Leydigia (Neoleydigia) cf. striata Birabén, 1939 (Crustacea: Cladocera: Chydoridae) from Colombia and its differentiation from L. (N.) cf. ipojucae (Brehm, 1938)

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ABSTRACT - This paper concerns the chydorid cladoceran Leydigia (Neoleydigia) cf. striata Birabén, 1939 in plankton samples from Ciénaga El Convento, Colombia. The specimen from Colombia bears the diagnostic features of L. (N.) cf. striata as redescribed by Kotov and Elías-Gutiérrez (2003), Kotov et al. (2004), and Kotov, (2009). However, this particular specimen shows some subtle differences in the morphology of basal spine of claw, spine-like setules on first and second endopod segments of antenna II, and striation on valve. In the Neotropics, L. (N.) cf. striata Birabén, 1939 most closely resembles L. (N.) cf. ipojucae Brehm, 1938 in the structure of thoracic limb II and postabdominal claw, but can be separated from the latter by differences in setules in lateral fascicles on labrum, postpore distance (PP), shape of postabdomen, preanal margin of the postabdomen, and seta 2 of thoracic limb III.

Key words: Ciénaga El Convento, cladoceran, distribution, Leydigia, taxonomy

INTRODUCTION

The aim of this paper is to describe L. (N.) cf. striata for Colombia, expanding its distributional range and discuss some morphological differences from its congener L. (N.) cf. ipojucae.

MATERIAL AND METHODS
The samples were collected in the littoral zone of Ciénaga El Convento, Atlantic, Colombia covered by floating vegetation by filtering the water through a plankton net (45 μm) and immediately preserving with 70% alcohol. Specimens were selected from samples under
a binocular stereoscopic microscope, and studied under a compound optical microscope in a drop of a glycerol-formaldehyde mixture in toto. A single adult and a single juvenile female were dissected under a stereoscopic microscope for the study of appendages and postabdomen. Images were taken using a Kodak Easy Share C140 digital camera attached to a compound Olympus CX22 microscope. The taxonomic identification of the genus and species recorded herein followed Kotov et al. (2003), Kotov and Elías-Gutiérrez (2004), and Kotov (2009). These specimens were deposited at the Museo de Colecciones Biológicas at the Universidad del Atlántico (UARC), Colombia. For explanation of the system of seta numeration on the thoracic limbs see Smirnov and Kotov (2010).

**Results**

Order Anomopoda Sars, 1865  
Family Chydoridae Dybowski and Grochowski, 1894 emend. Frey, 1967  
Subfamily Aloninae Dybowski and Grochowski, 1894 emend. Frey, 1967  
Genus Leydigia Kurz, 1875  
Subgenus Leydigia (Neoleydigia) Kotov, 2009  
Leydigia (Neoleydigia) cf. striata Birabén, 1939  
(Figs. 1 – 3)

*Material examined.* One adult female and one juvenile female dissected from Ciénaga El Convento, Colombia (10º 38’ N 74º 55’ W), collected in July 2014, and preserved on semi-permanent slides mounted in glycerine, UARC 201M- UARC 209M.

*Description.* Parthenogenetic female.  
**General.** In lateral view, body subovoid, maximum height in posterior half, height/length = 0.55 in adult (Fig. 1A), and 0.67 in juvenile. Dorsal margin slightly and regularly convex, postero-dorsal angle rounded, although expressed. Postero-ventral angle broadly rounded; ventral margin regularly convex. In both the adult and juvenile specimens, a coarse large striaion and dots on valve were not observed. Eye smaller than oculus. Head shield wide, covered by fine striaion (Fig. 1B, arrow), PP = 0.45, lateral head pore at level of central major pore at distance 0.3 IP from midline (Fig. 1B-C). Labral keel triangular-ovoid, posterior and anterior margin with bunch of setules (Fig. 1D-E). Valves large, subovoid, with numerous setae on ventral margin, small setules between them were seen (Fig. 1A, F).

Postabdomen robust, with maximum height in middle, height/length ratio = 2.2 ventral margin straight (Fig. 1G). Preanal margin (Fig. 1G, arrow) somewhat shorter than anus, with 4 hillocks (Fig. 1H); distal portion with setae regularly decreasing from marginalmost to medialmost ones. Anus ornamented with tiny denticles (Fig. 1I), numerous fascicles (15) of lateral setules on proximal half of postanal and anal margin (Fig. 2A). Postabdominal seta (Fig. 1G) about two times longer than anal plus preanal margin. Postabdominal claw almost straight, about 1.8 as long as the anal, on lateral side with fine pecten (Figure 2B, arrow). Basal spine was not observed (Figs. 1G, 2B).

Antenna I not reaching tip of rostrum, with transverse rows of long setules on anterior face (Fig. 2C). Antenna II with 4 spine-like setules on first and second endopod segments. Spine on proximal segment of exopod very long, projecting beyond middle of apical segment, but antennal formula, setae 0-0-3/1-1-3, spines 1-0-1/0-0-1 like in other species (Fig. 2D).

Thoracic limb I: ODL robust and elongated, bearing a single seta (not illustrated), proximal portion of IDL with short setules, distal portion bearing three long setae, endite 1 with 4 setae, endite 2 with robust setae, endite 3 with one small and two long setae (Fig. 2E-F).

Thoracic limb II: typical for the genus, exopodite small, rounded. Inner portion of limb II with eight scrapers (Fig. 3A), distalmost scraper (1) very large, with numerous setules on its basal segment (Fig. 3B, arrow). Filter plate of gnathobase with seven setae.

Thoracic limb III: exopodite rectangular, elongated, supplied with three setae (Fig. 3C): seta 1 with proximal segment unilaterally
armed by long setules and distal segment bearing long setules, seta 2 specially long, with naked proximal segment and distal segment armed by few long, robust setules, seta 3 very small. Distal endite with three stiff setae, seta 1 especially long and stiff, seta 2 with short setules distally and seta 3 armed distally by longer setules (Fig. 3D). Epipodite large and ovoid (Fig. 3E)


Distribution and ecology: According to Kotov et al. (2013), this species is considered Neotropical. It has been reported from Paraguay (Daday, 1905), Argentina (Biraben, 1939), Perú (Harding 1955), Venezuela (Infante, 1980; Zoppi and Lopez, 2008),
Brazil (Elmoor-Louroiro, 1997; Hollwedel et al., 2003), Mexico (Kotov and Elías-Gutiérrez, 2004; Elías-Gutiérrez et al., 2006; Elías-Gutiérrez et al., 2008) and Cuba (Elías-Gutiérrez and Varela, 2009). This is the first record for the Ciénaga El Convento and Colombia.

Members of genus *Leydigia* are truly benthic (Kotov, 2006) and in the survey, *L.* (N.) cf. *stirata* was found among vegetation (*Eichhornia crassipes* Mart & Solms). In Ciénaga El Convento, floating aquatic vegetation is abundant, represented by patches of *Eichhornia crassipes* and *Nelumbo nucifera* (Gaertn.). This small (surface area of 250 Ha) lagoon system is a shallow water body (depth 0.3–0.8 m), whose temperature varies over the seasons in the range of 27.5–30 ºC; pH values during sampling measured 8.6 and conductivity measured 2828 μS.cm-1.

![Figure 2: Leydigia (Neoleydigia) striada, parthenogenetic female from Ciénaga El Convento. (A) Proximal portion of postanal margin. (B) Postabdominal claws. (C) Antena I. (D) Antena II. (E) Limb I. (F) Basis of IDL. Scale bars: A, C, F = 10 μm; D = 50 μm; B, E = 20 μm.](image-url)
**DISCUSSION**

At present, eight species and one subspecies of *Leydigia* have been recorded from the Americas (*Leydigia acanthoceroides*, *L. fimbriata*, *L. glabra*, *L. ipojucae*, *L. leydigi*, *L. louisi louisi*, *L. louisi mexicana*, *L. schubarti*, *L. cf. striata*, and *L. lourdesae*). Within the subgenus *Leydigia* (*Neoleydiga*), the *Leydigia (N.) acanthoceroides* group is the most species rich, having five taxa in the Americas: *Leydigia (N.) laevis* Gurney, 1927, *L. (N.) cf. ipojucae* Brehm, 1939, *L. (N.) acanthoceroides* (Fischer, 1854), *L. (N.) ciliata* Gauthier, 1939 and *L. (N.) cf. striata* Birabén, 1939.

According to Kotov (2009), *L. cf. striata* can be easily differentiated from *acanthoceroides*-like species by a whole of characteristics such us: 1) the postabdomen of the female is the most narrowest among all species, 2) setules in marginal membrane are minute, 3) setules in lateral fascicles on labral keel are fine, 4) has preanal margin with

![Figure 3: Leydigia (Neoleydiga) striata, parthenogenetic female from Ciénaga El Convento. (A) Limb II. (B) Scraper 1 of Limb II. (C) Limb III. (D) inner portion of limb III. (E) Epipodite of Limb III. Scale bars: A, B, C = 20 μm; E = 10 μm.](image-url)
relatively high hillocks, 5) has distal scraper of limb II with fully setose proximal segment. These five distinctive traits are characteristic for the specimens from Colombia also.

The specimens from Colombia bears the diagnostic features of *L. (N.)* cf. *striata* as redescribed by Kotov and Elías-Gutiérrez (2003), Kotov *et al.* (2004), and Kotov (2009), but some fine-scale differences were observed in our specimens:

1) the basal spine is fully absent in Colombia specimens, while it is present in the populations from Mexico, Paraguay, Brazil and Argentina in rudimentary state or as a smooth hillock (Kotov *et al.*, 2003, fig. 90; Kotov and Elías-Gutiérrez, 2004, figs. 13-14; Kotov, 2009, page 7).

2) Colombian specimens have four spine-like setules on first and second endopod segments of antenna II, while in Mexican population there are only two setules (Kotov and Elías-Gutiérrez, 2004, fig. 18); Paraguay, Perú and Brazil populations also have four setules (Kotov *et al.*, 2003, page 192).

3) Coarse striation on valves in the Colombia specimen was not observed while it is present in the populations from Mexico, Paraguay, Brazil and Argentina (Kotov *et al.*, 2003, fig 91; Kotov and Elías-Gutiérrez, 2004, fig 1; Kotov, 2009, figs. 376-377).

But I do not regard such differences as signs of a separate status of the Colombian populations. According to Kotov (2009) striation on valve and basal spine are good traits for discriminating the two subgenera of *Leydiga*. Nevertheless, striation on valve is subject of a significant variability, for example, young female of *Leydiga* cf. *striata* has no large-scale striation (Kotov and Elías-Gutiérrez, 2004).

In South America *L. (N.)* cf. *striata* could be confused with *L. (N.)* *ciliata* (Infante, 1980; Harding, 1955; Elmoor-Loureiro, 1997). However, they are distinct species (see Kotov *et al.*, 2003). In the Neotropics, *L. (N.)* cf. *striata* Birabén, 1939 most closely resembles *L. (N.)* cf. *ipojucae* Brehm, 1938 in thoracic limb II and postabdominal claw but these species can be separated by the following characters:

1) setules in lateral fascicles on labrum are shorter or of the same size as marginal setae in *L. (N.)* cf. *striata* (present paper, Fig. 1C-D, Kotov *et al.*, 2003, figs. 67, 74, Kotov and Elías-Gutiérrez, 2004, figs. 5-6); while they are longer in *L. (N.)* cf *ipojucae* (Kotov, 2009, figs. 344-345)

2) post-pore distance (PP) in the *L. (N.)* cf. *striata* is about 4-6 (Present paper, Fig. 1B; Kotov *et al.*, 2003, figs. 65-66; Kotov and Elías-Gutiérrez, 2004, fig. 3; Kotov, 2009, page, 71) while PP is 7-8 in *L. (N.)* cf. *ipojucae* from Brazil (Kotov, 2009, figs. 341-343).

3) postabdomen in *L. (N.)* cf. *striata* is narrow (present paper, Fig. 1F; Kotov *et al.*, 2003, figs. 77, 80; Kotov, 2009, page 71), while in *L. (N.)* cf. *ipojucae* it is broad (Kotov, 2009, figs. 350-352);

4) preanal margin of the postabdomen of *L. (N.)* cf. *striata* has distinct hillocks (present paper, Fig. 1G; Kotov *et al.*, 2003, fig 77; Kotov and Elías-Gutiérrez, 2004, fig. 12) while in *L. (N.)* cf. *ipojucae* hillocks are smooth (Kotov, 2009, figs. 353-354);

5) seta 2 on inner portion of thoracic limb III of *L. (N.)* cf. *striata* bears relative long setules (present paper, Fig 3C; Kotov *et al.*, 2003, figs. 84-85; Kotov and Elías-Gutiérrez, 2004, fig. 24; Kotov, 2009, page 71) while in *L. (N.)* cf. *ipojucae* it has short setules of different lengths (Kotov, 2009, figs. 369-370);

6) spine-like setules on endopod of antenna II projecting beyond middle of next segment in *L. (N.)* cf. *striata* (present paper, Fig 2E; Kotov and Elías-Gutiérrez, 2004, fig. 18) while in *L. (N.)* cf. *ipojucae* they reach middle portion of the next segment (Kotov, 2009, fig. 363).

The number of Neotropical species recognized by Kotov *et al.* (2013) was 4 and it remained unchanged until the recent finding of *L. lourdesae* from Colombia (Kotov and Fuentes-Reinés *et al.*, 2014). The diversity of the genus in the Neotropics could be underestimated and certainly deserves further investigations.
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