Bottorff, R.L. & R.W. Baumann. 2015. *Sierracapnia*, a new genus of Capniidae (Plecoptera) from western North America. Illiesia, 11(09):104-125. Available online: http://illiesia.speciesfile.org/papers/Illiesia11-09.pdf

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SIERRACAPNIA, A NEW GENUS OF CAPNIIDAE (PLECOPTERA) FROM WESTERN NORTH AMERICA

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ABSTRACT

The members of the *Capnia barberi* species group, as defined in Nelson and Baumann (1989), are included in a new genus, *Sierracapnia*, with *C. barberi* Claassen as the type species. Seven species are included: *S. barberi* (Claassen 1924) new comb., *S. hornigi* (Baumann and Sheldon 1984) new comb., *S. mono* (Nelson and Baumann 1987) new comb., *S. palomar* (Nelson and Baumann 1987) new comb., *S. shepardi* (Nelson and Baumann 1987) new comb., *S. yosemite* (Nelson and Baumann 1987) new comb., and *S. washoe* sp. n. *Sierracapnia washoe* is described as a new species. Line drawings are given for *S. washoe* and scanning electron micrographs are provided for all species.

Keywords: Plecoptera, stonefly, Capniidae, *Sierracapnia*, western North America

INTRODUCTION

Nelson and Baumann (1989) listed 51 species of *Capnia* from North America. Since then five additional species have been described: *C. caryi* Baumann and Jacobi 2002, *C. fialai* Nelson and Baumann 1990, *C. kersti* Nelson 2004, *C. nelsoni* Kondratieff and Baumann 2002, and *C. shasta* Nelson and Baumann 2009. It was recognized by Nelson and Baumann (1989) that North American *Capnia*, as then defined, was paraphyletic, containing at least ten species groups that could be placed in different genera. Murányi et al. (2014) noted differences and resurrected *Arsapnia* Banks 1897 as a valid genus in North America for the *Capnia decepta* species group sensu Nelson and Baumann (1989). They also provided evidence that the only true *Capnia* species in North America was *C. nearctica* Banks 1918.

Recently, while studying the stonefly fauna of Nevada and the Great Basin in western North America, a new species was found that belonged to the *C. barberi* species group sensu Nelson and Baumann (1989). Comparison of the *C. barberi* species group with species in the recently restored genus *Arsapnia* and a revised concept of *Capnia sensu stricto* and *Capnia sensu lato* (Murányi et al. 2014) indicated that the *C. barberi* species group had sufficient differences to merit generic status.

MATERIALS AND METHODS

Adult specimens of all species of *Sierracapnia* were studied with a Wild M-8 stereomicroscope at Brigham Young University and Bausch and Lomb StereoZoom 4 microscope at South Lake Tahoe. Line drawings of the new species were prepared using a Bausch and Lomb StereoZoom 4 microscope.

Adult genitalia of all *Sierracapnia* species were studied at the Brigham Young University Electron Microscope Laboratory using a Philips XL30 ESEM FEG microscope as in Nelson and Baumann (2009). Scanning electron micrographs were prepared by Michael Standing at the BYU Electron Microscope Laboratory.

Specimens studied are located at Brigham Young University, Provo, Utah (BYUC); Colorado State University, Fort Collins, Colorado (CSUC); the collection of Richard L. Bottorff, South Lake Tahoe, California (RLBC); and United States National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM).

In this study of North American Capniidae, we compared all species of *Sierracapnia* with the newly resurrected *Arsapnia* (Murányi et al. 2014), eight species groups of *Capnia* sensu Nelson and Baumann (1989), and seven species of *Capnia* with uncertain group or taxonomic status (Nelson and Baumann 1989, Nelson and Baumann 1990, Baumann and Jacobi 2002), but no comparisons were made with *Capnia* species or species groups from the Palaearctic, except for *C. nearctica*.

To enhance the future use of *Sierracapnia* data listed in the Materials Examined sections of this paper, an archive of all specimen collection records and georeferenced locations is provided in comma separated format at the following link: http://illiesia.speciesfile.org/papers/Sierracapnia collections.csv

RESULTS AND DISCUSSION

Sierracapnia, new genus

Type Species. *Sierracapnia barberi* (Claassen 1924).

Adults. Body length 5-7 mm; color dark brown to black; wings macropterous, forewing R_1 vein curved forward near origin of R_S vein and A_1 curved beyond crossvein a; cerci long, 14-18 segments. Ventral sclerites of adult thorax identical to those reported for *Arsapnia* and *Capnia s. s.* (Table 1 in Murányi et al. 2014). Drumming signals unknown.

Male. Median knobs absent on terga 1-6; large median raised knob present on tergum 7; median knob absent on tergum 8; pair of smaller raised knobs present on tergum 9, located on each side of epiproct apex; tergal knobs densely covered with rounded tubercles of conical sensilla. Epiproct a single sclerotized member, elongated and laterally compressed, with a curved ventral keel (deep or shallow) positioned between tergum 9 knobs; pair of dorsolateral horns pointing anteriorly and with slightly divergent tips. Epiproct basal sclerite present (small to large) and fused to main epiproct sclerite; laterobasal sclerites large and fused to main epiproct sclerite. Epiproct base with a narrow or thick neck in lateral view. Epiproct apex thin, rounded, or wedge-shaped in dorsal view. Epiproct glabrous, except caudal setae present. Anterior half of epiproct surface covered with numerous shallow sensory pits, each with a small pointed projection in the center; sensory pits less abundant or absent from epiproct neck and base. Epiproct dorsal membrane extends longitudinally for more than one-half epiproct length; membrane linearly folded and with anterior eversible crest that expands or contracts in size. Subgenital plate broadly fused with sternum and tergum 9 (see Fig. 35 in Murányi et al. 2014 for definition of terms). Ventral vesicle absent. Fusion plate (Hanson 1946) a long narrow internal structure largely hidden behind broad triangular paraprocts that are covered with stout hairs or spines, fusion plate apex exposed with a small tubular opening that fits into epiproct base, retractoral plate a thin sclerite separated from fusion plate (Figs. 4, 12, 32, and see Figs. 23-31 in Murányi et al. 2014).

Female. Subgenital plate large and heavily sclerotized, covering all of sternum 8 and posterior margin of sternum 7; division line between sterna 7 and 8 not always obvious; posterior margin of

Table 1. Characters of *Sierracapnia* adult males. Ab7=abdominal segment 7, EP=epiproct, and EP neck (see Fig. 22).

Sierracapnia	n	Ab7 knob	Ab7 knob width/ Ab7 width (%)	EP apex shape	EP width/ EP length (%)	EP depth/ EP length (%)	EP Membrane color	Horn length/EP length (%)	Horn tip/EP length (%)	EP Neck
barberi	5	thin, unnotched	9-13	thin, sharp	15-21	30-35	light	22-25	70-78	narrow
hornigi	5	thin, small notch	11-16	rounded	17-24	19-24	light	15-18	76-85	narrow
mono	5	wide, deep notch	30-40	thin, sharp	16-23	32-35	light	16-20	67-75	thick
palomar	5	thin, small notch	13-17	wedged	13-15	12-14	light	15-17	92-95	narrow
shepardi	5	wide, deep notch	29-32	rounded	17-25	18-20	dark	14-18	80-86	narrow
washoe	5	wide, deep notch	30-36	rounded	22-26	22-26	dark	24-29	83-88	narrow
yosemite	5	thin, notched tip	14-15	rounded	18-24	25-30	light	18-21	85-88	narrow

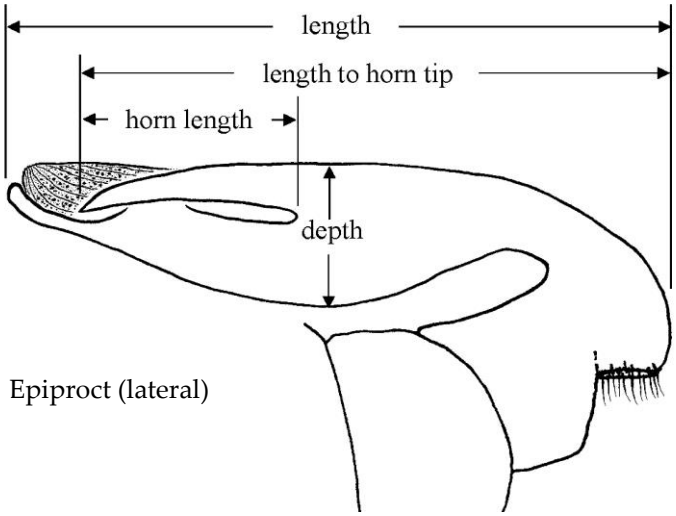


plate broadly truncated at posterior edge of sternum 8, plate not projecting onto sternum 9. Dorsum of abdominal segments 1-8 with median membranous band; posterior margin of segment 8 with small median V-shaped sclerite.

Larva. Unknown.

Diagnosis. Murányi et al. (2014) provided a diagnosis of *Capnia s. s.* Pictet 1841 and concluded that eight species, primarily from the Palaearctic, were included in this restricted concept of the genus. *Capnia nearctica* Banks 1919, the only Holarctic species, has a distribution in North America that includes Alaska and northwestern Canada (Nelson and Baumann 1989, Stewart and Oswood 2006, DeWalt et al. 2015).

Males of *Sierracapnia* differ from *Capnia s. s.* by their epiproct and knobs on tergum 9. *Sierracapnia*

males have an undivided epiproct with distinct dorsolateral horns and prominent knobs on tergum 9. *Capnia s. s.* males have an epiproct divided into upper and lower members, but lack dorsolateral epiproct horns and knobs on tergum 9. In addition, *Sierracapnia* males have a basal sclerite and large laterobasal sclerites fused to the main epiproct sclerite, whereas in *Capnia s. s.* the basal sclerite is vestigial and the laterobasal sclerites are divided from the main epiproct sclerite (Murányi et al. 2014). The retractoral plate is separated from the fusion plate in *Sierracapnia* males, but the retractoral plate is fused to the fusion plate in *Capnia s. s.* males. The subgenital plate of *Sierracapnia* female adults is broad, heavily sclerotized, and extends from sternum 8 to the posterior half of sternum 7, whereas in species of *Capnia s. s*. this plate is small and does not extend onto sternum 7.

Sierracapnia and *Arsapnia* adults also differ. The glabrous epiproct of *Sierracapnia* males is laterally compressed and the ventral surface is most often deeply curved (less deeply curved in *S. palomar*), while for *Arsapnia* males the epiproct has a narrow apical tip, laterally expanded bulb-like midsection (often with a row of stiff setae or spines), narrowed posterior neck, and straight ventral surface (Figs. 209-210 in Nelson and Baumann 1989). The epiproct of *Sierracapnia* males has a basal sclerite, but this sclerite is lacking or vestigial for *Arsapnia* males (Murányi et al. 2014). The dorsolateral horns of *Sierracapnia* are prominent, long structures that originate near mid-epiproct and project or arch forward about 15-30% of epiproct length. In contrast, the dorsolateral epiproct projections of *Arsapnia* are small, closely appressed to the main body, and confined to the anterior quarter. The dorsal epiproct membrane of *Sierracapnia* is often clearly exposed for over one-half of the epiproct length and the apex forms an eversible crest of linearly folded tissue that expands and contracts in size. In contrast, the epiproct dorsal membrane of *Arsapnia* is confined to a small, narrow area near the tip and the large eversible crest is absent. *Sierracapnia* males have well-developed knobs on tergum 9, with prominent rounded conical sensilla. These knobs are lacking on most species of *Arsapnia*, but tiny processes are present on three species: *A. pileata* (Jewett 1966), *A. teresa* (Claassen 1924), and *A. utahensis* (Gaufin and Jewett 1962). *Sierracapnia* female adults have a broad, heavily sclerotized subgenital plate that extends onto the posterior margin of sternum 7, while this plate is small and does not extend onto sternum 7 in *Arsapnia* females.

Both *S. palomar* and *Arsapnia arapahoe* (Nelson and Kondratieff 1988) have linear or fusiform epiprocts that differ from the typical forms found in all other species of both genera. Yet each species has characters that are most similar with their respective genus. That is, *S. palomar* has a laterally compressed, glabrous epiproct with shallow ventral keel, a large basal sclerite fused to the epiproct, and a median dorsal groove that extends the full epiproct length (Figs. 13-15). In addition, median knobs are present on terga 7 and 9. In contrast, *A. arapahoe* has a slightly recurved epiproct that lacks a ventral keel (Fig. 4 in Nelson and Kondratieff 1988) and exhibits some dorsoventral flattening in the anterior third. Its median dorsal groove extends to one-half the epiproct length and a dorsal row of 4-6 anteriorly directed stiff setae or spines occur on each side of the median groove in the anterior third. A median knob is present on tergum 7, but the pair of knobs is absent from tergum 9.

Sierracapnia demonstrates similarities with the three species of the *Capnia mariposa* species group sensu Nelson and Baumann (1989), especially with *C. giulianii* Nelson and Baumann 1987 and *C. mariposa* Nelson and Baumann 1987. In these two species, the epiproct exhibits varying degrees of lateral compression, a keeled ventral surface, dorsolateral horns, a large exposed dorsal membrane, and an eversible crest, plus tergum 9 has a pair of median knobs. Additionally, the *C. mariposa* species group is restricted to the Sierra Nevada. The *Capnia mariposa* group was excluded from *Sierracapnia* because all three species lack a knob on tergum 7 and the dorsolateral horns are small and restricted to the tip of the epiproct.

The identification key for *Capnia* males in Nelson and Baumann (1989) separates *Sierracapnia* (then defined as the *C. barberi* species group) from

nine other *Capnia* species groups and several unplaced species found in North America, but does not separate *Capnia* species groups found in the Palaearctic. With the exceptions noted above for three *Arsapnia* species, *Sierracapnia* differs from *Arsapnia* and all other *Capnia* species groups of North America by having distinct median knobs on terga 7 and 9, and lacking knobs on tergum 8. Further, except for two species of the *Capnia mariposa* group, *Sierracapnia* is unique among all other *Capnia* species groups of North America by having a laterally compressed epiproct.

Distribution. The greatest diversity of *Sierracapnia* species is found in the Sierra Nevada; this includes *S. barberi, S. mono, S. shepardi,* and *S. yosemite* (Figs. 39, 40). Closely adjacent to the eastern Sierra Nevada, two species, *S. hornigi* and *S. washoe*, occur in the White Mountains and northwestern Nevada, respectively. The distribution of *S. barberi* extends northward into the southern Cascade Range. *Sierracapnia palomar*, which occurs on several mountains of southern California, lies outside the rather compact distribution of the other six species of the genus. In addition to the distributional separation of *S. palomar*, the shallow ventral curve and general linear proportions of its epiproct are obvious differences from the typical form of *Sierracapnia*. Nevertheless, this species was included in *Sierracapnia* because it bears knobs on terga 7 and 9 and its glabrous narrow epiproct has a ventral curved surface, dorsolateral horns, long membrane groove, and an apical eversible crest.

The distributions of *Capnia s. s.* and *Sierracapnia* do not overlap in western North America: *Capnia s. s.* occurs in the far north; *Sierracapnia* is found much further south in California and Nevada. In contrast, overlap exists in the distributions of some *Sierracapnia* and *Arsapnia* since the latter has a wide range in western North America, occurring from the central and southern Rocky Mountains to the Coast Range. Members of several other *Capnia s. l.* species groups overlap broadly in their ranges with *Sierracapnia, Arsapnia*, and *Capnia s. s.* in western North America. *Sierracapnia* species inhabit mid-elevation, perennial, streams and creeks.

Etymology. The name *Sierracapnia* reflects the primary Sierra Nevada distribution of the genus.

Species Treatments

Sierracapnia barberi (Claassen 1924)

(Figs. 1-4)

Sierracapnia barberi (Claassen 1924):55. Holotype ♂ (USNM). Type locality: California, Plumas Co., Feather River Canyon, near Caribou.

Material Examined. USA, California: Alpine Co., West Fork Carson River, 2 mi W Woodfords, 4-IV-1985, D. Giuliani, 5♂, 16♀ (BYUC); Hot Springs Creek, near Grover Hot Springs, N 38.69879° W 119.84299°, 5878′, 2-III-2001, R.L. Bottorff, 3♂, 6♀ (RLBC); Markleeville Creek, Hwy 89, Markleeville, 21-III-1985, R. W. Baumann & C. R. Nelson, 11♂, 10♀ (BYUC). **El Dorado Co.,** South Fork American River, Hwy 50, Riverton, 21-III-1985, R.W. Baumann & C.R. Nelson, 13♂, 7♀ (BYUC); North Fork Cosumnes River, Capps Crossing, N 38.65045° W 120.40741°, 5044′, 5-IV-1981, R.L. Bottorff, 26♂, 53♀ (RLBC); North Fork Cosumnes River, Capps Crossing, Grizzly Flats, N 38.65045° W 120.40741°, 5044′, 24-III-1982, R.L. Bottorff, 6♂, 9♀ (BYUC); North Fork Cosumnes River, Meiss Ranch, N 38.63579° W 120.33655°, 5440′, 5-IV-1981, R.L. Bottorff, 2♂, 14♀ (RLBC); North Fork Cosumnes River, Sciaroni Crossing, N 38.66946° W 120.53347°, 3221′, 21-I-1986, R.L. Bottorff, 7♂, 2♀ (RLBC). **Nevada Co.,** Bear River, Hwy 20, near Placer County line, 21-IV-1987, R.W. Baumann, C.R. Nelson & S.A. Wells, 2♂, 7♀ (BYUC); Bear River, Hwy 20, Tahoe National Forest, 29-I-1992, R.W. Baumann, J.T. Zenger & B.C. Kondratieff, 32♂, 31♀ (BYUC); Donner Creek, W Truckee, 21-II-1985, R.W. Baumann & C.R. Nelson, 40♂, 25♀ (BYUC); Sagehen Creek, Sagehen Creek Biological Station, 9-15-III-1965, A. L. Sheldon, 37♂, 29♀ (BYUC, USNM); Truckee River, Truckee, 21-II-1985, R.W. Baumann & C.R. Nelson, 21♂, 8♀ (BYUC). **Placer Co.,** Ward Creek, Hwy 89, near Lake Tahoe, 22-II-1985, R.W. Baumann & C.R. Nelson, 15♂, 15♀ (BYUC). **Plumas Co.,** Bucks Lake, 17 mi SW Quincy, 29-IV-1950, H.P. Chandler, 3♀ (BYUC); Long Valley Creek, Hwy 70, Cromberg, 14- II-1985, R.W. Baumann & C.R. Nelson, 124♂, 26♀ (BYUC). **Shasta Co.,** North Fork Battle Creek, Hwy 44, near Shingletown, 27-I-1985, D.R. Lauck,

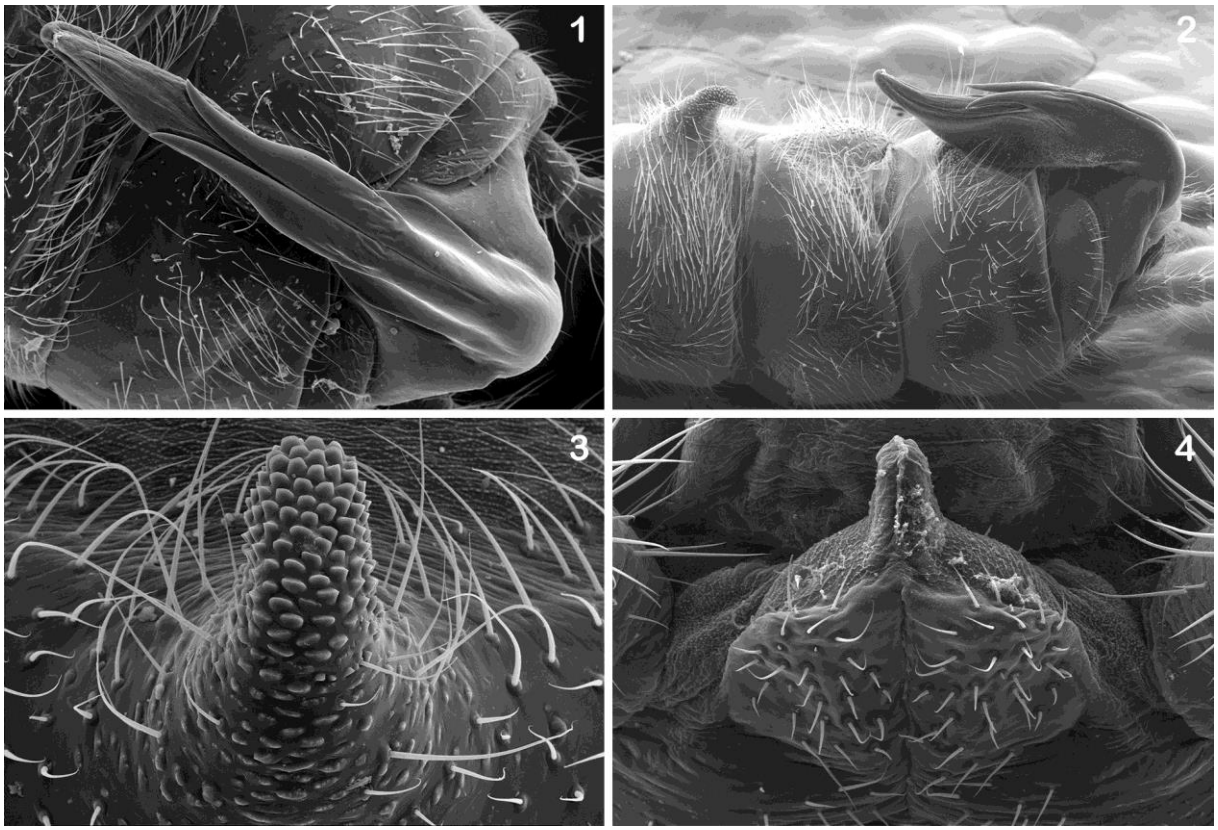


Fig. 1-4. *Sierracapnia barberi*. Male: 1. North Fork Cosumnes River, California. Genitalia, dorsal, epiproct. 2. North Fork Cosumnes River, California. Genitalia, lateral, epiproct and knob on tergum 7. 3. Sierra Canyon Creek, Nevada. Knob on tergum 7, dorsal, anterior. 4. Sierra Canyon Creek, Nevada. Tip of paraprocts and fusion plate (center prong), ventral, terminal.

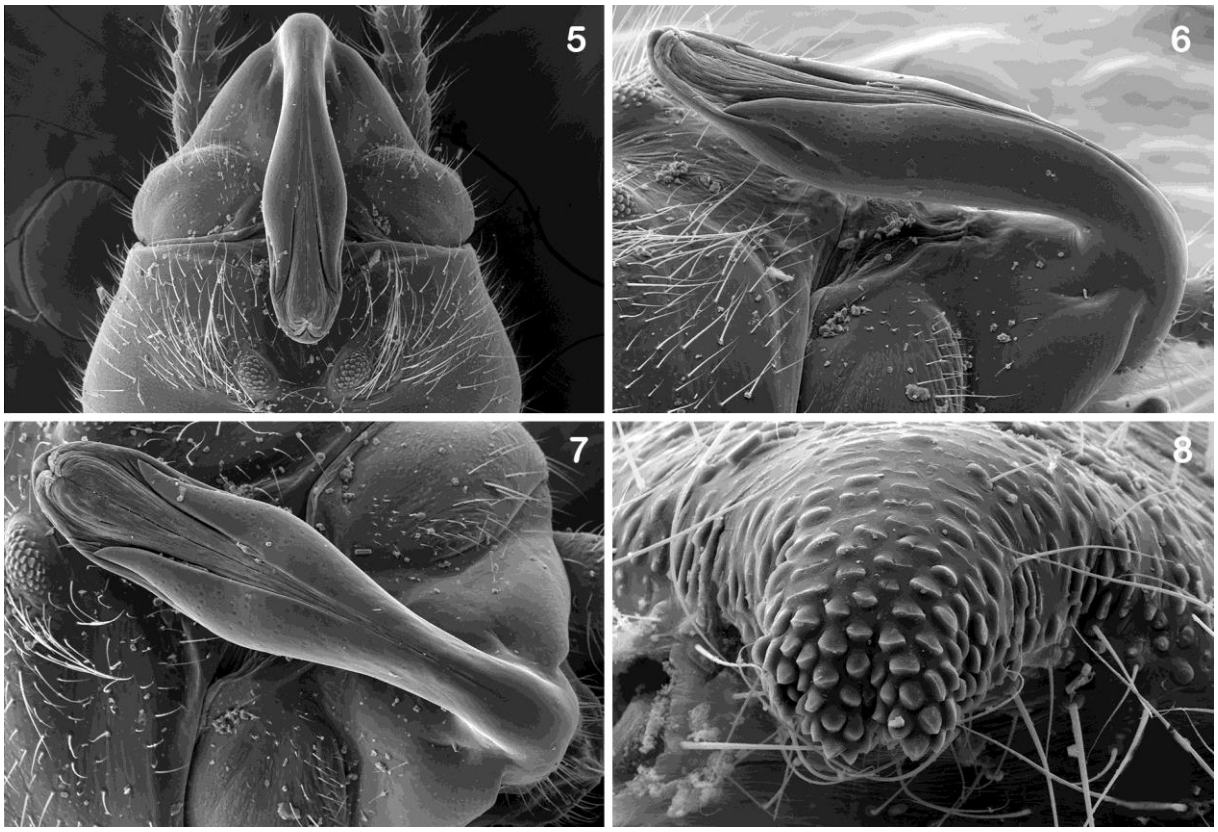
5♂, 2♀ (BYUC); Hat Creek, Hwy 44, Old Station, 26-I-1985, D.R. Lauck, 4♂, 8♀ (BYUC). **Sierra Co.,** Cold Creek, Hwy 89, Cold Creek Campground, 9-XII-1986, R.W. Baumann, C.R. Nelson, B.C. Kondratieff & S.A. Wells, 111♂, 49♀ (BYUC). **Tehama Co.,** North Fork Deer Creek, Hwy 32, 1 mi S junction Hwy 36, 15-II-1985, R. W. Baumann & C.R. Nelson, 20♂, 35♀ (BYUC); Martin Creek, Hwy 36, Mineral, 15-II-1985, R.W. Baumann & C.R. Nelson, 5♂ (BYUC); Mill Creek, Hwy 36, Childs Meadow, 15-II-1985, R.W. Baumann & C.R. Nelson, 1♂ (BYUC). **Tuolumne Co.,** Cow Creek, Hwy 108, 4 mi N Strawberry, 19-III-1985, R.W. Baumann & C.R. Nelson, 78♂, 24♀ (BYUC); Herring Creek, near Strawberry, 19-III-1985, R.W. Baumann & C.R. Nelson, 140♂, 38♀ (BYUC); South Fork Stanislaus River, Hwy 108, Strawberry, 19-III-1985, R.W, Baumann & C.R. Nelson, 10♂, 9♀ (BYUC); North Fork Tuolumne River, Pinecrest, 19-III-1985, R.W. Baumann & C.R. Nelson, 46♂, 27♀ (BYUC). **Nevada: Douglas Co.,** Sierra Canyon Creek, 1 mi N Genoa, N 39.01687° W 119.84985°, 5163', 26-I-2013, R.L. Bottorff, 38♂, 7♀ (BYUC, RLBC). **Washoe Co.,** Dog Creek, Verdi, 22-II-1985, R.W. Baumann & C.R. Nelson, 64♂, 46♀ (BYUC); Galena Creek, Hwy 431, Galena Creek Park, 22-III-1985, R.W. Baumann & C.R. Nelson, 5♂ (BYUC); Galena Creek, Hwy 431, above Reno, 21-IV-1987, R.W. Baumann, C.R. Nelson & S.A. Wells, 1♀ (BYUC).

Male. Tergum 7 knob narrow and unnotched (knob height 20-25% of segment 7 height; knob width 9-13% of segment 7 width) (Figs. 2, 3). Epiproct in dorsal view narrow, lateral margins sinuous (Fig. 1); maximum width 15-21% of

epiproct length; apex acutely pointed; posterior third of epiproct with narrow ventrolateral flange; dorsal membrane light colored. Epiproct in lateral view slightly convex dorsally, deeply keeled ventrally; maximum depth 30-35% of length; maximum depth near middle of epiproct; basal neck narrow (Fig. 2). Epiproct dorsolateral horns arch above main dorsal surface; horn length 22-25% epiproct length; horn tips extend forward to 70-78% epiproct length (Fig. 2, Table 1).

Female. Subgenital plate heavily sclerotized and dark, covering entire width of sternum 8 and posterior portion of sternum 7 (Fig. 211, Nelson and Baumann 1989).

Distribution. *Sierracapnia barberi* occurs in a north-south band of northern California and Nevada, including the Cascade Mountains in Shasta County, the Mount Lassen area, northern and central Sierra Nevada, and Carson Range near Lake Tahoe (Fig. 39).



Figs. 5-8. *Sierracapnia hornigi*. Male: Middle Creek, Nevada: 5. Genitalia, dorsal, epiproct and knobs on tergum 9. 6. Genitalia, lateral, epiproct. 7. Epiproct, dorsal. 8. Knob on tergum 7, dorsal, posterior.

Sierracapnia hornigi (Baumann and Sheldon 1984)

(Figs. 5-8)

Sierracapnia hornigi (Baumann and Sheldon 1984):30. Holotype ♂ (USNM). Type locality: Nevada, Esmeralda Co., Middle Creek, White Mountains.

Material Examined. USA, California: Inyo Co., Cottonwood Creek, White Mountains, 5700', 30-XII-1985, D. Giuliani, 1♂ (BYUC). **Mono Co.,** Millner Creek, White Mountains, 6800', 21-II-1985, D. Giuliani, 4♂, 11♀ (BYUC); Willow Creek, 10 mi S 6 mi E Benton, 7000', White Mountains, 5-III-

1986, D. Giuliani, 1 ♀ (BYUC). **Nevada: Esmeralda Co.,** Chiatovich Creek, White Mountains, 11-II-1986, R.W. Baumann & B.J. Sargent, 1♂ (BYUC); Leidy Creek, White Mountains, 7400′, 18-III-1999, A.L. Sheldon, 1♂, 10♀ (BYUC); Middle Creek, White Mountains, 10-II-1977, A.L. Sheldon, 12♂, 41♀ (BYUC); Middle Creek, White Mountains, 4-III-1979, C.E. Hornig, 14♂, 17♀ (BYUC); Middle Creek, mouth of canyon, 11-II-1986, R.W. Baumann & B.J. Sargent, 7♂, 11♀ (BYUC).

Male. Tergum 7 knob narrow and slightly notched, knob width 11-16% of segment 7 width (Fig. 8). Epiproct in dorsal view increases in width between neck and anterior half; maximum width 17-24% of epiproct length; maximum width occurs anterior of mid epiproct; apex rounded and with median posterior-projecting triangular lobe; dorsal membrane light colored (Figs. 5, 7). Epiproct in lateral view slightly convex dorsally, deeply keeled ventrally; maximum depth 19-24% of length; maximum depth occurs anterior of mid epiproct; neck narrow (Fig. 6). Epiproct dorsolateral horns closely appressed to main dorsal surface; horn length 15-18% epiproct length; horn tips extend forward to 76-85% epiproct length (Fig. 7, Table 1).

Female. Subgenital plate heavily sclerotized and dark; plate covers full width of sternum 8 from posterior to anterior edge; posterior of sternum 7 sclerotized (Fig. 224, Nelson and Baumann 1989).

Distribution. *Sierracapnia hornigi* occurs in the White Mountains of Mono Co., California, and Esmeralda Co., Nevada (Fig. 39).

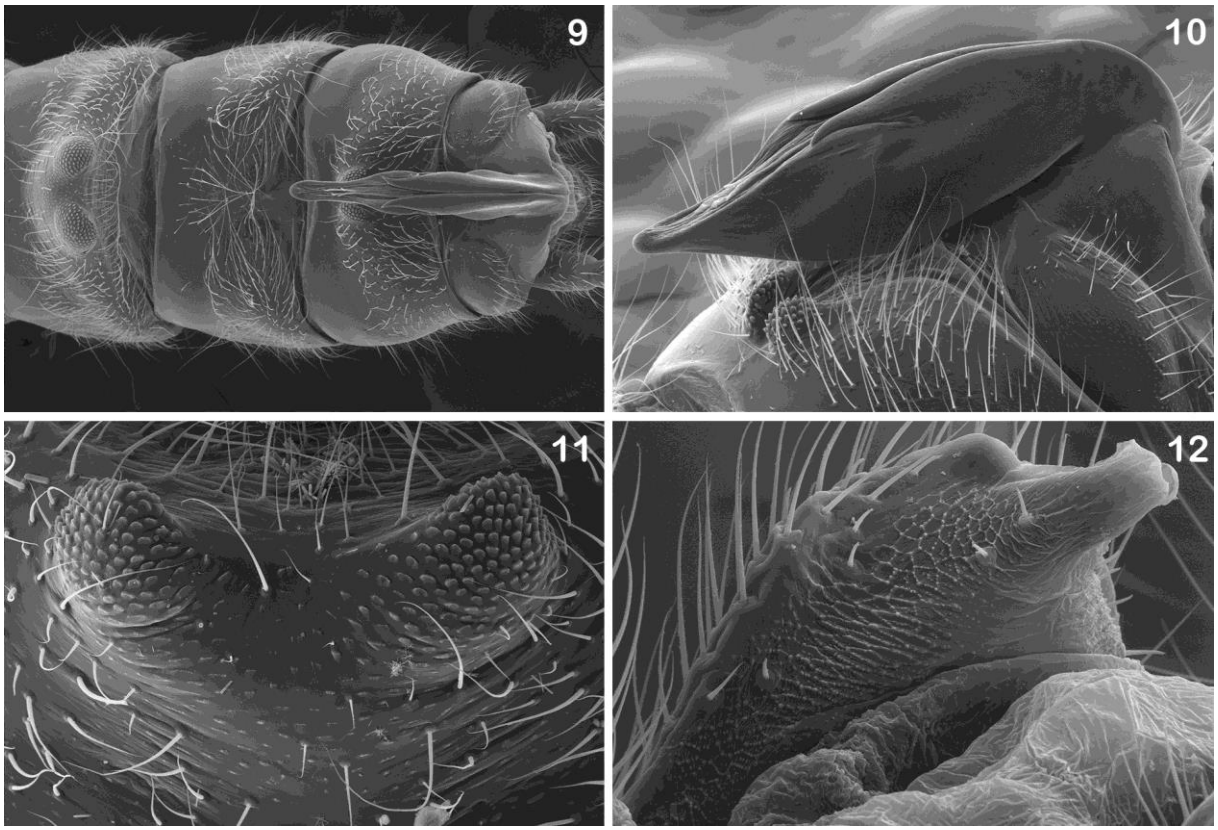
Sierracapnia mono (Nelson and Baumann 1987)

(Figs. 9-12)

> *Sierracapnia mono* (Nelson and Baumann 1987):493. Holotype ♂ (USNM). Type locality: California, Mono Co., Slinkard Creek, 2 miles north of Topaz.

Material Examined. USA, California: Mono Co., Baxter Canyon, Glass Mountains, 9-II-1996, M. Myers, 1♂ (BYUC); Convict Creek, 7 mi ESE Mammoth, 7600′, 8-II-1987, D. Giuliani, 1♂ (BYUC); Glass Creek, 1 mi W Crestview, 7600′, 4-IV-1990, D. Giuliani, 1♂ (BYUC); Laurel Creek, 4 mi ESE Mammoth, 7300′, 9-II-1987, D. Giuliani, 46♂, 30♀ (BYUC); Laurel Creek, 1.5 mi S 4 mi E Mammoth, 7300′, 23-II-1988, D. Giuliani, 9♂, 20♀ (BYUC); creek, 7 mi NW Lee Vining, 7400′, 2-III-1987, D. Giuliani, 21♂, 33♀ (BYUC); Lee Vining Creek, below Poole Power Station, 8-IV-1986, R.W. & J.W. Baumann, 1♀ (BYUC); Parker Creek, 5.5 mi S Lee Vining, 7200′, 23-II-1988, D. Giuliani, 59♂, 56♀ (BYUC); Slinkard Creek, 2 miles north of Topaz, 5-XI-1983, W.D. Shepard, 9♂, 4♀ (USNM, BYUC); unnamed spring, 18 miles north of Bridgeport, 19-I-1983, W.D. Shepard, 1♀ (BYUC); Virginia Creek, 8,200′, 5-IV-1985, D. Giuliani, 9♂, 5♀ (BYUC); Virginia Creek, Hwy 395, 0.5 mi W Conway Summit, 15-IV-1998, C.R. Nelson, B.P. Stark & I. Sivec, 1♂, 1♀ (BYUC). **Nevada: Carson City Co.,** Clear Creek, SW Carson City, N 39.11467° W 119.79979°, 5019′, 8-I-2013, R.L. Bottorff, 9♂, 6♀ (RLBC); Clear Creek, SW Carson City, N 39.11467° W 119.79979°, 5019′, 31-I-2013, R.L. Bottorff, 8♂, 3♀ (RLBC); Secret Harbor Creek, near Lake Tahoe, N 39.14009° W 119.9242°, 6877′, 10-III-2013, R.L. Bottorff, 13♂, 8♀ (RLBC). **Douglas Co.,** Clear Creek, W Carson City, 12-I-1992, D. Giuliani, 8♂, 8♀ (BYUC); Mott Canyon Creek, Mottsville Cemetery, N 38.93139° W 119.83827°, 4769′, 31-I-2013, R.L. Bottorff, 1♂ (RLBC); Mott Canyon Creek, Mottsville Cemetery, N 38.93139° W 119.83827°, 4769′, 26-II-2013, R.L. Bottorff, 5♂, 6♀ (RLBC); unnamed creek, Zephyr Cove, Lake Tahoe, N 39.01409° W 119.94947°, 6244′, 31-I-2013, R.L. Bottorff, 5♂, 1♀ (RLBC); unnamed creek, Zephyr Cove County Park, Lake Tahoe, N 39.00822° W 119.94282°, 6281′, 26-II-2013, R.L. Bottorff, 14♂, 6♀ (RLBC). **Washoe Co.,** Incline Creek, Incline Village, N 39.23945° W 119.94514°, 6248′, 10-III-2013, R.L. Bottorff, 2♂ (RLBC).

Male. Tergum 7 knob wide and usually divided into two lobes, knob width 30-40% of segment 7 width (Figs. 9, 11). Epiproct in dorsal view with sinuous lateral edges, maximum width 16-23% of epiproct length (Fig. 9); maximum width occurs near mid epiproct; apex narrow and pointed; posterior third of epiproct with narrow ventrolateral flange; dorsal membrane light colored. Epiproct in lateral view slightly convex dorsally, deeply keeled ventrally; maximum depth 32-35% of length; maximum depth occurs anterior of mid epiproct; neck thick (Fig. 10). Epiproct



Figs. 9-12. *Sierracapnia mono*. Male: 9. Zephyr Cove, Nevada. Genitalia, dorsal, epiproct and knob on tergum 7. 10. Zephyr Cove, Nevada. Genitalia, lateral, epiproct and knobs on tergum 9. 11. Slinkard Creek, California. Knob on tergum 7, anterior. 12. Clear Creek, Nevada. Tip of paraprocts and fusion plate showing tube, dorsal, terminal.

dorsolateral horns closely appressed to main dorsal surface; horn length 16-20% epiproct length; horn tips extend forward to 67-75% epiproct length (Figs. 9, 10; Table 1).

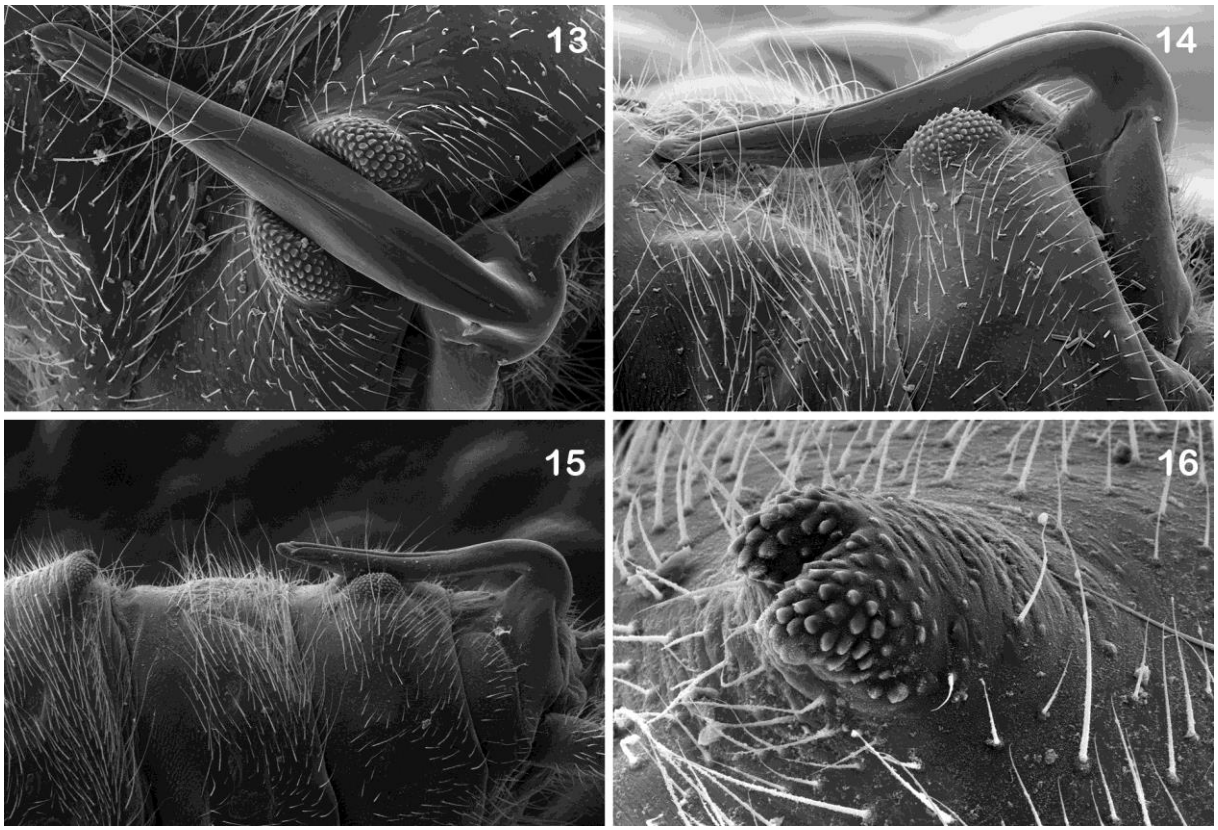
Female. Subgenital plate heavily sclerotized and dark; plate covers entire width of sternum 8 from posterior to anterior edge; sclerotization extends onto sternum 7 (Fig. 232, Nelson and Baumann 1989).

Distribution. *Sierracapnia mono* occurs in a north-south band that includes the Carson Range at Lake Tahoe in western Nevada and the east side of the central and southern Sierra Nevada (Fig. 39), at least as far south as Convict Lake, California (Nelson and Giuliani 2001).

***Sierracapnia palomar* (Nelson and Baumann 1987)**
(Figs. 13-16)

Sierracapnia palomar (Nelson and Baumann 1987):498. Holotype ♂ (USNM). Type locality: California, San Diego Co., Fry Creek, Palomar Mountains.

Material Examined. USA, California: Riverside Co., North Fork San Jacinto River, Hwy 243, below Dark Canyon Campground, 19-I-1985, R.W. Baumann & C.R. Nelson, 5♂, 3♀ (BYUC). **San Diego Co.,** Fry Creek, Palomar Mountain Road, Fry Creek Campground, 18-I-1985, R.W. Baumann & C.R. Nelson, 4♂, 1♀ (USNM, BYUC); Fry Creek, Rd. S-6, Fry Creek Campground, 11-I-2012, B.C. Kondratieff, D. Murányi, J.B. Sandberg & C.R.

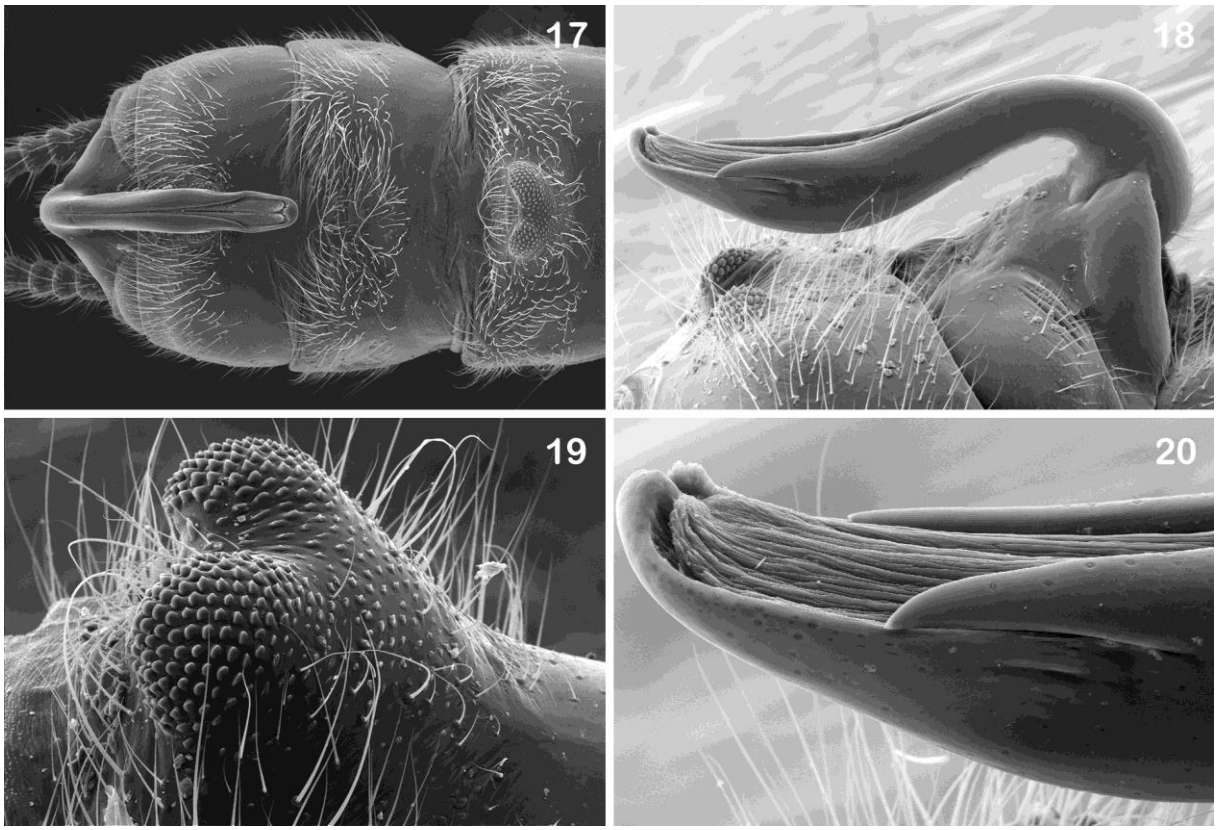


Figs. 13-16. *Sierracapnia palomar*. Male: 13. Headwaters North Fork San Jacinto River, California. Genitalia, dorsal, epiproct and knobs on tergum 9. 14. Headwaters North Fork San Jacinto River, California. Genitalia, lateral, epiproct and knob on tergum 9. 15. Fry Creek, California. Terminalia, lateral, epiproct, knob on tergum 7 and knob on tergum 9. 16. Fry Creek, California. Knob on tergum 7, dorsolateral.

Nelson, 2♂ (CSUC).

Additional Specimens (Nelson et al. 2012). **California: Riverside Co.,** San Jacinto Mountains, Fuller Mill Creek, Hwy 243, Fuller Mill Creek Picnic Area, N 33.79893° W 116.74905°, 1561 m, 10-I-2012, CRN 10113, C.R. Nelson, J.B. Sandberg, D. Murányi & B.C. Kondratieff, 3♂. **San Bernardino Co.,** San Gabriel Mountains, Mount Baldy Road, San Antonio Creek, at San Antonio Falls, N 34.27313° W 117.63637°, 1942 m, 8-I-2012, CRN 10102, C.R. Nelson, J.B. Sandberg, D. Murányi & B.C. Kondratieff, 2♂; San Bernardino Mountains, Snow Fork, Hwy 18, 3 miles west of Big Bear Lake, N 34.24503° W 117.02787°, 2185 m, 9-I-2012, CRN 10109, C.R. Nelson, J.B. Sandberg, D. Murányi & B.C. Kondratieff, 1♂. **San Diego Co.,** Palomar Mountain, Fry Creek, Fry Creek Campground, Road S-6, N 33.34466° W 116.88013°, 1462 m, 11-I-2012, CRN 10119, C.R. Nelson, J.B. Sandberg, D. Murányi & B.C. Kondratieff, 19♂, 1♀; Palomar Mountain, Iron Springs Creek, Road S-6, N 33.33277° W 116.87142°, 1467 m, 11-I-2012, CRN 10120, C.R. Nelson, J.B. Sandberg, D. Murányi & B.C. Kondratieff, 1♂.

Male. Tergum 7 knob narrow and slightly notched, knob width 13-17% of segment 7 width (Figs. 15, 16). Tergum 9 with rounded knobs located near mid segment (Figs. 13-15). Epiproct in dorsal view narrow and linear, maximum width 13-15% of epiproct length; maximum width occurs posterior of mid epiproct; apex wedge-shaped or narrowly rounded; dorsal membrane light colored and



Figs. 17-20. *Sierracapnia shepardi*. Male: 17. Parker Creek, California. Genitalia, dorsal, epiproct and knob on tergum 7. 18. South Fork Yuba River, California. Genitalia, lateral, epiproct and knobs on tergum 9. 19. Parker Creek, California. Knob on tergum 7, dorsolateral. 20. South Fork Yuba River, California. Epiproct, lateral, apex.

confined to a small area between the epiproct apex and dorsolateral horn tips; dorsal median groove extends full epiproct length (Figs. 13-15). Epiproct in lateral view generally linear, with slight reverse curve dorsally and shallow keel ventrally; maximum depth 12-14% of length; maximum depth occurs anterior of mid epiproct; neck narrow (Figs. 14, 15). Epiproct dorsolateral horns appressed to main dorsal surface; horn length 15-17% of epiproct length; horn tips extend forward to 92-95% of epiproct length (Figs. 13-15; Table 1).

Female. Subgenital plate heavily sclerotized and dark, covering most of sternum 8 and extending onto sternum 7 (Fig. 237, Nelson and Baumann 1989).

Distribution. *Sierracapnia palomar* has been collected in the San Bernardino, San Gabriel, San Jacinto and Palomar mountains of southern California (Nelson et al. 2012) (Fig. 39).

Sierracapnia shepardi (Nelson and Baumann 1987)
(Figs. 17-20)

Sierracapnia shepardi (Nelson and Baumann 1987):495. Holotype ♂ (USNM). Type locality: California, Mono Co., Lee Vining Creek, Lee Vining Campground.

Material Examined. USA, California: Inyo Co., Little Cottonwood Creek, 9400', Sierra Nevada Range, 2-IV-1985, D. Giuliani, 1♀ (BYUC); North Fork Big Pine Creek, 9200', Sierra Nevada Range, 16-IV-1985, D. Giuliani, 1♂, 1♀ (BYUC); North Fork Big Pine Creek, 8800', Sierra Nevada Range, 13-IV-1986, D. Giuliani, 7♂, 5♀ (BYUC); Rock Creek,

10,200', 13-V-1985, D. Giuliani, 6♂, 11♀ (BYUC). **Mariposa Co.,** Chilnualna Creek, above Wawona, 18-III-1985, R.W. Baumann & C.R. Nelson, 1♂ (BYUC). **Mono Co.,** Lee Vining Creek, Lee Vining Campground, 14-III-1985, R. W. Baumann & C.R. Nelson, 16♂, 2♀ (USNM, BYUC); Lee Vining Creek, 7100-7600', 2-III-1987, D. Giuliani, 74♂, 49♀ (BYUC); Lower Horse Meadow, 1.5 mi S Lee Vining, 7200', 23-II-1988, D. Giuliani, 17♂, 23♀ (BYUC); Parker Creek, 5.5 mi S Lee Vining, 7200', 23-II-1988, D. Giuliani, 7♂ (BYUC); Parker Creek, 17-II-1989, D. Giuliani, 39♂, 27♀ (includes 3 mating pairs) (BYUC); North Fork Parker Creek, 6 mi S 1.5 mi W, Lee Vining, 7600', 23-II-1988, D. Giuliani, 9♂, 23♀ (BYUC); Walker Creek, 4.1 mi S 0.1 mi W Lee Vining, 23-II-1988, D. Giuliani, 26♂, 25♀ (BYUC). **Nevada Co.,** Donner Creek, W Truckee, 21-II-1985, R.W. Baumann & C.R. Nelson, 1♂ (BYUC); South Fork Yuba River, Soda Springs, 18-III-1984, W.D. Shepard, 15 ♂ (BYUC). **Placer Co.,** South Fork Yuba River, Hwy 80, Cisco Grove, 8-IV-1978, R.D. Williams, 1♂, 2♀ (BYUC); South Fork Yuba River, Hwy I-80. Cisco Grove, 21-IV-1987, R.W. Baumann, C.R. Nelson & S.A. Wells, 2♂, 1♀ (BYUC). **Sierra Co.,** North Fork Yuba River, Hwy 49, W Yuba Pass, 29-V-1991, R.W. Baumann & B.P. Stark, 1♀ (BYUC).

Male. Tergum 7 knob wide and often divided into right and left lobes, knob width 29-32% of segment 7 width (Figs. 17, 19). Epiproct in dorsal view with nearly uniform width along length, maximum width 17-25% of epiproct length; maximum width occurs near mid epiproct; apex broadly rounded and with median posterior-projecting triangular lobe (Fig. 17 and see Fig. 19 in Nelson and Baumann 1987); dorsal membrane dark gray or black, sometimes lighter at tip. Epiproct in lateral view with pronounced reverse (S-shaped) curve, the dorsal surface concave in anterior half and convex in posterior half; ventral surface deeply curved; maximum depth 18-20% of length; maximum depth occurs anterior of mid epiproct; neck narrow (Fig. 18). Epiproct dorsolateral horns closely appressed to main dorsal surface; horn length 14-18% epiproct length; horn tips extend forward to 80-86% of epiproct length (Figs. 18, 20; Table 1).

Female. Subgenital plate heavily sclerotized and dark; plate covers entire width of sternum 8 from its posterior to anterior edge; subgenital plate often with small lateral notches; sclerotization extends onto sternum 7 (Fig. 247, Nelson and Baumann 1989).

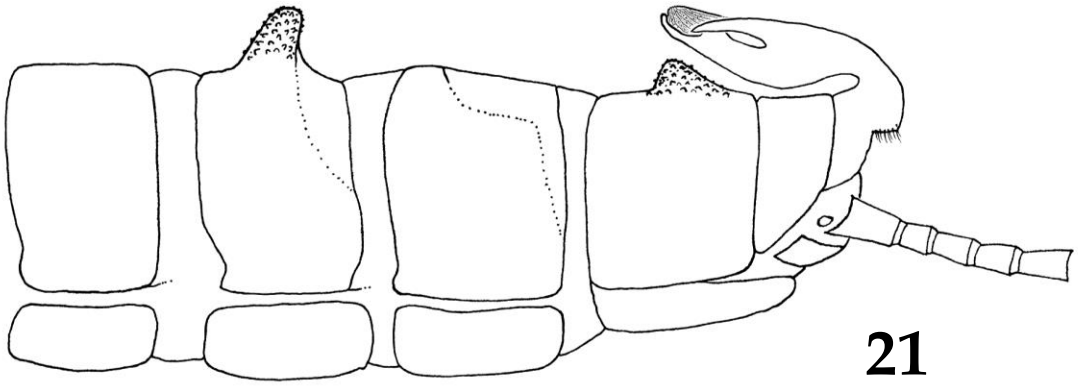
Distribution. *Sierracapnia shepardi* occurs in the central and southern Sierra Nevada, California (Fig. 40).

Sierracapnia washoe Bottorff & Baumann sp. n.

Washoe Snowfly
(Figs. 21-33)

Material Examined. Holotype ♂ and allotype ♀, **USA, Nevada: Storey Co.,** Cedar Hill Canyon Creek, 2 km north of Virginia City, Virginia Range, N 39.32948° W 119.64898°, 6334', 1-III-2013, R.L. Bottorff (USNM). The holotype ♂ and allotype ♀ were deposited in the U.S. National Museum of Natural History, Smithsonian Institution, Washington, D. C. Paratypes: **USA, Nevada, Pershing Co.,** Jenny Creek, Selenite Range, N 40.42103° W 119.27392°, 5704', 23-I-2014, R.L. Bottorff, 33♂, 3♀ (BYUC, RLBC); **Storey Co.,** Cedar Hill Canyon Creek, 2 km N of Virginia City, Virginia Range, N 39.32948° W 119.64898°, 6334', 27-II-2013, R.L. Bottorff, 4♂, 9♀ (RLBC); 1-III-2013, R.L. Bottorff, 25♂, 35♀ (BYUC, RLBC); **Washoe Co.,** Cottonwood Creek, Granite Range, N 40.87406° W 119.43338°, 5426', 24-I-2014, R.L. Bottorff, 35♂, 3♀ (BYUC, RLBC); Cottonwood Creek spring brook, Granite Range, N 40.87357° W 119.43261°, 5411', 24-I-2014, R. L. Bottorff, 3♂, 2♀ (RLBC); Cottonwood Creek, Granite Range, N 40.86061° W 119.4513°, 6301', 26-II-2014, R.L. Bottorff, 12♂, 6♀ (RLBC); Cottonwood Creek, Granite Range, N 40.85722° W 119.45338°, 6361', 26-II-2014, R. L. Bottorff, 4♂, 4♀ (RLBC); Rock Creek, 5300', Granite Range, 17-III-1999, A.L. Sheldon, 2♀ (BYUC); Rock Creek, Granite Range, N 40.81296° W 119.37982°, 4831', 23-I-2014, R.L. Bottorff, 4♂, 3♀ (BYUC, RLBC).

Male. Body length 3.7-6.3 mm (mean, 5.0 mm); wings macropterous; length of forewing 4.4-5.3 mm (mean, 4.8 mm); body color dark brown or black. Abdominal tergum 6 without median knobs (occasional individuals with median pair of



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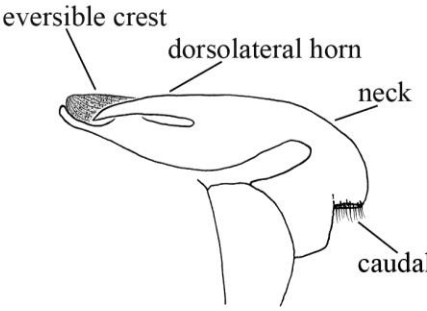

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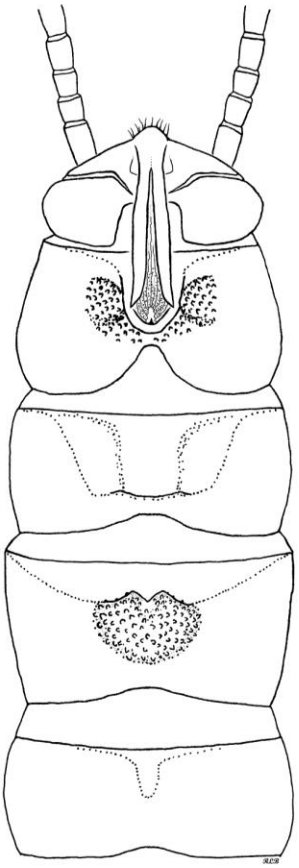

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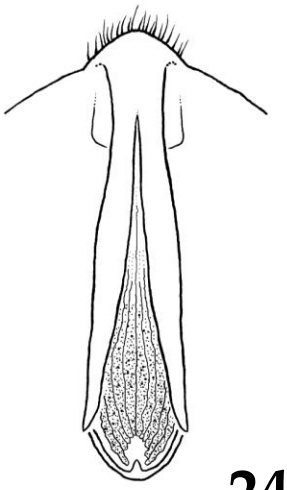

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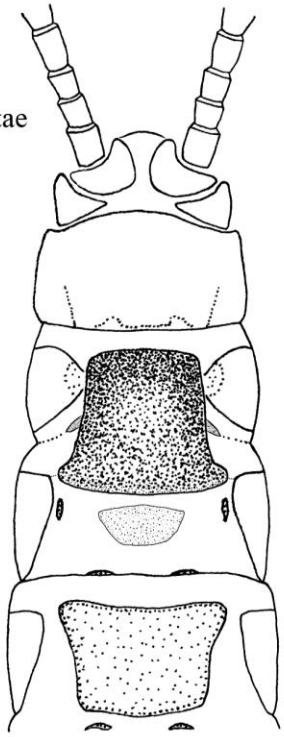

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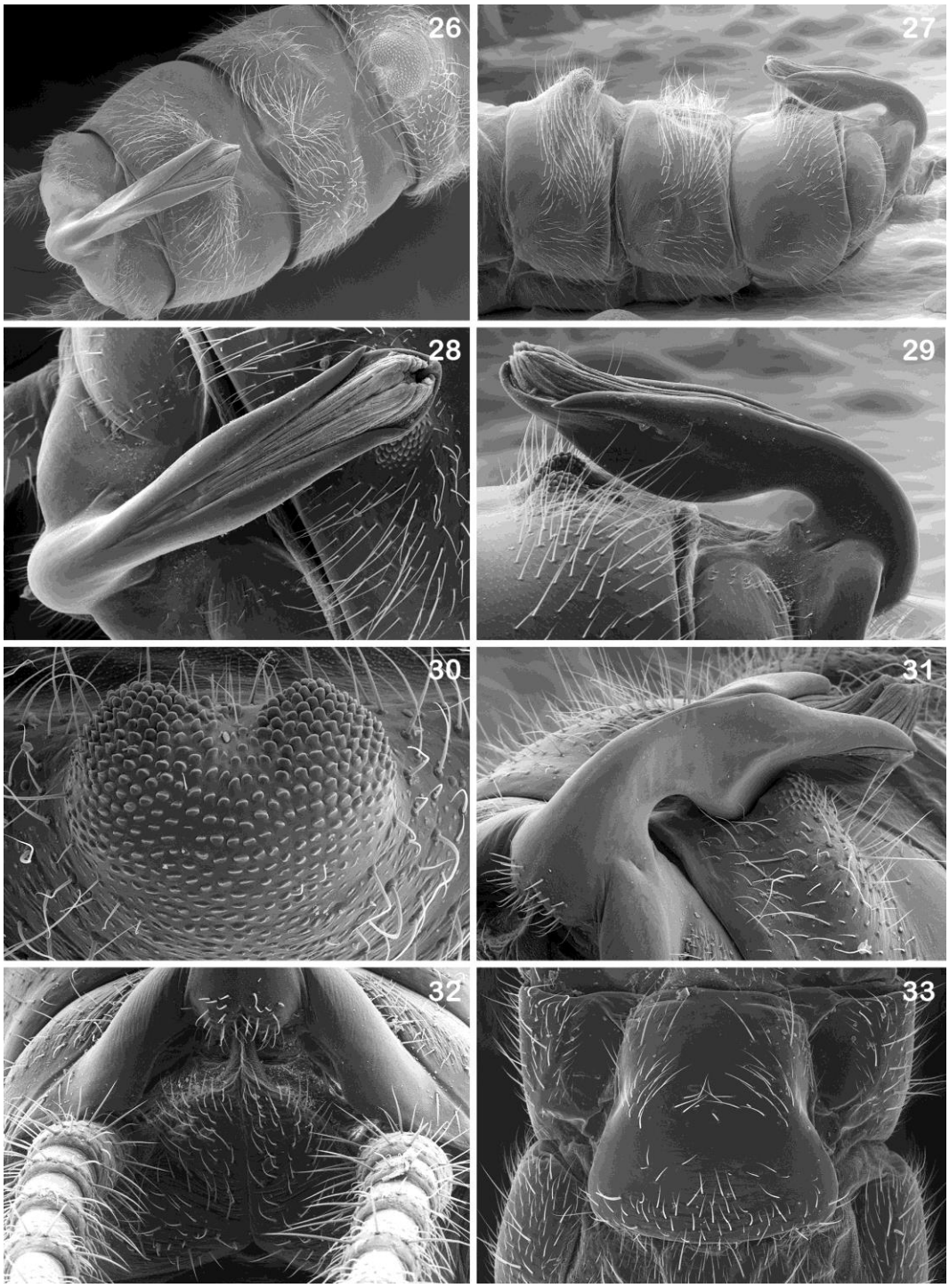
Figs. 21-25. *Sierracapnia washoe* sp. n. Cedar Hill Canyon Creek, Nevada. 21. Male. Genitalia, lateral, epiproct, knob on tergum 7 and knob on tergum 9. 22. Male. Genitalia, lateral, close up, eversible crest, dorsolateral horn, neck and caudal setae. 23. Male. Genitalia, dorsal, epiproct, knob on tergum 7 and knobs on tergum 9. 24. Male. Epiproct, dorsal, close up. 25. Female. Genitalia, subgenital plate, sclerotized areas on sterna 7 and 8.



Figs. 26-33. *Sierracapnia washoe* sp. n. 26. Jenny Creek, Nevada. Male. Genitalia, dorsal, epiproct and knob on tergum 7. 27. Cedar Hill Canyon Creek, Nevada. Male. Genitalia, lateral, epiproct, knob on tergum 7 and knobs on tergum 9. 28. Cedar Hill Canyon Creek, Nevada. Male. Epiproct, dorsal. 29. Cedar Hill Canyon Creek, Nevada. Male. Epiproct, lateral and knobs on tergum 9. 30. Jenny Creek, Nevada. Male. Knob on tergum 7, anterior. 31. Jenny Creek, Nevada. Male. Epiproct with expanded eversible crest, dorsolateral, terminal. 32. Jenny Creek, Nevada. Male. Tip of paraprocts and fusion plate inserted into epiproct base, terminal. 33. Cedar Hill Canyon Creek, Nevada. Female. Genitalia, subgenital plate on sterna 7 and 8.

slightly sclerotized bumps). Tergum 7 with a notched median knob (Figs 21, 23, 26, 27, 30; Table 1), knob width 30-36% segment 7 width, depth of apical notch in knob variable. Tergum 8 lacking median knobs, with membranous central area dividing right and left sclerotized portions (Fig. 23). Tergum 9 with median pair of sclerotized knobs (Figs. 21, 23, 27, 29). Terga 7 and 9 knobs covered with dense rounded tubercles of conical sensilla; terga 6-9 with long stiff setae. Epiproct glabrous, except for caudal setae. Anterior half of epiproct surface covered with numerous shallow sensory pits, these less abundant or absent from epiproct neck and base. Epiproct laterally compressed and elongated; in lateral view, slightly convex dorsally and deeply convex ventrally, ventral edge of keel located between pair of tergum 9 knobs (Figs. 21, 23, 27, 29); epiproct width increases between narrow neck region and dorsolateral horn tips; epiproct extends forward to posterior margin of tergum 8; epiproct length 4.0-4.5 times maximum width and 4.0-4.5 times maximum depth; apical half of epiproct membrane is an eversible crest that is longitudinally folded or grooved and dark gray or black, except extreme tip lighter (Figs. 22, 24, 26, 28, 29); eversible crest may be greatly expanded in size at apex (Fig. 31) or not; epiproct apex broadly rounded, with short median posterior-projecting lobe (Figs. 24, 28). Dorsolateral horns arch above main body of epiproct, creating slight membranous gap between the sclerotized horns and main body; horns long, about 24-29% epiproct length when viewed laterally; horn tips extend forward to 83-88% of epiproct length (Figs. 22, 29; Table 1); horn tips slightly divergent; dorsolateral horns and epiproct body light brown, contrasting with dark membrane (Figs. 22, 24, 26, 28, 29).

Female. Body length 4.4-7.5 mm (mean, 5.9 mm), color dark brown or black; wings macropterous (Fig. 41); length of forewing 5.6-6.6 mm (mean, 6.0 mm); subgenital plate wide, heavily sclerotized, and black, sclerotization extends from the truncated posterior edge of sternum 8 onto sternum 7 (Figs. 25, 33). Sternum 7 sclerotization varies for individuals and populations; females from the Selenite Range have nearly full sclerotization, but most females from Storey County and Granite Range have a limited posterior band of sclerotization and a small lightly sclerotized area in mid segment.

Distribution. *Sierracapnia washoe* has been found in the Granite, Selenite, and Virginia ranges of western Nevada (Fig. 39).

Etymology. This species is named for the Washoe people, Native Americans whose ancestral homeland included the type locality in Storey County, Nevada. We suggest Washoe Snowfly as a common name.

Diagnosis. The males of all *Sierracapnia* species can be separated by their uniquely shaped and curved epiprocts (Figs 2, 6, 10, 14, 18, 29, 34). In addition, *Sierracapnia washoe* males are distinguished from all other species in the genus, except *S. mono* and *S. shepardi,* by having a wide median knob on tergum 7 (knob width 30-36% of tergum width) (Figs. 23, 26, 30; Table 1). The dorsal membrane of the epiproct is dark in both *S. washoe* and *S. shepardi,* but is lightly colored in *S. mono* and all other *Sierracapnia* species. *Sierracapnia washoe* and *S. shepardi* are quite similar, sharing dark epiproct membranes, size and shape of tergal knobs, similarities in dorsal view of male terminalia, and nearly identical female subgenital plates. Yet, *S. washoe* differs from *S. shepardi* in the shape and proportions of the epiproct in lateral view. The epiproct of *S. washoe* (Figs. 22, 29) is stouter (length 4.0-4.5 times depth versus 5.0-5.5 times depth for *S. shepardi*), less reversely curved, and with longer arching dorsolateral horns than for *S. shepardi* (Fig. 18; Table 1). When expanded, the eversible crest of *S. washoe* (Fig. 31) is much larger than that which occurs in *S. shepardi.* The females of *S. washoe* and *S. shepardi* cannot be separated without associated males. Presently, the known distributions of these two species do not overlap. *Sierracapnia shepardi* has a wide north-south distribution in the central and southern Sierra Nevada, California, but has not been found in Nevada, while *S. washoe* occurs in a north-south narrow band of western Nevada that extends 170 km south from the Granite Range near Gerlach to the mountains near Virginia City (Figs. 39, 40).

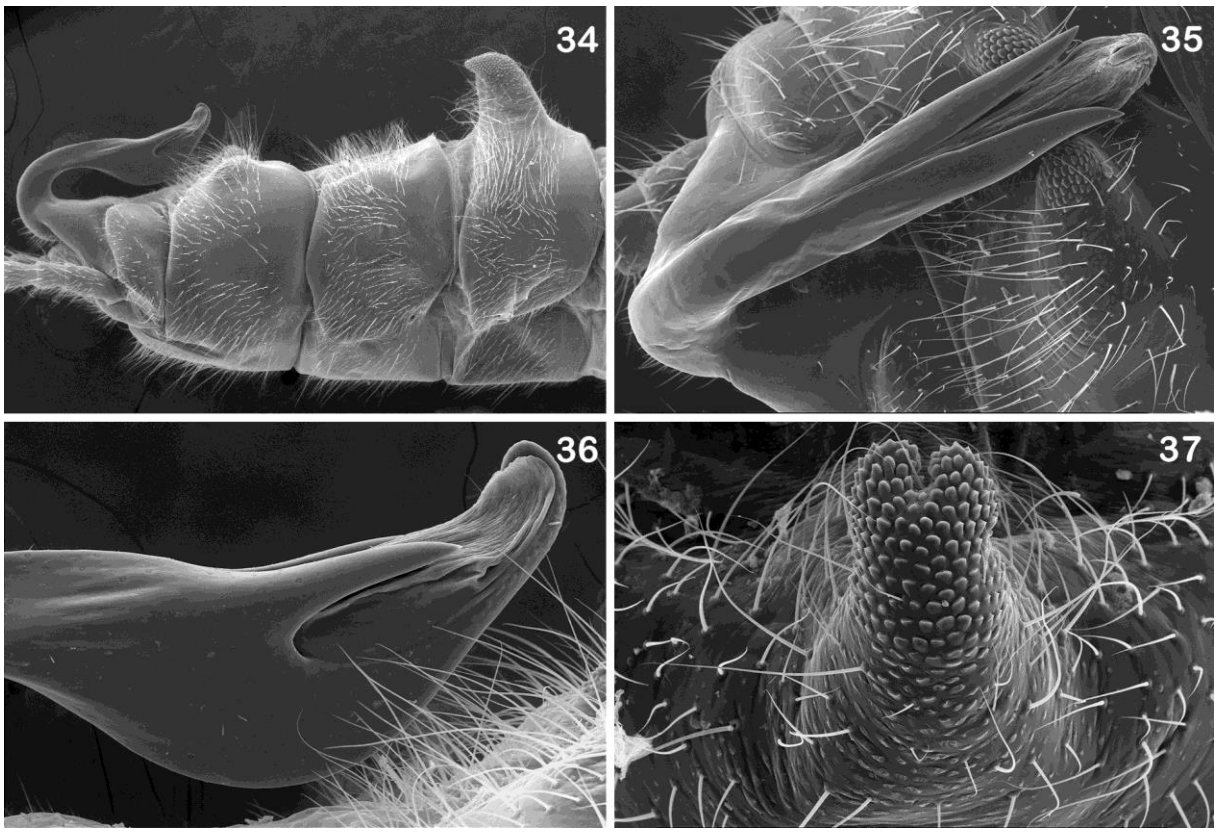
Comments. *Sierracapnia washoe* was collected from Cedar Hill Canyon Creek near Virginia City (Fig. 38) and several additional sites in northern Washoe County, a dry region of western Nevada lying in the Sierra Nevada rain shadow (Hershler et al. 2002). Cedar Hill Canyon Creek flows only 700 m from its spring source before completely drying in the desert. *Zapada cinctipes* (Banks 1897) adults and chloroperlid larvae also have been collected at the creek. Cedar Hill Canyon was mined for silver and gold during the Comstock Lode era (1860-1880) and mine tailings are present in the canyon. While other small aquatic habitats may harbor this species in the nearby Virginia and Flowery ranges, the nearest running water beyond the type locality is Long Valley Creek, about 8 km to the northeast. We failed to find *S. washoe* there. This species also occurs in small creeks of the Selenite and Granite ranges in Washoe County, Nevada. Of the 24 species of Capniidae known to occur in Nevada, *S. washoe* is apparently the only species endemic to the state. *Sierracapnia washoe* may have been isolated in this region of Nevada by drying that occurred at the end of the Pleistocene (Hershler et al. 2002).

Sierracapnia yosemite (Nelson and Baumann 1987)

(Figs. 34-37)

Sierracapnia yosemite (Nelson and Baumann 1987): 491. Holotype ♂ (USNM). Type locality: California, Mariposa Co., Big Creek, Summerdale Campground.

Material Examined. USA, California: Mariposa Co., Big Creek, Hwy 41, Summerdale Campground above Fish Camp, 18-III-1985, R.W. Baumann & C.R. Nelson, 28♂, 11♀ (USNM, BYUC); Chilnualna Creek, above Wawona, 18-III-1985, R.W. Baumann



Figs. 34-37. *Sierracapnia yosemite*. Male: Tuolumne River, California: 34. Genitalia, lateral, epiproct, knob on tergum 7 and knobs on tergum 9. 35. Genitalia, dorsal, epiproct and knobs on tergum 9. 36. Epiproct, lateral, apex. 37. Knob on tergum 7, anterior.

& C.R. Nelson, 1♂, 2♀ (BYUC); creek at south entrance Yosemite National Park, 18-III-1985, R.W. Baumann & C.R. Nelson, 5♂, 3♀ (BYUC). **Tuolumne Co.,** Middle Fork Tuolumne River, Evergreen Road, 18-III-1985, R.W. Baumann & C.R. Nelson, 31♂, 6♀ (BYUC); South Fork Tuolumne River, Evergreen Lodge Road, NW Big Oak Entrance, 18-III-1985, R.W. Baumann & C.R. Nelson, 38♂, 37♀ (BYUC); South Fork Tuolumne River, Hwy 120, Smoky Jack Campground, N 37°49′ W 119°43′, 22-VI-2006, R.W. Baumann & B.C. Kondratieff, 1♂ (BYUC).

Male. Tergum 7 knob tall, thin, and narrowly divided at apex (knob height 30-35% of segment 7 height; knob width 14-15% of segment 7 width) (Figs. 34, 37). Epiproct in dorsal view with uniform width along length, maximum width 18-24% of epiproct length; maximum width occurs anterior of mid epiproct; apex rounded or wedge-shaped, with a long thin posterior-projecting lobe (Fig. 35); dorsal membrane light colored. Epiproct in lateral view with a shallow reverse (S-shaped) curve dorsally and deep curve ventrally; maximum depth 25-30% of length; maximum depth occurs in anterior third of epiproct; apex elongated and raised, with thin median lip that wraps around tip of eversible crest; neck narrow (Figs. 34, 36). Dorsolateral horns arch high above main epiproct body, exposing membrane of eversible crest in lateral view; horn length 18-21% epiproct length; horn tips extend forward to 85-88% of epiproct length (Fig. 36; Table 1).

Female. Subgenital plate heavily sclerotized and dark, plate covers entire width of sternum 8 from its posterior to anterior edge, sclerotization extends onto posterior third of sternum 7 (Fig. 257, Nelson and Baumann 1989).

Distribution. *Sierracapnia yosemite* inhabits the western slope of central and southern Sierra Nevada near Yosemite National Park in Mariposa and Tuolumne counties, California (Fig. 39).

Key to male adults of *Sierracapnia*

Key. Male adults of *Sierracapnia* species are separated by differences in (1) tergum 7 knobs, (2) epiproct proportions and curvatures, (3) epiproct membrane (or eversible crest), and (4) dorsolateral horns.

1 Epiproct linear in both dorsal and lateral view; shallow ventral keel (Figs. 13-15) ..... *palomar*
1′ Epiproct thick in lateral view; deep ventral keel (Figs. 2, 6, 10, 18, 29, 36) 2
2 Tergum 7 knob narrow (10-15% segment width) (Figs. 3, 8, 37) 3
2′ Tergum 7 knob wide (30-35% segment width) (Figs. 9, 17, 26) 5
3 Dorsolateral horns appressed to main epiproct body, membrane not visible below horns (lateral view); epiproct apex not raised; epiproct ventral keel less prominent (Fig. 6) ..... *hornigi*
3′ Dorsolateral horns arch above main epiproct body and expose membrane laterally; epiproct apex raised; epiproct ventral keel prominent (Figs. 2, 36) 4
4 Tergum 7 knob not notched and medium high (20-25% of tergum 7 height) (Figs. 2, 3); epiproct base with ventrolateral flange (Fig. 1); tips of dorsolateral horns extend forward to 70-78% of epiproct length (Fig. 2) ..... *barberi*
4′ Tergum 7 knob notched and tall (30-35% of tergum 7 height) (Figs. 34, 37); epiproct base lacks ventrolateral flange (Fig. 35); tips of dorsolateral horns extend forward to 85-88% of epiproct length (Fig. 34) ..... *yosemite*
5 Epiproct dorsal membrane light colored; epiproct apex narrow (dorsal view) (Figs. 9, 10) ..... *mono*
5′ Epiproct dorsal membrane dark gray or black (Figs. 22, 24); epiproct apex more broadly rounded (Fig. 28) 6
6 Epiproct depth ≤20% length; epiproct reversely curved (lateral view); dorsolateral horns 14-18% epiproct length (Fig. 18); epiproct width uniform in apical third (Fig. 17) ..... *shepardi*
6′ Epiproct depth >20% length; epiproct less reversely curved; dorsolateral horns 24-29% epiproct length (Fig. 29); epiproct width increases in apical third (Figs. 26, 28) ..... *washoe* sp. n.

Fig. 38. Type locality of *Sierracapnia washoe*. Cedar Hill Canyon Creek, Storey Co., Nevada, 1 March 2013.

ACKNOWLEDGEMENTS

This study could not have been accomplished without the foundational work on North American Capniidae by C. Riley Nelson of Brigham Young University and the comparative studies of worldwide Capniidae by Dávid Murányi of the Hungarian Natural History Museum in Budapest. Special thanks are given to Boris C. Kondratieff of Colorado State University for providing male specimens of *Sierracapnia palomar* and *Arsapnia arapahoe* for scanning electron micrographs. We acknowledge Andrew L. Sheldon for first collecting *Sierracapnia washoe* and providing specimens for this study. Oliver S. Flint, Jr. assisted our studies of specimens deposited at the U. S. National Museum of Natural History, Smithsonian Institution, Washington, D.C. We appreciate the collections of Sierra Nevada capniid stoneflies by William D. Shepard. The late Derham Giuliani made valuable collections of *Sierracapnia* specimens in the 1980s and 1990s. Michael Standing and Kyrie Carpenter helped to prepare the scanning election micrographs and figure plates at Brigham Young University Electron Microscope Laboratory, Provo, Utah.

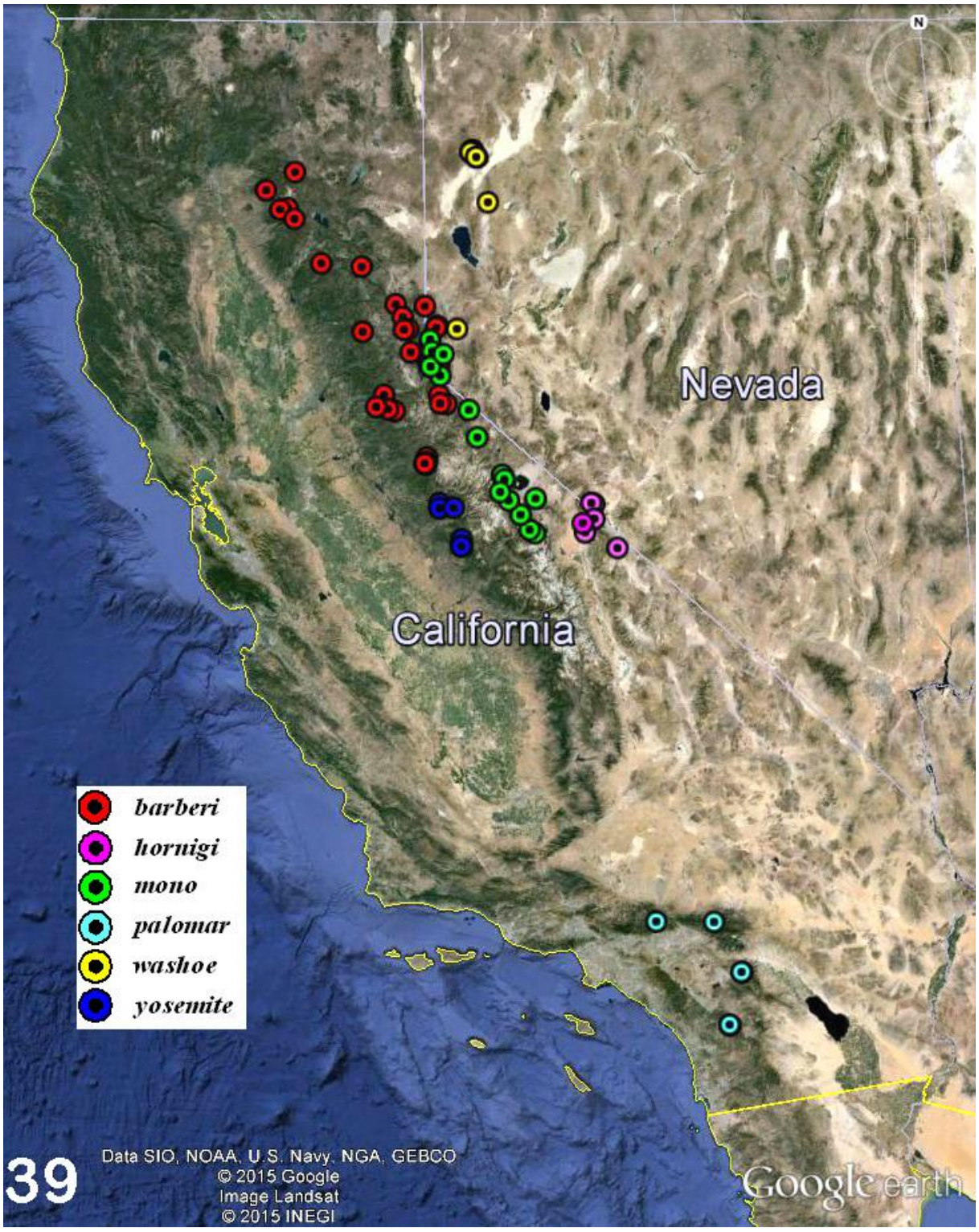


Fig. 39. Distributional map of *Sierracapnia* spp.: *barberi* (red), *hornigi* (purple), *mono* (dark green), *palomar* (light blue), *washoe* (yellow), and *yosemite* (dark blue).

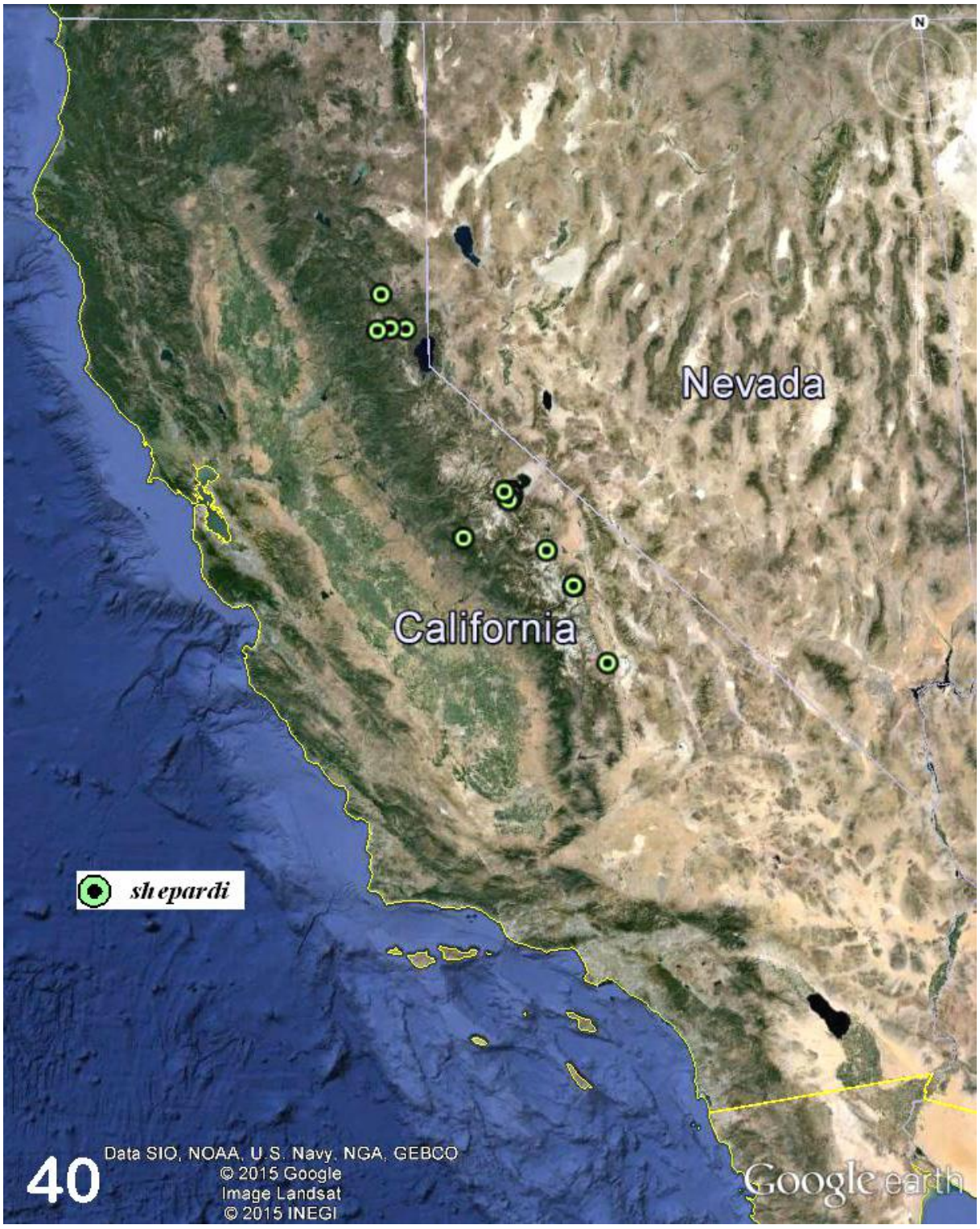


Fig. 40. Distributional map of *Sierracapnia shepardi*.

Fig. 41. *Sierracapnia washoe* sp. n., female adult, Cedar Hill Canyon Creek, Nevada, 27 February 2013.

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Submitted 18 March 2015, Accepted 23 April 2015, Published 27 July 2015