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## On the taxonomic position of *Notosimus angustipennis* (Melichar, 1906) (Hemiptera: Auchenorrhyncha: Fulgoroidea: Acanaloniidae)

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### ABSTRACT

The taxonomic position of the genus *Notosimus* Fennah, 1965 in the family Acanaloniidae Amyot et Serville, 1843 is discussed and confirmed by the characters of ovipositor structure described and illustrated for the first time. *Notosimus angustipennis* (Melichar, 1906) is newly recorded from Cordoba Province in Central Argentina. The photos of holotype of *N. angustipennis* and the drawings of hind wing of this species as well as *Acanalonia conica* (Say, 1830) and *A. pumila* (Van Duzee, 1908) are given.

**Key words:** Acanaloniidae, morphology, New World, systematics

## О таксономическом положении *Notosimus angustipennis* (Melichar, 1906) (Hemiptera: Auchenorrhyncha: Fulgoroidea: Acanaloniidae)

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### РЕЗЮМЕ

Проанализировано таксономическое положение рода *Notosimus* Fennah, 1965 в семействе Acanaloniidae Amyot et Serville, 1843 с учетом данных по строению яйцеклада, который впервые описан и проиллюстрирован. *Notosimus angustipennis* (Melichar, 1906) впервые указан из провинции Кордоба в Центральной Аргентине. Приведены фотографии голотипа *N. angustipennis*, а также рисунки заднего крыла этого вида и *Acanalonia conica* (Say, 1830) с *A. pumila* (Van Duzee, 1908).

**Ключевые слова:** Acanaloniidae, морфология, Новый Свет, систематика

## INTRODUCTION

In 1906, Melichar described in his “Monographie der Issiden” a new species from Eastern Argentina – *Conosimus angustipennis*. The description was based on a single male (Melichar 1906) deposited now in the Naturhistoriska Riksmuseet (NHRS, Stockholm, Sweden) (Figs 1–4). Later Fennah (1965) redescribed this species, showing that *Conosimus angustipennis* Melichar, 1906 does not belong to the Mediterranean genus *Conosimus* Mulsant et Rey, 1855 and erected a new genus, *Notosimus*, to

accommodate it. According to external morphological characters, Fennah (1965) placed this species in the family Acanaloniidae Amyot et Serville, 1843 [subfamily Acanaloniinae of the family Issidae Spinola, 1839 *sensu* Fennah (1954)]. Fennah (1965: 265) noted that he placed the genus *Notosimus* in the Acanaloniidae ‘confidently’ although the structure of ovipositor of *Notosimus angustipennis* was unknown at that time. During my research stay in the Zoologische Staatssammlung (München, Germany) one female of *Notosimus angustipennis* (Melichar, 1906) from Central Argentina was discovered. The descrip-

tion of ovipositor structure with a new record from Cordoba Province in Argentina of *N. angustipennis* are provided below.

Recently the family Acanaloniidae was revised and it was suggested to treat Acanaloniidae *sensu stricto* as an endemic group to the New World comprising five genera with characteristic venation of fore wings and the structure of male and female genitalia (Gnezdilov 2012a, b): *Acanalonia* Spinola, 1839, *Batusa* Melichar, 1901, *Bulldolonia* Gnezdilov, 2012, *Chlorochara* Stål, 1869, and *Philatis* Stål, 1862 (= *Galapagosana* Distant, 1909 = *Euthiscia* Van Duzee, 1923). The genus *Notosimus* Fennah, 1965 was not included in the family; however, the structure of the female genitalia of this species examined and described below supports its placement within the Acanaloniidae *sensu stricto*.

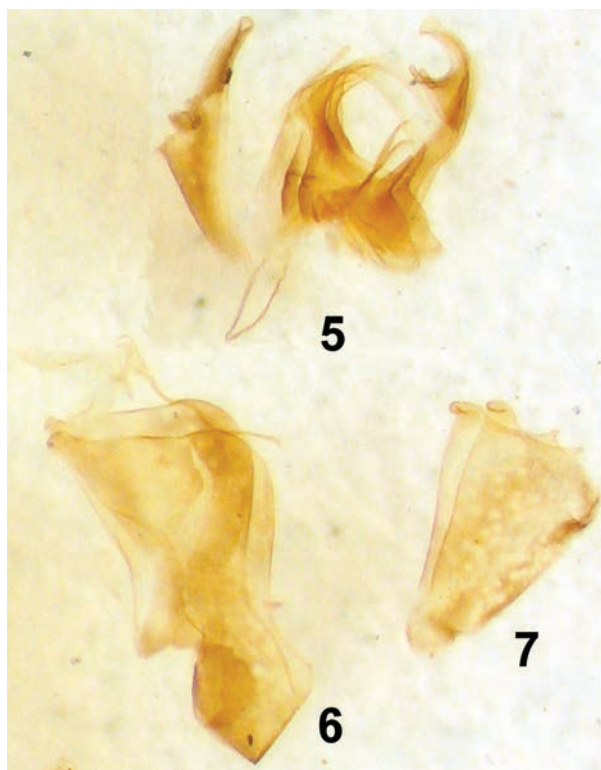
## MATERIAL AND METHODS

Morphological terminology including ovipositor structure following Bourgoin (1993) and Gnezdilov (2002, 2003) and wing venation following Gnezdilov (2018).

The specimens examined during the study are deposited in the Zoologische Staatssammlung, München, Germany (ZSM) and in the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZIN). The photos of male holotype are provided by Dr. Gunvi Lindberg (Stockholm, Sweden, NHRS) and the photos of male genitalia slide from the specimen described by Fennah (1965) is provided by Mr. Mick Webb (London, UK, BMNH). The drawings were made using Leica MZ9.5 light microscope with camera lucida attached. The photos



**Figs 1–4.** *Notosimus angustipennis* (Melichar, 1906), male, holotype. 1 – lateral view, 2 – face, 3 – styles, ventral view, 4 – labels. Scale bar – 1 mm.



**Figs 5–7.** *Notosimus angustipennis* (Melichar, 1906) (Argentina, Patquia), male genitalia, slide photo. 5 – penis and anal tube, lateral view; 6 – pygofer, lateral view; 7 – styles, lateral view.

were taken using the same microscope with a Leica DFC 290 camera. Images were produced using the Helicon Focus and Adobe Photoshop software.

## SYSTEMATICS

### Family Acanaloniidae Amyot et Serville, 1843

#### Subfamily Acanaloniinae Amyot et Serville, 1843

#### Genus *Notosimus* Fennah, 1965

*Notosimus* Fennah, 1965: 264. Type species: *Conosimus angustipennis* Melichar, 1906.

**Supplementary description.** Metope with well developed median and sublateral carinae (Figs 2, 19). Postclypeus large. Lateral parts of metopoclypeal suture are almost vertical. Third segment of rostrum at least twice shorter than second one. Fore wings narrowing apically, with wide hypocostal plate (Figs 1, 18). Clavus long –  $4/5$  of wing length, opened (Pcu +  $A_1$  running into claval apex) (Fig. 17). Forewing vein sequence: R 3, first furcation near to basal cell;

M 2, furcating after the wing middle; CuA 1; poor transverse venation. Hind wings bi-lobed, narrow, reaching apex of abdomen (Figs 20, 21). Hind tibia with 2 lateral spines subapically. First and second metatarsomeres are almost equal in length. First metatarsomere with 2 latero-apical and 7 intermediate spines. Arolium of pretarsus reaching claw apices (in dorsal view). Gonoplasts with third lobes (Gp 3) without fork (Fk) or deep incision, but with intact membrane (Fig. 15).

**Composition and distribution.** Monotypic genus known from Argentina.

#### *Notosimus angustipennis* (Melichar, 1906) (Figs 1–15, 17–22)

*Conosimus angustipennis* Melichar, 1906: 109.

*Notosimus angustipennis*: Fennah, 1965: 265, figs 162–170.

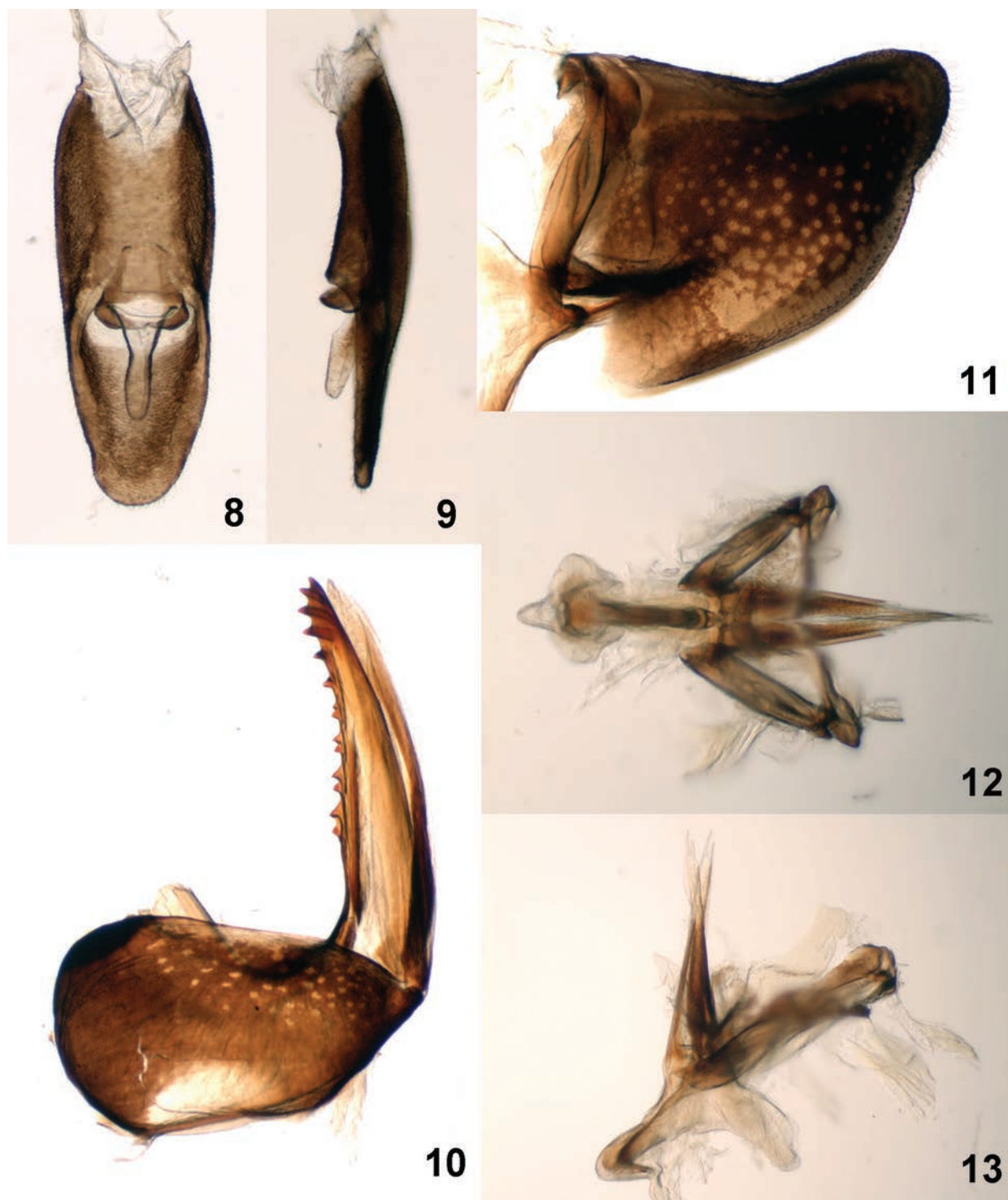
**Material examined.** 1 female, Argentina, Capilla del Monte, 6 February 1958, Hans Förster leg. (ZSM).

**Supplementary description.** Remigial and remigio-vannal lobes of hind wing fused without cubital cleft (Figs 20, 21). Hindwing vein sequence: Sc+R 1, weak; M 2, furcating apically; CuA 2, furcating in apical third of the wing; cua-cup 1; CuP 1; cup-pcu 1; Pcu 1; pcu- $a_1$  1;  $A_1$  2;  $A_2$  1. Fore and middle tibiae slightly flattened dorsally.

**Mal genitalia** (Figs 5–7). Anal tube elongate (Fig. 5). Pygofer with strongly convex hind margins in their upper half (Fig. 6). Phallobase with pair of long apical processes directed downwards and pair of narrow spine-shaped lateral processes. Aedeagus stout, curved. Style vertically elongate, with a tooth on its hind margin (Fig. 7).

**Female genitalia** (Figs 8–15, 22). Sternum VII with deep median concavity (Figs 14, 22). Anal tube long and narrow, with anal column 0.25 as long as whole anal tube (Figs 8, 9). Gonoplasts large, nearly triangular-shaped (Fig. 11), with marginal teeth apically (Figs 14, 15). Gp 1–2 of each gonoplast fused completely. Gp 3 of both gonoplasts connected by membrane without fork (Fig. 15). Gonocoxa VIII with convex hind margin (Fig. 10). Endogonocoxal process narrowing apically. Anterior connective lamina of gonapophyses VIII long and narrow, with many teeth (Fig. 10). Posterior connective laminae of gonapophyses IX elongate, in shape of isosceles triangular, distal parts of the laminae bi-lobed apically,





**Figs 8–13.** *Notosimus angustipennis* (Melichar, 1906) (Argentina, Capilla del Monte), female genitalia. 8 – anal tube, dorsal view; 9 – anal tube, lateral view; 10 – anterior connective lamina of gonapophyse VIII and gonocoxa VIII; 11 – gonoplacs, lateral view; 12 – posterior connective laminae of gonapophyses IX, dorsal view; 13 – posterior connective laminae of gonapophyses IX, lateral view.



**Figs 14–16.** Acanaloniidae, ovipositor. 14–15 – *Notosimus angustipennis* (Melichar, 1906); 16 – *Acanalonia conica* (Say, 1830). 14 – genital segments, ventral view; 15, 16 – gonoplace, dorsal view.

lateral fields flat (Figs 12, 13). Gonospiculum bridge large (Fig. 13).

**Distribution.** The species is currently known from three provinces of Eastern and Central Argentina: Buenos Aires Province (San Carlos, La Plata) (Melichar 1906); Cordoba Province (Capilla del Monte); La Rioja Province (Patquia) (Fennah 1965).

**Total length** (from the apex of coryphe to the apices of fore wings). Female – 6.7 mm.

## DISCUSSION

Current examination of female genitalia of *Notosimus angustipennis* showed that these structures are typical for the family Acanaloniidae *sensu* Gnezdilov (2012a) – large triangular flat gonoplace with marginal teeth, narrow anterior connective lamina of gonapophyses VIII, narrow isosceles triangular-shaped posterior connective laminae of gonapophyses IX, and large gonospiculum bridge (Figs 10–13), which confirms Fennah's opinion on placement of this species within Acanaloniidae. However, the gonoplace of *N. angustipennis* are characterized by third lobes (Gp 3) without fork (Fk) or deep incision (Fig. 15) as it is in *Acanalonia conica* (Say, 1830) (Fig. 16) and *A. pumila* (Van Duzee, 1908) examined, but with intact membrane between the lobes. In male genitalia structure of *N. angustipennis* there

is a characteristic acanaloniid feature – presence of long apical processes of the phallobase directed downwards (Fig. 5). The style of *N. angustipennis* with a peculiar tooth on its hind margin (Fig. 7). Small tooth (spine-shaped) on hind margin of style is discovered in *A. pumila* examined and it was figured by Caldwell and Martorell (1951, Pl. 53a) also for *Chlorochara vivida* (Fabricius, 1775).

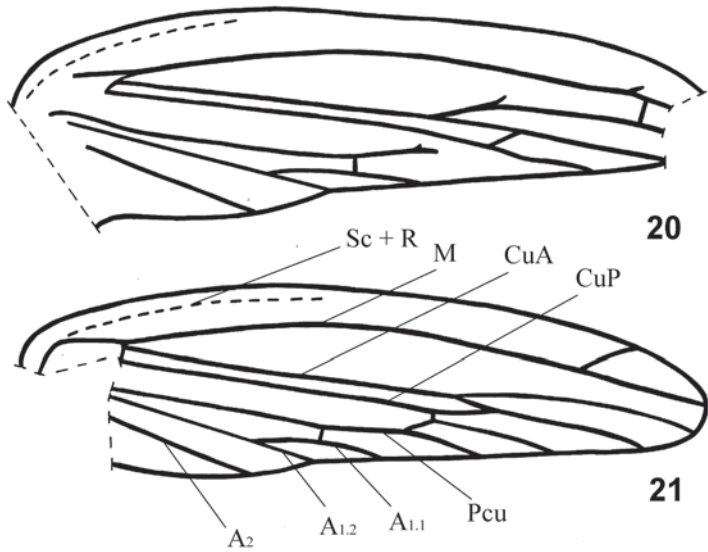
*Notosimus angustipennis* is characterized by fore and hind wings narrowing apically (Figs 1, 20, 21), while in many other Acanaloniidae fore wings widely rounded or truncate apically and hind wings well developed and wide (Fowler 1905; Doering 1932; Caldwell and Martorell 1951; Bartlett 2019) (Figs 23, 24) or rudimentary in *Philatis* spp. (Stål 1862; C.R. Bartlett, personal communication). Hind tibia of *N. angustipennis* with two lateral spines while in other Acanaloniidae usually without spines (Doering 1932; Fennah 1954) or with single spine as in *Philatis signata* (Van Duzee, 1923) (the photo of holotype was examined).

Thus *Notosimus angustipennis* is a member of the family Acanaloniidae *sensu stricto*, but the family is in need of revision involving examination of all available types and the material on other taxa included for clarification of tribal system of the family and the position of *Notosimus* within the family according to other genera.

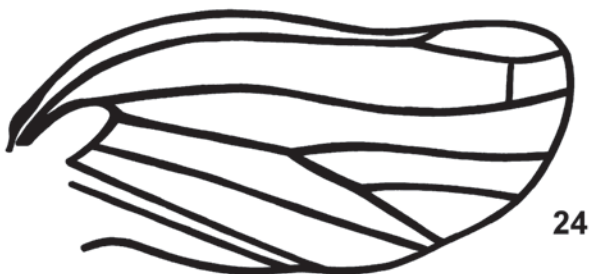
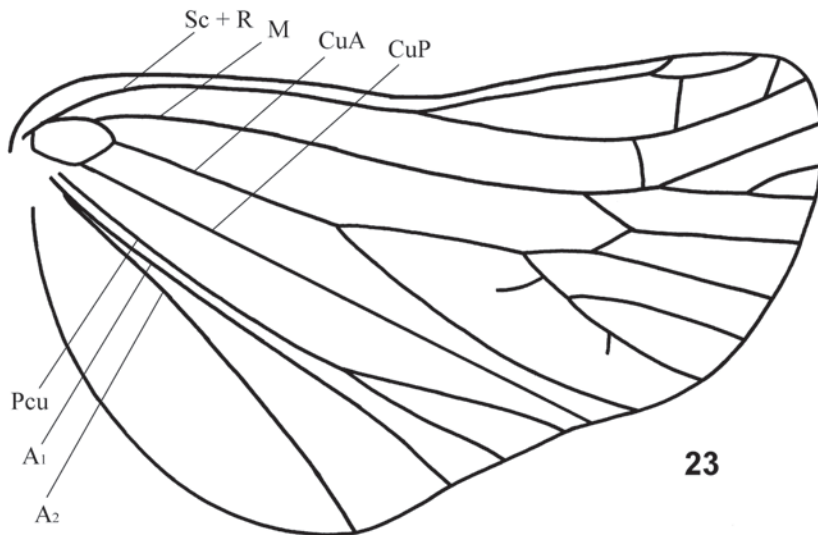


**Figs 17–19.** *Notosimus angustipennis* (Melichar, 1906) (Capilla del Monte), female. 17 – dorsal view; 18 – lateral view; 19 – frontal view. Total length of the specimen – 6.7 mm.





**Figs 20–22.** *Notosimus angustipennis* (Melichar, 1906) (Capilla del Monte), female. 20 – right hind wing; 21 – left hind wing; 22 – sternum VII, ventral view. Length of the wings – 4.0 mm.



**Figs 23–24.** *Acanalonia* spp., hind wing. 23 – *A. conica* (Say, 1830) (USA), length of the wing – 8.0 mm; 24 – *A. pumila* (Van Duzee, 1908) (Cuba), length of the wing – 2.0 mm.

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## REFERENCES

- Bartlett C.R. 2019 (and updates).** Planthoppers of North America. Available from: <http://canr.udel.edu/planthoppers> (accessed 05 February 2019)
- Bourgoin T. 1993.** Female genitalia in Hemiptera Fulgoromorpha, morphological and phylogenetic data. *Annales de la Société Entomologique de France. (N.S.)*, **29**(3): 225–244.
- Caldwell J.S. and Martorell L.F. 1951.** Review of the Auchenorrhyncha [sic] Homoptera of Puerto Rico. Part 2. The Fulgoroidea except Kinnaridae. *Journal of Agriculture of University of Puerto Rico*, 1950, **34**(2): 133–269.
- Doering K.C. 1932.** The genus *Acanalonia* in America north of Mexico (Fulgoridae, Homoptera). *Annals of the Entomological Society of America*, **25**: 758–786. <https://doi.org/10.1093/aesa/25.4.758>
- Fennah R.G. 1954.** The higher classification of the family Issidae (Homoptera: Fulgoroidea) with descriptions of new species. *Transactions of the Royal entomological Society of London*, **105**(19): 455–474. <https://doi.org/10.1111/j.1365-2311.1954.tb00772.x>
- Fennah R.G. 1965.** Fulgoroidea from Southern Chile. *Bulletin of British Museum of Natural History (Entomology)*, **17**: 233–272. <https://doi.org/10.5962/bhl.part.14815>
- Fowler W.W. 1905.** Family Issidae. Order Rhynchota. Suborder Hemiptera-Homoptera. Insecta (Continued). *Biologia Centrali-Americana; contributions to the knowledge of the fauna and flora of Mexico and Central America*, **1**: 113–129.
- Gnezdilov V.M. 2002.** Morphology of the ovipositor in members of the subfamily Issinae (Homoptera, Cicadina, Issidae). *Entomologicheskoe obozrenie*, **81**(3): 605–626. English translation published in *Entomological Review* (2004), **82**(8): 957–974.
- Gnezdilov V.M. 2003.** Review of the family Issidae (Homoptera, Cicadina) of the European fauna, with notes on the structure of ovipositor in planthoppers. *Chteniya pamyati N.A. Kholodkovskogo (Meetings in memory of N.A. Cholodkovsky)*, St. Petersburg, **56**(1): 1–145. [In Russian with English summary].
- Gnezdilov V.M. 2012a.** On the composition and distribution of the family Acanaloniidae Amyot et Serville (Homoptera, Fulgoroidea). *Entomologicheskoe obozrenie*, **91**(3): 643–647. English translation published in *Entomological Review* (2013), **93**(1): 69–72. <https://doi.org/10.1134/S0013873813010107>
- Gnezdilov V.M. 2012b.** A new genus of the family Acanaloniidae Amyot et Serville (Homoptera: Fulgoroidea) from the Caribbean Basin. *Zoosystematica Rossica*, **21**(2): 302–305.
- Gnezdilov V.M. 2018.** A new genus representing a new tribe of the family Issidae (Hemiptera: Auchenorrhyncha: Fulgoroidea) from the forest canopy of French Guiana. *Zoosystematica Rossica*, **27**(1): 122–129.
- Melichar L. 1906.** Monographie der Issiden (Homoptera). *Abhandlungen der K. K. Zoologisch-botanischen Gesellschaft in Wien*, **3**(4): 1–327.
- Stål C. 1862.** Bidrag till Rio Janeiro-traktens Hemipter-fauna II. *Kongliga Svenska Vetenskaps-Akademiens Handlingar*, **3**(6): 1–75.

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