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A REVIEW OF THE GENUS *BOLSHECAPNIA* RICKER, 1965 (PLECOPTERA: CAPNIIDAE), AND RECOGNITION OF TWO NEW NEARCTIC CAPNIID GENERA

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ABSTRACT

Male epiprocts of five of the six species currently placed in the genus *Bolshecapnia* Ricker, 1965 were examined with scanning electron microscopy. In addition to the plesiomorphic characters historically used to define the genus (e.g. ventral male vesicle), these species share at least one potentially apomorphic character of the epiproct, a long median groove with a pair of low parallel ridges that extend for most of the epiproct length, but additional epiproct apomorphies emphasize fundamental differences within the group. No new species are proposed, but we recognize two new genera, *Eurekapnia* gen. n., based on *Capnia maculata* Jewett, 1954, and *Sasquacapnia* gen. n., based on *Capnia* (*Bolshecapnia*) *sasquatchi* Ricker, 1965. A modified, partial key is presented to accommodate adults of the new genera, and revised keys are presented for adults of the species of *Bolshecapnia* and *Sasquacapnia.*

Keywords: Plecoptera, Capniidae, *Bolshecapnia,* epiproct morphology, scanning electron microscopy, new genera

INTRODUCTION

Ricker (1965) proposed *Bolshecapnia* as a subgenus of western North American *Capnia* (Pictet, 1841). The group, later given generic status by Ricker & Scudder (1975), was distinguished from other western Nearctic capniids by Ricker (1965) based on "…large size, presence of a vesicle at the base of the 8th sternite, and a ♀ subgenital plate produced well beyond the hind margin of the 8th sternite." The subgenus originally included five species, *Capnia* (*Bolshecapnia*) *gregsoni* Ricker, 1965, *Capnia* (*B.*) *maculata* Jewett, 1954, *Capnia* (*B.*) *rogozera* Ricker, 1965, *Capnia* (*B.*) *sasquatchi* Ricker, 1965, and *Capnia* (*B.*) *spenceri* Ricker, 1965 (DeWalt et al. 2018). Two additional species were subsequently described, *Capnia* (*B.*) *milami* Nebeker & Gaufin, 1967, and *Bolshecapnia missiona* Baumann & Potter, 2007. The study by Baumann & Potter (2007) is

Table 1. Western Nearctic capniid species and references that include scanning electron microscopy images for epiproct structure.

Genus	Species	SEM Study
Arsapnia	*coyote*	Baumann & Stark 2017
Arsapnia	*decepta*	Baumann & Stark 2017, Nelson & Baumann 1987a
Bolshecapnia	*gregsoni*	Current study
Bolshecapnia	*milami*	Current study
Bolshecapnia	*spenceri*	Current study
Capnia (s.l.)	*cheama*	Nelson & Baumann 1987a
Capnia (s.l.)	*coloradensis*	Nelson & Baumann 1987a
Capnia (s.l.)	*melia*	Nelson & Baumann 1987a
Capnia (s.l.)	*nelsoni*	Heinhold et al. 2013
Capnia (s.l.)	*shasta*	Nelson et al. 2013
Capnia (s.l.)	*uintahi*	Nelson & Baumann 1987a
Capnia (s.l.)	*umpqua*	Baumann & Stewart 2009
Capnura	*elevata*	Nelson & Baumann 1987a, 1987b
Capnura	*fibula*	Nelson & Baumann 1987a, 1987b
Capnura	*manitoba*	Nelson & Baumann 1987a, 1987b
Capnura	*venosa*	Nelson & Baumann 1987b
Eurekapnia	*maculata*	Current study
Mesocapnia	*aptera*	Lee & Baumann 2011
Paracapnia	*angulata*	Stark & Baumann 2004
Paracapnia	*baumanni*	Kondratieff & Lee 2010
Paracapnia	*boris*	Stark & Baumann 2004
Paracapnia	*disala*	Stark & Baumann 2004
Paracapnia	*ensicala*	Stark & Baumann 2004
Paracapnia	*humboldta*	Baumann & Lee 2007
Sasquacapnia	*missiona*	Baumann & Potter 2007, Current study
Sasquacapnia	*sasquatchi*	Baumann & Potter 2007, Current study
Sierracapnia	*barberi*	Bottorff & Baumann 2015
Sierracapnia	*hornigi*	Bottorff & Baumann 2015
Sierracapnia	*mono*	Bottorff & Baumann 2015
Sierracapnia	*palomar*	Bottorff & Baumann 2015
Sierracapnia	*shepardi*	Bottorff & Baumann 2015
Sierracapnia	*washoe*	Bottorff & Baumann 2015
Sierracapnia	*yosemite*	Bottorff & Baumann 2015

based primarily on scanning electron microscopy (SEM) of the epiproct structure. They demonstrated the usefulness of SEM application that was suggested in an earlier study of capniid epiprocts by Nelson & Baumann (1987a). As indicated in Table 1, SEM analysis of capniid epiprocts has become standard protocol in the systematic study of the capniid species found in western North America. Currently, SEM images exist for 34 western Nearctic Capniidae (Table 1). In this study epiprocts, vesicles and female subgenital plates of available *Bolshecapnia* species were examined with SEM in

order to evaluate the limits of the genus. No new specimens were available for *B. rogozera*, still known from only the holotype female. Ricker (1965) suggests "…this [*B. rogozera*] may in fact be the female of *B. sasquatchi."* However, the recent SEM study by Baumann & Potter (2007) shows the subgenital plate of *S. sasquatchi* to be truncate across the posterior margin (figs. 13-14 in Baumann & Potter) and to scarcely project beyond sternum 8, whereas Ricker's (1965) figure of this structure indicates the posterior margin of the *B. rogozera* holotype is slightly rounded (fig. 19 in Ricker) and projects well beyond the anterior margin of sternum 9. We are leaving *B. rogozera* as a potentially valid species in genus *Bolshecapnia* until male specimens are available from the type locality of "Moosehorn Lake", British Columbia.

MATERIALS AND METHODS

Specimens were selected from material stored in 75-80% ethanol in the following collections: Bill P. Stark Collection, Mississippi College, Clinton, Mississippi (BPSC); Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah (BYU); California Academy of Sciences, San Francisco, California (CAS); Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario (CNC); C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado (CSUIC); Flathead Lake Biological Station, University of Montana, Polson, Montana (FLBS); Illinois Natural History Survey, Champaign, Illinois (INHS); Gerald Z. Jacobi Collection, Santa Fe, New Mexico (GZJC); John B. Sandberg Collection, Paradise, California (JBSC); Jonathan J. Lee Collection, Eureka, California (JJLC); Larry E. Serpa Collection, Fairfax, California (LESC); Richard L. Bottorff Collection, South Lake Tahoe, California (RLBC); Royal British Columbia Museum, Victoria, British Columbia (RBCM); University of British Columbia, Spencer Entomological Collection, Beaty Biodiversity Museum, Vancouver, British Columbia (UBCZ); United States Geological Survey, Glacier Field Station Alpine Invertebrate Collection, West Glacier, Montana (USGSAIC), and United States National Museum, Washington, D.C. (USNM).

Wings were removed from specimens, or alternatively the terminal abdominal segments were clipped and the bodies, or terminalia, were sonicated in an ultrasonic cleaner for 10-15 seconds for cleaning. Specimens were inspected under an Olympus SZ61, Olympus SZH10, or Wild M8 dissecting microscope, and then dehydrated through a series of ethanol solutions of 90, 95, and 100% for 10 minutes each. Specimens were then transferred to hexamethyldisilizane (HMDS) for 1 hour before they were attached to aluminum stubs with double stick copper tape. Specimens were then coated with a gold/palladium alloy using a Hummer sputter coater. The specimens were studied with an Amray 1810 scanning electron microscope at Mississippi College, or with a Phillips XL30 ESEM FEG microscope at the Brigham Young University Electron Microscopy Laboratory. More than 230 SEM images were prepared from populations of the six *Bolshecapnia* s.l. species available to us.

RESULTS

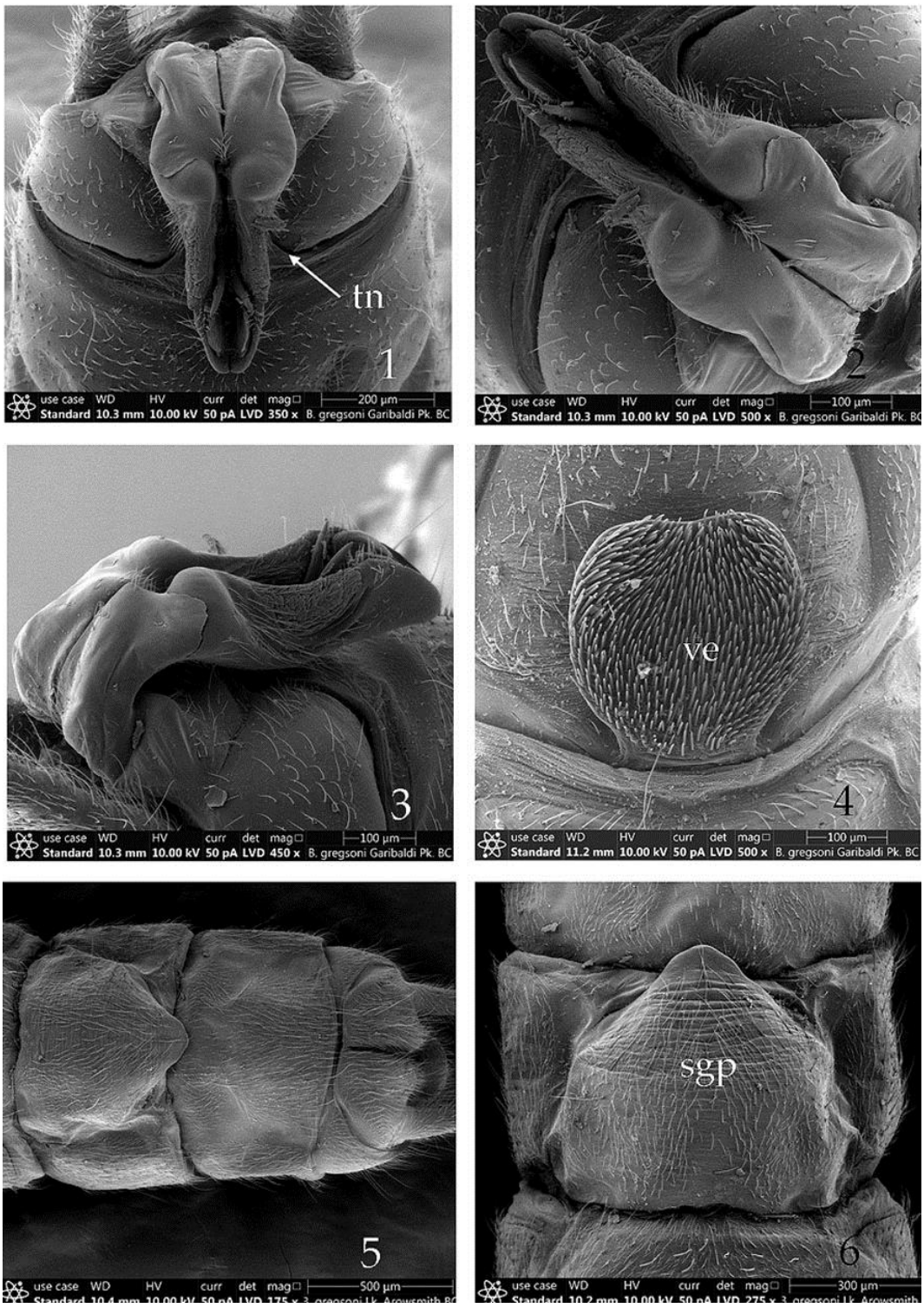
Bolshecapnia Ricker, 1965

Type species *Capnia* (*Bolshecapnia*) *gregsoni* Ricker, 1965 = *Bolshecapnia gregsoni* (Ricker), original designation

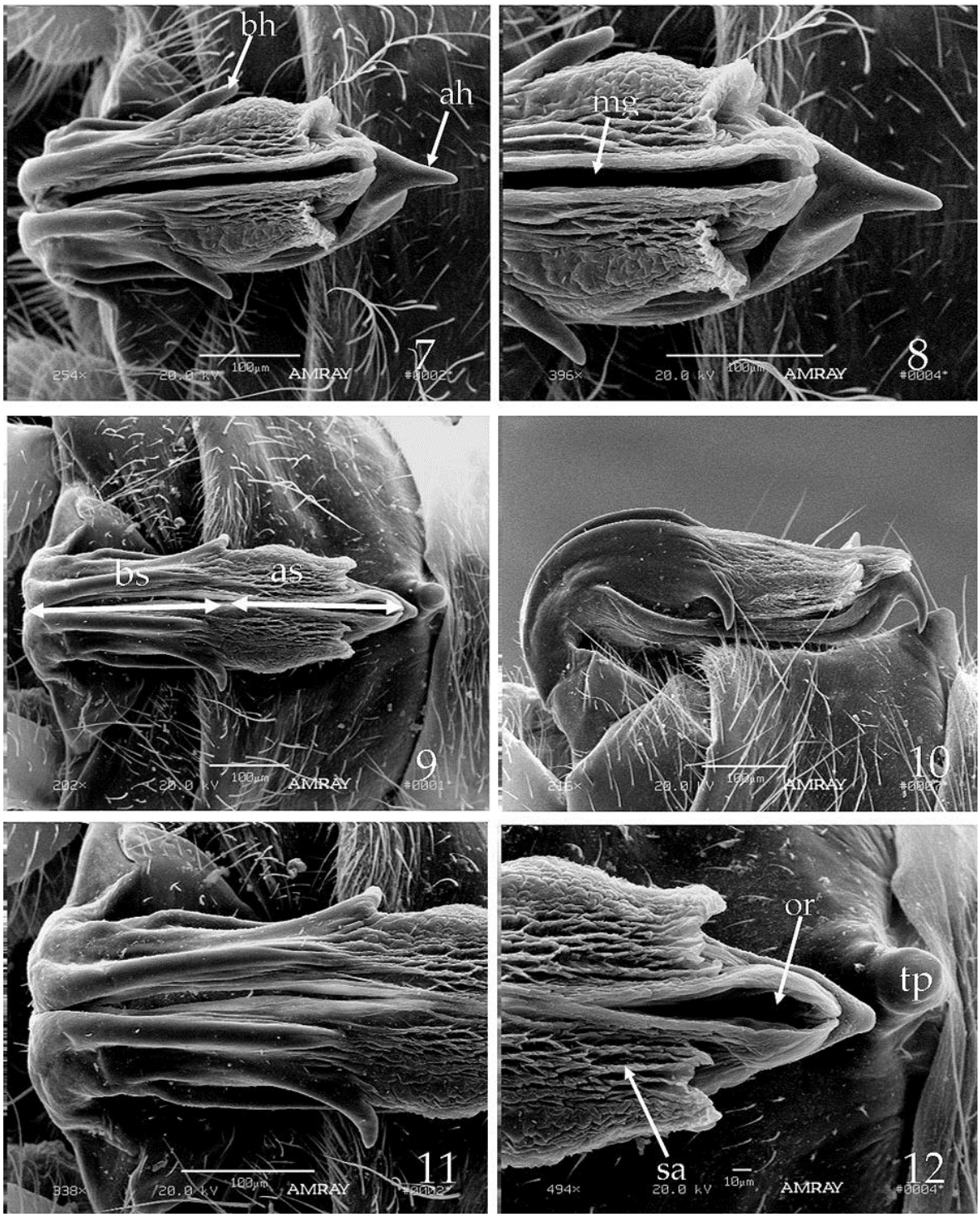
Male characteristics: 1. Epiprocts are relatively wide, tongue-shaped structures that bear a pair of sclerotized, acute lateral hooks (Figs. 1-2, 7, 28). 2. Patches of spongy-appearing tissue occur dorsoapically along the lateral margins of the epiproct (Fig. 12). 3. A relatively wide and long median dorsal groove is present on the epiproct (Figs. 7-8). 4. A well developed, hairy vesicle arises from the intersegmental membrane between the 8th and 9th abdominal sterna (Figs. 22, 32). 5. Tergum 9 modified with patches of short, thick setae, or with thimble, or cone-shaped dorsal knobs (Figs. 2, 9-10, 27-28).

Female characteristics: 1. Subgenital plates project slightly beyond the posterior margin of sternum 8, often reaching to, or beyond the sclerotized base of sternum 9 (Figs. 5-6, 33-34). 2. Subgenital plate usually sclerotized, but rather uniformly, without a distinctive pattern of pale and dark pigment.

Wings: 1. Most known specimens of *Bolshecapnia* are macropterous, but at least some individual



Figs. 1-6. *Bolshecapnia gregsoni*, male and female reproductive structures. All localities in British Columbia. 1. Garibaldi Provincial Park, male epiproct and terminal abdominal segments, dorsal. 2. Garibaldi Provincial Park, epiproct dorsal. 3. Garibaldi Provincial Park, epiproct lateral. 4. Garibaldi Provincial Park, vesicle ventral. 5. Mt. Arrowsmith, Vancouver Island, female terminal abdominal segments. 6. Mt. Arrowsmith, Vancouver Island, female subgenital plate (sgp = subgenital plate; tn = tergal notch; ve = vesicle).



Figs. 7-12. *Bolshecapnia milami*, male reproductive structures. All localities in Montana, Lake Co., Lion Creek. 7. Male epiproct dorsal. 8. Epiproct apex dorsal. 9. Epiproct and tergal process dorsal. 10. Epiproct lateral. 11. Epiproct base dorsal. 12. Epiproct apex dorsal. (af = anterolateral fold; ah = anterior hook; as = anterior section; bh = basolateral hook; bs = basal section; mg = median groove; or = orifice; sa = spongy area; tp = tergal process).

males of the Iceberg Lake, Montana population of *B. spenceri* have wings that reach about mid-length of the abdomen and some females of that population have wings that reach almost to the abdominal tip. 2. The R_1 forewing vein is correctly described as "curved upward at origin" by Baumann et al. (1977) in their generic key, however their fig. 295, which purportedly illustrates this character, shows a straight, but anteriorly slanted R_1 vein. The same language is used by Stewart & Oswood (2006) in their generic key to regional capniid genera. Their (fig. 3.7), illustrates this character correctly as an anterior curvature of the R_1 vein beyond its junction with R_s. The wording of this character and figure used to illustrate it are also in agreement in Stewart & Stark (2008), however the degree of cephalad curvature of the R_1 vein in *Bolshecapnia* is slightly less than that shown in species of *Mesocapnia* Raušer, 1968, by Stewart & Stark (2008).

Larval characteristics: Only one *Bolshecapnia* species, *B. spenceri*, has been described in the larval phase (Stewart & Stark 1988, 2002, Stewart & Oswood 2006). A key to larvae of the genus is included in Stewart & Stark (1988, 2002, 2008) and in Stewart & Oswood 2006). 1. The cerci of *B. spenceri* have more than 18 segments and each has an apical whorl of a few moderately long setae, and a few (1-3) short intercalary setae along the outer and inner margins of each cercal segment (Stewart & Oswood 2006). 2. A relatively wide, almost rectangular area is enclosed within the Y-arms and the anterior transverse ridge of the mesosternum (Stewart & Oswood 2006).

Recognized species: *B. gregsoni, B. milami, B. rogozera, B. spenceri*

Distribution: *Bolshecapnia* species are known from the Rocky Mountains and Pacific Northwest of Alberta, British Columbia, Colorado, Idaho, Montana, New Mexico, Washington, Wyoming and Yukon Territory. No records are currently available from Alaska (DeWalt et al. 2018, Stewart & Oswood 2006).

***Bolshecapnia gregsoni* (Ricker, 1965)**

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:5037

(Figs. 1-6)

Capnia (*Bolshecapnia*) *gregsoni* Ricker, 1965:479. Holotype ♂ (Canadian National Collection), Kokli Lake between Mount Arrowsmith and Mount Kokli Vancouver Island, British Columbia

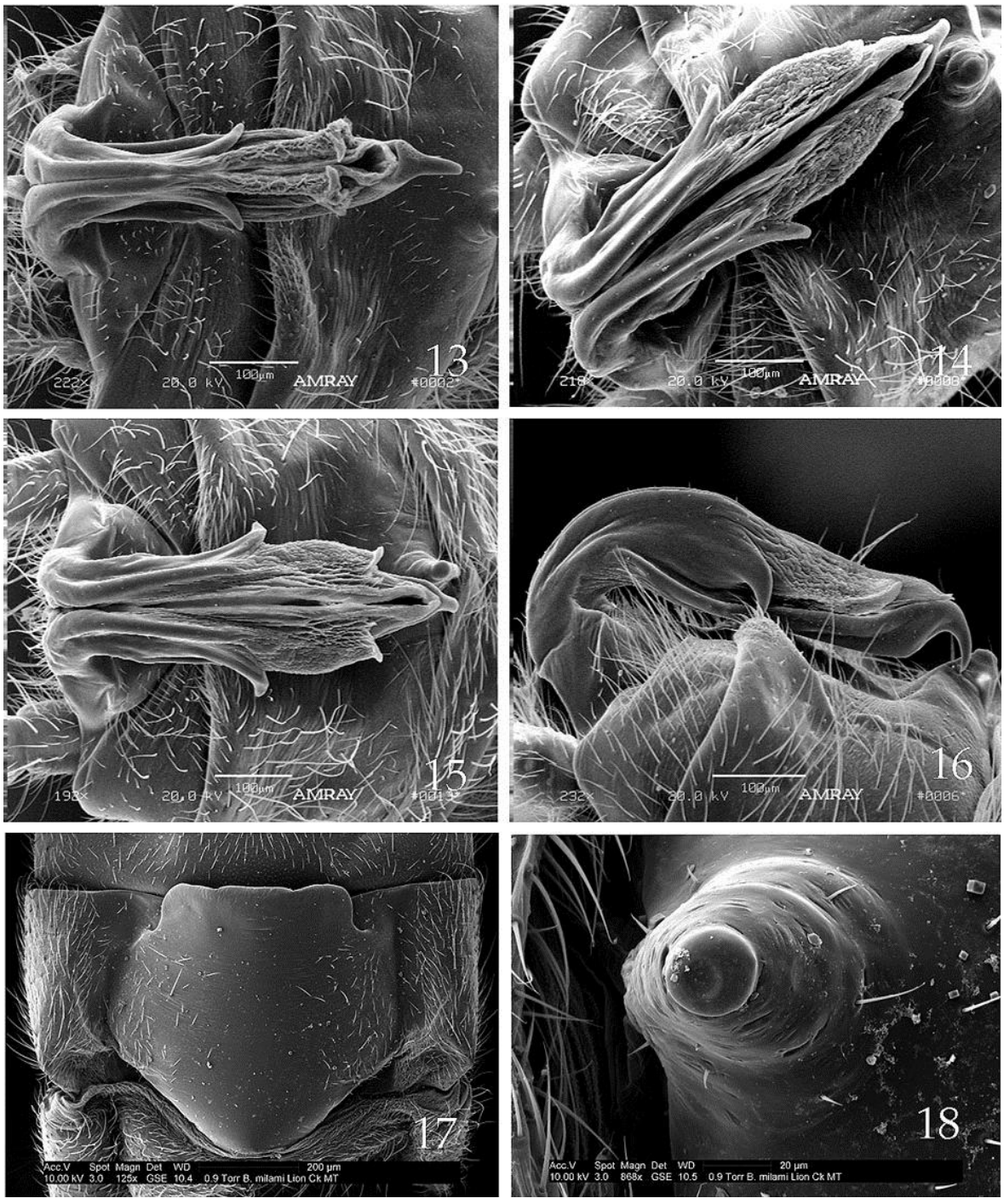
Bolshecapnia gregsoni: Ricker & Scudder, 1975:338

Distribution. CANADA: BC (DeWalt et al. 2018)

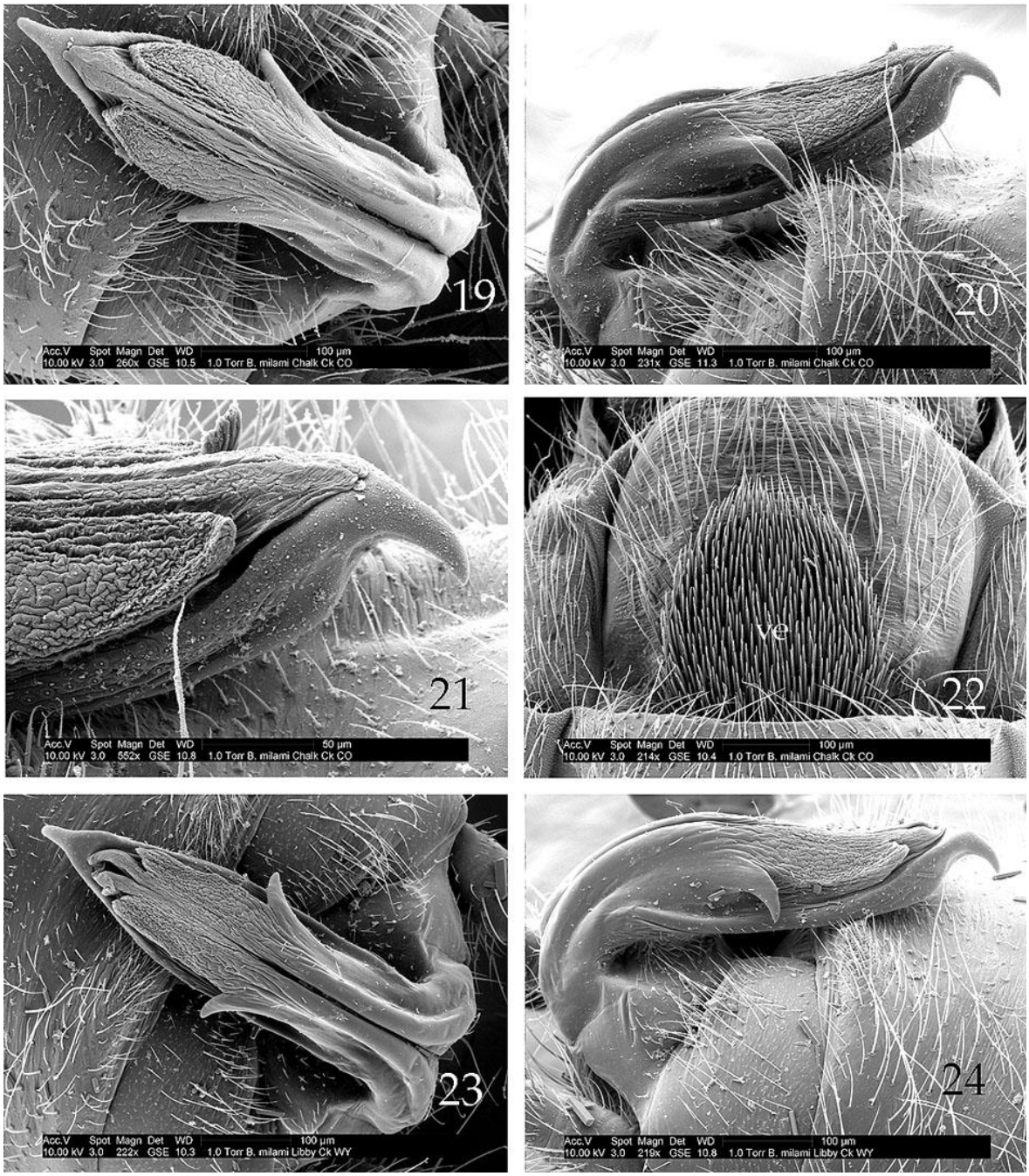
Material examined. CANADA: British Columbia: Kokli Lake, between Mount Arrowsmith and Mount Kokli, near Cameron Lake, Vancouver Island, 9 June 1957, F. Neave, W.E. Ricker, Holotype ♂, 21 paratypes (CNC). Lake on Mount Arrowsmith, Vancouver Island, 9 June 1957, F. Neave, W.E. Ricker, 1♂, 1♀ (INHS, paratypes). Head of Gwillim Creek near Glacier Lakes, near Camp 3 on Gladsheim Massef, NW of Slocan City, 22-31 July 1958, J. Ricker, 1♀ (CNC). Garibaldi Lake, Spring Glacier on new snow, 18 April 1966, K. Ricker, N. Hansen, M. Shakespeare, 2♂, 1♀ (CNC). Garibaldi Park, 14 May 1958, J. Ricker, 6♂, 2♀ (CNC). Helen Lake, Garibaldi Park, 12 May 1951, J. Barton, 1 ♀ (CNC). Mount Alava Base Camp Snowfields, 24-31 July 2010, J. Cullington, 6♀ (RBCM).

Male epiproct (n = 3). Length 544-593 μm, width at midlength 185-213 μm, greatest width near base 147-253 μm. A pair of curved, acute, sclerotized hooks arise from either side of the median groove at about half the distance between the epiproct apex and the base of the spongy area from either side of the median groove. The hooks extend slightly beyond lateral margins of the epiproct body (Figs. 1-3), and their tips reach to about 0.8 of the epiproct length. Median groove wide near apex and narrowed near dorsobasal knobs (Fig. 4). Median groove divides a pair of spongy-appearing clumps of tissue near hooks (Fig. 2). Apex without a protruding membranous process; dorsobasal humps low, smooth and not outlined by a prominent posterodorsal ridge (Fig. 2-3). Paraprocts with a hairy, plate-like basal area and slender apices.

Tergal process (n = 3). Absent, but tergum 9 bears a median patch of short, thick setae (Fig. 1) and lacks a median anterior notch. However, tergum 10 bears a median anterior notch filled with membranous tissues projecting into the notch from tergum 9 (Fig. 7).



Figs. 13-18. *Bolshecapnia milami,* male and female reproductive structures, localities 13-16 in Colorado, Pitkin Co., Snowmass Creek and 17-18 in Montana, Lake Co., Lion Creek. 13. Male epiproct and terminal abdominal segments dorsal. 14. Epiproct dorsal. 15. Epiproct dorsal. 16. Epiproct lateral. 17. Female subgenital plate. 18. Male tergal process dorsal.



Figs. 19-24. *Bolshecapnia milami,* reproductive structures, localities 19-22 in Colorado, Chaffee Co., Chalk Creek, and 23-24 in Wyoming, Albany Co., Libby Creek. 19. Male epiproct dorsal. 20. Epiproct lateral. 21. Epiproct apex lateral. 22. Male abdominal sternum 9 and vesicle (ve = vesicle). 23. Epiproct dorsal. 24. Epiproct lateral.

Vesicle (n = 1). Length 305 µm, width at midlength 311 µm, basal stalk short and 168 µm wide. Surface entirely covered with thick setae except for the short stalk that extends under the basal roll of tissue (Fig. 4).

Female subgenital plate (n = 2). This structure is a triangular plate that extends beyond the anterior margin of sternum 9 (see fig. 10 in Ricker 1965, fig. 173 in Baumann et al. 1977, and fig. 3.12 in Stewart & Oswood 2006). The images we present show an almost triangular plate, rounded and glabrous at the apex with convergent lateral margins (Figs. 5-6). The transverse striations observed on the subgenital plate in Fig. 6 may be an artifact of dehydration.

Larva. Unknown.

Comments. The figures and descriptions of the male of this species by Ricker (1965) and Stewart & Oswood (2006), and our SEM figures indicate that it is related to *B. milami* and *B. spenceri.* Ricker (1965) states the species "…is closely related to *C. spenceri…*". The two species are thought to be allopatric in British Columbia with the western limit of *B. spenceri* extending into the Selkirk Mountains and the eastern limit of *B. gregsoni* extending to the Valhalla range (Ricker 1965). According to Ricker (1965) the major distinction between *B. gregsoni* and *B. spenceri* males is the presence of a "deep groove" that extends posteriorly from the midpoint of tergum 9 in males of the latter; females of *B. spenceri* have a very narrow, and often asymmetrical, subgenital plate (figs. 15-16 in Ricker 1965). Males of these species each have epiprocts with a pair of sharply pointed, sclerotized hooks near midlength and conspicuous, spongy-appearing dorsal patches of anterolateral tissue (Figs. 3, 9, 21, 28), consequently these two capniid species have the distinction of being relatively easy to distinguish as females and somewhat more difficult to distinguish as males. The epiprocts of *B. milami* differ from the other two species in having a downturned mesoapical hook. The original material of *B. gregsoni* reported by Ricker (1965) includes 21 ♂ and 30 ♀ specimens; most of these were collected from Vancouver Island at "…sites at or near high mountain lakes" (Ricker 1965).

***Bolshecapnia milami* (Nebeker & Gaufin, 1967)**

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:5031

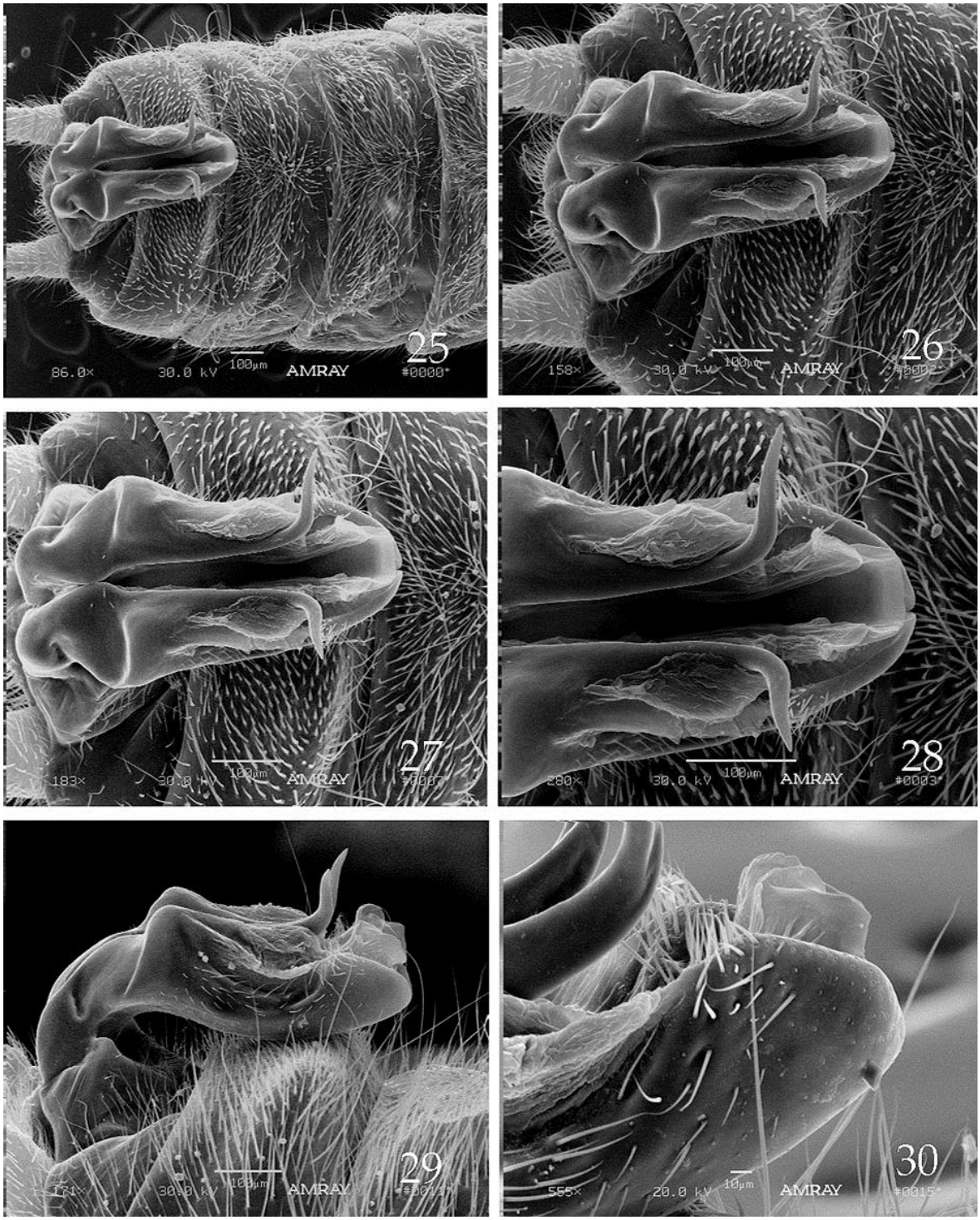
(Figs. 7-24)

Capnia (*Bolshecapnia*) *milami* Nebeker & Gaufin, 1967:235. (Holotype ♂), Lion Creek, Seeley Lake area, Lake Co., Montana

Bolshecapnia milami: Baumann et al., 1977:60

Distribution. CANADA: AB, BC, YK, UNITED STATES: CO, ID, MT, NM (DeWalt et al. 2018)

Material examined. CANADA: British Columbia: Pine Creek, Halfway Bridge, Spruce Creek Bridge, 59.5915 N, -133.6177 W, 4 April 2010, S.G. Cannings, 1♀ (RBCM). Pine Creek, Halfway Bridge, upstream, 59.5914 N, -133.6114 W, 4 April 2010, S.G. Cannings, 16♂, 5♀ (RBCM). Manning Park, Similkameen River, 2 February 1976, S.G. Cannings, 1♂ (UBCZ). Same site, 19 March 1982, S.G. Cannings, 1♀ (UBCZ). Same site, 19 March 1983, S.G. Cannings, 5♀ (UBCZ). Manning Park, Fat Dog Creek, 19 March 1983, S.G. Cannings, 2♀ (UBCZ). Manning Park, Similkameen River at Chuwanten Creek, elevation 4000 ft, S.G. Cannings, 1♂ (UBCZ). Skeena River, 6.5 km W of Kitwanga, 16 March 1990, D. Weir, 2♂ (UBCZ). Tetsa River, 19 June 1958, C.H. Lindroth, 24♀ (USNM). **Yukon Territory:** Big Creek, 60.158369 N, -129.704311 W, 783 m, 13 April 2009, P. Maltais, 2♂, 3♀ (RBCM). Trout River, at Alaska Hwy, 59.335874 N, -125.93963 W, 14 April 2009, P. Maltais, 1♀ (RBCM). Wheaton River, first bridge, 60.28202 N, -135.03137 W, 800 m, 11 April 2009, L. Mennell, 3♂, 3♀ (RBCM). Same site, 11 April 2009, S.G. Cannings, 15♂, 12♀ (RBCM). **UNITED STATES: Colorado:** Chaffee Co., Chalk Creek, Road 162, Agnes Vaille Falls Trailhead, 16 March 2010, R. Durfee, B.C. Kondratieff, 5♂ (BYU). Garfield Co., East Branch Canyon Creek, upper foot bridge, 18 March 1976, D.E. Ruiter, 3♂ (BYU). Pitkin Co., Snowmass Creek, 2-3 miles up Snowmass Creek Road, 25 March 2006, E. Thorp, R. Thorp, 25♂, 8♀ (BYU). **Idaho:** Blaine Co., Beaver Creek, Hwy 75, 23 April 1985, R.W. Baumann, C.R. Nelson, 1♂ (BYU). Smiley Creek, Hwy 75, Sawtooth City, 23 April 1985, R.W. Baumann, C.R. Nelson, 1♂ (BYU). **Montana:** Flathead Co., Kootenai Creek, junction Middle Fork Flathead River, 25 March 1966, P.



Figs. 25-30. *Bolshecapnia spenceri*, male reproductive structures. All localities in Montana, Glacier Co., Iceberg Lake. 25. Male epiproct and terminal abdominal segments dorsal. 26. Epiproct dorsal. 27. Epiproct dorsal. 28. Epiproct apex dorsal. 29. Epiproct lateral. 30. Epiproct apex lateral.

Milam, 8♂, 14♀ (BYU). McDonald Creek, Glacier National Park, along Going-to-the-Sun Road, 48.64620 N, -113.84633 W, 18 March 1993, J. Giersch. 1♂, 1♀ (USGSAIC). McDonald Creek, second falls above Lake McDonald, Glacier National Park, 48.65550 N, -113.84069 W, 18 March 1997, J. Giersch, 1♂, 2♀ (USGSAIC). McDonald Creek, Glacier National Park, above McDonald Lake at bridge, 48.63539 N, -113.86693 W, 18 March 1997, J. Giersch, 3♂ (USGSAIC). Middle Fork Flathead River, 2 mi E Essex, 26 March 1966, P. Milam, 14♂, 18♀ (BYU). Lake Co., Lion Creek, 25 February 1967, P. Milam, 20♂ (BYU). Same site, 16 March 1969, P. Milam, 21♂, 45♀ (BYU). Same site, 21 March 1969, B.R. Oblad, 4♀ (BYU). Same site, 7 March 1970, R.A. Haick, 2♂, 1♀ (BYU). Same site, 7 March 1970, D.S. Potter, 2♂, 1♀ (USNM). Same site, 18 March 1973, R.A. Haick, 3♂, 9♀ (BYU). Lion Creek, Swan Range, 4 April 1970, R.A. Haick, 1♂ (BYU). **New Mexico:** Taos Co., Rio Hondo above Twining, 26 March 1988, G.Z. Jacobi, 1♂ (GZJC). **Oregon:** Union Co., Catherine Creek, Hwy 203, above Catherine Creek State Park, 27 February 1984, R.W. Baumann, C.R. Nelson, 1♂ (BYU). **Wyoming:** Albany Co., Libby Creek, Snowy Range, 2 April 1987, J.C. Burne, 2♂ (BYU).

Male epiproct (n = 6). Length 490-530 µm, width at midlength 137-148 µm, basal width 127 µm. Lateral margins almost parallel, but slightly swollen in areas (Figs. 7, 9, 13-15, 19, 23). Epiproct bearing a pair of short basolateral hooks and an apical, ventrally curved hook (7-8, 10, 15, 16, 21); tips of basolateral hooks extend forward for about 0.5 of the total epiproct length. On the dorsal surface, forward of the basolateral hooks a large area of spongy appearing tissue is located on either side of the well-developed median groove (Figs. 11-12, 17-18, 21, 24). Median groove extends from the base to an enlarged, subapical orifice (Figs. 7-8, 14).

Tergal process (n = 6). A thimble-shaped process is located in the median field of tergum 9, near the anterior border of the segment (Figs. 9, 12, 18). The anterior hook reaches approximately to, or slightly beyond the tergal process (Figs. 14-15).

Vesicle (n = 1). Length = 275 µm, basal width = 231 µm, median width = 312 µm; outline oval, surface covered with thick setae (Fig. 22).

Female subgenital plate (n = 2). This structure is truncate across the posterior margin, sometimes with the suggestion of one or more small notches; and scarcely reaches beyond the posterior margin of sternum 8 (Fig. 17, see also fig. 172 in Baumann et al. 1977).

Larva. Unknown.

Bolshecapnia rogozera (Ricker, 1965)

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:5028

Capnia (*Bolshecapnia*) *rogozera* Ricker, 1965:483. Holotype ♀ (Canadian National Collection), Moosehorn Lake, British Columbia

Distribution. CANADA: BC (DeWalt et al. 2018, Ricker 1965)

Material examined. CANADA: British Columbia: Moosehorn Lake, 58° 10′ N, -132° 07′ W, 29 July 1960, R.J. Pilfrey, Holotype ♀ (CNC).

Male. Unknown.

Female subgenital plate. Apical margin rounded and extending over anterior margin of sternum 9. Plate about half as wide as sternum 8 and relatively strongly sclerotized (see figure 19 in Ricker 1965).

Larva. Unknown.

Bolshecapnia spenceri (Ricker, 1965)

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:5022

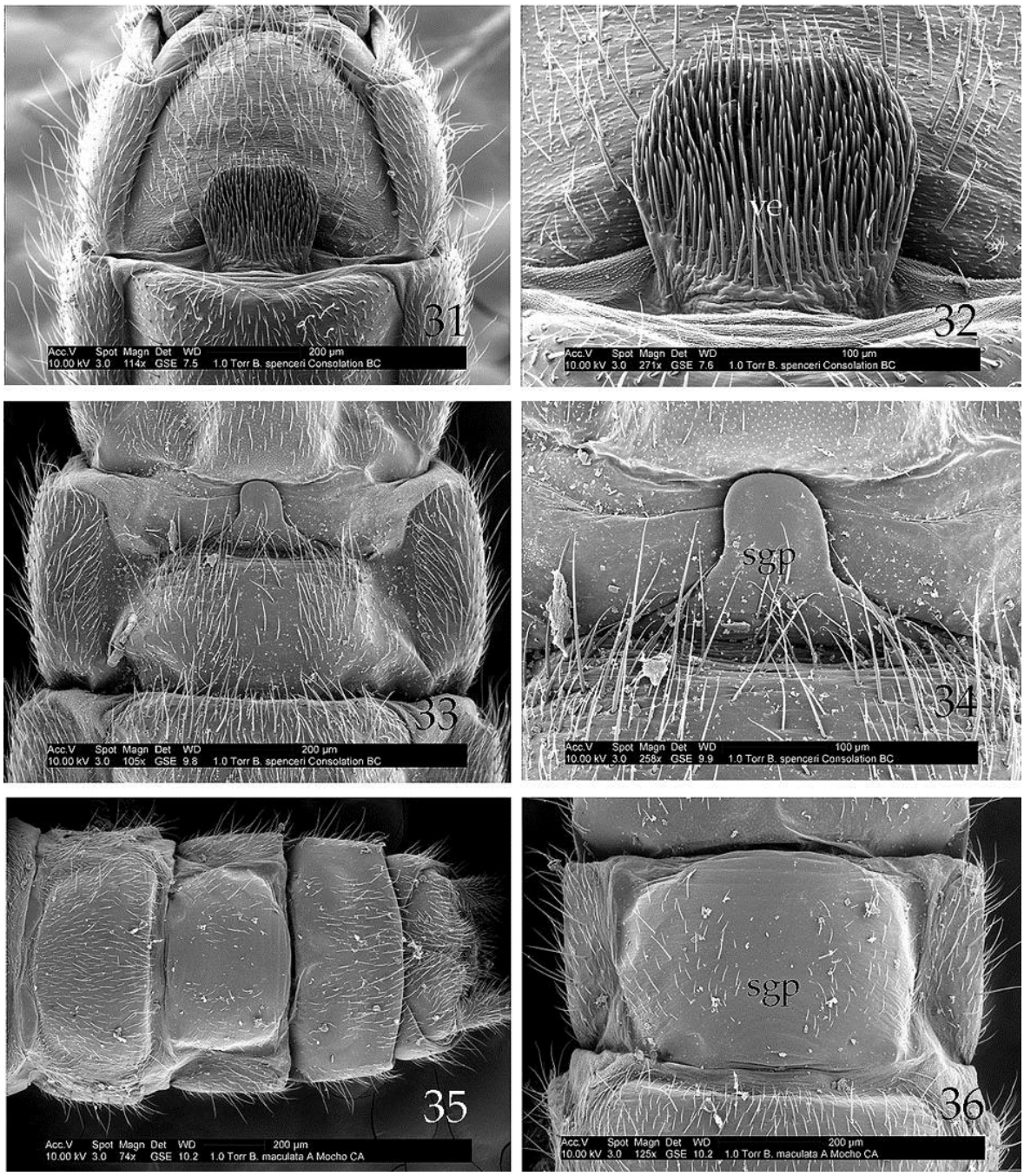
(Figs. 25-34)

Capnia (*Bolshecapnia*) *spenceri* Ricker, 1965:481. Holotype ♂ (Canadian National Collection), Consolation Lake, Banff National Park, Alberta

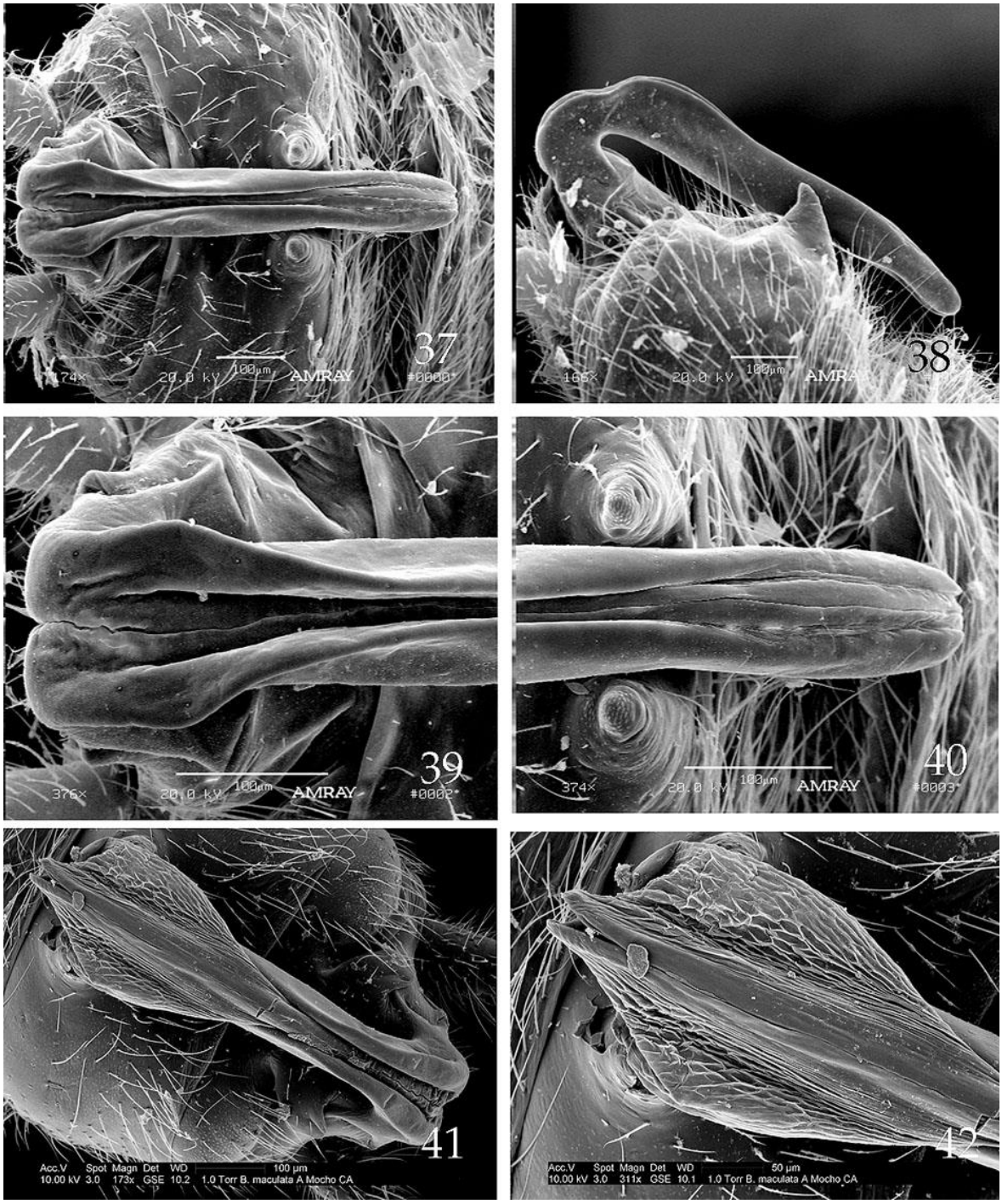
Bolshecapnia spenceri: Ricker & Scudder, 1975:338

Distribution. CANADA: AB, BC, UNITED STATES: MT (DeWalt et al. 2018)

Material examined. CANADA: Alberta: Consolation Lake, near Moraine Lake, Banff National Park, 51.316 N, -121.77 W, 1 June 1958, W.E. Ricker, Holotype ♂, Allotype ♀, 37 Paratypes (CNC). Same data, 2♂, 1♀ (INHS, Paratypes). **British Columbia:** Headquarters Creek near Sorcerer Glacier, Selkirk Mountains, 14 July 1960, J. Ricker, 3♀ Paratypes (CNC). NW branch Lyell Creek, Golden, 30 June 1961, J. Ricker, 1♀ Paratype



Figs. 31-36. *Bolshecapnia spenceri* (31-34) and *Eurekapnia maculata* (35-36) male and female reproductive structures. *B. spenceri* localities in British Columbia, Consolation Lake., and *E. maculata* localities in California, Alameda Co., Arroyo Mocho. 31. Male abdominal sternum 9 and vesicle. 32. Male vesicle. 33. Female subgenital plate. 34. Subgenital plate detail. 35. Female abdominal sterna 7-10. 36. Subgenital plate detail (sgp = subgenital plate, ve = vesicle).



Figs. 37-42. *Eurekapnia maculata*, male reproductive structures. All localities in California, Alameda Co., Arroyo Mocho. 37. Male epiproct and terminal abdominal segments dorsal. 38. Epiproct lateral. 39. Epiproct base dorsal. 40. Epiproct apex unexpanded dorsal. 41. Epiproct, with apex expanded dorsal. 42. Epiproct apex expanded dorsal.

(CNC). **UNITED STATES: Montana:** Glacier Co., Iceberg Lake, Glacier National Park, 3 July 1968, S.M. Stauffer, 4♂ (USNM). Same site, 5 July 1981, Levine, Weber, 7♂, 2♀ (FLBS). Same site, 5 July 1981, W.D. Shepard, 26♂, 1♀, 2 larvae (CAS). Same site, 17 July 1971, G.G. Lawley, 1♂ (BYU). Same site, 20 July 1966, P. Milam, 11♂ (FLBS). Same site, 21 July 1979, B. Stark, K.W. Stewart, R.W. Baumann, 97♂, 48♀, 32 larvae (BPSC, BYU). Same site, 24 July 1964, D. C. Lowrie, 18♂, 2♀ (BYU). Same site, 28 July 1970, R.A. Haick, 1♂, 1♀ (BYU). Same site, 29 July 1969, R.A. Haick, 94♂, 20♀ (BYU, USNM). Same site 29 July 1970, R.A. Haick. 2♂, 2♀ (USNM). Same site, 5 August 1972, R.A. Haick, 87♂, 22♀ (USNM). Iceberg Lake, above trail to lower lake, 48.81944 N, -113.76401 W, 15 July 2013, J. Giersch, 1♀ (USGSAIC). Iceberg Creek, below Iceberg Lake, Glacier National Park, 28 July 1964, A.R. Gaufin, 1♀ (BYU). Same site, 48.82098 N, -113.73896 W, 14 July 2014, J. Giersch, 3♀ (USGSAIC). Iceberg Lake, Glacier National Park, 5 mi NW Many Glacier Hotel, 28 July 1964, A.R. Gaufin, A.V. Nebeker, 36♂, 6♀ (CNC). Iceberg Lake, Glacier National Park, Many Glacier Campground Area, 29 July 1969, A.R. Gaufin, 91♂, 20♀ (BYU). Sue Lake, east shore, Glacier National Park, 48.861896 N, -113.84058 W, 8 August 2012, J. Giersch, 6♀ (USGSAIC). Tarn above Preston Park, Glacier National Park, 48.72157 N, -113.63796 W, 27 July 1997, J. Giersch, 2♂, 1♀ (USGSAIC). Upper Twin Lakes Basin, Proglacial pond outlet, NW Fusillade Mountain, Glacier National Park, 48.64387 N, -113.73931 W, 22 September 2015, J. Giersch, 1 larva (USGSAIC).

Male epiproct (n = 6). Length 524-543 µm, width at midlength 224-250 µm, greatest width near base 295-300 µm. Sclerotized hooks arise subapically from either side of the median groove, and are bent sharply laterad, and extend beyond the lateral margins of the epiproct body (Figs. 25-29); tips of basolateral hooks extend forward for about 0.75 of the total epiproct length. Median groove wide near apex, narrowing gradually to the widest point near the epiproct base (Fig. 26). Small clumps of spongy appearing tissue located along lateral margins near base of hooks (Figs. 27-28). Base of epiproct body bearing a pair of dorsal ridges separated by terminus of median groove (Figs. 27, 29). Apex with a protruding membranous process (Figs. 29-30).

Tergal process (n = 3). Absent, but tergum 9 covered with a broad band of short, thick setae (Figs. 27-28).

Vesicle (n = 1). Length = 219 µm, basal width =. 214 µm, median width = 252 µm. Process relatively wide, slightly wider near midlength (Fig. 31-32). Ventral surface covered with thick setae.

Female subgenital plate (n = 3). This structure is an apically narrowed, tongue-shaped process, about twice as wide at midlength as near the apical margin (Figs. 33-34); the structure extends beyond the anterior margin of sternum 9 (see fig. 169 in Baumann et al. 1977), and is hairless except for a few scattered long setae on the basal half. Several variations in the structure are shown in figs. 15-16 (Ricker 1965).

Larva. Described by Stewart & Stark (1988, 2002) and Stewart & Oswood (2006). The larval characteristics listed above for the genus are based on these descriptions.

Key to *Bolshecapnia* Adults

(*B. rogozera* males unknown)

1 Finger-like epiproct present on the dorsoapical portion of the abdomen (Fig. 15) ..……...……. Males 2

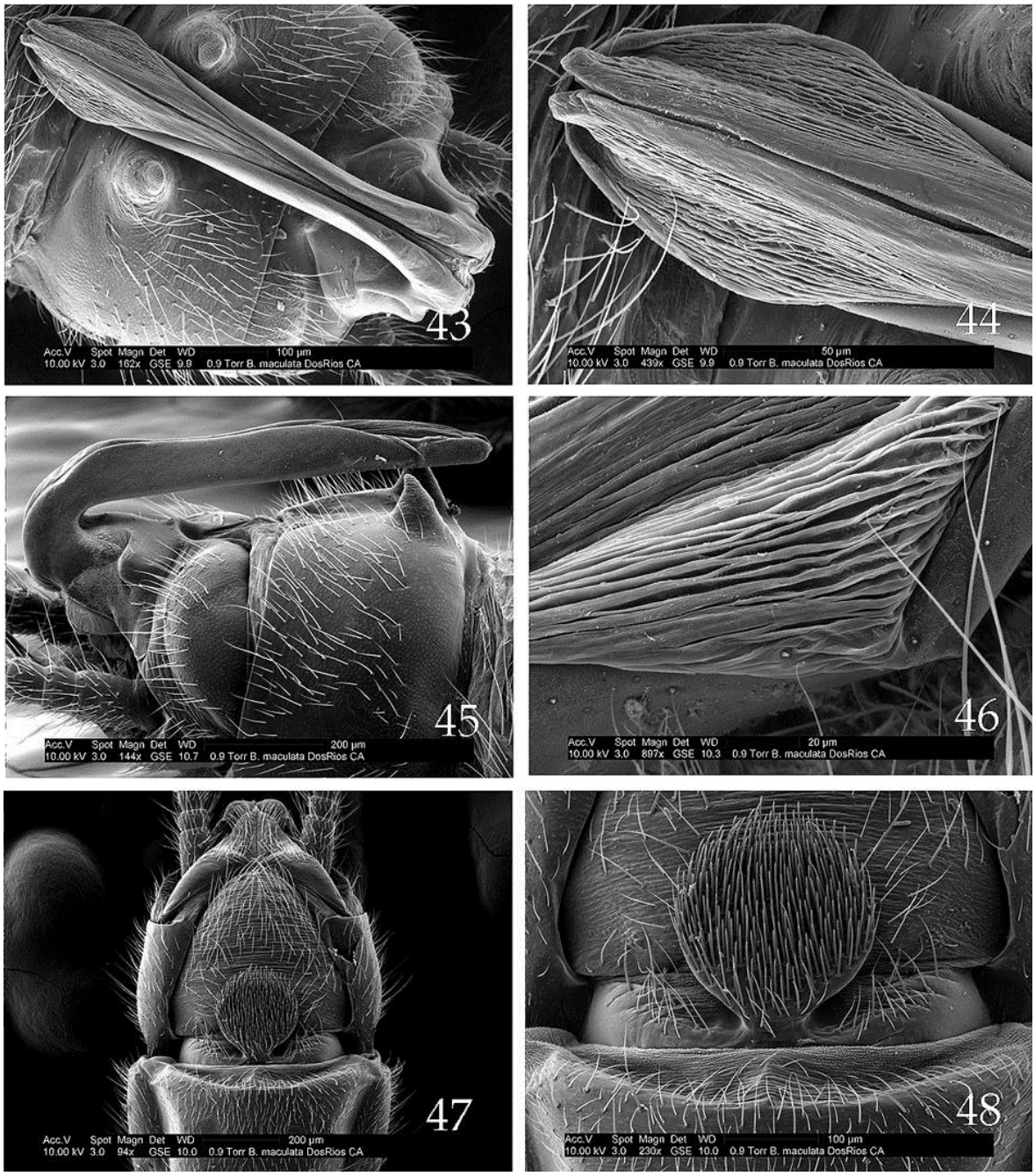
1′ Finger-like epiproct absent ……..…. Females 4

2 Epiproct tip modified as a downwardly curved hook (Figs. 7, 16); lateral hooks diverge from epiproct body near midlength (Figs. 9, 15); tergum 9 bears a thimble-shaped dorsal process (Figs. 12, 18) ...…….. *B. milami*

2′ Epiproct tip without hook (Figs. 3, 28); lateral hooks diverge from epiproct body near apex (Figs. 2, 28); tergum 9 without thimble-shaped dorsal process (Fig. 21) …… 3

3 Epiproct lateral hooks usually strongly bent near midlength and projecting beyond lateral margins of epiproct (Figs. 27, 29); tergal notch on anterior margin of segment 10 absent …….. *B. spenceri*

3′ Epiproct lateral hooks usually straight and not projecting beyond lateral margins of epiproct (Fig. 2); tergal notch on anterior margin of 10 filled with projecting intersegmental membrane



Figs. 43-48 *Eurekapnia maculata,* male reproductive structures. All localities in California, Mendocino Co., Upper Burger Creek, Dos Rios Road. 43. Epiproct with partially expanded apex and terminal abdominal segments dorsal. 44. Epiproct apex partially expanded dorsal. 45. Epiproct and terminal abdominal segments lateral. 46. Detail of epiproct apex dorsolateral. 47. Terminal abdominal segments ventral. 48. Vesicle ventral.

from tergum 9 (Fig. 2) ..…… *B. gregsoni*

4 Subgenital plate apex truncate (Fig. 17); apex of projecting portion of plate almost as wide as its base ..……..…….... *B. milami*

4′ Subgenital plate apex rounded, or subtruncate, projecting portion of plate narrower than plate at midlength ..……..…. 5

5 Projecting portion of subgenital plate with lateral margins almost parallel, or weakly convergent …… *B. rogozera*

5′ Lateral margins of projecting portion of subgenital plate strongly convergent (Figs. 6, 34) ..…….. 6

6 Apical half of projecting portion of subgenital plate very narrow (Figs. 33-34), sometimes asymmetrical ……. *B. spenceri*

6′ Apical half of projecting portion of subgenital plate broadly triangular and symmetrical (Fig. 6) ...…….. *B. gregsoni*

Eurekapnia Stark & Broome, New genus

Type species: *Capnia maculata* Jewett, 1954 = *Eurekapnia maculata* (Jewett) by monotypy.

Male characteristics: 1. The male epiproct is almost uniformly slender from base to apex except for an apical area capable of being folded laterally to increase the apical width (Figs. 37, 40-42). 2. The ventral and lateral margins of the finger-like epiproct are formed by a pair of thick sclerites that are separated along the dorsum by a wide groove (Figs. 37-40); width of the groove varies based on position of the sclerites (compare Figs. 51-52). 3. Abdominal tergum 9 bears a pair of conical knobs separated by a gap slightly wider than the folded epiproct tip (Figs. 37-38, 40, 43, 45). 4. The ventral vesicle is almost circular in outline and is attached to the intersegmental membrane between sterna 8 and 9 (Figs. 47-48). The vesicle surface is covered with thick setae.

Female characteristics: 1. The subgenital plate is uniformly pigmented and extends across the entire width of sternum 8 between the two pleural membranes (Figs. 35-36). 2. The posterior margin of the plate is rounded and scarcely exceeds the posterior margin of sternum 8.

Wings: 1. The venation of *E. maculata*, the only known species, is very similar to that of *Bolshecapnia* and *Sasquacapnia*, however the wings of *Eurekapnia* have scattered brown maculations that give them a distinctive appearance.

Larval characteristics: Undescribed.

Currently recognized species: *E. maculata*

Distribution: Known only from California (DeWalt et al. 2018).

Etymology: The generic name, *Eurekapnia*, is based on the California state motto, "Eureka", a Greek word whose literal meaning is defined as "I have found it". This word was supposedly uttered by Archimedes after he discovered a successful method for estimating the purity of gold.

Eurekapnia maculata (Jewett, 1954), New combination

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(Figs. 35-54)

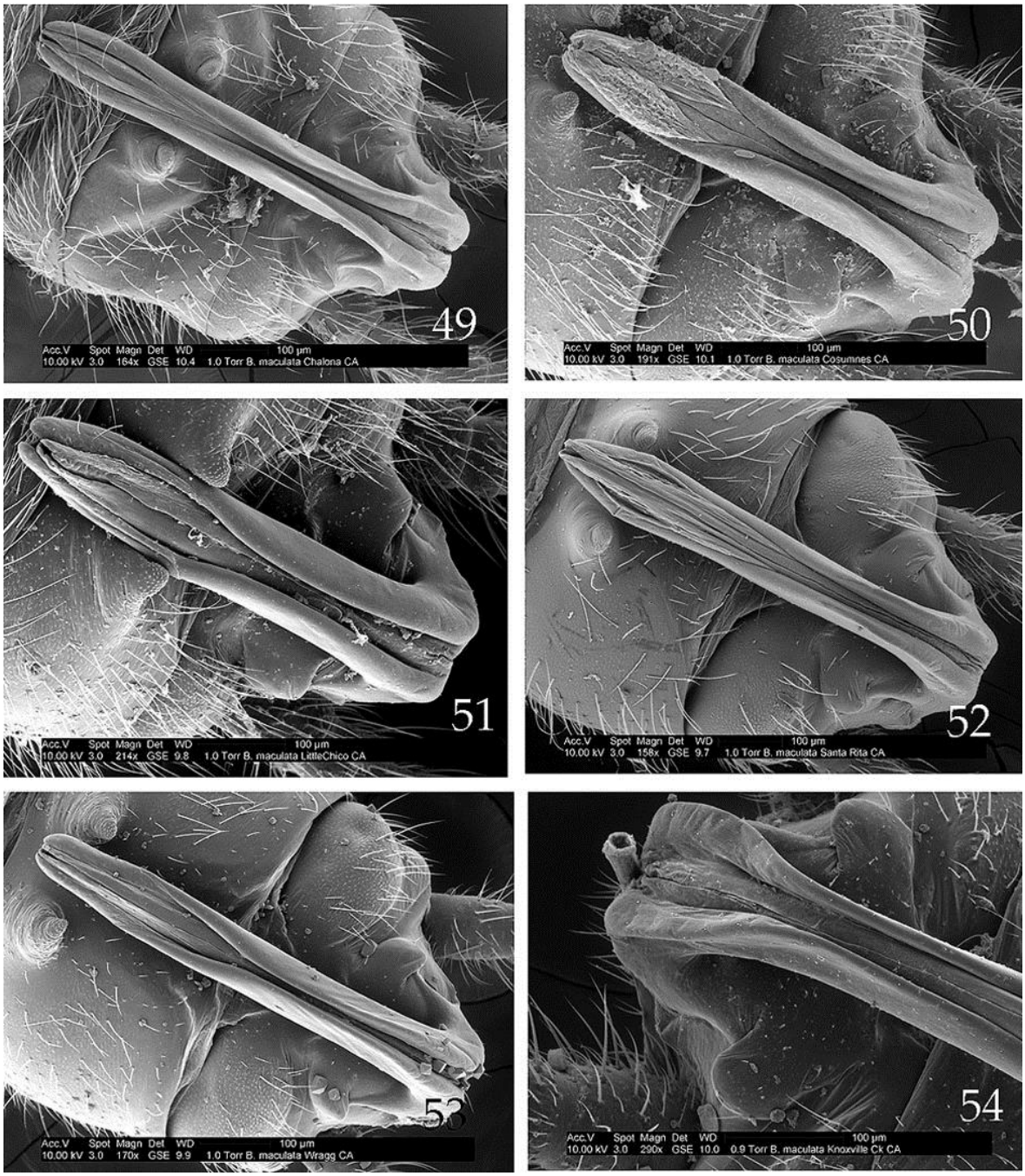
Capnia maculata Jewett, 1954:174. Holotype ♂ (California Academy of Sciences Collection), Marsh Creek, Contra Costa County, California

Capnia (*Bolshecapnia*) *maculata*: Ricker, 1965:479

Bolshecapnia maculata: Stewart et al., 1991:202

Distribution. UNITED STATES: CA (DeWalt et al. 2018).

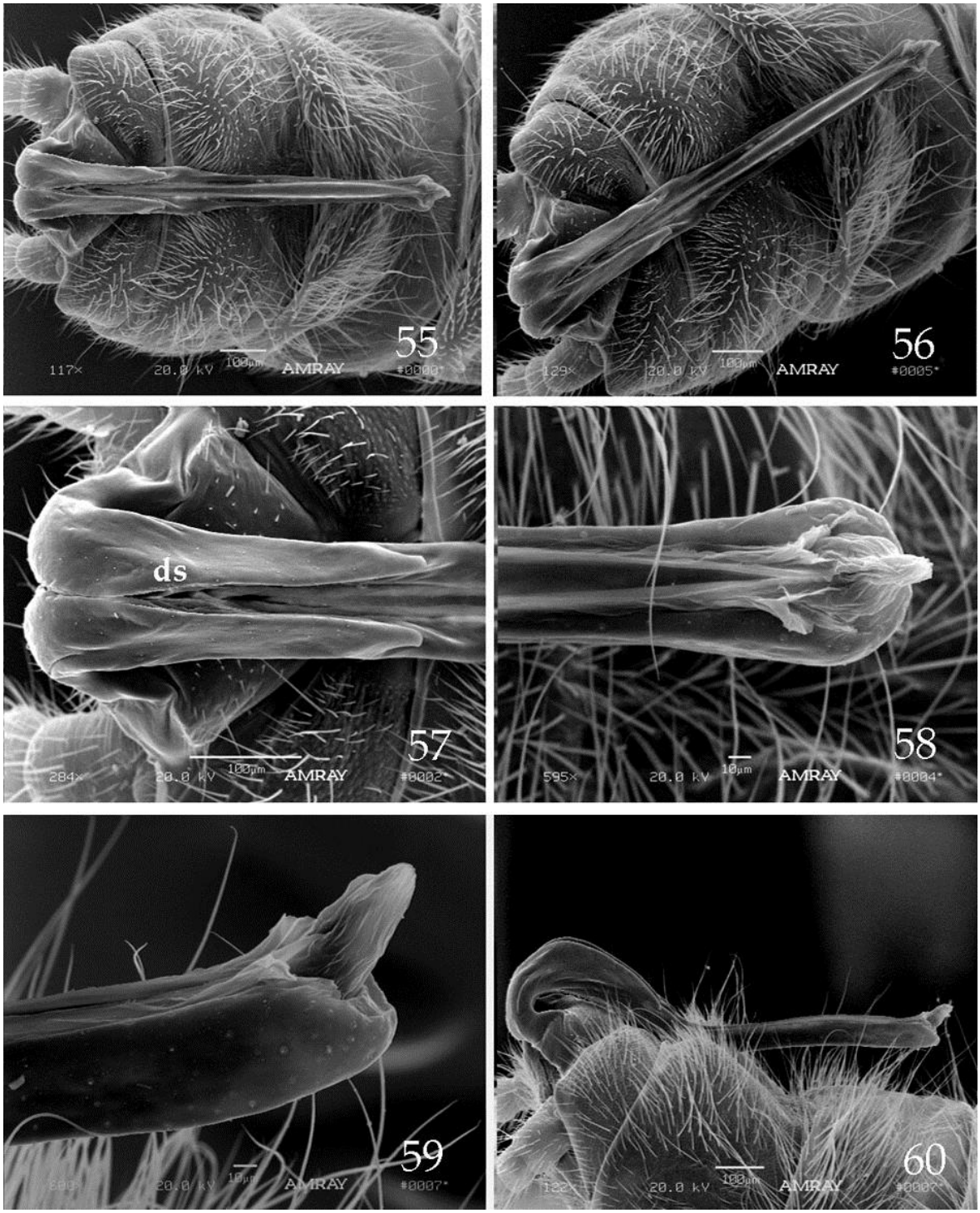
Material examined. UNITED STATES: California: Alameda Co., Arroyo Mocho, hills behind Livermore, 24 February 1956, 1♂, 1♀ (USNM). Arroyo Mocho, S of Livermore, 14 March 1957, S.W. Hitchcock, 3♂, 1♀ (USNM). Arroyo Mocho, 20 miles S of Livermore, 19 March 1985, R.W. Baumann, C.R. Nelson, 2♂, 1♀ (BYU). Amador Co., Little Indian Creek, Old Sacramento Road, 3 mi W Plymouth, 16 February 1989, R.L. Bottorff, 2♂, 1♀ (RLBC). Little Indian Creek, W of Plymouth, 16 February 1989, R.L. Bottorff, 2♂, 1♀. Butte Co., Campbell Creek, North Table Mountain Ecological Preserve, 2 February 2007, A.B. Richards, J.B. Sandberg, 2♂, 2♀ (BYU). Campbell Creek and tributary, North Table Mountain Ecological Preserve, 5 mi S Cherokee, 39.59779 N, -121.54646 W, 2 February 2007, J.B. Sandberg, J.P. Slusark, A.B. Richards, 1♂ (JBSC). Same site, 1 March 2008, J.B. Sandberg, 1♂, 1♀ (JBSC). Little Chico Creek. Chico, Hwy 32, 15 February 1985, R.W. Baumann, C.R. Nelson, 1♂, 5♀ (BYU). Oregon Gulch, Red Bridge, Oregon City, 39.59369 N, -121.52996 W, 23



Figs. 49-54. *Eurekapnia maculata,* variation in male epiprocts. All localities in California. 49. San Benito Co., Chalone Creek male epiproct unexpanded. 50. Sacramento Co., Cosumnes River epiproct partially expanded. 51. Butte Co., Little Chico Creek, epiproct apex slightly expanded. 52. San Luis Obispo Co., Santa Rita Creek, epiproct apex slightly expanded. 53. Napa Co., Wragg Creek epiproct apex unexpanded. 54. Napa Co., Knoxville Creek, exposed fusion plate at epiproct base.

February 2008, J.B. Sandberg, D.P. Pickard, 1♂, 1♀ (JBSC). Colusa Co., Bear Creek, Bear Valley Road near Hwy 20, 17 February 2012, J.J. Lee, 1♀ (BYU). Tributary South Fork Stony Creek, Fout Springs Road, 8 February 2016, C.J. Verdone, M. Fairchild, 2♂ (CSUIC). Contra Costa Co., Back Creek, 37° 54′ 55.9″ N, -121°55′ 52.9″ W, 14 January 2010, L.E. Serpa, 18♂, 3♀ (LESC). El Dorado Co., Knickerbocker Creek, 3 mi NW Pilot Hill, 6 February 1988, R.L. Bottorff, 22♂, 8♀ (RLBC). Ringgold Creek, 3 mi S Placerville, 4 March 1988, R.L. Bottorff, 20♂ (RLBC). Seep near Martinez Creek, near El Dorado, 16 February 1989, R.L. Bottorff, 2♂, 1♀ (USNM). Fresno Co., Mill Creek, 3 miles E Piedra, 20 February 1982, R.F. Gill, 1♀ (BYU). Watts Creek, 6 mi NW Trimmer, near Pine Flat Lake, 28 November 1981, R.F. Gill, 6♂, 2♀ (BYU). Lake Co., small stream parallel to Hwy 53, S jct. with Hwy 20, 22 January 1955, S.W. Hitchcock, 10♂, 1♀ (USNM). South Fork Scotts Creek, 38° 59′ 24.4″ N, -122° 58′ 4.3″ W, 5 March 2012, L.E. Serpa, 1♀ (LESC). Marin Co., Potread Meadows, Mount Tamalpais, 2 January 1955, S.W. Hitchcock, 2♂, 5 larvae (USNM). Mendocino Co., Long Valley Creek, Hwy 101, S Laytonville, 39.62529 N, -123.46301 W, 17 January 2011, J. Lee, 3♂, 4♀ (JJLC). Spring, Upper Burger Creek, Dos Rios Road, 17 January 2011, J. Lee, 22♂, 3♀ (JJLC, BYU). Napa Co., Capell Creek, 2.6 mi NW Hwy 128, Hwy 121 junction, 2 February 1993, T. Eichlin, F. Andrews, 2♂ (BYU). Knoxville Creek, Knoxville-Berryessa Road, 27 January 1992, R.W. Baumann, J. Zenger, 12♂, 5♀ (BYU). Wragg Creek, Hwy 128, 2 February 1993, T. Eichlin, F. Andrews, 2♂ (BYU). Wragg Creek, Hwy 128, 0.2 mi E Gordon Valley Road, 38.43090 N, -122.15925 W, 26 February 2007, J.B. Sandberg, 1♂ (JBSC). Sacramento Co., Cosumnes River, Michigan Bar, Ruman Ranch Bridge, 27 January 1982, R.L. Bottorff, 11♂, 3♀ (RLBC). Cosumnes River, Sloughhouse, 16 January 1983, R.L. Bottorff, 1♂, 1♀ (RLBC). San Benito Co., Chalone Creek, Pinnacles National Monument, 25 February 1955, S.W. Hitchcock, 1♂, 2♀ (USNM). Same site, 25 February 1955, S.W. Hitchcock, 1 ♂ (CNC). Chalone Creek, W Pinnacles National Monument, 7 January 1983, W.D. Shepard, 10♀ (CAS). San Luis Obispo Co., Rocky Creek, Cypress Mountain Road, 22 January 1989, T. Eichlin, F. Andrews, 1♂ (BYU). Santa Rita Creek, 5.2 mi W Templeton, 22 January 1989, T. Eichlin, F. Andrews, 1♂ (BYU). Santa Clara Co., Arroyo Mocho, 20 mi S Livermore at Santa Clara Co., line, J. Herring, 33♂, 5♀ (USNM). Coyote Creek, 37° 6′ 7.5″ N, -121° 28′ 21.7″ W, 16 February 2010, L.E. Serpa, 3♂, 3♀ (LESC). Hunting Hollow Creek, 37° 4′ 30.9″ N, -121° 27′ 44.7″ W, 16 February 2010, L.E. Serpa, 9♂, 5♀ (LESC). Isabel Creek, 5 km ENE Lick Observatory (UC Berkeley), San Antonio Valley Rd, 37.3563 N, -121.5887 W, 19 February 2007, R.E. DeWalt, W.D. Shepard, 23♂ (INHS). Jumpoff Creek, 37° 19′ 15.2″ N, -121° 28′ 0.8″ W, 18 January 2006, L.E. Serpa, 4♂ reared (LESC). Smith Creek, 37°, 19.6′ 1″ N, -121° 39′ 13″ W, 7 February 2003, L.E. Serpa, 3♀ (LESC). 20 mi S Livermore, March 1956, J. Herring, 2♂ (USNM). 1 mi E junction Del Puerto Road and Mines Road, 18 March 1958, S.W. Hitchcock, 1♀ (USNM). Solano Co., Cold Creek, Cold Canyon, Hwy 128, 0.8 mi W Winters, 38.50798 N, -122.097738 W, 28 February 2008, J.B. Sandberg, D.P. Pickard, 1♂ (BYU). Cold Creek, Monticello Dam, Stebbins Preserve above Hwy 128, 17 March 1992, A.W. Knight, 6♂, 2♀ (RLBC). Sonoma Co., Dry Creek, 38° 20′ 38.3″ N, -122° 35′ 39.7″ W, 2 February 1982, L.E. Serpa, 1♂ (LESC). Stanislaus Co., Del Puerto Creek, Frank Raines Park, 20 February 1985, R.W. Baumann, C.R. Nelson, 1♂ (BYU). Del Puerto Creek, 37° 24′ 42.2″ N, -121° 24′ 42.2″ W, 7 April 2008, L.E. Serpa, 1♀ (LESC). Orestimba Creek, 37° 17′ 24.7″ N, -121° 11′ 37.1″ W, 23 January 2003, L.E. Serpa, 1♂, 2♀ (LESC). Tehama Co., Cottonwood Truck Scale, 2 February 1995, R.E. Hill, 1♂ (BYU).

Male epiproct (n = 10). Length 569-775 µm, width at midlength 88-100 µm, basal width 128-145 µm. Epiproct elongate, nearly parallel-sided for most of length beyond base. Dorsal sclerite longitudinally divided for entire length by a groove, wide at base and in apical third (Figs. 37, 39-40). Epiproct recurved over abdomen in lateral aspect, its apical third lying between a pair of dorsal tubercles on the anterior margin of tergum 9 (Fig. 38); posterior curved section with a short concave notch in dorsal margin. Epiproct apex may be everted partially (Figs. 43-44), completely (Figs. 41-42), or not at all (Figs. 37, 49-53), to expose membranous spongy tissue.



Figs. 55-60. *Sasquacapnia missiona*, male reproductive structures. All localities in Montana, Missoula Co., Grant Creek. 55. Male epiproct and terminal abdominal segments dorsal. 56. Epiproct and terminal abdominal segments dorsal. 57. Epiproct base dorsal (ds = dorsobasal sclerite). 58. Epiproct apex dorsal. 59. Epiproct apex lateral. 60. Epiproct lateral.

Tergal process. (n = 8) A pair of conical processes located on the anteromedian margin of tergum 9, separated by the width of the epiproct (Figs. 37-38, 40, 43, 45)).

Vesicle (n = 1). Densely hairy over most of surface, outline almost circular, but with a short anterior pedicel (Figs. 47-48).

Female subgenital plate (n = 2). The plate is apically rounded and projects slightly beyond the posterior margin of sternum 8; lateral margins narrowed basally (Fig. 35-36).

Larva. Undescribed.

Sasquacapnia Baumann & Broome, New genus

Type species *Capnia* (*Bolshecapnia*) *sasquatchi* (Ricker, 1965) = *Sasquacapnia sasquatchi* (Ricker) by present designation

Male characteristics: Epiproct long, slender and curved dorsad near mid-length (Figs. 56, 60, 67, 71). A pair of dorsal sclerites arise from the epiproct base and extend forward for approximately a third or more of the epiproct length (Fig. 57, 72); sclerites narrow and may be acute at their tips. Epiproct narrows subapically and expands at the apex; apical area contains extrudable membranous material that may be partially or fully exposed (Figs. 64, 69). Abdominal terga without dorsal knobs; tergum 9 with patches of long setae (Figs. 55, 61).

Vesicle (n = 5). Oval in outline, constricted at the base and covered with thick setae (Fig. 65).

Female characteristics: Subgenital plate usually reaching anterior margin of sternum 9; margin rounded and notched in *S. missiona* (Fig. 66) and truncate in *S. sasquatchi* (fig. 14 in Baumann & Potter 2007).

Wings: As noted above, the wing venation for *Sasquacapnia* is indistinguishable from that of *Bolshecapnia* and *Eurekapnia.*

Larval characteristics: Unknown.

Current species: *S. missiona, S. sasquatchi*

Distribution: Known from British Columbia, Montana and Washington (DeWalt et al. 2018).

Etymology: The generic name, *Sasquacapnia*, is based on "Sasquatchi", a species name assigned by Ricker (1965) and formed from the name of the "yeti-like forest giants of the Fraser River valley Salish Indian legends" (Ricker 1965).

Sasquacapnia missiona (Baumann & Potter, 2007), New combination

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:505897

(Figs. 55-66)

Bolshecapnia missiona Baumann & Potter, 2007:159. Holotype ♂ (California Academy of Sciences), Grant Creek, Snow Bowl Road, Missoula Co., Montana

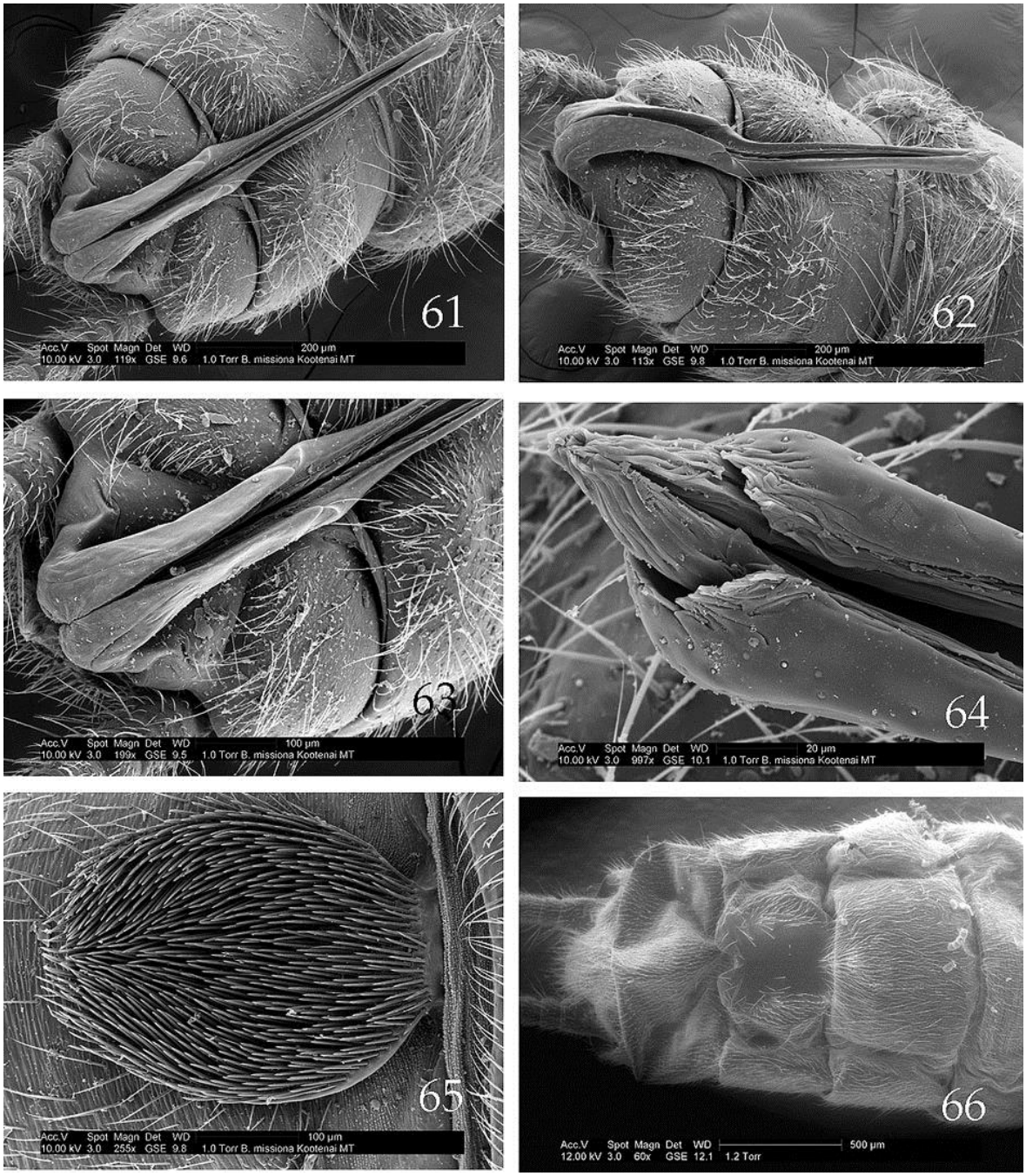
Distribution. UNITED STATES: MT (DeWalt et al. 2018)

Material examined. UNITED STATES: Montana: Flathead Co., Alpha Creek, junction South Fork Flathead River, Hungry Horse Dam, 26 March 1966, P. Milam, 1♂ (BYU paratype). Canyon Creek, South Fork Road, 25 March 1973, D.S. Potter, J.A. Stanford, 7♂, 4♀ (BYU, FLBS paratypes). Kootenai Creek, junction Middle Fork Flathead River, 26 March 1966, P. Milam, 8♂, 14♀ (BYU, FLBS paratypes). Lake Co., Six Mile Creek, between Swan Lake and Big Fork, 6 March 1966, P. Milam, 1♂ (BYU paratype). Missoula Co., Grant Creek, Snow Bowl, 8 March 1970, D.S. Potter, R.A. Haick, 13♂, 3♀ (BYU paratypes). Same site, 15 March 1971, D.S. Potter, 4♂, 2♀ (BYU paratypes). Same site, 15 March 1971, D.S. Potter, 15♀ (CAS paratypes).

Male epiproct (n = 3). Length 920-928 µm, width at midlength about 70 µm, greatest width near base 143 µm. Epiproct body long and slender (Figs. 55-56, 61-62), bearing a prominent pair of triangular dorsobasal sclerites which cover most of the basal third of the epiproct (Fig. 57, 63); epiproct abruptly narrowed, and upturned beyond the apical margin of the dorsobasal sclerites (Figs. 57, 60). Apex complexly lobed in dorsal aspect and displaying a membranous protruding structure in lateral aspect (Figs. 58-59, 64). Median groove extends from near apex to basal area of the dorsobasal sclerites (Fig. 56, 61); dorsobasal sclerites approximately 345-360 µm.

Tergal process. Absent, but terga 8-9 bear patches of long setae (Fig. 55).

Female subgenital plate. Details of this structure are show below (Fig. 66) and in figs. 15-16 in



Figs. 61-66. *Sasquacapnia missiona,* male and female reproductive structures. All localities in Montana. 61. Flathead Co., Kootenai Creek, male epiproct and terminal abdominal segments dorsal. 62. Flathead Co., Kootenai Creek, epiproct oblique lateral. 63. Flathead Co., Kootenai Creek, epiproct base dorsal. 64. Flathead Co., Kootenai Creek, epiproct apex dorsal. 65. Flathead Co., Kootenai Creek vesicle ventral. 66. Missoula Co., Grant Creek, female abdomen and subgenital plate ventral.

Baumann & Potter (2007). The structure generally projects beyond the posterior margin of sternum 8, and bears a small apical notch.

Sasquacapnia sasquatchi (Ricker, 1965), New combination

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:505899

(Figs. 67-72)

Capnia (*Bolshecapnia*) *sasquatchi* Ricker, 1965:482. Holotype ♂ (Canadian National Collection), Fraser River near Agassiz, British Columbia *Bolshecapnia sasquatchi*: Ricker & Scudder, 1975:338

Distribution. CANADA: BC (Ricker 1965, DeWalt et al. 2018), **UNITED STATES: WA (**DeWalt et al. 2018, Kondratieff & Lechleitner 2002).

Material examined. CANADA: British Columbia: Fraser River, near Agassiz, 49.206 N, -121.777 W, 21 February 1958, W.E. Ricker, Holotype ♂ (CNC). Manning Park, Skagit River, 18 February 1983, S.G. Cannings, 1♂ (UBCZ). Manning Park, Similkameen River, 19 March 1983, S.G. Cannings, 1♂ (UBCZ). **UNITED STATES: Washington:** Pierce Co., Ohanapecosh River, Mount Rainier National Park, 17 March 1970, R.A. Haick, 1♂ (BYU). Same site, 17 March 1970, D.S. Potter, 2♂ (BYU). Same site, 16 March 1973, D.S. Potter, L.M. Preble, 1♂ (BYU). Whatcom Co., Razor Hone Creek, Hwy 542, Mount Baker National Forest, 4 March 1967, K.E. Vander Mey, 2♂, 6♀ (BYU).

Male epiproct (n = 3). Length 718 µm, width at midlength about 147 µm, width near base 158 µm, greatest width 194 µm, subapical width at narrowest point 70 µm. Epiproct body broad basally and narrowed gradually to subapical bottleneck (Figs. 67, 70-71) in dorsal and lateral aspect; apex bearing complexly lobed membranous tissue above a well formed ventral lip (Figs. 69, 71). Median groove well developed, with a pair of parallel ridges extending subapically to near base of dorsobasal sclerites (Figs. 67, 70). Dorsobasal sclerites short, broad and apically pointed (Figs. 68, 72).

Tergal process (n = 2). A pair of hairy, low rounded hump-like structures located on tergum 9 (Figs. 67, 71).

Vesicle (n = 3). Similar to *S. missiona* but slightly more rounded in ventral aspect.

Female subgenital plate (n = 1). Correctly associated and illustrated in figs. 13-14, by Baumann & Potter (2007). Ricker's earlier figure for this structure is now attributed to *S. missiona* (Baumann & Potter 2007). The posterior margin of the plate is truncate and scarcely projects beyond the posterior margin of sternum 8.

Larva. Unknown.

Key to Adult *Sasquacapnia*

1 Long finger-like epiproct present on dorsobasal aspect of abdomen (Fig. 61) ..... Males, 2

1′ Abdomen without dorsobasal finger-like epiproct …….……..... Females, 3

2 Epiproct bottle-shaped in dorsal aspect (Figs. 67, 70), sinuate in lateral aspect with apex curved downward (Fig. 71); dorsobasal sclerite about 3 times long as basal width (Fig. 72) ……..... *S. sasquatchi*

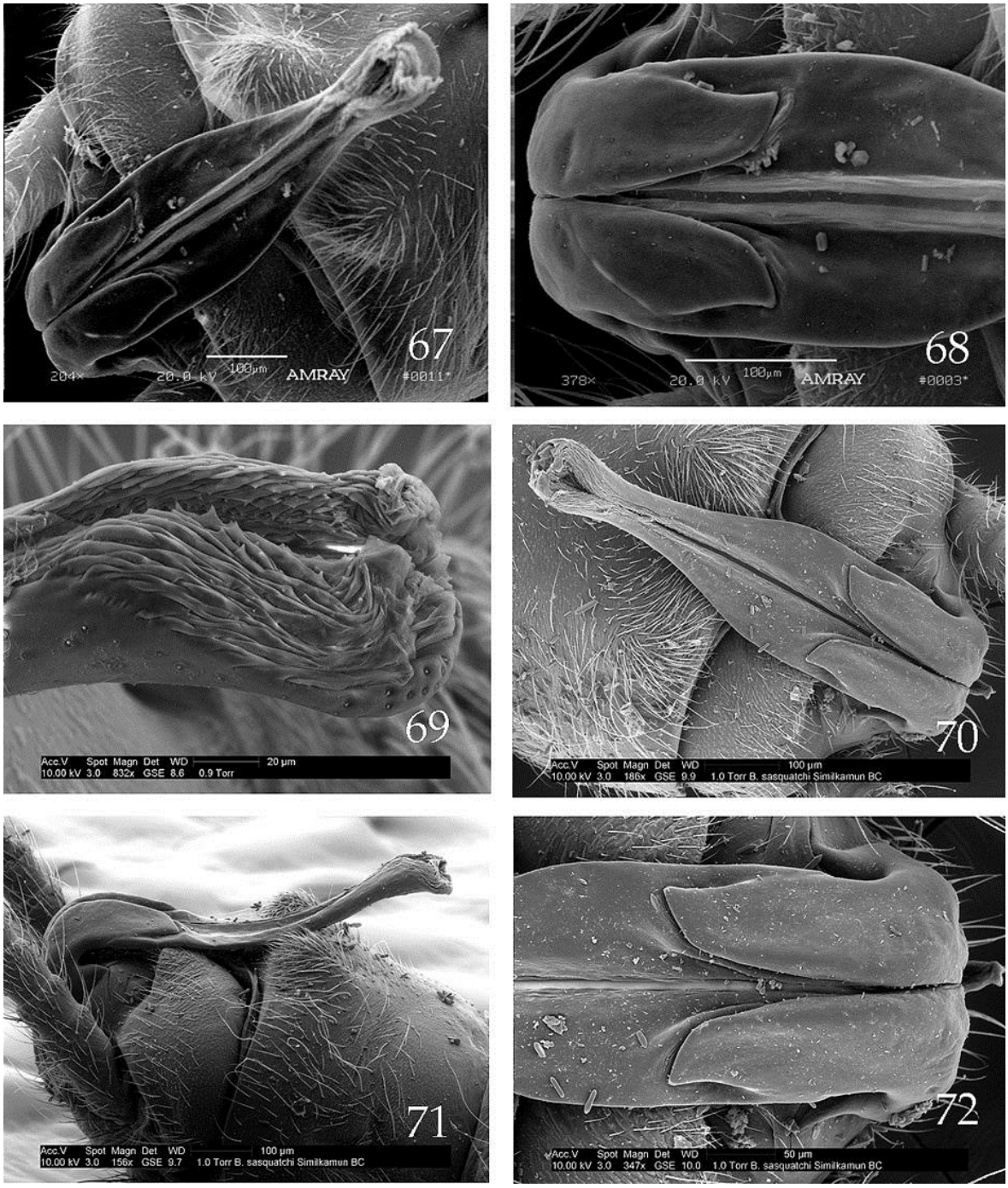
2′ Epiproct long and narrow, not distinctly bottle shaped in dorsal aspect (Fig. 56); angled abruptly upward along a relatively straight line beyond apex of dorsobasal sclerites (Fig. 60); dorsobasal sclerites about 5.5 times long as wide (Figs. 57, 63) ……..... *S. missiona*

3 Subgenital plate rounded across posterior margin and bearing a shallow median notch (Fig. 66) ……..... *S. missiona*

3′ Subgenital plate usually truncate and without a median notch ……..…..…..….. *S. sasquatchi*

DISCUSSION

Ricker (1965) recognized *Bolshecapnia* as a subgenus of *Capnia* on the basis of large size, a ventral abdominal male vesicle at the base of sternum 8, and a prominent female subgenital plate. None of these characters are unique to *Bolshecapnia* and Zwick (1973) placed the group in synonymy under the genus *Capnia*. Subsequent authors [e.g. Ricker & Scudder (1975), Baumann et al. (1977), Stewart & Oswood (2006)] have continued to recognize *Bolshecapnia* and have elevated it to generic status. Although we agree with this position, on the basis of epiproct morphology it appears the group is not monophyletic and that three distinct genera are included under the current concept of *Bolshecapnia*.



Figs. 67-72. *Sasquacapnia sasquatchi,* male reproductive structures, localities in Washington (67-68), and British Columbia (69-72). 67. Whatcom Co., Razor Hone Creek, male epiproct and terminal abdominal segments dorsal. 68. Whatcom Co., Razor Hone Creek, epiproct base dorsal. 69. Manning Park, Similkameen River, epiproct apex dorsolateral. 70. Manning Park, Similkameen River, epiproct dorsal. 71. Manning Park, Similkameen River epiproct lateral. 72. Manning Park, Similkameen River, epiproct base dorsal.

Three of the currently recognized species (*B. gregsoni*, *B. milami* and *B. spenceri*) should retain the generic name *Bolshecapnia* on the basis of similar epiproct structure (prominent curved and sclerotized epiproct hooks). Two additional species (*B. missiona* and *B. sasquatchi*) share a pair of dorsobasal, triangular sclerites, an eversible apical membranous process on the epiproct, and a slender, elongate upwardly bent apical section of the epiproct. This pair of sister species appears distinct from the three designated *Bolshecapnia* species and is placed in the new genus *Sasquacapnia*. *Bolshecapnia maculata*, apparently shares only one conspicuous apomorphic feature with the two groups discussed above, the long median dorsal longitudinal groove on the epiproct and is placed in the new genus *Eurekapnia.* The remaining species, *B. rogozera*, known only from the holotype female collected at Moosehorn Lake, British Columbia in late July, 1960, is tentatively retained in *Bolshecapnia.*

The key below provides characters for recognition of males and females of *Bolshecapnia* and the new genera, *Eurekapnia* and *Sasquacapnia.* For convenience we refer to these three genera as the "*Bolshecapnia* complex" because adults of these genera key to *Bolshecapnia* in Stewart & Stark (2008). No larval key is included herein because only one species, *B. spenceri*, has been described in the immature stage (Stewart & Stark 1988).

Key to Adult *Bolshecapnia* Complex Genera

1 Epiproct present on tergum 10; sternum 9 covers much of sternum 10 (Figs. 1, 31) ..... Males (2)
1′ Epiproct undeveloped on tergum 10; sternum 9 not extending over sternum 10 ……. Females (4)
2 Male epiproct with a pair of curved lateral hooks (Figs. 19, 27) ….....…..... *Bolshecapnia*
2′ Male epiproct without curved lateral hooks (Figs. 37, 70) ……..... 3
3 Anterior margin of male tergum 9 bearing a median pair of conical knobs separated by the epiproct (Figs. 43, 45); epiproct not bent near midlength (Fig. 38) ..... *Eurekapnia*
3′ Anterior margin of male tergum 9 without conical knobs (Figs. 56, 70); epiproct bent upward near midlength (Figs. 60, 71) .....……. *Sasquacapnia*
4 Projecting tip of subgenital plate usually narrower than median part of plate (Figs. 6, 17, 34) ..... *Bolshecapnia*
4′ Projecting tip of subgenital plate usually about as broad as median part of plate (Fig. 36) …..... 5
5 Subgenital plate rounded with a mesal notch (Fig. 66), or if truncate, then wider than long; wings without maculations ……. *Sasquacapnia*
5′ Subgenital plate posterior margin scarcely projecting (Fig. 35); margin rounded but without notch; wings with scattered brown maculations ….....…..... *Eurekapnia*

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