

A New Genus of Frenguelliidae (Insecta: Odonata) from Arroyo Chacay, Eocene of Patagonia, Argentina¹

Julián F. Petrulevičius²

Abstract: A new genus and species of fossil Odonata, *Chacayala campeona* gen. et sp. nov., from the Eocene of Arroyo Chacay, Eocene of Patagonia, Argentina is described. Arroyo Chacay is the least known locality of the Eocene Caldera Lake deposits of Northern Patagonia. The new genus is the fourth in the family Frenguelliidae. *Chacayala* gen. nov. is characterized mainly by the shorter postdiscoidal field in comparison with the other genera of the family.

Key Words: Frenguelliidae, fossil, Odonata, Insecta, Arroyo Chacay, Eocene, Patagonia, Argentina

Introduction

The Frenguelliidae Petrulevičius and Nel, 2003 is a family of Odonata only recorded from Patagonia, present in the lower Eocene (52 Ma) of Laguna del Hunco, middle Eocene (47 Ma) of Río Pichileufú, and Arroyo Chacay. Thus far, it consists of three genera and four species, namely *Frenguella patagonica* Petrulevičius and Nel, 2003, *F. iglesiasi* Petrulevičius and Nel, 2013, *Treintamilun vuelvenlucha* Petrulevičius, 2017, and *Nelala chori* Petrulevičius, 2019. The new finding is an incomplete forewing of a single specimen coming from the Patagonian locality of Arroyo Chacay, Río Negro, Argentina. The locality belongs to the volcanic caldera complex composed also by Laguna del Hunco and Río Pichileufú, and thus could be considered a priori Eocene in age (Petrulevičius 2019). These other two neighbouring localities are relatively well surveyed and show high diversity of plants (Wilf et al. 2003, Wilf, 2012) and, among insects, representatives of the order Odonata (Petrulevičius and Nel, 2003, 2005; Petrulevičius, 2013, 2015, 2017a-b, 2018, 2019).

Methods

The fossil is housed at the Museo Asociación Paleontológica Bariloche (repository prefix MAPBAR), San Carlos de Bariloche, Río Negro, Argentina. In this work, I follow the wing venation nomenclature of Kukalová-Peck (1983), amended by Kukalová-Peck (1991, 2009), also contributions by Riek and Kukalová-Peck (1984), Nel et al. (1993), Bechly (1996), as well as Petrulevičius

¹ Received on December 9, 2022. Accepted on December 15, 2022. Last revisions received on December 19, 2022.

² CONICET – Consejo Nacional de Investigaciones Científicas y Técnicas and FCNyM-UNLP – División Paleozoología Invertebrados, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata. Paseo del Bosque, s/n. La Plata (1900), Buenos Aires, Argentina. E-mail: levicius@fnym.unlp.edu.ar

and Gutiérrez (2016). The specimen was drawn with a camera lucida and photographed with a digital camera (DMC5400) both attached to a Leica M205C stereomicroscope.

Systematic Palaeontology

Order Odonata Fabricius, 1793

Family Frenguelliidae Petrulevičius and Nel, 2003

Genus *Chacayala* gen. nov.

Figures 1 and 2

Type species. *Chacayala campeona* sp. nov. by present designation.

Etymology. For the locality Arroyo Chacay, and the Latin word *ala*, meaning wing. Chacay means shrub with spines in Mapudungun.

Diagnosis. (1) terminal kink of CP in a slightly distal position to nodal crossvein; (2) two rows of cells between CuA and posterior wing margin; (3) strongly curved MP after its origin at distal angle of the discoidal cell; (4) special cell between MA and MP and distal to discoidal cell. The cell is bigger than in other frenguelliids, but strongly irregular, trapezoidal in shape; (5) four cells at postdiscoidal field between MA and MP and basal to subnodus; (6) RP3+4 arise one and a half cell distal to discoidal cell.

Character (1) is shared with *Treintamilun* Petrulevičius, 2017 and *Nelala* Petrulevičius, 2019. Character (2) is shared with *Frenguella* Petrulevičius and Nel, 2003 and *Nelala*. Characters (3) and (4) are shared with *Nelala*. Characters (5) and (6) are unique to the new genus.

Chacayala campeona sp. nov.

Type material. Holotype MAPBAR 4141, Museo Asociación Paleontológica Bariloche, Río Negro, Argentina.

Etymology. Campeona means champion in Spanish. Dedicated to Argentina, Champion of the FIFA World Cup Qatar 2022. To the Scaloneta (current men's national football team), its 26 players and its coaching staff, especially Lionel Messi and Lionel Scaloni, and to the Argentinian people that waited 36 years to win again and for the third time the Football World Cup.

Diagnosis. As for the genus (*vide supra*).

Type locality and horizon. Arroyo Chacay, province of Río Negro, Patagonia, Argentina, palaeolatitude ~46°S.

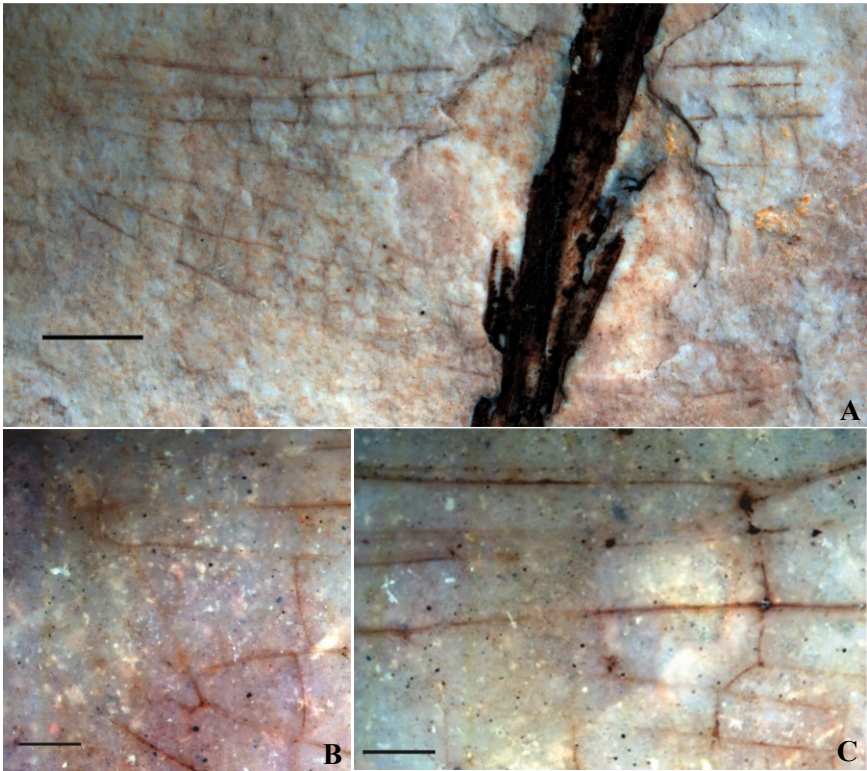


Figure 1. Photograph of *Chacayala campeona* gen. et sp. nov. Holotype MAPBAR 4141 from Arroyo Chacay (Río Negro, Argentina). Eocene. A. Species habitus. Scale bar = 2 mm. B. Detail of discoidal cell. Scale bar = 0.5 mm. C. Detail of nodus. Scale bar = 0.5 mm.

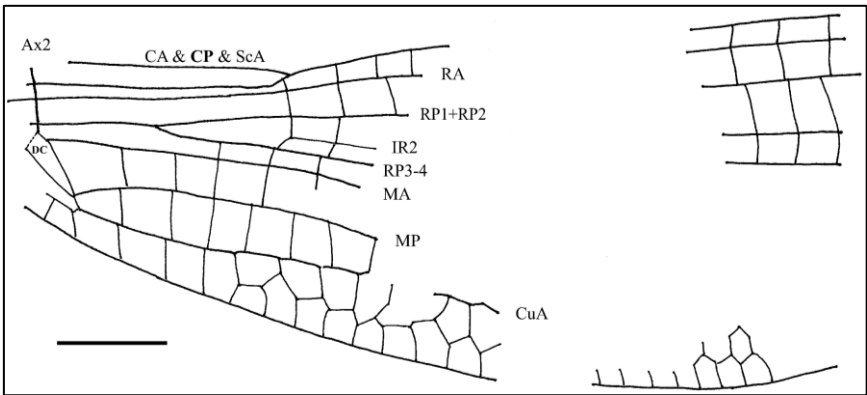


Figure 2. Line drawing of *Chacayala campeona* gen. et sp. nov. Holotype MAPBAR 4141 from Arroyo Chacay (Río Negro, Argentina), Eocene. Scale bar = 2 mm.

Description. An incomplete forewing; preserved part 15.2 mm long, 6.4 mm wide; distance between arculus and nodus 4.5 mm; nodus basally recessed; Ax2 aligned to arculus; discoidal cell (DC) basally closed, oblique, very narrow, anterior side (MA) 0.2 mm long, distal side 1 mm long, basal side 0.3 mm long, posterior side 1.2 mm long; no antesubnodal crossveins; arculus short; RP get free in the arculus base; base of RP₃₊₄ lying between arculus and nodus, one cell and a half (2.1 mm) basal to subnodus, and one cell and a half (2.1 mm) distal to discoidal cell; base of IR2 below subnodus; nodal crossvein vertical just distal to point of fusion of ScP with costal margin; subnodus vertical; posterior bent of CP not aligned with nodal crossvein but in a slightly distal position, at fusion point between ScP and costal margin; six postnodal crossveins preserved between ScP and RA, at least four of them aligned with postsubnodal ones; cubito-anal area with two rows of cells between CuA and posterior wing margin four cells distal to discoidal cell; postdiscoidal area with a large and irregular quadrangular cell just distal to discoidal cell, and only one row of cells (distally narrowed); four cells in postdiscoidal area from discoidal cell to subnodus; area between RP1 and IR1 with one row of broad cells; CuA distally zigzagged.

Discussion

The specimen could be included into the Frenguelliidae, a family present in the palaeontofauna of Arroyo Chacay, because of the following characters: terminal kink of CP very weak, not aligned with nodal crossvein, but distal; nodal furrow reduced; ScP reaching costal margin very obliquely at nodus; nodal crossvein vertical; subnodus vertical; midfork symmetrical and recessed basally to a position between 12–26% of wing length; discoidal cell oblique and very narrow in forewing; all secondary antenodal crossveins between ScP and RA suppressed; antesubnodal space without crossveins; cubito-anal area broad; nodus in basal third of wing.

The specimen could not be included into *Frenguella* because of its terminal kink of CP in a slightly distal position to nodal crossvein (contra a very distal position). The specimen could not be included into *Treintamilun* by having only two rows of cells between CuA and the posterior wing margin (contra three). The specimen could not be included into the genus *Nelala* because it presents a forewing discoidal cell “normally” oblique (as in *Frenguella*) (contra nearly vertical). The new species could be considered as a new genus by having unique characters within the family, i.e., four cells at the postdiscoidal field between MA and MP and a RP₃₊₄ arising one and a half cell distal to the discoidal cell.

Acknowledgements

Funding support for the fieldtrip and lab studies came from grants: SECyT N875 from the National University of La Plata (UNLP), PIP 1539 from the National Research Council of Argentina (CONICET); FONCYT PICT-2020-2550 from the National Agency for Promotion of Research, Technological Development, and Innovation of Argentina (Agencia I+D+I); and DEB-1556666 from the National Science Foundation of USA (NSF). Thanks are also due to four anonymous reviewers that provided valuable recommendations.

Literature Cited

- Bechly, G. 1996. *Morphologische Untersuchungen am Flügelgeäder der rezenten Libellen und deren Stammgruppenvertreter (Insecta; Pterygota; Odonata), unter besonderer Berücksichtigung der Phylogenetischen Systematik und des Grundplanes der Odonata. Petalura*. Special Volume 2. 402 pp.
- Kukulová-Peck, J. 1983. Origin of the insect wing and wing articulation from the arthropodan leg. *Canadian Journal of Zoology* 61:1618–1669. <https://doi.org/10.1139/z83-217>
- Kukulová-Peck, J. 1991. Fossil history and the evolution of hexapod structures. pp. 141–179. In, Naumann, I. D. (Editor). *The Insects of Australia: A Textbook for Students and Research Workers*. Volume 1. Second Edition. Melbourne University Press. Melbourne, Australia. 1137 pp. (in two volumes).
- Petrulevičius, J. F. 2013. Palaeoenvironmental and palaeoecological implications from body fossils and ovipositions of Odonata from the Eocene of Patagonia, Argentina. *Terrestrial Arthropod Reviews* 6:53–60. <https://doi.org/10.1163/18749836-06021057>
- Petrulevičius, J. F. 2015. A new Synlestidae damselfly (Insecta: Odonata: Zygoptera) from the early Eocene of Nahuel Huapi Este, Patagonia, Argentina. *Archivos Entomológicos* 14:287–294.
- Petrulevičius, J. F. 2017a. A new burmagomphid dragonfly from the Eocene of Patagonia, Argentina. *Acta Paleontologica Polonica* 62(4):779–783. <https://doi.org/10.4202/app.00427.2017>
- Petrulevičius, J. F. 2017b. First Frenguelliidae (Insecta: Odonata) from the middle Eocene of Río Pichileufú, Patagonia, Argentina. *Archivos Entomológicos* 18:367–374.
- Petrulevičius, J. F. 2018. A new malachite damselfly (Synlestidae: Odonata) from the Eocene of Patagonia, Argentina. *Life: The Excitement of Biology* 6(2):36–43. <https://blaypublishers.files.wordpress.com/2018/12/Petrulevicius-A-New-Malachite-Damselfly.pdf>
- Petrulevičius, J. F. 2019. A new Frenguelliidae (Insecta: Odonata) from the Eocene of Arroyo Chacay, Patagonia, Argentina. *Palaeoentomology* 002:591–595. <https://doi.org/10.11646/palaeoentomology.2.6.9>
- Petrulevičius, J. F. and A. Nel. 2003. Frenguelliidae, a new family of dragonflies from the earliest Eocene of Argentina (Insecta: Odonata). Phylogenetic relationships within Odonata. *Journal of Natural History* 37:2909–2918. <https://doi.org/10.1080/0022293021000007543>
- Petrulevičius, J. F. and A. Nel. 2005. Austroperilestidae, a new family of damselflies from the earliest Eocene of Argentina (Insecta: Odonata). Phylogenetic relationships within Odonata. *Journal of Paleontology* 79:658–662. [https://doi.org/10.1666/0022-3360\(2005\)079\[0658:AANFOD\]2.0.CO;2](https://doi.org/10.1666/0022-3360(2005)079[0658:AANFOD]2.0.CO;2)
- Petrulevičius, J. F. and A. Nel. 2007. Enigmatic and little known Odonata (Insecta) from the Paleogene of Patagonia and northwest Argentina. *Annales de la Société Entomologique de France* (n. s.) 43:341–347. <https://doi.org/10.1080/00379271.2007.10697530>
- Petrulevičius, J. F. and A. Nel. 2013. A new Frenguelliidae (Insecta: Odonata) from the early Eocene of Laguna del Hunco, Patagonia, Argentina. *Zootaxa* 3616:597–600. <https://doi.org/10.11646/zootaxa.3616.6.6>
- Petrulevičius, J. F., A. Nel, and J.-F. Voisin. 2010. Discovery of a new genus and species of darner dragonfly (Aeshnidae: Odonata) from the lower Eocene of Laguna del Hunco, Patagonia, Argentina. In, Nel, A., D. Azar, and J. F. Petrulevičius. (Editors). Fossil insects, systematics, phylogeny and palaeoecology. Special issue. *Annales de la Société Entomologique de France* (n. s.) 46:271–275. <https://doi.org/10.1080/00379271.2010.10697668>
- Riek, E. F. and J. Kukulová-Peck. 1984. A new interpretation of dragonfly wing venation based upon early Carboniferous fossils from Argentina (Insecta: Odonatoidea) and basic character states in pterygote wings. *Canadian Journal of Zoology* 62:1150–1166. <https://doi.org/10.1139/z84-166>
- Wilf, P. 2012. Rainforest conifers of Eocene Patagonia: attached cones and foliage of the extant southeast-Asian and Australasian genus *Dacrycarpus* (Podocarpaceae). *American Journal of Botany* 99:562–584. <https://doi.org/10.3732/ajb.1100367>
- Wilf, P., N. R. Cúneo, K. R. Johnson, J. F. Hicks, S. L. Wing, and J. D. Obradovich. 2003. High plant diversity in Eocene South America: Evidence from Patagonia. *Science* (American Association for the Advancement of Science, Washington, District of Columbia, USA) 300:122–125. <https://doi.org/10.1126/science.1080475>