depression; setae on each side of mesonotum: 5-7 dorsocentrals, middle setae weaker, posterior seta longest, 1 presutural supra-alar (posthumeral), 2–3 postsutural supra-alars (sometimes with a couple additional small setae anteriorly), 2 notopleurals, 1 postalar, area laterad anterior dorsocentrals with a few small setae. Scutellum broadly crescent-shaped with 1 long seta per side, rarely with small outer seta present. Mesopleuron bare. Halter brown to blackish brown. Legs (Fig. 4): Slender; dark brown with prominent setae dark brown or black; femora, tibiae and tarsi largely covered with tiny, dark brown setae (paler on medial surfaces); tarsomeres 1-4 of all legs progressively shorter apically with tarsomere 5 slightly longer than 4 and often dorsoventrally flattened; tarsal claws, pulvilli and empodium normally developed on all legs. Foreleg: Coxa with setae on anterior surface, stronger and longer apically; femur and tibia subequal in length, tarsus slightly longer; tarsomere 1 slightly shorter than combined length of tarsomeres 2-5. Midleg: Coxa with a few prominent setae on anterior surface; femur slightly shorter than tibia, tibia and tarsus subequal in length; apex of tibia with 1 strong ventral seta, and often weaker anterior seta; tarsomere 1 slightly shorter than combined length of tarsomeres 2-5. Hindleg: Coxa with 2 prominent setae on lateral surface; trochanter (Figs 8, 9) ventrally with short cylindrical tubercle bearing thick, anteriorly directed, apical spine-like seta and some small adjacent setae, spine-like seta pointed or blunt-tipped, straight or weakly curved; femur, tibia and tarsus subequal in length; femur (Figs 8, 9) weakly bowed outwardly (in dorsal view), with dorsal setae longer and more erect near base, with prominent anteroventral row of setae, setae subequal in length to femur width; tarsomere 1 subequal to combined length of tarsomeres 2–4. Wing (Fig. 4, inset): Slightly longer than body (based on non shriveled specimens). Hyaline, veins dark brown, about 2.7× longer than wide. Pterostigma absent, membrane entirely covered with minute microtrichia, alula absent. Costa circumambient. Anterior base of costa with strong dorsal seta and a few shorter proximal setae. Anterior section of costa (between base and R_{2+3}) with double row of spine-like setae. Posterior section of costa (beyond R_{2+3}) with setae finer and slightly longer. Radial and medial veins complete and reaching wing margin, CuA+CuP (anal vein) short extending about halfway to wing margin, Sc faint apically. R1 terminating slightly beyond midpoint of wing and M2. Base of Rs originating opposite humeral crossvein. R₂₊₃, R₄₊₅ and M₁ nearly straight, divergent in basal part, weakly divergent or sometimes subparallel distally beyond base of M2. M1 and M2 divergent. M2 and M4 slightly divergent to subparallel beyond cell dm. Costal section between M₁ and M₂ slightly longer than costal section between M₂ and M₄. CuA rounded (convex). Crossvein r-m short. Crossvein bm-m incomplete. Cell dm present, closed by base of M_2 and dm-m crossvein, cell extending to middle of wing. Cells br, bm and cua in basal fourth of wing. Cell cua ovoid. Anal lobe not developed. Calypter with fine setae. Abdomen (Figs 4, 6, 7): Dark brown with short dark setae (very weak on sternites); segment 7 bare. Segments 5-7 narrowed and laterally compressed to form cavity on right side for hypopygium (Fig. 10). Sternite 5 with broad bilobate ventral projection (Fig. 10), membranous medially, symmetrical with rounded setulose lateral lobes. Sternite 8 subrectangular to rounded, setose, slightly wider than segment 7; tergite 8 vestigial. Hypopygium (Figs 7, 10-15): Concolourous with abdomen; lateroflexed to right; inverted with posterior end directed anteriorly; large, about half as long as abdomen; asymmetrical. Right and left epandrial lamellae narrowly connected dorsally behind cerci. Left epandrial lamella (Fig. 11) shorter than hypandrium and partially overlapping its left side, posterior margin with projecting surstylar lobes and ventral epandrial process, ventral edge broadly rounded and fused with hypandrium but margin distinct; ventral epandrial process articulated at base, basal 2/3 of uniform width, with narrow hook-like tip, medial surface with short dentiform projection near mid-length. Left surstylus divided into dorsal and ventral lobes separated by U-shaped cleft through which left postgonite lobe protrudes. Dorsal lobe of left surstylus with dorsolateral tubercle bearing prominent blade-like prensiseta, subtended by thin medial flap-like lobe with rounded dorsal edge; posteromedially with pair of lobes (hidden behind postgonite lobe), dorsal lobe thumb-like with pair of dorsal setae, ventral lobe globular with 1 basal seta. Ventral lobe of left surstylus projecting medially behind postgonite lobe, as long as dorsal surstylar lobe, digitiform with 5 apical setae (some occasionally with branched tip). Right epandrial lamella (Fig. 12) shorter than hypandrium and partially overlapping its right side, longer than high, ventral edge broadly rounded and fused with hypandrium but margin distinct; ventral epandrial process absent. Right surstylus divided into dorsal and ventral lobes separated by U-shaped cleft through which right postgonite lobe protrudes. Dorsal lobe of right surstylus thumb-like bearing prominent blade-like prensiseta laterally, 2 adjacent lateral setae and 1 medial seta, subtended by thin medial flap-like lobe with rounded dorsal edge. Ventral lobe of right surstylus projecting dorsomedially behind postgonite lobe, similar in length and breadth to dorsal surstylar lobe, with several setae on posterior surface. Hypandrium (Figs 7, 11, 12) reniform, large, longer than epandrium in lateral view, bare except for pair of short posterior setae. Left postgonite lobe globular basally with bifid apex projected medially (best seen in dorsal view, Fig. 10), inner lobe thumb-like, outer lobe tapered to pointed tip (Fig. 11). Right postgonite lobe similar in size and form to left lobe (Figs 10, 12). Phallus (Figs 13–15) long and convoluted, basal portion tubular with S-shaped double curve giving rise to inflated curve in middle portion, followed by straight, tubular apical portion, apical portion with basal kink, angled to right in posterior view (Fig. 15). Ejaculatory apodeme large, keel-like, with pointed posterior margin and rounded anterior margin (like a bearded axe head). Hypoproct simple, left and right lobes symmetrical, broad and flap-like with a few tiny setae. Cercus membranous and sac-like laterally, sclerotized medially with setose conical mound dorsally and apically tapered process ventromedially, left and right cercus symmetrical (similar to Fig. 38).



FIGURES 11–16. Hypopygium of *Microphorella acroptera* Melander and *M. subacroptera* sp. nov. 11. Hypopygium of *M. acroptera* (CNC1155812), left lateral. 12. Same, right lateral. 13. Phallus and ejaculatory apodeme of *M. acroptera* (CNC1155834), left lateral. 14. Same, right lateral. 15. Same except, isolated posterior view of phallus. 16. Right dorsal surstylus of *M. subacroptera* sp. nov. paratype (CNC1155816), lateral view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; ej apod—ejaculatory apodeme; epand—epandrium; hypd—hypandrium; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Female. Similar to male except as follows: **Head:** Face and clypeus apparently slightly broader, broader than $2 \times$ width of anterior ocellus. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without prominent anteroventral row of setae. **Abdomen:** Apical segments retractable into segment 5. Tergite 5 with cluster of stout medial setae. *Terminalia*: Tergite 6 with setae on posterior margin unmodified (*i.e.*, not forming prominent row of long, stout setae). Syntergite 9+10 medially divided into hemitergites, with 3–4 acanthophorous spines on each side; cercus sclerotized, pointed apically, with a few short ventral setae.

Distribution and seasonal occurrence. This species as currently recognized, is known from eastern Washington, western Oregon, and northern, central and southern California (Fig. 100). Specimens were collected from March to July.

Remarks. In addition to the types from Pullman, Washington, Melander (1928) mentioned specimens from San Jose and Berkeley Hills, California. The specimens from San Jose were not found in the holdings of the USNM, and the Berkeley Hills specimens, collected by E.T. Cresson Jr on April 11, 1908, are females, which do not appear to be conspecific with *M. acroptera*. Males from both localities are needed to confirm these distributional records. The specimens from northern California (Eighteenmile Creek) and Oregon (Floras Creek) are less dark in colour, especially on the thorax and halters, than other specimens of *M. acroptera*, although this could just be an artifact of being critical point dried, unlike most of the other known material. These three specimens have been sequenced and the one from California has a different Barcode Index Number (BIN) than the two from Oregon. The Floras Creek male (CNC DIPTERA 105201) has terminalia that are nearly identical to other *M. acroptera*, but with a pair of stronger posterior hypandrial setae and a dorsal surstylus prensiseta with a longer narrowly tapered apex. It is therefore possible, that the current concept of *M. acroptera* includes the presence of additional cryptic species. A photograph of one of the males from Oregon was published in Cumming & Brooks (2022, fig. 28).

The newly described species, *M. subacroptera* **sp. nov.** and *M. triangulata* **sp. nov.**, are apparently closely related to *M. acroptera* based on their very similar hypopygial morphology.

Microphorella bifida sp. nov.

urn:lsid:zoobank.org:act:9E930F53-FBF6-4ECF-864C-3182FD66343D (Figs 17–20, 25–28, 101)

Type material. HOLOTYPE, \Diamond (Fig. 17) labelled: "RiversideCAL| 17 Mar. 35| ALMelander"; "ALMelander] Collection| 1961"; "HOLOTYPE| *Microphorella*| *bifida*| Brooks & Cumming" [red label] (USNM). **PARATYPES: USA: California:** *Riverside County*: same data as holotype [33°58'N 117°22'W] ($4\Diamond$, 1 \bigcirc , USNM); same data as holotype except, CNC1155804 ($1\Diamond$, USNM); same data except, 10.ii.1935 ($1\Diamond$, 1 \bigcirc , USNM); same data except, 22.ii.1935 ($6\Diamond$, 1 \bigcirc , USNM); same data except, CNC1155806 ($1\Diamond$, 1 \bigcirc , USNM); same data except, 24.ii.1935 ($15\Diamond$, 8 \bigcirc , USNM); same data except, 20.1155806 ($1\Diamond$, USNM); same data except, 24.ii.1935 ($15\Diamond$, 8 \bigcirc , USNM); same data except, 20.1935 ($1\Diamond$, USNM); same data except, 21.01935 ($1\Diamond$, USNM); same data except, 25.v.1942 ($1\heartsuit$, USNM); same data except, 10.iv.1944 ($1\Diamond$, $1\heartsuit$, USNM); same data except, 11.iv.1951 ($6\Diamond$ mounted as pairs on three pins, USNM).

Other material examined. USA: Arizona: *Mohave County*: Littlefield [36°53'14"N 113°55'47"W], B-9 1931, 27.iii.1931, *Chrysothamnus speciosus*, 2018, CNC1155831 (1Å, USNM). **California:** *Fresno County*: 10 mi. E Mercy Hot Springs [36.7044°N 120.8595°W], 25.iii.1985, L.G. Bezark (1Å, UCDC). *Monterey County*: Arroyo Seco Campground [36.2359°N 121.4816°W], 26.iv.1998, M. & P.H. Arnaud, Jr, CNC487295 (1Å, USNM); Carmel Valley, Hastings Natural History Reservation [36.3795°N 121.5626°W], *ca* 1750 ft, 19.vi.1998, P.H. Arnaud, Jr & M.M. Arnaud, Arnaud Flight Trap over Big Creek, Collection No. 01958-A (1Å, 2♀, USNM); same data except, CNC487293 (1♀, USNM); same data except, 20.vi.1998, Collection No. 01959-A (1♀, USNM); Paraiso Hot Springs [36.3314°N 121.3688°W], 13 km SW Soledad, 400 m, 20/21.iv.1974, P.H. Arnaud, Jr (2♀, USNM); same data except, 29.v.1977 (1♀, USNM); same data except, 30.v.1977 (2♀, USNM). *Riverside County*: Agua Caliente Indian Reservation, Palm Canyon [33°46'N 116°34'W], 2.iv.1980, P.H. Arnaud, Jr (2♂, 1♀, USNM); Cathedral Canyon [33°45'N 116°32'W], 3.iv.1945, A.L. Melander (2♂, 1♀, USNM); 1000 Palms Oasis [33°50'N 116°18'W], Thousand Palms, 30.iii.1955, W.R. Richards (1Å, CNC). *San Diego County*: Julian [33°04'N 116°36'W], 5.v.1945, A.L. Melander (2♂, USNM). *Stanislaus County*: Frank Raines Co. Park [37°25'N 121°22'W], Del Puerto

Canyon, 15.v.1971, M. Wasbauer, CNC1155824 (1³, CSCA). *Ventura County*: Wheeler's Sprgs [34.5084°N 119.2915°W], 15.vi.1948, W.W. Wirth (1³, EMEC).



FIGURES 17–24. Habitus, abdomen and hindleg of *Microphorella bifida* sp. nov., *M. convoluta* sp. nov., *M. paracroptera* sp. nov. and *M. serpentina* sp. nov. 17. Habitus of *M. bifida* sp. nov. male holotype 18. Male hindleg and abdomen of *M. bifida* sp. nov. paratype, right lateral view, arrow indicates trochanter tubercle. 19. Process of male abdominal sternite 5 (macerated) of *M. bifida* sp. nov. (CNC1155824), posterior view. 20. Female abdomen of *M. bifida* sp. nov. paratype, left lateral view of posterior segments. 21. Male hindleg of *M. convoluta* sp. nov. holotype, anteroventral view of basal segments, arrow indicates trochanter tubercle. 22. Same except, hind tibia and tarsus, lateral view, arrow indicates spur-like seta on basitarsus. 23. Male hindleg, thorax and abdomen of *M. paracroptera* sp. nov. holotype, left lateral view, arrow indicates trochanter tubercle. 24. Male hindleg of *M. serpentina* sp. nov. paratype, posterior view, arrow indicates trochanter tubercle.



FIGURES 25–28. Hypopygium of *Microphorella bifida* sp. nov. 25. Hypopygium (CNC1155831), left lateral view. 26. Same (CNC1155824), right lateral view. 27. Phallus (CNC1155824), ventral view. 28. Cerci (CNC1155831), dorsal view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; hypd—hypandrium; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Diagnosis. Males of this species can be distinguished from other members of the *M. acroptera* species group by the following combination of characters: acrostichal setae well-developed, biserial; hind basitarsus without basiventral spur-like seta; halter dark brown (Fig. 17); hind trochanter with tubercle cylindrical or weakly clavate (Fig. 18); face with sides subparallel; hypandrium large and bulbous (Figs 18, 25, 26); dorsal lobe of surstylus with pair of prensisetae (1 disc-like, 1 blade-like, Figs 25, 26); cercus with bifid lateral lobe (Fig. 28).

Description. Male (Figs 17–19, 25–28): Wing length 1.7–2.0 mm. Similar to *M. acroptera* except as follows:

Head (Fig. 17): Face and clypeus slightly broader, broader than 2× width of anterior ocellus; antenna with arista-like stylus shorter, $1.25-1.3 \times$ length of postpedicel. Thorax: Acrostichals biserial, with well-developed rows extending to prescutellar depression; 7–9 dorsocentrals; area laterad dorsocentrals more extensively covered with small setae. Legs: Hindleg: Trochanter with tubercle cylindrical or weakly clavate with rounded apex (Fig. 18), apical spine-like seta with sharply pointed tip; femur sometimes with anteroventral row of setae longer than femur width, especially basally. Wing: As in description of *M. acroptera*. Abdomen (Fig. 18): Blackish with weak metallic green tinge. Sternite 5 with broad ventral projection (Fig. 19), narrower basally with more developed lateral lobes, bilobate or trilobate (with medial lobe present). Hypopygium (Figs 18, 25-28): Left epandrial lamella (Fig. 25) with ventral epandrial process roughly uniform in width, apex bifid, divided into a pair of similar claw-like processes, medial surface lacking projection. Dorsal lobe of left surstylus with broad, truncate dorsolateral lobe bearing 2 prominent prensisetae (upper one disc-like, lower one blade-like) and 1 long posterior seta; medioventrally with tubercle bearing sinuous seta and broad adjacent lobe. Ventral lobe of left surstylus as long as dorsal lobe, somewhat flattened, curved medially, apex slightly broader bearing 5 setae. Right epandrial lamella (Fig. 26) with dorsal lobe of surstylus broad and truncate (similar to left side), bearing 2 prominent prensisetae (upper one disc-like, lower one blade-like), 1 lateral seta near ventral prensiseta and 1 posterior seta. Ventral lobe of right surstylus as long as dorsal lobe, medially curved at base with apex projecting dorsally and somewhat clavate, with several setae on posterior surface. Phallus (Figs 26, 27) long and convoluted, with curving tubular basal portion, inflated and protruding middle portion (with small dentiform process on outer surface), tapering into relatively short tubular apical portion. Cercus (Figs 25, 26, 28) with bifid lateral lobe projecting dorsally from cercal base, outer process of lobe conical and half as long as clavate inner process which bears several prominent setae; with rounded flap-like medioventral lobe.

Female (Fig. 20). Similar to male except as follows: **Head:** Face and clypeus slightly broader, broader than $2.5 \times$ width of anterior ocellus; antenna with arista-like stylus slightly shorter, about $1.15 \times$ length of postpedicel. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without prominent anteroventral row of setae. **Abdomen:** As in description of *M. acroptera*.

Distribution and seasonal occurrence. This new species is known from northwestern Arizona and also California, from Stanislaus County south to San Diego County (Fig. 101). Specimens were collected from February to June.

Etymology. This species is named for the diagnostic bifid structure of the male cercus (Fig. 28).

Remarks. This species appears to be closely related to *M. sinuosa* **sp. nov.**, with which it shares very similar hypopygial morphology, especially in the structure of the dorsal surstylar lobes, phallus and cercus (Figs 25–28, 52–55).

Males from the northern part of the species range in California (*i.e.*, Arroyo Seco Campground, Carmel Valley, 10 mi. E Paraiso Hot Springs, Mercy Hot Springs and Del Puerto Canyon, Fig. 101) have longer anteroventral setae on the hind femur. However, the hypopygial morphology of this northern group appears similar to that of the specimens from the southern part of California and Arizona that have shorter anteroventral setae on the hind femur.

Microphorella convoluta sp. nov.

urn:lsid:zoobank.org:act:0FD45154-9404-44C0-A0F0-2CF7DD9880AC (Figs 21, 22, 29–31, 100)

Type material. HOLOTYPE, ♂ labelled: "Onefour, Alta. |49°6', 110°24'|4.VI.1955|J.R. Vockeroth"; "HOLOTYPE| *Microphorella*| *convoluta*| Brooks & Cumming" [red label]; "CNC| 1155851" [white label with blue border, text duplicated on underside] (CNC). **PARATYPE: USA: Montana:** *Valley County*: Duncan Rd, alkali area, 48.81786°N 107.09033°W, 21–22.vi.2023, bee bowls, M. Campano, P. Watkins (1♂, MTEC).

Diagnosis. Males of this species can be distinguished from other members of the *M. acroptera* species group by the following combination of characters: hind trochanter with rounded, globular tubercle (Fig. 21); hind basitarsus with upturned basiventral spur-like seta (Fig. 22); halter brown; postpedicel bulb-shaped; cercus with narrow, dorsally-projecting lobe (Figs 29–31); dorsal lobe of surstylus with 3–4 prensisetae (Figs 29, 30); apical portion of phallus (distal to inflated part) elongate, with U-shaped curve protruding posteriorly.



FIGURES 29–31. Hypopygium of *Microphorella convoluta* sp. nov. holotype. 29. Hypopygium, right lateral view. 30. Same, left lateral view. 31. Cerci, dorsal view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Description. Male (Figs 21, 22, 29–31): Wing length 1.6 mm. Similar to *M. acroptera* except as follows: Head: Face tapered ventrally, about $1.3 \times$ width of anterior ocellus at narrowest point in middle; antenna with arista-like stylus shorter, subequal to length of postpedicel. Thorax: Setae relatively weak; acrostichals biserial, short, extending to prescutellar depression; 6 dorsocentrals. Legs: *Hindleg*: Trochanter (Fig. 21) with tubercle rounded and globular; basitarsus (Fig. 22) with tiny, upturned, basiventral spur-like seta. Wing: As in description of *M. acroptera*. Abdomen: Sternite 5 with apically pointed subtriangular projection. *Hypopygium* (Figs 29–31): Left epandrial lamella (Fig. 30) as long as hypandrium, ventral margin mostly distinct, fading into hypandrium anteriorly; ventral epandrial process gradually tapering to bluntly pointed apex, with pointed projection arising near mid-length about 1/3 as long as process. Dorsal lobe of left surstylus (Fig. 30) with 3 blade-like prensisetae dorsolaterally near base, apex of lobe tapered to point, with rounded medioventral projection bearing curved seta (not visible in Fig. 30). Ventral lobe of left surstylus as long as dorsal lobe, with long seta near mid-length and a few smaller setae apically. Right epandrial lamella (Fig. 29) nearly as long as hypandrium, ventral margin mostly distinct, fading into hypandrium anteriorly. Dorsal lobe of right surstylus short with rounded margin, bearing 4 prominent blade-like prensisetae. Ventral lobe of right surstylus long and relatively narrow, about $3 \times$ longer than dorsal lobe, with a few setae on posterior surface. Hypandrium (Figs 29, 30) ovoid, large, as long as epandrium in left lateral view, slightly longer than epandrium in right lateral view. Phallus (Figs 29, 30) long and convoluted, with curving tubular basal portion, inflated middle portion, and long J-shaped tubular apical portion bearing tiny spines preapically. Ejaculatory apodeme about half as wide as in *M. acroptera*, anterior margin straight. Cercus (Figs 29–31) with broad base bearing a few prominent setae, with narrow, dorsally projecting lateral lobe and short flap-like posteromedial lobe.

Female. Unknown.

Distribution and seasonal occurrence. This new species is only known from Onefour in southeastern Alberta and Valley County in northeastern Montana (Fig. 100). Specimens were collected in June.

Etymology. This species is named for the convoluted basal part of the phallus, a characteristic feature of the *M*. *acroptera* lineage.

Remarks. The paratype was collected from an alkali area, which was presumably an arid habitat.

Microphorella paracroptera sp. nov.

urn:lsid:zoobank.org:act:6D864BBC-62F0-4503-9C46-C53B2D32F5C5 (Figs 3, 23, 32, 33, 36–40, 102)

Type material. HOLOTYPE, \Diamond (Fig. 32) labelled: "NEVADA: Nye Co.| Ash Meadow NWR| N36°27.64' W116°20.79'| y[e]llow pans nr *Stanleya*| 23.iv.2014, 670m| JB Runyon, CM Delphia"; "HOLOTYPE| *Microphorella*| *paracroptera*| Brooks & Cumming" [red label] (CNC). **PARATYPES: USA: Nevada:** same data as holotype (4 \Diamond , 2 \bigcirc , CNC); same data as holotype except, CNC1155811 (1 \Diamond , CNC).

Other material examined. USA: California: Imperial County: jct Boyd & Whitlock Rds, 32°54'9"N 115°17'26"W, 18.iii.2015, E. Natwick, PT(1∂, UCRC). Inyo County: Amargosa R at Tecopa, 35°50.96'N 116°13.85'W, 12.iv.2014, 1300 ft, J.B. Runyon (13, CNC); Death Valley, Saratoga Sprgs [35.68219°N 116.42306°W], 19.iii.1955 (13, LACM). Riverside County: Thousand Palms, Thousand Palms Oasis [33°50'N 116°18'W], 10.iii.1955, W.R.M. Mason (13, CNC); same data except, 18.iii.1955 (33, CNC); same data except, 7.iii.1955, J.C. Hall (13, UCDC); Thousand Palms, Willis Palms Oasis [33°49'N 116°19'W], 8.iii.1955, W.R. Richards (5♂, CNC); same data except, CNC1155809 (1∂, CNC); Thousand Palms Cyn, 18.iii.1964, P. Rauch (1♀, UCRC); R.R. Cyn, 4 mi. Elsinore [33.67195°N 117.27122°W], 17.iv.1965, P. Turner (13, EMEC). San Bernardino County: Kelbaker Rd, 10.6 mi. SE Baker [35.24689°N, 115.891568°W], 29.iii.1993, P.H. Arnaud, Jr & M.M. Arnaud, swp flowers/foliage Isomeris arborea Nutt., Collection No. 00903 (19, USNM); 9 air mi. S Baker, sand dunes S Zzyzx Sprs, 27.iv.1977, Buegler, lizard dung (1[♀], EMEC); Soda Dry Lake, vicinity of Baker, Zzyzx Rd [35°08'N 116°06'W], 28/30.iii.1993, P.H. Arnaud, Jr, S.M.C. Arnaud & M.M. Arnaud, Collection No. 00902 (2∂, 5♀, USNM); Soda Springs (Zzyzx Springs), S of Baker [35°08'N 116°06'W], 9–11.iv.1990, #00210, P.H. Arnaud, Jr (45∂, 13♀, USNM); Zzyzx Desert Study Area [35°08'N 116°06'W], 12 mi. SE Baker, adjacent Soda Lake, 16/17.ii.1995, 930 ft, P.H. Arnaud, Jr & M.M. Arnaud, Arnaud flight trap, Collection # 01265 (13, USNM); same data except, 18.ii.1995, Collection # 01266 (53, 4♀, USNM). Nevada: Nye County: Ash Meadow NWR, Carson Slough, 36°25.51'N 116°21.90'W, 24.iv.2014, J.B. Runyon (1∂, CNC); Ash Meadow NWR, Indian Garden Springs outlet at Longstreet Rd, 36°28.05'N 116°19.58'W, 30.iii.2018, J.B. Runyon (13, CNC); Ash Meadow NWR, Kings Spring, 36°24.09'N 116°16.44'W, 2315 ft, 31.iii.2018, J.B. Runyon (3♂, CNC); Ash Meadow NWR, Peterson Reservoir, 36°26.70'N 116°21.01'W, 23.iv.2014, J.B. Runyon (5♂, 1♀, CNC); Amargosa River, 1 mi. S Beatty, 36°53.46'N 116°45.02'W, 3200 ft, 2.iv.2018, J.B. Runyon (2^{\uparrow}_{\circ} , CNC).

Diagnosis. Males of this species can be distinguished from other members of the *M. acroptera* species group by the following combination of characters: halter pale yellow (Fig. 32); wing vein CuA+CuP unmodified; antenna with stylus longer than bulb-shaped postpedicel; hind basitarsus without basiventral spur-like seta; hypopygium relatively small (Fig. 33); hypandrium with anterior end tapered and broadly conical (Figs 36, 37); phallus (Figs 36, 37, 39, 40) without U-shaped portion protruding posteriorly from hypopygium.



FIGURES 32–35. Male habitus and abdomen of *Microphorella paracroptera* sp. nov. and *M. serpentina* sp. nov. 32. Habitus of *M. paracroptera* sp. nov. holotype. 33. Abdomen of *M. paracroptera* sp. nov. (jct Boyd & Whitlock Rds, Imperial Co., California), right lateral view. 34. Habitus of *M. serpentina* sp. nov. holotype. 35. Posterior end of thorax and abdomen of *M. serpentina* sp. nov. paratype, right lateral view.

Description. Male (Figs 23, 32, 33, 36–40): Wing length 2.1–2.4 mm. Similar to M. acroptera except as follows: Head (Fig. 32): Face and clypeus slightly narrower, about 1.75× width of anterior ocellus. Thorax (Fig. 32): Dorsum blackish metallic green with violet tinges, bronze along and laterad dorsocentrals; acrostichals biserial, weak, extending to prescutellar depression or ending before, sometimes sparse and irregular; 5-6 dorsocentrals; halter pale yellow (Figs 23, 32). Wing: As in description of *M. acroptera*. Abdomen (Figs 32, 33): Sternite 5 with broad ventral trilobate projection (similar to Fig. 46). *Hypopygium* (Figs 33, 36–40): relatively small, about 1/3 as long as abdomen. Left epandrial lamella (Fig. 36) slightly shorter than hypandrium; ventral epandrial process with basal 3/4 of uniform width, with narrow hook-like tip, medial surface with pointed projection near mid-length. Dorsal lobe of left surstylus with dorsal posteromedial lobe slightly longer and narrower. Right epandrial lamella (Fig. 37) slightly shorter than hypandrium. Dorsal lobe of right surstylus broad and irregular in shape, with prensiseta well separated from pair of lateral setae. Ventral lobe of right surstylus longer and narrower than dorsal surstylar lobe, with several setae on posterior surface. Hypandrium (Figs 36, 37) ovoid and relatively small, anterior end tapered and broadly conical. Phallus (Figs 39, 40) identical to M. acroptera except, with inflated curve in middle portion slightly larger (best observed in posterior view). Ejaculatory apodeme with rounded anterior margin less developed. Hypoproct larger, left and right lobes symmetrical, with subquadrate apicolateral projection (Fig. 36). Cercus more robust and larger, prominently projecting dorsally from hypopygium.



FIGURES 36–40. Hypopygium of *Microphorella paracroptera* sp. nov. 36. Hypopygium (CNC1155811), left lateral view. 37. Same, right lateral view. 38. Same, dorsal view. 39. Phallus (CNC1155809), left lateral view. 40. Same, right lateral view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; hypd—hypandrium; hyprct—hypoproct; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Female. Similar to male except as follows: **Head:** Face and clypeus slightly broader, broader than $2 \times$ width of anterior ocellus. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without prominent anteroventral row of setae. **Abdomen:** As in description of *M. acroptera*.

Distribution and seasonal occurrence. This new species is known from southwestern Nevada (Fig. 3) and eastern California, from Inyo County south to Imperial County (Fig. 102). Specimens were collected from February to April.

Etymology. This species is named for its similarity to *M. acroptera*.

Remarks. *Microphorella paracroptera* **sp. nov.** is primarily restricted to Mojave (Fig. 3) and Sonoran Desert oasis habitats.

Microphorella serpentina sp. nov.

urn:lsid:zoobank.org:act:AB879159-FA6B-4F85-B310-B3B237D0BE47 (Figs 24, 34, 35, 41–46, 104)

Type material. HOLOTYPE, ♂ (Fig. 34) from Andreas Canyon, California, labelled: "AndreasCan| 1/IV/45CAL| ALMelander"; "ALMelander| Collection| 1961"; "HOLOTYPE| *Microphorella*| *serpentina*| Brooks & Cumming" [red label] (USNM). **PARATYPES: USA: California:** *Riverside County*: same data as holotype [33.7694°N 116.5394°W] (1♂, USNM); same data except, CNC1155814 (1♂, USNM); same data except, 10.iv.1956 (1♂, USNM); same data except, Andreas Canyon, Palm Springs, 4.iv.1955, W.R. Richards (1♂, CNC); Palm Springs, 1.iv.1945, A.L. Melander (1♀, USNM).

Other material examined. USA: California: *Monterey County*: Arroyo Seco, The Lakes [36°14'N 121°28'W], 12.iv.1997, Arnaud flight trap, Collection 01737-A, P.H. Arnaud, Jr & M.M. Arnaud (1♂, USNM); 5 air mi. SW Greenfield, Arroyo Seco River [36°16'55"N 121°18'57"W], 400 ft, 8.v.1975, E. Rogers, flight trap, EMEC 1188817, CNC1155828 (1♂, EMEC). *Riverside County*: Agua Caliente Ind. Res., Palm Canyon [33°46'N 116°34'W], 2.iv.1980, P.H. Arnaud, Jr, CNC1155813 (1♂, USNM); R.R. Cyn, 4 mi. Elsinore [33°40N 117°14W], 14.iv.1965, C.A. Toschi (1♂, EMEC). *San Diego County*: Alpine [32°50'4"N 116°46'14"W], 8.iv.1915, M.C. Van Duzee (1♂, CAS).

Diagnosis. Males of this species can be distinguished from other members of the *M. acroptera* species group by the following combination of characters: halter pale yellow (Fig. 35); wing vein CuA+CuP unmodified; antenna with stylus longer than bulb-shaped postpedicel; hind basitarsus without basiventral spur-like seta; hypopygium (Figs 34, 35, 41, 42) large with bulbous hypandrium; phallus with U-shaped curve protruding posteriorly (Figs 41, 42, 44, 45).

Description. Male (Figs 24, 34, 35, 41–46): Wing length 2.1–2.3 mm. Similar to *M. acroptera* except as follows: **Head** (Fig. 34): Face and clypeus slightly narrower, about 1.75× width of anterior ocellus. **Thorax:** Blackish and shiny with dark metallic green tinge in lateral view, dorsum dark metallic green and shiny; 5–6 dorsocentrals; halter pale yellow (Figs 34, 35). **Wing:** As in description of *M. acroptera*. **Abdomen** (Figs 34, 35): Blackish brown. Sternite 5 with broad ventral trilobate projection (Fig. 46). *Hypopygium* (Figs 35, 41–46): Left epandrial lamella (Fig. 41) slightly shorter than hypandrium, relatively large and expanded ventrally; ventral epandrial process with weak ventral bend, with shorter hook-like tip, medial surface with short blunt-tipped projection near mid-length or preapically. Dorsal lobe of left surstylus with thick seta laterally (not developed as blade-like prensiseta set on a tubercle). Right epandrial lamella (Fig. 42) with dorsal lobe of right surstylus broad and truncate (with posterior margin shallowly concave), bearing prominent blade-like lateral prensiseta proximal to pair of lateral setae, 1 medial seta opposite lateral pair. Ventral lobe of right surstylus longer and narrower than dorsal surstylar lobe, with several setae on posterior surface. Phallus (Figs 42, 44, 45) long and convoluted, basal portion tubular with S-shaped double curve giving rise to weakly inflated middle portion, followed by elongate apical portion with U-shaped curve protruding posteriorly. Hypoproct lobes projecting and more robust (Fig. 43). Cercus (Fig. 43) relatively small.

Female. Similar to male except as follows: **Head:** Face and clypeus apparently slightly broader, broader than $2 \times$ width of anterior ocellus. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without prominent anteroventral row of setae. **Abdomen:** Apical segments retractable into segment 5. Tergite 5 with cluster of stout medial setae, other features not observable (abdomen of unique female paratype not dissected).



FIGURES 41–46. Male terminalia of *Microphorella serpentina* **sp. nov. 41.** Hypopygium (CNC1155814), left lateral view. 42. Same, right lateral view. 43. Cerci and hypoproct (CNC1155828), dorsal view. 44. Phallus (CNC1155828), left lateral view. 45. Same, right lateral view. 46. Sternite 5 (CNC1155813), ventral view. Abbreviations: cerc—cercus; epand—epandrium; hypd—hypandrium; hyprct—hypoproct; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Distribution and seasonal occurrence. This new species is known from Riverside and San Deigo Counties in southern California and Monterey County in central California (Fig. 104). Specimens were collected during April and May.

Etymology. This species is named for the serpentine basal part of the phallus, a characteristic feature of the *M*. *acroptera* lineage.

Microphorella sinuosa sp. nov.

urn:lsid:zoobank.org:act:BB526468-87E3-47EC-9532-A798162EB0C4 (Figs 47–55, 102)

Type material. HOLOTYPE, ♂ (Fig. 47) labelled: "Malaise Trap| Lily Pond [37°56'N 122°38'W], 1500'[ft.]| Alpine Lk., Marin| Co., Cal. 6| VII.70"; "HOLOTYPE| *Microphorella*| *sinuosa*| Brooks & Cumming" [red label] (UCDC). See Remarks. **PARATYPES: USA: California:** *Contra Costa County*: Briones Reg. Park at Alhambra Valley Rd [37°57'N 122°08'W], 20.iii.1978, D.D. Wilder (1♂, CAS). *Mendocino County*: Hopland Field Station [39°00'N 123°04'W], Kelsey Cab. Orch. Area, 2600–2800 ft., 1.v.1982, N. Stone, EMEC 1188818 (1♂, EMEC). *Monterey County*: Horse Bridge, 1.5 air mi. SW Arroyo Seco Grd Sta. [36°14'N 121°28'W], 3–8.v.1975, E. Rogers, EMEC 1188815 (1♂, EMEC); same data except, EMEC 1188491, CNC1155836 (1♂, EMEC). *Sacramento County*: Elk Grove [38°24'N 121°22'W], 18.iv.1952, E.C. Carleson (4♂, 6♀, UCDC); same data except, CNC1155829, CNC1155830 (2♂, UCDC). *Santa Barbara County*: Los Prietos [34.5416°N 119.8020°W], 14.iii.1967, *Ceanothus*, J. Powell, EMEC 1189165, CNC1155835 (1♂, EMEC). *Santa Clara County*: creek along Sanborn Rd, 2.7 km SE Congress Springs Rd [37°13'N 122°03'W], ca. 440 m, 14.iv.1974, P.H. Arnaud, Jr (1♂, USNM).

Diagnosis. Males of this species can be distinguished from other members of the *M. acroptera* species group by the following combination of characters: acrostichal setae well-developed, biserial; hind basitarsus without basiventral spur-like seta; halter dark brown (Fig. 51); hind trochanter with cylindrical tubercle; face with sides subparallel; hypandrium large and bulbous (Figs 52, 53); dorsal lobe of surstylus with pair of prensisetae (1 disc-like, 1 blade-like, Figs 52, 53); cercus with digitiform lateral lobe (Fig. 55).

Description. Male (Figs 47–55): Wing length 2.4–2.8 mm. Similar to *M. acroptera* except as follows: Head (Fig. 47): Face and clypeus slightly broader, about 2.25× width of anterior ocellus. Thorax: Acrostichals biserial, with well-developed rows extending to prescutellar depression; 7-8 dorsocentrals; area laterad dorsocentrals usually more extensively covered with small setae. Legs: Hindleg: Trochanter tubercle with spine-like seta shorter with sharply pointed tip (Figs 48, 51). Wing: As in description of *M. acroptera*. Abdomen (Figs 49–51): Sternite 5 with broad ventral bilobate projection (Figs 49-51), with elongate, digitiform, spiny lateral lobes. Hypopygium (Figs 49, 51–55): Left epandrial lamella (Fig. 52) slightly shorter than hypandrium; ventral epandrial process with bifurcate apex and pair of small setae borne on tubercles, bifurcation variable, with processes similar in size and adjacent to each other (Fig. 54), or of different sizes and divergent (Figs 51, 52). Dorsal lobe of left surstylus with broad, truncate dorsolateral lobe bearing 2 prominent prensisetae (upper one disc-like, lower one blade-like) and 1 long posterior seta; medioventrally with tubercle bearing sinuous seta and broad adjacent lobe. Ventral lobe of left surstylus slightly longer than dorsal lobe, with shallowly bilobate apex (best seen in posterior view), outer lobe bearing 2 setae, inner lobe bearing 3 setae (one of which is branched apically). Right epandrial lamella (Fig. 53) with ventral margin mostly distinct, fading into hypandrium anteriorly. Dorsal lobe of right surstylus broad and truncate (similar to left side), bearing 2 prominent prensisetae (upper one disc-like, lower one blade-like), 1 lateral setae posterior to ventral prensiseta and 1 seta medially. Ventral lobe of right surstylus as long as dorsal lobe, medially curved at base with apex projecting dorsally and expanded, with several setae on posterior surface. Phallus (Figs 52, 53) long and convoluted, basal portion tubular with S-shaped double curve, followed by inflated and protruding apical portion which gradually tapers to tip, with small dentiform process near base of inflated portion and second process preapically. Cercus (Figs 52, 53, 55) with digitiform lateral lobe projecting dorsally from cercal base.

Female. Similar to male except as follows: **Head:** Face and clypeus apparently slightly broader, broader than $2.5 \times$ width of anterior ocellus. Legs: *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without prominent anteroventral row of setae. Abdomen: As in description of *M. acroptera*.

Distribution and seasonal occurrence. This new Californian species is known from southern Mendocino County south to Monterey County and east to Sacramento County (Fig. 102). Specimens were collected from March to July.

Etymology. This species is named for the sinuous basal part of the phallus, a characteristic feature of the *M*. *acroptera* lineage.

Remarks. This species appears to be closely related to *M. bifida* **sp. nov.**, with which it shares very similar hypopygial morphology, especially in the structure of the dorsal surstylar lobes, phallus and cercus (Figs 25–28, 52–55).

The holotype (Fig. 47) is a well-preserved critical point dried specimen in excellent condition, but lighter in colouration than the paratypes, presumably as a result of storage in ethanol for some time prior to drying.



FIGURES 47–51. Male habitus, hindleg and abdomen of *Microphorella sinuosa* **sp. nov. 47**. Habitus of holotype. **48**. Legs of holotype, left lateral view, arrow indicates trochanter tubercle. **49**. Abdomen of holotype, dorsal view, arrow indicates process of sternite 5. **50**. Process of sternite 5 (CNC1155835), posterior view. **51**. Abdomen and right hindleg of paratype (Elk Grove, California), lateral view, arrows indicate trochanter tubercle and process of sternite 5.



FIGURES 52–55. Hypopygium of *Microphorella sinuosa* sp. nov. 52. Hypopygium (CNC1155830), left lateral view. 53. Same, right lateral view. 54. Tip of ventral epandrial process (CNC1155835, CNC1155836), left lateral view. 55. Cerci (CNC1155836), dorsal view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; hypd—hypandrium; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Microphorella subacroptera sp. nov.

urn:lsid:zoobank.org:act:009C4AAA-CAD2-4F84-9B69-D962E7FEE3A8 (Figs 1, 16, 56, 57,102)

Type material. HOLOTYPE, 👌 from South Fork Santa Ana River, California, labelled: "SFKSSTAANA |

18/6/45CAL| ALMELANDER"; "ALMelander| Collection| 1961"; "HOLOTYPE| *Microphorella*| *subacroptera*| Brooks & Cumming" [red label] (CNC). **PARATYPE: USA: California:** *San Bernardino County*: same data as holotype [34°10'N 116°49'W] except, CNC1155816 (1승, USNM).

Other material examined. USA: California: *Kern County*: Mt. Pinos [34°48'46"N 119°08'43"W], 2550 m, 3–4.vi.1992, A. Goering, J. Skevington, Malaise, Iris meadow (1³, DEBU).

Diagnosis. Males of this species can be distinguished from other members of the *M. acroptera* species group by the following combination of characters: hind basitarsus with upturned basiventral spur-like seta (Fig. 57); halter brown (Fig. 56); hind trochanter with cylindrical tubercle (similar to Fig. 8); antenna with stylus longer than bulb-shaped postpedicel; hypopygium very similar to *M. acroptera* (see Figs 11–16).

Description. Male (Figs 16, 56, 57): Wing length 1.8-1.9 mm. Similar to *M. acroptera* except as follows: Head (Fig. 56): Face and clypeus apparently narrower, about $1.3 \times$ width of anterior ocellus; antenna with arista-like stylus slightly shorter, $1.45 \times$ length of postpedicel. Thorax: Blackish and shiny in lateral view, dorsum blackish-bronze and shiny; acrostichals weak, biserial or mostly absent; 5–6 dorsocentrals. Legs: *Hindleg*: Basitarsus (Fig. 57) with tiny, upturned, basiventral spur-like seta. Wing: As in description of *M. acroptera*. Abdomen (Fig. 56): Sternite 5 apparently with ventral projection, membranous medially (damaged in dissections and not readily observable on holotype). *Hypopygium*: Dorsal lobe of left surstylus with dorsolateral tubercle bearing thick seta (not developed as blade-like prensiseta), subtended by thin medial flap-like lobe with triangular dorsal edge. Dorsal lobe of right surstylus (Fig. 16) broad, with tuberculate prensiseta proximal to small thumb-like lobe bearing a pair of lateral setae and 1 medial seta. Phallus identical to *M. acroptera* except, with smaller inflated loop in middle portion. Hypoproct larger, left and right lobes symmetrical, with rounded apicolateral projection. Cercus with longer process ventromedially.

Female. Unknown.

Distribution and seasonal occurrence. This new Californian species is known from the South Fork of the Santa Ana River (Fig. 1) in San Bernardino County and Mount Pinos in Kern County (Fig. 102). Specimens were collected in June.



FIGURES 56–59. Male habitus, antenna and hind tarsus of *M. subacroptera* sp. nov. and *M. triangulata* sp. nov. 56. Habitus of *M. subacroptera* sp. nov. holotype. 57. Left hind tarsus of *M. subacroptera* sp. nov., anterior view, arrow indicates spur-like seta on basitarsus (Mt. Pinos, California). 58. Left antenna of *M. triangulata* sp. nov. holotype, medial view. 59. Left hind tarsus of *M. triangulata* sp. nov. holotype, posterior view, arrow indicates spur-like seta on basitarsus.

Etymology. This species is named for its similarity to *M. acroptera*.

Remarks. This species is apparently closely related to *M. acroptera* and *M. triangulata* **sp. nov.**, based on their very similar hypopygial morphology.

Microphorella triangulata sp. nov.

urn:lsid:zoobank.org:act:CEBE7C56-0B72-43C8-AF26-1D70F3CF963D (Figs 58, 59, 101)

Type material. HOLOTYPE, ♂ labelled: "CALIF: Inyo Co.| 2mi.S 1miW Lone Pine| sand Alabama Hills| III-19 to V-17-1980"; "D. Giuliani collr.| antfreeze pit trap"; "HOLOTYPE| *Microphorella*| *triangulata*| Brooks & Cumming" [red label] (CSCA). **PARATYPES: USA: California:** *Inyo County*: same data as holotype [36°34'N 118°05'W] (10♂, 13♀, CSCA); same data as holotype except, CNC1155801, CNC1155847 (2♂, CSCA).

Diagnosis. This species can be distinguished from other members of the *M. acroptera* species group by the elongate, narrowly triangular postpedicel (Fig. 58), that is longer than the stylus, and yellow halter. Males are further distinguished by the upturned spur-like basiventral seta on the hind basitarsus (Fig. 59); hypopygium very similar to *M. acroptera* (see Figs 11–15).

Description. Male (Figs 58, 59): Wing length 1.9 mm. Similar to *M. acroptera* except as follows: Head: Face and clypeus narrower, about 1.3× width of anterior ocellus; postpedicel long and triangular, longer than arista-like stylus (Fig. 58). Thorax: Acrostichals biserial, weak and sparse; 5 dorsocentrals; halter yellow. Legs: *Hindleg*: Basitarsus (Fig. 59) with tiny, upturned, basiventral spur-like seta. Wing: As in description of *M. acroptera*. Abdomen: Sternite 5 with broad ventral trilobate projection (similar to Fig. 46). *Hypopygium*: Left epandrial lamella with hook-like tip of ventral epandrial process slightly shorter and medial surface without dentiform projection. Dorsal lobe of left surstylus with prensiseta developed as a thick tapering seta, not blade-like. Phallus identical to *M. acroptera* except, with tubular apical portion gently curved to right in posterior view, without basal kink.

Female. Similar to male except as follows: **Head:** Antenna with arista-like stylus nearly subequal length of postpedicel. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without prominent anteroventral row of setae; basitarsus without basiventral spur-like seta. **Abdomen:** As in description of *M. acroptera*.

Distribution and seasonal occurrence. Specimens of this new species are known only from the type locality near Lone Pine, Inyo County, California, collected during March to May (Fig. 101).

Etymology. This species is named for the elongate triangular postpedicel of the antenna, which is subequal in length to the stylus in both males and females (Fig. 58).

Remarks. This species is apparently closely related to *M. acroptera* and *M. subacroptera* **sp. nov.**, based on their very similar hypopygial morphology.

Microphorella tubifera Melander

(Figs 60-70, 101)

Microphorella tubifera Melander, 1928: 88. Microphorella tuberifera, Melander (1928: 88, key), misspelling.

Type material. HOLOTYPE, ♂ (Figs 60–62) labelled: "Palo Alto, Cal.| 2 Mar. '95"; "R.W. Doane| Collector"; "TYPE| Microphorella| tubifera| Mel." [red label]; "ALMelander| Collection| 1961" (USNM). **PARATYPE: USA: California:** *Santa Clara County*: same data as holotype [37°25'45"N 122°8'17"W] except, 26.iii.1985 (1♀, USNM).

Other material examined. USA: California: *Marin County*: Liberty Gulch nr Alpine Lake [37°57'N 122°37'W], 640–900 ft, 16.iv.1971, P. Loggins, Univ. Calif. Insect Survey Specimen # 100068, EMEC 1188832 (1 \bigcirc , EMEC). *Mendocino County*: NCCRP 3 mi. N Branscomb [39°42'N 123°39'W], 1400 ft, 17.v.1975, J. Powell, Univ. Calif. Insect Survey Specimen #'s 181899–181905, EMEC 1188490, 1188503–1188505, 1188506, 1188833 (2 \bigcirc , 4 \bigcirc , EMEC); same data except, Univ. Calif. Insect Survey Specimen # 181907, EMEC 1188505, CNC1155805 (1 \bigcirc , EMEC). *San Mateo County*: Junipero Serra Park [37.609°N 122.426°W], 4.iv.1964, P.H. Arnaud, Jr (1 \bigcirc , CAS); Redwood City [37°28'58"N 122°14'10"W], 28.ii.1943, P.H. Arnaud coll. (1 \bigcirc , 1 \bigcirc , mounted as pair, USNM).



FIGURES 60–63. *Microphorella tubifera* Melander, male holotype and male from Redwood City, California. 60. Habitus of holotype. 61. Abdomen of holotype, left lateral view. 62. Labels of holotype. 63. Head and thorax of male from Redwood City, California, anterolateral view.

Diagnosis. Males of this distinctive species can be easily distinguished from other members of the *M. acroptera* species group by the large clavate tubercle on the hind trochanter (Fig. 66) and the unusual hypopygium (Figs 61, 66–69) with projecting posterior components pale yellow and large bicoloured cercus with pale yellow base and dark brown subtriangular apical lobe. Males and females are further distinguished by their relatively large, stocky body, ventrally tapering face and brown-tinged wing.



FIGURES 64–66. Habitus, thorax, abdomen and hindleg of *Microphorella tubifera* Melander male from Redwood City, California. **64.** Habitus, left lateral view. **65.** Habitus, right lateral view. **66.** Thorax, abdomen and hindleg, right lateral view, arrows indicate trochanter tubercle and process of sternite 5.



FIGURES 67–70. Male terminalia of *Microphorella tubifera* Melander (CNC1155805). 67. Hypopygium, left lateral view. 68. Same, right lateral view. 69. Cerci, dorsal view. 70. Sternite 5, posteroventral view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; hypd—hypandrium; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Description. Male (Figs 60–70): Wing length 2.0–2.3 mm. Similar to *M. acroptera* except as follows: Body relatively large and stocky. **Head** (Figs 63–65): Face tapered ventrally to width of anterior ocellus; antenna with arista-like stylus longer, nearly $2.5 \times$ length of postpedicel. **Thorax** (Figs 60, 63–66): Coppery brown pruinose to blackish-bronze pruinose; acrostichals biserial, with well-developed rows almost extending to prescutellar depression; 5–6 prominent dorsocentrals; scutellum usually with small outer seta laterad long seta. **Legs:** *Foreleg*: Femur thicker, with row of fine posteroventral setae, setae shorter than femur width. *Hindleg*: Trochanter (Fig. 66) with tubercle large and clavate, bearing thick, blunt-tipped spine-like seta; tibia with longer erect setae ventrobasally; basitarsus with longitudinal series of 4 tiny, upturned spur-like setae basiventrally. **Wing:** Membrane with brownish tinge, otherwise as in description of *M. acroptera*. **Abdomen** (Figs 61, 66): Sternite 5 with broad, trilobate, strongly

protruding ventral projection (Figs 66, 70), membranous posteromedially, with broad conical medial lobe and hooklike lateral lobes. Sternite 8 oval with tapered base. Hypopygium (Figs 61, 66-69): Mostly concolourous with abdomen, base of cerci and other projecting posterior components pale yellow. Left epandrial lamella (Fig. 67) as long as hypandrium; ventral epandrial process unusual in shape, broad with dorsal margin rounded and finely serrate, apically with narrow pointed projection adjacent to broad rounded lobe with pair of apical setae. Dorsal lobe of left surstylus broad and truncate with short marginal seta, medial surface bearing elongate prensiseta with 90° preapical bend and adjacent unmodified seta. Ventral lobe of left surstylus longer than dorsal surstylar lobe, clavate with 3 long, thick apical setae and 2 smaller setae. Right epandrial lamella (Fig. 68) as long as hypandrium. Dorsal lobe of right surstylus lacking prensiseta, with boot-shaped lobe bearing 3 lateral setae, subtended by weakly sclerotized, pillow-like lobe anteriorly. Ventral lobe of right surstylus about twice as long as dorsal surstylar lobe, clavate with apex setulose and bearing a few setae. Hypandrium (Figs 67, 68) relatively small, as long as epandrium in lateral view. Left postgonite lobe globular basally with bifid apex projected medially (best seen in dorsal view), inner lobe thumb-like, outer lobe elongate and tapered to bluntly pointed tip (Fig. 67). Right postgonite (Fig. 68) smaller with inner and outer lobes similar in length. Phallus (Figs 67, 68) long and convoluted, basal portion tubular with S-shaped double curve followed by large, inflated portion which tapers to tip. Ejaculatory apodeme small, keel-like. Hypoproct lobes globular. Cercus (Figs 67–69) large and distinctive, basally pale and setulose, with short, rounded, dorsolaterally projecting ridge and dark, subtriangular medial lobe bearing long seta on outer surface and several smaller setae.

Female. Similar to male except as follows: **Head:** Antenna with arista-like stylus shorter, about $2 \times$ length of postpedicel. **Legs:** *Foreleg*: Femur without row of fine posteroventral setae. *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without prominent anteroventral row of setae; tibia with setae unmodified; basitarsus without basiventral spur-like setae. **Abdomen:** As in description of *M. acroptera*.

Distribution and seasonal occurrence. The few known specimens of this species were collected from February to May in the San Francisco Bay Area and northern Mendocino County, California (Fig. 101).

Microphorella acuminata lineage

This lineage includes the following five species: *M. acuminata* **sp. nov.**, *M. compacta* **sp. nov.**, *M. cornuta* **sp. nov.**, *M. elongata* **sp. nov.** and *M. tenuis* **sp. nov.** Males of these species have the tubercle of the hind trochanter short and cylindrical with a stubby spine-like seta (Figs 77, 73), scutum blackish with a metallic blue tinge (Fig. 71), and distinctive male genitalic morphology (Figs 74–85) characterized by the following features, of which, the last two are considered synapomorphies of the lineage: relatively compact hypopygium with small hypandrium, long narrow ventral lobe, broadly curved phallus, small simple cercus, left surstylus structure (*i.e.*, with long narrow dorsal lobe and shorter narrow ventral lobe), digitiform apical projection of the left postgonite lobe.

Microphorella acuminata sp. nov.

urn:lsid:zoobank.org:act:7BA1250A-3A11-4E38-8C71-C90BB7130F92 (Figs 71, 78, 103)

Type material. HOLOTYPE, \Diamond (Fig. 71) labelled: "USA: CALIFORNIA: Mon-| terey County, Carmel| Valley, HastingsNatural| History Reservation| ca 1750' 20-Jun-1998"; "Paul H. Arnaud, Jr &| Madeline M. Arnaud| Arnaud Flight Trap| over Big Creek| Collection No.01959-A"; "HOLOTYPE| *Microphorella*| *acuminata*| Brooks & Cumming" [red label] (USNM). **PARATYPES: USA: California:** *Monterey County*: same data as holotype [36°22'N 121°33'W] (2 \Diamond , 10 \wp , USNM); same data except, 19.vi.1998, Collection No. 01958-A (11 \wp , USNM); same data except, 21.vi.1998, Collection No. 01961-A; Paraiso Hot Springs, 13 km SW Soledad [36°19'N 121°22'W], 400 m, 25.v.1975, P.H. Arnaud, Jr (1 \wp , USNM); same data except, 28.v.1977 (2 \wp , USNM); same data except, 29.v.1977, CNC1155844 (1 \Diamond , USNM).



FIGURES 71–77. Male habitus, hindleg and abdomen of *M. acuminata* sp. nov., *M. compacta* sp. nov. and *M. cornuta* sp. nov. 71. Habitus of *M. acuminata* sp. nov. holotype. 72. Habitus of *M. compacta* sp. nov. holotype. 73. Mid and hindleg of *M. compacta* sp. nov. holotype, arrow indicating trochanter tubercle. 74. Abdomen of *M. compacta* sp. nov. holotype, right lateral view. 75. Same, dorsal view. 76. Abdomen and hindlegs of *M. cornuta* sp. nov. paratype (Portola Valley, California), right lateral view. 77. Same, left lateral view, arrow indicating trochanter tubercle.



FIGURES 78–80. Hypopygium of *Microphorella acuminata* sp. nov. and *M. cornuta* sp. nov. 78. Hypopygium of *M. acuminata* sp. nov. (CNC1155844), left lateral view. 79. Hypopygium of *M. cornuta* sp. nov. (CNC1155802), left lateral view. 80. Same, right lateral view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; epand—epandrium; hypd—hypandrium; hyprct—hypoproct; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Diagnosis. In addition to the characters listed above for the *M. acuminata* lineage, males of this species can be distinguished from the other members of the *M. acroptera* species group by several features of the hypopygium (Fig. 78), including the acuminate ventral epandrial process, the long, thick apical projection of the left postgonite and the deeply bifurcate phallus.

Description. Male (Figs 71, 78): Wing length 1.5–1.6 mm. Head (Fig. 71): Mainly blackish-brown pruinose, with metallic blue tinge dorsally (concolourous with thorax), ventral part of frons, face and clypeus blackishbrown in anterior view; slightly narrower than thorax in dorsal view; ovoid in lateral view (higher than broad); slightly broader than high in anterior view; larger setae black, smaller setae brown. Ocellar triangle conspicuous. Occiput weakly concave on upper median part. Eyes covered with short ommatrichia; medial edge of eye with small emargination adjacent to antenna; ommatidia subequal in size. Frons about 2× broader than high, widening above. Face slightly tapered ventrally to about 2× width of anterior ocellus. Face and clypeus blackish-brown with light grey pruinosity, concolourous with ventral part of frons (in anterior view). Clypeus separated from face, small, barely broader than high, slightly widened ventrally, with truncate ventral margin. Setae of head well differentiated (larger dorsal setae similar in size to anterior dorsocentrals): 1 pair of inclinate fronto-orbitals arising slightly ventral to median ocellus; 1 pair of lateroclinate anterior ocellars; 1 pair of small posterior ocellars; 1 pair of inner verticals (sometimes referred to as postocellars); 2 pairs of outer verticals; postocular setae short and uniserial. Antenna (Fig. 71) inserted above middle of head in profile; scape short, funnel-shaped, blackish-brown; pedicel about 2× longer than scape, spheroidal with subapical circlet of setulae, blackish-brown; postpedicel about 3× longer than pedicel, about $2 \times \text{longer}$ than wide, bulb-shaped, blackish-brown, clothed in fine setulae; arista-like stylus apical, about 1.75–1.8× length of postpedicel, blackish-brown, with minute hairs. Palpus blackish-brown, relatively small, narrowly ovate, about 2.5× longer than wide, with 1 long preapical seta. Proboscis brown, short, projecting ventrally. Gena narrow. Thorax (Fig. 71): Black to blackish brown, weakly pruinose, with distinct metallic blue tinge, setae black. Mesoscutum moderately arched, prescutellar depression present. Proepisternum with 1-2 tiny setae. Postpronotal lobe with a few small setae. Mesonotum longer than wide. Acrostichal setae biserial, with well-developed rows extending to prescutellar depression; setae on each side of mesonotum: 7-8 dorsocentrals, middle setae weaker, posterior seta longest, 1 presutural supra-alar (posthumeral), 1-2 postsutural supra-alars, 2 notopleurals, 1 postalar, area laterad dorsocentrals with numerous small setae. Scutellum broadly crescent-shaped with 1 long seta and 1 small outer seta per side. Mesopleuron bare. Halter blackish brown. Legs: Slender; black with prominent setae black; femora, tibiae and tarsi largely covered with tiny, black setae; tarsomeres 1-4 of all legs progressively shorter apically with tarsomere 5 slightly longer than 4 and often dorsoventrally flattened; tarsal claws, pulvilli and empodium normally developed on all legs. Foreleg: Coxa with setae on anterior surface, stronger and longer apically; femur, tibia and tarsus subequal in length; tarsomere 1 subequal to combined length of tarsomeres 2-4. Midleg: Coxa with a few prominent setae on anterior surface; femur slightly shorter than tibia, subequal in length to tarsus; apex of tibia with 1 strong ventral seta; tarsomere 1 subequal to combined length of tarsomeres 2-4. Hindleg: Coxa with 2 prominent setae on lateral surface; trochanter ventrally with short cylindrical tubercle bearing thick, anteriorly directed, apical spine-like seta and some small adjacent setae, spine-like seta stubby and short (as in Figs 73, 77); femur, tibia and tarsus subequal in length; femur weakly bowed outwardly (in dorsal view), with anteroventral row of setae, setae shorter than femur width; tarsomere 1 subequal to combined length of tarsomeres 2-4. Wing: As in description of M. acroptera. Abdomen (Fig. 71): Blackish with short dark setae (very weak on sternites); segment 6 nearly bare, segment 7 bare. Segments 5–7 narrowed and laterally compressed to form cavity on right side for hypopygium (as in Fig. 75). Sternite 5 with rounded, setulose, flap-like posteromedial projection. Sternite 6 with short, close-set, bilobate ventral projection. Sternite 8 subrectangular to rounded, setose, slightly wider than segment 7; tergite 8 vestigial. Hypopygium (Fig. 78): Concolourous with abdomen; lateroflexed to right; inverted with posterior end directed anteriorly; large, about half as long as abdomen; asymmetrical. Right and left epandrial lamellae narrowly connected dorsally behind cerci. Left epandrial lamella nearly as long as hypandrium and partially overlapping its left side, posterior margin with projecting surstylar lobes and ventral epandrial process, ventral edge broadly rounded and fused with hypandrium but margin distinct; ventral epandrial process articulated at base, long, narrow and weakly sinuous, acuminate. Left surstylus divided into dorsal and ventral lobes separated by cleft through which left postgonite lobe protrudes. Dorsal lobe of left surstylus elongate, straight and narrow with rounded apex, with a few setae in basal half. Ventral lobe of left surstylus projecting medially behind postgonite lobe, half as long as dorsal surstylar lobe, narrowly digitiform with 5 setae on broader apex. Right epandrial lamella subtriangular, shorter than hypandrium and partially overlapping its right side, slightly longer than high, ventral

edge broadly rounded and fused with hypandrium but margin mostly distinct, fading into hypandrium anteriorly; ventral epandrial process absent. Right surstylus divided into dorsal and ventral lobes separated by U-shaped cleft through which right postgonite lobe protrudes. Dorsal lobe of right surstylus projected dorsally as a short, broad subtriangular mound bearing 4 setae (similar to Fig. 80). Ventral lobe of right surstylus projecting dorsomedially behind postgonite lobe, digitiform, longer than dorsal surstylar lobe, with several setae on apical third. Hypandrium narrowly ovoid and slightly longer than epandrium in lateral view, uniformly narrow in ventral view, bare except for pair of short posterior setae. Left postgonite lobe with long, thick apical projection. Right postgonite with broad subrectangular basal process protruding posteriorly below ventral lobe of surstylus with convex posterior margin, apical portion long and broad with evenly bifurcate apex. Phallus broadly curved and J-shaped, well-sclerotized, deeply bifurcate with long acuminate ventral process arising near base and extending to full length of tubular phallus. Ejaculatory apodeme of moderate size, keel-like. Hypoproct simple, left and right lobes symmetrical and tongue-like with a few tiny setae, larger than cerci. Cercus small, simple and flap-like, with several setae apically, left and right cercus symmetrical (similar to Fig. 82).

Female. Similar to male except as follows: **Head:** Face apparently slightly broader, tapered ventrally to slightly more than $2 \times$ width of anterior ocellus. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without distinct anteroventral row of setae. **Abdomen:** As in description of *M. acroptera*.

Distribution and seasonal occurrence. This new species is known from Monterey County, California (Fig. 103). Specimens were collected in May and June.

Etymology. This species is named after the pointed (acuminate) tip of the ventral epandrial process (Fig. 78).

Microphorella compacta sp. nov.

urn:lsid:zoobank.org:act:C2F35FD9-533C-43C6-BCEA-E50F4F6D0E10 (Figs 72–75, 81, 82, 103)

Type material. HOLOTYPE, ♂ (Fig. 72) labelled: "USA:CA: Del Norte Co., French| Hill Rd, 1km NW French Hill| (41.8255°N 123.9914°W)| 546m, swp meadow with pines| 03.vi.2009, J. Mlynarek"; "*Microphorella*| Det. J.M. Cumming"; "HOLOTYPE| *Microphorella*| *compacta*| Brooks & Cumming" [red label] (CNC). **PARATYPE: USA: California:** *Del Norte County*: Gasquet [41°50'43"N 123°58'10"W], 20.vi.1974, P.H. Arnaud, Jr, CNC1155837 (1♂, CAS).

Other material examined. USA: California: *Del Norte County*: Jedediah Smith Redwoods SP, Walker Rd., creek, 41°48'44"N 124°6'36"W, 25-31.v.2009,YPT, J.M. Cumming & S.E. Brooks (1^Q, CNC).

Diagnosis. In addition to the characters listed above for the *M. acuminata* lineage, males of this species can be distinguished from other members of the *M. acroptera* species group by a combination of hypopygial features (Fig. 81), including the delicately sclerotized phallus with narrow preapical process, the long, narrow apical projection of the left postgonite, the digitiform tip of the ventral epandrial process, the reduced hypandrium (narrow in ventral view), the broad, curved left dorsal surstylar lobe and the non-protruding lower margin of the right postgonite which is even with the posterior epandrial margin below the surstylus.

Description. Male (Figs 72–75, 81, 82): Wing length 1.4–1.5 mm. Similar to *M. acuminata* **sp. nov.** except as follows: **Head** (Fig. 72): Antenna with arista-like stylus shorter, about $1.6 \times$ length of postpedicel. **Thorax** (Fig. 72): Dark brown, with metallic blue tinge faint; 6 dorsocentrals, anterior setae rather short; scutellum without small outer seta. Halter dark brown. **Legs:** Dark brown with dark brown setae. **Wing:** As in description of *M. acroptera* (except holotype which has M₂ incomplete on both wings) (Fig. 72). **Abdomen** (Figs 74, 75): Dark brown. Sternite 5 with broad posteromedial emargination (based on examination of unmacerated holotype only). Sternite 6 with small, bilobate ventral projection. *Hypopygium* (Figs 74, 75, 81, 82): relatively small, less than half as long as abdomen. Left epandrial lamella as long as hypandrium and almost completely overlapping its left side; ventral epandrial process uniformly wide in basal 2/3, broadening apically with narrow, digitiform dorsoapical process. Dorsal lobe of left surstylus with gentle posterior curve and broader apex. Ventral lobe of right surstylus bifurcate, with short outer lobe and longer medial lobe, both bearing a few setae (similar to Fig. 80). Hypandrium smaller, narrow in ventral view and tapering anteriorly. Left postgonite lobe with long, narrow apical projection. Right postgonite not protruding posteriorly below ventral lobe of surstylus, even with posterior epandrial margin, apical portion with unevenly bifurcate apex. Phallus thin and delicately sclerotized, with short, narrow pointed process arising preapically and extending nearly to phallic tip. Ejaculatory apodeme small. Hypoproct and cercus as in Fig. 82.



FIGURES 81–85. Hypopygium of *Microphorella compacta* sp. nov., *M. elongata* sp. nov. and *M. tenuis* sp. nov. 81. Hypopygium of *M. compacta* sp. nov. (CNC1155837), left lateral view. 82. Cerci and hypoproct of same specimen, dorsal view. 83. Hypopygium of *M. elongata* sp. nov. holotype (CNC1155833), right lateral view. 84. Same, left lateral view. 85. Hypopygium of *M. tenuis* sp. nov. (CNC1155838), left lateral view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; epand—epandrium; hypd—hypandrium; hyprct—hypoproct; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Female. Similar to male except as follows: **Head:** Antenna with arista-like stylus apparently shorter, about 1.4× length of postpedicel. **Thorax:** Scutellum with small outer seta present. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without distinct anteroventral row of setae. **Abdomen:** Apical segments retractable into segment 5. Tergite 5 with cluster of stout medial setae. *Terminalia*: Tergite 6 not observable. Syntergite 9+10 medially divided into hemitergites, with 3–4 acanthophorous spines on each side; cercus sclerotized, pointed apically (abdomen of unique female not dissected).

Distribution and seasonal occurrence. This new species is known from Del Norte County (Fig. 2) in northern California (Fig. 103). The only three specimens known were collected in late May and June.

Etymology. This species is named in reference to the compact shape of the hypandrium.

Microphorella cornuta sp. nov.

urn:lsid:zoobank.org:act:22EA5D5B-EF93-47F2-A373-E6DFED45CEEC (Figs 76, 77, 79, 80, 103)

Type material. HOLOTYPE, ♂ labelled: "U.S.A.: CALIFORNIA: SanMateoCounty, Por- tola Valley, Alpine Road, CorteMaderaCr| eek 24-VI-1984 230m| Paul H. Arnaud, Jr."; "[upper margin with row of asterisks]| Flight trap in| shaded creek bed,| 1315–1615 hours DST| [lower margin with row of asterisks]"; "HOLOTYPE| Microphorella| cornuta Brooks & Cumming" [red label] (USNM). PARATYPES: USA: California: Contra Costa County: Briones Reg. Park [37°57'N 122°08'W], Toyon Canyon, 25.v.1979, D.D. Wilder (5♂, 9♀, CAS); same data except, 26.v.1979 (2♀, CAS). Marin County: Tocaloma [38°03'01"N 122°45'34"W], 13.v.1962, L.R. O'Brien (1♂, CMNH). Napa County: Oakville [38°26'N 122°24'W], 180 ft, 25.iv.1971, P.H. Arnaud, Jr (13, USNM). San Mateo County: Corte de Madera Cr. nr Portola [37°23'N 122°19'W], 3.vi.1954, P.H. Arnaud (1♀, USNM); same data except, 31.v.1958 (1♀, USNM); Corte de Madera Ck, 19.vi.1965, J.D. Birchim (1♀, CAS); Corte de Madera Crk, Alpine Rd, SE of Portola, 19.v.1968 (19, USNM); Portola Valley, Alpine Road, Corte de Madera Crk, 230 m, 12.vi.1965, P.H. Arnaud, Jr (23, 19, USNM); same data except, 26.v.1968 (13, USNM); same data except, 12.vi.1983 (39, USNM); same data except, 13.vi.1971, P.H. Arnaud, Jr & M.M. Arnaud (13, 10, USNM); same data except, 3.vi.1983, flight trap over creek, sun/shaded, 1310–1450 hours, air temperature 76 F, water 62.5 F, P.H. Arnaud, Jr (23, 32, USNM); same data as holotype (33, 42, USNM); same data except, CNC1155802 (13, USNM); same data except, flying low over water of creek, 1430–1500 hours DST, P.H. Arnaud, Jr (13, 12, USNM); same data except, 30.vi.1984, flight trap, creek bed, 1300–1730 hours, P.H. Arnaud, Jr (163, 209, USNM).

Diagnosis. In addition to the characters listed above for the *M. acuminata* lineage, males of this species can be distinguished from other members of the *M. acroptera* species group by a combination of hypopygial features (Figs 79, 80), including the short, thick, horn-like process of the phallus arising near mid-length, the long, narrow apical projection of the left postgonite, the emarginate tip of ventral epandrial process and the protruding, emarginate lower margin of the right postgonite.

Description. Male (Figs 76, 77, 79, 80): Wing length 1.6–1.7 mm. Similar to *M. acuminata* **sp. nov.** except as follows: **Thorax:** Dull and more intensely bronze pruinose, with distinct metallic blue tinge. **Legs:** Dark brown with dark brown setae. **Wing:** As in description of *M. acroptera*. **Abdomen** (Figs 76, 77): Sternite 5 with posteromedial projection subtriangular. *Hypopygium* (Fig. 76, 77, 79, 80): Left epandrial lamella with ventral epandrial process uniformly wide, apex emarginate. Dorsal lobe of left surstylus elongate, straight and narrow with expanded apex. Ventral lobe of right surstylus (Fig. 80) bifurcate, with short outer lobe and longer medial lobe, both bearing a few setae. Left postgonite lobe with long, narrow apical projection (Fig. 79). Right postgonite with posterior margin of protruding basal process concave, apical portion with unevenly bifurcate apex (Fig. 80). Phallus robust with short, thick, horn-like process arising near mid-length that ends well before phallic tip (Fig. 79).

Female. Similar to male except as follows: **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spinelike seta; femur without distinct anteroventral row of setae. **Abdomen:** As in description of *M. acroptera*.

Distribution and seasonal occurrence. This new species is known from the San Francisco Bay Area of central California (Fig. 103). Specimens were collected from April to June.

Etymology. This species is named in reference to the diagnostic horn-like process of the phallus (Fig. 79).

Microphorella elongata sp. nov.

urn:lsid:zoobank.org:act:BCCF9B20-97EA-4168-B765-565E11B0A0AF (Figs 83, 84, 104)

Type material. HOLOTYPE, ♂ labelled: "Univ. Calif.| Insect Survey| Specimen #| 125254"; "CALIF. Marin Co.| Liberty Gulch nr.| Alpine Lk., 640–| 900', 15 Apr 1972| R.C. Gregory"; "UC Berkeley| EMEC| 1188823| [QR code]"; "CNC| 1155833" [printed on both sides]; "HOLOTYPE| *Microphorella*| *elongata*| Brooks & Cumming" [red label] (EMEC).

Other material examined. USA: California: *Marin County*: same data as holotype [37°57'N 122°37'W] except, Univ. Calif. Insect Survey Specimen # 101199, 17.iv.1971, E.I. Schlinger (1^Q, EMEC).

Diagnosis. In addition to the characters listed above for the *M. acuminata* lineage, males of this species can be distinguished from other members of the *M. acroptera* species group by its distinctive phallus, which is elongate, C-shaped and broadened apically (Fig. 83).

Description. Male (Figs 83, 84): Wing length 1.7 mm. Similar to *M. acuminata* **sp. nov.** except as follows: **Head:** Face wider, about 2.5× width of anterior ocellus; antenna with arista-like stylus shorter, about 1.5× length of postpedicel. **Thorax:** Colouration more brownish, less dark. **Legs:** Dark brown with dark brown setae. **Wing:** As in description of *M. acroptera*. **Abdomen:** Tergite 6 with a few marginal setae. Sternite 6 setulose medially, lacking ventral projection. *Hypopygium* (Figs 83, 84): Left epandrial lamella (Fig. 84) as long as hypandrium and completely overlapping its left side, ventral edge mostly fused with hypandrium, but margin distinct (epandrium and hypandrium apparently separated proximal to base of ventral epandrial process in holotype, but this may be maceration related damage); ventral epandrial process uniformly wide in basal 4/5, broadening apically with narrow, digitiform dorsoapical process. Dorsal lobe of left surstylus with apex enlarged and weakly curved medioventrally. Ventral lobe of right surstylus (Fig. 83) bifurcate, with short outer lobe and longer medial lobe, both bearing a few setae. Hypandrium smaller, narrow in ventral view, with posterior end slightly wider. Left postgonite lobe with moderately long, narrow apical projection (Fig. 84). Right postgonite with posterior margin below ventral surstylus rounded and protruding beyond epandrium (Fig. 83). Phallus greatly elongated and C-shaped with broadened apex, with narrow, pointed preapical process extending nearly to phallic tip. Hypoproct with lobes similar in size to cerci.

Female. Similar to male except as follows: **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spinelike seta; femur with weaker anteroventral row of setae. **Abdomen:** Apical segments retractable into segment 5. Tergite 5 with cluster of stout medial setae. *Terminalia*: Tergite 6 not observable. Syntergite 9+10 medially divided into hemitergites, with 3–4 acanthophorous spines on each side; cercus sclerotized, pointed apically (abdomen of unique female not dissected).

Distribution and seasonal occurrence. This new species is known only from the holotype male and a single female collected in mid-April, from Marin County, California (Fig. 104).

Etymology. This species is named for the distinctively elongate phallus.

Microphorella tenuis sp. nov.

urn:lsid:zoobank.org:act:3837FEBC-B458-4D70-A842-C0821A649DC9 (Figs 85, 104)

Type material. HOLOTYPE, ♂ labelled: "1.5 mi. south| Asti Cal| Sonoma Co.| iv-8 1954"; "E.I. Schlinger| Collector"; "HOLOTYPE| *Microphorella*| *tenuis*| Brooks & Cumming" [red label] (UCDC). **PARATYPES: USA: California:** *Sonoma County*: same data as holotype [38°45'47"N 122°58'23"W] (1♂, 9♀, UCDC); same data as holotype except, CNC1155838, CNC1155846 (2♂, UCDC).

Diagnosis. In addition to the characters listed above for the *M. acuminata* lineage, males of this species can be distinguished from the other members of the *M. acroptera* species group by a combination of hypopygial features (Fig. 85), including the short apical projection of the left postgonite, the narrow, preapical phallic process, the emarginate apex of the ventral epandrial process with dorsally pointed tip and the straight, narrow left dorsal surstylar lobe.

Description. Male (Fig. 85): Wing length 1.7–1.8 mm. Similar to *M. acuminata* sp. nov. except as follows:

Head: Face wider, slightly tapered ventrally to about 4× width of anterior ocellus; antenna with arista-like stylus shorter, about 1.5× length of postpedicel. **Thorax:** Scutellum without small outer seta. **Legs:** Dark brown with dark brown setae. **Wing:** As in description of *M. acroptera*. **Abdomen:** Blackish with weak blue tinge. Sternite 6 without ventral projection. *Hypopygium* (Fig. 85): Dark brown; relatively small, slightly less than half as long as abdomen. Left epandrial lamella with ventral epandrial process uniformly wide in basal 4/5, broadening apically, apex emarginate with pointed dorsal process. Dorsal lobe of right surstylus with apical seta borne on narrow tubercle. Ventral lobe of right surstylus bifurcate, with short outer lobe and longer medial lobe, both bearing a few setae. Left postgonite lobe with short thin apical projection. Right postgonite with posterior margin below ventral surstylus rounded and protruding beyond epandrium. Phallus with short, narrow, pointed process arising preapically and extending nearly to tip of phallus.

Female. Similar to male except as follows: **Head:** Face narrower, slightly tapered ventrally to about $3 \times$ width of anterior ocellus; antenna with arista-like stylus shorter, about $1.3 \times$ length of postpedicel. **Thorax:** Scutellum sometimes with small outer seta present. **Legs:** *Hindleg*: Trochanter without tubercle bearing apical spine-like seta; femur without distinct anteroventral row of setae. **Abdomen:** As in description of *M. acroptera*.

Distribution and seasonal occurrence. This new species is only known from the type series collected in April from Sonoma County in central California (Fig. 104).

Etymology. This species is named for the small, thin (tenuous) process on the left postgonite compared with other species of the *M. acuminata* lineage.

Microphorella maculata lineage

This lineage includes the single species, *M. maculata* **sp. nov.** The male of this unusual autapomorphic species (Figs 86–91) is easily recognized by its distinctive face and wing, among other features (see Diagnosis below). Unlike the other members of the *M. acroptera* species group, *M. maculata* **sp. nov.** has a very reduced tubercle on the male hind trochanter.

Microphorella maculata sp. nov.

urn:lsid:zoobank.org:act:77F34E7F-4253-4073-82B1-311067F9AE59 (Figs 86–91, 105)

Type material. HOLOTYPE, ♂ (Fig. 86) from Oak Grove [33°23'N 116°47'W], San Diego County, California, labelled: "OAK GROVE| 9/5/45 CAL| ALMELANDER"; "ALMelander| Collection| 1961"; "CNC| 1155850"; "HOLOTYPE| *Microphorella*| *maculata*| Brooks & Cumming" [red label] (USNM).

Diagnosis. The male of this species is readily distinguished from other known Nearctic *Microphorella* by its spot-like CuA+CuP wing vein (Figs 88, 89), narrow silver face and concolourous clypeus with rounded lower margin projecting to the lower eye level (Fig. 87). Additional diagnostic features include the following: antennal postpedicel with long, narrow apex bearing long setulae (Fig. 87); white setae on the head (lower postoculars), legs (mainly coxae) and abdomen (sternite 8, hypopygium) (Fig. 86); halter pale yellow; hind trochanter with small tubercle bearing minute seta; surstylus with long setae; ventral epandrial process strongly bent (Figs 90, 91).

Description. Male (Figs 86–91): Wing length 1.7 mm. **Head** (Figs 86–87): Silvery pruinose, dark bronze dorsally (concolourous with thorax), face and clypeus silvery pruinose; slightly narrower than thorax in dorsal view; ovoid in lateral view (higher than broad); slightly narrower than high in anterior view; larger setae brown, lower postocular setae white. Ocellar triangle conspicuous. Occiput weakly concave on upper median part. Eyes covered with short ommatrichia; medial edge of eye with small emargination adjacent to antenna; ommatidia subequal in size. Frons about 2× broader than high, widening above. Face slightly narrowed in middle, about 2× width of anterior ocellus. Face and clypeus with concolourous silvery pruinosity. Clypeus not distinctly separated from face, narrower than high, slightly widened ventrally, projecting to lower eye level with rounded ventral margin. Setae of head well differentiated (larger dorsal setae similar in size to anterior dorsocentrals): 1 pair of inclinate fronto-orbitals arising slightly ventral to median ocellus; 1 pair of lateroclinate anterior ocellars; 1 pair of small posterior ocellars; 1 pair of inner verticals (sometimes referred to as postocellars); 2 pairs of outer verticals; postocular setae



FIGURES 86–89. Male habitus, head and wings of *Microphorella maculata* sp. nov. holotype. 86. Habitus. 87. Head, anterior view. 88. Right wing. 89. Left wing. Abbreviation: CuA+CuP—anterior branch of cubital vein + posterior branch of cubital vein.

uniserial, longer ventrally. Antenna (Fig. 87) inserted above middle of head in profile; scape short, funnel-shaped, blackish-brown; pedicel about 2× longer than scape, spheroidal with subapical circlet of setulae, blackish-brown; postpedicel about 4× longer than pedicel, about 2.5× longer than wide, bulb-shaped with long narrow apex bearing long setulae, blackish-brown, lighter apically; arista-like stylus apical, about 1.0× length of postpedicel, blackishbrown, with minute hairs. Palpus blackish-brown, relatively small, narrowly ovate, about 2.5× longer than wide, with 1 long white preapical seta. Proboscis brown, short, projecting ventrally. Gena very narrow. Thorax (Fig. 86): Silvery pruinose in lateral view, dorsum dark bronze with reddish and dark green tinges, larger setae dark brown. Mesoscutum moderately arched, prescutellar depression apparently present. Proepisternum with a few tiny white setae on upper and lower parts. Postpronotal lobe with 2-3 small setae. Mesonotum longer than wide. Acrostichal setae absent; setae on each side of mesonotum: 6 dorsocentrals, posterior seta longer, 1 presutural supra-alar (posthumeral), apparently 4 small postsutural supra-alars, 2 notopleurals, 1 postalar, area laterad anterior dorsocentrals with a few small setae. Scutellum broadly crescent-shaped with 1 long seta per side. Mesopleuron bare. Halter pale yellow. Legs: Slender; silvery pruinose with brown background colour, knees pale; prominent setae white or pale brown; femora tibiae and tarsi mainly covered with tiny white or pale brown setae; tarsomeres 1-4 of all legs progressively shorter apically with tarsomere 5 slightly longer than 4 and slightly flattened dorsoventrally; tarsal claws, pulvilli and empodium normally developed on all legs. Foreleg: Coxa with white setae on anterior surface, stronger and longer apically; femur and tibia subequal in length, tarsus slightly longer; femur with some erect white setae basiventrally; tarsomere 1 subequal to combined length of tarsomeres 2–3, base broad and short, notched and narrowed below, with series of tiny ventral spine-like setae. Midleg: Coxa with a few prominent white setae on anterior surface; femur slightly shorter than tibia, tibia subequal in length to tarsus; apex of tibia with 1 strong brown ventral seta; tarsomere 1 subequal to combined length of tarsomeres 2-4. Hindleg: Posterior surface of hindleg lacking silvery pruinescence; coxa with 2 prominent white setae on lateral surface; trochanter ventrally with small tubercle bearing minute seta; femur, tibia and tarsus subequal in length; femur strongly bowed outwardly



FIGURES 90–91. Hypopygium of *Microphorella maculata* sp. nov. holotype. 90. Left lateral view. 91. Right lateral view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; epand—epandrium; hypd—hypandrium; hyprct—hypoproct; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

(in dorsal view), with anteroventral row of 5–6 setae on apical half, longest seta as long as femur width; tarsomere 1 slightly shorter than combined length of tarsomeres 2-4. Wing (Figs 88, 89): CuA+CuP modified as a spot, otherwise as in description of *M. acroptera*. Abdomen (Fig. 86): Concolourous with thorax, with short intermixed dark and pale setae (very weak on sternites); segment 7 bare. Segments 5-7 narrowed and laterally compressed to form cavity on right side for hypopygium. Sternite 5 apparently with broad glabrous ventral projection, subtriangular and symmetrical with small dentiform process midway along lateral margin. Sternite 8 subquadrate with long white setae on posterior margin and several short white setae proximally, slightly wider than segment 7; tergite 8 vestigial. Hypopygium (Figs 90, 91): Dark brown with white setae; lateroflexed to right; inverted with posterior end directed anteriorly; large, at least half as long as abdomen; asymmetrical. Right and left epandrial lamellae not connected dorsally behind cerci. Left epandrial lamella (Fig. 90) shorter than hypandrium and partially overlapping its left side, posterior margin with projecting surstylar lobes and ventral epandrial process, ventral edge broadly rounded and fused with hypandrium but margin distinct; ventral epandrial process articulated at base, basal half broad, strongly bent near mid-length with a pair of ventrolateral setae, apical half narrower with pointed tip. Left surstylus divided into dorsal and ventral lobes separated by shallow rounded cleft through which left postgonite lobe protrudes. Dorsal lobe of left surstylus weakly developed, with 2 long setae and 1 smaller adjacent seta. Ventral lobe of left surstylus broad and long, with apicodorsal subrectangular lobe bearing 1 long seta and medially projecting apicoventral lobe bearing a pair of funnel-shaped processes. Right epandrial lamella (Fig. 91) shorter than hypandrium and partially overlapping its right side, longer than high, ventral edge fused with hypandrium, margin distinct anteriorly but fading into hypandrium posteriorly; ventral epandrial process absent. Right surstylus divided into dorsal and ventral lobes separated by U-shaped cleft through which right postgonite lobe protrudes. Dorsal lobe of right surstylus with subtriangular process bearing 1 seta on rounded tip and 2 long marginal setae proximally. Ventral lobe of right surstylus projecting dorsomedially behind postgonite lobe, large and broad, longer than dorsal lobe of surstylus, with pair of basal setae laterally, 1 thick preapical seta on posterior margin and similar preapical seta medially. Hypandrium large and ovoid, longer than epandrium in lateral view, bare except for pair of short posterior setae. Left postgonite lobe large, bifurcate (best seen in dorsal view), inner lobe shorter with broadly rounded apex and flattened prensiseta medially, outer lobe tapered to pointed tip (Fig. 90). Right postgonite lobe (Fig. 91) similar in size to left lobe, large, bifurcate (best seen in dorsal view), inner lobe shorter with subtriangular apex and flattened prensiseta basally, outer lobe with broadly rounded apical margin. Phallus (Fig. 90) J-shaped, deeply bifurcate with long acuminate process extending to full length of tubular, ridged phallus. Ejaculatory apodeme of moderate size, keel-like, subtriangular. Hypoproct large and irregular in shape, left and right lobes asymmetrical, with a few apical setae. Cercus simple and flap-like, dorsoventrally flattened, with several dorsal setae and 1 seta midway along lateral margin.

Female. Unknown.

Distribution and seasonal occurrence. This new species is only known from Oak Grove in San Diego County in southern California, where the holotype was collected in May of 1945 (Fig. 105).

Etymology. This species name is derived from the Latin for spot, in reference to the spot-like appearance of the CuA+CuP wing vein (Figs 88, 89).

Remarks. This very distinctive species is provisionally included in the *M. acroptera* species group because of the apparent presence of a male hind trochanter tubercle. However, the tubercle is very reduced and lacks an apical spine-like seta. Future studies may determine that *M. maculata* **sp. nov.** is not closely related to the other species in the species group.

Microphorella trochanterata lineage

This distinctive lineage includes *M. trochanterata* **sp. nov.** and a second species, *Microphorella* sp. A, which is not formally named and described on account of the poor condition of the unique male specimen (see below). Males of this lineage share a number of putative synapomorphies including a large rounded or disc-like apex of the hind trochanter (Figs 93, 94), a narrow process of abdominal sternite 6 (Fig. 96), an articulated elbow-like phallus, a posteriorly produced hypandrium and a digitiform cercus with long setae (Figs 97–99).

Microphorella trochanterata sp. nov.

urn:lsid:zoobank.org:act:A9F90F27-7385-49A3-885E-C1D7542873B7 (Figs 92–99, 105)

Type material. HOLOTYPE, ♂ (Fig. 92) labelled: "USA: CALIFORNIA: Mon-| terey County, Carmel| Valley, HastingsNatural| History Reservation| ca 1750' 19-Jun-1998"; "Paul H. Arnaud, Jr.| & Madeline M. Arnaud| Arnaud Flight Trap| over Big Creek| Collection No. 01958-A"; "HOLOTYPE| *Microphorella*| *trochanterata*| Brooks & Cumming" [red label] (USNM). **PARATYPES: USA: California:** *Marin County*: Cypress Ridge, vic. Alpine Lake [37°56'N 122°38'W], 22.v.1967, P.H. Arnaud, Jr, CNC1155849 (1♂, USNM). *Monterey County*: same data as holotype [36°22'N 121°33'W] (1♂, USNM).

Diagnosis. In addition to the characters listed above for the *M. trochanterata* lineage, males of this species can easily be distinguished from other members of the *M. acroptera* species group by the distinctive tubercle of the hind trochanter (Figs 93, 94), the row of long setae on the hind tibia (Fig. 93), the elongate setae on abdominal sternite 8 (Figs 92, 96) and the knob-like posterior protrusion of the hypandrium (Figs 97, 98).

Description. Male (Figs 92–99): Wing length 1.2–1.3 mm. Head (Fig. 92): Mainly blackish-brown pruinose, ventral part of frons, face and clypeus blackish-brown in anterior view; about as wide as thorax in dorsal view; ovoid in lateral view (higher than broad); slightly broader than high in anterior view; larger setae black, smaller setae brown. Ocellar triangle conspicuous. Occiput weakly concave on upper median part. Eyes covered with short ommatrichia; medial edge of eye with small emargination adjacent to antenna; ommatidia slightly larger in size ventrally. Frons about 2× broader than high, widening above. Face slightly tapered ventrally to about width of anterior ocellus. Face and clypeus blackish-brown with brownish-grey pruinosity, concolourous with ventral part of frons (in anterior view). Clypeus separated from face, small, slightly narrower than high, with truncate ventral margin.



FIGURES 92–96. Male habitus, hindleg, wing and abdomen of *Microphorella trochanterata* sp. nov. 92. Habitus of holotype, arrow indicates setae of sternite 8. 93. Left hindleg of holotype, posterior view. 94. Same, anterior view. 95. Wing of paratype (Carmel Valley, California). 96. Abdomen of holotype, arrow indicates process of sternite 6. Abbreviations: bm-m—basal medial crossvein; cua—anterior cubital (=anal) cell; CuA—anterior branch of cubital vein; CuA+CuP—anterior branch of cubital vein; M_1 , M_2 , M_4 —medial veins; R_1 , R_{2+3} , R_{4+5} —radial veins; Sc—subcostal vein.

Setae of head well differentiated (larger dorsal setae similar in size to anterior dorsocentrals): 1 pair of inclinate frontoorbitals arising slightly ventral to median ocellus; 1 pair of lateroclinate anterior ocellars; 1 pair of small posterior ocellars; 1 pair of inner verticals (sometimes referred to as postocellars); 2 pairs of outer verticals; postocular setae short and uniserial. Antenna inserted above middle of head in profile; scape short, funnel-shaped, dark brown; pedicel about 2× longer than scape, spheroidal with subapical circlet of setulae, dark brown; postpedicel about 2× longer than pedicel, about 2× longer than wide, bulb-shaped, blackish-brown, clothed in fine setulae; arista-like stylus apical, 2× length of postpedicel, blackish-brown, with minute hairs. Palpus dark brown, relatively small, narrowly ovate, about 2.5× longer than wide, with 1 long preapical seta. Proboscis brown, short, projecting ventrally. Gena narrow. Thorax (Fig. 92): Blackish to blackish brown and shiny, dorsum with weak bronze pruinosity, setae black. Mesoscutum moderately arched, prescutellar depression present. Proepisternum with 2 tiny setae. Postpronotal lobe with a few small setae. Mesonotum longer than wide. Acrostichal setae short, biserial, extending to prescutellar depression; setae on each side of mesonotum: 7–8 dorsocentrals, most short with posterior setae longer, 1 presutural supra-alar (posthumeral), 2–3 small postsutural supra-alars, 2 notopleurals, 1 postalar, area laterad dorsocentrals with a few small setae. Scutellum broadly crescent-shaped with 1 long seta and 1–2 small outer setae per side. Mesopleuron bare. Halter blackish brown. Legs: Slender; dark brown with prominent setae black; femora, tibiae and tarsi largely covered with tiny, black setae; tarsomeres 1-4 of all legs progressively shorter apically with tarsomere 5 slightly longer than 4; tarsal claws, pulvilli and empodium normally developed on all legs. Foreleg: Coxa with setae on anterior surface, stronger and longer apically; femur, tibia and tarsus subequal in length; tarsomere 1 subequal



FIGURES 97–99. Hypopygium of *Microphorella trochanterata* sp. nov. (CNC1155849). 97. Hypopygium, right lateral view. 98. Same, left lateral view. 99. Cerci, dorsal view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; epand—epandrium; hypd—hypandrium; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

to combined length of tarsomeres 2–4. *Midleg*: Coxa with a few prominent setae on anterior surface; femur slightly shorter than tibia, tibia subequal in length to tarsus; apex of tibia with 1 strong ventral seta; tarsomere 1 subequal to combined length of tarsomeres 2–4, with a few erect basiventral setae and longitudinal row of short setae. *Hindleg*: Coxa with 2 prominent setae on lateral surface; trochanter ventrally with large complex tubercle (Figs 93, 94), tubercle with cylindrical stem-like base and broad oval, disc-like apex bearing a large, anteroventrally directed, spine-like seta with pointed tip, stem-like base with subapical tuberculate ventral seta, disc-like apex with margin of anterior surface (Fig. 94) and posterior surface (Fig. 93) desclerotized, posterior surface concave; femur, tibia and

tarsus subequal in length; femur strongly bowed outwardly (in dorsal view), with prominent anteroventral row of setae, setae subequal to femur width; tibia with dorsal row of about 5 long setae, shortening distally, proximal seta nearly as long as tibia; tarsomere 1 subequal to combined length of tarsomeres 2-4, with thick, stubby, spur-like basiventral seta borne on mound-like tubercle. Wing (Figs 92, 95): Relatively small, slightly shorter than body, R_1 ending at level of M₂, otherwise as in description of *M. acroptera*. Abdomen (Figs 92, 96): Blackish with short dark setae (very weak on sternites); segment 7 bare. Segments 5-7 narrowed and laterally compressed to form cavity on right side for hypopygium. Sternite 5 with broad bilobate ventral projection, symmetrical with short rounded lateral lobes. Sternite 6 with narrow process, with stalk-like base and flared apex (Fig. 96). Sternite 8 rounded and slightly wider than segment 7, setose on and adjacent to margin, with 4 elongate setae on posterior margin, outer pair longer than sternite 8 and about 3× longer than inner pair; tergite 8 vestigial. Hypopygium (Figs 96–99): Concolourous with abdomen; lateroflexed to right; inverted with posterior end directed anteriorly; large, nearly as long as abdomen; asymmetrical. Right and left epandrial lamellae narrowly connected dorsally behind cerci. Left epandrial lamella (Fig. 98) shorter than hypandrium and mostly overlapping its left side, posterior margin with projecting surstylar lobes and ventral epandrial process, ventral edge broadly rounded and fused with hypandrium but margin distinct; ventral epandrial process articulated at base, basal 2/3 of uniform width, apex widely bifurcate. Left surstylus divided into dorsal and ventral lobes separated by cleft adjacent to left postgonite lobe. Dorsal lobe of left surstylus long and broad with prominent lateral ridge, with deeply cleft apicodorsal process bearing basal prensiseta and broadly rounded flap-like medioventral process. Ventral lobe of left surstylus narrow, digitiform, shorter than dorsal lobe of surstylus, with a few apical setae. Right epandrial lamella (Fig. 97) shorter than hypandrium and partially overlapping its right side, longer than high, ventral edge sinuously curved and fused with hypandrium, margin mostly distinct, fading into hypandrium anterodorsally; ventral epandrial process absent. Right surstylus divided into dorsal and ventral lobes separated by V-shaped cleft through which right postgonite lobe protrudes. Dorsal lobe of right surstylus narrow with preapical prensiseta subtended by pair of small setae, apex projecting medially with small apical seta. Ventral lobe of right surstylus longer and broader than dorsal lobe of surstylus, with narrowed tip. Hypandrium (Figs 97, 98) large and ovoid, with knob-like posterior protrusion. Left postgonite lobe long and broad with trifurcate apex (Fig. 98), dorsal process about half as long as middle process, ventral process projecting medially and about $1.5 \times$ longer than middle process. Right postgonite lobe narrow with bifurcate apex (Fig. 97), as long as ventral lobe of surstylus. Phallus J-shaped, with elbow-like articulation point near mid-length, apex bifurcate with narrow curved process nearly as long as straight tubular distal portion of phallus. Ejaculatory apodeme large, keel-like, with pointed posterior margin and rounded anterior margin. Hypoproct simple, left and right lobes symmetrical, subrectangular and flap-like with a few tiny setae. Cercus (Fig. 99) long and digitiform, curved medially with several long lateral setae and 1 shorter medial seta, base of cercus membranous laterally, left and right cercus symmetrical.

Female. Unknown.

Distribution and seasonal occurrence. This new species is known from specimens collected in May and June in the San Francisco Bay Area and Monterey County of northern and central California (Fig. 105).

Etymology. This species is named for the unusual morphology of the trochanter of the male hindleg (Figs 93, 94).

Microphorella sp. A

(Fig. 105)

Material examined. USA: California: *Contra Costa County*: Lafayette [37°53'N 122°07'W], 8.vi.1956, R.A. Stirton, UC Berkeley EMEC 1188338, CNC1155841 (1∂, EMEC).

Diagnosis. In addition to the characters listed above for the *M. trochanterata* lineage, the male of this species is distinguished from other members of the *M. acroptera* species group by its elongated hypandrium with a broad, dome-like posterior protrusion. It is easily distinguished from *M. trochanterata* **sp. nov.** by the absence of specialized elongate setae on the hind tibia and abdominal sternite 8.

Distribution and seasonal occurrence. This species is known only from a single badly damaged male collected in early June of 1956, from the San Francisco Bay Area of northern California (Fig. 105).



FIGURES 100–101. Known geographical distribution of the *Microphorella acroptera* species group. 100. *Microphorella acroptera* Melander and *M. convoluta* sp. nov. 101. *Microphorella bifida* sp. nov., *M. triangulata* sp. nov. and *M. tubifera* Melander.

Remarks. The single known male is in bad condition and is missing most of the right wing and several legs. The abdomen, along with the right hindleg (minus tarsomeres 3–5) and left coxa and trochanter have been removed and macerated in lactic acid. The tip of the ventral epandrial process of the male terminalia is also broken off and lost. Given the poor condition of the only known specimen of this species, we have elected to leave it undescribed until additional material becomes available for study and type designation.

Microphorella arcana species group

Diagnosis. The *Microphorella arcana* species group can be distinguished from other Nearctic *Microphorella* species groups by the following suite of characters: clypeus separated from face by suture; mouthparts with sensory pit on palpus (sometimes difficult to see in non-macerated specimens); male hind trochanter setulose, lacking tubercle; male hind femur with dense patch of fine setae on posterior surface (Figs 107, 109); wing with moderately long R_1 vein that terminates beyond midpoint of wing (Fig. 106); male abdominal sternite 5 with subtriangular apically tapered ventral projection; hypopygium (Figs 110–113) with epandrium and hypandrium mostly separate, with margins defined; right epandrial lamella with dorsally directed ventral process; hypandrium bare; female abdomen (only known for *M. gilaensis* **sp. nov.**) with tergite 5 bearing a cluster of stout median setae, tergite 6 with setae on posterior margin unmodified (*i.e.*, not forming prominent row of long, stout setae), syntergite 9+10 with acanthophorous spines and cercus narrow and pointed.



FIGURES 102–103. Known geographical distribution of the *Microphorella acroptera* species group. 102. *Microphorella paracroptera* sp. nov., *M. sinuosa* sp. nov. and *M. subacroptera* sp. nov. 103. *Microphorella acuminata* sp. nov., *M. compacta* sp. nov. and *M. cornuta* sp. nov.

Distribution. The M. arcana species group is known from California and central Arizona.

Remarks. The dense patch of fine setae on the posterior surface of the male hind femur (Figs 107, 109) and the dorsally directed ventral process of the right epandrial lamella (Figs 111, 113) are considered to be synapomorphies supporting the monophyly of the *M. arcana* species group.

Included species. This group includes the following species: *M. arcana* **sp. nov.**, *M. gilaensis* **sp. nov.** and *M. ovata* **sp. nov.** A fourth species, *Microphorella* sp. B, is recognized but not formally named and described because the terminalia of the unique male specimen is missing.



FIGURES 104–105. Known geographical distribution of the *Microphorella acroptera* species group. 104. *Microphorella* serpentina sp. nov., *M. elongata* sp. nov. and *M. tenuis* sp. nov. 105. *Microphorella maculata* sp. nov., *M. trochanterata* sp. nov. and *Microphorella* sp. A.

Key to males of the Microphorella arcana species group

1	Mid femur without cluster of long basiventral setae	Microphorella sp. B
-	Mid femur with cluster of 6 long basiventral setae (Figs 106, 107, 109)	
2	Abdominal sternite 5 with transverse row of about 6 long curved setae near posterolateral margin (Fig.	108), sternite 6 with
	bulbous lateral projection (Fig. 107)	<i>M. arcana</i> sp. nov.
-	Abdominal sternite 5 and 6 not modified as above	
3	Hind femur with posterior patch of setae dense and brush-like (Fig. 109); hypopygium (Figs 112, 113) w	vith hypandrium large
	and egg-shaped, dorsal lobe of surstylus with claw-like process adjacent to cercus	M. ovata sp. nov.
-	Hind femur with posterior patch of setae less dense (similar to Fig. 107); hypopygium (Figs 110, 111) with	hypandrium smaller,
	dorsal lobe of surstylus lacking claw-like process adjacent to cercus	M. gilaensis sp. nov.

Microphorella arcana sp. nov.

urn:lsid:zoobank.org:act:386AA3CC-A3FB-434F-BB61-EA0E9D5A5060 (Figs 106–108, 115)

Type material. HOLOTYPE, ♂ (Fig. 106) labelled: "USA: CA: Kent[*sic*]|Co.,Mt. Pinos [34°48'46"N 119°08'43"W], 2550m| 3-4.vi.1992| A. Goering/ J. Skevington| malaise, iris meadow"; "HOLOTYPE| *Microphorella*| *arcana*| Brooks & Cumming" [red label] (DEBU).

Diagnosis. Males of this species can be distinguished from other members of the *M. arcana* species group by the following features: mid femur with cluster of 6 long basiventral setae (Fig. 106), hind femur with posterior patch of setae relatively sparse and not brush-like (Fig. 107), abdomen with transverse row of long curved setae on sternite 5 (Fig. 108) and bulbous projection on sternite 6 (Fig. 107).



FIGURES 106–109. Male habitus, legs and abdomen of *Microphorella arcana* sp. nov. and *M. ovata* sp. nov. 106. Habitus of *M. arcana* sp. nov. holotype. 107. Body and legs of *M. arcana* sp. nov. holotype, dorsolateral view, arrows indicate setae on hind femur and bulbous projection on sternite 6. 108. Legs and abdomen of *M. arcana* sp. nov. holotype, left lateral view, arrow indicates setae on sternite 5. 109. Body and legs of *M. ovata* sp. nov. paratype, posterolateral view, arrow indicates setae on hind femur.

Description. Male (Figs 106–108): Wing length 1.8 mm. Similar to *M. ovata* **sp. nov.** except as follows: **Head** (Figs 106, 107): Antenna with postpedicel ending in longer narrow apex. **Thorax:** Dark brown in lateral view; acrostichal setae weak and sparsely biserial, ending near 2nd pair of dorsocentrals. **Legs:** *Hindleg*: Femur with setae of anteroventral row distinctly longer than femur width, posterior surface with mound-like swelling weaker and bearing less dense cluster of setae (Fig. 107). **Wing:** As in description of *M. acroptera*. **Abdomen** (Figs 106–108): Dark brown with short dark setae; segment 6 mostly bare; segment 7 bare. Segments 5–7 narrowed and laterally compressed to form cavity on right side for hypopygium. Sternite 5 with broad subtriangular ventral process with membranous tip, with transverse row of about 6 long curved setae near posterolateral margin (Fig. 108). Sternite 6 with bulbous lateral projection (Fig. 107). Sternite 8 subquadrate, setose, slightly wider than segment 7. *Hypopygium* (Fig. 106): Concolourous with abdomen and about half as long; other features not observable on unique male holotype, which has the hypopygium mostly encased in glue.

Female. Unknown.

Distribution and seasonal occurrence. This new species is only known from Mount Pinos in Kern and Ventura counties, southern California, where the holotype was collected in early June of 1992 (Fig. 115).

Etymology. This species is named after the Latin for mystery, in reference to Iwihinmu, the Chumash name for Mount Pinos, which means "a place of mystery" in the Samala language. The name also alludes to the currently mysterious morphology of the terminalia of the only known male, which unfortunately is encased in glue.

Microphorella gilaensis sp. nov.

urn:lsid:zoobank.org:act:F6C662D7-E2DA-493F-8AA1-FF1B553A7DB4 (Figs 110, 111, 115)

Type material. HOLOTYPE, \Diamond labelled: "Globe Ariz| 13 Apr. 35| ALMelander"; "ALMelander| Collection| 1961"; "CNC| 1155803"; "HOLOTYPE| *Microphorella*| *gilaensis* | Brooks & Cumming" [red label] (USNM). **PARATYPES: USA: Arizona:** *Gila County*: same data as holotype [33°23'59"N 110°46'54"W] (4 \heartsuit , USNM).

Diagnosis. Males of this species can be distinguished from other members of the *M. arcana* species group by the following features: mid femur with cluster of 6 long basiventral setae (similar to Fig. 106), hind femur with posterior patch of setae relatively sparse and not brush-like (similar to Fig. 107), abdominal sternite 5 without transverse row of long curved setae, abdominal sternite 6 without bulbous projection, hypopygium with dorsal surstylus lacking claw-like process adjacent to cercus and hypandrium not strongly produced posteriorly (Figs 110, 111).

Description. Male (Figs 110, 111): Wing length 1.8 mm. Similar to *M. ovata* sp. nov. except as follows: Head: Antenna with arista-like stylus longer, about 3× length of postpedicel. Thorax: Acrostichal setae absent; 5 dorsocentrals; scutellum of holotype with setae broken off. Legs: Hindleg: Femur with setae of anteroventral row subequal to femur width, posterior surface without mound-like swelling, cluster of setae less dense, basiventral surface below and proximal to cluster with fewer and shorter setae. Wing: As in description of *M. acroptera*. Abdomen: Hypopygium (Figs 110, 111): Left epandrial lamella (Fig. 110) with ventral epandrial process longer, narrower in middle portion, with short dorsal setae closer to base, apex enlarged and bifurcate. Dorsal lobe of left surstylus digitiform with strong apical seta, dorsal margin with weak setulose bump adjacent to cercus, lacking claw-like process. Ventral lobe of left surstylus with upper medial prensiseta flared apically and lacking bifurcation, lower medial prensiseta with flared, truncate apex. Right epandrial lamella (Fig. 111) with ventral epandrial process narrowed apically, tip not laterally flattened. Dorsal lobe of right surstylus broad with rounded apical margin bearing 2 setae (upper one missing in unique holotype), dorsal margin broadly hump-like posterior to cercus, lacking clawlike process. Hypandrium (Figs 110, 111) smaller, not strongly produced posteroventrally, with only short projection posterodorsally. Phallus (Fig. 110) trifurcate, with large curved acuminate process about 2/3 as long as distal portion of phallus and shorter spine-like process. Hypoproct with lobes large, rounded and strongly projected dorsally. Cercus small, short and rounded with several setae, left and right lobes symmetrical.

Female. Similar to male except as follows: **Head:** Face broader, tapered ventrally to about $3 \times$ width of anterior ocellus. **Thorax:** Acrostichal setae present, sparse and irregular, or biserial; 2–3 notopleurals; scutellum with 1 long seta and 1 small outer seta per side. **Legs:** *Midleg*: Femur unmodified, without cluster of long basiventral setae. *Hindleg*: Femur without cluster of setae on posterior surface. **Abdomen:** As in description of *M. acroptera*.



FIGURES 110–111. Hypopygium of *Microphorella gilaensis* sp. nov. holotype. 110. Left lateral view. 111. Right lateral view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; hypd—hypandrium; hyprct—hypoproct; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Distribution and seasonal occurrence. This new species is known only from Globe, Gila County, Arizona, where the type series was collected in April of 1935 (Fig. 115).

Etymology. This species is named after Gila County in Arizona.

Microphorella ovata sp. nov.

urn:lsid:zoobank.org:act:6EDD3819-744E-40E5-8AEA-89E10943506E (Figs 1, 109, 112–114, 115)

Type material. HOLOTYPE, ♂ from the Upper Santa Ana River, California, labelled: "UpStaAnaRiv| 31/v/47 Cal| ALMelander"; "ALMelander| Collection| 1961"; "HOLOTYPE| *Microphorella*| *ovata*| Brooks & Cumming" [red label] (USNM). **PARATYPES: USA: California:** *San Bernardino County*: same data as holotype [34°10'N 116°49'W] (1♂, USNM); same data as holotype except, CNC1155848 (1♂, USNM).

Diagnosis. Males of this species can be distinguished from other members of the *M. arcana* species group by the following features: mid femur with cluster of 6 long basiventral setae (Fig. 109), hind femur with dense, brushlike posterior patch of setae (Fig. 109), abdominal sternite 5 without transverse row of long curved setae, abdominal sternite 6 without bulbous projection, hypopygium with claw-like process of dorsal surstylus adjacent to cercus and hypandrium strongly produced posteriorly (Figs 112, 113).

Description. Male (Figs 109, 112–114): Wing length 1.7–1.8 mm. **Head:** Mainly blackish-brown pruinose, ventral part of frons, face and clypeus blackish-brown in anterior view; about as wide as thorax in dorsal view; ovoid in lateral view (higher than broad); slightly broader than high in anterior view; larger setae black, smaller setae brown. Ocellar triangle conspicuous. Occiput weakly concave on upper median part. Eyes covered with short ommatrichia; medial edge of eye with small emargination adjacent to antenna; ommatidia subequal in size. Frons about 2× broader than high, widening above. Face slightly tapered ventrally to about 2× width of anterior ocellus. Face and clypeus blackish-brown with brownish-grey pruinosity, concolourous with ventral part of frons (in anterior view). Clypeus separated from face, small, as broad as high, very slightly widened ventrally, with truncate ventral

margin. Setae of head well differentiated (larger dorsal setae similar in size to anterior dorsocentrals): 1 pair of inclinate fronto-orbitals arising slightly ventral to median ocellus; 1 pair of lateroclinate anterior ocellars; 1 pair of small posterior ocellars; 1 pair of inner verticals (sometimes referred to as postocellars); 2 pairs of outer verticals; postocular setae short and uniserial. Antenna inserted above middle of head in profile; scape short, funnel-shaped, dark brown; pedicel about 2× longer than scape, spheroidal with subapical circlet of setulae, dark brown; postpedicel about 2× longer than pedicel, about 2× longer than wide, bulb-shaped, blackish-brown, clothed in fine setulae; aristalike stylus apical, about 1.5× length of postpedicel, blackish-brown, with minute hairs. Palpus blackish-brown, relatively small, narrowly ovate, about 2.5× longer than wide, with 2 long preapical setae. Proboscis brown, short, projecting ventrally. Gena narrow. Thorax: Blackish to blackish brown in lateral view, dorsum blackish bronze, weakly pruinose and somewhat shiny, with metallic blueish-green tinge, setae black. Mesoscutum moderately arched, prescutellar depression present. Proepisternum with a few tiny setae. Postpronotal lobe with 2 small setae. Mesonotum longer than wide. Acrostichal setae weak and sparsely biserial to mostly absent; setae on each side of mesonotum: 6 dorsocentrals, posterior seta longer, 1 presutural supra-alar (posthumeral), 3 postsutural supra-alars, 3 notopleurals (posteroventral seta weaker), 1 postalar, area laterad dorsocentrals with a few small setae. Scutellum broadly crescent-shaped with 1 long seta and 1 small outer seta per side. Mesopleuron bare. Halter dark brown. Legs: Slender, dark brown with prominent setae dark brown to blackish; femora, tibiae and tarsi largely covered with tiny, dark brown setae (paler on medial surfaces); tarsomeres 1-4 of all legs progressively shorter apically with tarsomere 5 slightly longer than 4; tarsal claws, pulvilli and empodium normally developed on all legs. Foreleg: Coxa with setae on anterior surface, stronger and longer apically; femur, tibia and tarsus subequal in length; tarsomere 1 subequal to combined length of tarsomeres 2-4. Midleg: Coxa with a few prominent setae on anterior surface; femur slightly shorter than tibia, tibia subequal in length to tarsus; femur slightly swollen basally with cluster of 6 long basiventral setae (Fig. 109); apex of tibia with 1 strong ventral seta; tarsomere 1 subequal to combined length of tarsomeres 2-5. Hindleg: Coxa with 2 prominent setae on lateral surface; trochanter setose ventrally; femur and tibia subequal in length, tarsus slightly shorter; femur with prominent anteroventral row of setae, setae at most slightly longer than femur width, posterior surface with mound-like swelling near mid-length bearing dense brushlike cluster of setae (Fig. 109), basiventral surface below and proximal to cluster with long fine setae; tarsomere 1 subequal to combined length of tarsomeres 2-4. Wing: As in description of *M. acroptera*. Abdomen (Fig. 109): Dark brown with short dark setae (very weak on sternites); segment 7 bare. Segments 5–7 narrowed and laterally compressed to form cavity on right side for hypopygium. Sternite 5 with broad subtriangular ventral process with membranous tip, with a few relatively short setae near posterolateral margin. Sternite 6 without bulbous lateral projection. Sternite 8 subquadrate, setose, slightly wider than segment 7; tergite 8 vestigial. Hypopygium (Figs 109, 112–114): Concolourous with abdomen; lateroflexed to right; inverted with posterior end directed anteriorly; large, about half as long as abdomen; asymmetrical. Right and left epandrial lamellae not connected dorsally behind cerci. Left epandrial lamella (Fig. 112) shorter than hypandrium and partially overlapping its left side, posterior margin with projecting surstylar lobes and ventral epandrial process, ventral edge broadly rounded and separate from hypandrium; ventral epandrial process articulated at base, relatively short, basal 2/3 of uniform width with a few short dorsal setae, apex bifurcate. Left surstylus divided into dorsal and ventral lobes separated by U-shaped cleft through which left postgonite lobe protrudes. Dorsal lobe of left surstylus with dorsally projected claw-like process adjacent to cercus, subtended by short irregular ridge bearing 1 long seta and adjacent long blade-like prensiseta with bent tip. Ventral lobe of left surstylus broad, margin rounded with 2 long apical setae and 2 highly modified prensisetae projecting from medial surface (Fig. 114), upper prensiseta with flared, bifurcate apex, lower prensiseta narrow with pointed spiny apex. Right epandrial lamella (Fig. 113) shorter than hypandrium and partially overlapping its right side, longer than high, ventral edge separate from hypandrium; ventral epandrial process present, not articulated at base, projecting dorsally, uniformly wide in lateral view (tip laterally flattened), about 4× longer than wide. Right surstylus divided into dorsal and ventral lobes separated by U-shaped cleft through which right postgonite lobe protrudes. Dorsal lobe of right surstylus with dorsally projected claw-like process adjacent to cercus, subtended by short, rounded lobe bearing 2 long apical setae. Ventral lobe of right surstylus projecting dorsomedially behind postgonite lobe, slightly longer than wide, rounded apically, bearing 2 long apical setae and a few shorter setae. Hypandrium (Figs 112, 113) large and ovoid, strongly produced posteroventrally, with short trough-like extension posterodorsally, longer than epandrium in lateral view, bare. Left postgonite lobe long and curved medially, with thumb-like preapical medial process subtended by flat-tipped modified seta. Right postgonite lobe similar in size and form to left lobe. Phallus (Fig. 112) J-shaped, bifurcate with straight acuminate process,

process half as long as ridged, tubular, distal portion of phallus. Ejaculatory apodeme relatively small, narrow and keel-like. Hypoproct simple, left and right lobes symmetrical, short and subquadrate. Cercus small, digitiform with several apical setae, left and right lobes symmetrical.

Female. Unknown.

Distribution and seasonal occurrence. This new species is known from the Upper Santa Ana River (Fig. 1) in the San Bernadino Mountains in California (Fig. 115), where the type series was collected in late May of 1947. **Etymology.** This species is named in reference to the oval, egg-shaped hypandrium.



114 M. ovata

FIGURES 112–114. Hypopygium of *Microphorella ovata* **sp. nov.** paratype (CNC1155848). **112.** Left lateral view. **113.** Right lateral view. **114.** Left ventral lobe of surstylus, posterior view. Abbreviations: cerc—cercus; d sur—dorsal lobe of surstylus; hypd—hypandrium; pgt lb—postgonite lobe; ph—phallus; v epand proc—ventral epandrial process; v sur—ventral lobe of surstylus.

Microphorella sp. B

(Fig. 115)

Material examined. USA: California: *Sutter County*: Sutter Buttes [39.2058°N 121.8199°W], 2.iv.1953, J.C. Hall (1♂, 1♀, UCDC).

Diagnosis. Males of this species differ from the other members of the *M. arcana* species group by the mid femur lacking long basiventral setae and hind femur with posterior patch of setae relatively sparse and not brush-like (similar to Fig. 107).

Distribution and seasonal occurrence. This species is known only from a pair of specimens collected in early April of 1953, from the Sutter Buttes near Yuba City in the Central Valley of northern California (Fig. 115).

Remarks. The male is missing its hypopygium, so we have elected to leave this species undescribed until additional material becomes available for study and type designation.



FIGURE 115. Known geographical distribution of the *Microphorella arcana* species group: *M. arcana* **sp. nov.**, *M. gilaensis* **sp. nov.**, *M. ovata* **sp. nov.** and *Microphorella* **sp.** B.

Additional records of the *M. acroptera* and *M. arcana* species groups

The following list includes additional collection records comprised of females that could not be confidently determined to species level. These female specimens were either collected without corresponding males, or do not correspond with males taken during a common collection event. The records below do not significantly extend the known range of either species group and are not plotted on the maps.

Material Examined. USA: Arizona: *Mohave County:* Littlefield [36°53'14"N 113°55'47"W], B-19 1932, 15.iv.1932, E.W. Davis, *Covillea tridentata* (DE) Vail (1 \bigcirc , USNM). **California:** *Alameda County:* Sunol Valley Regional Park [37.51514°N 121.83100°W], 1.vi.1968, 120 m, P.H. Arnaud, Jr (1 \bigcirc , USNM). *Fresno/San Benito County:* Big Panoche Ck [36°44'55"N 120°30'48"W], 21.iv.1967, J. Powell (1 \bigcirc , EMEC). *Lake County:* Lake Pillsbury [39.42063°N 122.95979°W], 4.iv.1962 (1 \bigcirc , EMEC). *Los Angeles County:* Los Angeles, Griffith Pk [34°8'N 118°18'W], 3.vi.1945, A.L. Melander (1 \bigcirc , USNM). *Marin County:* Bolinas [37°54'34"N 122°41'11"W], 4.iv.1976, R.O. Schuster (1 \bigcirc , UCDC); Lily Pond [37°56'N 122°38'W], 1500 ft, Alpine Lk., 10–15.vi.1970, Malaise

Trap (1 \bigcirc , CNC); same data except, 6.vii.1970 (3 \bigcirc , CNC); same data except, 26.vi–2.vii.1970, D. Monroe (1 \bigcirc , EMEC); same data except, 7.vii.1970, D.D. Monroe (1♀, CNC); Mill Valley [37°54'N 122°33'W], 25.vii.1967, P.H. Arnaud, Jr (2, USNM); same data except, 26–27.v.1965, flight trap (1, USNM); Samuel P. Taylor SP, along Lagunitas Ck below [37°56'N 122°38'W], 20.v.1978, D.D. Wilder (1°, CAS); Mt Tamalpais [37°55'N 122°34'W], vic. Rock Springs, 610 m, 197[?], P.H. Arnaud, Jr, collected at flower *Ranunculus* sp. (1°) , mounted with flower, USNM); Mt Tamalpais, Old Stage Rd nr Bootjack Camp, 9.v.1992, #00719-B, P.H. Arnaud, Jr (1^o, USNM); Novato [38°06'27"N 122°34'11"W], San Jose Creek, south of San Jose School, 10.vii.1971, 55 m, P.H. Arnaud, Jr (1[♀], USNM). *Mendocino County*: Willits [39°24'35"N 123°21'20"W], 30.v.1955, E.I. Schlinger (1[♀], UCDC). Monterey County: Arroyo Seco Campground [36.2359°N 121.4816°W], 22.iv.1980, Malaise trap, L.G. Bezark (1^o+, CNC); same data except, Abbott Lakes, 18–19.iv.1970, P.H. Arnaud, Jr (1♀, USNM); Arroyo Seco, The Lakes [36°14'N 121°28'W], 12.iv.1997, flight trap, Collection 01737-A, P.H. Arnaud, Jr & M.M. Arnaud (1♀, USNM). Napa County: Butts Canyon, 13 km NW Pope Valley [$38^{\circ}37$ 'N 122°26'W], 21.iv.1979, T.W. Davies (1 \mathcal{Q} , CAS); north side Howell Mtn, 3.2 km NNE Angwin [38°34'28"N 122°26'53"W], 395 m, 17.iv.1977, P.H. Arnaud, Jr (1^o, USNM); same data except, 2 mi. NNE Angwin, 1300 ft, 28.iii.1982, H.B. Leech (1♀, CAS). Plumas County: 8 km NW Quincy [39°56'11"N 120°56'53"W], 1030 m, 26–30.vi.1982, L.D. French (1♀, UCDC). *Riverside County*: Agua Caliente Indian Reservation, Palm Canyon [33°46'N 116°34'W], 27.ii.1970, P.H. Arnaud, Jr (1♀, USNM); R.R. Cyn, 4 mi. Elsinore [33.67195°N 117.27122°W], 17.iv.1965, P. Turner (1♀, EMEC); Mg. Spr. Can. nr Indio [33°43'N 116°13'W], 5.iv.1945, A.L. Melander (1♀, USNM); Temecula [33°30'12"N 117°7'25"W], 10.v.1945, A.L. Melander (1♀, USNM); Thousand Palms [33°50'N 116°18'W], 25.iii.1955, W.R. Richards (2♀, CNC); 1000 Palms Oasis, Thousand Palms, 30.iii.1955, W.R. Richards (1♀, CNC); Snow Crk, White Water [33°56'08"N 116°41'14"W], 1500 ft, 7.iii.1955, W.R. Richards (12, CNC). San Benito County: Hwy 146, Bear Valley, Pinnacles Cpgd nr E entrance to Pinnacles National Monument [36.49055°N 121.14829°W], 900 ft, 24/25.v.1992, #00729, P.H. Arnaud, Jr (4♀, USNM). San Bernardino County: Lucerne Valley [34°26'38"N 116°58'1"W], 13.v.1955, W.R.M. Mason (1[♀], CNC). San Diego County: Cajon [32°47'54"N 116°57'36"W], 23.iv.1946, A.L. Melander (1[♀], USNM); Lake Cuyamaca [32°59'11"N 116°34'50"W], 7.v.1945, A.L. Melander (19, USNM); Oakzanita Springs Park [32.88403°N 116.57446°W], 4200 ft, 25.v.1971, P.H. & M. Arnaud, flight trap, creek (1♀, USNM); Palomar Observatory Cpgd [33.34304°N 116.87773°W], 26.vi.1968, 1524 m, P.H. Arnaud, Jr (2♀, USNM). San Luis Obispo County: S end of Soda Lake, 15 mi. SE Simmler [35°12'N 119°51'W], 2.iv.1969, H.B. Leech (19, CAS). San Mateo County: La Honda [37°19'N 122°16'W], 10.vii.1963, P.H. Arnaud, Jr (1[♀], CAS); same data except, 120 m, 31.vii.1966 (2[♀], USNM); same data except, 29.vi.1969 (1^Q, USNM); Redwood City [37°29'N 122°14'W], 30.iii.1951, P.H. Arnaud, Jr (1♀, USNM); San Bruno Mountains [37°41'15"N 122°26'08"W], 26.iv.1968, P.H. Arnaud, Jr (1♀, USNM); oak grassland N of Sand Hill Rd, W of Junipero Serra Freeway [37.41931°N 122.22830°W], 26.iii.1978, P.H. Arnaud, Jr (1♀, USNM); Stanford Univ. [37°25'39"N 122°10'12"W], 20–23.v.1995, P.H. Arnaud, Jr (1♀, USNM); same data except, 3.vi.1995 (12, USNM). Santa Clara County: 2.5 mi. W Saratoga, Congress Springs Rd [37.25236°N 122.08266°W], 22.v.1965, P.H. Arnaud, Jr (2♀, USNM); Soquel [36°59'13"N 121°56'44"W], 12.vi.1952, E.I. Schlinger (2♀, UCDC). Ventura County: mouth of Ventura River [34.27606°N 119.311178°W], 24.iv.1966, J. Powell (1 $^{\circ}$, EMEC).

Discussion

In their phylogenetic analysis of the Parathalassiinae, Cumming & Brooks (2019) determined that *Microphorella* was both paraphyletic and polyphyletic, and made up of at least 12 species groups world-wide, including four (now five) from the Nearctic Region. In their analysis, there was no evidence that the Nearctic species together formed a single monophyletic group. Each of the Nearctic species groups, including the *M. acroptera* species group and the newly established *M. arcana* species group appear to be monophyletic, although the relationships between the groups remain unclear. It is possible however, that the *M. acroptera* and *M. arcana* species groups are more closely related to each other than to the other three Nearctic species groups.

Both species groups occur only in western North America, ranging together from southeastern Alberta and northeastern Montana south to southern California and central Arizona. The included species in both groups are generally found in riparian areas, but some occur in more arid habitats than other *Microphorella* species. These periodically dried-up areas, in our experience, are often overlooked by empidoid collectors and this may have contributed to their relative rarity in collections.

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