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# *LEDNIA TETONICA,* A NEW SPECIES OF STONEFLY FROM WYOMING (PLECOPTERA: NEMOURIDAE)

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## ABSTRACT

*Lednia tetonica,* sp. n. of the stonefly family Nemouridae is named from South Fork Darby Creek, Wind Cave, Teton County, Wyoming. The male and female adults and male and female larvae are described. Illustrations are provided as line drawings and scanning electron microscope images. Photographs are provided of the cave and the creek near the type locality.

**Keywords:** Plecoptera, Nemouridae, *Lednia*, stoneflies, Wyoming, North America

## INTRODUCTION

The genus *Lednia* was recently revised for North America recognizing three extant species (Baumann and Kondratieff 2010). In addition, an extinct species, *Lednia zilli* Caruso and Wichard 2010 was named concurrently from the Baltic Amber. Thus, four species were recognized in a genus that had remained monotypic for over fifty years. *Lednia tumana* (Ricker 1952), the original species, was confirmed from Glacier National Park, Montana and Waterton Lakes National Park, Alberta. In addition, two females and several nymphs collected in Wyoming were listed as potentially belonging to *L. tumana* (Baumann and Kondratieff 2010). The Wyoming population was the object of additional collecting activity and finally in August 2011 a large series of male and female adults was obtained. This study is based on the Wyoming specimens and what they add to the understanding of this rare stonefly genus.

## MATERIALS AND METHODS

Specimens were studied using a Wild M-8 stereomicroscope and a Philips XL30 ESEM FEG electron microscope at Brigham Young University. The line drawing illustration was made from electron micrographs. Photographs of the collection locality were made using a Konica Minolta Di MAGE Z2 camera. Figure plates were produced at the Monte L. Bean Life Science Museum. Specimens listed are located at Brigham Young University, Provo, Utah (BYUC), Colorado State University, Fort Collins, Colorado (CSUC) and the personal collection of Ronald Call (RCPC) in Rexburg, Idaho.

## RESULTS AND DISCUSSION

### *Lednia tetonica* sp. n.

(Figs. 1-9)

*Lednia tumana*: Baumann and Kondratieff, 2010:316. (Distribution in part).

**Material examined.** Holotype ♂, USA: Wyoming, Teton County, South Fork, Darby Creek, Wind Cave, southeast of Driggs, Idaho, 27 August 2011, R.G. Call. Paratypes: Same locality and collector , 14 August 2008, 1♀ (BYUC); 11 July 2009, 2♀ (BYUC, RCPC); 27 August 2011, 22♂, 125♀ (BYUC, CSUC, RCPC). Larvae: Same locality and collector , 26 July 2010, 9 larvae (BYUC, RCPC). The holotype will be deposited at the United States National Museum, Smithsonian Institution, Washington, D. C.

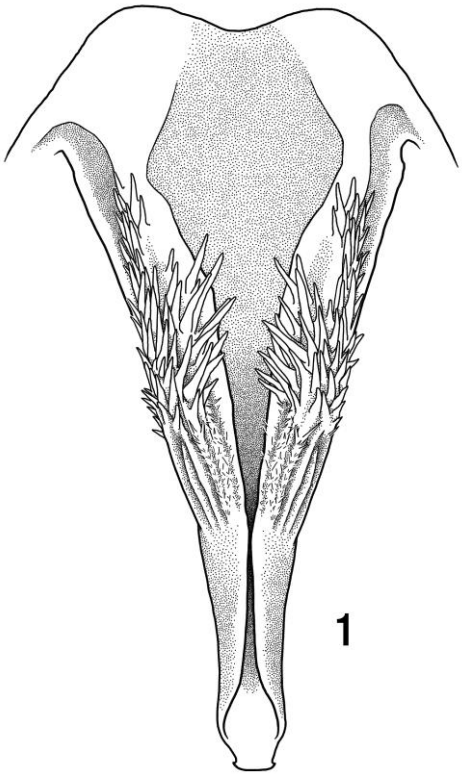


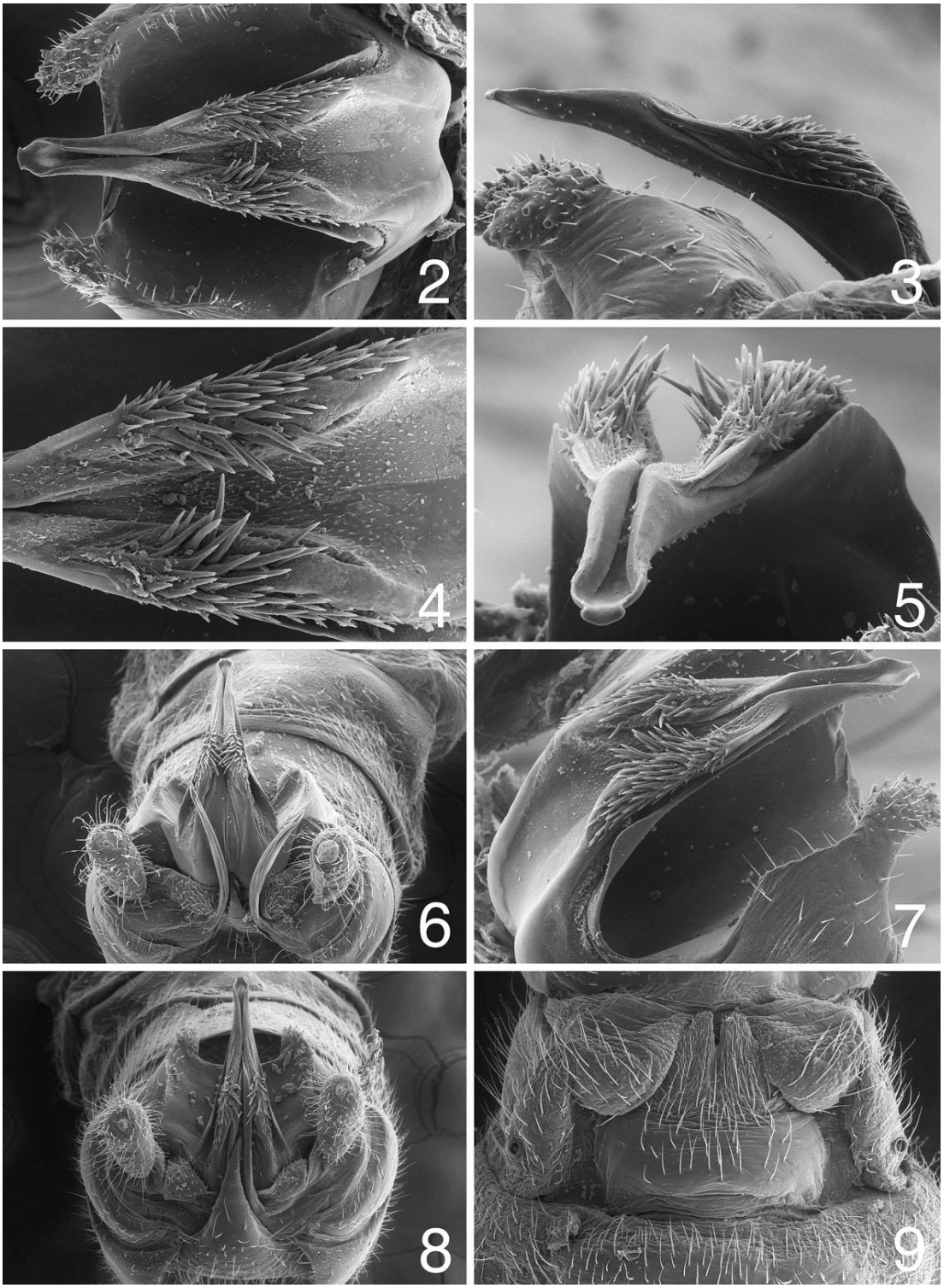

Fig. 1. *Lednia tetonica* male, epiproct, dorsal.

**Male.** Macropterous, wings hyaline, with darker veins near cord. Length of body 4.0-5.0 mm, color dark brown, anterior abdominal segments lightly sclerotized and lighter in color. Legs dark brown. Epiproct bilaterally symmetrical, with deep, median dorsal groove (Fig. 1); ventral sclerite thin, flat and darkly sclerotized, bearing scattered stout spines ventrally in apical third, basal-lateral margins shaped like small fans, apex extending beyond apical margin of dorsal sclerite, tip bluntly rounded with short triangular lateral points, appearing as a blunted arrowhead (Figs. 3, 5, 7); dorsal sclerite with broad bare base, terminating in paired rounded lobes, sclerite narrowing gradually towards apex, anterior dorsal surface bearing paired lateral patches of large backward directed spines, containing from 50-60 spines per patch, spine patches elongate and covering more than a third of the length of the sclerotized lateral margins, spines variable in size with longest spines located medially, few tiny hair-like spines present at anterior base of large spines (Figs. 2, 4, 5, 7). Hypoproct sclerotized, broad at base, tapering towards narrow apex, vesicle absent (Fig. 8). Paraprocts composed of two lobes, outer lobe broad and short, covered with numerous short hairs, inner lobes long and thin, curving outward along base of epiproct, tip sharply pointed (Figs. 6, 8). Tergum ten with broad dished out dorsal area nearly naked of spines, bearing large paired lateral projections, covered with short stout spines and numerous sensory pits, tips appearing as large mace-like structures, which border the apex of the epiproct (Figs. 3, 7).

**Female.** General color of body and wings similar to male. Length 5.0-6.0 mm. Sternum seven with broadly rounded lightly sclerotized lobe posteriormedially. Subgenital plate covering most of sternum eight, darkly sclerotized, bearing numerous long hairs medially, base broad, tapering to narrow rounded apex, which is often divided medially by a thin groove, tips of apex covered with short stout spines (Fig.9). Lateral posterior margins of sternum eight formed into large nearly rounded sclerotized lobes, which border the apex of the subgenital plate.

**Larva.** Gills absent. Length: mature male 4.5-5.5 mm, mature female 5.0-6.0 mm. Dorsal surface of body nearly naked of spines except at anterior margins of thoracic segments, abdominal terga with few spines except along posterior margin of terminal segment. Legs with few dorsal spines, occasional larger spines present on anterior margin of segments. Female larvae exhibiting large truncate lobe on dorsomedial margin of sternum eight. Cerci with whorls of short stout spines at posterior margins of segments, few intercalary spines present, most numerous on basal segments.

**Etymology.** The species name *L. tetonica* is derived from the fact that the specimens were collected from




Figs. 2-9. *Lednia tetonica* adult terminalia: 2. Male, epiproct, dorsal. 3. Male, epiproct, lateral and 10th tergal prongs. 4. Male, epiproct, dorsal, close up. 5. Male, epiproct, anterior. 6. Male, terminalia, posterior, relaxed. 7. Male, epiproct, dorsolateral and 10th tergal prong. 8. Male, terminalia, posterior, contracted. 9. Female, subgenital plate and terminalia.

a tributary of the Teton River, located in the Teton Mountains, Teton County, Wyoming.

**Diagnosis.** *Lednia tetonica* is most similar to *L. tumana* and *L. sierra* Baumann and Kondratieff. It differs mostly in the details of the epiproct. There are 70-80 spines in the spine patches on the dorsal surface of the epiproct in *L. tumana*. The spine patch number is 50-60 spines in *L. tetonica.* There are fewer than 40 spines in the patches of *L. sierra.* The spine patches are also found on different areas of the epiproct and they are shaped differently. *Lednia tumana* has the spines located only on the anterior half of the epiproct and they are confined to elongate oval patches, the spines are found further back toward the base of the epiproct in the other two species. *Lednia tetonica* has most of the spines attached near the middle of the epiproct, with only a few located on the lateral margins, which extend toward the epiproct base. *Lednia sierra* has fewer spines medially while most of the spines are on the margins and extend well back toward the base. The spines are smaller and all about the same size in *L. tumana*, while they vary in size in the other species. A patch of large spines is located close to the midline in *L. tetonica* with fewer small spines covering the edges. In *L. sierra*, there are a few large spines near the midline but many smaller spines extend along the midline from the middle to near the base of the epiproct. The shape of the epiproct also differs between species. Dorsally, the epiproct in *L. tumana* is stouter in shape with a shorter apex. Both *L. tetonica* and *L. sierra* exhibit a long, narrow epiproct with an elongate tip which is more deeply grooved in *L. sierra.* The females are very similar and cannot be separated at this time without associated males.

**Remarks.** The South Fork of Darby Creek is an excellent stonefly habitat and the following species were found between the cave and the confluence with Darby Creek. Collections were made during the summer months of June-August, while searching for the elusive *Lednia.*

*Zapada cinctipes* (Banks)
*Zapada columbiana* Claassen
*Zapada haysi* (Ricker)
*Capnia nana* Claassen
*Capnia petila* Jewett
*Paraleuctra jewetti* Nebeker & Gaufin
*Paraleuctra projecta* (Frison)
*Perlomyia collaris* Banks
*Pomoleuctra purcellana* (Neave)
*Isoperla sobria* (Hagen)
*Megarcys signata* (Hagen)
*Alloperla serrata* Needham & Claassen
*Plumiperla diversa* (Frison)
*Sweltsa borealis* (Banks)
*Sweltsa fidelis* (Banks)

**Discussion.** The Teton Mountain Range lies along the border of Wyoming and Idaho southwest of Grand Teton and Yellowstone National Parks. The Teton Mountains are geologically young, beginning to form about ten million years ago (Crammerer 1937). Varied geological forces including earthquakes, uplifts and volcanism from the Yellowstone Hotspot, and glacial advances and retreats have made the Tetons a unique area (Smith and Siegel 2000). Six peaks reach an elevation greater than 12,000 feet (3,657 m), the highest of which is the Grand Teton at 13,770 feet (4,200 m). These mountains are popular for mountain climbing, back packing, hiking, horseback riding, camping, and skiing. Darby Canyon and the Wind Cave are within the Jedediah Smith Wilderness Area of the Caribou-Targhee National Forest, along the western edge of the Teton Range. Although Darby Canyon is located in Wyoming, the only road to access the canyon is from Idaho on the western side of the mountains. Geologically, Darby Canyon cuts through the Lodgepole formation, part of the Madison Limestone formation. The rocks are from the early Mississippian period. Fossils of corals and other marine organisms occur throughout the canyon. The forest is primarily lodgepole pine with other conifers, some aspen, and mixed deciduous trees. Wildflowers of many species are abundant. Wind Cave is at the end of Darby Canyon at an elevation of about 9,000 feet (2743 m). The opening to the Wind Cave is about 120 feet (36 m) high by about 40 feet (12 meters) wide. The rock walls and floor are jagged chunks of limestone that have fallen from the ceiling. Water percolates down from the melting snowpack on the top of the mountain giving rise to a stream that flows from the mouth of the cave. Within 15 or 20 feet (5 or 6 m) inside the cave, the stream no longer flows over the tops of the rocks, but can be heard flowing beneath


Fig. 10. Wind Cave in winter.


Fig. 11. Wind Cave Valley and waterfall.


Fig. 12. Wind Cave in summer.


Fig. 13. Wind Cave at mouth.

the rocks, as an underground stream. Deep inside the cave, the temperature is low enough to maintain year-round ice. The cave connects to another opening about one-half mile (0.8 km) away on the same side of the mountain called the Ice Cave. About 300 feet (90 m) downstream from Wind Cave, the stream drops over a waterfall about 70 feet (20 m) high then continues to flow down Darby Canyon as part of the South Fork of Darby Creek.

The first *Lednia* specimen found in Darby Canyon, a female, was fortuitously collected by one of the authors (Ron Call), while hiking with his family. Three years after discovering the first female *Lednia* specimen, and after many unsuccessful collecting trips, adults were found inside the cave. They were abundant inside the cave but were not collected outside. This species may be a troglophile because of its cavernicolous life style. Cave dwelling Plecoptera species have been found previously in Europe in studies such as Sivec (1979) and Tierno de Figueroa and Lopez-Rodriguez (2010). Finding *Lednia* at this location highlights several important points: First, that this genus is likely more widespread than recently believed. Second, it was finally only successfully collected after years of work, reminding us that it is important to remember that lack of data does not make for sound conclusions about species distribution. Species often exist in an area but have eluded collection because of the difficulty in getting to remote areas, or with problems gaining access to the habitat during the adult emergence period. So, if the new species emerged then, it would have been impossible to access the cave during the winter or early spring and it would probably still not have been discovered. Third, finding this species in a remote, backcountry, high elevation area illustrates the importance of collecting in special difficult to reach areas. A study of the greater Teton-Yellowstone region, particularly remote, back-country habitats, would be useful and could provide a much clearer picture about the distribution of this and other rare stonefly species.

## ACKNOWLEDGEMENTS

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