

DESCRIPTION OF THE LARVA OF THRAULODES *CENTRALIS*
(EPHEMEROPTERA: LEPTOPHLEBIIDAE, THRAULODES)

An Undergraduate Research Scholars Thesis

by

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ABSTRACT

Description of the Larva of *Thraulodes centralis*. (May 2014)

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The genus *Thraulodes* (Ephemeroptera: Leptophlebiidae) is a diversity and widely distributed genus throughout aquatic streams in Central America. Although very diverse with over 50 species in the genus, most species have been described based upon the adult stage. The majority of species are unknown or undescribed from the larval stage. The purpose of this project is to describe, in detail, the larval stage of *Thraulodes centralis* based upon field associated rearings. This association will improve our understanding of the taxonomy of the group and allow ecologists to more readily identify species in streams they encounter during ecological studies.

CHAPTER I

INTRODUCTION

The genus *Thraulodes* was established by Ulmer (1920) based upon an adult collected from Columbia and described as *Thralus laetus* by Eaton (1883). The genus is distributed primarily in South and Central America, with the northernmost species in the southwestern United States (Nieto and Dominguez 2001). *Thraulodes* contains over 50 species (Nieto and Dominguez 2001) with several new species described over the last ten years (Goncalves et al., 2013), (Goncalves et al., 2010), (Lima et al., 2013). This genus represents an important aspect of benthos and of nutrient flow in aquatic systems (Nieto and Dominguez 2001). Often specimens are captured during mating emergence and only the adults are identified.

The adults were revised by Traver and Edmunds (1967), and the larvae by Allen and Brusca (1978). While both revisions attempted to split the genus into two distinctive groups based on genitalia and gill structure, both disagreed (Lopes et al., 2003). The purpose of this paper is to describe the larval stage of *Thraulodes centralis* (Traver, 1945) based upon reared specimens collected in Costa Rica in 2011. This newly described larval stage will be compared and contrasted with other known described larvae. The terms used for this larval description follow Allen and Brusca (1978).

CHAPTER II

MATERIALS AND METHODS

Thraulodes centralis larvae were captured using kick nets and forceps in streams. They were then preserved in 70% ethyl alcohol or kept alive to emerge into adult form for species identification. Legs, gills, and mouthparts were dissected from the body and mounted on slides for image capture and describing. An AmScope MU 1000 camera with an Amscope dissecting microscope, an AmScope MU 900 camera with an AmScope compound microscope, and AmScope MU series digital camera solution version 3.2 software was used for specimen dissection and image capture. Collection information is given with longitude and latitude coordinates in degrees, minutes, seconds as determined by a Garmin hand-held global positioning system. All measurements were made with an optical micrometer used on the AmScope dissecting microscope.

CHAPTER III

DESCRIPTION

Thraulodes Centralis Travers

Mature Larvae. Body length 8-12mm; caudal filaments 10-15mm. Body dorsoventrally flattened. General color light tan with dark brown to black maculae. Head: Pale tan with variable dark brown to black maculae; Compound eyes small and widely separated; three ocelli present; antennae 2-4mm. Mouthparts: Labrum (Fig. 1) dorsally with numerous acuminate setae along the anterior edge; dorsal width subequal to clypeus; width more than three times length. Planate (right) mandible (Fig. 2) outer incisor 3 lobed, mostly fused; fine elongate setae along the proximal edge from the outer incisor to the basal part of the mandible; inner incisor two lobed, mostly fused; kinetodontium and prosthema present with setae projecting towards molar region. Angulate (left) mandible (Fig. 3) outer incisor 3 lobed; fine elongate setae along the proximal edge from the outer incisor to the basal part of the mandible; inner incisor three lobed; kinetodontium and prosthema present with setae projecting towards molar region. Hypopharynx (Fig. 4): lingua in a rounded "W" shape; numerous acuminate setae on anterior margin; superlinguae with long setae on anterior margin. Maxilla (Fig. 5): outer margin with long fine bristles; outer basal surface margin with short spines; inner subbasal margin with elongate fine setae that increase in length towards the base; palp medial and basal sections similar in length with apical section near three quarters in length of these. Labium (Fig. 6): Palpi with similar basal and medial segment length; basal width greater than twice that of medial width at some points; apical segment between one fourth and one fifth of the length basal and medial segments; basal segment with spine like setae on the posterior margin; medial segment with fine setae on the margin near the apical segment; paraglossa ovular and significantly larger than glossa with

fine elongated setae along the anterior margin; glossa rounded and mostly fused with fine elongate setae on the anterior margin. Thorax: pale tan with dark brown maculae; forewing pads touching or almost touching to form a hemispherical shape; forewing width is sub equal to length; hindwing pads are touching and the length is three or four times the width. Coxa (Fig. 7) with fine setae on anterior margin. Femora light tan to dark brown; tibiae and tarsi light tan to dark brown. Femur with both elongate and acuminate setae along anterior margin; spines are dispersed across the whole femur; posterior row of spines; length approximately twice the width. Tibia: anterior edge lined with elongate setae; setae are interspersed with spines on the anterior edge. Setae at the junction between the tibia and tarsi. Tarsi with elongate setae interspersed with spines on the anterior margin. Claw (Fig. 8 and 9) with eight to ten denticles; the most apical denticle is shortened and appears jagged or broken. Abdomen (Fig. 10) is light tan with dark brown maculae; coloration and pattern are defined by segment; terga 1-3 are a solid brown coloration with a pale spot on each distal edge; terga 4-5 have dark brown upside-down U patterns leaving them mostly pale; terga 6-7 are similar to 1-3 with dark brown covering the whole tergum except for a pale spot on each distal side; tergum 10 contains a U pattern similar to terga 4-5; however this U is not upside-down and the posterior margin has more brown that extends up into the vertex of the U; terga 8,9, and 10 form a pale large spot like structure together. Gills: dark brown to black coloration; length .75-1.5mm; attached at the front of the abdominal segment, not fringed.

CHAPTER IV

CONCLUSION

Thraulodes centralis commonly appears in streams throughout much of Central America. This formal description will now allow ecologists to accurately identify the species in aquatic samples. The distinctive abdominal color pattern is unique among all known species of *Thraulodes* described from the larval stage in Central America. The jagged most apical denticle on the tarsal claws is also a defining feature for this species. Whether this description is used for water quality research, energy flow research, or taxonomic purposes, it improves our understanding of the genus *Thraulodes* in Central America.

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APPENDIX

Figure 1. Labrum



Figure 2. Right Mandible



Figure 3. Left Mandible



Figure 4. Hypopharynx

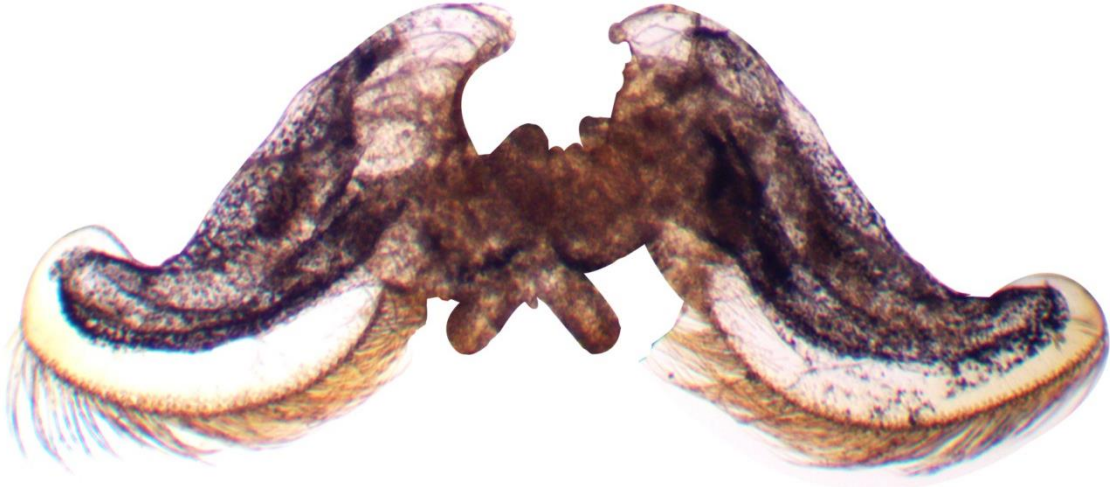


Figure 5. Left Maxillae



Figure 6. Labium



Figure 7A. Right Foreleg

Figure 7B. Right Mesoleg

Figure 7C. Right Metaleg



Figure 8. Right Claw (Side view)



Figure 9. Right Claw (Top View)



Figure 10. Body

