

The Triassic insect fauna from South America (Argentina, Brazil and Chile): a checklist (except Blattoptera and Coleoptera) and descriptions of new taxa

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Received: 25 Feb., 2002

Accepted for publication: 30 Sep., 2002

MARTINS-NETO R. G., GALLEGO O. F., MELCHOR R. N. 2003. The Triassic insect fauna from South America (Argentina, Brazil and Chile): a checklist (except Blattoptera and Coleoptera) and descriptions of new taxa. *Acta zoologica cracoviensia*, **46**(suppl.– Fossil Insects): 229-256.

Abstract. The present paper describes new fossil insect taxa from the Los Rastros and Ischichuca Formations, La Rioja Province, Argentina; and from the Santa Juana Formation, Chile. These formations are dated as late Middle Triassic to early Late Triassic. Eight new genera and nine new species are described: *Frenguelliophlebia labandeirai* n. gen. et n. sp. (Odonoptera); *Argentinoperlidium rogersi* n. gen. et n. sp. (Plecoptera: Gripopterigidae); *Dysmorphoptiloides pulcherrima* n. sp.; *Bandelnielsenia chilena* n. gen. et n. sp., *Gallegomorphoptila breviptera* n. gen. et n. sp. (all Auchenorrhyncha: Dysmorphoptilidae), *Gualoscytina mayae* n. gen. et n. sp. (Auchenorrhyncha: Scytinopteridae), *Argentinopheloscyta forsterae* n. gen. et n. sp. (Auchenorrhyncha: Stenovicidae); *Yurigomicex popovi* n. gen. et n. sp., and *Popovigomicex yurii* n. gen. et n. sp. (both Coleorrhyncha: Progonomicidae). Additionally a checklist of all known described species of South America Triassic is provided (except Blattoptera and Coleoptera, paper in preparation), as well as a discussion of dispersal paths of Triassic conchostracan and insects faunas of Gondwana.

Key words: Triassic insects, new genus, new species, Argentina, Brazil, Chile, Gondwana.

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I. INTRODUCTION

This paper presents new data about the fossil record of Triassic insects from Argentina, Brazil and Chile, and a compendium of reported occurrences. The Triassic insect faunas from South America are sparse and poorly known from this time. Only six Triassic insect localities are presently known: Mendoza (Cacheuta hill), La Rioja (Gualo River and “Quebrada de Ischichuca Chica”) Provinces (western Argentina), São Paulo (Timbó river), Rio Grande do Sul (Passo das Tropas) states (Brazil), and Concepción (southern Chile).

Previous records of these faunas were summarized by GALLEG0 (1997), GALLEG0 & MARTINS-NETO (1999) and MARTINS-NETO & GALLEG0 (1999). The presence of fossil insects in Triassic sediments of South America was first reported by WIELAND (1925); this record has been significantly expanded by subsequent authors.

Argentinian faunas are the richest in South America, with the most described species in an extensive literature. Only three species have been described from Brazil; Chilean occurrences have been mentioned only as undetermined insects (FUENZALIDA 1937; CECIONI & WESTERMANN 1968) from localities Punta Puquén, Los Lobos and Los Molles in Central Chile.

In the present paper we describe new taxa from Argentina, the described species from Argentina and Brazil are listed, and new specimens from Chile are reported for the first time (Concepción locality, southern Chile).

This paper contains the first overview of the Triassic insect fauna of Argentina (excluding Coleoptera and Blattoptera), including many recent findings. Coleoptera and Blattoptera (which include a total of about 1355 specimens) will be treated by us elsewhere. The material described herein includes 23 genera and 28 species (33 specimens, Table I) from Cuyo and Ischigualasto – Villa Unión Basins of Argentina (Fig. 1) (most specimens) and from the Paraná basin of Brazil (two specimens).

Terminology and classification adopted here conforms mainly to that of KUKALOVÁ-PECK (1991) and VILESOV & NOVOKSHONOV (1994).

A b b r e v i a t i o n s:

CORD-PZ – Palaeozoological Collection, Universidad Nacional de Cordoba, Argentina

MACN – Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina

MLP – Museo de La Plata (Invertebrate Paleontology), Argentina

MMHN – Museo Municipal de Historia Natural de San Rafael, Mendoza, Argentina

PULR-I – Invertebrate Paleontological Collection, Universidad Nacional de La Rioja, Argentina

PZ-CTES – Paleozoological Collection of the Facultad de Ciencias Exactas, Naturales y Agrimensura de la Universidad Nacional del Nordeste, Mendoza, Argentina.

SGO-PI – Paleontology Section of the Museo Nacional de Historia Natural, Santiago, Chile.

USP – Universidade de São Paulo, campus de Ribeirão Preto, SP, Brazil.

A c k n o w l e d g e m e n t s. We thank Dr. Ana Maria ZAVATTIERI (Ianigla-Cricyt-CONICET, Mendoza, Argentina), Dr. Augusto MENÉNDEZ, Lic. Jorge CRUZ and Sr. Alberto ACOSTA for field assistance and collaboration in the Mendoza Province Triassic outcrops. We also acknowledge Lic. Andrea ARCUCCI (Universidad Nacional de San Luís, Argentina), Drs. Catherine FORSTER, Cathleen MAY and Raymond ROGERS from the project “El contexto del origen de los Dinosaurios: Paleontología y Paleoecología de la Formación Los Rastros, Triásico Medio de La Rioja”, National Geographic Society (Grant 5317-94). Special thanks to Dr. Klaus BANDEL and Geol. Sven NIELSEN (Universität Hamburg, Geologisch-Paläontologisches Institut and Museum) for providing us with material collected in the Chilean Triassic. Thanks are also due to our special friend, Dr. Yuri POPOV (Russian Academy of Sciences), for his help in the description of the Heteroptera specimen, and to our “computer magician”, Vinicius Moreno DE GODOI (FFCLRP/SBPr), for help in all of the informatics problems and solutions.

Table I

Summary of the insect taxa described in this paper, grouped by unit and locality

Order	Family	Species
Potrerrillos Formation (Cerro Cacheuta, Mendoza, Cuyo basin)		
Odonatoptera	<i>Incertae sedis</i>	<i>Triassothemis mendozensis</i> CARPENTER 1960
Odonatoptera	<i>Incertae sedis</i>	<i>Frenguelliophlebia labandeirai</i> MARTINS-NETO & GALLEG0 n. sp.
Plecoptera	Gripopterygidae: Euxenoperlinae	<i>Gondwanoperlidium argentinorum</i> PINTO & PURPER 1978
		<i>Gondwanoperlidium mendozensis</i> PINTO & PURPER 1978
Miomoptera	<i>Incertae sedis</i>	<i>Miomina mendozina</i> MARTINS-NETO & GALLEG0 1999
Grylloblattida	Atactophlebiidae	<i>Triasseuryptilon acostai</i> (MARQUAT) STOROZHENKO 1997
Ensifera	Haglidae	<i>Notopamphagopsis bolivari</i> CABRERA 1928
Auchenorrhyncha	Dysmorphoptilidae	<i>Dysmorphoptiloides acostai</i> MARTINS-NETO & GALLEG0 1999 (*)
Auchenorrhyncha	Chiliocyclidae	<i>Tipuloidea rhaetica</i> WIELAND 1925
		<i>Argentinocicada magna</i> MARTINS-NETO & GALLEG0 1999
		<i>Argentinocicada minima</i> MARTINS-NETO & GALLEG0 1999
Auchenorrhyncha	Scytinopteridae	<i>Potrerrillia nervosa</i> MARTINS-NETO & GALLEG0 1999
Trichoptera? /		<i>Tipulidites affinis</i> WIELAND 1926
Diptera?		<i>Necrotaulius affinis</i> WIELAND 1926
Los Rastros Formation (Río Gualo, La Rioja, Ischigualasto – Villa Unión basin)		
Glosselytrodea	Polycyttellidae	<i>Argentinoglosselytrina pulchella</i> MARTINS-NETO & GALLEG0 2000 (*)
Plecoptera	Gripopterygidae: Euxenoperlinae	<i>Argentinoperlidium rogersi</i> MARTINS-NETO & GALLEG0 n. sp.
Ensifera	Haglidae	<i>Notopamphagopsis?</i> sp. 1
		<i>Notopamphagopsis?</i> sp. 2
		<i>Notopamphagopsis?</i> sp. 3
Auchenorrhyncha	Dysmorphoptilidae	<i>Dysmorphoptiloides acostai</i> MARTINS-NETO & GALLEG0 1999 (*)
		<i>Dys morphoptiloides gigantea</i> MARTINS-NETO & GALLEG0 2000
		<i>Dysmorphoptiloides pulcherrima</i> MARTINS-NETO & GALLEG0 n. sp.
		<i>Gallegomorphoptila breviptera</i> MARTINS-NETO n. sp.
Auchenorrhyncha	Scytinopteridae	<i>Australocicada arcucciae</i> MARTINS-NETO & GALLEG0 2000 (*)
		<i>Gualoscytina mayae</i> MARTINS-NETO & GALLEG0 n. sp.
Auchenorrhyncha	Stenoviciidae	<i>Argentinopheloscyta forsterae</i> MARTINS-NETO & GALLEG0 n. sp.
Coleorrhyncha	Progonomicidae	<i>Yurigocimex popovi</i> MARTINS-NETO & GALLEG0 n. sp.
		<i>Popovigocimex yurii</i> MARTINS-NETO & GALLEG0 n. sp.
Ischichuca Formation (Quebrada Ischichuca, La Rioja, Ischigualasto – Villa Unión basin)		
Auchenorrhyncha	Prosboloidea: Prosbolidae (2)	<i>Lariojaprosbole melchori</i> MARTINS-NETO & GALLEG0 2000 (*)
Rio Do Rastro Formation (near Poço Preto, Santa Catarina, Paraná basin)		
Auchenorrhyncha	Prosboloidea: Prosbolidae	<i>Prosbolidinella riorastensis</i> MARTINS-NETO & ROHN 1996
Santa Maria Formation (Passo das Tropas, Rio Grande do Sul, Paraná basin)		
Trichoptera?		<i>Sanctipaulus mendesi</i> PINTO 1956

(*) Indicates two specimens. The remaining occurrences are known from a single specimen.

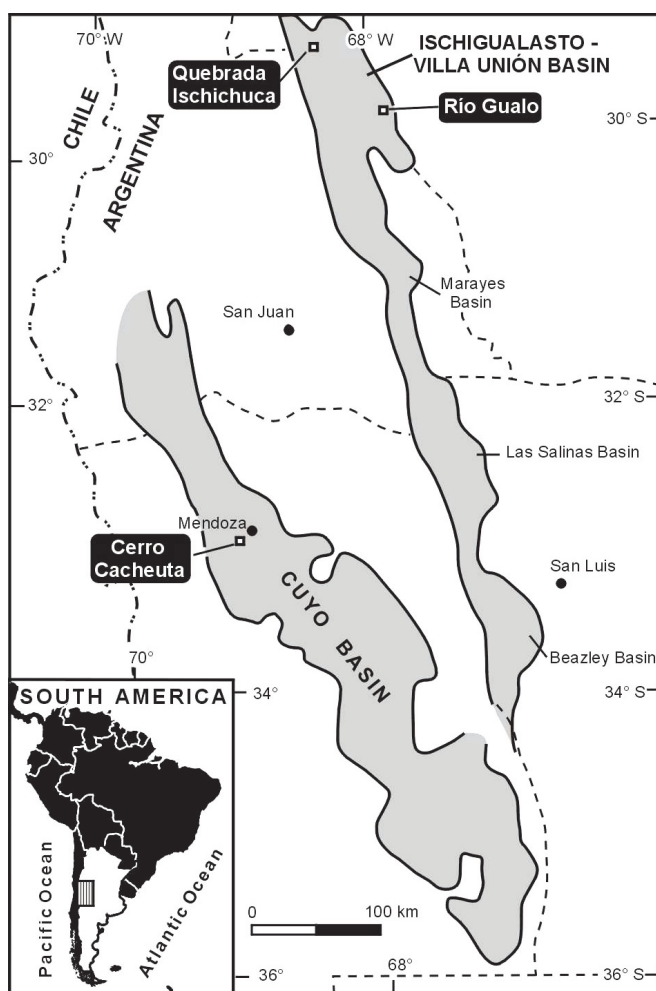


Fig. 1. Map showing the Cuyo and Ischigualasto – Villa Unión basins and the locations of the three insect-bearing localities mentioned in the text.

II. GEOLOGICAL ASPECTS

Most of the known Triassic insect fauna from Argentina come from the Potrerillos and Los Rastros Formations, which belong to Cuyo and Ischigualasto Villa-Unión rift basins respectively (Fig. 1). Each of these units have yielded a single insect-bearing locality or area: Cerro Cacheuta, of the Potrerillos Formation (northern Mendoza Province) and the Río Gualo area of the Los Rastros Formation (Talpampaya Park, southern La Rioja Province). The Potrerillos Formation is included in the Uspallata Group and represents the depositional record of the second sinrift phase of KOKOGIÁN et al. (1993). Occurrences of insect remains at Cerro Cacheuta were concentrated in a 3 km-long tract along the strike of the upper part of the Potrerillos Formation in the southern flank of the hill (approximately 33° 05' S, 69° 07' W; see MOREL 1994: Fig. 1). The stratigraphic interval where most insect remains were collected has been interpreted as floodplain, crevasse, and levee facies (MOREL 1994; KOKOGIÁN et al. 1999) in an intermediate to high sinuosity fluvial system (KOKOGIÁN et al. 1999; BELLOSI et al., in press). At Cerro Cacheuta, these facies grade to distributary sys-

tems (mouth bar, channel, and interdistributary bay) of lacustrine deltas (KOKOGIÁN et al. 1999). Associated plant remains have been attributed to the BNP biozone of SPALLETTI et al. (1999).

Both the Los Rastros and Ischichuca Formations belong to the Agua de la Peña Group of the Ischigualasto – Villa Unión Basin. The insect fauna from the Los Rastros Formation was recovered from Río Gualo (about 29° 53' S; 67° 46' W), southern La Rioja Province, Talampaya Park (Fig. 1). In this area the exposures of the Los Rastros Formation are mostly composed of deep-lacustrine mudstones, storm and wave-influenced delta-front siltstones, and channel sandstones. Insect remains are preferentially preserved in olive-green, thinly laminated mudstones deposited in deep, well-oxygenated lakes.

Ischichuca Formation is dominantly composed of shallow and deep lacustrine facies with progradational deltaic successions (MELCHOR 1998). In particular, insect remains come from dark brown to olive-green claystones with abundant plant remains from the lower part of the unit. This interval is interpreted as a shallow, partially saline lake. The Ischichuca Formation continental palynologic assemblage is closely comparable to those of the Ipswich Microflora of Australia (ZAVATTIERI & MELCHOR 1999). The Macroflora of this unit was included by SPALLETTI et al. (1999) in the CSD biozone.

There is general agreement that the age of the Potrerillos Formation is late Middle Triassic to early Late Triassic (e.g., STIPANICIC 1983; MOREL 1994; ZAVATTIERI & BATTEN 1996; SPALLETTI et al. 1999; KOKOGIÁN et al. 1999). In contrast, disagreement exists on the age of the Ischichuca and Los Rastros Formations (mainly concerning the former). Most authors consider these units to be of approximately the same age as the Potrerillos Formation (STIPANICIC & BONAPARTE 1979; STIPANICIC 1983; KOKOGIÁN et al., 1999). However, in the recent chronostratigraphic scheme of SPALLETTI et al. (1999) both the Ischichuca and Los Rastros Formations are restricted to the lower part of the Middle Triassic. Conversely, ZAVATTIERI & MELCHOR (1999) suggest that the age of the Ischichuca Formation, on the basis of its palynological content, is late Ladinian-nearly Carnian. This is in agreement with a previous palynological assessment of Carnian age for the overlying Los Rastros Formation (ZAVATTIERI & BATTEN 1996).

The remaining occurrences of Triassic insects discussed in this paper (Table I) come from the Paraná basin in southeast Brazil, from Rio do Rasto, and from the Santa Maria Formation. The Rio do Rasto Formation (uppermost unit of the Passa Dois Group) have been considered of Late Permian age until recent findings of MARTINS-NETO & ROHN (1996), who suggest a maximum Early Triassic age for this unit based on its flora, Conchostracan fauna, and insect remains (*Prosbolidinella riorastensis* MARTINS-NETO & ROHN 1996). This formation is considered essentially of fluvial origin. The overlying Santa Maria Formation (Rosario do Sul Group) is a continental red-bed sequence from the central region of Rio Grande do Sul. Typical facies include mudstones intercalated with fine-grained sandstones, deposited in the floodplains of a braided fluvial system (HOLZ & BARBERENA 1994). The Santa Maria Formation is well known for its high diversity of fossil tetrapods (e.g., BONAPARTE 1982), which allowed its assignment to the Late Triassic (e.g., ANDERSON & ANDERSON 1993; BENTON 1983), specifically the Carnian (SHUBIN & SUES 1991). Its fauna is similar to that of the Ischigualasto Formation of the Ischigualasto – Villa Unión basin of Argentina, which may imply a slightly younger age than the Ischichuca and Los Rastros Formations.

III. SYSTEMATIC PALEONTOLOGY

ODONATOPTERA

Family incertae sedis

Triassothemis mendozensis CARPENTER, 1960

Fig. 2G-H

*1960 *Triassothemis mendozensis* CARPENTER: 71-73, Fig. 1

1992 *Triassothemis mendozensis* CARPENTER: 78; 1997 *Triassothemis mendozensis* CARPENTER in GALLEG0: 512-513; 1999 *Triassothemis mendozensis* CARPENTER in GALLEG0 & MARTINS-NETO: 87-88, Fig. 16.

H o l o t y p e. MACN no. 18040, housed in MACN, Argentina. Type locality: Aguas de las Avispas, Cerro Cacheuta, Argentina. Type stratum : Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

***Frenguelliophlebia* MARTINS-NETO & GALLEG0, n. gen.**

D i a g n o s i s. Wing similar to *Petrotypus* ZALESSKY, 1950 in the general aspect of the venation, but with M and Cu moderately wavy.

Type species. *Frenguelliophlebia labandeirai* MARTINS-NETO & GALLEG0 n. sp., designated here.

E t y m o l o g y. In honor of Dr. Joaquin FRENGUELLI, the paleobotanist who first mentioned the insect fossils of this region, and *phlebia*, a common odonate suffix. Gender: feminine.

D i s c u s s i o n. *Frenguelliophlebia* n. gen. is similar to *Petrotypus* ZALESSKY, 1950 (Meganeuridae), from the Upper Permian of the Urals by having CuA and CuP multi-branched, differing however, by having M and Cu moderately wavy (notably wavy in *Petrotypus*). In this aspect *Frenguelliophlebia* n. gen. is similar to *Triadotypus* GRAUVOGEL & LAURENTIAUX, 1952 (Triadotypidae) from the Lower Triassic of France, differing, however, by having a wider cubital area and long and curved branches of Cu. The Meganeuridae as well as Triadotypidae are mostly consisting of giant species (90 mm in length), unlike this specimen, which is not more than 25 mm long. Additionally, *Frenguelliophlebia* n. gen. exhibits a combination of characters present separately in Meganeuridae and Triadotypidae. Because of this, correct family placement is uncertain, and *Frenguelliophlebia* n. gen. may belong to a new family. More complete material is necessary to confidently determine the family placement of this genus.

***Frenguelliophlebia labandeirai* MARTINS-NETO & GALLEG0, n. sp.**

Fig. 2 I

D i a g n o s i s. As for the genus.

E t y m o l o g y. In honor of Dr. Conrad Christopher LABANDEIRA (Smithsonian Institution), in recognition of his great contribution to the paleoentomology.

H o l o t y p e. PULR-I n° 269, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

D e s c r i p t i o n (Fig. 2I). Basal fragment of incomplete fore wing, 12 mm in length preserved. R+MA and Cu moderately wavy. Cu origin close to the wing base. CuA with at least five secondary branches with intercalary veins; CuP single, distally branched. Anal branches long and curved.

GLOSSELYTRODEA

Family: **Polycyttellidae** MARTYNOVA, 1952

***Argentinoglosselytrina pulchella* MARTINS-NETO & GALLEG0 2001**

Fig. 2A, B

*2001 *Argentinoglosselytrina pulchella* MARTINS-NETO & GALLEG0.

H o l o t y p e. PULR-I n° 253, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

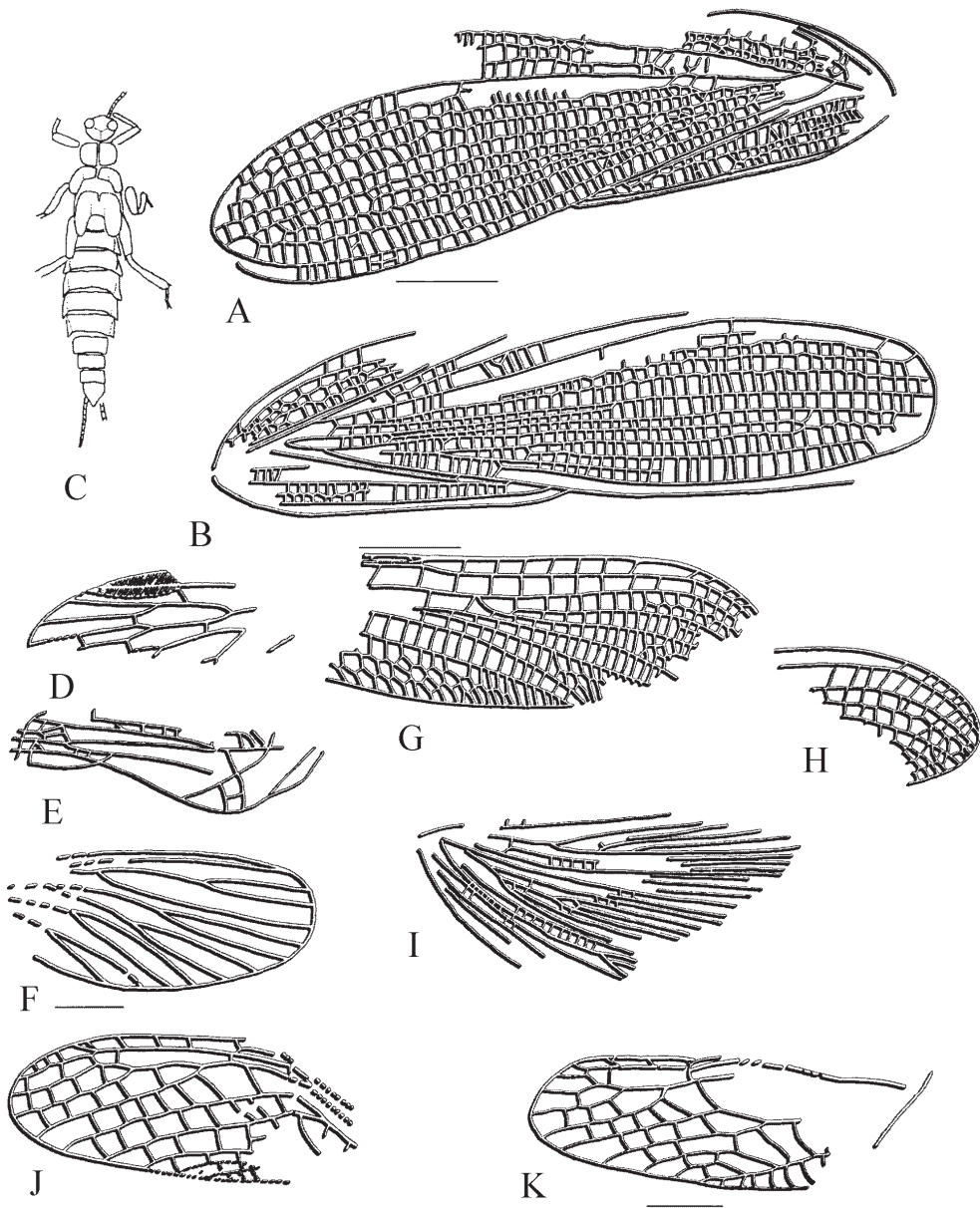


Fig. 2. A – B: *Argentinoglosselytrina pulchella* MARTINS-NETO & GALLEG0 2001 (Odonatoptera: Polycyttellidae), holotype PULR-I n° 253 (A); *Argentinoglosselytrina pulchella* MARTINS-NETO & GALLEG0, 2001, specimen PULR-I n° 263 (B); C. *Tryasseuryptilon acostai* (MARQUAT) STOROZHENKO 1997 (Grylloblattida: Atactophlebiidae), holotype MMNH n° 1518, reproduced from STOROZHENKO (1997: Fig. 1); D. *Necrotaulius affinis* WIELAND 1925 (Mecoptera?), holotype, redrawn from WIELAND (1925: Fig. 1); E. *Argentinoperlidium rogersi* n. sp. (Plecoptera: Gripopterigidae), holotype PULR-I, n° 258; F. *Miomima mendozina* MARTINS-NETO & GALLEG0 1999 (Miomoptera, fam. inc. sed.), holotype PZ-CTES n° 5731; G-H: *Triassothemis mendozensis* CARPENTER 1960 (Odonatoptera, fam. inc. sed.), holotype MACN n°18040; I. *Frenguelliophlebia labanderae* MARTINS-NETO & GALLEG0 n. sp. (Odonatoptera, fam. inc. sed.), holotype PULR-I, n° 269; J. *Gondwanoperlidium argentinorum* PINTO & PURPER 1978 (Plecoptera: Gripopterigidae), holotype MLP n° 8908; K. *Gondwanoperlidium mendozensis* PINTO & PURPER 1978, holotype CORD-PZ n° 336. Scale bar 1 mm. All drawings are original, if not otherwise stated.

Supplementary material. (Fig. 2B); PULR-I n° 263. Same age, locality, stratum and destination as in Holotype.

PLECOPTERA

Family: **Gripopterigidae** sensu RIEK, 1976

Subfamily: Euxenoperlinae RIEK, 1976

Gondwanoperlidium argentinum PINTO & PURPER, 1978

Fig. 2J

1921 *Baiera argentinii* KURTZ: Pl. 21, Fig. 336

1926 *Elcana?* *argentina* COCKERELL in: WIELAND: 131.

1927 ?*Elcana* sp. COCKERELL

1939 *Elcana?* *argentina* HANDLIRSCH

1941 *Locustopsis?* *argentina* ZEUNER

*1978 *Gondwanoperlidium argentinum*, PINTO & PURPER: 79-80, Pl. 1A, Fig. 1C.

1992 *Gondwanoperlidium argentinum* PINTO & PURPER in CARPENTER: 97; 1997 *Gondwanoperlidium argentinum* PINTO & PURPER, GALLEG0: 512-513; 1999 *Gondwanoperlidium argentinum* PINTO & PURPER in GALLEG0 & MARTINS-NETO: 87-88

H o l o t y p e. MLP n° 8908, housed in MLP, Argentina. Type locality: “Minas de Petróleo”, at Cacheuta, 14 km W of Mendoza city, Mendoza Province, Argentina. Type stratum: Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

Gondwanoperlidium mendozensis PINTO & PURPER 1978

Fig. 2K

*1978. *Gondwanoperlidium mendozensis* PINTO & PURPER: 81, Pl. 1B, Fig. 1D.

1995 *Gondwanoperlidium mendozensis* PINTO & PURPER in MAZZONI: 229, 230, Lám XXII, Fig. 22; Fig-text. 45; 1997 *Gondwanoperlidium mendozensis* PINTO & PURPER in GALLEG0: 512-513; 1999 *Gondwanoperlidium mendozensis* PINTO & PURPER in GALLEG0 & MARTINS-NETO: 87-88, Fig. 17.

H o l o t y p e. CORD-PZ n° 336, housed in CORD-PZ, Argentina. Type locality: “Minas de Petróleo”, at Cacheuta, 14 km W of Mendoza city, Mendoza Province, Argentina. Type stratum: Potrerillos Formation (Cacheuta Fm., sensu MAZZONI, 1995). Age: late Middle Triassic to early Late Triassic.

Argentinoperlidium MARTINS-NETO & GALLEG0, n. gen.

D i a g n o s i s. Wing similar to *Euxenoperla* RIEK, 1976 in general aspect of venation, but ScP fused distally with RA, and M strongly curved.

Type species. *Argentinoperlidium rogersi* MARTINS-NETO & GALLEG0 n. sp., designated here.

E t y m o l o g y. Argentina, from which the material originates, and *perlidium*, from Perlida. Gender: neutrum.

D i s c u s s i o n. *Argentinoperlidium* n. gen. differs of all known Euxenoperlinae by having ScP distally fused with RA (connected by a cross-vein in *Euxenoperla* RIEK, 1976 as well as in *Gondwanoperlidium* PINTO & PURPER, 1978), and M strongly curved. Additionally, *Argentinoperlidium* n. gen. has a more complex cross-veins pattern.

***Argentinoperlidium rogersi* MARTINS-NETO & GALLEG0, n. sp.**

Fig. 2E

D i a g n o s i s. As for the genus.**E t y m o l o g y.** In honor of Dr. Raymond ROGERS (Department of Geology, McAlester College, St. Paul, Minnesota), who collaborated in fieldwork, working in the collections, and did sedimentological analysis at the Gualo river site (La Rioja) for the NGS project (grant 5317-94).**H o l o t y p e.** n° 258, housed in PULR-I. Type locality: Picos Gemelos, Gualo, La Rioja, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.**D e s c r i p t i o n.** Fore wing fragment 5 mm in length. Costal area very narrow where preserved, filled with pectinate cross-veins. ScP relatively long, distally fused with RA. RA sigmoid. M very curved towards apex. Complex pattern of cross-veins forming a heterogeneous mosaic of cells.

MIOMOPTERA

Family *incertae sedis****Miomina mendozina* MARTINS-NETO & GALLEG0 1999**

Figs 2F

*1999 *Miomina mendozina* MARTINS-NETO & GALLEG0: 198, Figs 1H, 5B.**H o l o t y p e:** n° 5731, housed in PZ-CTES, Argentina. Type locality: 300 m W of Quebrada del Durazno. South of the Cerro Cacheuta. Mendoza, Argentina, levels EP I and EP II of MOREL (1994). Type stratum: Upper Section of the Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

GRYLLOBLATTIDA

Family: **Atactophlebiidae** sensu STOROZHENKO, 1997***Triasseuryptilon acostai* (MARQUAT) STOROZHENKO, 1997**

Fig. 2C

1991 *Delopterum acostai* MARQUAT: 6, Fig. 21997 *Paleomantis acostai* (MARQUAT) GALLEG0: 513-514.*1997 *Triasseuryptilon acostai* (MARQUAT) STOROZHENKO: 8, Fig. 1.1999 *Triasseuryptilon acostai* (MARQUAT) STOROZHENKO in GALLEG0 & MARTINS-NETO: 87; Fig. 15**H o l o t y p e.** MMHN n° 1518, housed in MMHN, Argentina. Type locality: Cerro Cacheuta, Mendoza Province, Argentina. Type stratum : Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

ENSIFERA

Family: **Haglidae** HANDLIRSCH, 1906***Notopamphagopsis bolivari* CABRERA 1928**

Fig. 3A

*1928 *Notopamphagopsis bolivari* CABRERA: 372, Figs 1 and 21939 *Notopamphagopsis bolivari* CABRERA in ZEUNER: 18; 1962 *Notopamphagopsis bolivari* CABRERA in ROHDENDORF: 201; 1968 *Notopamphagopsis bolivari* CABRERA in SHAROV: 51; 1991 *Notopamphagopsis*

bolivari CABRERA in MARTINS-NETO: 26; 1992 *Notopamphagopsis bolivari* CABRERA in CARPENTER: 168; 1995 *Notopamphagopsis bolivari* CABRERA in GOROCHOV: 137; 1997 *Notopamphagopsis bolivari* CABRERA in GALLEG0: 511; 1999 *Notopamphagopsis bolivari* CABRERA in GALLEG0 & MARTINS-NETO: 87, Fig. 11; 1999 *Notopamphagopsis bolivari* CABRERA in MARTINS-NETO & GALLEG0: 198-200, Fig. 3A.

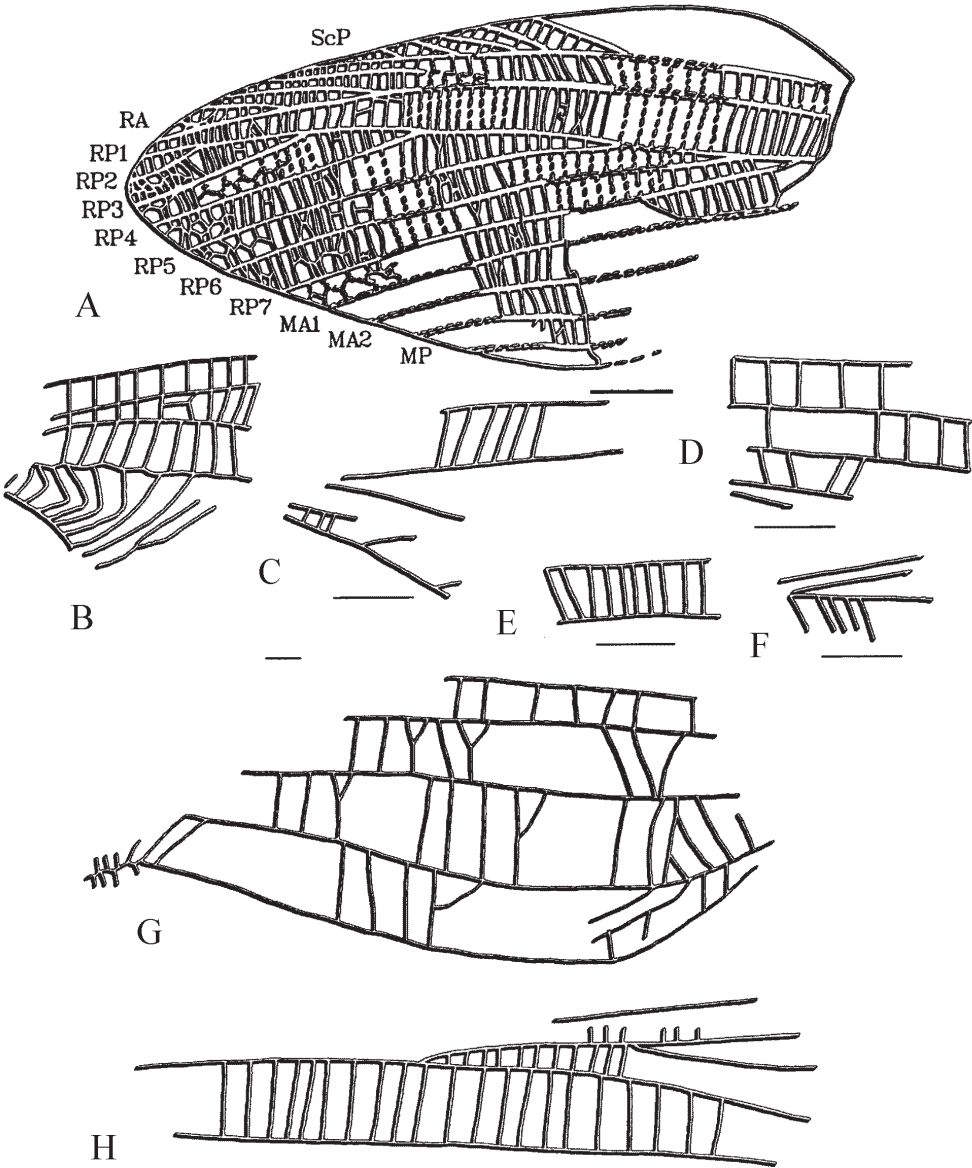


Fig. 3. Ensifera: Haglidae. A. *Notopamphagopsis bolivari* CABRERA 1928, holotype MLP n° 4354; B-F: *Notopamphagopsis*? sp. 1, specimen PULR-I n° 223 (B); unnumbered specimens fragments, possibly attributable to genus (C–F); G. *Notopamphagopsis*? sp. 2, specimen PULR I n° 259; H. *Notopamphagopsis*? sp. 3, specimen PULR I n° 270. Terminology: ScP, Subcosta posterior, RA, RP, anterior and posterior Radius, respectively; MA, MP, anterior and posterior Media, respectively. Scale bar 1 mm.

H o l o t y p e: MLP n° 4354, housed in MLP, Argentina. Type locality: Cerro Cacheuta, Mendoza, Argentina (possibly the same horizon EP I and EP II of MOREL, 1994). Type stratum: Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

Notopamphagopsis? sp. 1.

Fig. 3B

1999 *Notopamphagopsis?* sp. MARTINS-NETO & GALLEG0, 2001: Figs 3B-F, 4D-E

M a t e r i a l. PULR-I n° 223, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

Notopamphagopsis? sp. 2

Fig. 3G

M a t e r i a l. PULR-I n° 259, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

Notopamphagopsis? sp. 3

Fig. 3H

M a t e r i a l: PULR-I n° 270, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

AUCHENORRHYNCHA

CERCOPOIDEA

Family: **Dysmorphoptilidae** HANDLIRSCH, 1906

Dysmorphoptiloides EVANS, 1956

Type species: *Dysmorphoptiloides elongata* EVANS 1956, by original designation.

Dysmorphoptiloides acostai MARTINS-NETO & GALLEG0, 1999

Fig. 4B

*1999 *Dysmorphoptiloides acostai* MARTINS-NETO & GALLEG0: 192, 194, Fig. 2A.

2001 *Dysmorphoptiloides acostai* MARTINS-NETO & GALLEG0

H o l o t y p e. PZ-CTES n° 5772, housed in PZ-CTES, Argentina. Type locality: 300 m west of Quebrada del Durazno. South of the Cerro Cacheuta. Mendoza, Argentina, levels EP I and EP II of MOREL (1994). Type stratum: Upper Section of the Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

S u p p l e m e n t a r y m a t e r i a l. PULR-I n° 254 (Fig. 4A). PULR-I n° 260 (Fig. 4C): fore wing basal fragment with 6 mm of length preserved. Both housed in PULR-I; locality: Gualo, La Rioja Province, Argentina; Los Rastros Formation. PZ-CTES n° 7200, (Fig. 4D): fore wing fragment with 10 mm of length preserved; destination and other data as in Holotype.

Dysmorphoptiloides gigantea MARTINS-NETO & GALLEG0 2001

Fig. 4G

*2001 *Dysmorphoptiloides gigantea* MARTINS-NETO & GALLEG0.

H o l o t y p e: PULR-I n° 255, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

***Dysmorphoptiloides pulcherrima* MARTINS-NETO & GALLEGO n. sp.**

Fig. 4E-F

D i a g n o s i s. Costal and Anal margin concave at the Apical margin. r-m close to the R+MA fusion; MP1 and MP2 two-branched.

E t y m o l o g y. From Latin *pulcherrima*, “the most beautiful”.

H o l o t y p e: PULR-I n° 261, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

D e s c r i p t i o n. Fore wing 18 mm long. Costal and Anal margin sigmoid, concave at apical margin boundary. Apical margin rounded. Costal area broad. ScP+RA five-branched, with first branch near mid length of wing, second and third enclosing concave area of the Costal margin. R+MA distally fused at same level of concave area of Costal margin. MP two-branched: MP1 and MP2 two-branched and MP1a, MP1b, MP2a and MP2b of similar size. r-m close to fusion of R+MA. CuA two-branched: CuA1 curved and longer than CuA2. CuA1 and CuA2 encloses concave area of Anal margin. m-cu relatively short. Color pattern consists of circular spots placed in R+MA fusion, between MP1 and MP2, close to Anal margin, between CuA1 and CuA2, close to anal margin, in the middle of wing, and in base of wing. Entire surface of wing rugose, with homogeneously granular surface.

D i s c u s s i o n. Similar to *Dysmorphoptiloides acostai*, described for the same sediments in the general aspects of the wing venation. The new species differs, however, by having both the Costal and the Anal margins concave at the apical margin (just in the Costal margin in *D. acostai*), MP1 two-branched (unbranched or at least not branching at the same level in *D. acostai*) and r-m close to the R+MA fusion (far from the R+MA fusion in *D. acostai*). Additionally, *D. pulcherrima* n. sp. has a different color pattern, formed by spots distributed in the fore wing.

***Gallegomorphoptila* MARTINS-NETO n. gen.**

D i a g n o s i s. Costal margin distally notably deflected toward RA+RP, dome-like. Apical area short. Anal margin slightly concave at Apical margin. R+MA distally fused. MP1 and MP2 unbranched.

Type species. *Gallegomorphoptila breviptera* MARTINS-NETO n. sp., by present designation.

E t y m o l o g y. In honor of Dr. Oscar Florencio GALLEGO, who collected all of the material described here, and from *morphoptila*, alluding to *Dysmorphoptila*, the most similar genus. Gender: feminine.

D i s c u s s i o n. *Gallegomorphoptila* n. gen. is very similar in general appearance to the Jurassic genus *Dysmorphoptila* HANDLIRSCH, recorded from the German Triassic as well as from the Russian Triassic. *Gallegomorphoptila* differs, however, by R+MA distally fused (R is connected to MA by a vertical cross-vein in *Dysmorphoptila* and in *Tennentsia* RIEK, 1974, from the South Africa Triassic). *Gallegomorphoptila* n. gen. differs of *Dysmorphoptiloides*, recorded in the Australian Triassic as well as the Argentinean Triassic, by having a costal margin dome-like in shape, apical area very short, MP1 and MP2 unbranched, and reduced secondary venation.

***Gallegomorphoptila breviptera* MARTINS-NETO n. sp.**

Fig. 4H

D i a g n o s i s. As for the genus.

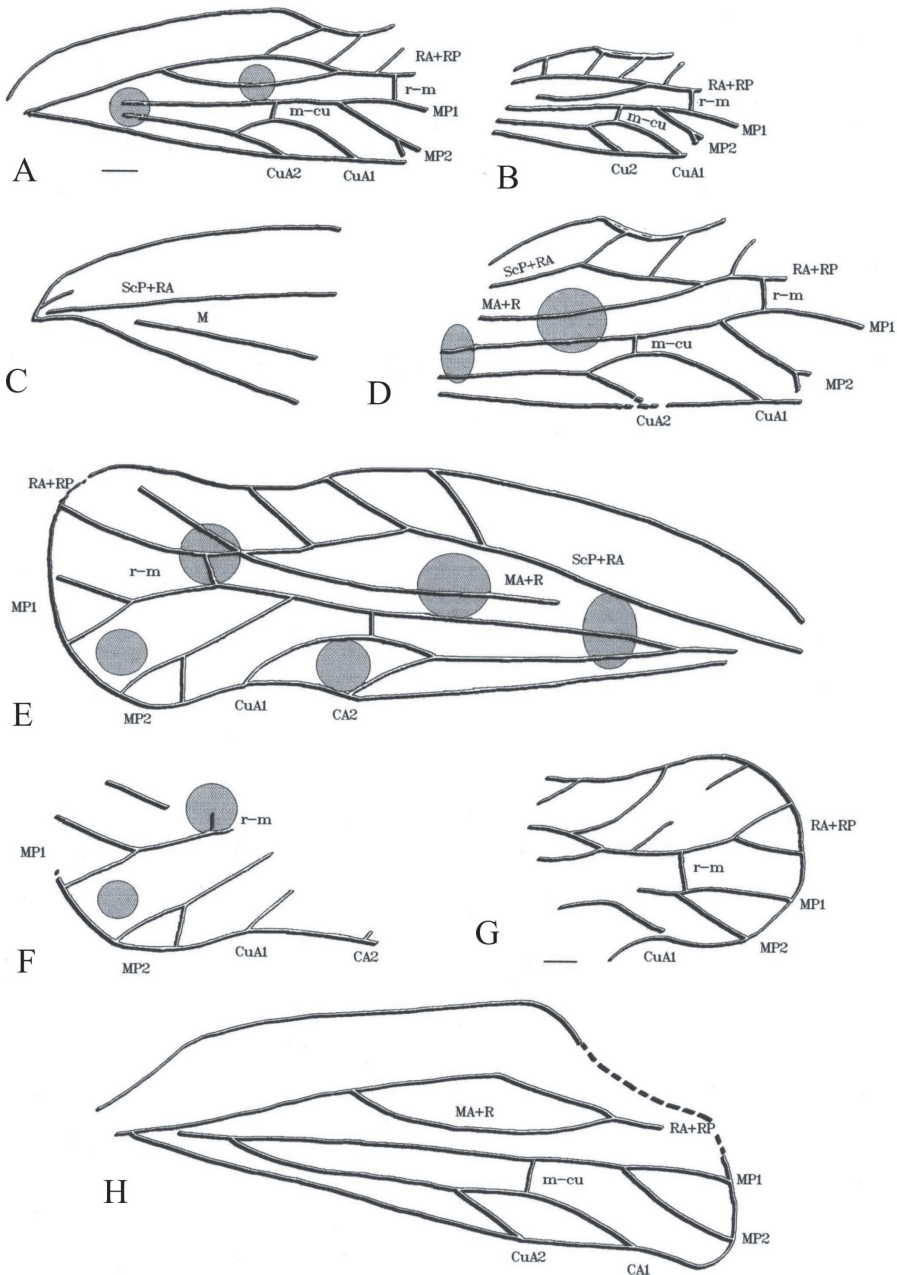


Fig. 4. Auchenorrhyncha: Dismorphoptilidae. A-D. *Dismorphoptiloides acostai* MARTINS-NETO & GALLEG0 1999: specimen PULR-I n° 254 (A); holotype PZ-CTES n° 5772 (B); specimen PULR-I n° 260 (C); and specimen PULR-I n° 264 (D). E-F: *Dismorphoptiloides pulcherrima* MARTINS-NETO & GALLEG0 n. sp., holotype PULR-I n° 261, part (E), and counterpart (F); G. *Dismorphoptiloides gigantea* MARTINS-NETO & GALLEG0, 2001, holotype PULR-I n° 255; H. *Gallegomorphoptila breviptera* MARTINS-NETO n. sp., holotype PULR-I n° 265. Terminology: ScA, anterior subcosta; CuA, anterior cubitus; m-cu, medial-cubital cross-vein; r-m; radial-medial cross-vein. Other abbreviations as for Fig. 2. Scale bar 1 mm.

E t y m o l o g y. From Latin *brevis* for ‘short’, alludes to the small apical area of the species.

H o l o t y p e: PULR-I n° 265, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation (second cycle). Age: late Middle Triassic to early Late Triassic.

D e s c r i p t i o n. Fore wing 14 mm long. Costal margin conspicuously deflected distally, forming a dome-like structure. Costal area as wide as Radial and Medial areas together. Apical margin quite straight where preserved, Apical area short. R+MA distally fused, after level of costal margin deflection. MP two-branched: MP1 and MP2 unbranched. CuA two-branched: CuA1 relatively long, curved and longer than CuA2. CuA1 and CuA2 branch before of concave area of Anal margin. m-cu relatively long. Color pattern absent, or at least, not preserved. Entire surface of wing rugose, with homogeneously granular surface.

D i s c u s s i o n. Similar to *Dysmorphoptiloides acostai* (described for the same stratum) in the general aspects and bearing similar wing venation, differing however by having both the Costal area relatively wider and the Apical area shorter. The anal margin is slightly concave at the Apical margin (straight in *D. acostai*, curvature more pronounced in *D. pulcherrima* n. sp.), MP1 and MP2 unbranched (MP2 two-branched in *D. acostai* and *D. pulcherrima* n. sp.). *Gallegomorphoptila breviptera* n. sp. is similar to *Dysmorphoptiloides gigantea*, described from the same sediments, by MP1 and MP2 unbranched, and differing by its small size, Costal margin dome-like (slightly concave in *D. gigantea*), Anal margin slightly concave (more pronounced in *D. gigantea*). Additionally, *G. breviptera* n. sp. does not have a color pattern formed by spots distributed in the fore wing.

***Bandelnielsenia* MARTINS-NETO & GALLEGO n. gen.**

D i a g n o s i s. Fore wing with apical area short, rounded and wide; ScP+RA and MA+R distally fused; MP three-branched with MP3 as long as MP2.

Type species. *Bandelnielsenia chilena* MARTINS-NETO & GALLEGO n. sp., by present designation.

E t y m o l o g y. In honor of Dr. Klaus BANDEL and Geol. Sven NIELSEN (Universität Hamburg, Geologisch-Paläontologisches Institut and Museum), who collected the material described here.

D i s c u s s i o n. *Bandelnielsenia* n. gen. differs of all known Dysmorphoptilidae by having a short and wide apical area, characteristically elongated and narrow in the other known genera. It differs from *Dysmorphoptiloides*, *Dysmorphoptila* HANDLIRSCH, *Tennentsia* RIEK and *Gallegomorphoptila* n. gen. by MP three-branched (four-branched in *Dysmorphoptiloides*, two-branched in *Dysmorphoptila* and *Gallegomorphoptila*, and five-branched in *Tennentsia*). *Bandelnielsenia* n. gen. is similar to *Dysmorphoptiloides* and *Gallegomorphoptila* by having SCP+RA and MA+R distally fused (unfused in *Dysmorphoptila* as well as in *Tennentsia*). Additionally, *Bandelnielsenia* n. gen. differs from all of these genera by CuA branches long (short in the others and CuA1 longer than CuA2).

***Bandelnielsenia chilena* MARTINS-NETO & GALLEGO n. sp.**

Fig. 6G

D i a g n o s i s. As for the genus. Fore wing 4 mm long. Concave distal region in Costal margin incipient, absent in Anal area.

E t y m o l o g y. Named for the nation of Chile.

H o l o t y p e: SGO.PI.5989, housed in the Paleontology Section of SGO, Chile. Type locality: outcrop at South of Santa Juana city, Southeast Concepción, southern Chile. Type stratum: Santa Juana Formation. Age: Upper Triassic.

D e s c r i p t i o n. Fore wing 4 mm long. Costal margin slightly deflected distally, forming an incipient dome-like structure. Costal area wider at Apical margin boundary. Apical margin wide and rounded, relatively short. R+MA distally fused, after level of Costal margin deflection. MP three-branched; MP1+MP2 origin before fusion of ScP+RA with MA+R, MP3 slightly longer than MP1+MP2. CuA two-branched, CuA1 long, as long as CuA2. CuA1+CuA2 origin before origin of MP3. m-cu relatively long, placed between both MP3 and CuA1+CuA2 origin. No color patterning detected. Entire surface of wing rugose, but not consisting of homogeneously granular surface.

D i s c u s s i o n. All known Dymorphoptilidae have a typical constriction in the distal part of the costal area, incipient in *Bandelnelsenia chilena* n. sp. and absent in the anal margin (conspicuous or at least incipient in the other known species). Additionally, the fore wing of *Bandelnelsenia chilena* n. sp. is very small when compared with the other known species, in which the fore wing is longer than 10 mm.

SCYTINOPTEROIDEA

Family: **Chiliocyclidae** EVANS, 1956

Tipuloidea rhaetica WIELAND 1925

Fig. 5F

*1925 *Tipuloidea rhaetica* WIELAND: Figs 2, 3.

1925 *Wielandia rhaetica* (WIELAND) in TILLYARD: Fig. 1

1956 *Tipuloidea rhaetica* WIELAND in EVANS: 209, Fig. 12a; 1992 *Tipuloidea rhaetica* WIELAND in CARPENTER: 258, Fig. 162. 2; 1997 *Tipuloidea rhaetica* WIELAND in GALLEG0: 511-516; 1999 *Tipuloidea rhaetica* WIELAND in GALLEG0 & MARTINS-NETO: 87, Fig. 3; 1999 *Tipuloidea rhaetica* WIELAND in MARTINS-NETO & GALLEG0: 194: Fig. 2D.

H o l o t y p e. Unknown. Type locality: Minas de Petroleo (= Puesto Miguez), Cerro Cacheuta, southwest of Mendoza, Argentina. Type stratum : Potrerillos Formation ? Age: late Middle Triassic to early Late Triassic.

R e m a r k s. TILLYARD (1925) discussed this material and placed it in the family Scytinopteridae HANDLIRSCH, 1926, which was followed by MARTINS-NETO & GALLEG0 (1999). However, EVANS (1956) created the family Chiliocyclidae, which have a small discal cell in the fore wing, and removed *Tipuloidea* to this new family, which is now adopted here, also including the genus *Argentinocicada* MARTINS-NETO & GALLEG0 1999.

Argentinocicada magna MARTINS-NETO & GALLEG0 1999

Fig. 5C

*1999 *Argentinocicada magna* MARTINS-NETO & GALLEG0: 194, 196; Figs 2C, 4A

1999 *Argentinocicada magna* GALLEG0 & MARTINS-NETO: 87; Fig. 4

H o l o t y p e. PZ-CTES n° 5729, housed at PZ-CTES, Argentina. Type locality: 300 m west of Quebrada del Durazno. South of the Cerro Cacheuta. Mendoza, Argentina, levels EP I and EP II of MOREL (1994). Type stratum: Upper Section of the Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

Argentinocicada minima MARTINS-NETO & GALLEG0 1999

Fig. 5D

*1999 *Argentinocicada minima* MARTINS-NETO & GALLEG0: Figs 2G, 4B-C

1999 *Argentinocicada minima* GALLEG0 & MARTINS-NETO: 87; Fig. 5

H o l o t y p e. PZ-CTES n° 5776, housed at PZ-CTES, Argentina. Type locality: 300 m west of Quebrada del Durazno. South of the Cerro Cacheuta. Mendoza, Argentina, levels EP I and

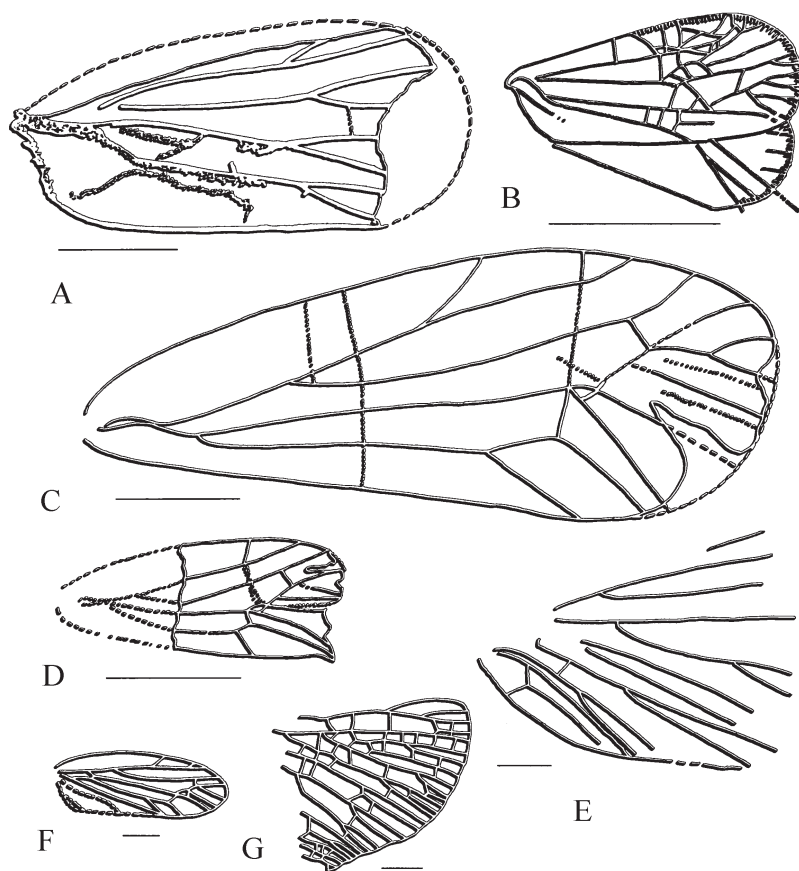


Fig. 5. A. *Prosboldinella riorastensis* MARTINS-NETO & ROHN 1996 (Prosboldidae), holotype RGMN-T007; B. *Potrerillia nervosa* MARTINS-NETO & GALLEG0 1999 (Scynopteridae), holotype PZ-CTES n° 5728; C. *Argentinocicada magna* MARTINS-NETO & GALLEG0 1999 (Chiliocyclidae), holotype PZ-CTES n° 5729; D. *Argentinocicada minima* MARTINS-NETO & GALLEG0 1999 (Chiliocyclidae), holotype PZ-CTES n° 5776; F. *Tipuloidea rhaetica* WIELAND 1925 (Chiliocyclidae), redrawn from WIELAND (1925: Fig. 2); E, G: *Lariojaprosbole melchori* MARTINS-NETO & GALLEG0 2001 (Prosboldidae), holotype PULR-I n° 257, basal part (E), possible apical part (G), respectively. Scale bar 1 mm.

EP II of MOREL (1994). Type stratum: Upper Section of the Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

Supplementary material. PZ-CTES n° 5733, same data as in Holotype.

Family: **Scytinopteridae** HANDLIRSCH, 1906

Potrerillia nervosa MARTINS-NETO & GALLEG0 1999

Fig. 5B

*1999 *Potrerillia nervosa* MARTINS-NETO & GALLEG0: 196, 198: Figs 2B, 5A

1999 *Potrerillia nervosa* GALLEG0 & MARTINS-NETO: 87, Figs 2;

H o l o t y p e. PZ-CTES n° 5728, housed at PZ-CTES, Argentina. Type locality: 300 m west of Quebrada del Durazno, south of the Cerro Cacheuta. Mendoza, Argentina, levels EP I and EP II of MOREL (1994). Type stratum: Upper Section of the Potrerillos Formation. Age: late Middle Triassic to early Late Triassic.

***Australocicada arcucciae* MARTINS-NETO & GALLEG0 2001**

Fig. 6D

*2001 *Australocicada arcucciae* MARTINS-NETO & GALLEG0: Fig. 1C.

H o l o t y p e. PULR-I n° 256, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

S u p p l e m e n t a r y m a t e r i a l. PULR-I n° 266 (Fig. 6C), same data as in Holotype.

***Gualoscytina* MARTINS-NETO & GALLEG0 n. gen.**

D i a g n o s i s. Similar to *Saaloscytina* BRAUCKMANN and SCHLÜTER, 1993 in general aspect of venation, differing, however, by ScP long, ending close to apex (short, reaching costal margin before mid length of wing in *Saaloscytina*); RP origin close to the wing base; and CuA forking close to wing base (close to apex in *Saaloscytina*).

Type species. *Gualoscytina mayae* MARTINS-NETO & GALLEG0 n. sp., by present designation.

E t y m o l o g y. Named for the Gualo locality and *scytina*, common suffix for Scytinoptera. Gender: feminine.

D i s c u s s i o n. *Gualoscytina* n. gen. is very similar in general aspects of venation to *Saaloscytina* BRAUCKMANN & SCHLÜTER, 1993, described from the Upper Triassic of Germany, differing however, mainly by ScP morphology: short in *Saaloscytina* and notably long in *Gualoscytina* n. gen. (perhaps a plesiomorphic condition). Also, CuA forks differently: close to the wing base in *Gualoscytina* n. gen. (a plesiomorphic condition), with CuA1 and CuA2 long; close to the apex in *Saaloscytina* (an apomorphic condition), with CuA1 and CuA2 short.

***Gualoscytina mayae* MARTINS-NETO & GALLEG0 n. sp.**

Fig. 6B

D i a g n o s i s. As for the genus. Fore wing 9 mm long, foliaceous in shape. All principal veins with color pattern, contrasting with wing surface.

E t y m o l o g y. In honor of Dr. Cathleen MAY (Newkirk Engler & May Foundation, Denver, Colorado), who collected some of the material described here and coordinated the NGS project (grant 5317-94).

H o l o t y p e. PULR(I) n° 267, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation (second cycle). Age: late Middle Triassic to early Late Triassic.

D e s c r i p t i o n. Fore wing 9 mm long, foliaceous in shape. Wing base very narrow. Apex acuminate. ScP long, reaching Costal margin close to apex. RA long, reaching Apical margin at apex, with at least one secondary branch. RP origin close to wing base, unbranched. MP long and sigmoid, originating shortly after origin of RP, also unbranched. CuA forks at same level of MP origin, two-branched: CuA1 long and sigmoid; CuA2 quite straight. Color pattern consists of darker color covering all longitudinal veins. Entire surface of the wing rugose, with homogeneously granular surface.

D i s c u s s i o n. *Gualoscytina mayae* n. sp. considerably differs from *Saaloscytina perreticulata* from the Triassic of Germany in wing shape: foliaceous acuminate in *G. mayae* n. sp.,

petular in *Saaloscytina perreticulata*. Additionally *G. mayae* n. sp. is larger than *Saaloscytina perreticulata* (fore wing 9 mm in *G. mayae* n. sp., 4 mm in *S. perreticulata*) and *G. mayae* n. sp. has color patterning in the longitudinal veins, absent in *S. Perreticulata*.

Family: **Stenoviciidae** EVANS, 1956

Argentinopheloscyta MARTINS-NETO & GALLEG0, n. gen.

D i a g n o s i s. Similar to *Apheloscyta* TILLYARD, 1922 in general aspect of wing, differing by MP three-branched.

Type species. *Argentinopheloscyta fosterae* MARTINS-NETO and GALLEG0 n. sp., by present designation.

E t y m o l o g y. Named for Argentina and *pheloscyta*, from *Apheloscyta*, a similar genus. Gender: feminine.

D i s c u s s i o n. *Argentinopheloscyta* n. gen. differs from all known Stenoviciidae genera by having MP three-branched.

Argentinopheloscyta forsterae MARTINS-NETO & GALLEG0 n. sp.

Fig. 6A

D i a g n o s i s. As for the genus.

E t y m o l o g y. In honor of Dr. Catherine FORSTER (Department of Anatomical Sciences, State University of New York, Stony Brook), who collected some of the material described here, and coordinated the NGS project (grant 5317-94).

H o l o t y p e. PULR-I n° 268, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation (second circle). Age: late Middle Triassic to early Late Triassic.

D e s c r i p t i o n. Fore wing 9 mm long. Costal margin slightly curved. Apical margin slightly acuminate, long. Costal area as wide as radial area. RA+RP parallel to Costal margin. RA short, reaching Costal margin before Apical margin. RP unbranched. M long and sigmoid, notably deflecting after mid length of wing, deflecting again toward Apical margin, with three short branches of similar size: MP1 reaching apex, MP2 reaching Apical margin at its mid length and MP3 reaching Apical margin close to Anal margin; r-m quite vertical; mp1-mp2 oblique to r-m; m-cu perpendicular to MP3, reaching it after MP2+MP3 fork. CuA long and straight, distally two-branched: CuA1 longer than CuA2, CuA2 oblique to the anal margin. CuP long, parallel to CuA, distally fused with CuA2 at anal margin.

PROSBOLOIDEA

Family: **Prosbolidae** HANDLIRSCH, 1904

Prosbolidinella riorastensis MARTINS-NETO & ROHN 1996

Fig. 5A

*1996 *Prosbolidinella riorastensis* MARTINS-NETO & ROHN: 246-247, Figs 2, 3.

H o l o t y p e. RGMN-T007, MARTINS-NETO Collection, housed in the Paleontological Collection, USP, Brazil. Type locality: 200 m East from Timbó river, in the road Canoinhas-Porto União (BR-280), Santa Catarina State, near Poço Preto locality. Type stratum: Morro Pelado Member, Rio do Rasto Formation, Paraná Basin. Age: Lower Triassic.

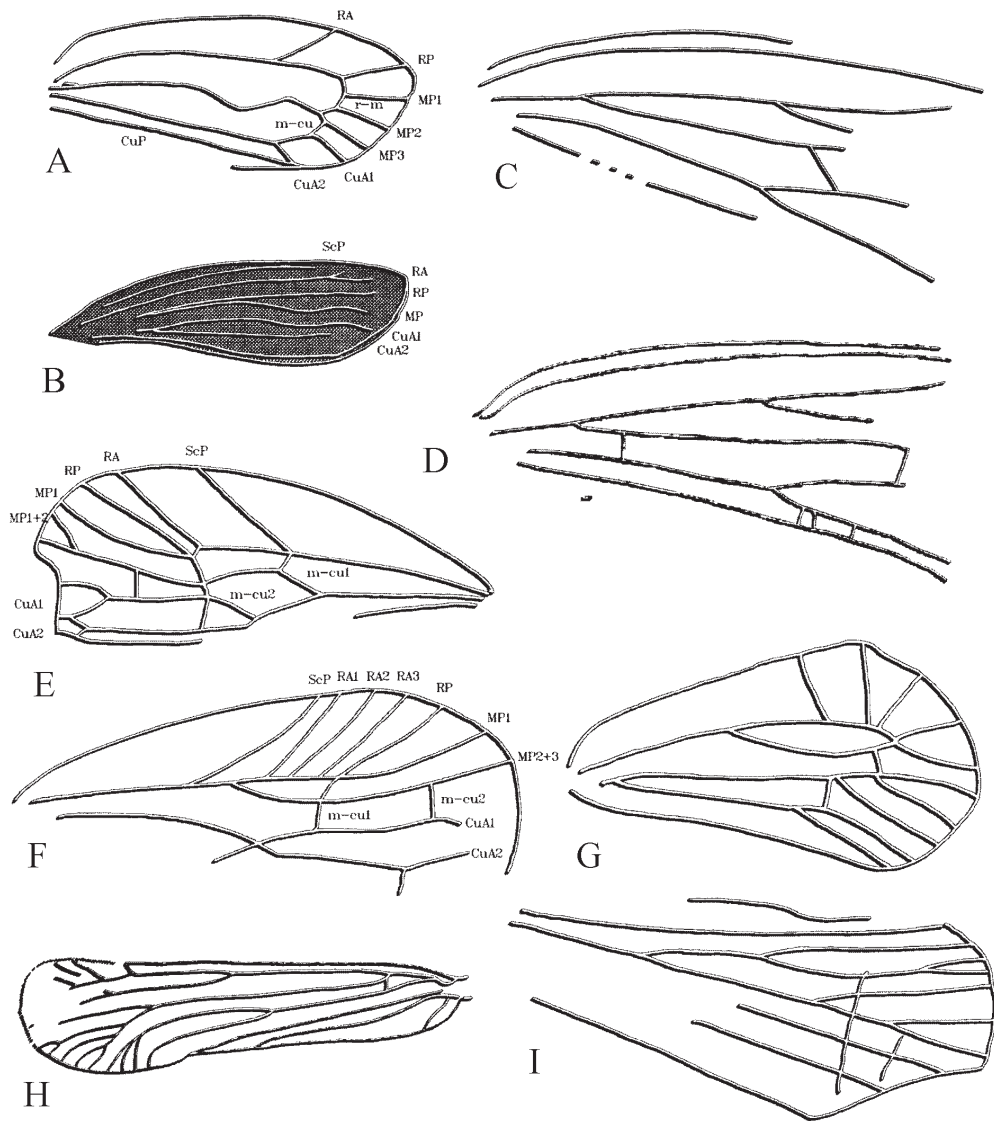


Fig. 6. A. *Argentinopheloscyta forsterae* MARTINS-NETO & GALLEG0 n. sp., (Stenoviciinae), holotype PULR-I n° 268; B. *Gualoscytina mayae* & GALLEG0 n. sp. (Scynopteridae), holotype PULR-I n° 267; C-D. *Australocicada arcucciae* MARTINS-NETO & GALLEG0 2001 (Chiliocyclidae), specimen PULR-I n° 266 (C), and holotype PULR-I n° 266 (D); E. *Yurigocimex popovi* MARTINS-NETO & GALLEG0 n. sp., holotype PULR-I n° 262; F. *Popovigocimex yurii* MARTINS-NETO & n. s., holotype PULR-I n° 271; G. *Bandelnielsenia chilena* MARTINS-NETO & GALLEG0 n. sp. (Dysmorhoptilidae), holotype SGO.PI.5989; H. *Sanctipaulus mendesi* PINTO 1956 (Derbidae), redrawn from PINTO (1956: Fig. 2); I. Auchenorrhyncha indet (probably attributable to *Australocicada* MARTINS-NETO & GALLEG0), specimen PULR-I n° 264.

***Lariojaprosbole melchiori* MARTINS-NETO & GALLEG0, 2001**

Fig. 5E

*2001 *Lariojaprosbole melchiori* MARTINS-NETO & GALLEG0: Pl. IB, Fig. 1E.

H o l o t y p e. PULR-I nş 257a, housed in PULR-I, Argentina. Type locality and type stratum: Quebrada de Ischichuca Chica, La Rioja Province, Argentina. Ischichuca Formation. Age: late Middle Triassic (or early Late Triassic sensu ZAVATTIERI & MELCHOR, 1999).

S u p p l e m e n t a r y s p e c i m e n possibly attributable to *Lariojaprosbole melchiori* MARTINS-NETO & GALLEG0, PULR-I nş 257b, preserved in the same slab as above (Fig. 5G).

TRICHOPTERA

Family: incertae sedis

***Sanctipaulus mendesi* PINTO 1956**

Fig. 6H

*1956 *Sanctipaulus mendesi* PINTO: 82-83, Fig. 2.

H o l o t y p e. MP/ 241, Museu de Paleontologia of the ICN of the Universidade Federal do Rio Grande do Sul, Brazil. Type locality: the Passo das Tropas locality, Santa Maria, Rio Grande do Sul, Brazil. Type stratum: associated with the *Thinnfeldia* Flora, in the Santa Maria Formation. Age: Upper Triassic.

R e m a r k s. Originally this species was described as Auchenorrhyncha Derbidae, being removed here for Trichoptera incertae family.

COLEORRHYNCHAFamily: **Progonocimicidae** HANDLIRSCH, 1906***Yurigocimex* MARTINS-NETO & GALLEG0 n. gen.**

D i a g n o s i s. Similar to *Arhegocimex* HANDLIRSCH, 1906 by fore wing with small basal cell and CuA zigzag-like. ScP far from RA. M connected to CuA by three cross-veins.

Type species. *Yurigocimex popovi* MARTINS-NETO & GALLEG0 n. sp., by present designation.

E t y m o l o g y. In honor of Dr. Yuri POPOV (Russian Academy of Sciences) and *gocimex*, from *Arhegocimex*, the most similar genus. Gender: neutrum.

D i s c u s s i o n. *Yurigocimex* n. gen. is similar to *Arhegocimex* HANDLIRSCH, 1906, by having a small basal cell and CuA zigzag-like, differing however, by the shape of the basal cell (triangular in *Arhegocimex*, pentagonal in *Yurigocimex* n. gen.). *Yurigocimex* n. gen. differs of all known Jurassic Progonomicidae genera (reviewed by POPOV & WOOTTON 1977), by having ScP far from RA. In this aspect, *Yurigocimex* n. gen. is similar to the Triassic genus *Heteronella* EVANS, 1961, differing, however, by having a small basal cell (absent in *Heteronella* as figured, or if existing, is longer than in *Yurigocimex* n. gen.). *Yurigocimex* n. gen. differs from all known Jurassic Progonomicidae genera by having three cross-veins connecting M to CuA (two or less in the Jurassic genus). Three cross-veins connecting M to CuA are also found in *Heteronella*, differing however from those of *Yurigocimex* n. gen. by m-cua2 close to m-cu3, forming a small square cell (far from m-cua3, forming a great triangular cell in *Yurigocimex* n. General.).

***Yurigocimex popovi* MARTINS-NETO & GALLEG0 n. sp.**

Fig. 6E

D i a g n o s i s. As for the genus. MP2 distally branched; CuA two-branched with small distal dichotomy.

E t y m o l o g y. In honor of Dr. Yuri POPOV (Russian Academy of Sciences), specialist on Hemiptera.

H o l o t y p e. PULR-I n° 262, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

D e s c r i p t i o n. Fore wing 5 mm long. Costal margin curved, Apical margin rounded. Costal area very wide, broad at wing apex, narrowing slightly towards wing base. ScP origin at MP origin, long, oblique to Costal margin. RA relatively far from ScP, connected to RP by small cross-vein. r-m at origin of RP+MP1. MP zigzag-like, three-branched: MP1 origin at RP origin; MP2 distally branched, connected to RP+MP1 by cross-vein, forming distal part of basal cell. Basal cell pentagonal, relatively small. Three cross-veins connect MP to CuA: m-cu1, the longer, at MP origin; m-cu2 continuous to r-m; and m-cu3 in mid length of CuA1. CuA two-branched: CuA1 distally branched and CuA2 unbranched. CuA2 distally connected to CuA1 through small cross-vein.

***Popovigocimex* MARTINS-NETO & GALLEG0 n. gen.**

D i a g n o s i s. Similar to *Archegocimex* HANDLIRSCH, 1906, and *Yurigocimex* n. gen. by fore wing with small basal cell, and CuA zigzag-like. Similar to *Yurigocimex* n. gen. by ScP far from RA, differing however, by having two extra branches of RA. M connected to CuA by two cross-veins.

Type species. *Popovigocimex yurii* MARTINS-NETO & GALLEG0 n. sp., by present designation.

E t y m o l o g y. In honor of Dr. Yuri POPOV (Russian Academy of Sciences) and *gocimex*, from *Archegocimex*, the genus most similar. Gender: neutrum.

D i s c u s s i o n. *Popovigocimex* n. gen. is similar to *Archegocimex* and *Yurigocimex* n. gen. by having a small basal cell and CuA zigzag-like, differing, however, by the shape of the basal cell (triangular in *Archegocimex*, pentagonal in *Yurigocimex* n. gen. and rectangular in *Popovigocimex* n. gen.). *Popovigocimex* n. gen. differs of all known Jurassic Progonomicidae genera (reviewed by POPOV & WOOTTON, 1977), by having ScP far from RA. In this aspect, *Popovigocimex* is similar to the Triassic genus *Heteronella*, differing however by having a small basal cell (absent in *Heteronella* as figured, or if existing, it is longer than in *Popovigocimex*). *Popovigocimex* n. gen. differs of *Yurigocimex* n. gen. by having two extra branches of RA (just one in *Yurigocimex* n. gen.), two cross-veins joining MP to CuA (three in *Yurigocimex* n. gen.), and CuA branches are longer, and not connected by a cross-vein.

***Popovigocimex yurii* MARTINS-NETO & GALLEG0 n. sp.**

Fig. 6F

D i a g n o s i s. As for the genus. MP2 distally unbranched.

E t y m o l o g y. In honor of Dr. Yuri POPOV (Russian Academy of Sciences), specialist on Hemiptera.

H o l o t y p e. PULR-I n° 271, housed in PULR-I, Argentina. Type locality: Gualo, La Rioja Province, Argentina. Type stratum: Los Rastros Formation. Age: late Middle Triassic to early Late Triassic.

D e s c r i p t i o n. Fore wing 4 mm long. Costal margin curved, Apical margin rounded. Costal area very wide, broad at wing apex, narrowing slightly towards wing base. ScP origin anterior to MP origin, long, oblique to Costal margin. RA three-branched. MP two-branched: MP1 origin at the RP origin, MP2 unbranched, connected to RP+MP1 by cross-vein, forming distal part of basal cell. Basal cell rectangular, relatively small. Two cross-veins connecting MP to CuA: m-cu1, smaller, at MP1+RP origin, and m-cu2 close to apex. CuA two-branched: CuA1 and CuA2 unbranched, as preserved. Two cross-veins preserved, probable connected to CuP (not preserved).

MECOPTERA?

Tipulidites affinis WIELAND 1926*Necrotaulius (Tipulidites) affinis* WIELAND 1926*?Necrotaulius (Tipulidites) affinis* WIELAND 1926

Fig. 2D

H o l o t y p e. Unknown. Type locality: Minas de Petroleo (= Puesto Miguez), Cerro Cacheuta, southwest of Mendoza, Argentina. Type stratum. Potrerillos Formation? Age: late Middle Triassic to early Late Triassic.

R e m a r k s. In previous papers this species was reported as Diptera, Trichoptera, and more recently as Mecoptera as proposed by W. KRZEMIŃSKI (pers. obs).

IV. TAXONOMIC COMPOSITION AND DISPERSAL PATHS OF THE TRIASSIC CONCHOSTRACAN AND INSECT FAUNAS FROM ARGENTINA

Triassic insect faunas from Argentina occur mostly in association with conchostracan faunas. For this reason it is appropriate to include a brief consideration of conchostracan assemblages, and their relation to dispersal and migration of insect faunas.

Conchostracan fossils from Argentina and Chile have been recorded since the beginning of the last century, however, detailed taxonomic and stratigraphic studies are more recent. Studies carried out by one of the authors (GALLEGO 1992, 1999; GALLEGO & COVACEVICH 1998; GALLEGO & MELCHOR 2000) yielded new information on the taxonomic composition of these faunas. Due to the frequent occurrence of conchostracans in the Triassic successions of Argentina it is envisaged that this taxonomic list will be enlarged in the near future. For this reason the following comments are preliminary.

Work on migration and dispersal paths of fossil Gondwanan conchostracan faunas is scarce. TASCH (1970, 1987) described Late Paleozoic – Middle Mesozoic migration routes displaying a general trend from the southern to the northern hemisphere, which were named as “Trans-Antarctic fresh-brackish water routes”. Taxa considered by TASCH range from the genus level (*Paleolimnadia* sp.), sub-generic (“lioestheriids”, sensu TASCH 1969), to the family level (Leaiidae) for the Permian-Jurassic interval.

TASCH’s (1970) proposal imposes serious problems for the taxonomy of the group, because the “lumping” scheme of TASCH (1969) implied a drastic reduction in the number of taxa. Furthermore, the information available at the time of his proposal was scarce, he did not also consider previous work, and he included secondary data in his conclusions. At present, there is new and abundant information from Argentina, Chile, and Brazil for the Triassic. TASCH (1970) made some inferences about the dispersal of “lioestheriids” in Gondwana using data from the Triassic of Argentina, where the record is fairly meager and dubious at the time of his proposal. Triassic Argentine fauna shows a marked diversity and higher frequency of species belonging to Euestheriidae (first recorded by RUSCONI 1948), which is a family with a poor record in other regions of Gondwana (GALLEGO 1999).

TASCH (1970) mentioned migratory routes in the southern hemisphere through Antarctica joining Australia, South Africa and South America. This author did not consider Triassic conchostracan faunas from South America, South Africa and Antarctica, as the available information was very scarce or non-existent. The Australian fauna was all referred to the genus *Paleolimnadia*, which was not recorded from the Triassic of Argentina and Chile, and is now known from the Triassic of Brazil and Bolivia and the Upper Permian of Brazil and Chile.

New information produced in the last decade (GALLEGO 1992, 1999; GALLEGO & COVACEVICH 1998; GALLEGO & MELCHOR 2000) allows some preliminary comments to be made on relationships with other conchostracan faunas and on probable migration paths of some taxa. It is clear that

new information on this and other Gondwanan faunas (e.g., recent studies on Triassic faunas from Australia; P. JONES, pers. comm., 2001), might modify these conclusions.

Six of the seven conchostracan families recorded from the Triassic of Argentina show close relationships with faunas from Laurasia and Gondwana. The families Palaeolimnadiopseidae (genus *Endolimnadiopsis* SHEN, 1994), Pemphilimnadiopseidae, Ulugkemiidae, Loxomegaglyptidae and Fushunograptidae (genus *Liograpt* GALLEGÓ & COVACEVICH 1998) recorded in the Triassic of Argentina have Devonian to Cretaceous representatives in Laurasia. In particular, Palaeolimnadiopseidae is documented by the genus *Endolimnadiopsis*, also recorded from the Upper Permian of Russia. *Challaolimnadiopsis* SHEN & GALLEGÓ, 2001 belongs to Pemphilimnadiopseidae, a family recorded from the Upper Devonian of China, Upper Carboniferous of North America, and the Upper Permian-Lower Triassic of Germany, Italy, Russia, China and Africa (SHEN et al. 2001). Ulugkemiidae are represented by the genus *Triassulugkemia* GALLEGÓ, 1999, which is also recorded from Middle Devonian and Upper Permian of Russia (GALLEGÓ & MELCHOR 2000). The Loxomegaglyptidae (documented in Argentina and the south of Brazil by the genus *Triasoglypta* GALLEGÓ, 1999) have representatives from the Carboniferous to the Tertiary of Laurasia, Lower Carboniferous of England, Permian through Triassic of Russia, Triassic through Tertiary of China, and Triassic and Tertiary of South America. The Fushunograptidae (documented in Argentina and Chile by the genus *Liograpt*) was recorded in Russia (Upper Permian and Jurassic), Korea (Triassic), China (Triassic and Jurassic), Europe (Upper Triassic and Jurassic), and Africa (Triassic). The above-mentioned evidence, along with the record from the Triassic of Argentina allows for the suggestion that it is highly probable that members of these families migrated from Asia either via India to Africa and South America or via India to Antarctica and South America through the southern point of Patagonia.

The oldest records of Eosestheriidae are from the Triassic of Argentina and Chile (documented by the genus *Menucoestheria* GALLEGÓ & COVACEVICH, 1998). Prior to these findings its biochron was restricted to the Middle Jurassic to Lower Cretaceous of Asia, Europe and Antarctica. SHEN (1994) described the genus *Carapacestheria* (Eosestheriidae) from the Ferrar Group (Middle Jurassic of Victoria Land, Antarctica) and also noted that some of the characters of this genus are also present in specimens from the Middle Jurassic of Argentina, namely *Cyzicus* (*Lioestheria*) *patagoniensis* TASCH 1970 (Cañadón Asfalto Formation, Chubut Province) and in *Cyzicus* (*Lioestheria*) *malacaraensis* TASCH 1970 (La Matilde Formation, Santa Cruz Province). *Cyzicus* (*Euestheria*) *taschi* VALLATI and *Cyzicus* (*Euestheria*) sp. 1 (also from the Cañadón Asfalto Formation, Chubut) described by VALLATI (1986) might be added to this list of related forms, also belonging to Eosestheriidae. VALLATI (1986) already mentioned the similarities between *Cyzicus* (*Euestheria*) sp. 1 and *Yanjiestheria* *xiaxiaensis* WANG (Eosestheriidae), the last described from the Upper Jurassic-Lower Cretaceous of China. These new records of this family allow a hypothesis on its dispersal from Argentina or the southernmost end of South America through Antarctica to Asia and Europe (see Fig. 7).

The family Polycyttellidae (Glosselytrodea) has been restricted until now to the Upper Triassic. They are very rare; only 6 species are now known in the geological record. These include: *Mesojurina sogjutensis* MARTYNOVA (1952), *Mongolourina altaica* PONOMARENKO (1988) and *Karatajurina unica* VILESOV & NOVOKSHONOV 1994, from the Russian Upper Triassic, *Polycyttella triassica* TILLYARD 1922, and *Permoberothella perplexa* RIEK 1974, both from the Upper Triassic of Australia, and *Argentinoglosselytrina pulchella* MARTINS-NETO & GALLEGÓ 2001, from the Upper Triassic of Argentina. The paleogeographic distribution of the group is presented in Fig. 7. Although containing a relatively small number of well-known species, this is an important record, as Polycyttellidae make excellent index-fossils, being restricted to the Upper Triassic, and with an exclusively Gondwanan distribution. In paleobiogeographic terms, this group possesses wide distribution within Gondwana, with records in Argentina, Australia and in the South Asia. It is very probable that Polycyttellidae could be found in Antarctica in the future.

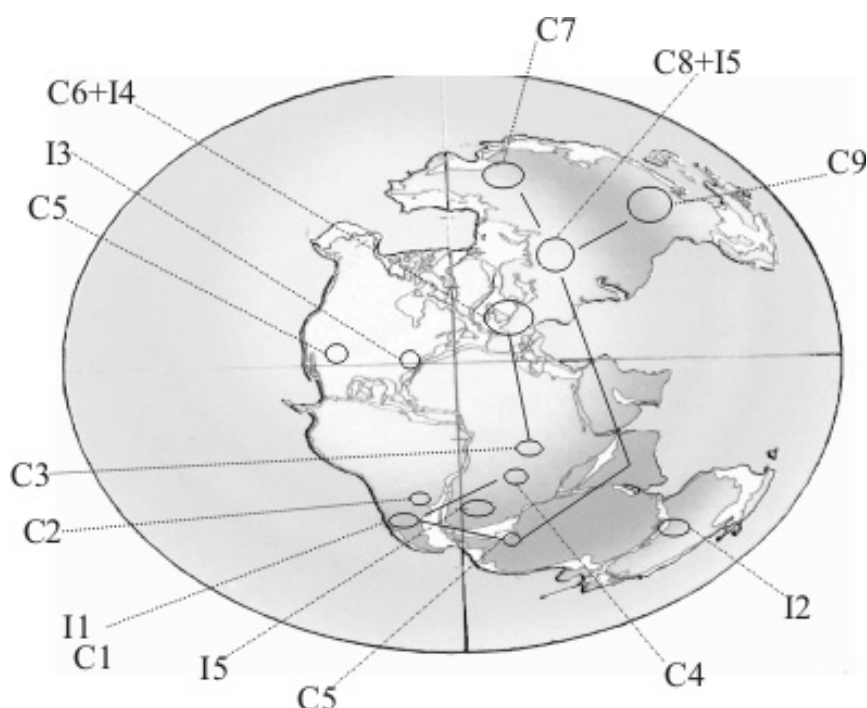


Fig. 7. Dispersion tracks of Triassic Conchostraca and selected Triassic insect groups herein proposed. Conchostraca associations: C1 – Ulugkemiidae, Pemphilmnadiopseidae, Paleolmnadiopseidae, Fushunograptidae, Loxomegaglyptidae and Eosestheriidae; C2 – Loxomegaglyptidae; C3 – Pemphilmnadiopseidae; C4 – Fushunograptidae; C5 – Eosestheriidae; C6 – Loxomegaglyptidae, Eosestheriidae, Pemphilmnadiopseidae, and Fushunograptidae; C7 – Loxomegaglyptidae, Fushunograptidae, Ulugkemiidae, Pemphilmnadiopseidae and Paleolmnadiopseidae; C8 – Pemphilmnadiopseidae, Paleolmnadiopseidae, Fushunograptidae, Loxomegaglyptidae and Eosestheriidae; C9 – Eosestheriidae. Insect associations: I1 – Dysmorphoptilidae, Scytinopteridae, Grosselytroidea and Ademosynidae; I2 – Dysmorphoptilidae, Scytinopteridae, Grosselytroidea, Locustopsidae and Ademosynidae; I3 – Locustopsidae; I4 – Scytinopteridae and Ademosynidae; I5, Dysmorphoptilidae, Scytinopteridae, Grosselytroidea, Locustopsidae, and Ademosynidae.

Another group of the Auchenorrhyncha, the Dysmorphoptilidae, is more abundant in the Upper Triassic, and is extinct in the Lower Jurassic. Ten species are presently known: *Dysmorphoptiloides elongata* EVANS 1956 and *Dysmorphoptiloides parva* EVANS 1956 (both from the Australian Upper Triassic), *Dysmorphoptiloides acostai* MARTINS-NETO & GALLEG0 1999, *Dysmorphoptiloides gigantea* MARTINS-NETO & GALLEG0 2001, *Dysmorphoptiloides pulchra* MARTINS-NETO & GALLEG0 2001, *Gallegomorphoptila breviptera* MARTINS-NETO n. sp. (all from the Upper Triassic of Argentina), *Bandelnielsenia chilena* MARTINS-NETO & GALLEG0 n. sp., from the Upper Triassic of Chile, *Tennentsia protuberans* RIEK 1974, from the Upper Triassic of South Africa, *Dysmorphoptila notodon* SHCHERBAKOV 1988 (Lower Jurassic, Mongolia), and *Dysmorphoptila liasina* HANDLIRSCH 1906 (Lower Jurassic, Germany). The known record of these species is supplied in Fig. 7. Species of Polycitellidae are also excellent index fossils. This family has few species, but those have wide geographic distribution. Species of the genus *Dysmorphoptiloides*, represented in both the Australian and the Argentinean Triassic, are an excellent index fossils for the Upper Triassic of Gondwana, and the genus *Dysmorphoptila* is a useful index fossil for the Lower Jurassic of Laurasia.

The informal group Scytinopteromorpha is discussed here as including the families Scytinopteridae, Serpentinidae, Cicadoprosobolidae, Chiliocyclidae and Hylicellidae among others: all with

restricted distribution in the Upper Triassic of Gondwana to the Lower Jurassic Inferior of Laurasia. Twenty three species are known for the Australian Upper Triassic: *Chiliocyclus scolopoides* TILLYARD 1920; *Mesoscytina australis* TILLYARD 1920; *Mesoscytina affinis* TILLYARD 1920; *Mesodiphthera subcostalis* TILLYARD 1920; *Mesodiphthera prosboloides* TILLYARD 1922; *Mesodiphthera dunstani* TILLYARD 1922; *Triassojassus proavitus* TILLYARD 1920; *Triassocarta subcostalis* TILLYARD 1920; *Mesocixius triassicus* TILLYARD 1920; *Mesocixiodes terminoneura* TILLYARD 1920; *Triassoscytina incompleta* EVANS 1956; *Triassoscytinopsis stenuata* EVANS 1956; *Triassoscytinopsis aberrans* EVANS 1956; *Triassoscytinopsis paranotalis* EVANS 1956; *Mesothymbris perkinsi* EVANS 1956; *Mesothymbris woodwardi* EVANS 1956; *Mesonirvana abrupta* EVANS 1956; *Triassoscelis anomala* EVANS 1956; *Mesocicadella venosa* EVANS 1956; *Triassocotis australis* EVANS 1956; *Apheloscysta mesocampia* TILLYARD 1922; *Crosbella elongata* EVANS 1956; and *Crosbella alata* EVANS 1956. The species *Scytinoptera distorta* RIEK 1976 is known from the South Africa Upper Triassic. From the Argentina Upper Triassic, eight species are known: *Tipuloidea rhaetica* WIELAND 1925; *Argentinocicada magna* MARTINS-NETO & GALLEGU, 1999; *Argentinocicada minima* MARTINS-NETO & GALLEGU 1999; *Potrerillia nervosa* MARTINS-NETO & GALLEGU 1999; *Australocicada arcucciae* MARTINS-NETO & GALLEGU 2001, *Gualoscytina mayae* MARTINS-NETO & GALLEGU n. sp., a possible new genus et species (Fig. 6 I), and *Argentinopheloscysta forsterae* MARTINS-NETO & GALLEGU n. sp. The only species known from the Upper Triassic of Germany is *Saaloscytina perreticulata* BRAUCKMANN & SCHLÜTER 1993. The record of this group in the Lower Jurassic consists of seven species: *Mesocixiella asiatica* MARTYNOV 1937; *Mesocixiella furcata* MARTYNOV 1937; *Mesocixiella extensa* MARTYNOV 1937 and *Mesocixiella major* MARTYNOV, 1937. All of these are from the Lower Jurassic of Russia. Finally, *Archijassus vicinus* HANDLIRSCH 1906; *Liojassus affinis* HANDLIRSCH 1906; and *Mesojassus pachynavus* HANDLIRSCH 1906, are known from the Lower Jurassic of Germany.

As in the previously discussed group, the Scytinopteromorpha origin is clearly gondwanan, well represented in Argentina and Australia, index fossils for the Upper Triassic of Gondwana, and for the Lower Jurassic of Laurasia through Asia, reaching Germany, westward of which they are unknown on the continent. The paleogeography of Scytinopteromorpha is virtually identical of the previously discussed groups.

Two important zones based on the insect taxa discussed above may be proposed:

- (a) the association zone *Dysmorphoptila/Mesocixiella*, marking the Lower Jurassic (Liassic) of Laurasia, correlating the deposits of central Asia and of Europe; and
- (b) association zone Polycitellidae/*Dysmorphoptiloides*, marking the upper part of the Middle Triassic to the beginning of the Upper Triassic in Gondwana, correlating the deposits of Argentina (Potrerillos and Los Rastros formations), of the south of Africa (Molteno Formation), of Antarctica (Graham Land Series), of Australia (Ipswich Series) and of the south of Asia.

The Triassic of Gondwana has very representative insect fossils that allow, through their distribution, correlation to be established between several deposits. The Triassic insect assemblage of Argentina (Potrerillos and Los Rastros formations) is virtually identical with that of the Ipswich Series in Australia. The Ipswich Series in Australia is probably the region of origin for these insect groups.

The dispersion routes for insects are very well defined from Australia through Antarctica to Argentina, and are not very different to the conchostracans migration routes proposed above. The faunas of the Triassic of South Africa and of South Brazil are not correlated to each other (in the case of Brazil, this is likely a result of few records reported), but correlation of the South Africa deposits with those of the Argentina + Australia Triassic is very low. On the other hand, Triassic conchostracan faunas from Argentina are correlated with those of Chile and Brazil, and these differ greatly with the faunas of South Africa and Australia.

Different migration trackway of insects and conchostracans would be due to their distinct dispersion forms. Conchostracans migrate by wind transport, and insects mainly by powered flight. GALLEGU & MELCHOR (2000) mentioned that the presence of some conchostracan taxa in the

northern and southern hemispheres during the Triassic would be due to the presence of monsoonal (transequatorial) circulation of winds. New expectable insects finds, mainly from Brazilian Triassic, could give us a more accurate picture of the distribution of Gondwanan paleoentomofauna.

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