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# NOTES ON *CLAUDIOPERLA TIGRINA* (KLAPÁLEK) IN ECUADOR (PLECOPTERA: GRIPOPTERYGIDAE)

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**ABSTRACT**

The first adult specimens of *Claudioperla* from the Republic of Ecuador are described from light and scanning electron microscopy. Males are compared with existing descriptions of the only currently accepted species, *C. tigrina* (Klapálek), and the known Ecuadorian distribution is summarized.

**Keywords:** *Claudioperla*, Gripopterygidae, Plecoptera, Republic of Ecuador, new records

## INTRODUCTION

*Claudioperla* Illies 1963, is presently considered a monotypic genus of gripopterygid stoneflies known from scattered Andean sites extending from the Republic of Colombia to the Republic of Chile (Stark et al. 2009). Illies (1963) provided the definitive study of *Claudioperla tigrina* (Klapálek 1904) with a generic diagnosis and description of the larva. He also placed *Gripopteryx enderleini* Froehlich 1960, as a synonym and referred to Froehlich (1960) for additional details and figures of adult genitalia. The sample available to Illies included adult specimens from six Peruvian localities and larvae from the Republic of Chile, the Pluranational state of Bolivia and the Republic of Peru.

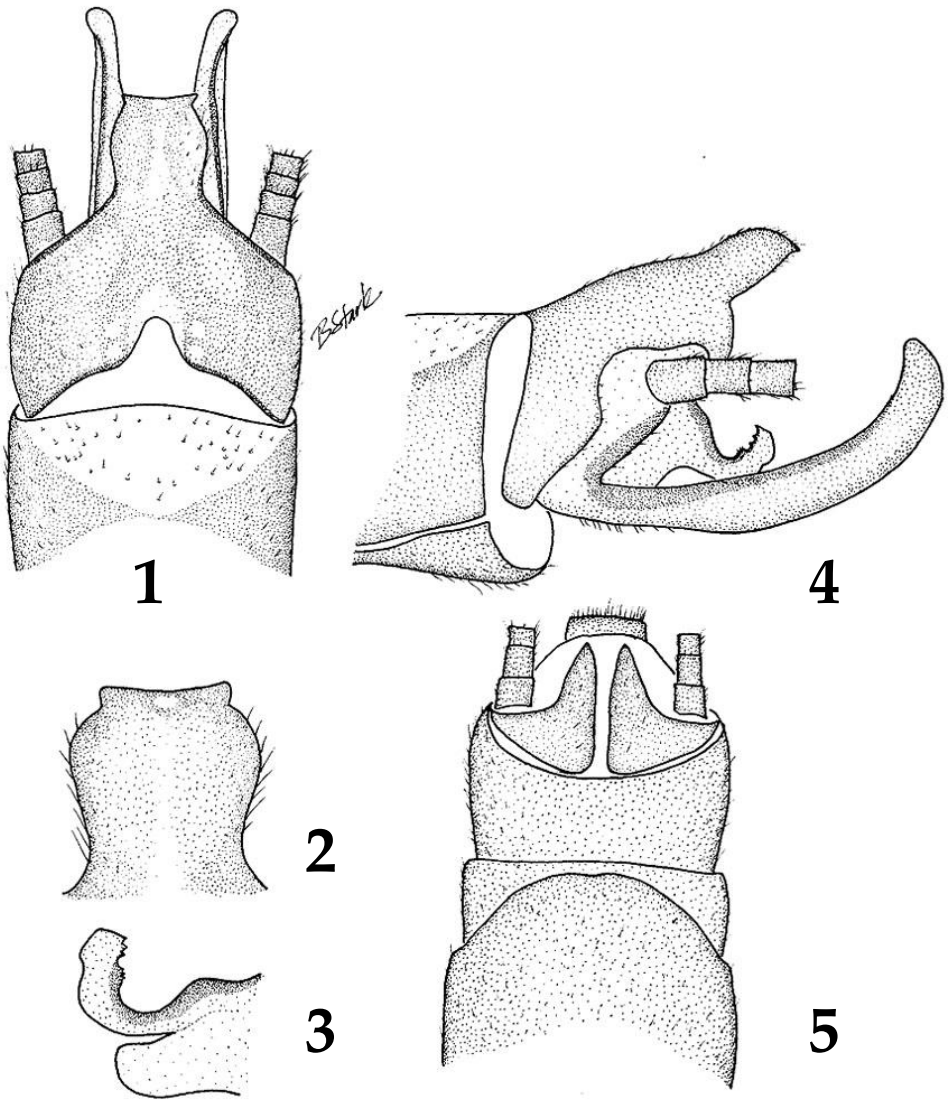
The few reports from the Republic of Ecuador were based solely on larval specimens. Turcotte & Harper (1982a) found *Claudioperla* larvae in drift samples taken from a site "approximately 20 km northwest of the city of Cuenca [Azuay Province] in the republic of Ecuador"; later Turcotte & Harper (1982b) referred this record to *C. tigrina*, presumably on the basis of additional larval specimens collected in benthic samples from the same stream. More recently, Jacobsen & Encalada (1998) found eleven *Claudioperla* larvae at four of eight Ecuadorian sites they sampled near Quito in Pichincha Province (Río Blanco, Río Cinto, Río Pichán, Río San José). Recently, the genus has been found among samples of adults and larvae from the Republic of Colombia (Barreto-Vargas et al. 2005; Zúñiga et al. 2009).

The present study, based on 54 males, 33 females and 3 larvae collected from 17 sites in Chimborazo, Cotopaxi, Napo and Pichincha provinces, Republic of Ecuador appear to represent a single species near, and perhaps conspecific with *C. tigrina*. Because the holotype of *C. tigrina* is lost (C. Froehlich pers. comm.), and the holotype of *C. enderleini* is also missing (V. Lee pers. comm.), no nomenclatural changes are proposed despite the appearance of

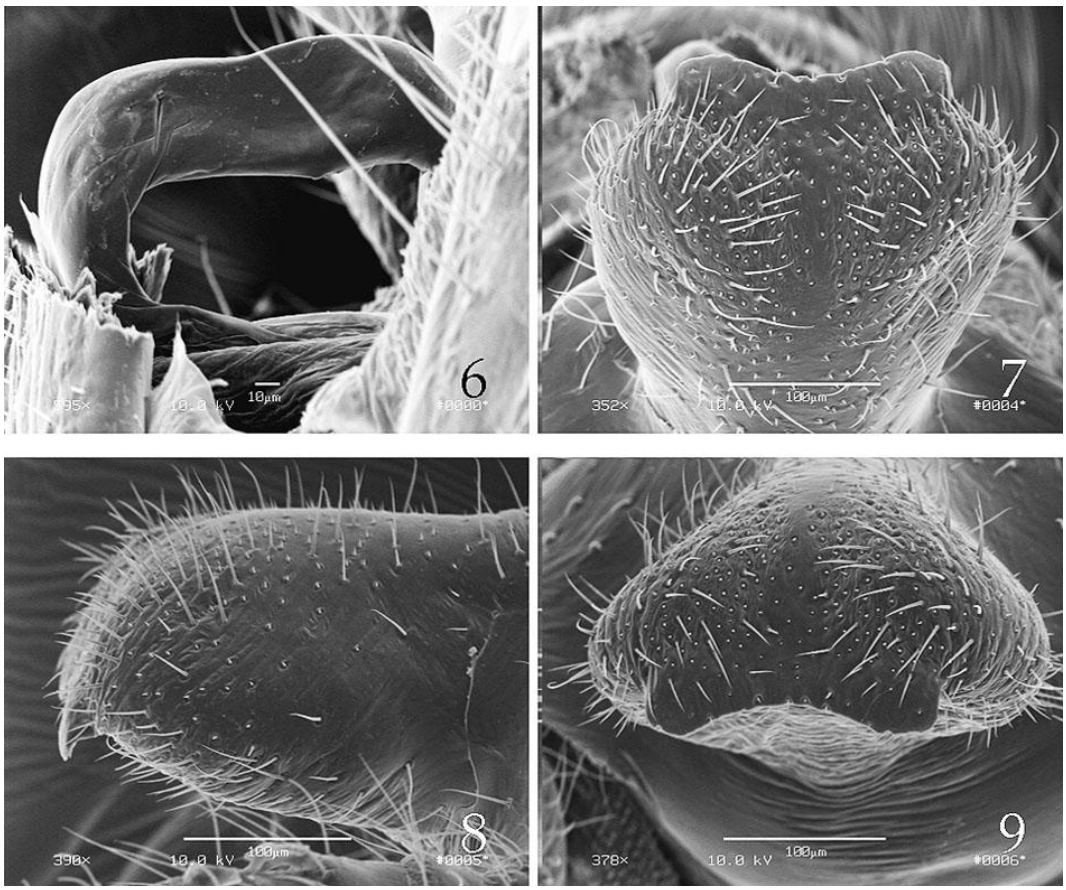
variation between our figures of Ecuadorian specimens and the Peruvian holotypes illustrated by Klapálek (1904) and Froehlich (1960), respectively. We are hopeful that our descriptions of these Ecuadorian specimens will provide a basis for comparison of Colombian specimens being studied by colleagues, but an effort should be made to acquire Peruvian topotypic material for *C. enderleini* and *C. tigrina* before new taxa are proposed.

## MATERIAL AND METHODS

Terminal abdominal segments of adult specimens were clipped, placed in 10% KOH and brought to a boil for a few seconds, rinsed in distilled $H_2O$ and examined with an Olympus SZH10 dissecting microscope, or with a Wild M5A dissecting microscope. Terminalia of specimens selected for scanning electron microscopy study were sonicated for 15 seconds to remove debris, and the right cercus




Figs. 1-5. *Claudioperla tigrina* genitalic structures. 1. Male terminalia, dorsal. 2. Male process of tergum 10, dorsal. 3. Male epiproct, lateral. 4. Male terminalia, lateral. 5. Female terminalia, ventral.




Figs. 6-9. Scanning electron micrographs of *Claudioperla tigrina* male genitalic structures. 6. Epiproct, lateral, apex concealed, paraprocts removed. 7. Tergum 10 process, dorsal. 8. Tergum 10 process, lateral. 9. Apex of tergum 10 process, caudal.

and paraproct were removed. Specimens were then dehydrated through a series of 90%, 95% and 100% ethanol for 10 minutes in each solution and placed in Hexamethyldisilizane for 30 minutes. Dehydrated specimens were mounted on stubs with double stick copper tape coated with gold-palladium in a Hummer sputter coater and examined with an Amray 1810 scanning electron microscope.

Specimens used in this study are deposited in the United States National Museum of Natural History, Washington (USNM), the Royal Ontario Museum, Toronto, Ontario (ROM), and in the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado (CSUC).

## RESULTS AND DISCUSSION

### *Claudioperla tigrina* (Klapálek)

(Figs. 1-9)

*Gripopteryx tigrina* Klapálek 1904:11. Holotype ♂ (Hamburg), Callonga, Republic of Peru, apparently lost (Froehlich, i.l.)

*Gripopteryx enderleini* Froehlich 1960:4. Holotype ♂ (California Academy of Sciences), 60 km N Puno, Republic of Peru, missing (Lee, i.l.), syn. Illies, 1963

**Material examined. Republic of Ecuador:** Chimborazo Province, near La Magdalena, 10,425


Figs. 10-13. *Claudioperla* habitat, Republic of Ecuador, Napo Province. 10. Tributary of Oyacachi River, Hwy E20, 2.4 miles W Oyacachi, - 0.385893°, -78.143530°, February 2012. 11. Tributary of Papallacta River, Hwy E20, 12.11 km NW Papallacta, - 0.346555°, - 78.199776°, January 2012. 12. Tributary of Papallacta River, Park road 3.5 miles N of Papallacta, - 0.332655°, - 78.147178°, January 2012. 13. General features of area near Volcán Antisana where collections were made in 2012.

feet, 11 May 1976, Langley, 1 larva (USNM). Cotopaxi Province, 34 km W Pujili, 3650 m, 15 January 1978, P.J. Spangler, J. Anderson, 1 larva (USNM). Napo Province, 4 km W Papallacta, 3220 m, 18 January 1978, P.J. Spangler, J. Anderson, 1♂, 1 larva (USNM). Napo Province, 12.11 km NW Papallacta, Hwy E20, 3900 m, 17 January 2012, B.C. Kondratieff, B. Gill, 1♂ (CSUC). Napo Province, 2.73 km SW Papallacta, Hwy E20, 25 January 2012, 3296 m, B.C. Kondratieff, B. Gill, 3♂, 3♀ (CSUC). Napo Province, Jatunhuayen Stream, E Volcán Antisana, 3911 m, 28 January 2012, B.C. Kondratieff, B. Gill, 17♂, 3♀ (CSUC). Napo Province, Micahuayon Stream, 3982 m, 27 January 2012, B.C. Kondratieff, B. Gill, 3♂, 2♀ (CSUC). Napo Province, spring, Humboldt Home near Volcán Antisana, 28 January 2012, B.C. Kondratieff, B. Gill, 9♂, 9♀ (CSUC). Napo Province, tributary Oyacachi River, ca. 2.4 miles W Oyacachi, 25 February 2012, B. Gill, 16♂, 8♀ (CSUC). Napo Province, tributary Rio Oyacachi, about 2.5 miles E Oyacachi, 25 February 2012, B. Gill, 1♀ (CSUC). Napo Province, tributary Río Papallacta, park road between Papallacta and Oyacachi, 4 mi N Papallacta, 6 March 2012, B. Gill, 1♀ (CSUC). Napo Province, tributary Río Papallacta, park road between Papallacta and Oyacachi, 3.6 miles N Papallacta, 6 March 2012, B. Gill, 1♂, 1♀. Napo Province, tributary Río Papallacta, park road between Papallacta and Oyacachi, 3.5 miles N Papallacta, 20 January 2012, B.C. Kondratieff, B. Gill, 1♂ (CSUC). Napo Province, Paso de Guamani, stream in Paramo E of Quito, 12,500', 19 May 1982, H. Frania, 2♀ (ROM). Pichincha Province, 20.5 km E Pifo, 3700 m, 26-28 September 1990, O.S. Flint, 2♂, 2♀ (USNM). Pichincha Province, 7 km E Pifo, 2950 m, 26-28 September 1990, O.S. Flint, 12 larvae (USNM). Pichincha Province, 41 km E Quito, 11,250 feet, 15 May 1975, Spangler, Langley, Cohen, 1♀ (USNM).

**Male.** Forewing length 7-9 mm. Forewings patterned with diffuse brown spots. Tergum 10 terminal process ca. 300 μm long, narrow at base (ca. 310 μm), wider subapically (ca. 380 μm) and narrowed at the apex; apex of process almost truncate with lateral margins forming a blunt thorn-like, downturned point (Figs. 1-2, 4, 7-9). Epiproct curved upward forming a U-shaped configuration, sclerotized along anterior margin, ca. 33 μm wide at apex, and membranous along posterior margin and apex; projecting portion with a narrow subapical notch visible in lateral aspect; anterior margin with ca. 4 inconspicuous teeth clustered near apex and ca. 3 smaller ones set on a low mound proximal to apex (Figs. 3-4, 6). Paraprocts scythe shaped, darkly sclerotized along dorsal margin; apex bluntly rounded (Figs. 1, 4).

**Female.** Forewing length 11 mm. Subgenital plate covers most of sternum 9; posterior margin slightly emarginate mesally (Fig. 5). Paraprocts typically straight at apex, but twisted in one specimen.

**Comments.** Males from our material are similar to *C. tigrina* (Froehlich 1960, as *G. enderleini*) but the epiproct in lateral aspect is truncate at the apex, notched subapically and armed along the anterior margin with a few small teeth. These features are apparent in Figs. 3-4, drawn from light microscopy, however it was difficult to obtain clear evidence of these teeth in the SEM images (Fig. 6). The process of tergum 10 is less constricted at the base, and bears a narrow tab-like apex without the apparent concavity shown in Froehlich's (1960) figure; the process appears shorter and more expanded subapically than the structure illustrated by Klapálek (1904). These subtleties require the examination of specimens from throughout the reported range of *Claudioperla* before these populations can be considered specifically distinct. One female from 41 km E Quito appears distinct by virtue of twisted paraproct apices, but this may represent individual variation.

*Claudioperla* specimens are now known from 22 Ecuadorian localities representing the provinces of Azuay, Chimborazo, Cotopaxi, Napo and Pichincha. All sites where the elevation is known are at 2,900 m or higher, and enter the Río Esmeraldas drainage basin, or headwaters of Río Quijo which enter the Río Amazonas basin. Adult specimens are typically collected from shrubby páramo vegetation and grasses adjacent to stream riffles (Figs. 10-13). Often adults are found deep among both dead and live plants, or in sheltered areas under the stream bank close to the water surface. Adults of *Claudioperla* are easily collected using a beating sheet, but are apparently not attracted to light traps (Zúñiga et al. 2009).

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