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TAXONOMY OF THE SPECIES OF *AMPHIGERONTIA* (PSOCOPTERA: PSOCIDAE) OF THE ROCKY MOUNTAINS OF THE UNITED STATES AND CANADA

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Abstract.—Five species of psocids of the genus *Amphigerontia* Kolbe 1880, are recorded from the Rocky Mountains of the United States and Canada. ***Amphigerontia longicauda*, n. sp.**, is described. *Amphigerontia petiolata* (Banks) is recorded from the Rocky Mountains for the first time. The holotype of *Amphigerontia infernicola* (Chapman) is re-examined and described in detail. New characters for the separation of females of *Amphigerontia bifasciata* (Latreille) and *Amphigerontia montivaga* (Chapman) resulted in many new records of the latter species, previously known in the Rocky Mountains from only a single locality. Species-level characters are reviewed and several new ones are added. A key to the species known from North America north of Mexico is included.

Key Words: Psocoptera. Psocidae, *Amphigerontia*, new species, Rocky Mountains

Psocids of the genus *Amphigerontia* are found throughout the Rocky Mountains of the United States and Canada. These relatively large psocids sometimes become abundant locally in late summer and autumn on the foliage and branches of coniferous trees. The species are much alike in superficial appearance and accurate identification of the Rocky Mountain species is not possible with the existing literature. In this paper we attempt to resolve this problem with a new evaluation of characters, new diagnoses, and a revised key to the species. It should be noted that the term "Rocky Mountains" as used here includes the desert ranges of New Mexico, Arizona, and Utah and also an area west of the mountains in British Columbia.

Five species are now known from the Rocky Mountains. One of these is new and is here named and described from material collected in Arizona, New Mexico, and Colorado. *Amphigerontia infernicola* (Chapman) remains known only from the holotype male, collected at West Thumb, Yellowstone National Park. Our restudy of the type makes known several additional characters for recognition of this species. The other three species have fairly wide distributions elsewhere in North America (Mockford 1993). *Amphigerontia petiolata* (Banks) is recorded for the first time from the Rocky Mountains, with localities in New Mexico and southern Arizona. *Amphigerontia montivaga* (Chapman) was previously known in the Rocky Mountains from a single locality in west-central Colorado. Prior to the present study, many females of this species were misidentified as *Amphi-*

gerontia bifasciata (Latreille) and the fact that it is well represented in the central and northern Rocky Mountains went unnoticed. *Amphigerontia bifasciata* occurs throughout the Rocky Mountains and north of the mountains in the Yukon and Northwest Territories (Mockford 1993). Without presenting its copious collection data, we summarize its geographic, seasonal, altitudinal, and habitat distribution in the study area.

A key to the species of *Amphigerontia* known from the U.S. and Canada is presented in which *Amphigerontia contaminata* (Stephens) is included. This European species has become established on conifers at Vancouver, B.C. *Amphigerontia* continues southward through the mountains of Mexico and Central America, but the fauna of that area is too poorly known for proper systematic treatment at present.

Materials and Methods

Collecting by ELM was done in the field seasons of 1963, 1966, 1969, 1987, 2001, 2002, and 2003. His former student, D.M. Sullivan, collected in Arizona, New Mexico, and Colorado in the field seasons of 1984 and 1985. JEA collected at two localities in central British Columbia in August, 1993. Other material, primarily from Utah, is on loan from Utah State University. Approximately 3,000 adult specimens were examined.

Major types as well as some paratypes of the single new species will be deposited in the collection of the Illinois Natural History Survey (INHS) Champaign, Illinois. The remaining paratypes will be retained in the collection of ELM, currently housed in the Department of Biological Sciences, Illinois State University, Normal, Illinois. The type of *A. infernicola* is in the collection of the Department of Entomology, Cornell University, Ithaca, New York (CUIC).

Illustrations were made with the aid of a drawing tube (body parts) and micro projector (wings). Measurements (expressed in μm) were made on slide-mounted parts with a filar micrometer. Color descriptions are based on observations through a dissecting microscope with direct light on specimens preserved in 80% or 95% ethyl alcohol for various periods of time.

Abbreviations used in the descriptions and measurements are as follows: FW = forewing, HW = hindwing, F = hind femur, T = hind tibia, t1 and t2 = hind first and second tarsomeres, t1ct = number of ctenidiobothria (comb-based setae) on hind first tarsomere, f1–f3 = first to third antennal flagellomeres, IO = least distance between compound eyes, d = lateral diameter of a compound eye, IO/d = index thus obtained, v1–v3 = first to third valvulae (ventral, dorsal, and lateral valvulae or gonapophyses respectively).

All measurements except those of the type of *A. infernicola* represent a mean of two measurements from two individuals from different localities.

Evaluation of Characters

Species-level characters for the North American species have not been evaluated thoroughly, and some new ones have been found in the present study. A review and evaluation of characters for species discrimination follows.

1) Head characters.

   a) Male IO/d. This index is relatively constant except in *A. bifasciata*. In that species, much inter-populational variation is seen, resulting in overlap with *A. montivaga*.
   b) Extent of sexual dimorphism in eye size. Female eyes are of a relatively constant small size. The eyes of the male *A. petiolata* are nearly the same size as those of the female. In the other species

males have much larger eyes than females. The greatest difference is in some populations of *A. bifasciata*. IO and d are indicated separately and as an index in the descriptions.

2) Forewing characters.

a) Relative length of rs-m crossvein (Fig. 28). This crossvein, found throughout the genus, tends to be shortest in *A. montivaga*, longest in *A. infernicola*, and intermediate in the other species, with *A. bifasciata* towards the longer end and *A. longicauda* n. sp. towards the shorter end and overlapping with *A. montivaga*.

b) Extent of development of the nodal band (cf. Lienhard, 1998: fig. 7c). This character is highly sexually dimorphic and is useful as an identification aid primarily for females. It is consistently wide and well-pigmented in *A. montivaga* (Fig. 21), variable but overlapping with *A. montivaga* in *A. bifasciata* (Fig. 2), somewhat narrower than in *A. montivaga* but well-pigmented in *A. longicauda* (Fig. 12), and very poorly developed in *A. petiolata* (Fig. 29). Chapman (1930) mentioned this band as "inconspicuously marked" in *A. infernicola* but did not illustrate it.

3) Abdominal characters.

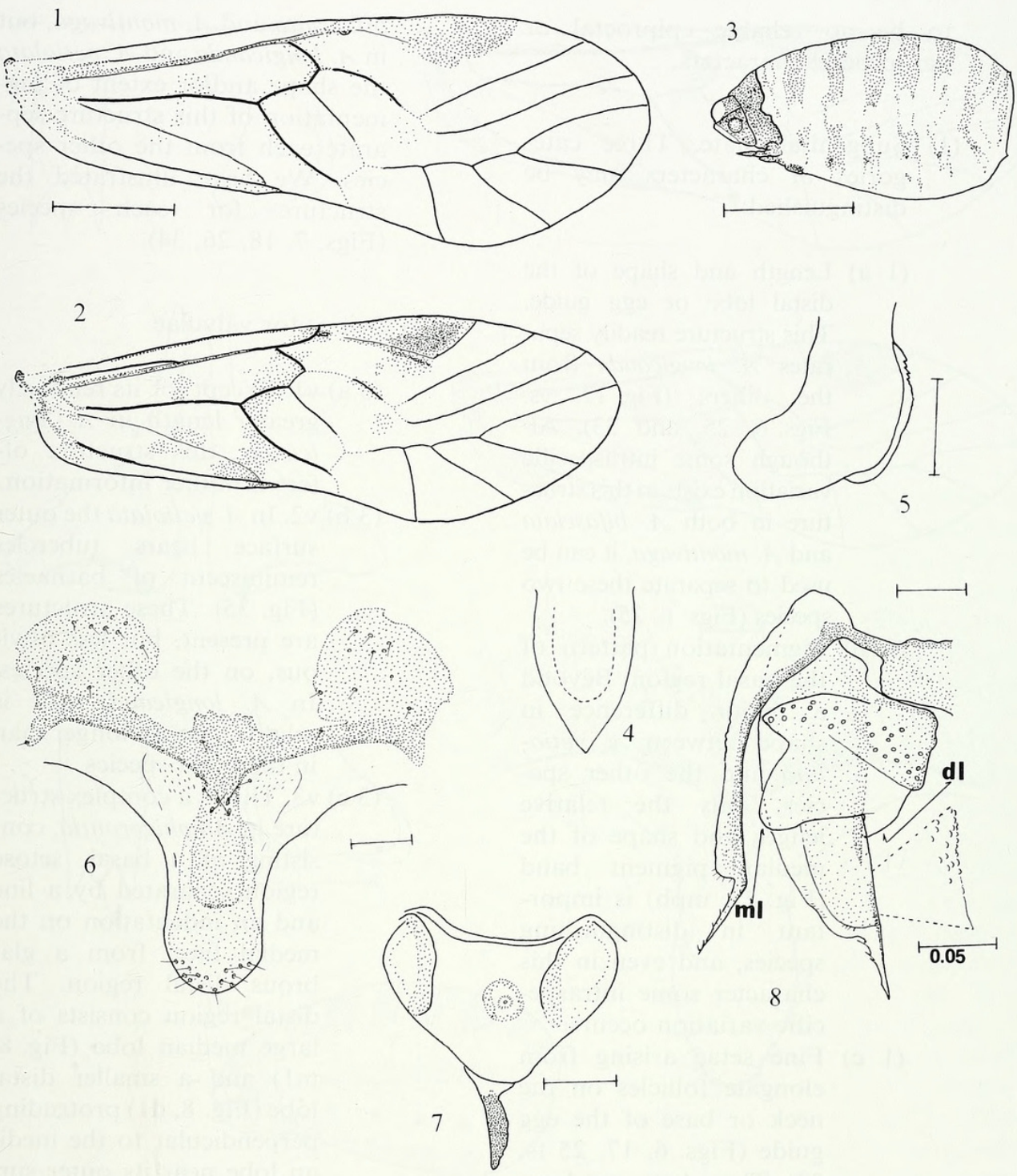
a) Color pattern of the preclunial segments (Figs. 3, 16, 22, 30). These patterns are in subcuticular pigment and do not maintain their positions well in specimens that have been much handled. Although they are essentially the same in both sexes, they are more easily seen in females due to the larger abdomen. The pattern of each species is included in the descriptions.

b) Male terminal abdominal characters. The epiproct and paraprocts appear to offer no useful characters at the light-microscopic level.

(1) Median distal hypandrial process, (Figs. 4, 9, 14, 23, 31). This structure terminates distally in a single point in *A. bifasciata* and *A. petiolata*, but is slender throughout in the former and broad-based and tapering distally in the latter species. In the others, it ends in two points and slight differences in shape may be observed. Caution must be exercised in the case of *A. montivaga*, where variation in the shape of this structure is notable. On its dorsal surface the median distal process bears a lobe, here termed the dorsal lobe (Fig. 14, d), apposing the outer (ventral) surface of the process. This lobe appears to be relatively much shorter in *A. infernicola* than in *A. bifasciata, A. montivaga*, and *A. longicauda*. In *A. petiolata*, it is a short rim, forming a shallow cavity enclosed ventrally by the ventral wall of the process.

(2) Lateral distal hypandrial processes (Figs. 5, 10, 15, 24, 31). Shape of this structure and extent of its outer crest are constant within and differ among the species in this study. Care must be taken to orient the structure uniformly in a temporary preparation.

(3) Phallomeres (paired skeletal elements of the phallosome, joined by membrane). These



Figs. 1–8. *Amphigerontia bifasciata*. 1, Male, forewing. 2, Female, forewing. 3, Female, abdomen, lateral view. 4, Male, median distal hypandrial process, scale of Fig. 5. 5, Male, right distal hypandrial process. 6, Female, subgenital plate. 7, Female, spermapore plate. 8, Female, ovipositor valvulae (m1 = median lobe, d1 = distal lobe). Scale for wings and abdomen = 1.0 mm; all other scales = 0.1 mm unless indicated otherwise.

are of very limited value in the group of species under study. A rounded crest on the distal end bearing large denticles (Fig. 32) separates *A. petiolata* from the other species, but among the others no reliable differences were found.

c) Female terminal abdominal characters. As in the male there appear

to be no reliable epiproctal or paraproctal characters.

(1) Subgenital plate. Three categories of characters may be distinguished:

(1 a) Length and shape of the distal lobe or egg guide. This structure readily separates *A. longicauda* from the others (Fig. 17 vs. Figs. 6, 25, and 33). Although some intraspecific variation exists in this structure in both *A. bifasciata* and *A. montivaga*, it can be used to separate these two species (Figs. 6, 25).

(1 b) Pigmentation pattern of the basal region. Beyond a major difference in shape between *A. petiolata* and the other species, only the relative length and shape of the median pigment band (Fig. 25, mpb) is important in distinguishing species, and even in this character some intraspecific variation occurs.

(1 c) Fine setae arising from elongate follicles on the neck or base of the egg guide (Figs. 6, 17, 25 fs, 33). These have not been observed previously, and they have not been reported in other genera. Differences among species may exist in their number, follicular size, and arrangement.

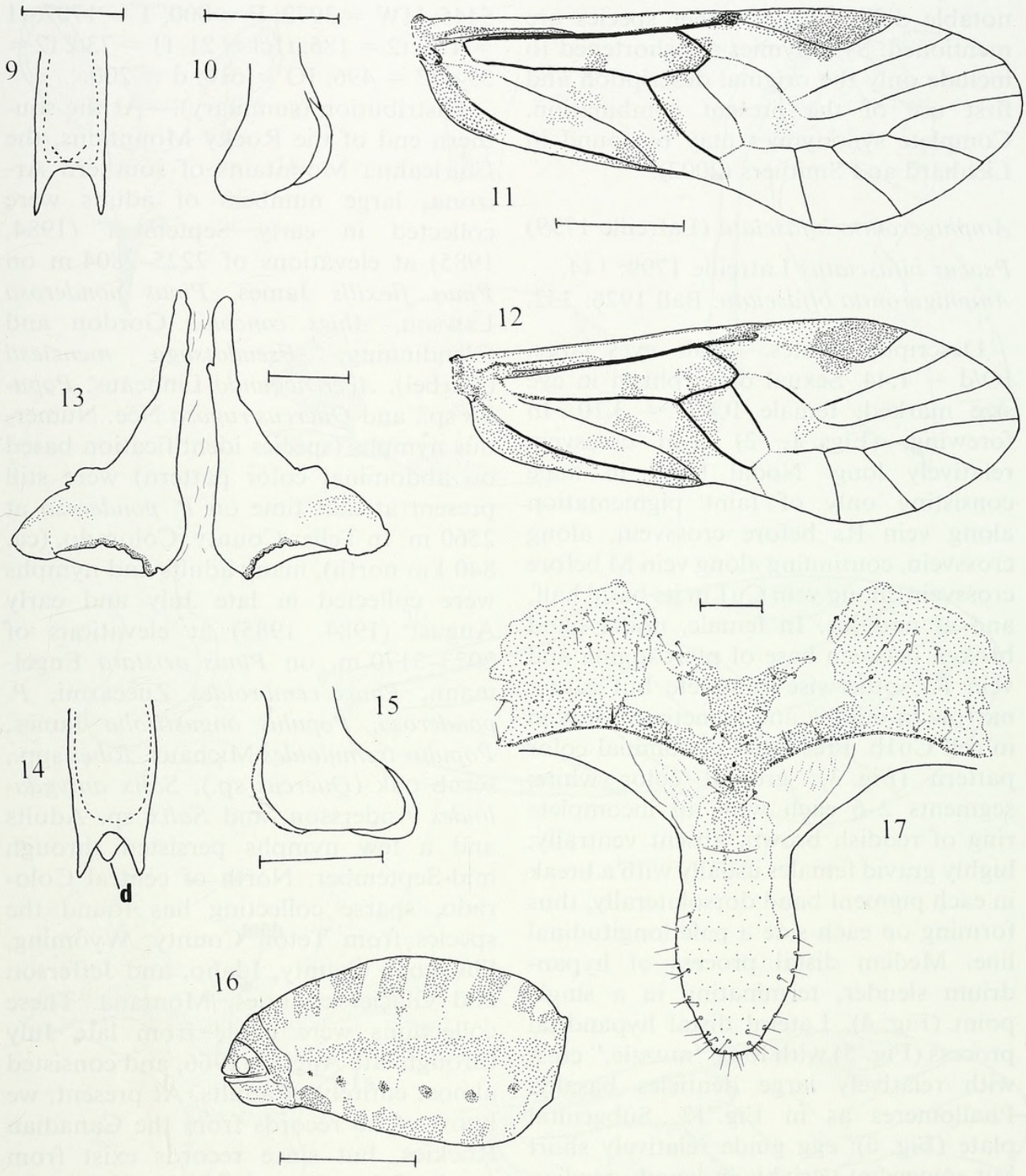
(2) Spermapore plate. No reliable difference is found between *A. bifasciata* and *A. montivaga*, but in *A. longicauda* and *A. petiolata* the shape and/or extent of pigmentation of this structure separate each from the other species. We have illustrated the structure for each species (Figs. 7, 18, 26, 34).

(3) Ovipositor valvulae.

(3 a) v1. Except for its relatively greater length in *A. longicauda*, this structure offers no other information.

(3 b) v2. In *A. petiolata* the outer surface bears tubercles reminiscent of barnacles (Fig. 35). These structures are present, but less obvious, on the other species. In *A. longicauda*, v-2 is relatively much longer than in the other species.

(3 c) v3. This is a complex structure in *Amphigerontia*, consisting of a basal, setose region separated by a line and an indentation on the medial face, from a glabrous distal region. The distal region consists of a large median lobe (Fig. 8, m1) and a smaller distal lobe (Fig. 8, d1) protruding perpendicular to the median lobe near its outer surface. In *A. bifasciata*, the median lobe is relatively large and its apex is oriented at a decided angle to the basal region (Fig. 8). In the other species, it is relatively smaller and sits more nearly parallel to the basal region. The distal lobe shows some differences in length among the species.



Figs. 9–17. *Amphigerontia* spp. 9–10, *A. infernicola*, male. 9, Median distal hypandrial process. 10, Right distal hypandrial process. 11–17, *A. longicauda*. 11, Male, forewing. 12, Female, forewing. 13, Male, phallomeres. 14, Male, median distal hypandrial process, scale of Fig. 9 (d = dorsal lobe). 15, Male, left distal hypandrial process. 16, Female, abdomen, lateral view. 17, Female, subgenital plate. Scale for wings and abdomen = 1.0 mm; all other scales = 0.1 mm.

Diagnoses and Descriptions

A diagnosis of the genus and a key to the North American genera of the subfamily Amphigerontiinae were presented by Mockford (1993:293–297). The species dealt with here are all essentially alike in color of the head, thorax, antennae, and legs, so that these features are described only for the single new species. Any

notable differences in other species are mentioned. Synonymies are shortened to include only the original description and first use of the present combination. Complete synonymies may be found in Lienhard and Smithers (2002).

Amphigerontia bifasciata (Latreille 1799)

Psocus bifasciatus Latreille 1799: 144.
Amphigerontia bifasciata: Ball 1926: 332.

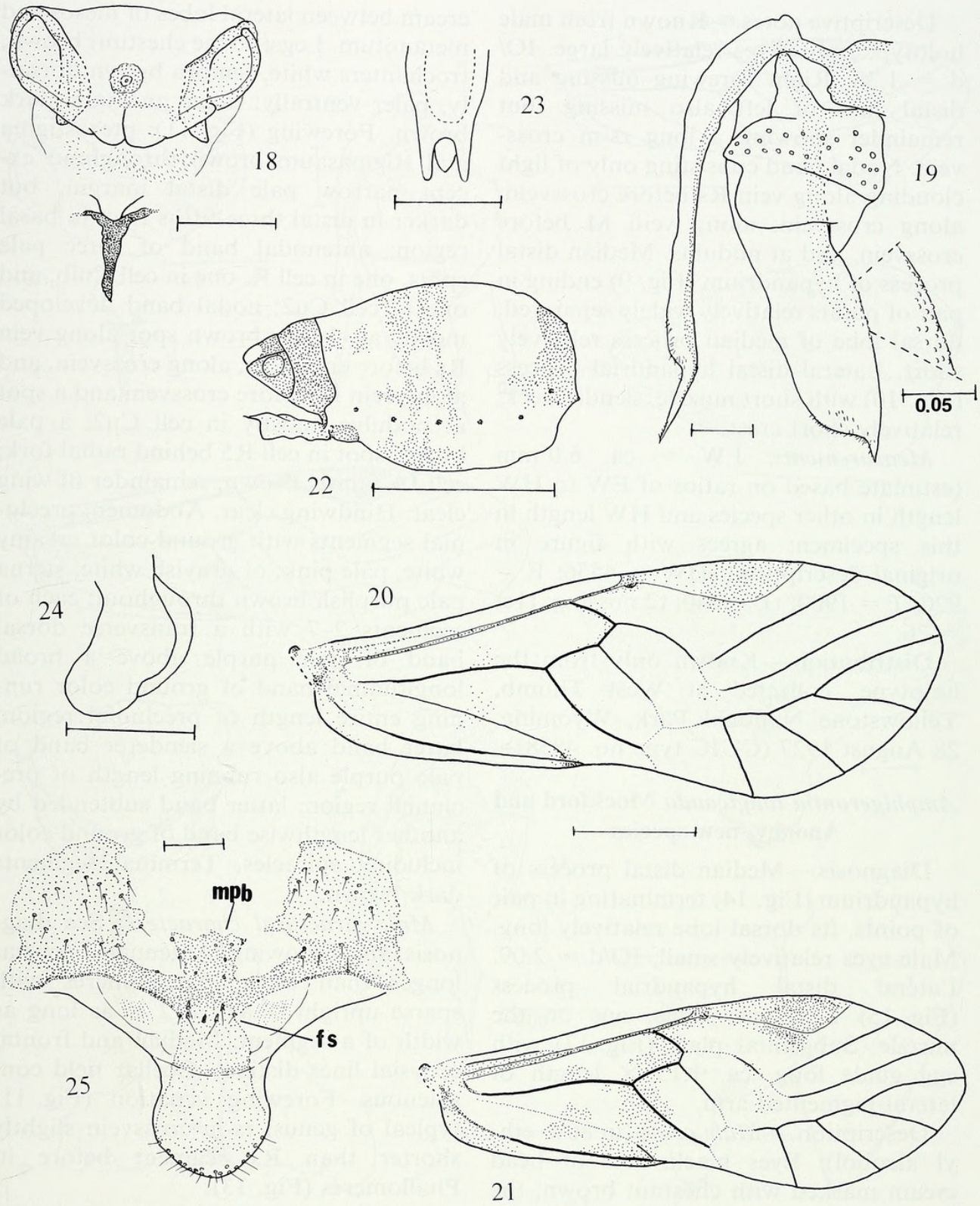
Descriptive notes.—Male eyes large, IO/d ≈ 1.44. Sexual dimorphism in eye size marked; female IO/d ≈ 3.10. In forewing, (Figs. 1, 2) rs-m crossvein relatively long. Nodal band in male consisting only of faint pigmentation along vein Rs before crossvein, along crossvein, continuing along vein M before crossvein, along vein Cu1 in its basal half, and at nodulus. In female, nodal band broken between base of pterostigma and vein Rs, otherwise complete but rather narrow in middle and sometimes broken in cell Cu1b. Preclunial abdominal color pattern (Fig. 3): ground color white; segments 2–6 each with an incomplete ring of reddish brown, absent ventrally; highly gravid females usually with a break in each pigment band dorsolaterally, thus forming on each side a pale longitudinal line. Median distal process of hypandrium slender, terminating in a single point (Fig. 4). Lateral distal hypandrial process (Fig. 5) with long "muzzle," crest with relatively large denticles basally. Phallomeres as in Fig. 13. Subgenital plate (Fig. 6): egg guide relatively short but somewhat variable in length; median pigment band short, sometimes slightly bifid at apex. Spermapore plate (Fig. 7). Ovipositor valvulae (Fig. 8): v2 with faint tubercles on outer surface; v3 with large median lobe projecting at a decided angle to basal region.

Measurements: Male: FW = 5558; HW = 4420; F = 817; T = 1723; t1 = 550; t2 = 176; t1ct = 24; f1 = 805; f2 = 628; f3 = 529; IO = 403; d = 283. Female: FW = 5445; HW = 3972; F = 800; T = 1707; t1 = 478; t2 = 186; t1ct = 21, f1 = 736; f2 = 554; f3 = 496; IO = 616; d = 200.

Distribution (summary).—At the southern end of the Rocky Mountains, the Chiricahua Mountains of southern Arizona, large numbers of adults were collected in early September (1984, 1985) at elevations of 2225–2804 m on *Pinus flexilis* James, *Pinus ponderosa* Lawson, *Abies concolor* Gordon and Glendinning, *Pseudotsuga menziesii* (Mirbel), *Acer negundo* Linneaus, *Populus* sp., and *Quercus rugosa* Née. Numerous nymphs (species identification based on abdominal color pattern) were still present at that time on *P. ponderosa* at 2560 m. In Teller County, Colorado, (ca. 840 km north), many adults and nymphs were collected in late July and early August (1984, 1985) at elevations of 2073–3170 m, on *Pinus aristata* Engelmann, *Pinus cembroides* Zuccarini, *P. ponderosa, Populus angustifolia* James, *Populus tremuloides* Michaux, *Ribes* spp., scrub oak (*Quercus* sp.), *Salix amygdaloides* Andersson, and *Salix* sp. Adults and a few nymphs persisted through mid-September. North of central Colorado, sparse collecting has found the species from Teton County, Wyoming, Shoshone County, Idaho, and Jefferson and Glacier counties, Montana. These collections were made from late July through late August, 1966, and consisted almost entirely of adults. At present, we know of no records from the Canadian Rockies, but since records exist from north of the mountains in the Northwest and Yukon Territories (Mockford 1993: 298), it is reasonable to assume that the species occurs in those mountains.

Amphigerontia infernicola
(Chapman 1930)

Psocus infernicolus Chapman 1930: 240.
Amphigerontia infernicola: Mockford 1993: 299.



Figs. 18–25. *Amphigerontia* spp. 18–19, *A. longicauda*. 18, Female, spermapore plate. 19, Female, ovipositor valvulae. 20–25, *A. montivaga*. 20, Male, forewing. 21, Female, forewing. 22, Female, abdomen, lateral view. 23, Male, median distal hypandrial process. 24, Male, right distal hypandrial process. 25, Female, subgenital plate (fs = fine setae, mpb = median pigment band). Scale for wings and abdomen = 1.0 mm; all other scales = 0.1 mm unless indicated otherwise.

Descriptive notes.—Known from male holotype only. Eyes relatively large. IO/d = 1.38. Right forewing missing and distal half of left also missing, but remainder showing a long rs-m crossvein. Nodal band consisting only of light clouding along vein Rs before crossvein, along crossvein, along vein M before crossvein, and at nodulus. Median distal process of hypandrium (Fig. 9) ending in pair of points relatively widely separated; dorsal lobe of median process relatively short. Lateral distal hypandrial process (Fig. 10) with short muzzle, slender neck, relatively short crest.

Measurements: FW = ca. 6.0 mm (estimate based on ratios of FW to HW length in other species and HW length in this specimen; agrees with figure in original description); HW = 4556; F = 920; T = 1900; t1 = 640; t2 missing; t1ct = 26.

Distribution.—Known only from the holotype, collected at West Thumb, Yellowstone National Park, Wyoming, 28 August 1927 (CUIC type no. 4838).

Amphigerontia longicauda Mockford and Anonby, new species

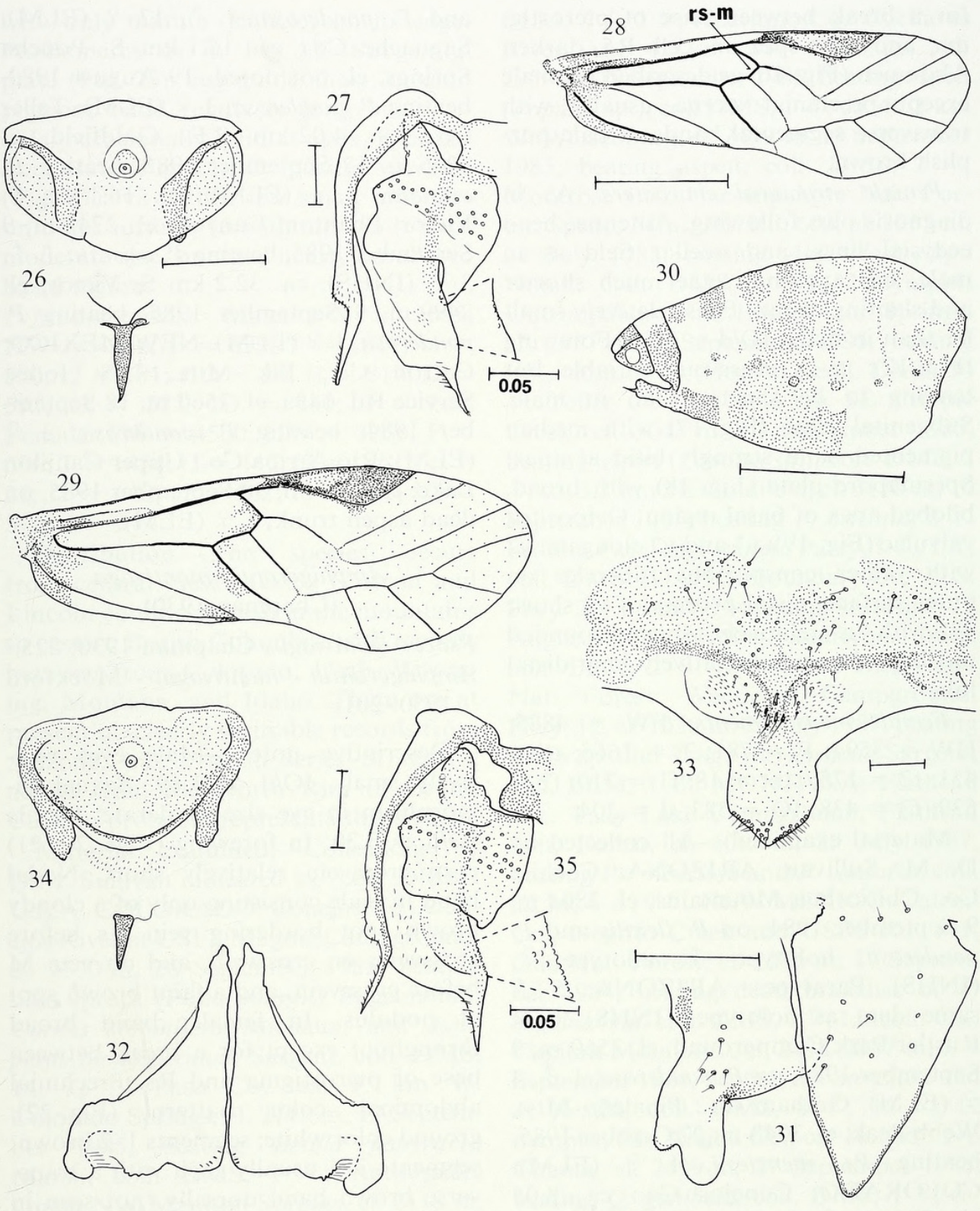
Diagnosis.—Median distal process of hypandrium (Fig. 14) terminating in pair of points, its dorsal lobe relatively long. Male eyes relatively small, IO/d ≈ 2.09. Lateral distal hypandrial process (Fig. 15) with two crests, one on the muzzle. Subgenital plate (Fig. 17) with egg guide long, ca. 1.15 × length of lateral pigmented arm.

Description.—*Male color* (in 80% ethyl alcohol): Eyes black; rest of head cream marked with chestnut brown, the latter in broad band bordering ecdysial line, broadening posteriorly to include entire hind margin of vertex, an aggregate of small spots mesad to each eye, a v-shaped mark open anteriorly on frons before ocellar field, and slender vertical lines on postclypeus. Antenna black. Thorax chestnut brown with streak of cream between lateral lobes of meso- and metanotum. Legs: coxae chestnut brown, trochanters white, femora brown dorsally, paler ventrally; tibiae and tarsi dark brown. Forewing (Fig. 11): pterostigma and stigmasaum brown throughout except narrow pale distal margin, but darker in distal three-fifths than in basal region; antenodal band of three pale spots, one in cell R, one in cell Culb, and one in cell Cu2; nodal band developed mostly as cloudy brown spot along vein Rs before crossvein, along crossvein, and along vein M before crossvein and a spot at nodulus, mostly in cell Cu2; a pale brown spot in cell R5 behind radial fork; cell IA faintly brown; remainder of wing clear. Hindwing clear. Abdomen: preclunial segments with ground color creamy white, pale pink, or grayish white; sterna pale purplish brown throughout; each of segments 2–7 with a transverse dorsal band of pale purple above a broad longitudinal band of ground color running entire length of preclunial region; latter band above a slenderer band of pale purple also running length of preclunial region; latter band subtended by another lengthwise band of ground color including spiracles. Terminal segments dark brown.

Male structural characters: See diagnosis, also following. Antenna somewhat longer than body; flagellomeres with sparse upright setae ca. 2 × as long as width of a segment. Median and frontal ecdysial lines distinct. Ocellar field conspicuous. Forewing venation (Fig. 11) typical of genus; rs-m crossvein slightly shorter than Rs segment before it. Phallomeres (Fig. 13).

Male measurements: FW = 4914; HW = 3703; F = 792; T = 1670; t1 = 493; t2 = 169; t1ct = 22; f1 = 769; f2 = 579; f3 = 500; IO = 481; d = 231.

Female color: Head, thorax, antenna, and legs as in male. Forewing (Fig. 12) as in male except spots of antenodal band darker, nodal band continuous but



Figs. 26–35. *Amphigerontia* spp. 26–27, *A. montivaga*. 26, Female, spermapore plate. 27. Female, ovipositor valvulae. 28–35, *A. petiolata*. 28, Male, forewing (rs-m = rs-m crossvein). 29, Female, forewing, scale of Fig. 28. 30, Female, abdomen, lateral view. 31, Male, median and left distal hypandrial processes. 32, Male, phallomeres. 33, Female, subgenital plate. 34, Female, Spermapore plate. 35, Female, ovipositor valvulae. Scales for wings and abdomen = 1.0 mm; all other scales = 0.1 mm unless indicated otherwise.

for a break between base of pterostigma and Rs, spot in cell R5 darker. Abdomen (Fig. 16) as described for male except preclunial sterna usually with transverse segmental bands of pale purplish brown.

Female structural characters: As in diagnosis plus following. Antenna, head ecdysial lines, and ocellar field as in male, but antennal setae much shorter and slanting distad. Eyes relatively smaller than in male, IO/d ≈ 2.86. Forewing (Fig. 12): rs-m crossvein variable but tending to be shorter than in male. Subgenital plate (Fig. 17) with median pigmented band strongly bifid at apex. Spermapore plate (Fig. 18) with broad, bilobed apex of basal region. Ovipositor valvulae (Fig. 19): v1 and v2 elongate; v2 with rather conspicuous tubercles on outer surface; distal process of v2 short; v3 with a relatively short, rounded median lobe and a relatively long distal lobe.

Female measurements: FW = 4883; HW = 3594; F = 781; T = 1665; t1 = 451; t2 = 175; t1ct = 18; f1 = 719; f2 = 539; f3 = 438; IO = 583; d = 204.

Material examined.—All collected by D. M. Sullivan. ARIZONA: Cochise Co.: Chiricahua Mountains, el. 2804 m, 9 September 1984, on *P. flexilis* and *P. ponderosa*, holotype ♂, allotype ♀, (INHS). Paratypes: ARIZONA: 5 ♂ same data as holotype, (INHS); 6 ♀ Rustler Park Campground, el. 2560 m, 9 September 1984, on *P. ponderosa*, 1 ♂, 4 ♀ (ELM); Graham Co.: Pinaleño Mts., Webb Peak, el. 3048 m, 27 October 1985, beating *Ps. menziesii*, 1 ♀ (ELM). COLORADO: Conejos Co.: ca. 8.05 km S. Lake Fork, Rio Grande National Forest, el. 2743 m, 25 September 1985, beating *Ps. menziesii*, 1 ♂, 2 ♀ (ELM); El Paso Co.: Gold Camp Rd., ca. 24.1 km E. Victor, el. 2895 m, 24 August 1984, beating *P. flexilis*, 1 ♀ (ELM); ca. 16.1 km S. Del Norte, el. 2850 m, 21 September 1985, beating *Ps. menziesii* and *P. ponderosa*, 1 ♂, 13 ♀ (ELM); Saguache Co.: ca. 16.1 km S. Poncha Springs, el. not noted, 19 August 1983, beating *P. ponderosa*, 1 ♀ (ELM); Teller Co.: ca. 4.02 km S.E. Goldfield, el 3246 m, 12 September 1985, beating *P. aristata*, 1 ♀ (ELM); ca. 16.1 km S. Victor, Phantom Canyon, el. 2743 m, 9 September 1985, beating *P. aristata*, 3 ♂, 3 ♀ (INHS); ca. 32.2 km S. Victor, el. 2499 m, 9 September 1985, beating *P. ponderosa*, 1 ♀ (ELM). NEW MEXICO: Catron Co.: Elk Mtn., U.S. forest Service Rd. 143a, el. 2560 m, 18 September 1984, beating *P. ponderosa*, 2 ♀ (ELM); Rio Arriba Co.: Upper Canjilon Lake, el. 2987 m, 30 September 1985, on dead aspen trunk, 1 ♀ (ELM).

Amphigerontia montivaga (Chapman 1930)

Psocus montivagus Chapman 1930: 225.
Amphigerontia montivaga: Mockford 1950: 201.

Descriptive notes.—Male eyes relatively small, IO/d ≈ 1.69. Sexual dimorphism in eye size moderate; female IO/d ≈ 3.30. In forewing (Figs. 20, 21) rs-m crossvein relatively short. Nodal band in male consisting only of a cloudy brown spot bordering vein Rs before crossvein, on crossvein, and on vein M before crossvein, and a faint brown spot at nodulus. In female, band broad throughout except for a break between base of pterostigma and Rs. Preclunial abdominal color pattern (Fig. 22): ground color white; segments 1–2 brown; segments 3–4 usually each with a transverse brown band dorsally (not seen in Fig. 22); segments 5–6 each with a complete brown ring broken only at spiracles; segment 7 with a transverse brown band dorsally. Median distal hypandrial process (Fig. 23) terminating in two points, with a relatively long dorsal lobe. Lateral distal hypandrial process (Fig. 24) with short muzzle, long crest

with only minute denticles on its edge. Phallomeres as in Fig. 13. Subgenital plate (Fig. 25): egg guide short; median pigment band relatively long but variable, occasionally bifid at apex. Spermapore plate (Fig. 26). Ovipositor valvulae (Fig. 27): v2 with a few small tubercles on outer surface; v3 with median lobe of moderate size, oriented nearly parallel to basal region.

Measurements: Male: FW = 5699; HW = 4236; F = 899; T = 1817; t1 = 550; t2 = 181; t1ct = 24; f1 = 817; f2 = 591; f3 = 523; IO = 440; d = 261. Female: FW = 4500; HW = 3266; F = 696; T = 1454; t1 = 446; t2 = 176, t1ct = 21; f1 = 640; f2 = 561; f3 = 428; IO = 574; d = 171.

Distribution.—The species occurs from central New Mexico (Catron and Lincoln counties) north in the mountains to eastern British Columbia, with records between from Colorado, Utah, Wyoming, Montana, and Idaho. There are at present no clearly verifiable records from Arizona, but a small series of teneral adults from the North Rim of Grand Canyon probably represents this species.

Material examined.—Collections by D.M. Sullivan indicated as "coll. DMS". U.S.A. COLORADO: Conejos Co.: Conejos River at USFS Magote Campground, el. 2530 m, 26 September 1985, beating blue spruce (*Picea pungens* Engelmann), *Cornus stolonifera* Michaux, and *Juniperus monospermum* Sargent, coll. DMS, 14 ♀; El Paso Co.: ca. 9.7 km W. Colorado Springs, el. 2713 m, 17 September 1985, beating *Betula papyrifera* Marsh, coll. DMS, 1 ♀; Rattlesnake Gulch NW Manitou Springs, el. 2118 m, 26 August 1984, beating *Quercus gambelii* Nutall, coll. DMS, 4 ♀, 1 nymph; ca. 40.2 km E. Victor, Gold Camp Rd., el 2515 m, 24 August 1984, beating *A. concolor*, coll. DMS, 5 ♀; Gunnison Co.: Agate Campground, Gunnison Nat. Forest, el. 2438 m, 21 July 1969, beating *Pinus contorta* Loudon and *P. pungens*, coll. ELM, 7 ♂, 1 ♀; Huerfano Co.: Cucharas River, ca. 4.2 km SW Cucharas, el. 2957 m, 19 September 1985, beating aspen (*Populus* sp.), coll DMS, 1 ♂; ca. 40.2 km W. Walsenburg, el. 2499 m, 19 September 1985, beating aspen, coll. DMS, 2 ♀; Montrose Co.: Uncompahgre Nat. Forest, Spruce Mtn., NF Rd. 600, el. 2957 m, 24 July 1985, beating *Abies lasiocarpa* Nutall, coll. DMS, 1 ♀, 12 nymphs; Uncompahgre Nat. Forest, Iron Springs, el. 2957 m, 5 September 1985, beating *Abies lasiocarpa* (Hooker), coll. DMS, 14 ♀; Teller Co.: ca. 48.3 km SE Cripple Creek, el. 3048 m, 17 September 1985, beating aspen (*Populus* sp.), coll. DMS, 3 ♀; ca. 3.2 km SE Goldfield, el. 3170 m, 12 September 1985, beating *P. aristata*, 2 ♀, beating *Picea engelmannii* Parry, 1 ♂, 1 ♀, coll. DMS. IDAHO: Boundary Co.: U.S. Hwy. 2, 1.6 km W. Montana State line, 19 August 1966, beating coniferous trees, coll. ELM, 2 ♀; Idaho Co.: Clearwater Nat. Forest: Wendover Campground, Hwy. 12, el. 1036 m, 28 July 1987, beating *Abies* sp. and *Tsuga mertensiana* Sargent, coll. ELM, 1 ♂. MONTANA: Flathead Co.: Tally Lake Campground, Flathead Nat. Forest, el. 1067 m, 29 July 1987, beating *Ps. menziesii* and *P. contorta*, coll. ELM, 4 ♂, 9 ♀. NEW MEXICO: Catron Co.: Negrito Creek and USFS Rd. 141, Gila Nat. Forest, el. 2286 m, 17 September 1984, beating dead branches of *P. engelmannii*, coll. DMS, 1 ♀; Lincoln Co.: Capitan Mountain., el. 2438–2987 m, 3–4 September 1984, beating *Ps. menziesii* and *P. flexilis*, coll. DMS, 8 ♂, 12 ♀, 12 nymphs; Rio Arriba Co.: ca. 16.1 km NE Chama, el. 2499 m, 27 September 1985, beating *Q. gambelii*, coll. DMS, 1 ♀; ca. 8.0 km S. Tierra Amarilla, Hwy. 84, el. 2377 m, beating *Pinus edulis* Engelmann, coll. DMS, 1♀. UTAH: Cache Co.: Tony Grove Canyon, 25 August–2 September 1976, coll. Knowlton and Hanson, 1 ♂; Tony Grove Junction, 1–7 September 1984, Malaise trap, 1 ♂; Rich Co.: Logan Canyon Summit, 22–29 August 1980,

Malaise trap, 1 ♂; Utah Co.: Alpine Loop Rd. off Hwy. 189 nr. Heber City, el. 1768 m, 24 August 1953, coll. ELM, 5 ♀, 2 nymphs. Wyoming: Teton Co.: U.S. Hwy. 26, 22.5 km N. Jackson, 5 August 1966, beating *Ps. menziesii*, coll. ELM, 5 ♂, 6 ♀. CANADA: BRITISH COLUMBIA: Burns Lake, el. ca. 700 m, 2 August 1993, beating young *Picea glauca* Voss, coll. JEA, 1 ♀; Cariboo Regional District: Kersley, el. ca. 600 m, 1 August 1993, beating *Pseudotsuga*, coll. JEA, 1 ♀; Nakusp village, el. 450 m, 22 July 1993 beating young *Tsuga* in mature secondary forest, coll. JEA, 1 ♂, 1 ♀.

Amphigerontia petiolata (Banks 1918)

Psocus petiolatus Banks 1918: 4.
Amphigerontia petiolata: Mockford 1950: 201.

Descriptive notes.—Male eyes small, IO/d ≈ 2.28. Sexual dimorphism in eye size slight. Female IO/d ≈ 3.34. Eyes bicolored in both sexes: pale greenish gray in upper two-fifths, black in lower three-fifths. In forewing (Figs. 28, 29), rs-m crossvein relatively long. Nodal band absent in male; in female continuous but weakly pigmented and thin from vein Rs nearly to nodulus then as a spot at nodulus. A basal band also present in female. Preclunial abdominal color pattern (Fig. 30): ground color chalky white; segments 1–2 dark brown laterally, white dorsally except for a longitudinal brown dorsolateral streak on each side; segment 3 white laterally and ventrally, brown dorsally; segments 4–6 dark brown throughout (or with some white spots on sides); segment 7 white with two dorsolateral brown spots. Median distal process of hypandrium (Fig. 31) broad basally, tapering to single point distally. Lateral distal hypandrial process (Fig. 31) with long muzzle, short denticulate crest occupying prominence. Phallomeres (Fig. 32) each with short row of denticles distally near lateral margin. Subgenital plate (Fig. 33) with short egg guide tapered to blunt point at apex; median pigment band diffuse. Spermapore plate (Fig. 34). Ovipositor valvulae (Fig. 35): v2 with large tubercles on outer surface; v3 with median and distal lobes relatively small, the median parallel with basal region.

Measurements: Male: FW = 3606; HW = 2755; F = 613; T = 1331; t1 = 369; t2 = 119; t1ct = 16; f1 = 628; f2 = 477; f3 = 401; IO = 424; d = 186. Female: FW = 4129; HW = 3264; F = 607; T = 1242; t1 = 319; t2 = 122; t1ct = 16; f1 = 625; f2 = 433; f3 = 334; IO = 517; d = 155.

Distribution.—The Rocky Mountain records represent a range extension (from eastern Texas) westward in the U.S. of ~ 1045 km. to Arizona. The species appears to be restricted in the Rocky Mountains to southern New Mexico and southern Arizona.

Material examined (collected by ELM except where otherwise noted). ARIZONA: Cochise Co.: Chiricahua Mountains: South Fork Road of Cave Creek Area, Coronado National Forest, 6 September 2002, beating broad-leaf trees along creek, 11 ♂, 11 ♀, 18 nymphs; Pinery Canyon Rd. at North Fork Rd., 22 September 2002, beating dead branches of oak, sumac, and *Bumelia*, 1 ♂, 2 ♀; Huachuca Mountains: Miller Peak Trail, el. 1585–1646 m, 18 August 2001, beating dead branches of trees, 2 ♀; Santa Cruz Co.: Santa Rita Mountains: Madera Canyon, 21 August 1959, on *Quercus* sp., coll. G.H. Nelson, 4 ♀. NEW MEXICO: Lincoln Co.: ca 3.2 km S. Nogal on State Hwy. 37, 10 August 1983, beating piñon pines, 6 ♂, 2 ♀.

Key to the Species of *Amphigerontia* of North America North of Mexico

1. Abdomen terminating ventrally in a 2-segmented, heavily sclerotized plate, the hypandrium, ending posteriorly in three processes; male 2

– Termination of abdomen very different, a partially-sclerotized subgenital plate bearing posteriorly a single process, egg guide, latter closely flanked by ovipositor valvulae; female 7
2. Median process of hypandrium terminating in a single point (Figs. 4, 31) 3
– Median process of hypandrium terminating in a pair of points (Figs. 9, 14, 23) 4
3. Median process of hypandrium slender, tapering beyond middle to single point (Fig. 4) . . . . . *A. bifasciata* (Latreille)
– Median process of hypandrium long-arrowhead shaped, tapering from broad base to single point (Fig. 31) . . . . . *A. petiolata* (Banks)
4. Forewing length ca. 6 mm; eyes relatively large, IO/d = 1.38 . . . . . *A. infernicola* (Chapman)
– Forewing shorter, rarely over 5.8 mm; eyes smaller, IO/d ranging from 1.46–2.22 5
5. Lateral process of hypandrium lacking a crest on muzzle (Fig. 24); preclunial abdominal segments with a belt of pigment in segments 5 and 6, as in Fig. 22. . . . . *A. montivaga* (Chapman)
– Lateral process of hypandrium with a crest on muzzle (Fig. 15); preclunial abdominal segments lacking belt of pigment in segments 5 and 6 6
6. Median process of hypandrium greatly widened in middle; (cf., Mockford 1993, fig. 380) . . . . . *A. contaminata* (Stephens)
– Median process of hypandrium only slightly widened in middle (Fig. 14) . . . . . *A. longicauda*, n. sp.
7. Egg guide as well as v1 and v2 elongate (Figs. 17, 19), former ca. 1.15 × length of a lateral pigmented arm of subgenital plate; median pigmented band of subgenital plate usually strongly bifid at its apex (Fig. 17) . . . . . *A. longicauda*, n. sp.
– Egg guide as well as v1 and v2 shorter, former shorter than length of a lateral pigmented arm of subgenital plate; median pigmented band of subgenital plate either not bifid at apex or only slightly so 8
8. Median pigmented band of subgenital plate diffuse; egg guide tapered distally (Fig. 33) . . . . . *A. petiolata* (Banks)
– Median pigmented band of subgenital plate with distinct limits, at least at its base; egg guide rounded distally (Figs. 6, 25) 9
9. Median pigmented band of subgenital plate short, usually not longer than its basal width (Fig. 6); median lobe of v3 at a decided angle to basal region (Fig. 8) . . . . . *A. bifasciata* (Latreille)
– Median pigmented band of subgenital plate usually longer than its basal width (Fig. 25); median lobe of v3 nearly parallel to basal region (Fig. 27) 10
10. Preclunial abdominal sterna unpigmented; v2 with prominent tubercles on outer surface . . . . . *A. contaminata* (Stephens)
– Two preclunial abdominal sterna before subgenital plate usually pigmented (Fig. 22); tubercles of outer surface of v2 small and inconspicuous . . . . . *A. montivaga* (Chapman)

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