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Two new genera of Nearctic Chamaemyiidae (Diptera: Lauxanioidea) associated with *Cinara* aphids (Hemiptera: Aphididae) on *Pinus*

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Abstract

Two new genera of Chamaemyiidae (Diptera: Lauxanioidea) are described and illustrated, including: *Chamaethrix* **gen. nov.** (type species *Chamaethrix necopina* **sp. nov.**), possibly a predator of *Cinara ponderosae* (Williams) on *Pinus ponderosa* in the southwestern United States; and *Vitaleucopis* **gen. nov.** (type species *Vitaleucopis nidolkah* **sp. nov.**; other included species *Vitaleucopis astonea* (McAlpine), **comb. nov.**, and *Vitaleucopis scopulus* **sp. nov.**), predators of *Cinara* aphids and possibly adelgids on Pinaceae in western North America. Immature stages are discussed or described and illustrated for some taxa, including the eggs of *Chamaethrix necopina* and *Vitaleucopis nidolkah*; and the third instars and puparia of *Vitaleucopis nidolkah*.

Key words: new genus, new species, new combination, immature stages

Introduction

Chamaemyiidae (Diptera), or silver flies, represent a group of larval predators attacking sternorrhynchous Hemiptera such as aphids, adelgids, scales and mealybugs. Although the species of some chamaemyiid genera are quite general in their feeding habits, many genera are restricted to a particular sternorrhynchan host type. The two genera described herein have only been collected in association with Pinaceae, one reared as a confirmed predator of aphids in the genus *Cinara* Curtis (Hemiptera: Aphididae) on ponderosa pine, *Pinus ponderosa* P. Lawson & C. Lawson (Pinaceae), and the other a possible predator of the same, but never reared. There are currently 30 described extant genera and subgenera of Chamaemyiidae with more than 340 valid species. The vast majority of species-level work has been undertaken in the Palearctic Region (*e.g.*, Tanasijtshuk, 1986). For the New World fauna, no comprehensive treatments have been published, although McAlpine (1987) provided a key to genera and review of the Nearctic fauna. Tanasijtshuk (2002) summarized the Nearctic species of *Leucopis* Meigen published before 1965, and then (Tanasijtshuk 2003, 2005, 2006) proceeded to describe and illustrate 21 new species of *Leucopis* from this part of the world, but with no keys to species and leaving many more still in need of description. The Chamaemyiidae chapter (Gaimari 2010) in the *Manual of Central American Diptera* reviews the morphology, classification, and biology for the family, and includes a key to all New World genera. The current paper serves to make available two of the recognized new genera (undescribed genera B and D) from that work. One of the other undescribed genera from South America in that work (undescribed genus A) was recently described as *Chamaeleucopis* Gaimari, 2012, and the remaining undescribed genus (undescribed genus C) will be described in a forthcoming paper.

Materials and methods

Specimens for this study were mostly collected by the author in the southwestern United States, and are deposited in the California State Collection of Arthropods, Sacramento, California, USA (CSCA), in addition to other material from CSCA and from the Canadian National Collection of Insects, Arachnids & Nematodes, Agriculture & Agri-Food Canada, Ottawa, Ontario, Canada (CNC). Paratypes of one species are also deposited in the National Museum of Natural History, Washington, DC, USA (USNM).

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For all specimens where abdomens were dissected and macerated using lactic acid, the partial abdomen and genitalia are stored in glycerin in a glass vial mounted on the same pin. Specimens in the material examined section indicated as "[molecular voucher]" are only the abdomen, head, wings and some legs stored in a glycerin vial mounted on a pin; the thorax of each was used as part of an ongoing collaborative phylogenetic project with Nathan Havill (USDA Forest Service, Hamden, Connecticut, USA). These are indicated with unique "specimen numbers", which correspond to an entry in the database of the CSCA Frozen Tissue Collection (FTC). For complete specimens (or series) in the CSCA-FTC, they are indicated with unique "specimen numbers" or "voucher numbers" which correspond to samples in the freezer and database. Records of *Vitaleucopis nidolkah* indicated with such notation as "1#85L" refer to entries in the authors collecting notebooks, with L referring to a larva and P referring to a puparium collected and reared.

Terminology. Basic terminology follows Cumming & Wood (2009) and Gaimari (2010). Body length was measured in lateral view by adding the length of the head (without antennae) through the thorax with the abdominal length, to account for differential curling of the abdomens. For head ratios: the head length and height were measured from a lateral view, respectively, from the lunule through the posterior occiput, and from the dorsal edge of the head through the ventral edge of the gena; the frons width and length were measured from an anterodorsal view, with the frons width through the anterior ocellus, and the frons length from the anterior ocellus through the anterior edge of the frons. On the thorax, the scutal width is measured at the level of the supra-alar setae, and the scutellar width is measured through the area of contact with the scutum. Wing width was measured at the widest level just proximal to the apex of CuA_1. All other measurements were made through their maximum values. It is worth noting that structures are measured and ratios calculated from the perspective of their maximum value, which in many instances will not be the same as what appears on a photograph or illustration which shows only two dimensions. General characteristics of the family are given in McAlpine (1987) and Gaimari (2010), and are not repeated here unless recording deviation or variability.

Chamaethrix **gen. nov.**

urn:lsid:zoobank.org:act:0EB03507-C38A-48A1-9740-63D958CFBB9A

"Undescribed genus D"—Gaimari 2010: 1006.

Type species. *Chamaethrix necopina* sp. nov., by present designation.

Etymology. The prefix *Chamae-*, in reference to the family Chamaemyiidae, appended with the feminine Greek terminal root *-thrix*, meaning "hair." The name refers to the odd conformation of head setae for this genus.

Diagnosis. As a monotypic genus, the diagnosis for the genus is identical to that of the single known species.

Remarks. The genus is a member of the Leucopini (in the subfamily Chamaemyiinae), as evidenced by such characteristics as the stout and compact body, the absence of postocellar setae, the high setulose lunule, the lack of a presutural dorsocentral seta with dorsocentral setae generally located posteriorly, the presence in males of microtrichiae on the lateral edges of syntergite 1+2 and tergite 3, and the relatively compact form and pattern of furrows of the egg. But at the same time, there are characteristics present that are typical of Chamaemyiini, such as the proclinate ocellar setae (although they are tiny in this new genus), the flat frons descending at an angle from the vertex, and the multiple fronto-orbital setae along the length of the eye margin. This odd mix of chamaemyiine and leucopine characteristics made placement to tribe not straightforward, but the preponderance of evidence points to its inclusion in the Leucopini.

Chamaethrix necopina **sp. nov.**

urn:lsid:zoobank.org:act:CEE1D15E-AE26-4807-B7F2-A3436609F6F1
(Figs 1–10)

Etymology. From Latin, *necopina*, meaning "unexpected", indicating the author's surprise at finding this interesting taxon.

Diagnosis. The body is compact and stout. Postocellar setae are absent, but ocellar setae are tiny, widely sepa-

rated and proclinate. The frons is flat, and descends at an angle from the vertex, with the lunule above the antennae in the same angled plane. The fronto-orbital area has 5–6 evenly spaced setae along the eye margin. The lunule is high and setulose, curved back to be in the same plane with the frons. The antennae are yellow, except for a darkened spot on the 1st flagellomere anterobasally to the arista and the darkened distal section of the arista. The palpus, prementum and labellum are yellow, with the palpus being spatulate. The scutum is silvery grey pruinose, lacking dorsocentral vittae, and with 3–4 dorsocentral setae in the posterior half of the scutum. Prescutellar setae are absent. The abdominal tergites are mostly silvery grey, but tergite 3 has a pair of darkened pruinose spots. In the male genitalia, the postgonite is absent.

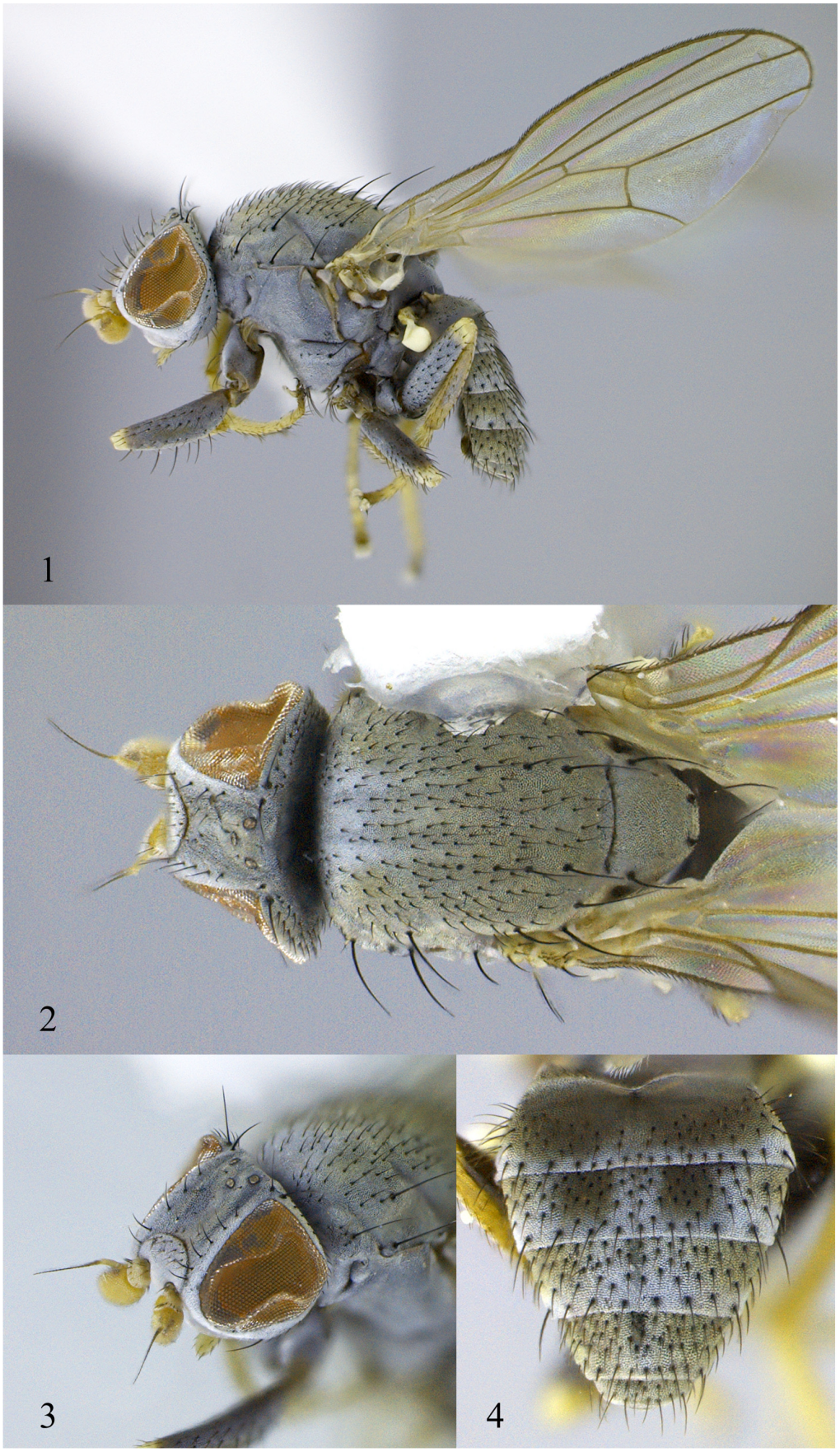
Description. *Adults*, ♂, ♀. Body (Fig. 1) length 2.0–2.4 mm (♂, 2.0–2.2 mm; ♀, 2.4 mm); mostly concolorous silvery grey pruinose.

Head (Figs 1–3). 1.2–1.4 X higher than long; 1.3–1.4 X wider than high. Vertex with outer vertical seta slightly longer than inner one. Postocellar setae absent. Ocellar triangle equilateral, slightly raised, placed slightly anterior to vertex; lacking setulae. Ocellar setae tiny, proclinate; separated by distance equal to distance between posterior ocelli; originating beside anterior ocellus. Eye 1.2–1.3 X higher than long; height 2.1–2.4 X genal height. Frons 1.5–1.7 X wider than long; with lateral edges only slightly diverging anteriorly, 1.1–1.2 X wider at level of lunule than at level of anterior ocellus; with small, fine, reclinate setulae medially; descending from vertex at angle, with lunule curved up into same plane. Mid frontal vitta slightly depressed, darker grey pruinose than fronto-orbital area and ocellar triangle. Fronto-orbital area with 5–6 evenly spaced setae along eye margin, with each seta shorter than outer vertical seta. Lunule arched, height 0.5–0.6 X frons length; sloping abruptly into plane of frons above antennal base; with small, fine, proclinate setulae in upper part. Antenna yellow except 1st flagellomere with darkened spot anterobasally to arista and distal segment of arista dark; separated by width of antennal socket; 1st flagellomere short, rounded; arista with distal segment 2.8–3.2 X longer than basal. Face and parafacial undifferentiated, whitish pruinose, receding, with deep antennal grooves. Gena whitish pruinose with one strong genal seta in addition to several setulae behind, receding below eye. Clypeus small, exposed. Palpus yellow, spatulate; with several scattered tiny setulae and one slightly larger distal setula. Prementum and labellum yellow.

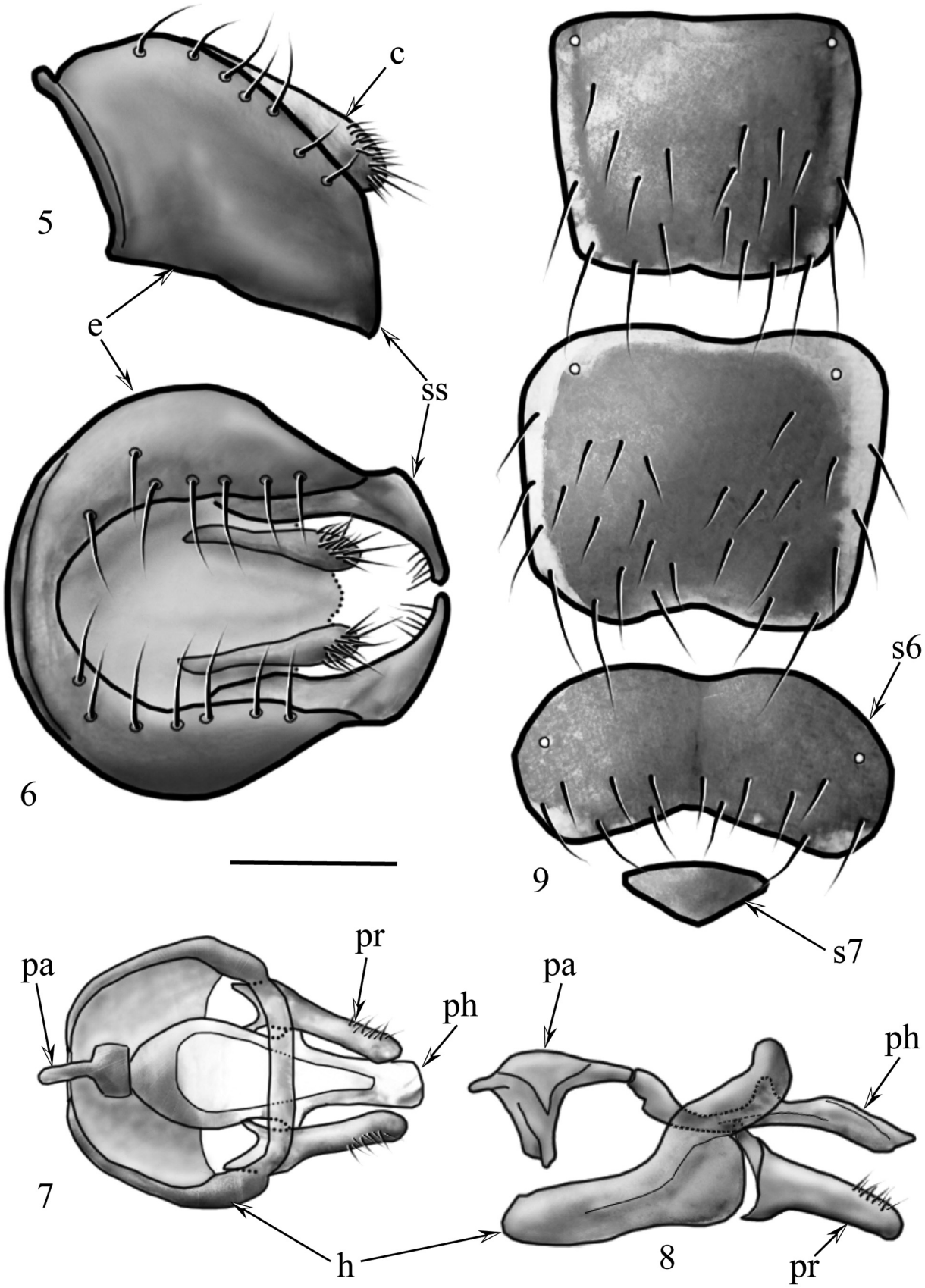
Thorax (Figs 1–2). Scutum 1.2–1.3 X longer than wide; 3.5–3.9 X scutellar length; setulose dorsally (bounded laterally by supra-alar line); dorsocentral vittae absent; color varies to slightly bronzy grey. Prescutellum present. Scutellum 1.5–1.7 X wider than long; color varies to slightly bronzy grey. Chaetotaxy: lacking presutural dorsocentral setae, with 3 or 4 postsutural dorsocentral setae, posterior seta longest, with size decreasing for each one anteriorly, and with anterior-most seta sometimes scarcely distinguishable from scutal setulae; one postpronotal seta, with several smaller setulae; two notopleural setae, in anterior and posterior corners, posterior one slightly smaller; one pre- and one postsutural supra-alar seta; two postalar setae; prescutellar acrostichal seta absent; proepisternum, anepisternum and anepimeron lacking setae; one strong katepisternal seta along upper edge, with 2–3 small setulae anterior to seta; two pairs scutellar setae, subequal in length, posterior pair subparallel but bowed out along length. *Legs*. Femora greyish pruinose, with distal tip yellow; forefemur thickened. Tibiae yellow, with sparse silvery pruinosity. Tarsi yellow, with distal part of tarsomere 5 slightly darkened. *Wing*. Length 2.0–2.6 mm (♂, 2.0–2.3 mm; ♀, 2.6 mm); 2.8–2.9 X longer than high. Hyaline, with veins brown. Veins R_{2+3}, R_{4+5} and M_1 subparallel in distal half of wing. Crossvein r-m located at halfway point of wing length, and at 2/3 point of cell dm length. Vein Cu extends to wing margin; apical section 1.3–1.6 X longer than crossvein dm-cu. Halter yellow.

Abdomen (Figs 4, 9). Tergites uniformly setulose, except setulae slightly enlarged along posterior margin, longest laterally. Syntergite 1+2 and tergite 3 of ♂ each with patch of microtrichiae on lateral edge (*cf*. fig. 2 of Gaimari *et al*. 2008). Tergites silvery grey pruinose, except syntergite 1+2 mostly brown pruinose (silvery grey only laterally and along posterior margin), tergites 3–5 with pruinosity bronzy grey anterolaterally, tergite 3 with paired brown spots, and tergites 4 and 5 each with small median black (less pruinose) vitta extending posteriorly through 2/3 length. Sternites 3, 4 and 5 rounded trapezoidal, subequal, with slight emargination on posterior edge of sternite 5. *Pregenital segments of male*. Tergite and sternite 6 absent. Syntergosternite 7+8 saddle-shaped, less than half length of preceding tergite; sternite 7 small, lightly sclerotized, longer than wide, tapering posteriorly, bare.

Male genitalia (Figs 5–8). Epandrium moderately convex posteriorly, with 6–9 setae along posterior part; smoothly tapering into distally pointed surstylar lobe; surstylus with sharpened edge, and distomedially with tiny setulae. Cercus small, with setulae at tip. Hypandrium in dorsal view subequal in length and width, widest in

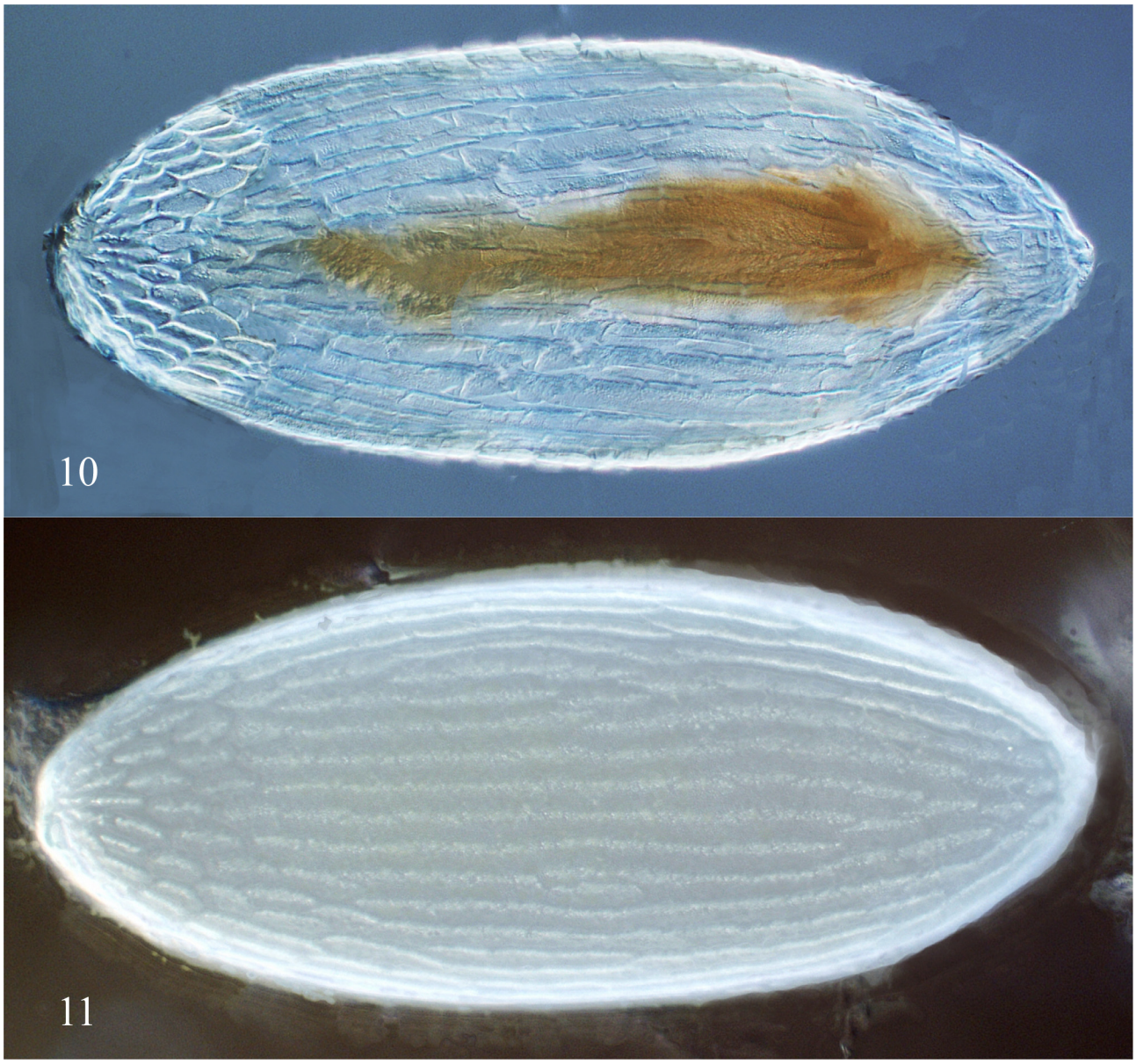


FIGURES 1–4. *Chamaethrix necopina* **sp. nov.**, holotype ♂. Habitus, lateral view. 2. Head and thorax, dorsal view. 3. Head, dorsal oblique view. 4. Abdomen, dorsal view.



FIGURES 5–9. *Chamaethrix necopina* **sp. nov.** 5–8. Paratype ♂, genitalia. 5. Epandrial complex, lateral view. 6. Epandrial complex, posterior view. 7. Phallic complex, dorsal view. 8. Phallic complex, lateral view. 9. Paratype ♀, sternites 4–7, ventral view. Abbreviations: c = cercus, e = epandrium, h = hypandrium, pa = phallapodeme, ph = phallus, pr = pregonite, ss = surstylus, s6 = sternite 6, s7 = sternite 7. Scale bar = 0.1 mm.

middle, with anterior half thicker than posterior half; in profile, slightly undulating, widest in middle and anteriorly, and abruptly narrower posteriorly. Pregonite articulating with widest point of hypandrium; parallel-sided, with blunt tip; dorsally setulose. Postgonite absent. Phallapodeme boomerang-shaped from lateral view, with the middle wide and tapering to each narrow tip; in ventral view club-shaped at posterior end. Phallus from ventral view widest anteriorly and tapering evenly with straight sides to tip, lateral part an even sclerotized strip with middle area membranous; length 2.5 X width at anterior end; at mid length each side with ventrolaterally directed extensions; thin and slightly undulating from lateral view.



FIGURES 10–11. Eggs from paratype ♀♀, dorsal view (posterior end left). 10. *Chamaethrix necopina* **sp. nov.** 11. *Vitaleucopis nidolkah* **sp. nov.** Note, the lighting difference between the two figures does not constitute morphological difference.

Female terminalia (Fig. 9). Tergite 6 about 3.3 X wider than long, length 0.7 X length of tergite 5; sternite 6 slightly enlarged, with width 0.5 X width of tergite 6, about 3 X wider than median length, and slightly wider than sternite 5, with long setulae along posterior edge, slightly emarginated on anterior and posterior edges; tergite 7 entirely membranous; sternite 7 small (half length and about 1/3 width of sternite 6), triangular, setulose on membrane posterior to sternite; tergite 8 subsquare, subequal in width to sternite 7, lightly sclerotized, with several long setulae along posterior margin; sternite 8 absent, entirely membranous, with corresponding setulose patch. Hypoproct tapering evenly to rounded tip. Epiproct subtriangular, with normal cercus bearing uniformly short setulae. Internally, spermathecae 2+2, round.

Immatures. *Egg* (from dissection of ♀) (Fig. 10). Similar to typical leucopine eggs (*e.g.*, Gaimari & Turner 1996), with the following particular characteristics: length 0.58–0.59 mm, width 0.22–0.23 mm; with series of 13–14 longitudinal ridges, rarely anastomosing except at posterior pole, and less so at anterior pole.

Type material. Holotype ♂ (point mounted, very good condition; Fig. 1A), deposited in CSCA, with the following labels: "USA: Arizona; Apache Co., Apache Nat'l For., 0.5 km S mi. 249 on US Rte. 191, 8 km S. Alpine, along Coleman Crk.; 2500 m; 33°47'24"N 109°10'01"W, 30 JUN 1995, coll: S.D. Gaimari, ex: sweep *Pinus ponderosa*" / "HOLOTYPUS ♂ *Chamaethrix necopina* Gaimari" (red label). Paratypes: USA. **ARIZONA**. **Apache Co.**, Apache National Forest, nr. Alpine, 33°51'52"N 109°10'18"W, 2440 m, 28.vi.1995, coll: S.D. Gaimari, ex: sweep young *Pinus ponderosa* (1 ♀ (SDG dissection 1387), CSCA). **NEW MEXICO**. **Lincoln Co.**, Lincoln National Forest, 2.4 km W Angus, Mills Canyon, along Rio Bonito, 33°27'05"N 105°41'46"W, 2130 m, 18–19.vi.1995, coll: S.D. Gaimari, ex: sweep colonies of *Cinara ponderosae* on *Pinus ponderosa* (1 ♂ (SDG dissection #1368), CSCA).

Distribution. Known from the southwestern United States (Arizona, New Mexico) in areas above 2100 m elevation. The species probably occurs in at least the intervening and surrounding areas at elevations and places characterized by stands of ponderosa pine.

Biology. All known specimens were swept from infestations of *Cinara ponderosae* (Williams) (Hemiptera: Aphididae) in young stands of *Pinus ponderosa* (*e.g.*, height less than 5 m throughout the large stand), but despite rearing >150 chamaemyiid larvae to adulthood from this host, none were this species. It remains a possibility that this species is a predator in that system, although species of non-aphid-feeding genera (*e.g.*, *Chamaemyia* Meigen) were also collected in the same sweep samples, presumably going to the aphids to feed on honey dew.

Remarks. At two different localities (one in New Mexico and one in Arizona), this species was collected together with *Vitaleucopis nidolkah* and the adelgid-feeding species *Leucopis argenticollis* Zetterstedt and *Leucopis atrifacies* Aldrich.

***Vitaleucopis* gen. nov.**

urn:lsid:zoobank.org:act:BB7B83C0-1A53-407C-993D-76429E2EAADB

"Undescribed genus B"—Gaimari 2010: 1005.

Type species. *Vitaleucopis nidolkah* sp. nov., by present designation.

Etymology. Named for my good friend and premier chamaemyiid expert, the late Vitali Tanasijtshuk, from *Vitali* truncated and appended to the feminine genus name *Leucopis*.

Diagnosis. The body is compact and stout, with length 1.9–2.5mm. The head is predominantly dark grey pruinose. Postocellar and ocellar setae are absent. The eye is higher than long, with the height >4 X the genal height. The frons lacks fronto-orbital setae, but has one or two rows of stiff black lateroclinate setulae along the eye margin. In males: the frons protrudes roof-like over the lunule, with a descending lunule and face, and has a cluster of enlarged laterally directed setulae in the anterolateral corners (sometimes clumped into horn-like pencils); and the ocellar triangle is elongate and only slightly tapering anteriorly (never to a point), ending with a dense patch of short white setulae on a distinct pale spot at the anterior tip of the frons. In females: the anterior frons curves into the plane of the lunule, and does not have a cluster of setae in the anterolateral corners; and ocellar triangle tapers to a point ending before the edge of the lunule, and does not have a pale spot or a patch of setulae. The maxillary palpus is spatulate, and in females is enlarged (subequal to first flagellomere) and flattened. On the thorax, the scutum is dark silvery grey pruinose, lacking dorsocentral vittae, setulose dorsally (bounded laterally by supra-alar line), and prescutellar acrostichal setae are absent. The abdomen is shiny black with only sparse pruinosity. In males, microtrichiae are present on the lateral edges of syntergite 1+2 and tergite 3, and the surstylus is long and fully or partly articulating with the epandrium (*i.e.*, is entirely separate, or is partly fused but separated at the base). In females, sternite 6 is wider than the preceding sternites, tergite 7 is entirely membranous, sternite 7 is small with a deeply emarginated posterior margin, tergite 8 is present but lightly sclerotized, and all setulae of the pseudo-ovipositor are large (subequal to setulae of cercus, and only slightly smaller than setulae of the pregenital sternites).

Remarks. In describing *Leucopis astonea* McAlpine, McAlpine (1977) posited that the species belongs to the group of species including *Leucopis argenticollis*, *Leucopis atrifacies* and *Leucopis piniperda* Malloch. However, despite several characteristics held in common with these species, it is included here in the discrete genus *Vitaleu-*

copis, which differs in several substantial respects, including egg and puparial morphology, the male-specific dimorphic characteristics, and the presence of an articulated or partly articulated and elongated surstylus in the male. However, it does seem likely that the new genus belongs to a complex of related genera with similar feeding habits, also including *Anchioleucopis* Tanasijtshuk, *Lipoleucopis* de Meijere and *Neoleucopis* Malloch. Besides the three species described or redescribed here, there is one additional species known, but only from a single female (Figs 46–47), so remains undescribed but is included in the key to species to aid in future recognition. The locality data for this specimen is as follows: USA. **CALIFORNIA**. **Los Angeles Co.**, La Crescenta, 2 km up Eagle Canyon, on S base Mount Lukens, 30.vi.1994, coll: S.D. Gaimari, ex: Malaise trap (1 ♀, CSCA). This specimen was collected in the same sample with *Leucopis atrifacies*, and although the author has collected in this area many times over the years, the species has not been encountered again.

Keys to species of *Vitaleucopis*

The following key separates males and females in the first couplet, because they are sexually dimorphic, and because the female of *Vitaleucopis scopulus* and the male of the undescribed species are unknown. Given the characteristics typically held in common between males and females, the following observations can be made to aid in recognizing the species for which the opposite sex is not known. For the undescribed species, it is very likely that the male differs from all other species in this genus using the characteristics presented in couplet 4. For *Vitaleucopis scopulus*, the female will likely key out to *Vitaleucopis astonea*, given the tarsal coloration in the male; however, no characters are obvious that would set the females of these two species apart.

1. Female (unknown for *Vitaleucopis scopulus*) 4
- Male (unknown for undescribed species). 2
2. Anterolateral part of frons with cluster of 2–4 lateroclinate setae, whisker-like (not clustered to appear as 1 very thick seta), with length less than length of inner vertical seta . . . . . *Vitaleucopis nidolkah* **sp. nov.**
- Anterolateral corner of frons with distinct tight cluster of 4–5 lateroclinate setae (appearing like 1 very thick seta), with length 1.5 X that of inner vertical seta 3
3. Frons with width and length subequal; distance from vertex to anterior tip of frons 1.7 X width of frons at level of anterior ocellus . . . . . *Vitaleucopis scopulus* **sp. nov.**
- Frons 1.4 X wider than long; distance from vertex to anterior tip of frons 1.3 X width of frons at level of anterior ocellus . . . . . *Vitaleucopis astonea* (McAlpine)
4. Upper face (between antennal sockets) silvery pruinose; antenna light brown, except basal part orange; palpus orange, with distal part light brown; scutum and scutellum bronzy pruinose, distinctly differentiated from silvery grey pruinose pleuron. . . . . undescribed species
- Upper face (between antennal sockets) shiny black, lacking pruinosity; antenna and palpus black; scutum, scutellum and pleuron concolorous silvery grey pruinose 5
5. At least basotarsomere of each leg yellow . . . . . *Vitaleucopis astonea* (McAlpine)
- Tarsi entirely dark brown (hind basotarsomere sometimes dark orange basally) . . . . . *Vitaleucopis nidolkah* **sp. nov.**

Vitaleucopis astonea (McAlpine)

(Figs 12–19)

Leucopis (Leucopis) astonea McAlpine, 1977: 14. Type locality: Canada. British Columbia: Vaseaux Lake, near Oliver. Holotype ♂, CNC.

Diagnosis. In males, the distance from the vertex to the anterior tip of the frons is 1.3 X the width of the frons at the level of the anterior ocellus, and the frons is 1.4 X wider than long. At the anterolateral corner of the frons, there is a tight lateroclinate cluster of 4–5 elongated setae (as long as the distance between inner vertical setae) appearing as one very thick seta. On the legs, the femora are dark grey pruinose, except the distal tip is yellow. The pleuron is silvery grey pruinose and lighter in color than the scutum. The scutum has dorsocentral setae 0+2, with the posterior seta at most 2 X longer than the anterior one; the anterior notopleural seta is 1.5 X longer than the posterior one. In the male pregenital segments and genitalia: syntergite 7+8 is entire, lacking a median strip; the surstylar lobe is articulated, but partly fused, with the epandrium; the phallus from ventral view is awl-shaped, with the middle part parallel-sided, and the tip abruptly curved and sharp.

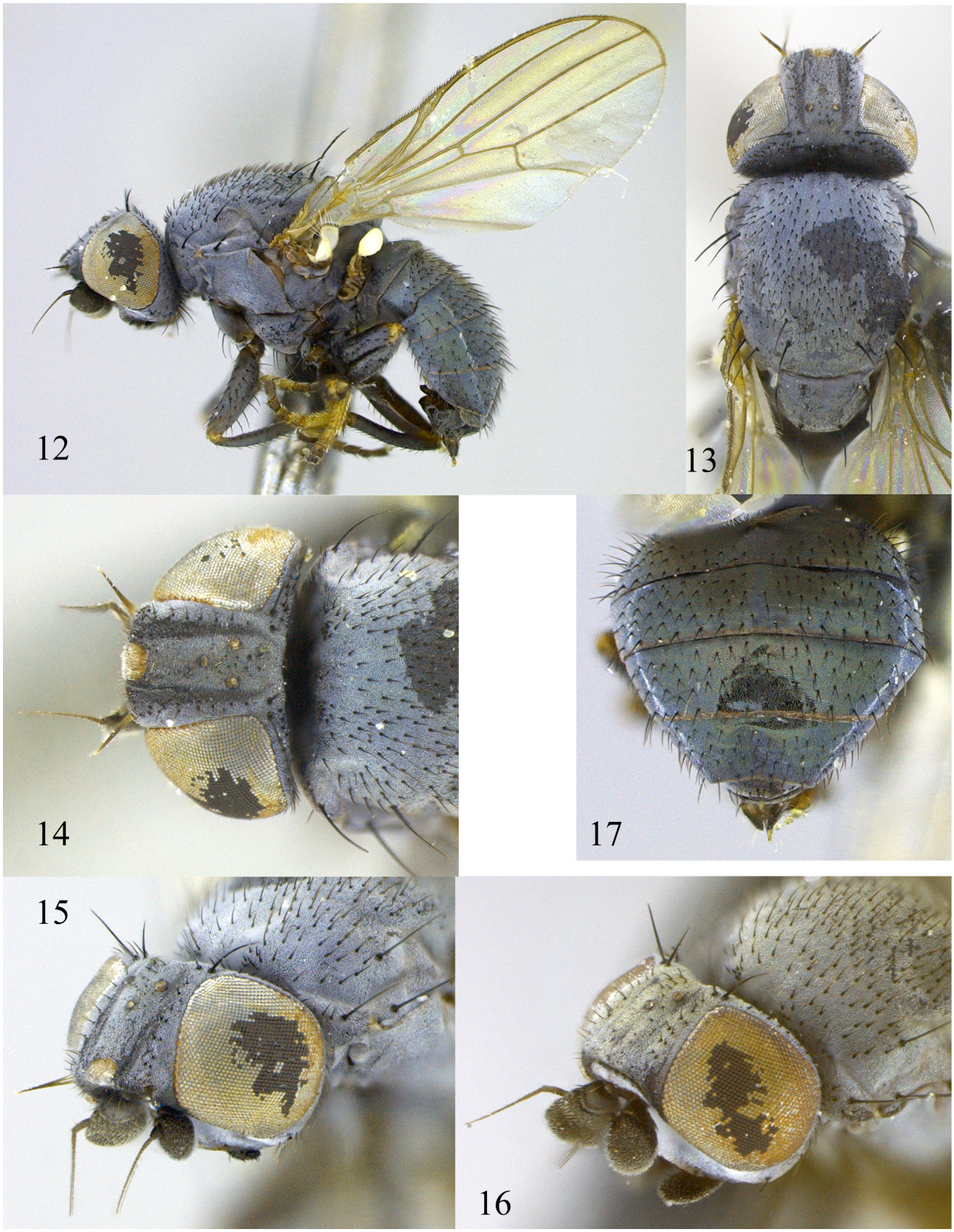
Description. *Adults*, ♂, ♀. Body (Fig. 12) length 2.3–2.5 mm (♂, 2.5 mm; ♀, 2.3–2.5 mm).

Head (Figs 12–16). 1.4–1.5 X higher than long; 1.3–1.4 X wider than high; mostly dark or silvery grey with exceptions following. Vertex with outer vertical seta longer than inner one by 1.7–2.0 X; in ♂, distance from vertex to anterior tip of frons 1.3 X width of frons at level of anterior ocellus. Postocellar setae absent. Ocellar triangle sexually dimorphic; in ♂, elongate, only slightly tapering to anterior margin of frons, slightly raised and distinct from fronto-orbital plate, anteriorly ending in dense patch of short white setulae on distinct yellow spot and extending over antennal bases; in ♀, extending most of distance of frons, not raised, distinguishable from fronto-orbital plate by only slight color difference, anteriorly lacking patch of distinct setulae, lacking yellow spot, and not extending over antennal bases, but instead abruptly curving downward into plane with lunule; ocelli in equilateral triangle, on small raised tubercle, with ocelli placed well anterior to vertex; setulose within triangle and behind posterior ocelli. Ocellar setae absent. Eye 1.1–1.2 X higher than long; height 4.3–5.2 X genal height. Frons with slightly darkened vitta along edge of ocellar triangle in ♂, without such vitta in ♀; 1.4 X wider than long in ♂, 1.8–1.9 X in ♀; with lateral edges only slightly diverging anteriorly, 1.0–1.2 X wider at level of lunule than at level of anterior ocellus. Mid frontal vitta depressed in ♂, not depressed in ♀; oriented downward below tip of ocellar triangle, and meeting lunule at sharp angle in ♂ and in same vertical plane with lunule in ♀. Fronto-orbital area lacking fronto-orbital setae; in ♂ with row of 6–7 setulae oriented slightly lateroclinate and with distinct cluster of 4–5 elongated (as long as distance between inner vertical setae), yellowish lateroclinate setae (appearing like 1 very thick seta) at anterolateral corners, and in ♀ with 10 or more setulae and with no cluster of elongated setulae anterolaterally. Lunule silvery grey pruinose above antennae, strongly depressed below mid frontal vitta in ♂, in same plane with mid frontal vitta in ♀; narrowly arched, height 0.3–0.4 X frons length; with 0–2 small, fine setulae. Antenna entirely black; bases separated by small carina, with area between antennal bases shiny black, lacking pruinosity; 1st flagellomere short, rounded, covered with short thick white setulae; arista with distal segment 3.6–4.2 X longer than basal. Face, parafacial and gena silvery grey pruinose. Face strongly receding. Parafacial narrow. Gena with one strong genal seta in addition to several setulae in front and behind. Clypeus black; small, barely exposed. Palpus black; spatulate; densely setulose, larger in ♀. Mouthparts very small and held within oral cavity above palpi; prementum and labellum dark.

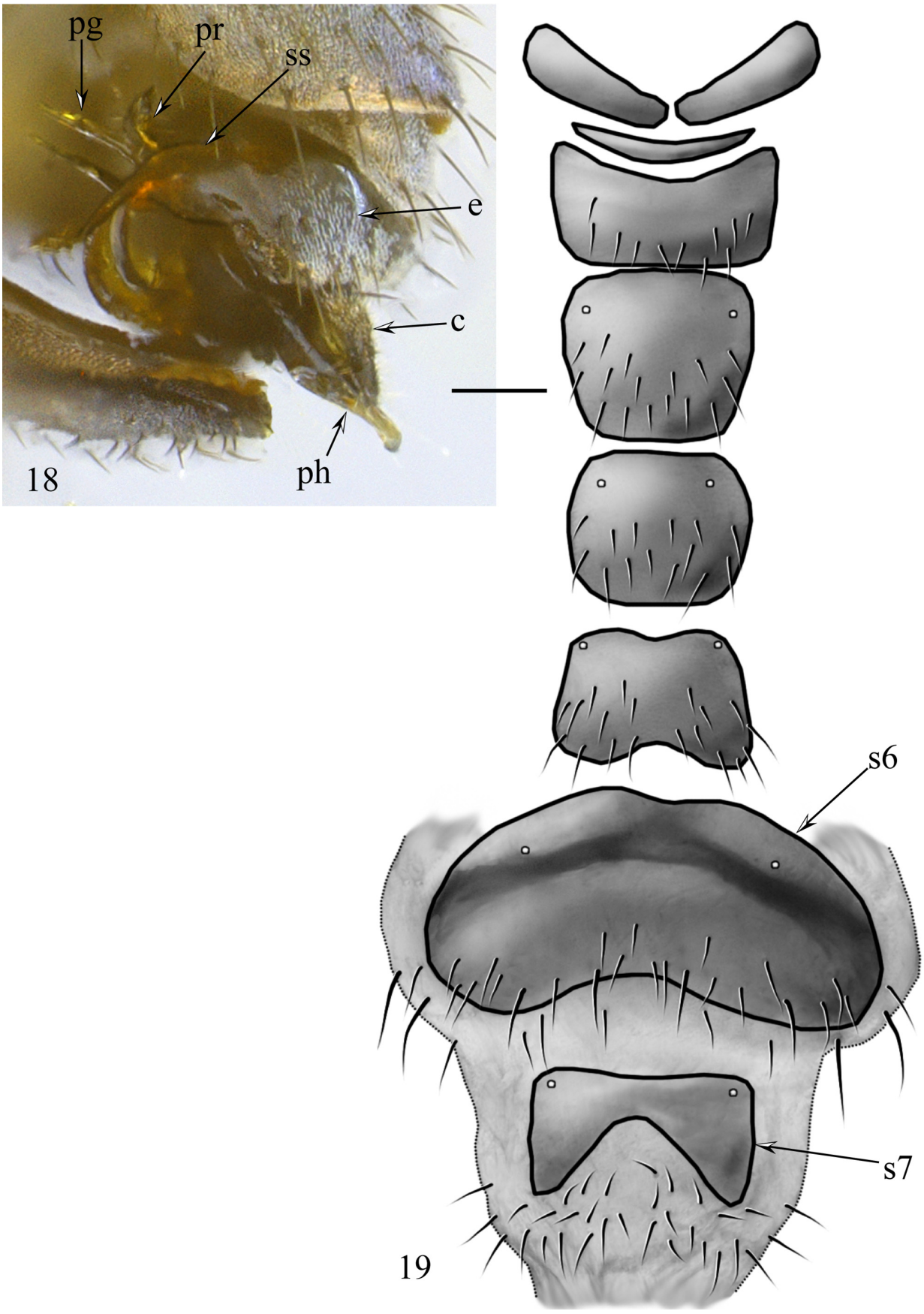
Thorax (Figs 12–13). Scutum uniformly dark silvery grey pruinose; 1.1–1.2 X longer than wide; 3.6–3.9 X scutellar length; setulose dorsally (bounded laterally by supra-alar line); dorsocentral vittae absent. Prescutellum present. Scutellum concolorous with scutum; 1.5–1.7 X wider than long. Pleuron silvery grey pruinose, lighter than scutum. Chaetotaxy: 0+2 dorsocentral setae, posterior seta 1.7–2.0 X longer than anterior one; one postpronotal seta, with several smaller setulae; two notopleural setae, in anterior and posterior corners, anterior one 1.5 X longer than posterior one; one pre- and one postsutural supra-alar seta; two postalar setae; prescutellar acrostichal seta absent; proepisternum, anepisternum and anepimeron lacking setae; one strong katepisternal seta along upper edge, with 2–4 small setulae in row anterior to seta; two pairs scutellar setae, subequal in length, posterior pair subparallel but bowed out along length. *Legs*. Dark brown, with femora dark grey pruinose except for distal tip yellow, and tibiae dark grey pruinose, and with basotarsomeres and second tarsomeres (and sometimes third tarsomeres) yellow. *Wing*. Length 2.2–2.4 mm (♂, 2.3 mm; ♀, 2.2–2.4 mm); 2.6–2.8 X longer than high. Hyaline, with veins brown. Veins R_{2+3}, R_{4+5} and M_1 subparallel in distal half of wing. Crossvein r-m located slightly basad of halfway point of wing length, and at 3/4 point of cell dm length. Vein Cu extends to wing margin; apical section 1.4–1.5 X longer than crossvein dm-cu. Halter stalk brown, knob yellow.

Abdomen (Figs 17, 19). Tergites shiny black, with light covering of silvery pruinosity, except bronzy pruinosity on the dorsal part of syntergite 1+2 and tergite 3; uniformly setulose, except setulae slightly enlarged along posterior margin, longest laterally. Syntergite 1+2 and tergite 3 of ♂ each with patch of microtrichiae on lateral edge (*cf*. fig. 2 of Gaimari *et al*. 2008). Sternites silvery grey pruinose; sternite 1 divided medially; sternite 2 divided transversely with anterior part a narrow strip and the posterior part 2 X wider than long and 1.2–1.4 X wider than sternite 3; sternite 3 in ♂ 1.7 X wider than long and 1.8 X wider than sternite 4, in ♀ slightly wider than long, slightly tapering posteriorly, subequal in size to sternite 4; sternites 4 and 5 each slightly wider than long, with sternite 5 slightly wider and slightly shorter. *Pregenital segments of male*. Tergite 6 absent, condition of sternites 6 and 7 not visible. Syntergosternite 7+8 a narrow undivided strip, tapering laterally, with longest setae along posterior margin.

Male genitalia (Fig. 18). Epandrium slightly convex posteriorly, with 7–8 setae along posterior part of each side; extending into surstylar lobe (whether entirely separate or partly fused to epandrium not evident without dissection); surstylus very long (as long as width of epandrium) and with large flat lobe medially from articulation



FIGURES 12–17. *Vitaleucopis astonea* (McAlpine), holotype ♂ (except 16, paratype ♀). 12. Habitus, lateral view. 13. Head and thorax, dorsal view. 14. Head, dorsal view. 15. Head, dorsal oblique view. 16. Head (paratype ♀), dorsal oblique view. 17. Abdomen, dorsal view.



FIGURES 18–19. *Vitaleucopis astonea* (McAlpine). 18. Holotype ♂, genitalia *in situ*, ventrolateral view. 19. Paratype ♀, sternites 1–7, ventral view. Abbreviations: c = cercus, e = epandrium, pg = postgonite, ph = phallus, pr = pregonite, ss = surstylus, s6 = sternite 6, s7 = sternite 7. Scale bar = 0.1 mm.

with epandrium, flattened throughout length, strongly incurved, with sharpened ventral edge, and distally with tiny setulae. Cercus large, narrowing to point distally, with several long and numerous short setulae. Hypandrium not visible. Pregonite parallel-sided, with blunt tip; slightly curved in lateral view; dorsally setulose. Postgonite long (shorter than pregonite), tapering to small outcurved tip; bare. Phallapodeme not visible. Phallus from ventral view awl-shaped, with bulbous basal half, parallel-sided in middle, then tapering evenly to sharp tip, evenly sclerotized through middle, with area near tip open; length 3 X width of bulbous base; from lateral view slightly curved, narrow throughout, with anterior part widest, with dorsal lobe small, and tapering posteriorly with abrupt curve at tip.

Female terminalia (Fig. 19). Tergite 6 4.3 X wider than length through middle, length through middle 0.4 X length of tergite 5, anterior and posterior margins emarginated, with darkly sclerotized transverse strip; sternite 6 enlarged, emarginate anteriorly and posteriorly, with width 0.8 X width of tergite 6, 2.4 X wider than long, and 2.5 X wider than sternite 5, with long setulae along posterior edge; tergite 7 entirely membranous, but with corresponding patch of long setulae on membrane; sternite 7 small (0.7 X length and half width of sternite 6), nearly 2 X wider than long, with deeply emarginated posterior margin, with long setulae on membrane posterior to sternite; tergite 8 subsquare, slightly narrower than sternite 7, lightly sclerotized, with long setulae (as long as setulae of cercus) along posterior margin; sternite 8 absent, entirely membranous, with corresponding patch of long setulae. Hypoproct tapering evenly to rounded tip. Epiproct subtriangular, with normal cercus bearing uniformly short setulae. Internally, spermathecae 2+2, round.

Immatures. Unknown.

Type material. Holotype ♂ (glued to side of pin, very good condition), deposited in CNC, with the following labels: "Vaseaux L., Oliver, B.C., 14.V.1959, R.E. Leech" / "IDEMA illustration" / "HOLOTYPE ♂, Leucopis, astonea, McAlpine, No." (red label). Paratypes (both labeled "IDEMA illustration." CANADA. **BRITISH COLUMBIA**. Oliver, Vaseaux Lake, 14.v.1959, coll. R.E. Leech [same data as holotype] (1 ♀ (labeled "Allotype"), 1 ♀ (labeled "Paratype", with dissected abdomen in microvial beneath specimen), CNC).

Distribution. Known from southwestern Canada (British Columbia).

Biology. Unknown.

Remarks. Male genitalia are a critical component of chamaemyiid identification. However, because there was no ambiguity as to the identity of this species relative to the other two species of this genus, the male abdomen was not dissected. Most genitalic characteristics (except the hypandrium, phallapodeme, and part of the basiphallus) are visible in the undissected state, so this author believed that because it is the sole male known for the species, it was more important to leave the specimen in its pristine condition, where external characteristics of the abdomen can also be studied. By the visible genitalic characteristics, this species differs only subtly from *Vitaleucopis scopulus*, in that *Vitaleucopis astonea* has a surstylus that is partly fused to the epandrium while it is fully articulated and separate in *Vitaleucopis scopulus*. In addition, several external characters can be used to differentiate those species, including the different number of dorsocentral setae (0+2) and the conformation of the frons (the length of the head from dorsal view, from the vertex to the tip of the frons is 1.3 X the width of the frons at the level of the anterior ocellus, and the width of the frons at the level of the anterior ocellus is 1.4 X the length of the frons from the anterior ocellus to the tip) and of syntergite 7+8 (entire and undivided). If the diversity of this genus becomes an issue, the specimen will still be available for dissection at a later date if necessary.

Vitaleucopis nidolkah sp. nov.

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(Figs 11, 20–34)

Etymology. From the word "*ndołkah*" in the Apache language, meaning cougar, referring both to the clustered whiskers present distolaterally on the frons, and in honor of the Mescalero Apache Tribe, with the type locality being near the Mescalero Apache Tribal lands in south-central New Mexico; a noun in apposition.

Diagnosis. In males, the distance from the vertex to the anterior tip of the frons is subequal to the width of the frons at the level of the anterior ocellus, and the frons is more than 2.2 X wider than long. At the anterolateral corner of the frons, there is a loose whisker-like lateroclinate cluster of 2–4 elongated setae (length equal to half the distance between inner vertical setae). On the legs, the femora are entirely dark grey pruinose. The pleuron is silvery grey pruinose and lighter in color than the scutum. The scutum has dorsocentral setae 0+4 or 0+5, with the posterior

seta at most 1.5 X longer than the next anterior one; the anterior notopleural seta is 1.5 X longer than the posterior one. In the male pregenital segments and genitalia: syntergite 7+8 is entire, lacking a median strip; the surstylar lobe is articulated, but partly fused, with the epandrium; the phallus from ventral view is bulbous basally and tapering evenly with straight sides to near the tip, which is abruptly expanded.

Description. *Adults*, ♂, ♀. Body (Fig. 20) length 1.9–2.5 mm (♂, 1.9–2.3 mm; ♀, 1.9–2.5 mm).

Head (Figs 20–24). 1.4–1.8 X higher than long; 1.2–1.4 X wider than high; mostly dark silvery grey with exceptions following. Vertex with outer vertical seta longer than inner one by 1.5 X; in ♂, distance from vertex to anterior tip of frons subequal to width of frons at level of anterior ocellus. Postocellar setae absent. Ocellar triangle sexually dimorphic; in ♂, elongate, slightly tapering to anterior margin of frons, slightly raised and distinct from fronto-orbital plate, anteriorly ending in dense patch of short white setulae on dark orange ground color and extending over antennal bases; in ♀, extending most of distance of frons, not raised, distinguishable from fronto-orbital plate by only slight color difference, anteriorly lacking patch of distinct setulae and not extending over antennal bases, but instead abruptly curving downward into plane with lunule; ocelli in equilateral triangle, on small raised tubercle, with ocelli placed well anterior to vertex; setulose within and in front of triangle, and behind posterior ocelli. Ocellar setae absent. Eye 1.2–1.4 X higher than long; height 4.6–5.1 X genal height. Frons with reddish brown vitta along edge of ocellar triangle in ♂, without such vitta in ♀; 2.3–2.5 X wider than long in ♂, 2.1–2.8 X in ♀; with lateral edges only slightly diverging anteriorly, 1.1–1.3 X wider at level of lunule than at level of anterior ocellus. Mid frontal vitta depressed in ♂, not depressed in ♀; oriented downward below tip of ocellar triangle, and meeting lunule at sharp angle in ♂ and in same vertical plane with lunule in ♀. Fronto-orbital area lacking fronto-orbital setae; setulose (setulae oriented slightly lateroclinate), in ♂ with distinct whisker-like cluster of 2–4 elongated (length equal to half distance between inner vertical setae) lateroclinate setulae at anterolateral corner, and in ♀ with no cluster of elongated setulae. Lunule silvery grey pruinose above antennae, strongly depressed below mid frontal vitta in ♂, in same plane with mid frontal vitta in ♀; narrowly arched, height 0.5–0.6 X frons length; with 0–2 small, fine setulae. Antenna entirely black; bases separated by small carina, with area between antennal bases shiny black, lacking pruinosity; 1st flagellomere short, rounded, covered with short thick white setulae; arista with distal segment 3.8–4.3 X longer than basal. Face, parafacial and gena silvery grey pruinose. Face strongly receding. Parafacial narrow. Gena with one strong genal seta in addition to several setulae in front and behind. Clypeus black with sparse covering of silvery grey pruinosity; small, barely exposed. Palpus black; spatulate; densely setulose, larger in ♀. Mouthparts very small and held within oral cavity above palpi; prementum and labellum dark.

Thorax (Figs 20–21). Scutum uniformly dark silvery grey pruinose; 1.1–1.2 X longer than wide; 3.5–3.9 X scutellar length; setulose dorsally (bounded laterally by supra-alar line); dorsocentral vittae absent. Prescutellum present. Scutellum concolorous with scutum; 1.4–1.6 X wider than long. Pleuron silvery grey pruinose, lighter than scutum. Chaetotaxy: 0+4 (or rarely 0+5, sometimes only on one side) dorsocentral setae, posterior seta 1.5 X longer than next anterior one, and each anteriorly subsequent seta smaller than the previous, with anterior-most seta only slightly larger than surrounding setulae; one postpronotal seta, with several smaller setulae; two notopleural setae, in anterior and posterior corners, anterior one 1.5 X longer than posterior one; one pre- and one postsutural supra-alar seta; two postalar setae; prescutellar acrostichal seta absent; proepisternum, anepisternum and anepimeron lacking setae; one strong katepisternal seta along upper edge, with 1–4 small setulae in row anterior to seta; two pairs scutellar setae, subequal in length, posterior pair subparallel but bowed out along length. *Legs*. Dark brown, with femora and tibiae dark grey pruinose, and some specimens with basal part of hind basotarsomere dark orange. *Wing*. Length 1.9–2.5 mm (♂, 1.9–2.2 mm; ♀, 1.9–2.5 mm), equal to body length; 2.5–2.9 X longer than high. Hyaline, with veins brown. Veins R_{2+3}, R_{4+5} and M_1 subparallel in distal half of wing. Crossvein r-m located slightly basad of halfway point of wing length, and at between 2/3 and 3/4 (about 0.7) point of cell dm length. Vein Cu extends to wing margin; apical section 1.2–1.6 X longer than crossvein dm-cu. Halter stalk brown, knob yellow.

Abdomen (Figs 25, 31). Tergites shiny black, with light covering of dark pruinosity dorsally, and silvery pruinosity laterally (from posterior view); uniformly setulose, except setulae enlarged along posterior margin, longest laterally. Syntergite 1+2 and tergite 3 of ♂ each with patch of microtrichiae on lateral edge (*cf*. fig. 2 of Gaimari *et al*. 2008). Sternites silvery grey pruinose; sternite 1 divided medially; sternite 2 divided transversely with anterior part a narrow strip and the posterior part emarginate anteriorly, nearly 2.2 X wider than long and 1.3 X wider than sternite 3; sternite 3 slightly emarginate anteriorly, slightly tapering posteriorly, subequal in length and width, wider than next two sternites; sternite 4 slightly longer than wide, subparallel-sided, rounded posteriorly; sternite 5 slightly wider than long, widest in posterior half, slightly emarginate anteriorly, deeply emarginate posteriorly. *Pregenital*

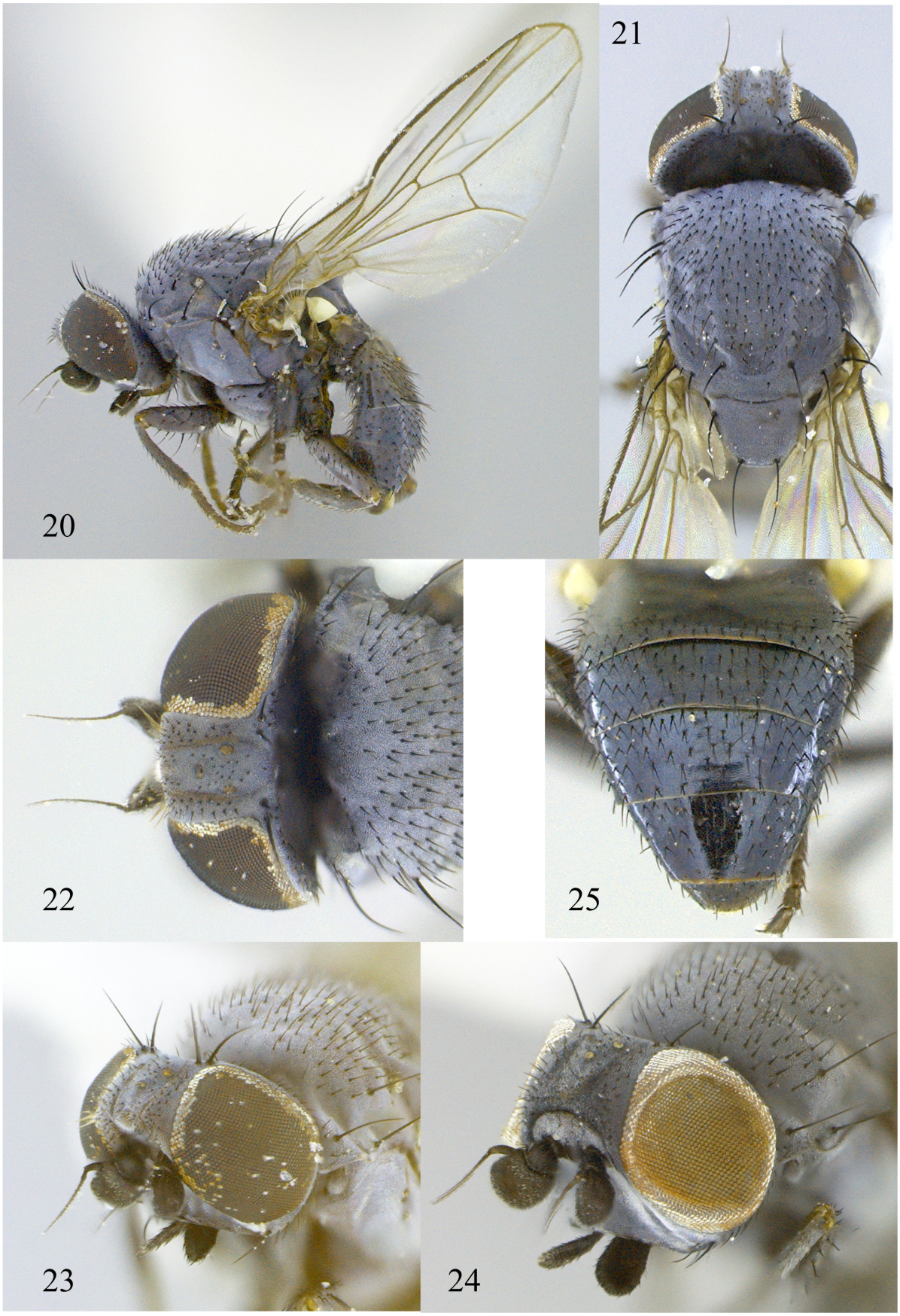
segments of male. Tergite and sternite 6 absent. Syntergosternite 7+8 a narrow undivided strip, 1/3 length of preceding tergite, tapering laterally; sternite 7 small, lightly sclerotized, 3 X longer than wide, parallel-sided, bare.

Male genitalia (Figs 26–30). Epandrium slightly convex posteriorly, with 4–8 setae along posterior part on each side; extending into partly articulating (*i.e.*, partly fused to epandrium, but partly separated at base) surstylar lobe; surstylus long (slightly shorter than width of epandrium) and with large flat lobe medially from articulation with epandrium, flattened throughout length, strongly incurved, with sharpened ventral edge, and distomedially with tiny setulae. Cercus large, rounded, with several long and numerous short setulae. Hypandrium in dorsal view 1.3 X longer than wide, with anterior arms very thick to point of articulation with pregonite, becoming abruptly thin posteriorly, anterior margin straight; in profile, slightly undulating, evenly wide in anterior half, and abruptly narrower posteriorly. Pregonite articulating with medial portion of wide part of hypandrium, such that bases are close together; parallel-sided, with blunt tip; slightly curved in lateral view; laterally setulose. Postgonite long (shorter than pregonite), tapering to small outcurved tip; bare. Phallapodeme as high as long from lateral view, with anterior edge evenly convex, with ventral edge evenly concave; in dorsal and ventral views, about 4 X longer than wide, narrow through middle, widening both anteriorly and posteriorly, with anterior end pointed. Phallus from ventral view bulbous basally, tapering evenly with straight sides to near tip, with tip slightly expanded, lateral part an even sclerotized strip with middle area membranous; length about 4 X width of bulbous base; from lateral view slightly curved, narrow throughout, with anterior part widest, with very small dorsal bump, and tapering posteriorly, but abruptly widening at tip.

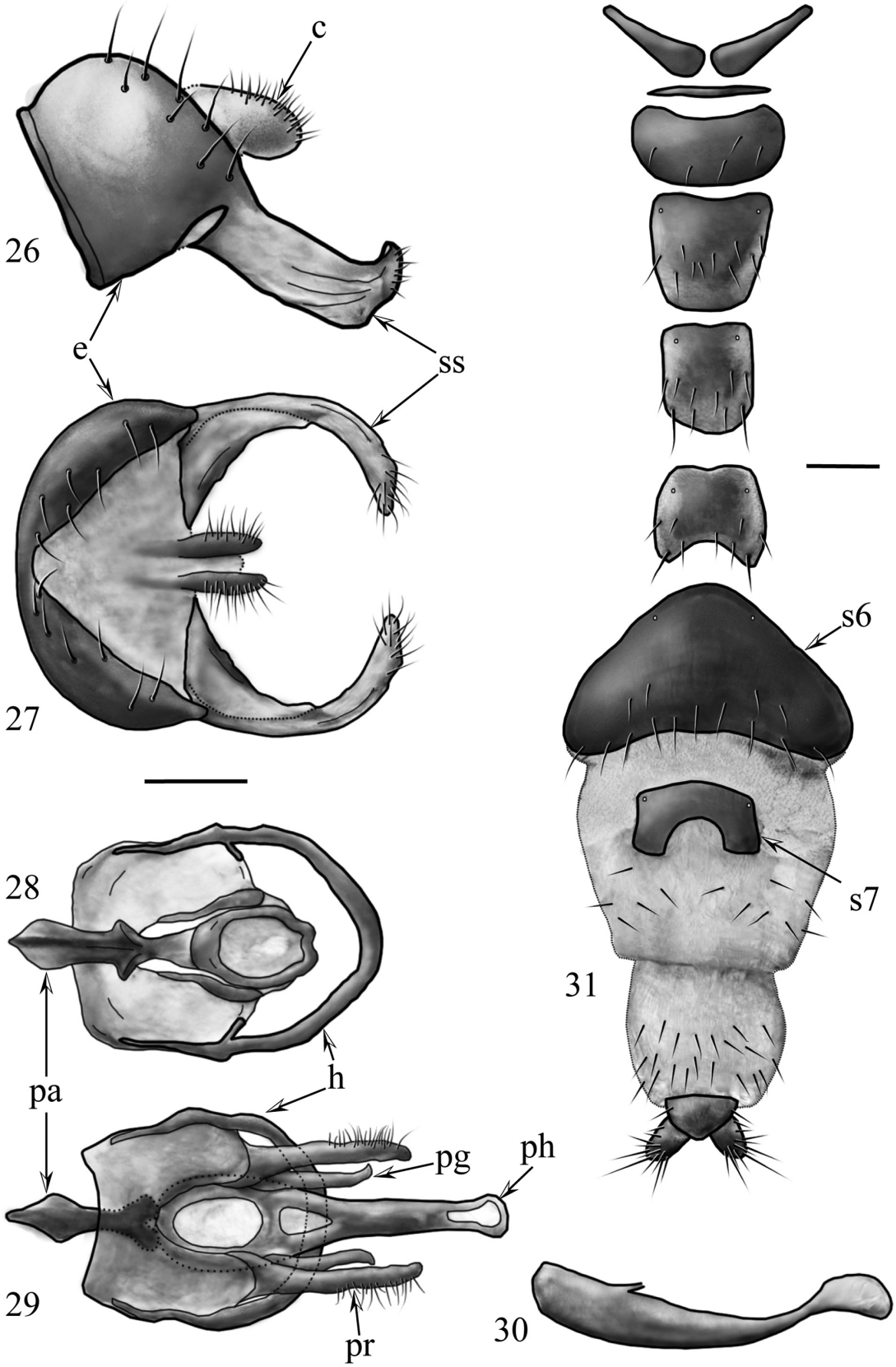
Female terminalia (Fig. 31). Tergite 6 about 3 X wider than long, length through middle 0.4 X length of tergite 5; sternite 6 enlarged, rounded anteriorly and emarginate posteriorly, with width subequal to width of tergite 6, about 2 X wider than maximum median length, and about 3 X wider than sternite 5, with long setulae along posterior edge; tergite 7 entirely membranous, but with corresponding patch of long setulae (as long as setulae of cercus) on membrane; sternite 7 small (half length and 2/5 width of sternite 6), nearly 2 X wider than long, with deeply emarginated posterior margin, with long setulae (as long as setulae of cercus) on membrane posterior to sternite; tergite 8 subsquare, slightly narrower than sternite 7, lightly sclerotized, with long setulae (as long as setulae of cercus) along posterior margin; sternite 8 absent, entirely membranous, with corresponding patch of long setulae (as long as setulae of cercus). Hypoproct tapering evenly to rounded tip. Epiproct subtriangular, with normal cercus bearing uniformly short setulae. Internally, spermathecae 2+2, round.

Immatures. Similar to typical leucopine immatures (*e.g.*, Gaimari & Turner 1996), with the following particular characteristics. *Egg* (from dissection of ♀) (Fig. 11). Length 0.55–0.57 mm, width 0.24–0.25 mm; with series of 16–18 longitudinal ridges, rarely anastomosing except at posterior pole, and less so at anterior pole. *Larva*. Integument in all instars white to translucent; 3rd instar with chaetoids black. *Puparium* (Figs 32–34). Length 0.26–0.32 mm, width 0.09–0.11 mm, barrel-shaped. Dorsal surface highly convex, with dense pattern of flattened chaetoids; each segment with paired patches of darkened cuticle dorsolaterally. Dehiscent anterior segments (dorsal and ventral) 0.07–0.09 mm long, with each strongly sloping in lateral view into thin anterior-most part. Anterior spiracle white; with slit-like spiracular opening at tip of each of 3 finger-like lobes. Posterior spiracles on separated, raised tubercles, 0.24–0.27 mm long, rugose, covered with sharp spinules and setulae, and with 3–4 larger spinules mediodistally; distally, spiracle white, trilobed, with slit-like spiracular opening at tip of each of 3 finger-like lobes.

Type material. Holotype ♂ (point mounted, very good condition, with gel capsule containing puparium), deposited in CSCA, with the following labels: "USA: New Mexico; Lincoln Co.; 2.4 km W Angus, Lincoln Nat'l For.; Mills Cyn, along Rio Bonito, 33°27'05"N 105°41'46"W, 2130 m, coll: S.D. Gaimari, 23 JUN 1995, ex: reared from colonies of *Cinara ponderosae* on *Pinus ponderosa* (1#3P), emerged: 3 JUL 1995" / "HOLOTYPUS ♂ *Vitaleucopis nidolkah* Gaimari" (red label). Paratypes: USA: **ARIZONA**. **Apache Co.**, Apache National Forest, 0.5 km S. mile marker 249 on US Rte. 191; 8 km S Alpine, along Coleman Creek, 33°47'24"N 109°10'01"W, 2500 m, coll: S.D. Gaimari, 30.vi.1995, ex: sweep *Pinus ponderosa* (1 ♀, CSCA); Apache National Forest, 7 km SSW Alpine, 33°47'24"N 109°10'01"W, 2500 m, coll: T.N. & S.D. Gaimari, 15.vi.2015, ex: *Pinus ponderosa* (1 ♀, CSCA). **NEW MEXICO**. **Lincoln Co.**, 2.4 km W Angus, Lincoln National Forest, Mills Canyon, along Rio Bonito, 33°27'05"N 105°41'46"W, 2130 m, coll: S.D. Gaimari, 18–19.vi.1995, ex: reared from colonies of *Cinara ponderosae* on *Pinus ponderosa*, larva 1#1L, pupariated 22.vi.1995, emerged 6.vii.1995 (1 ♂ with puparium, CSCA), larva 1#2L, pupariated 21.vi.1995, emerged 3.vii.1995 (1 ♀ with puparium, CSCA), larva 1#85L, pupariated 24.vi.1995, emerged 7.vii.1995 (1 ♂ with puparium, CSCA); 23.vi.1995, ex: sweep colonies of *Cinara ponderosae* on *Pinus ponderosa* (3 ♀, CSCA); 23.vi.1995, ex: reared from colonies of *Cinara ponderosae* on *Pinus ponderosa*, larva 1#11L,



FIGURES 20–25. *Vitaleucopis nidolkah* **sp. nov.** 20–23. Holotype ♂. 20. Habitus, lateral view. 21. Head and thorax, dorsal view. 22. Head, dorsal view. 23. Head, dorsal oblique view. 24–25. Paratype ♀. 24. Head, dorsal oblique view. 25. Abdomen, dorsal view.



FIGURES 26–31. *Vitaleucopis nidolkah* **sp. nov.** 26–30. Paratype ♂, genitalia. 26. Epandrial complex, lateral view. 27. Epandrial complex, posterior view. 28. Hypandrial complex, dorsal view (phallus reflexed downward). 29. Phallic complex, ventral view. 30. Phallus, lateral view. 31. Paratype ♀, sternites 1–7 and terminalia, ventral view. Abbreviations: c = cercus, e = epandrium, h = hypandrium, pa = phallapodeme, pg = postgonite, ph = phallus, pr = pregonite, ss = surstylus, s6 = sternite 6, s7 = sternite 7. Scale bars = 0.1 mm.

pupariated 24.vi.1995, emerged 8.vii.1995 (1 ♀ with puparium, CSCA), larva 1#149L, pupariated 27.vi.1995, emerged 9.vii.1995 (1 ♂ (SDG dissection #1369) with puparium, CSCA), larva 1#168L, pupariated 27.vi.1995, emerged 9.vii.1995 (1 ♂ with puparium, CSCA); 24.vi.1995; ex: sweep colonies of *Cinara ponderosae* on *Pinus ponderosa*, Lot CSCA09L771, Specimen #09E462 (1 ♀ [molecular voucher], CSCA), Specimen #09E463 (1 ♀ [molecular voucher], CSCA), Voucher #09E516 (3 ♀, CSCA-FTC); 26.vi.1995, ex: sweep colonies of *Cinara ponderosae* on *Pinus ponderosa*, Lot CSCA09L772, Specimen #09E464 (1 ♀ [molecular voucher], CSCA), Voucher #09E521 (5 ♀, CSCA-FTC).

Distribution. Known from the southwestern United States (Arizona, New Mexico), in areas above 2100 m elevation. The species probably occurs in at least the intervening areas at elevations and places characterized by stands of ponderosa pine.

FIGURES 32–34. *Vitaleucopis nidolkah* **sp. nov.**, paratype ♂, puparium. 32. Habitus, dorsal view. 33. Head segments, lateral view. 34. Posterior spiracles, dorsal view.

Biology. Confirmed as a predator on *Cinara ponderosae* infesting *Pinus ponderosa*. All specimens were collected from stands of infested young ponderosa pine (*e.g.*, average under 5 m high). Several specimens were swept from these infestations, and several were reared from larvae or puparia, with adult emergence from 12–14 days after pupariation. Specimens that were collected as larvae were held individually in snap-top petri dishes, feeding them daily with living *Cinara ponderosae* until pupariation, and then held until adult emergence.

Remarks. All larvae collected were reared, so none were preserved, but the black chaetoids are so far unique among chamaemyiids. At two different localities (one in New Mexico and one in Arizona), this species was collected together with *Chamaethrix necopina* and the adelgid-feeding species *Leucopis argenticollis* Zetterstedt and *Leucopis atrifacies* Aldrich.

***Vitaleucopis scopulus* sp. nov.**
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(Figs 35–45)

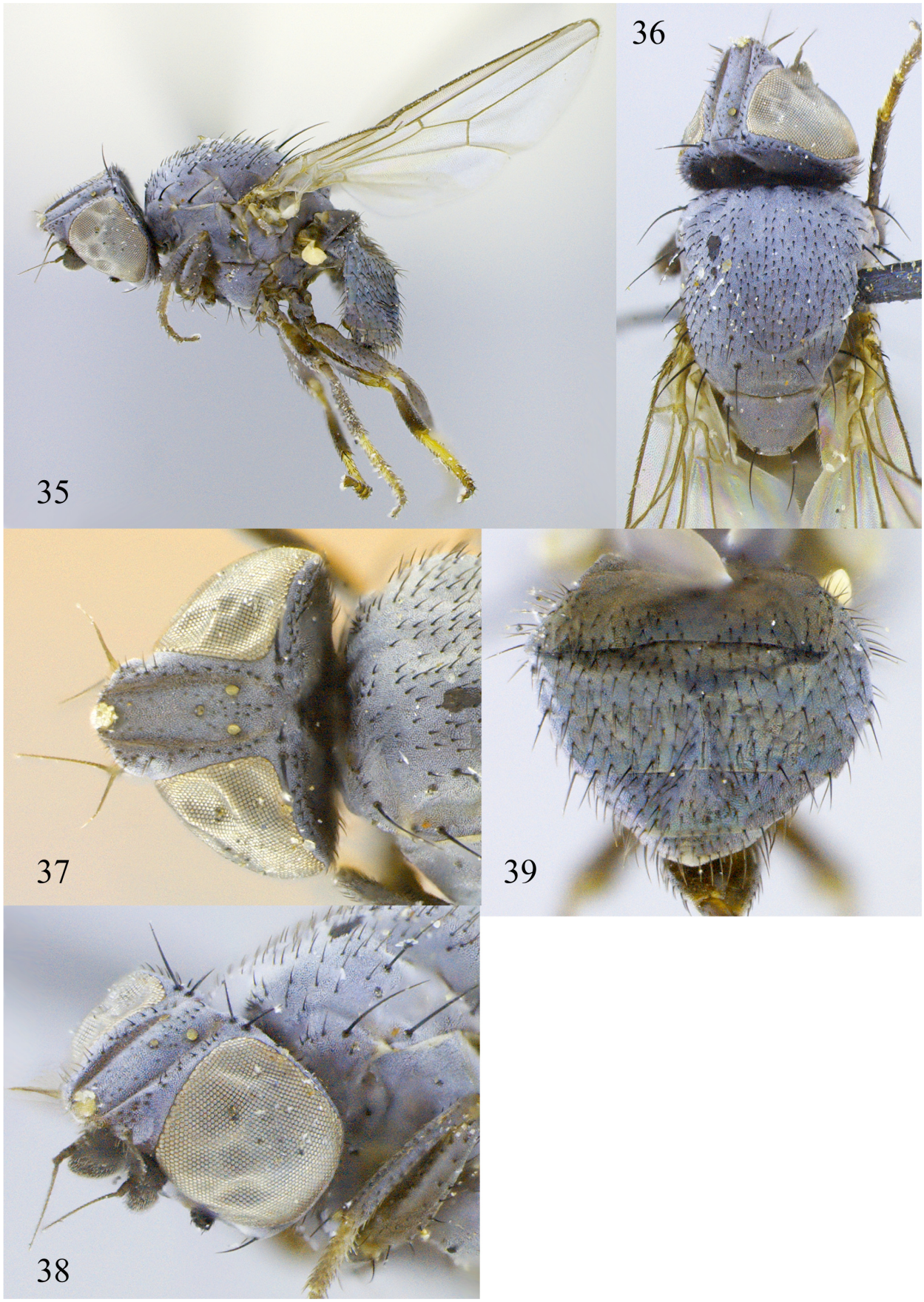
Etymology. From the masculine Latin noun "*scopulus*" (a descendant term from the Ancient Greek term σκόπελος meaning lookout place) meaning projecting rock, observation point, or cliff, referring to the frons projecting well over the antennae and descending face in the male of this species; a noun in apposition.

Diagnosis (male only). The distance from the vertex to the anterior tip of the frons is 1.7 X the width of the frons at the level of the anterior ocellus, and the frons is subequal in length and width. At the anterolateral corner of the frons, there is a tight lateroclinate cluster of 2–4 elongated setae (length 1.3 X the distance between inner vertical setae) appearing as one very thick seta. On the legs, the femora are entirely dark grey pruinose. The pleuron is concolorous with the uniformly dark grey pruinose scutum. The scutum has dorsocentral setae 0+3 or 0+4, with the posterior seta 2.5 X longer than the next anterior one; the anterior notopleural seta is nearly 2 X longer than the posterior one. Pregenital segments and genitalia: syntergite 7+8 has a median strip of reduced sclerotization, appearing split into two halves; the surstylar lobe is fully articulated with and separate from the epandrium; the phallus from ventral view is awl-shaped, with the middle part parallel-sided, and the tip abruptly curved and sharp.

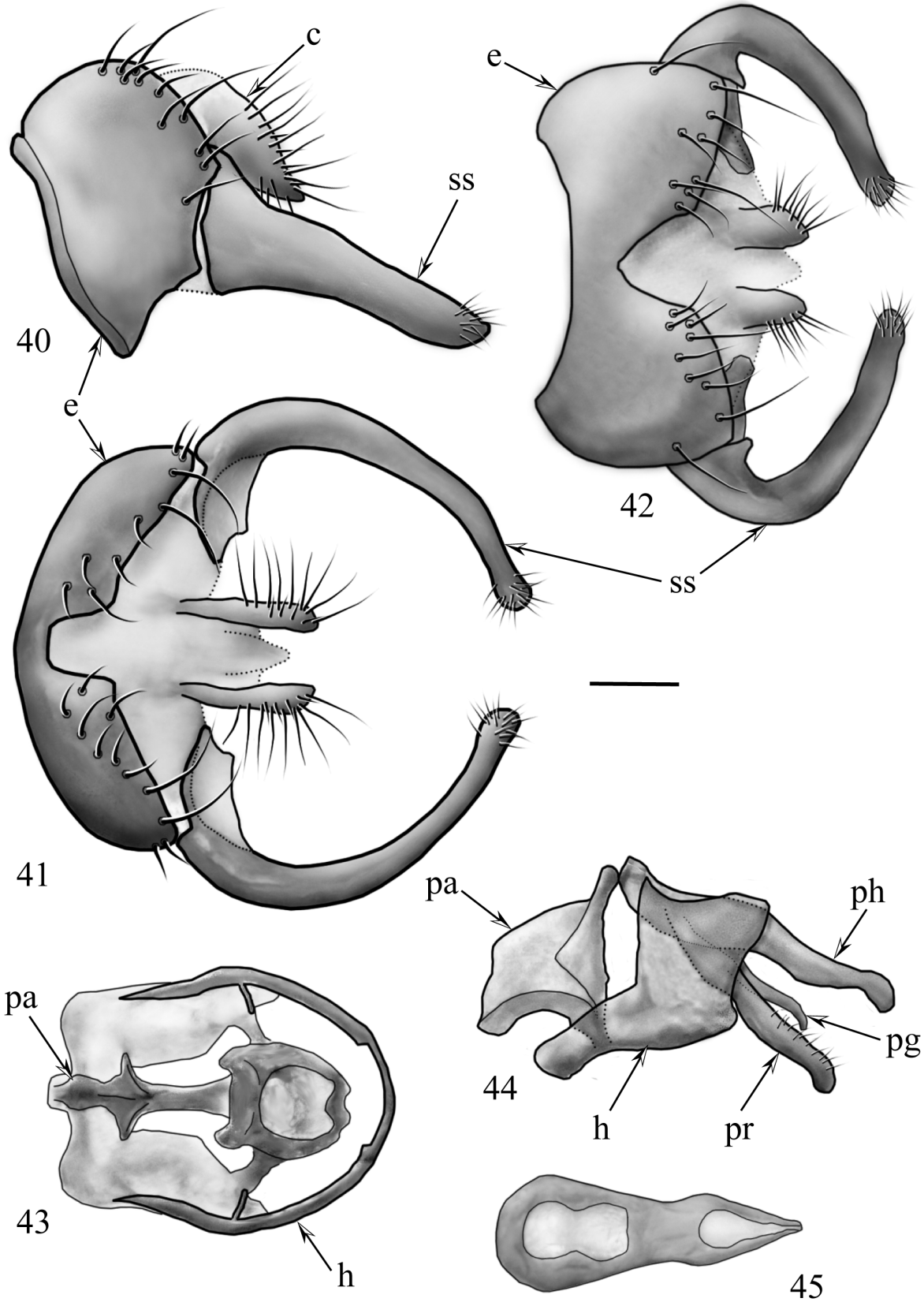
Description. *Adults*, ♂ (♀ unknown). Body (Fig. 35) length 2.4 mm.

Head (Figs 35–38). 1.7 X higher than long; 1.3 X wider than high; mostly dark silvery grey with exceptions following. Vertex with outer vertical seta longer than inner one by 1.6 X; distance from vertex to anterior tip of frons 1.7 X width of frons at level of anterior ocellus. Postocellar setae absent. Ocellar triangle (probably sexually dimorphic) elongate, only slightly tapering to anterior margin of frons, slightly raised and distinct from fronto-orbital plate, anteriorly ending in dense patch of short white setulae on distinct whitish spot and extending over antennal bases; ocelli in equilateral triangle, on small raised tubercle, with ocelli placed well anterior to vertex; setulose within and in front of triangle, and behind posterior ocelli. Ocellar setae absent. Eye 1.1 X higher than long; height 6.0 X genal height. Frons with reddish-brown vitta along edge of ocellar triangle; width and length subequal; with lateral edges only slightly diverging anteriorly, 1.2 X wider at level of lunule than at level of anterior ocellus. Mid frontal vitta depressed; oriented downward below tip of ocellar triangle, and meeting lunule at sharp angle. Fronto-orbital area lacking fronto-orbital setae; with scattered setulae and an irregular row of setulae oriented slightly lateroclinate, with distinct cluster of 4–5 elongated (length 1.3 X distance between inner vertical setae), yellowish lateroclinate setae (appearing like 1 very thick seta) at anterolateral corner. Lunule silvery grey pruinose above antennae, strongly depressed below mid frontal vitta; narrowly arched, height 0.4 X frons length; with 2 small, fine setulae. Antenna entirely black; bases separated by small carina, with area between antennal bases shiny black, lacking pruinosity; 1st flagellomere short, rounded, covered with short thick white setulae; arista with distal segment 3.3 X longer than basal. Face, parafacial and gena silvery grey pruinose. Face strongly receding. Parafacial narrow. Gena with one strong genal seta, lacking additional setulae in front and behind. Clypeus black; small, barely exposed. Palpus black; spatulate; densely setulose. Mouthparts very small and held within oral cavity above palpi; prementum and labellum dark.

Thorax (Figs 35–36). Scutum uniformly dark silvery grey pruinose; 1.2 X longer than wide; 3.8 X scutellar length; setulose dorsally (bounded laterally by supra-alar line); dorsocentral vittae absent. Prescutellum present. Scutellum concolorous with scutum; 1.7 X wider than long. Pleuron concolorous with scutum. Chaetotaxy: 0+3 (0+4 on one side) dorsocentral setae, posterior seta 2.5 X longer than next anterior one, with next anterior one(s) slightly smaller; one postpronotal seta, with several smaller setulae; two notopleural setae, in anterior and posterior corners, anterior one 1.9 X longer than posterior one; one pre- and one postsutural supra-alar seta; two postalar setae; prescutellar acrostichal seta absent; proepisternum, anepisternum and anepimeron lacking setae; one strong katepisternal seta along upper edge, with 3 small setulae in row anterior to seta; two pairs scutellar setae, subequal in length, posterior pair subparallel but bowed out along length. *Legs*. Brownish, with femora and tibiae dark grey pruinose except mid and hind legs with femora yellow distally, tibiae yellow apically, and basotarsomeres and second tarsomeres yellow. *Wing*. Length 2.1 mm; 2.3 X longer than high. Hyaline, with veins brown. Veins R_{2+3}, R_{4+5} and M_1 subparallel in distal half of wing. Crossvein r-m located slightly basad of halfway point of wing length, and at about 2/3 point of cell dm length. Vein Cu extends to wing margin; apical section 1.2 X longer than crossvein dm-cu. Halter stalk brown, knob yellow.



FIGURES 35–39. *Vitaleucopis scopulus* **sp. nov.**, holotype ♂. 35. Habitus, lateral view. 36. Head and thorax, dorsal view. 37. Head, dorsal view. 38. Head, dorsal oblique view. 39. Abdomen, dorsal view.

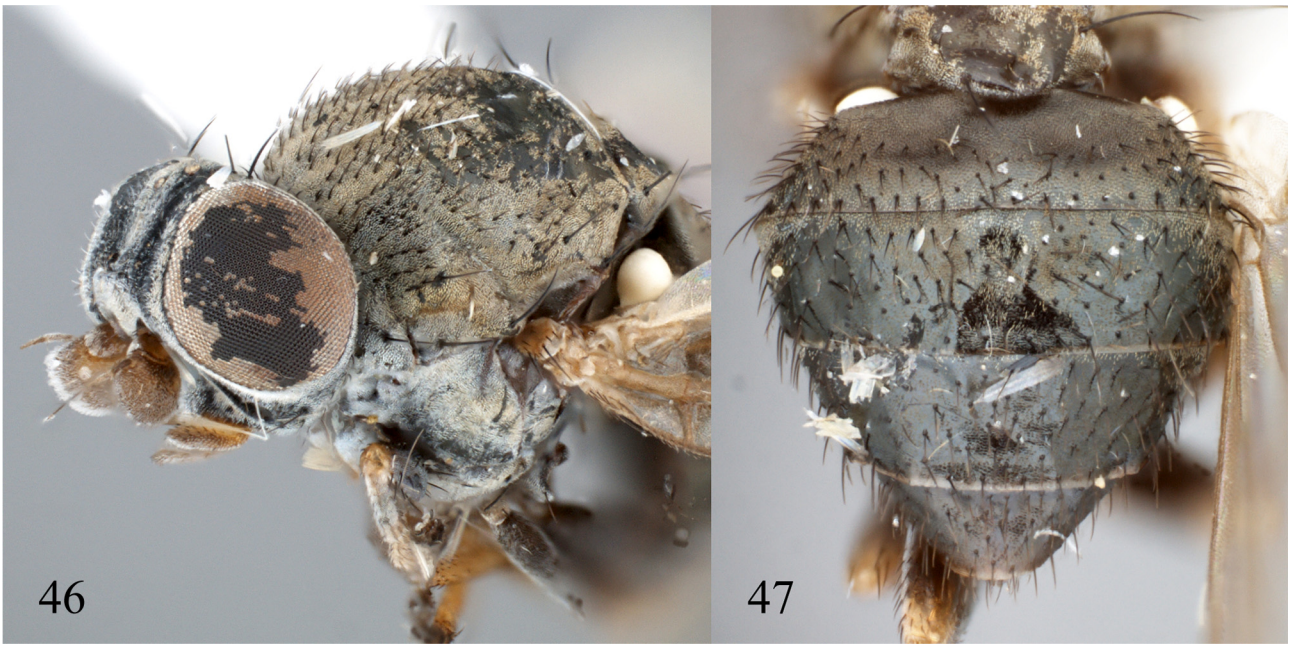


FIGURES 40–45. *Vitaleucopis scopulus* **sp. nov.**, holotype ♂, genitalia. 40. Epandrial complex, lateral view. 41. Epandrial complex, posterior view. 42. Epandrial complex, posterior view tilted ventrally (showing dorsum of epandrium). 43. Hypandrial complex, dorsal view (phallus reflexed downward). 44. Phallic complex, lateral view. 45. Phallus, dorsal view. Abbreviations: c = cercus, e = epandrium, h = hypandrium, pa = phallapodeme, pg = postgonite, ph = phallus, pr = pregonite, ss = surstylus. Scale bar = 0.1 mm.

Abdomen (Fig. 39). Tergites shiny black, with light covering of silvery pruinosity, except bronzy pruinosity on the dorsal part of syntergite 1+2 and tergite 3; uniformly setulose, except setulae slightly enlarged along posterior margin, longest laterally. Syntergite 1+2 and tergite 3 of ♂ each with patch of microtrichiae on lateral edge (*cf*. fig. 2 of Gaimari *et al*. 2008). Sternites silvery grey pruinose; sternite 2 nearly 2 X wider than long, 1.2 X wider than sternite 3; sternite 3 1.7 X wider than long, and 1.7 X wider than sternite 4; sternites 4 and 5 each slightly wider than long, with sternite 5 slightly larger. *Pregenital segments of male*. Tergite and sternite 6 absent. Syntergosternite 7+8 narrow, 0.6 X length of preceding tergite, with median strip lacking sclerotization (appears split into two halves), tapering laterally, with longest setae along posterior margin; sternite 7 apparently absent.

Male genitalia (Figs 40–45). Epandrium slightly convex posteriorly, with 9–11 setae along posterior part of each side; separated and articulating with surstylar lobe; surstylus very long (as long as width of epandrium) and with large flat lobe medially from articulation with epandrium, flattened throughout length, strongly incurved, with sharpened ventral edge, and distally with tiny setulae. Cercus large, narrowing to point distally, with several long and numerous short setulae. Hypandrium in dorsal view about 1.2 X longer than wide, with anterior arms very thick to point of articulation with pregonite, becoming abruptly thin posteriorly, anterior margin emarginate; in profile, abruptly angled with "chicken-leg" shape, evenly wide in posterior half, and abruptly narrower anteriorly. Pregonite articulating with medial portion of wide part of hypandrium, such that bases are close together; parallel-sided, with blunt tip; slightly curved in lateral view; dorsally setulose. Postgonite long (shorter than pregonite), tapering to small outcurved tip; bare. Phallapodeme slightly longer than high from lateral view, with anterior edge evenly convex, with ventral edge evenly concave; in dorsal view, "chess-pawn"-shaped, about 3 X longer than wide, widening into tear-drop-shaped anterior and wide posterior ends. Phallus from ventral view awl-shaped, with bulbous basal half, tapering through middle, then becoming bulbous and tapering evenly to sharp tip, evenly sclerotized through middle, with area near tip open; length about 3 X width of bulbous base; from lateral view undulating, narrow throughout, with anterior part widest, tapering posteriorly and with abrupt curve at tip.

Immatures. Unknown.



FIGURES 46–47. *Vitaleucopis* (undescribed species from La Crescenta, California), ♀. 46. Head and thorax, anterolateral view. 47. Abdomen, dorsal view.

Type material. Holotype ♂ (double mounted on minuten, very good condition), deposited in CSCA, with the following labels: "1958, aborted sugar pine cones, Orleans, Trinity Co., coll. Sept-1958, emerg. III–27–59" [note, Orleans is in Humboldt County, California] / "SDG dissection, 1388 ♂" / "HOLOTYPUS ♂ *Vitaleucopis scopulus* Gaimari" (red label).

Distribution. Known from the western United States (northern California).

Biology. As presented on the collection label, it seems likely that "aborted sugar pine cones" implies predation on adelgids attacking sugar pine, *Pinus lambertiana* Douglas, since they sometimes infest areas at the bases of new

cones and can stunt or abort their development. The fly could have pupariated on the cone after having fed upon associated adelgids or *Cinara* aphids.

Remarks. The male genitalia do not appear substantially different from *Vitaleucopis astonea* except for the surstylus being fully separated and articulated with the epandrium in the new species. Several external characters can also be used to differentiate them, including the different number of dorsocentral setae (0+3) and the conformation of the frons (the length of the head in dorsal view, from the vertex to the tip of the frons is 1.7 X the width of the frons at the level of the anterior ocellus; the width of the frons at the level of the anterior ocellus is subequal to the length of the frons from the anterior ocellus to the tip) and of syntergite 7+8 (with a median strip lacking sclerotization, appearing split into two halves).

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