



## THE LARVA OF *PARACAPNIA DISALA* (JEWETT) (PLECOPTERA: CAPNIIDAE)

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### ABSTRACT

The larva of *Paracapnia disala* (Jewett) was associated from two first order headwater streams in the H.J. Andrews Experimental Forest, Oregon, U.S.A. Larvae of this first western *Paracapnia* species to be associated, were studied and compared morphologically with those of the eastern *Paracapnia angulata* Hanson to determine if it conforms with proposed generic characters and if it has specific diagnostic characters. Habitus and character drawings and SEM's of *P. disala* and *P. angulata* larval mouthparts are presented. Wingpad presence/absence and ventral lacinial comb hair differences between the two species are diagnostic.

**Keywords:** Plecoptera, Capniidae, *Paracapnia*, larvae

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### INTRODUCTION

The work of Stewart & Stark (1988, 2002) established the generic level benchmark for larval morphology, identification and biology of the 104 North American stonefly genera. Their proposed generic characters, illustrations and keys to larvae were based on the few genotypes or other congener species that had been associated, and they encouraged further species associations and descriptions to test proposed generic characters and increase taxonomic resolution, where possible, within genera.

The ideal goal to eventually develop diagnostic illustrated keys to larvae of all species may prove to be problematic (Stewart 2009), since as Zwick (2004) pointed out, adults in most genera can be identified to species only by genital characters making it likely that less morphological resolution can be anticipated in immatures. The few studies describing the nymphs of all or a few species within selected North American genera were reviewed by Stewart & Stark (2002) and Stewart (2009). Only in the genera *Strophopteryx* (Earle & Stewart 2008), *Taenionema* (Stewart 2009), *Taeniopteryx* (Fullington & Stewart 1987, with the larva of *T. nelsoni* later added by

Kondratieff & Kirchner 1982), *Isogenoides* (Sandberg & Stewart 2005), and *Setvena* (Stewart & Stanger 1985) have whole genera been studied, leading to diagnostic illustrated keys. Other larval studies have dealt with individual or a few species within genera.

The capniid genus *Paracapnia* contains four Asian species and an additional six Nearctic species, two in eastern North America, and four western (Stark et al. 2009). A revision of the Nearctic members of the genus (Stark & Baumann 2004) and addition of the new species *Paracapnia humbolta* (Baumann & Lee 2007) were based on adult characters. Larvae of only the eastern species *P. angulata* Hanson have been described and illustrated in detail (Stewart & Stark 1988, 2002), and *P. opis* (Newman) partially described (Hardin & Mickel 1952; Harper & Hynes 1971). Larvae of *P. disala* (Jewett) and the other three western species have remained unknown until this report. The objective of this study was to describe and illustrate the field associated larvae of *P. disala* and compare them with those of *P. angulata* to determine if they fit with the proposed generic characters of Stewart & Stark (2002) and possibly possess specific, different characters.

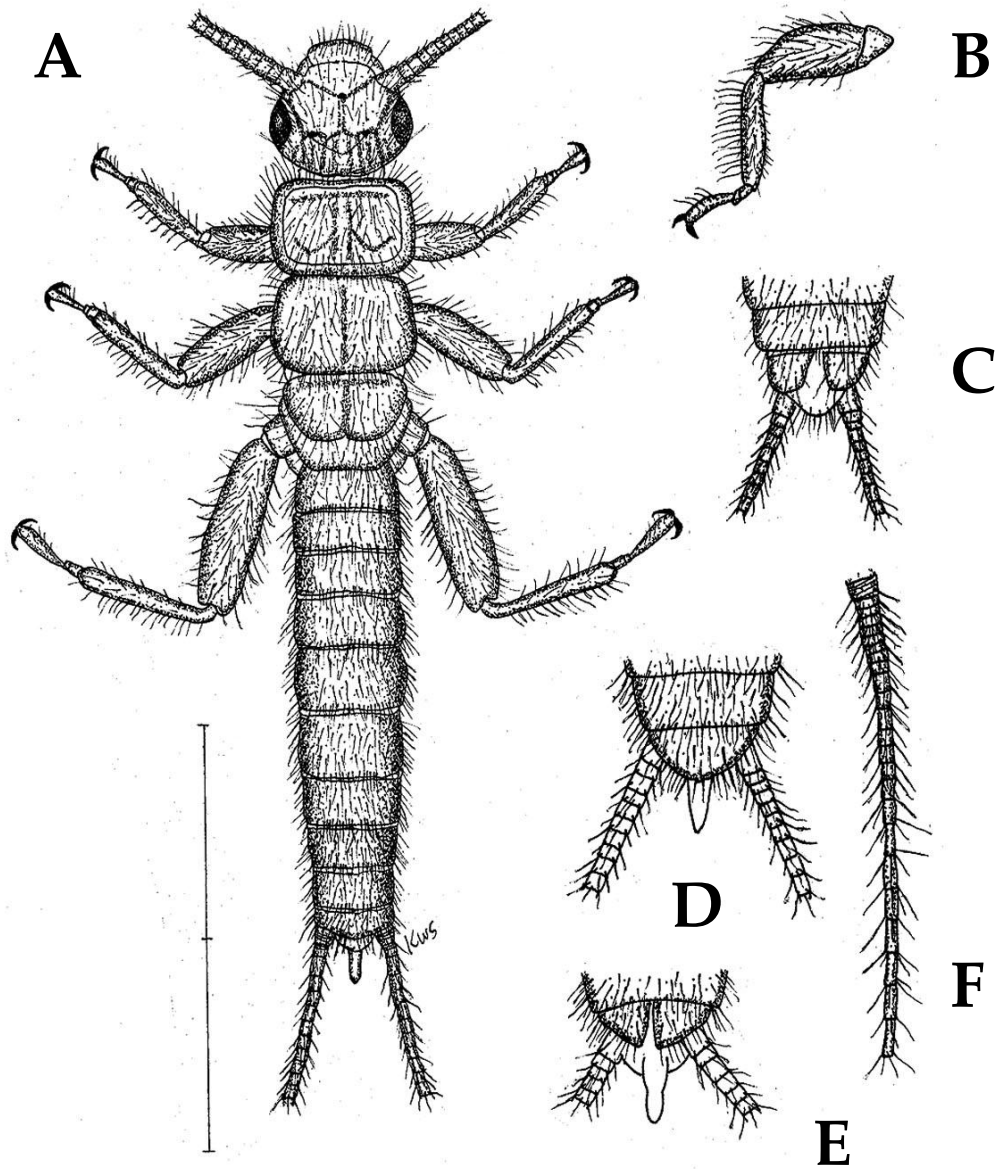


Fig. 1. *P. disala*. A. habitus, B. right front leg, dorsal, C. female terminalia, ventral, D. male terminalia , dorsal, E. male terminalia, ventral, F. male right cercus, lateral (first 28 segments).

## MATERIALS AND METHODS

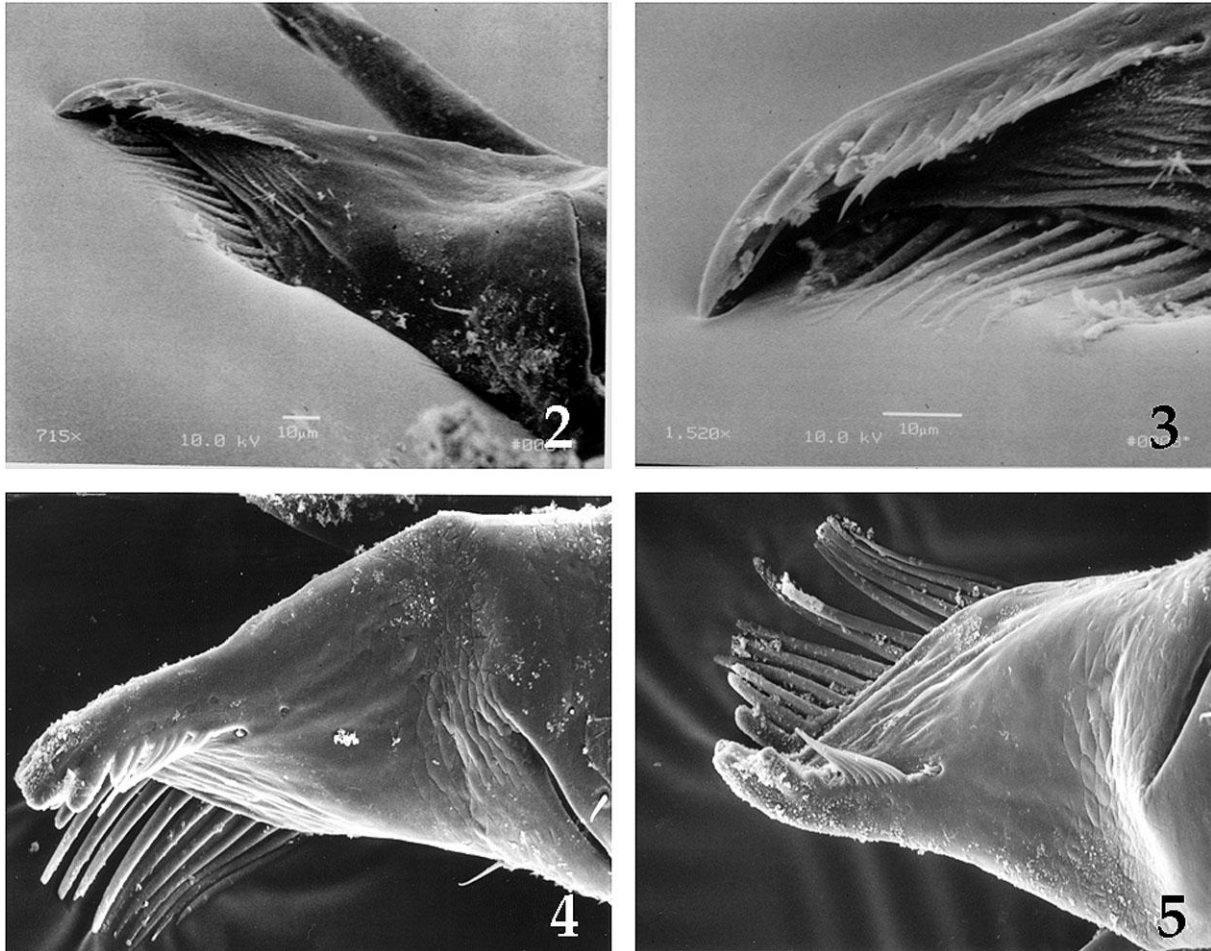
Adult males and females and associated larvae of *P. disala* were collected by Charles Frady in 2003 and 2004 in two of the uppermost, 1<sup>st</sup> order headwaters of the McRae Creek drainage in the H.J. Andrews Experimental Forest, Oregon, 5 km north of 44.2°N and at approximately 122.2°W. These two headwater streams originate in small, approximately 10-12 ha

basins designated as WS-7 and WS-8 in young growth of the experimental forest. Adults were apterous, as reported for all western *Paracapnia* species by Stark & Baumann (2004).

Adults and larvae were preserved in 80% ETOH and studied and drawn using a Wild M-5 stereomicroscope with a Wild Drawing Attachment. Scanning electron micrographs of mouthparts were

taken of *P. angulata* from East Fork of Stony Fork of Reed Creek, Wythe County, Virginia (same data as Fig. 7.17 Stewart & Stark 2002), and *P. disala* (from the WS-7 and WS-8 locations above) by Bill Stark generally using procedures outlined by Stark & Stewart (2005). The mouthparts of both species were too fragile to sonicate, so SEM's show some adhering small particulate matter.

**Material examined.** Oregon: Lane County, 1<sup>st</sup> order tributaries of McRae Creek (WS-7, WS-8), H.J. Andrews Experimental Forest, approximately 5 km north of N44.2° and at approximately W122.2°, 6♂ larvae, 4♀ larvae, 30-XI-2003, Charles Frady; 2♂, 1♀, 13-III-2004, Charles Frady; 7♂, 1♀, 11-IV-04, Charles Frady.



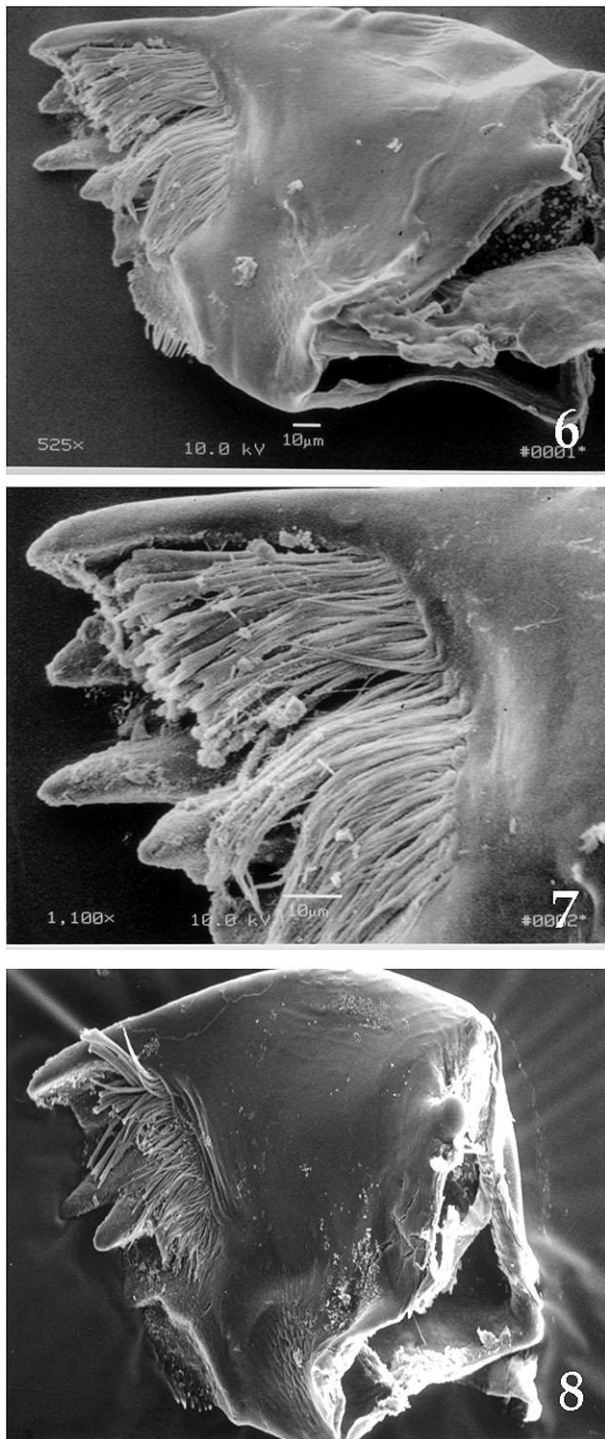
Figs. 2-5. *P. disala*. 2. left lacinia, ventral (715 X), 3. left lacinia, ventral closeup (1520X), *P. angulata*. 4. left lacinia, ventral (1000X), 5. right lacinia, ventral (1,000X).

## RESULTS AND DISCUSSION

***P. disala* larval morphology.** Body small, hairy, male 4-4.5 mm, female 5-5.5 mm. Head and pronotum with faint, darker pattern (Fig. 1A). Antennal segments 44-46. Lacinia palmate, with long, stout apical teeth, long dorsal and ventral combs of 12-14 long bristles, and

striated palm surface devoid of hairs (Figs. 2-3). Left mandible with 4 major unserrated apical teeth, inner molar pad with small, short marginal comb of about 10 teeth, and a large palmate brush of many long bristly hairs (Figs. 6-7). Pronotum rectangular with complete marginal fringe of long hairs (Fig. 1A). Apterous (wingpads absent) (Fig. 1A), reflecting condition of





Figs. 6-8. *P. disala*. 6. left mandible, ventral (525X). 7. left mandible, ventral closeup (1100X). *P. angulata*. 8. left mandible (500X).

adults (Stark & Baumann 2004). Femora clothed with long bristly hairs, tibia clothed with hairs and with an outer fringe of long hairs (Fig. 1B). Abdominal segments clothed with numerous hairs, and with distinct posterior tergal hair fringe (Fig. 1A). Sexual dimorphism evident; male 10<sup>th</sup> tergum with a tubular process (Fig. 1D, E), female 10<sup>th</sup> tergum without a process (Fig. 1C). Cercal segments more than 28 (tips broken off on all available larvae), with apical circle of bristles and no intercalary hairs or bristles (Fig. 1F).

**Generic and species diagnoses.** The generic diagnosis of a bristly (hairy) body separating *Paracapnia* larvae from those of the other capniid genera (Stewart & Stark 1988, 2002) is upheld by this study of *P. disala*, but their mention and illustration of “a few short intercalary bristles” on the cercal segments of *P. angulata* was incorrect. I have reexamined their *P. angulata* larval material from Wythe County Virginia, and specimens from Wisconsin and West Virginia, and there are no intercalary hairs present on cercal segments, as is also the case with *P. disala* (Fig. 1F); therefore, absence of cercal intercalary hairs is the current generic interpretation for *Paracapnia*.

There is interesting species difference between larvae of the eastern *P. angulata* and western *P. disala*. Those of *P. angulata* have macropterous wingpads, and the lacinia bears a short ventral comb of 6 or 7 medium length bristles (Figs. 4-5), whereas those of *P. disala* are apterous, with no wingpads (Fig. 1A), and the lacinia bears a long ventral comb of 12-14 long bristles (Figs. 2-3). The mandibles of both species are similar in teeth, molar pad, and brush of long, bristly hairs in the palm (Figs. 6-8). It will be interesting in future study of the larvae of *Paracapnia opis* and those of the three other western *Paracapnia* species to see if the same east-west wingpad condition/lacinial differences hold.

## ACKNOWLEDGMENTS

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