Abstract. The long-horned caddisfly genus *Triplectides* Kolenati, 1859 is the most species-rich within Triplectidinae, comprising about 90 species. Eight species have been recorded so far in Brazil, mainly distributed in the Southeast Region, and only one species has been recorded from the North Region. In this paper a new species of *Triplectides* is described and illustrated, *Triplectides nessimiani* Desidério & Pes sp. nov., based on adult males from Serra do Aracá, Amazonas, Brazil. We also provide the first record for Brazil of *T. neblinus* Holzenthal, 1988 and *T. nevadus* Holzenthal, 1988. In addition, an updated identification key to *Triplectides* species with occurrence in Brazil is presented.

Keywords. Aquatic insects, Triplectidinae, long-horned caddisflies, Neotropical, Amazon.
**Triplectides** Kolenati, 1859, with about 90 species worldwide, is the most species-rich genus within Triplectidinae (Morse 2018). The genus is characterized in the adult stage by an apically broad discoidal cell that usually extends posteriorly and a thyridial cell two or three times as long as the discoidal cell in the forewing, and male inferior appendages with mesal and basoventral processes or lobes (Morse & Neboiss 1982; Holzenthal 1988). *Triplectides* larvae build cases of a hollowed-out twig or from the discarded case of another trichopteran larva. Larvae of this genus are shredders and inhabit pool areas in small streams (Holzenthal & Calor 2017).

The genus occurs in Central and South America, Southern-East Asia and Oceania. Its highest diversity occurs in the Australian Region, with 15 species recorded from New Caledonia and 25 from Australia (Malm & Johanson 2008). In the Neotropical Region there are 17 species described, distributed from southern Mexico to southern Chile (Holzenthal & Calor 2017; Desidério et al. 2017). So far, eight species have been recorded from Brazil: *T. cipo* Henriques-Oliveira & Dumas, 2015, *T. egleri* Sattler, 1963, *T. gracilis* (Burmeister, 1839), *T. iatiaia* Dumas & Nessimian, 2010, *T. maranhensis* Desidério, Barcelos-Silva & Pes, 2017, *T. missionensis* Holzenthal, 1988, *T. neotropicus* Holzenthal, 1988 and *T. ultimus* Holzenthal, 1988 (Santos et al. 2019).

In this study, we describe and illustrate a new species of *Triplectides* based on adult males from Serra do Aracá, Amazonas state, Brazil. We also provide the first record for Brazil of *T. neblinus* Holzenthal, 1988 and *T. nevadus* Holzenthal, 1988. In addition, an updated identification key to species of *Triplectides* with occurrence in Brazil is presented.

**Material and methods**

Specimens were collected with Malaise traps (Gressit & Gressit 1962), Pennsylvania light traps (Frost 1957) and Suspended traps (Rafael & Gorayeb 1982). All collected specimens were preserved in 80% ethanol. In order to observe male genital structures, the abdomen was removed and cleared using hot 10% KOH as detailed by Blahnik & Holzenthal (2004). After clearing, the abdomen was examined with a Leica EZ4 stereo microscope; it was then stored in 80% ethanol in a plastic microvial, together with the remainder of the respective specimen.

Photographs were obtained using a Leica DMC4500 video camera attached to a Leica M205A stereo microscope using an LED illumination dome. Stacks of images of each structure were produced at different focal distances and then combined automatically into a single image with a greater depth of field using Helicon Focus® (version 6.7.1 Pro) stacking software. Stacked images of the genitalia were used as templates in Adobe Illustrator® to create vector graphic illustrations. Photographs and drawings were assembled into plates using Adobe Photoshop®.

The morphological terminology used for male genitalia follows that of Holzenthal (1988). The map showing the geographical distribution of the species was created using QGis ver. 2.18.10 free software.

The types and all other examined specimens are deposited at the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil.

**Abbreviations of genital structures:**

- **ap. lo.** = apicodorsal lobe
- **bv. lo.** = basoventral lobe
- **me. lo.** = mesal lobe
- **ph. bs.** = phallobase
- **ph. sc.** = phallotremal sclerite
Class Insecta Linnaeus, 1758
Order Trichoptera Kirby, 1813
Suborder Integripalpia Martynov, 1924
Superfamily Leptoceroidea Leach, 1815
Family Leptoceridae Leach, 1815
Subfamily Triplectidinae Ulmer, 1906
Genus Triplectides Kolenati, 1859

**Triplectides nessimiani** Desidério & Pes sp. nov.
urn:lsid:zoobank.org:act:0B5D5E41-9729-47F5-8108-8CAD58114588
Figs 1–3

**Diagnosis**

The male of *Triplectides nessimiani* sp. nov. is similar to that of *T. ultimus* by fork I in the hindwing having a very short petiole and both having a short, subtriangular mesal lobe on the inferior appendage. However, in *T. nessimiani* sp. nov. the mesal lobe has a slightly acute lateral projection and 5–7 stout ventral setae in the middle region, whereas *T. ultimus* has bifid lateral projection and three stout ventral setae. Furthermore, the new species can easily be distinguished by the preanal appendages, which are digitate with apices rounded (slender with apices pointed in *T. ultimus*), tergum X with apex obliquely truncated (rounded in *T. ultimus*) and phallostremal sclerite well developed, subpentagonal-shaped in dorsal view (simple in *T. ultimus*).

**Etymology**

The new species is named in honor of Prof. Dr. Jorge Luiz Nessimian (Universidade Federal do Rio de Janeiro, Brazil) who helped collect the type specimens and in recognition of his contributions to the study of the Neotropical caddisflies.

**Material examined**

**Holotype**

BRAZIL • ♂; Amazonas, Barcelos, Parque Estadual Serra do Aracá, Igarapé da Anta (#S05); 00°54'38.70" N, 63°25'54.70" W; alt. 1130 m; 26 Jul.–2 Aug. 2009; N. Ferreira Jr, J.L. Nessimain, F.F. Salles, A.P.M. dos Santos, U.G. Neiss and J.O. da Silva leg.; Malaise trap; INPA-TRI 000014.

**Paratype**

BRAZIL • 1 ♂; Amazonas, Barcelos, Parque Estadual Serra do Aracá, Igarapé de 1º ordem (#S03); 00°54'22.03" N, 63°27'33.23" W; alt. 1110 m; 23 Jul.–1 Aug. 2009; J.O. Silva, J.L. Nessimian and U.G. Neiss leg.; suspended trap; INPA-TRI 000015.
Fig. 1. Triplectides nessimiani Desidério & Pes sp. nov., ♂ holotype (INPA-TRI 000014). A. Dorsal habitus. B. Venation of the forewing. C. Venation of the hind wing. Scale bars = 2 mm.
Fig. 2. *Triplectides nessimiani* Desidério & Pes sp. nov., ♀ genitalia, holotype (INPA-TRI 000014). A. Lateral view. B. Dorsal view. C. Ventral view. D. Phallic apparatus, lateral view. E. Phalotremal sclerite, dorsal view. Scale bars = 0.2 mm.
**Description**

**Adult male** (Figs 1A–C, 2A–E)

LENGTH OF FOREWING: 8.12–8.22 mm (n = 2).

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**Fig. 3.** Distribution of *Triplectides* species treated in this study and general view of the streams where *Triplectides nessimiani* Desidério & Pes sp. nov. was collected. 

A. Distribution map of *T. neblinus*, *T. nessimiani* Desidério & Pes sp. nov. and *T. nevadus*. B. Igarapé da Anta, Amazonas, Brazil, stream where *T. nessimiani* Desidério & Pes sp. nov. holotype was collected. C. First order stream, Amazonas, Brazil, collection site of *T. nessimiani* Desidério & Pes sp. nov. paratype.
**COLOR.** General color brown (in alcohol). Antennae with scape and pedicel golden-brown, flagellum pale-yellow (Fig. 1A) and palps brown. Forewing pale-brown (Fig. 1A), with small pale spots; with forks I and V present; discoidal cell about as broad as apical cells, nearly parallel-sided distally; cross vein s long, curved; crossvein r-m curved (Fig. 1B). Hind wing with forks I, III and V present; fork I with very short petiole (Fig. 1C). Legs pale-brown. Tibial spur formula 2:2:4.

**Male genitalia** (Fig. 2A–E). Segment IX, in lateral view, narrow, annular, with tergum IX produced posteriorly, anterior margin nearly straight, posterior margin produced medially (Fig. 2A); tergum IX with sclerotized posterior margin sharply rounded to slightly angulate and with small mesal notch (Fig. 2B), bearing rounded dorsomesal membranous process (absent in male paratype). Preanal appendages setose, about $\frac{3}{4}$ length of tergum X; in dorsal view, digitate, apices rounded (Fig. 2B). Tergum X, in lateral view, with basal half less sclerotized than apical half, tall at base, narrowing apically (Fig. 2A), with ventral margin straight, apex rounded; in dorsal view, bearing short apical and lateral setae; apex obliquely truncate, with deep, V-shaped apicosomal incision extending anteriorly one-half the length of the segment (Fig. 2B). Inferior appendages long, surpassing tergum X, bearing long setae (Fig. 2A); each with 1st article, in lateral view, enlarged basally, slightly constricted at mid-length (Fig. 2A); apicodorsal lobe digitate, long, extending beyond second article, with long setae (Fig. 2A, C); basoventral lobe digitate, long, apex rounded, bearing long setae (Fig. 2A, C); mesal lobe, in ventral view, shorter than basoventral lobe, subtriangular, bearing a row of 5–7 stout ventral setae basally, with two longitudinal striae, divided into long, blunt apical projection and slightly acute lateral projection, apex concave (Fig. 2C); 2nd article short, slender, with pointed apex, directed apicosad (Fig. 2C). Phallic apparatus elongate, complex; in lateral view, basal portion of phallobase subtriangular with ventral trough, middle portion curved and slender, apex with pair of wide, semimembranous flanges directed dorsolateral; phallic membranes non-prominent, striate (Fig. 2D); phallostremal sclerite well developed, subpentagonal-shaped in dorsal view, with acute, thin median tip (Fig. 2E).

**Female and immature stages**
Unknown.

**Bionomics**
The males of *T. nessimiani* sp. nov. were collected in 1st and 3rd order streams with altitudes ranging from 1110 to 1130 m a.s.l. located in the Serra do Aracá mountain range, northern part of the Brazilian Amazon (Fig. 3A). The predominant vegetation is highland savanna (Fig. 3B), the water in the streams was black and acidic (pH 4.3–4.5) with low conductivity (10–20 $\mu$S cm$^{-1}$). At the sites where specimens were collected water temperatures of 21–22ºC were recorded and the streams were 1–5 m wide, 0.30–3 m deep, with rocky bottoms characterized by boulders and slow-flowing water (Fig. 3B–C).

**Distribution** (Fig. 3A)
Brazil (Amazonas state).

*Triplectides neblinus* Holzenthal, 1988

*Fig. 3*

*Triplectides neblinus* Holzenthal 1988: 199, figs 18–19 (type locality: Venezuela, Territorio Federal Amazonas, basecamp, 0°51′ N, 66°10′ W, Cerro de la Neblina; NMNH; ♂).

*Triplectides neblinus* — Holzenthal & Calor 2017: 346 (catalog).
Material examined

BRAZIL • 22 ♂♂; Amazonas, Manaus, Reserva Ducke, Igarapé Ipipanga; 2°58′53.6″ S, 59°54′24.4″ W; alt. 95 m; 7–19 Apr. 2017; G.R. Desidério and A.M.O. Pes leg.; Malaise trap; INPA-TRI 000016 • 59 ♂♂; same collection data as for preceding; 19 Apr.–9 May 2017; G.R. Desidério, A.M.O. Pes and D. DePaula leg.; Malaise trap; INPA-TRI 000017 • 1 ♂; Amazonas, Manaus, BR-174, km 56, ZF-2, sede (headquartes), Ramal km 38, Igarapé de 1º ordem (#73); 2°35′50.9″ S, 60°12′54.9″ W; alt. 49 m; 9–12 Nov. 2008; U.G. Neiss, F.F. Sales, P.V. Cruz and F. Laurindo leg.; Suspended trap; INPA-TRI 000018 • 5 ♂♂; Roraima, Cantá, Serra Grande, Cachoeira Véu da Noiva; 2°34′59.8″ N, 60°47′37.7″ W; alt. 103 m; 19–21 Aug. 2019; N. Hamada, J.O. da Silva and R. Koroiva leg.; Malaise trap; INPA-TRI 000019.

Distribution (Fig. 3A)

Brazil (Amazonas and Roraima states) and Venezuela (Territorio Federal Amazonas).

*Triplectides nevadus* Holzenthal, 1988

Fig. 3

*Triplectides nevadus* Holzenthal 1988: 202, figs 22, 24 (type locality: Venezuela, Territorio Federal Amazonas, 2 km east of San Carlos de Río Negro; NMNH; ♂; ♀).

*Triplectides nevadus* — Holzenthal & Calor 2017: 347 (catalog).

Material examined

BRAZIL • 1 ♂; Amazonas, Manaus, BR-174, km 56, ZF-2, sede, Ramal km 38, 1º order stream (#73); 2°35′50.9″ S, 60°12′54.9″ W; alt. 49 m; 9–12 Nov. 2008; U.G. Neiss, F.F. Sales, P.V. Cruz and F. Laurindo leg.; suspended trap; INPA-TRI 000020 • 1 ♂; Amazonas, Novo Airão, AM-352, km 9, Sítio São Sebastião, Sr. Valdenor, 2º order stream (#15); 2°42′04.5″ S, 60°55′23.4″ W; alt. 50 m; 6 Apr. 2008; J.L. Nessimian, R. Querino, M. Pepinelli, C.A.S. Azevedo and U.G. Neiss leg.; Pennsylvania trap; INPA-TRI 000021.

Distribution (Fig. 3A)

Brazil (Amazonas state), Peru (Loreto) and Venezuela (Territorio Federal Amazonas).

**Key to males of *Triplectides* species with occurrence in Brazil** *(modified from Holzenthal 1988)*

1. Tibial spur formula 0-2-2 or 0-2-3 .......................................................... 2
   – Tibial spur formula 2-2-3 or 2-2-4 .......................................................... 4

2. Preanal appendages very broad, rounded (see figs 18a–b in Holzenthal 1988) .......................................................... *T. neblinus* Holzenthal, 1988
   – Preanal appendages clavate or digitate .......................................................... 3

3. Mesal lobe of inferior appendage wrinkled in apical half (see fig. 3c in Desidério et al. 2017) .......................................................... *T. maranhensis* Desidério, Barcelos-Silva & Pes, 2017
   – Mesal lobe of inferior appendage non-wrinkled in apical half (see fig. 22c in Holzenthal 1988) .......................................................... *T. nevadus* Holzenthal, 1988

4. Tibial spur formula 2-2-3 .......................................................... *T. egleri* Sattler, 1963
   – Tibial spur formula 2-2-4 .......................................................... 5
5. Mesal lobe of inferior appendage short, subtriangular (see fig. 30c in Holzenthal 1988) .............. 6
   - Mesal lobe of inferior appendage long, digitate (see fig. 9c in Holzenthal 1988) ....................... 7
6. Preanal appendages slender, with apices pointed; tergum X with rounded apex (see fig. 30b in Holzenthal 1988) ................................................................. T. ultimus Holzenthal, 1988
   - Preanal appendages digitate, with apices rounded; tergum X with truncate apex ........................ T. nessimiani Desidério & Pes sp. nov.
7. Mesal lobe of inferior appendage with apex acute, pointed, with small, lateral point (see fig. 15c in Holzenthal 1988) ......................................................... T. misionensis Holzenthal, 1988
   - Mesal lobe of inferior appendage with apex obtuse, rounded, without lateral point .................. 8
8. Apex of mesal lobe of inferior appendage clearly capitate (see fig. 20c in Holzenthal 1988) ........ T. neotropicalis Holzenthal, 1988
   - Apex of mesal lobe of inferior appendage rounded, not capitate ............................................. 9
9. Hind wing fork I sessile or with very short petiole (see fig. 11b in Holzenthal 1988) ................... T. gracilis (Burmeister, 1839)
   - Hind wing fork I with distinct petiole (see fig. 1b in Dumas & Nessimian 2010) ...................... T. itatiaia Dumas & Nessimian, 2010
10. Tergum X with subtruncate apex and apicomeral excision extending anteriorly at half-length of segment (see fig. 2 in Henriques-Oliveira & Dumas 2015) ................................................................. T. cipo Henriques-Oliveira & Dumas, 2015
   - Tergum X with rounded apex and apicomeral excision extending anteriorly to less than half length of segment (see fig. 3 in Dumas & Nessimian 2010) ............. T. itatiaia Dumas & Nessimian, 2010

Discussion

Until now, the diversity of Triplectides in Brazil is concentrated in the Southeast region with six species (Triplectides cipo, T. gracilis, T. itatiaia, T. misionensis, T. neotropicalis and T. ultimus), followed by the Northeast (T. maranhensis and T. gracilis) and South (T. gracilis and T. misionensis) regions, both with two species registered. Only one species of Triplectides has been recorded from the North region so far, T. egleri (Santos et al. 2019), but with the new species described here, T. nessimiani sp. nov., and the new records of T. neblinus and T. nevadus, the number of Triplectides species reported from the North Region is increased to four, bringing the total number of species of the genus for Brazil to eleven (Table 1). However, the Midwest region is the only one that still has no recorded Triplectides species (Santos et al. 2019).

Triplectides neblinus was previously known only from its type locality at the Cerro de la Neblina base camp at 140 m a.s.l. (Holzenthal 1988), a mountainous region located in the southern portion of Venezuela at the border with Brazil. Here the distribution range of this species is extended to Amazonas and Roraima states, representing the first record for Brazil, at a distance of about 800 km from the type locality.

Triplectides nevadus was previously known from large rivers in Venezuela (Rio Negro) and Peru (Rio Nanay) (Holzenthal 1988). In this study the species was collected in two small streams in the Amazonas State, being reported for the first time for Brazil.

Although this study improves our knowledge of the Triplectides species that occur in Brazil, it does not represent the actual diversity of the genus. This is due to the scarcity of studies, particularly in neighboring states that share the Amazon biome, such as Acre, Amapá and Rondônia, and in the states of the Midwest.
Table 1. Distribution of *Triplectides* species recorded from Brazil. Abbreviations for Brazilian states: AM = Amazonas; BA = Bahia; ES = Espírito Santo; MA = Maranhão; MG = Minas Gerais; PA = Pará; PR = Paraná; RJ = Rio de Janeiro; RR = Roraima; SC = Santa Catarina; SP = São Paulo.

| Species                        | Regions (States)                              |
|--------------------------------|-----------------------------------------------|
| *T. cipo* Henriques-Oliveira & Dumas, 2015 | Southeast (MG)                              |
| *T. egleri* Sattler, 1963         | North (AM, PA)                               |
| *T. gracilis* (Burmeister, 1839)  | Northeast (BA); Southeast (ES, MG, RJ, SP); South (PR, SC) |
| *T. itatiaia* Dumas & Nessimian, 2010 | Southeast (RJ)                               |
| *T. maranhensis* Desidério, Barcelos-Silva & Pes, 2017 | Northeast (MA)                              |
| *T. misionensis* Holzenthal, 1988 | Southeast (MG, RJ, SP); South (PR, SC)       |
| *T. neblinus* Holzenthal, 1988    | North (AM, RR)                               |
| *T. neotropicalis* Holzenthal, 1988 | Southeast (MG, RJ, SP)                       |
| *T. nessimiani* Desidério & Pes sp. nov. | North (AM)                                  |
| *T. nevadus* Holzenthal, 1988     | North (AM)                                   |
| *T. ultimus* Holzenthal, 1988     | Southeast (MG, RJ)                           |

region (Distrito Federal, Goiás, Mato Grosso and Mato Grosso do Sul). Thus, these data highlight the need for more taxonomic studies focused on *Triplectides* in the Brazilian Amazon specifically and in Central Brazil, where it is highly probable that any specimens of this genus discovered in the future will be new to science or represent new distributional records for these regions.

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