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Original Article

The first record of *Bergamina lineolata* (Chydoridae; Aloninae) from Colombia

O primeiro registro de *Bergamina lineolata* (Chydoridae; Aloninae) na Colômbia

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Abstract

The Neotropical freshwater cladoceran *Bergamina lineolata* (Sars, 1901) was found in a small temporal pond in the Magdalena department. Hitherto, it has been reported in Brazil and El Salvador. It was originally described as *Alonella lineolata* by Sars, 1901 from Brazil and then placed to the genus *Bergamina* by Elmoor-Loureiro et al. (2013). This is the first record of this species in Colombia. *B. lineolata* can be identified by a unique combination of characters including: 1) a remarkably large and oblong postabdomen, with three denticles on distal corner; 2) basal spine of the claw very short, length less than the half claw diameter at base; 3) IDL with two setae shorter than ODL seta, armed with fine setules unilaterally in terminal half; 4) endite 1 of trunk limb I with a long smooth seta between endites 1 and 2.

Keywords: aquatic vegetation, temporary pond, neotropic, Cladocera, taxonomy.

Resumo

O cladócero neotropical de água doce *Bergamina lineolata* (Sars, 1901) foi encontrado em uma pequena lagoa temporária no departamento de Magdalena, na Colômbia. Até o momento, havia sido relatado no Brasil e em El Salvador. Foi originalmente descrito como *Alonella lineolata* por Sars, 1901 no Brasil, e, em seguida, colocado no gênero *Bergamina* por Elmoor-Loureiro et al. (2013). Esse é o primeiro registro dessa espécie na Colômbia. *B. lineolata* pode ser identificada por uma combinação única de caracteres, incluindo: 1) um pós-abdômen notavelmente grande e oblongo, com três dentículos no ângulo distal; 2) espinho basal da garra muito curto, comprimento menor que o diâmetro da metade da garra na base; 3) IDL com duas cerdas mais curtas que cerdas ODL, armadas com sétulas finas unilateralmente na metade terminal; e 4) endito 1 do toracópodo I com uma longa cerda lisa entre os enditos 1 e 2.

Palavras-chave: vegetação aquática, lagoa temporária, neotrópico, Cladocera, taxonomia.

1. Introduction

The Superorder Cladocera is one of the major zooplankton groups in many freshwater bodies (Jeong et al., 2015) and constitutes a vital component in aquatic food web worldwide by transferring energy from the lower (phytoplankton, bacteria, fungi) to higher trophic levels (Choedchim et al., 2017). Members of this group can inhabit in the deep zone of large lakes, ground waters, caves, between leafs of bromeliad plants, in small drops of water, on the mosses of cloud tropical forests (Sinev, 2002). This group comprises more than 700 species (Jeong et al., 2015) and they are dominant in littoral zone with macrophytes (Maia-Barbosa et al., 2008), nevertheless some species are not very frequent in sampling and has not been reported very often (e.g., *Bryospilus repens* Frey, 1980, *Anthalona milleri* (Kiser, 1948), *A. obtusa* Van Damme, Sinev & Dumont, 2011, *A. spinifera* Tiang-nga, Sinev & Sanoamuang, 2016) and they can be considered rare species (Kotov et al., 2013; Sousa et al., 2014; Sinev, 2016). *Bergamina lineolata* is also considered a rare species (Elmoor-Loureiro et al., 2013).

Bergamina lineolata is considered the sole species of the genus, and it has an exclusively Neotropical distribution. It was originally described as *Alonella lineolata* by Sars, 1901 from a single female found in aquaria prepared with dried mud from São Paulo, Brazil. Nevertheless, it was placed as *incertae sedis* by Smirnov (1996). Later on, Elmoor-Loureiro et al. (2013) redescribed *Alonella lineolata* and created the genus *Bergamina*.

The aim of this contribution is to document the first record of *B. lineolata* for Colombia, which expands its known distributional range, and also to provide comparative morphological data and illustrations of the Colombian specimens.

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2. Material and Methods

Biological samples were taken from a small temporary pond located in Pivijay, Magdalena-Colombia (10°27'10.93"N; 74°23'33.16"W). This small (surface area of 2820 m^2) temporary pond, is a shallow water body (depth 3 m). Qualitative surveys were performed in November 2020. Environmental parameters were measured with a WTW 3111 conductivity meter gear. Water samples were obtained using a bucket of 65 L, filtered with a 55 µm mesh size plankton net to obtain concentrates of 500 mL that were fixed in 96% ethanol. In the laboratory, samples were stained with Bengal rose and concentrated to 50 mL volume. A Bogorov chamber was used to sort and count cladocerans, with the aid of a stereomicroscope. Cladocerans were taxonomically examined in toto under a compound optical microscope in a drop of glycerol-formaldehyde mixture. Specimens were measured in lateral position, from the anterior end of the head to the posterior margin of carapace and then they were dissected to examine the taxonomically relevant appendages, which were mounted in semi-permanent slides. The appendages with taxonomic relevance were photographed using a Kodak Easy Share C140 digital camera adapted to a compound microscope at 1000× magnification.

The identification of this species, initially, followed the illustrations and descriptions by Sars (1901) and Elmoor-Loureiro et al. (2013). For more robust comparison, some available material from type locality (a farm pond from Pradópolis, Brazil, 21° 20.624' S; 48°07.125' W) has been also analyzed (slides EL01570 and EL02307), as well images previously taken of the neotype (MZUSP 15547).

The dissected materials (slide) were deposited at the Centro de Colecciones Biológicas held at the Universidad del Magdalena, Colombia (CBUMAG: MEI: 0828-1-CBUMAG: MEI: 0828-6) where they are available for consultation and/ or further examination.

3. Results

3.1. Taxonomy

Order Anomopoda Sars, 1865

Family Chydoridae Dybowski & Grochowski, 1894 emend. Frey, 1967

Subfamily Aloninae Dybowski and Grochowski, 1894 emend. Frey, 1967

Tribe Alonini Dybowski & Grochowski, 1894 emend. Kotov, 2000

Genus *Bergamina*

Bergamina lineolata (Sars, 1901)

Material examined: 2 adult females specimens were collected by one of us (JMF-R) from an ephemeral pond located in Magdalena, Colombia (10°27'12.20" N; 74°23'33.2" W) in November 2020 (Figures 1-12).

3.2. Morphology

General shape subquadrate (Figures 1, 2), body length of the Colombian female specimens = 294-322 µm (n = 2, average length = 308 µm). Maximum height in posterior half, height/length = about 0.7-0.72 (0.66-0.68 in Brazilian specimens, Figure 13). Rostrum short and relatively blunt, ocellus smaller than eye (Figure 1). With three connected head pore, the central major pore is the smallest (Figure 3), PP/IP about 0.36 (0.26-0.30 in Brazilian specimens) (Figure 14). Labral keel in lateral view quite quadrangular (instead of triangular, as in Brazilian specimens) without ornamentation (Figure 4), antenna I almost reaching tip of rostrum (Figure 1B). Antenna II with setal formula 1-1-3/0-0-3 (Figure 5), spine on the first exopodal segment of antenna II reaching the middle of the second segment (Figure 6). Mandibles are elongated; their distal ends (mandibular surfaces) bear small ridges.

Postabdomen large and oblong (Figure 7). Preanal margin somewhat longer than the anus. Preanal angle evident, but postanal not well defined. Postanal dorsal margin with about 9 denticles, the distal ones are the longest (Figure 8), with three distal denticles larger than the others. Postabdominal claw almost as long as pre-anal margin, slightly and evenly curved. Basal spine very short (Figure 9), but longer than Brazilian specimens (Figure 15). Outer distal lobe (ODL) and inner distal lobe (IDL) of limb I with one and two setae respectively (Figure 11). The IDL setae with fine setules unilaterally in terminal half and both of them shorter than ODL seta (Figure 11). The endite 1 of trunk limb I bears a long seta (Figure 10). Limb II with exopodite with elongate lobe and without seta, inner-distal limb portion with scrapers 1-4 (numeration according to Kotov, 1999) and 6-8 decreasing in size, scraper 5 longer than 4 (Figure 12); distal armature of gnathobase with three elements, filter plate with seven setae.

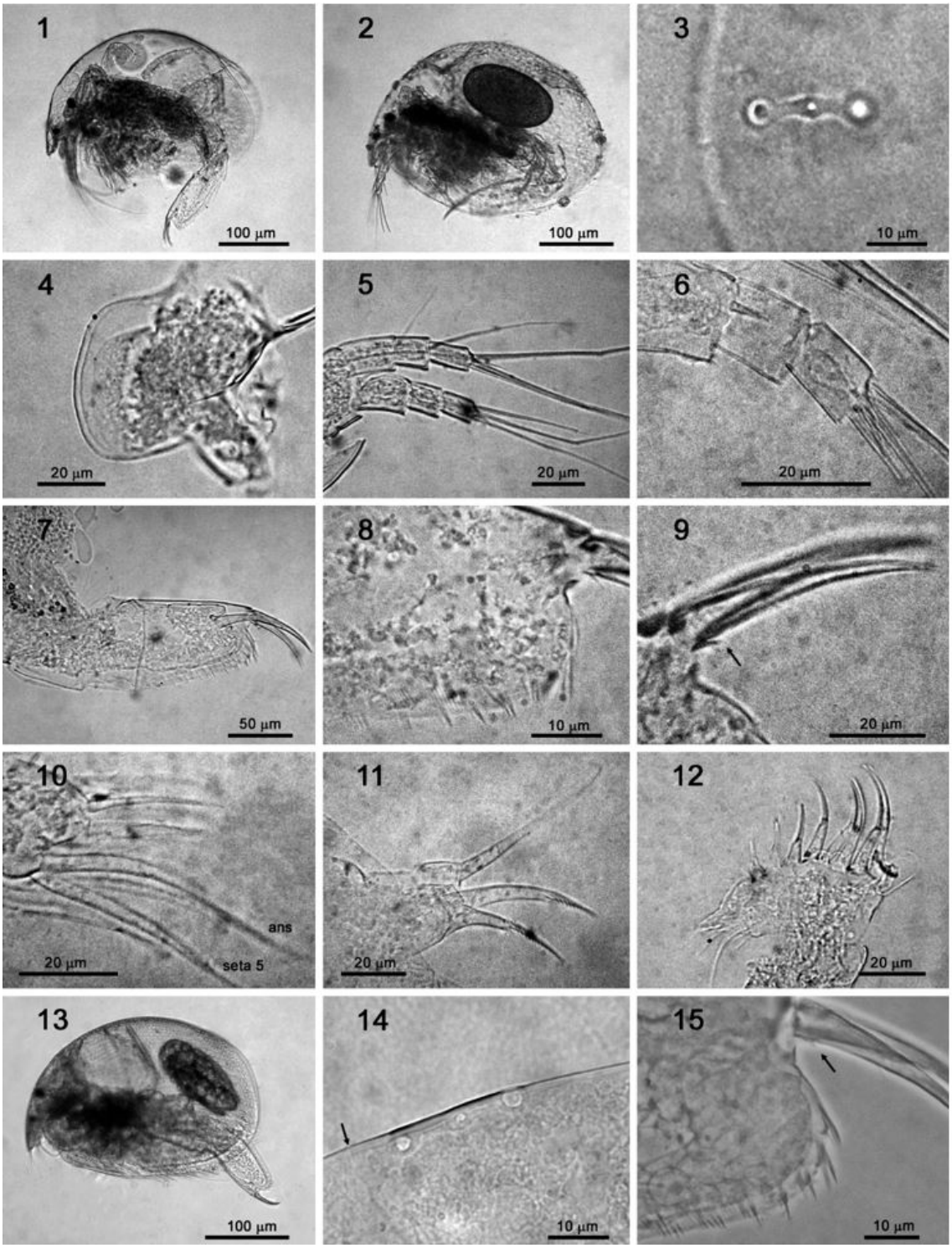
3.3. Remarks

The specimens were found among aquatic vegetation. At sampling time, the pond water temperature was 28 °C, pH value was 6.3, the conductivity 95 µS·cm-1, and dissolved oxygen 0.72 mg/mL.

4. Discussion

The studied specimens (two adult females), apart of some details, agreed with the descriptions of Sars (1901) and Elmoor-Loureiro et al. (2013). *Bergamina lineolata* can be easily recognized by a unique combination of characters including: 1) flattened and quadrangular shape; 2) a remarkably large and oblong postabdomen; 3) basal spine of the claw very short, length less than the half claw diameter at base; 4) IDL with two setae shorter than ODL seta, armed with fine setules unilaterally in terminal half; 5) endite 1 of trunk limb I with a long smooth seta between endites 1 and 2. These distinctive traits are also characteristic of the specimen from Colombia.

Some morphological traits of the Colombian specimens show differences from Brazilian specimens (Elmoor-Loureiro et al., 2013; present study, Figures 13-15), such as higher height/length ratio, the quadrangular labral plate, longer basal spine on postabdominal claw, and higher PP/IP ratio. Nevertheless, for both populations, only few specimens have been studied, so that is premature to suggest they belong to separate species. Instead, it is



Figures 1-15. ***Bergamina lineolata*** **(**Sars, 1901**). 1-12. Specimens from a temporary pond in Pivijay, Magdalena-Colombia** (1-2. Parthenogenetic female, habitus; 3. Head pores; 4. Labrum; 5. Antenna; 6. Antennal exopodite; 7-8. Postabdomen; 9. Postabdominal claw, arrow indicates the basal spine; 10. First trunk limb, endites 1-3; 11. First trunk limb, ODL and IDL; 12. Second trunk limb). **13-15. Specimens from type locality, Brazil** (13. Parthenogenetic female, neotype, habitus; 14. Head pores, arrow indicates the posterior margin of head shield; 15. Distal part of the postabdomen, arrow indicates the basal spine).

recommended to extend the sampling in both countries, allowing a more robust comparison.

In the surveyed area, *B. lineolata* was found in the littoral zone, related to the aquatic vegetation. This species has been also found associated with the aquatic macrophytes and shallow ponds (Maia-Barbosa et al., 2008; Castilho-Noll et al., 2010, 2012; Elmoor-Loureiro et al., 2013), supporting the idea that *B. lineolata* can be classified according to Wetzel (2001) as a species associated with macrophytes. Members of the family Chydoridae are truly scraper feeder on periphyton (Fryer, 1968; Elmoor-Loureiro, 2007), but further ecological studies is needed.

Distribution. *B. lineolata* has been previously reported in Brazil (Sars, 1901; Maia-Barbosa et al., 2008; Castilho-Noll et al., 2010; Rocha et al., 2011; Santos-Wisniewski et al., 2011) and El Salvador (Collado et al., 1984); this is the first record for Colombia. The presence of *B. lineolata* in adjacent areas seems very likely, so a wider distribution in South America might be expected. The diversity and distribution of this genus in the Neotropical region deserve further research.

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