

Identity of Miomoptera and Glosselytrodea (Insecta: Palaeomanteida, Jurinida) described from the Potrerillos and Los Rastros Formations, Upper Triassic of Argentina

ALEXANDR PAVLOVICH RASNITSYN^{1,2}
OSCAR FLORENCIO GALLEGOS^{3,4}

1. Palaeontological Institute, Russian Academy of Sciences. Profsoyuznaya Str. 123, 117647 Moscow, Russia.
2. Natural History Museum. Cromwell Rd, South Kensington, SW7 5BD London, United Kingdom.
3. Grupo Paleontología y Paleoambientes continentales fanerozoicos, Centro de Ecología Aplicada del Litoral (CECOAL), Centro Científico Tecnológico Nordeste-Consejo Nacional de Investigaciones Científicas y Técnicas (CCT Nordeste-CONICET), Universidad Nacional del Nordeste (UNNE). Ruta Provincial N° 5, Km 2,5, W3400 Corrientes, Corrientes, Argentina.
4. Geología Histórica-Micropaleontología (Área Ciencias de la Tierra), Departamento de Biología, Facultad de Ciencias Exactas y Naturales y Agrimensura (FaCENA), Universidad Nacional del Nordeste (UNNE). Av. Libertad 5540, W3400 Corrientes, Corrientes, Argentina.

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Asociación Paleontológica Argentina
Maipú 645 1° piso, C1006ACG, Buenos Aires
República Argentina
Tel/Fax (54-11) 4326-7563
Web: www.apaleontologica.org.ar

IDENTITY OF MIOMOPTERA AND GLOSSELYTRODEA (INSECTA: PALAEOMANTEIDA, JURINIDA) DESCRIBED FROM THE POTRERILLOS AND LOS RASTROS FORMATIONS, UPPER TRIASSIC OF ARGENTINA

ALEXANDR PAVLOVICH RASNITSYN^{1,2} AND OSCAR FLORENCIO GALLEG^{3,4}

¹Palaeontological Institute, Russian Academy of Sciences. Profsoyuznaya Str. 123, 117647 Moscow, Russia. alex.rasnitsyn@gmail.com

²Natural History Museum. Cromwell Rd, South Kensington, SW7 5BD London, United Kingdom.

³Grupo Paleontología y Paleoambientes continentales fanerozoicos, Centro de Ecología Aplicada del Litoral (CECOAL), Centro Científico Tecnológico Nordeste-Consejo Nacional de Investigaciones Científicas y Técnicas (CCT Nordeste-CONICET), Universidad Nacional del Nordeste (UNNE). Ruta Provincial N° 5, Km 2,5, W3400 Corrientes, Corrientes, Argentina. ofgallego@live.com.ar

⁴Geología Histórica-Micropaleontología (Área Ciencias de la Tierra), Departamento de Biología, Facultad de Ciencias Exactas y Naturales y Agrimensura (FaCENA), Universidad Nacional del Nordeste (UNNE). Av. Libertad 5540, W3400 Corrientes, Corrientes, Argentina.

 APR: <https://orcid.org/0000-0002-6350-0040>; OFG: <https://orcid.org/0000-0002-5460-6476>

Abstract. Upper Triassic (Carnian) Los Rastros and Potrerillos formations (Argentina) are famous for their fossil insects. Some interesting Triassic fossil insects are reviewed in this work. The present paper is devoted to four described extinct Paleozoic species from two orders, Miomoptera and Glosselytrodea. *Miomina mendozina* Martins-Neto & Gallego, 1999 from the Potrerillos Formation is described as Miomoptera based on a unique holotype which has not been located. After reviewing the published illustrations, we conclude that it is possibly a plant remain and not an insect wing. *Miomina riojana* Martins-Neto & Gallego, 2006 from the Los Rastros Formation, represents a wing fragment with a few short veins and we prefer to leave it identified as questionably assigned to the Order Miomoptera. Both fossils assigned to Glosselytrodea come from the Los Rastros Formation. *Argentinoglosselytrina pulchella* Martins-Neto & Gallego, 2001 represents a distinct genus and species of the glosselytrodean family Glosselytridae, redescribed herein. In contrast, *Chanarelytrina nana* Martins-Neto & Gallego, 2006 represents the detached clavus (anal section of a forewing) of *Saaloscytina carmonae* Martins-Neto *et al.*, 2006 (Hemiptera, Scytinopteroidea, Saaloscytinidae). *Argentinoglosselytrina pulchella* from the Upper Triassic of Argentina represents the only specimen from an extinct order that characterized the Paleozoic, which reflects the differences between this fauna and that of Central Asia, which is richer in ancient groups. Its modified morphology suggests a possible event of origin of a high-ranked and early aborted evolutionary line.

Key words. Carnian. Cuyo-Bermejo Basins. Fossil insects. Hemiptera.

Resumen. LA IDENTIDAD DE LOS INSECTOS MIOMOPTERA Y GLOSSELYTRODEA (INSECTA: PALAEOMANTEIDA, JURINIDA) DESCRITOS DE LAS FORMACIONES POTRERILLOS Y LOS RASTROS, TRIÁSICO SUPERIOR DE ARGENTINA. Las formaciones Los Rastros y Potrerillos del Triásico Superior (Carniense) de la Argentina son famosas por sus insectos fósiles, en este trabajo se revisan algunas especies de interés para la paleontología del Triásico. El presente artículo está dedicado a cuatro especies descritas pertenecientes a dos órdenes extintos, principalmente paleozoicos, Miomoptera y Glosselytrodea. *Miomina mendozina* Martins-Neto & Gallego, 1999 de la Formación Potrerillos, fue descrita como Miomoptera basándose en un holotipo único que no ha sido localizado. Luego de revisar las ilustraciones publicadas, llegamos a la conclusión de que posiblemente se trate de restos de una planta y no del ala de un insecto. *Miomina riojana* Martins-Neto & Gallego, 2006 de la Formación Los Rastros, representa un fragmento de ala con algunas venas cortas, y preferimos identificarla como cuestionablemente asignada al Orden Miomoptera. Los fósiles asignados a Glosselytrodea provienen ambos de la Formación Los Rastros. *Argentinoglosselytrina pulchella* Martins-Neto & Gallego, 2001 redescrita en este trabajo, representa un género y una especie distintos de glosselytrodeos de la Familia Glosselytridae. En contraste, *Chanarelytrina nana* Martins-Neto & Gallego, 2006 representa el clavus desprendido (sección anal de un ala anterior) de *Saaloscytina carmonae* Martins-Neto *et al.*, 2006 (Hemiptera, Scytinopteroidea, Saaloscytinidae). *Argentinoglosselytrina pulchella* representa el único hallazgo de un orden extinto Paleozoico en el Triásico Superior argentino, lo que refleja las diferencias entre esta fauna y la de Asia Central, más rica en grupos antiguos. Su morfología modificada sugiere un posible evento de origen de una línea evolutiva de alto rango que fue tempranamente abortada.

Palabras clave. Carniense. Cuencas Cuyana-Bermejo. Insectos fósiles. Hemiptera.

UPPER TRIASSIC (Carnian) deposits from Los Rastros Province) and Potrerillos (Cuyo Basin, Mendoza Province) (Ischigualasto-Villa Unión or Bermejo Basin, La Rioja formations in Argentina are famous for their fossil insects

together with the already famous *Dicroidium* flora, as well as for its record of spinicaudatan branchiopods (crustaceans), bivalved mollusks, fishes and tetrapods (Stipanovic *et al.*, 1996; Artabe *et al.*, 2001; Stipanovic & Marsicano, 2002). Knowledge about the presence of fossil insects in the Triassic sequences of Argentina begins with the works of Wieland (1925), Cockerell (in Wieland, 1926), Tillyard (1926), Cabrera (1928), and other authors (*e.g.*, Gallego, 1997). These studies were renewed starting in the 1990s due to the collection and description work carried out by one of the authors (OFG) in both the Potrerillos (Mendoza Province) and Los Rastros (La Rioja Province) formations, and initially reported by Gallego (1997) where all the historical background of these records is originally compiled (see additionally Martins-Neto *et al.*, 2003, 2011; Lara *et al.*, 2023). Twenty-four years after the first descriptions of new material from the Triassic of Argentina by Martins-Neto & Gallego (1999), the objective of this work is to review the taxonomic assignments of some of the taxa described at that time after major changes that occurred not only in the discipline but also in the availability of new technologies for the study of these fossil arthropods.

The present work has been launched in connection with the project of the Russian Science Foundation number 21–14–00284 “Early Mesozoic insects: post-crisis recovery and the origins of modern entomofaunas” conducted by the Russian team including one of the authors (APR). We concentrate here on four extinct species from two predominantly Palaeozoic orders, Miomoptera and Glosselytrodea. These are: *Miomina mendozina* Martins-Neto & Gallego, 1999 from the Potrerillos Formation and *M. riojana* Martins-Neto & Gallego, 2006 from the Los Rastros Formation, originally assigned to Miomoptera; and *Argentinoglosselytrina pulchella* Martins-Neto & Gallego, 2001 and *Chanarelytrina nana* Martins-Neto *et al.*, 2006, included as Glosselytrodea. These species come from the Los Rastros Formation (Martins-Neto & Gallego, 1999, 2001; Martins-Neto *et al.*, 2006).

MATERIAL AND METHODS

The studied materials are housed in the following repositories and with institutional abbreviations used here as: PULR-I (Paleontology Collection, Museo de Ciencias

Naturales, Universidad Nacional de La Rioja, La Rioja, Argentina) and CTES-PZ (Paleozoological section of the Paleontological Collections “Dr. Rafael Herbst”, Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste, Corrientes, Argentina).

The studied fossil insects were described using a low-magnification stereo microscope (Leica S8 APO) with digital camera (Leica EC3) and photographic software.

The terminology adopted here for insect wing veins is standard (*e.g.*, Rasnitsyn & Aristov, 2013): C, costal vein; SC, subcosta; R, radius; RS, radius sector; MA, anterior media; MP, posterior media; CuA, anterior cubitus; CuP, posterior cubitus; 1A, 2A, 3A, anal veins.

RESULTS

Examination of the holotypes of three species available thus far (the holotype of *Miomina mendozina* is unfortunately lost) reveals that two of them were misidentified, as follows.

Miomina riojana (in Martins-Neto *et al.*, 2006, p. 6, figs. 2F, 3E), Holotype PULR I 334b (part) and PULR-I 334/1c (counterpart) (Fig. 1). It was collected at Los Chañares locality, La Rioja Province, Argentina; Los Rastros Formation (1st cycle), early Late Triassic. The holotype represents a wing fragment with a few short veins. Based on such poor material, we prefer to leave it without further identification (as questionably assigned to the Order Miomoptera).

Chanarelytrina nana (in Martins-Neto *et al.*, 2006, p. 3, figs. 2D, 3C). Holotype PULR-I 334a, was collected at Los Chañares locality, La Rioja Province, Argentina; Los Rastros Formation (1st cycle), early Late Triassic (Fig. 2). According to Shcherbakov (2011), the holotype and only specimen available represents the detached clavus (anal section of a forewing) of *Saaloscytina carmonae* Martins-Neto *et al.*, 2006 (Hemiptera, Scytinopteroidea, Saaloscytinidae).

Argentinoglosselytrina pulchella (Martins-Neto & Gallego, 2001, p. 107, fig. 1A, pl. ID), holotype PULR-I 253, collected at Gualo locality, La Rioja Province, Argentina, Los Rastros Formation, late Middle Triassic to early Late Triassic. The species is based on a nicely preserved forewing and represents a distinct genus and species from the family Glosselytridae (previously assigned to Polycyrtellidae by Martins-Neto & Gallego, 2001) which is considered in detail below (Fig. 3).

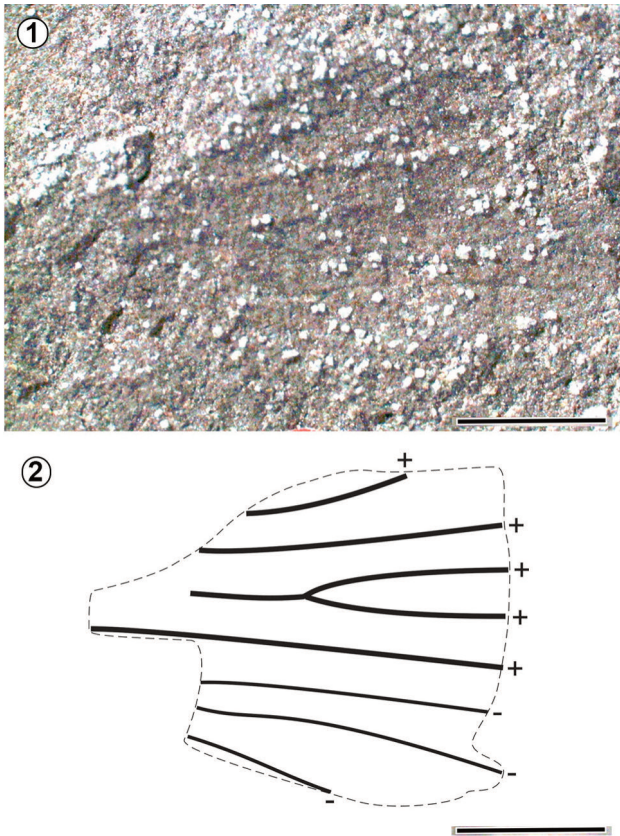


Figure 1. *Miomina riojana* Martins-Neto & Gallego (in Martins-Neto *et al.*, 2006); PULR I 334b (part); 1, photograph of the holotype specimen, a small wing fragment with unidentified few short veins. 2, new interpretation of the holotype specimen, with few veins only with positive or negative relief. Scale bar = 1 mm.

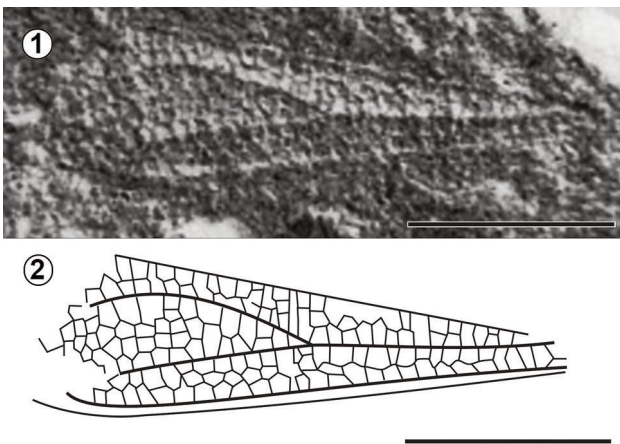


Figure 2. *Saaloscytina carmonae* Martins-Neto *et al.* (in Martins-Neto *et al.*, 2006) (ex *Chanarelytrina nana* Martins-Neto & Gallego (in Martins-Neto *et al.*, 2006)); PULR-I 334a; 1, photograph of the holotype specimen, a small wing fragment that represents the detached clavus (anal section of a forewing). 2, new interpretation of the holotype specimen, with few unidentified veins (see Lara *et al.*, 2021, Fig. 8) and covered with hexagonal areolae. Scale bar = 1 mm.

The fourth species under study, *Miomina mendozina* (Martins-Neto & Gallego, 1999, p. 198, figs. 2H, 5B), holotype PZ-CTES-5731, collected 300 m west of Quebrada del Durazno South of Cerro Cacheuta; Mendoza Province, Argentina, bands EP I and EP II of Morel (1994); Upper section of the Potrerillos Formation, late Middle Triassic to early Late Triassic. Unfortunately, the holotype and only specimen recorded is lost. The illustrations available indicate that the holotype represents a fragment with dichotomizing veins, all similar in thickness and placed in the same plane, with no distinction between convex and concave veins. These features are characteristic of the plant leaflets and not of insect wings. Therefore, the species in question belongs to a plant species and not to an insect.

SYSTEMATIC PALEONTOLOGY

Order JURINIDA M. Zalesky, 1929
Family GLOSSELYTRIDAE Martynov, 1938

Genus *Argentinoglosselytrina* Martins-Neto & Gallego, 2001

Type species. *Argentinoglosselytrina pulchella* Martins-Neto & Gallego, 2001. Carnian, Upper Triassic, Los Rastros Formation; Gualo locality, La Rioja Province, Argentina.

Emended diagnosis. Forewing. Precostal lobe with ambient vein well developed, separating border dilated proximally, narrowed distally, with other longitudinal veins including SC disorganized (thin and zigzag). Anterior ambient vein (R) mostly disorganized and replaced in that role by RS which joining with posterior ambient vein. Posterior branch of M and CuP fused in axial vein. All other longitudinal veins except 1A, 2A, partially 3A, and posterior A disorganized and hardly distinguishable from crossveins (thin and zigzag). All veins thin, wing membrane not incrassate.

Remarks. *Argentinoglosselytrina* is ascribed to the Family Glosselytridae as interpreted by Rasnitsyn & Aristov (2013) based on the presence of ambient veins (unlike Permoberothidae and Archoglosselytridae) and the presence of 12 rows of cells (or crossveinless intervein spaces) in the widest place in main wing part (at most ten rows in Jurinidae). The genus differs from other Glosselytridae, as well as from all other Glosselytroidea, in disorganized SC

and many other veins including most part of the anterior ambient vein (R) which is replaced in that role by RS.

Argentinoglosselytrina pulchella

Martins-Neto & Gallego, 2001

Figure 3.1–3.3

Type material. Holotype, PULR-I 253 and PULR-I 263, counterpart and part, respectively.

Geographic and stratigraphic occurrence. Gualo locality, La Rioja Province, Argentina; Los Rastros Formation. Carnian, Upper Triassic.

Diagnosis. As for genus.

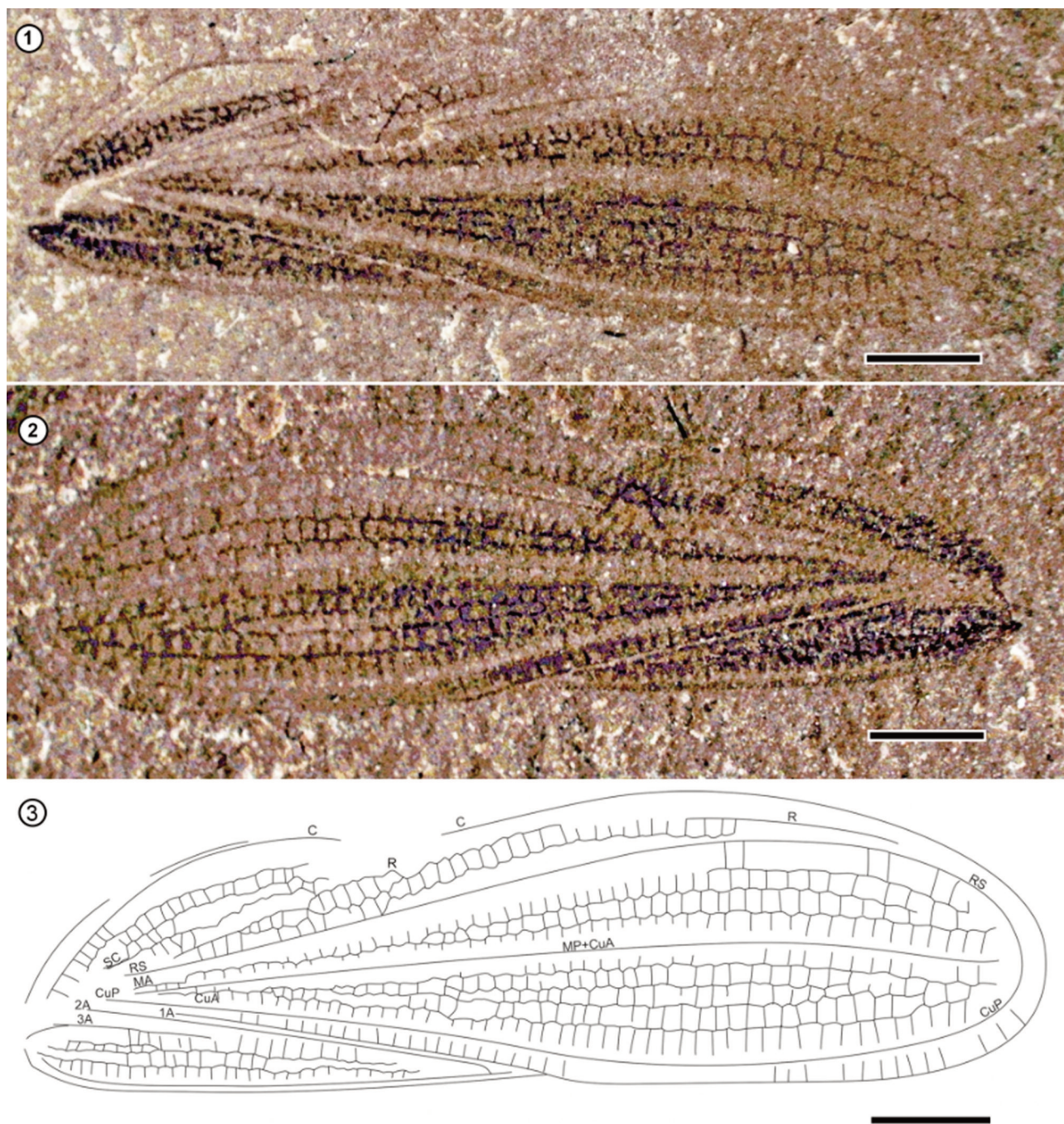


Figure 3. *Argentinoglosselytrina pulchella* Martins-Neto & Gallego, 2001; 1–2, holotype, PULR-I 253 (counterpart) and PULR-I 263 (part) respectively, photographs of the holotype specimen of a complete forewing with basal colored area; 3, new interpretation of the counterpart forewing with new ambient vein formed by RS and CuP. Scale bar= 1 mm.

Description. Forewing length 8.6 mm, width 2.4 mm. General color dark with wide pale strips along fore margin, RS, MP+CuA and CuP (ambient and axial veins), with darkening resulted from dark waved veins and crossveins and to a lesser extent from darkened wing membrane; coloration deeper basally because of veins and membrane being thicker there. Precostal lobe with three rows of cells, between R and RS two rows, between RS and MP+CuA four (MA with three branches), between MP+CuA and CuP five (CuA with four branches), anal area with four rows behind 3A (many crossveins are ill-preserved and respective intervals look partially or even totally empty).

Order HOMOPTERA Leach, 1815

Superfamily SCYTINOPTEROIDEA Handlirsch, 1906

Family SAALOSCYTINIDAE Brauckmann *et al.*

(in Martins-Neto *et al.*, 2006)

Genus *Saaloscytina* Brauckmann & Schlüter, 1993

Type species. *Saaloscytina perreticulata* Brauckmann & Schlüter, 1993. Lower Anisian, Middle Triassic, Uppermost Röt Formation (Myophoria beds Member); former quarry at Herolds-Berg in Hammelburg locality, Lower Franconia, Germany.

Saaloscytina carmonae (Martins-Neto *et al.*, 2006)

Shcherbakov, 2011

Figure 2

2006 *Chanarelytrina nana* Martins-Neto & Gallego, p. 3, figs. 2D, 3C.

2011 *Saaloscytina carmonae* (Martins-Neto & Gallego) Shcherbakov, p. 17.

Type material. Holotype, PULR-I 334a.

Geographic and stratigraphic occurrence. Los Chañares locality, La Rioja Province, Argentina; Los Rastros Formation (1st cycle), early Late Triassic.

Remarks. Synonymized by Shcherbakov (2011, p. 17). New data of this species is reported by Lara *et al.* (2021).

Order INCERTAE SEDIS

Genus *Miomina* Martins-Neto & Gallego, 1999

Type species. *Miomina mendozina* Martins-Neto & Gallego, 1999, Quebrada del Durazno locality, south of the Cerro Cacheuta, Mendoza

Province, Argentina; Potrerillos Formation, late Middle Triassic to early Late Triassic.

Remarks. Type species is lost and might represent a leaf fragment rather than insect wing (see Results above).

Miomina riojana Martins-Neto & Gallego

(in Martins-Neto *et al.*, 2006)

Figure 1

Type material. Holotype, PULR I 334b (part) and PULR-I 334/1c (counterpart).

Remarks. The holotype represents a wing fragment with a few short veins and cannot be identified with any certainty (see Results above).

FINAL COMMENTS

The present revision of the described Palaeomanteida and Jurinida from the Triassic of Argentina reveals only *Argentinoselytrina pulchella* as correctly identified. This leaves this species as the sole representative of an extinct insect order. It might imply that the Late Triassic insect fauna of Argentina is poor compared with at least Central Asia. Of course, analysis of further material could easily compromise this conclusion. Yet our results could reflect a younger age of the Los Rastros and Potrerillos faunas referred to as the Late Triassic in contrast to the Middle or Late Triassic age proposed for the Central Asian Madygen fauna (Shcherbakov, 2008; Voigt *et al.*, 2017).

It is also worth noting that *A. pulchella*, even though generally fits well in the diagnosis of the Family Glosselytridae, displays characters differing considerably from the morphological standard of the Order Jurinida and particularly its of both advanced and successful (diverse) families, Jurinidae and Glosselytridae. We mean a secondary disorganization of SC, R, MA, CuA, precostal and posterior anal veins that become crossvein-like thin and zigzag. In other glosselytrodeans, these veins are always (SC, R) or usually stable (straight or bent, not zigzag). There is a more striking modification of the morphological scheme of the advanced glosselytrodeans, origin of a new ambient vein formed by RS and CuP instead of R and CuP, as if we can see a distinct step toward the origin of a new higher rank group, which has been aborted prematurely.

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