

## **Class Trilobita (including agnostoids) from Argentine Precordillera**

SUSANA MARIEL DEVINCENZI <sup>1,\*</sup>, OSVALDO LUIS BORDONARO <sup>1</sup>

<sup>1</sup> *Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales (IANIGLA) CCT-CONICET  
Mendoza, Av. Ruíz Leal s/n, Parque General San Martín.  
5500 Mendoza, Argentina*

\* *email corresponding author: sdevincenzi@mendoza-conicet.gob.ar*

Keywords: Dataset, trilobite (including agnostoids) fauna, western Argentine, Lower Paleozoic.

### **SUMMARY**

This data paper inventories the records of 1763 trilobites (including agnostoids) from the Middle Cambrian inner and outer platform of the Argentine Precordillera (San Juan and Mendoza provinces). They were collected by Dr. Osvaldo Bordonaro and his colleagues between 1994 and 2013 and studied within the framework of scientific research. The specimens are stored in the Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales (IANIGLA, CCT-CONICET Mendoza, Argentina), an official paleontological repository of Mendoza Province and are part of its Paleoinvertebrates Collection. The study of these trilobites contributed to the taxonomy of the group and allowed the establishment of important paleobiogeographic connections between Cuyania and Laurentia during the Cambrian. From a preliminary Microsoft Excel format, the dataset is now included in the Global Biodiversity Information Facility (GBIF, <https://www.gbif.org>), under the publisher CCT-CONICET Mendoza (Argentina), making it available to the public.

### **INTRODUCTION**

The Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales (IANIGLA) stores a paleontological collection of invertebrates, identified with the acronym IANIGLA-PI, which mainly preserves the past biological record of the Cuyo region (central-west Argentina) and some from northwestern Argentina and from Mexico.

The first material was incorporated as a scientific collection in the mid-1990s, with specimens of *Blainia gregaria* (Walcott, 1916)

from the Middle Cambrian of La Laja Formation of the Precordillera of San Juan Province (Argentina). The collection was later enlarged with the incorporation of fossils of other phyla, such as Porifera, Mollusca and Hemichordata, being completed at present with fossil remains of Class Insecta from the Upper-Middle Triassic continental sequences of Mendoza (Potrerillos and Cacheuta formations) (Devincenzi, 2018). Even though no more trilobites (including agnostoids) have been added since 2013, this class represents the most abundant group in the collection.

Trilobite (including agnostoids) richness from Precordillera of San Juan and Mendoza provinces has caught the attention of both Argentine and North American paleontologists since mid-20th century (Leanza, 1947; Rusconi, 1950a & b; 1951a & b; 1952a & b; Poulsen, 1958; Borrello, 1963, 1964, 1971; Palmer, 1973; Ross, 1975). More recent research on these trilobites has provided important novelties in taxonomic and paleobiogeographic aspects of the group (see below).

From a preliminary Microsoft Excel format, the dataset was cleaned with OpenRefine, a free and open source software for working with data. Later, the dataset was included in the Global Biodiversity Information Facility (Devincenzi & Bordonaro, 2022), under the publisher Centro Científico Tecnológico (CCT) CONICET Mendoza. The data can also be obtained from the Paleobiology Database ([https://paleobiodb.org/classic/basicCollectionSearch?collection\\_no=200101](https://paleobiodb.org/classic/basicCollectionSearch?collection_no=200101), [https://paleobiodb.org/classic/basicCollectionSearch?collection\\_no=200106](https://paleobiodb.org/classic/basicCollectionSearch?collection_no=200106), [https://paleobiodb.org/classic/basicCollectionSearch?collection\\_no=200108](https://paleobiodb.org/classic/basicCollectionSearch?collection_no=200108), [https://paleobiodb.org/classic/basicCollectionSearch?collection\\_no=200109](https://paleobiodb.org/classic/basicCollectionSearch?collection_no=200109), [https://paleobiodb.org/classic/basicCollectionSearch?collection\\_no=200114](https://paleobiodb.org/classic/basicCollectionSearch?collection_no=200114), [https://paleobiodb.org/classic/basicCollectionSearch?collection\\_no=200661](https://paleobiodb.org/classic/basicCollectionSearch?collection_no=200661)).

The aim of this data paper is to compile data on all these specimens, the circumstances of their collection, and the main scientific results obtained from them. The authors of this manuscript are members of the IANIGLA, curator of the Paleoinvertebrates Collection and scientific research respectively.

## RESULTS

### Summary statistics

The dataset compiles the information on 1763 fossil remains of trilobites (including agnostoids). The specimens come from Argentine Precordillera, mostly from the

Middle Cambrian inner and outer platform and a few from the Lower Cambrian and Middle Ordovician sequences. Data was given following Darwin Core quick reference guide (Darwin Core Maintenance Group, 2020; Wicczorek et al., 2012). The dataset lists data of Record-level (type, modified, institutionCode, collection-Code, basisOfRecord); Occurrence (occurrence-ID, catalogNumber, recordedBy, disposition, associatedReferences, occurrenceRemarks); Event (eventDate); Location (higherGeography, continent, country, countryCode, stateProvince, county, locality, decimalLatitude, decimal-Longitude, geodeticDatum, coordinateUncertaintyInMeters, coordinatePrecision, verbatimLatitude, verbatimLongitude, georeferencedDate, georeferenceProtocol, georeferencedSources, georeferencedBy, georeferencedVerificationStatus); GeologicalContext (earliestEonOrLowestEonothem, earliestEraOrLowestErathem, latestEraOrHighestErathem, earliestPeriodOrLowestSystem, latestPeriodOrHighestSystem, earliestEpochOrLowestSeries, latestEpochOrHighestSeries, earliestAgeOrLowestStage, latestAgeOrHighestStage, formation, member, bed); Identification (identificationQualifier, identifiedBy); Taxon (scientificName, namePublishedIn, higherClassification, kingdom, phylum, class, order, family, genus, specificEpithet, scientificNameAuthorship). The dataset was exported to DarwinTest format and then uploaded to the IPT of MINCyT (Ministerio de Ciencia, Tecnología e Innovación Productiva, Argentina).

### Data set

*Data set name:* Registros de la clase Trilobita de la Precordillera de San Juan y Mendoza, Argentina

*Character encoding:* UTF\_8

*Format name:* csv, comma-separated values

*Distribution:* the data set is available in Global Biodiversity Information Facility (GBIF). GBIF

UUID 61044ae3-8a80-4cc0-bb62-a7fe2af6490b. Centro Científico Tecnológico (CCT) CONICET Mendoza publishes this resource and is itself registered in GBIF as a data publisher endorsed by GBIF Argentina.

*Hosted by:* Ministerio de Ciencia, Tecnología e Innovación Productiva

*Published by:* Centro Científico Tecnológico (CCT) CONICET Mendoza

*Date of publication:* May 12, 2022

*Metadata last modified:* May 12, 2022

*Update policy:* If necessary

*Language:* Spanish

*License of use:* Creative Commons Attribution Non Commercial (CC-BY-NC) 4.0

*Metadata language:* Spanish

*How to cite:* DOI 10.15468/apwnqn

*Citation:* Devincenzi S M, Bordonaro O L (2022). Registros de la clase Trilobita de la Precordillera de San Juan y Mendoza, Argentina. Centro Científico Tecnológico (CCT) CONICET Mendoza. Occurrence dataset <https://doi.org/10.15468/apwnqn> accessed via GBIF.org on 2022-08-23.

*Alternative identifiers:* [https://ipt.mincyt.gob.ar/resource?r=susana\\_bordonaro](https://ipt.mincyt.gob.ar/resource?r=susana_bordonaro)

### Management details

*Project title:* Class Trilobita from Argentine Precordillera (IANIGLA, CCT-CONICET Mendoza, Argentina).

*Database manager:* Susana Mariel Devincenzi

*Temporal coverage (specimens):* Early Paleozoic; Lower and Middle Cambrian, Middle Ordovician.

*Temporal coverage (collection formation):* 1994-2013.

*Record basis:* The dataset was created from fossils collected and studied by Dr. Osvaldo Bordonaro and colleagues within the framework of scientific research.

*Sampling methods:* Quarring

*Collection name:* Paleoinvertebrates Collection of IANIGLA, CCT-CONICET Mendoza.

*Collection identifier:* IANIGLA-PI

*Curatorial unit:* Fossil specimen

*Specimen preservation method:* Dried; articulated and non-articulated specimens (pygidium, cranidium).

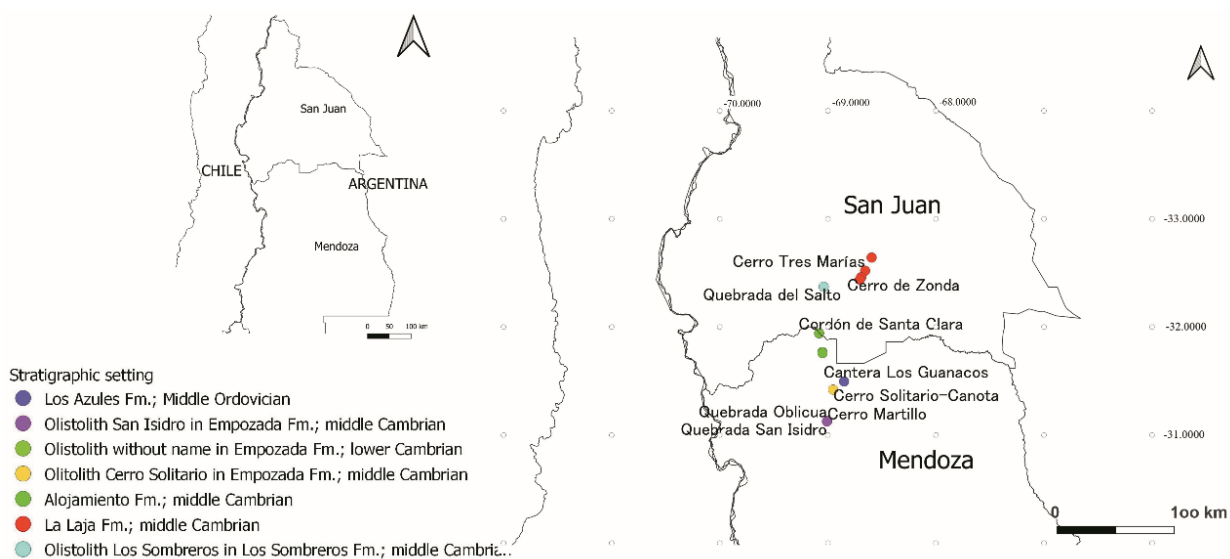


Figure 1. Location map and stratigraphic setting of the trilobite fauna (including agnostoids) included in the dataset.

*Funding grants:* The collection of the specimens was financed by the following international and national sources: “Cambrian trilobites biostratigraphy from the Soldano Member, La Laja Formation, Eastern Precordillera of San Juan”, PIP CONICET 5793 (2005-2007); “Cambrian Trilobites of the La Laja Formation, San Juan Precordillera”, Project CICITCA – UNSJ (2006 – 2007); “The biotic and Sedimentologic evolution of the Cambrian”, Discovery Grant n°46403, Natural Science and Engineering Research Council of Canada (NSERC) (2002- 2006); “Polymeroids trilobites from Olistoliths San Isidro, Mendoza”, PIP CONICET 0084 (2010-2012).

### **Geographic coverage**

*Study area:* The study area for this dataset was the Precordillera of western Argentina (San Juan and Mendoza provinces). The dataset mainly compiles data of a northeast-southwest transect that includes Middle Cambrian stratigraphic units (La Laja and Alojamiento formations and olistoliths). A few specimens come from a lenticular layer interbedded in a Middle Ordovician sequence (Los Azules Formation) interpreted as a tempestite, and others from a lower Cambrian olistolith (Figure 1).

La Laja Formation (Figure 2) constitutes the core of Precordilleran terrane (being part of the Cuyania terrane) and represents a restricted platform that contains a trilobite fauna with Laurentian affinities. This fauna occurs in limestone and argillaceous limestone. The Alojamiento Formation and the Middle Cambrian olistoliths represent an external platform with cosmopolitan species, which occurs in mudstones, calcareous shales, and limestones.

A review of the bibliographic references dealing with the general features of the La Laja Formation of the San Juan Province and the Cambrian olistoliths of the Mendoza Province

can be found in Bordonaro (2003) and Bordonaro et al. (1993). References on Alojamiento Formation can be found in Banchig (2006).

*Bounding box:* minimum longitude -68.595131; maximum longitude -69.0810333; minimum latitude -31.358075; maximum latitude -32.8753472. The sampling extended over fossiliferous localities in the following departments: Albardón, Calingasta, Sarmiento, Zonda (San Juan Province, Argentina) and Las Heras (Mendoza Province, Argentina).

*Sampling design:* The dataset was created including all specimens of Trilobita class (including agnostoids) hosted in the Paleoinvertebrates Collection of IANIGLA, CCT-CONICET Mendoza, Argentina

*Quality control for geographic data:* Locality descriptions, the corresponding geographic coordinates, and the full georeferences were checked by the collector, O. Bordonaro. The georeferences assigned to the locations were obtained using the point-radius method (Wieczorek et al., 2004), following the Georeferencing Best Practices (Chapman & Wieczorek, 2020), and calculated using the Georeferencing Calculator (Wieczorek & Wieczorek, 2019).

### **Taxonomic coverage**

*General description:* This dataset focused on trilobites (including agnostoids) followed the Fortey’s classification scheme (1997). According to this scheme, the dataset includes seven orders and 20 families. The most abundant order is Ptychopariida (1182 specimens) followed by Corynexochida (401 specimens) (Figure 3). The predominant species is *Blainia gregaria* (Walcott, 1916) followed by *Bathyriscus mendozanus* (Rusconi, 1945) (Figure 4; Figure 5. A-B).

*Taxonomic ranks:* 20 genera and 14 species have been identified (Table 1). The low

diversity is due, on the one hand, to the lack of diagnostic elements (pygidium, thorax or

cranidium) of the species and, on the other hand, to the poor preservation of the specimens.

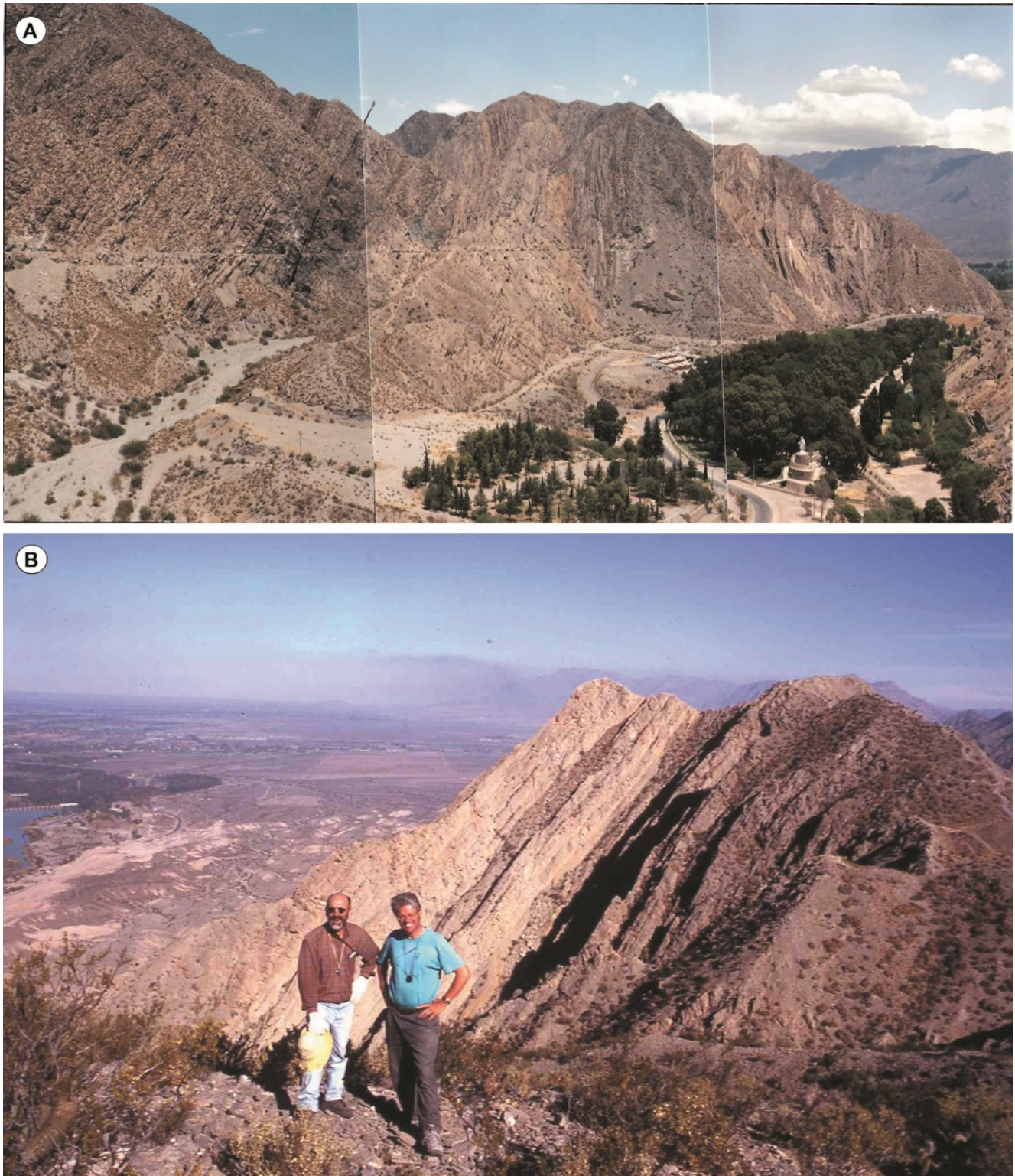


Figure 2. General views of La Laja Formation. A, Panoramic view at Quebrada del Zonda. B, Dr. O. Bordonaro and Dr. B. Pratt at Cerro Tres Marías.

Orders of Class Trilobita (including agnostoids)  
from Argentine Precordillera  
Collection IANIGLA-PI

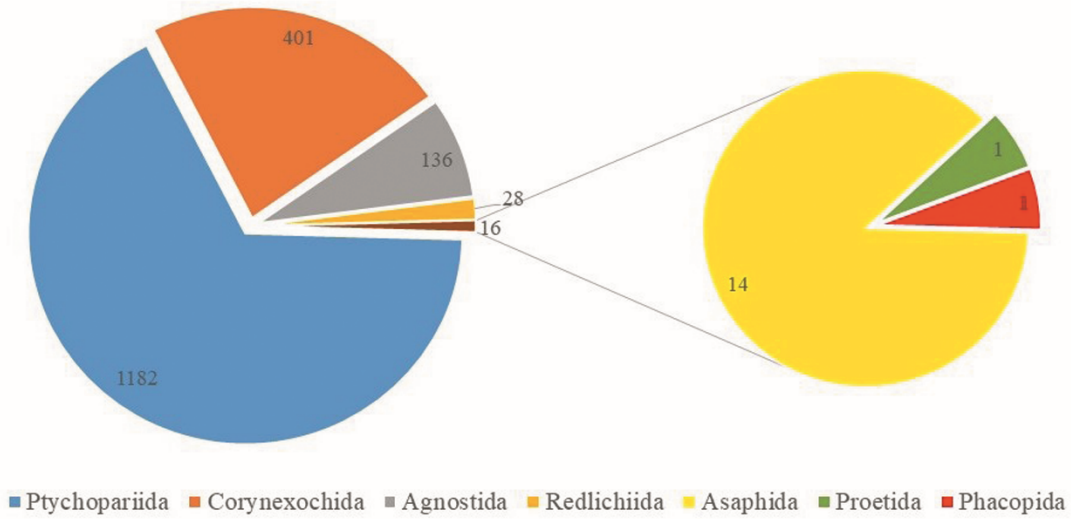


Figure 3. Taxonomic coverage. Distribution of Trilobita orders (including agnostoids) included in the dataset.

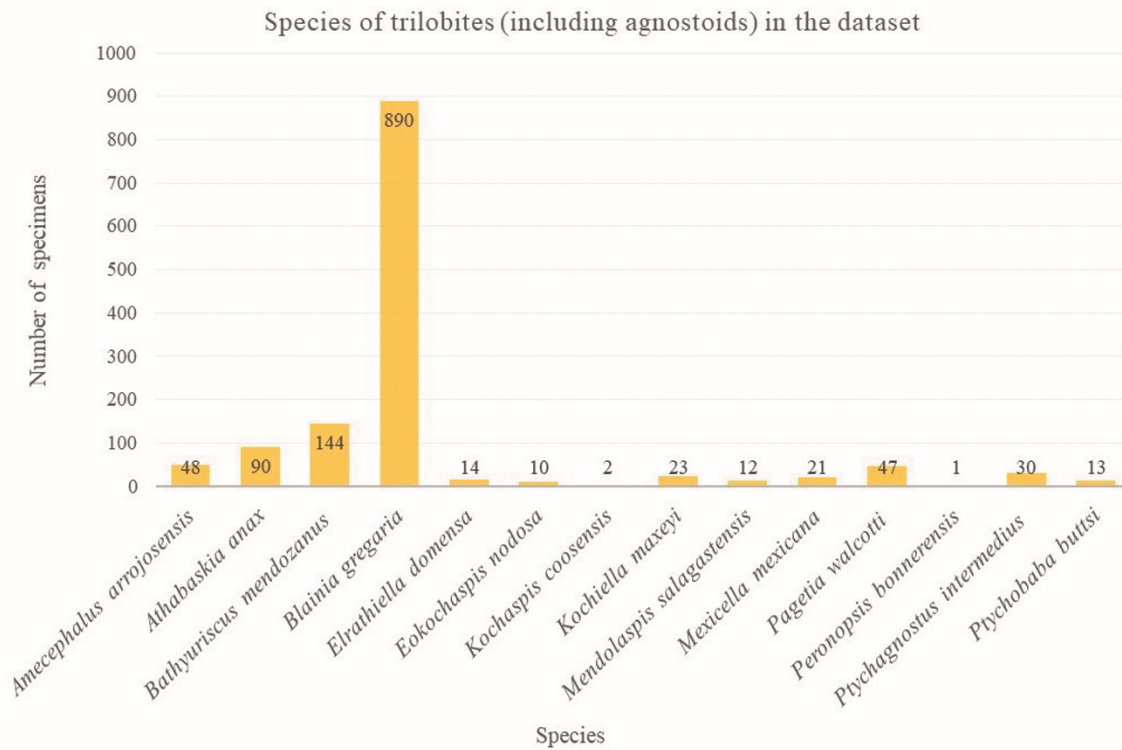


Figure 4. Species of trilobites (including agnostoids) included in the dataset.

Table 1. Taxonomic classification of trilobites (including agnostoids) included in the dataset according to Fortey (1997).

<b>Class Trilobita Walch, 1771</b>		
<b>Order</b>	<b>Family</b>	<b>Genus/Species</b>
Agnostida Salter, 1864	Eodiscidae Raymond, 1913	<i>Pagetia walcotti</i> Rasetti, 1966 <i>Pagetia</i> Walcott, 1916
	Metagnostidae Jaekel, 1909	<i>Geragnostus?</i> Howell, 1935
	Peronopsidae Westergård, 1936	<i>Peronopsis bonnerensis</i> Resser, 1939 <i>Peronopsis</i> Hawle & Corda, 1847
	Ptychagnostidae Kobayashi, 1939	<i>Ptychagnostus intermedius</i> (Tullberg, 1880) <i>Ptychagnostus</i> Jaekel, 1909
Asaphida Salter, 1864 emend. Fortey & Chatterton, 1988	Raphiophoridae Angelin, 1854	<i>Mendolaspis salagastensis</i> Rusconi 1951b
	Trinucleidae Hawle & Corda, 1847	
Corynexochida Kobayashi, 1935	Dolichometopidae Walcott, 1916	<i>Athabaskia anax</i> (Walcott 1916) <i>Bathyriscus mendozanus</i> (Rusconi, 1945) <i>Glossopleura</i> Poulsen 1927
	Dorypygidae Kobayashi, 1935	<i>Kootenia</i> Walcott, 1889
	Oryctocephalidae Beecher, 1897	<i>Oryctocephalites</i> Resser, 1939 <i>Tonkinella</i> Mansuy, 1916
	Zacanthoididae Walcott, 1888	<i>Zacanthoides</i> Walcott, 1888
	Illaenidae Hawle & Corda, 1847	
Phacopida Salter, 1864	Leiostegiidae Bradley, 1925	
	Encrinuridae Angelin, 1854	
Proetida Fortey & Owens, 1975	Telephinidae Marek, 1952	
Ptychopariida Swinnerton, 1915	uncertain	<i>Blainia gregaria</i> (Walcott, 1916)
	Alokistocaridae Resser, 1939	<i>Ehmaniella</i> Resser, 1937 <i>Elrathia</i> Walcott, 1924 <i>Elrathiella domensa</i> Sundberg, 1994 <i>Elrathiella</i> Poulsen, 1927 <i>Proehmaniella</i> Sundberg 1994
	Asaphiscidae Raymond 1924	<i>Blountia</i> Walcott 1916
	Cedariidae Raymond, 1937	<i>Cedaria</i> Walcott 1924
	Ptychopariidae Matthew, 1887	<i>Amecephalus arrosensis</i> (Lochman in Cooper et al., 1952) <i>Eokochaspis nodosa</i> Sundberg & McCollum, 2000 <i>Hadrocephalites</i> Sundberg & McCollum, 2002 <i>Kochaspis coosensis</i> Resser 1938 <i>Kochiella maxeyi</i> Rasetti, 1951 <i>Kochiella</i> Poulsen, 1927 <i>Mexicella mexicana</i> Lochman, 1948 <i>Ptychobaba buttsi</i> (Resser, 1938)
	Marjumiidae Kobayashi, 1935	<i>Marjumiella</i> Walcott, 1916
	Redlichiida Richter, 1932	
	Olenellidae Walcott, 1890	<i>Fremontella</i> Harrington, 1956 <i>Olenellus</i> Hall, 1861

Table 2. Taxonomic classification of trilobites (including agnostoids) included in the dataset according to Adrain (2011).

Class	Order	Family	Genus/Species
Trilobita Walch, 1771	Agnostida Salter, 1864	Metagnostidae Jaekel, 1909 Peronopsidae Westergård, 1936 Ptychagnostidae Kobayashi, 1939	<i>Geragnostus?</i> Howell, 1935 <i>Peronopsis bonnerensis</i> Resser, 1939 <i>Peronopsis</i> Hawle & Corda, 1847 <i>Ptychagnostus intermedius</i> (Tullberg, 1880) <i>Ptychagnostus</i> Jaekel, 1909
	Eodiscida Kobayashi, 1939	Eodiscidae Raymond, 1913	<i>Pagetia walcotti</i> Rasetti, 1966  <i>Pagetia</i> Walcott, 1916
	Redlichia Richter, 1932	Olenellidae Walcott, 1890	<i>Fremontella</i> Harrington, 1956 <i>Olenellus</i> Hall, 1861
	Corynexochida Kobayashi, 1935	Dolichometopidae Walcott, 1916  Dorypygidae Kobayashi, 1935 Oryctocephalidae Beecher, 1897 Zacanthoididae Swinerton, 1915 Illaenidae Hawle & Corda, 1847 Leiostegiidae Bradley, 1925	<i>Athabaskia anax</i> (Walcott 1916) <i>Bathyriscus mendozanus</i> (Rusconi, 1945) <i>Glossopleura</i> Poulsen 1927 <i>Kootenia</i> Walcott, 1889  <i>Oryctocephalites</i> Resser, 1939 <i>Tonkinella</i> Mansuy, 1916 <i>Zacanthoides</i> Walcott, 1888
	Phacopida Salter, 1864	Encrinuridae Angelin, 1854	
	Aulacopleurida Adrain, 2011	Alokistocaridae Resser, 1939  Marjumiidae Kobayashi, 1935 Telephinidae Marek, 1952	<i>Ehmaniella</i> Resser, 1937 <i>Elrathia</i> Walcott, 1924 <i>Elrathiella domensa</i> Sundberg, 1994 <i>Elrathiella</i> Poulsen, 1927 <i>Proehmaniella</i> Sundberg 1994 <i>Marjumiella</i> Walcott, 1916
	Asaphida Salter, 1864 emend. Fortey & Chatterton, 198	Raphiophoridae Angelin, 1854 Trinucleidae Hawle & Corda, 1847	<i>Mendolaspis salagastensis</i> Rusconi 1951
	Olenida Adrain, 2011	Asaphiscidae Raymond 1924 Cedariidae Raymond, 1937	<i>Blountia</i> Walcott 1916  <i>Cedaria</i> Walcott 1924
	Uncertain	Ptychopariidae Matthew, 188742	<i>Amecephalus arrojensis</i> (Lochman in Cooper et al., 1952) <i>Eokochaspis nodosa</i> Sundberg & McCollum, 2000 <i>Hadrocephalites</i> Sundberg & McCollum, 2002 <i>Kochaspis coosensis</i> Resser 1938 <i>Kochiella maxeyi</i> Rasetti, 1951 <i>Kochiella</i> Poulsen, 1927 <i>Mexicella mexicana</i> Lochman, 1948 <i>Ptychobaba butsi</i> (Resser, 1938) <i>Blainia gregaria</i> (Walcott, 1916)

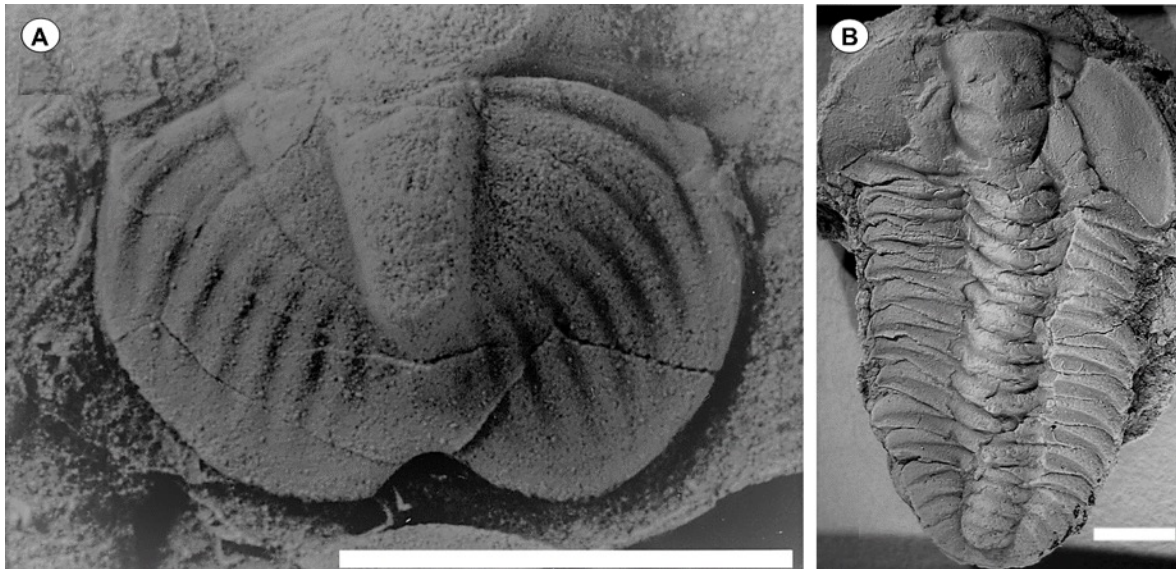


Figure 5. A, *Blainia gregaria* (Walcott, 1916), pygidium (modified from Bordonaro et al., 2013). Scale bar = 5 mm. B, *Bathyriscus mendozanus* (Rusconi, 1945), complete carapace (modified from Bordonaro & Fojo, 2011). Scale bar = 2.5 mm.

A new classification scheme for the Class Trilobita Walch, 1771 was proposed by Adrain (2011) who modified from that of Fortey (1997). Among the discrepancies in the taxonomy can be mentioned the exclusion of agnostoids from the Class Trilobita; the incorporation of two new orders, Aulacopleurida and Olenida; and the inclusion in a group of the taxa belonging to an uncertain order of many families previously assigned to the polyphyletic Order Ptychopariida. Table 2 shows the taxonomy of the 1763 arthropods collected according to this scheme. Raphiophoridae and Trinucleidae have been regarded as members of a new order, Trinucleida, by Bignon et al. (2020). This scheme was not considered in this dataset.

*Taxon specialists:* Osvaldo Bordonaro, Brian Pratt, Aldo Banchig, and Carlos Fojo

*Quality control for taxonomic data:* The record comes from the paleontological field works, planned from a bibliographic review and an exhaustive geological knowledge of the area. The specimens collected were cleaned through percussion and vibration methods, and later bleached with magnesium oxide. They were

examined using an Olympus SZ61 binocular microscope.

*Additional information:* The specimens are referred in published bibliography (Beresi et al., 2017; Bordonaro, 2014a & b; Bordonaro & Banchig, 2007; Bordonaro & Fojo, 2011; Bordonaro et al., 2008, 2013; Pratt & Bordonaro, 2014).

*Study extent description:* The dataset has greatly contributed to the knowledge of the Precordilleran Cambrian trilobite taxonomy that, in turn, has supported the proposal of a paleobiogeographic relationship between the microcontinent Cuyania and Laurentia during the Cambrian.

Concerning taxonomy, the Laurentian species *Athabaskia anax* (Walcott, 1916), from San Isidro Olistolith in Empozada Formation (Mendoza Province), led to the revision of the holotypes of *Clavaspidella digesta* Leanza, 1947, *Mendospidella asperoensis* Rusconi, 1952a, *Mendospidella quebradensis* Rusconi, 1952a, and *Mendospidella digesta* (Leanza) Poulsen, 1958, which were proposed as synonymous names of *Athabaskia anax* (Bordonaro, 2014a). In turn, *Plesioparabolina mendozana* Rusconi, 1945, from the outer

platform, was reassigned to the species *Bathyuriscus mendozanus* (Bordonaro & Fojo, 2011). Likewise, *Glyphaspis* Poulsen, 1927 was synonymized with *Blainia* Walcott, 1916, and their 30 species with *Blainia gregaria* (Bordonaro et al., 2013).

The Andean Precordillera (a terrane integrated in Cuyania) is one of the geological provinces of western Argentina, recognized and described since the end of the 19th century (Burmeister, 1876; Stelzner, 1876;

Bondenbender, 1902; Ramos, 1999). It was interpreted through different geotectonic models of the paleogeographic evolution of the South American continent during Neoproterozoic-Eopaleozoic. The Precordillera was understood as both an autochthonous or parautochthonous terrane to Gondwana and as an allochthonous terrane from a Late Proterozoic - Early Cambrian rifting event in the southern Laurentia (Aceñolaza & Toselli, 1988; Benedetto, 1993; Yrigoyen, 1999).

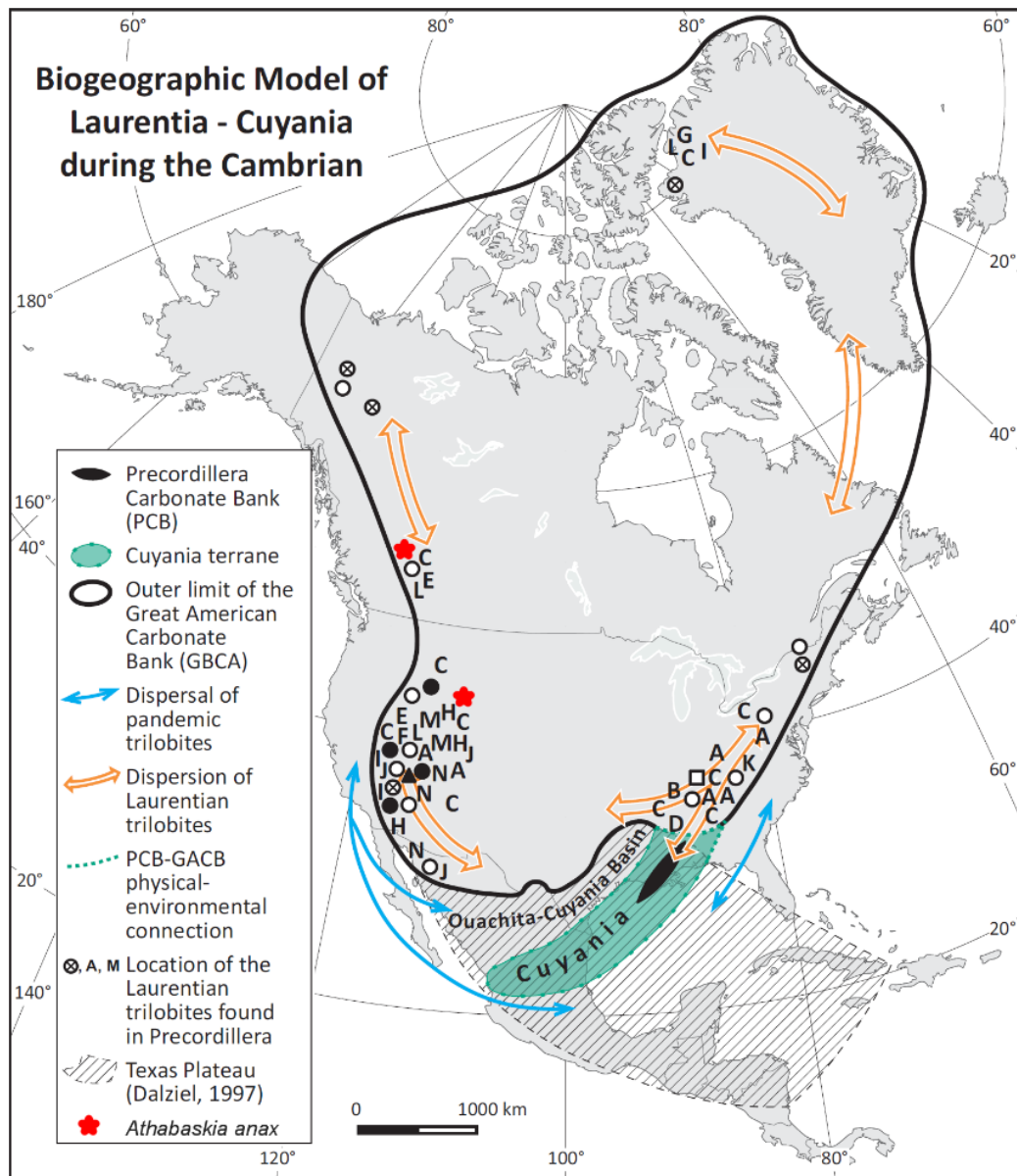


Figure 6. Biogeographic model of Laurentia – Cuyania during the Cambrian (modified from Bordonaro, 2016).

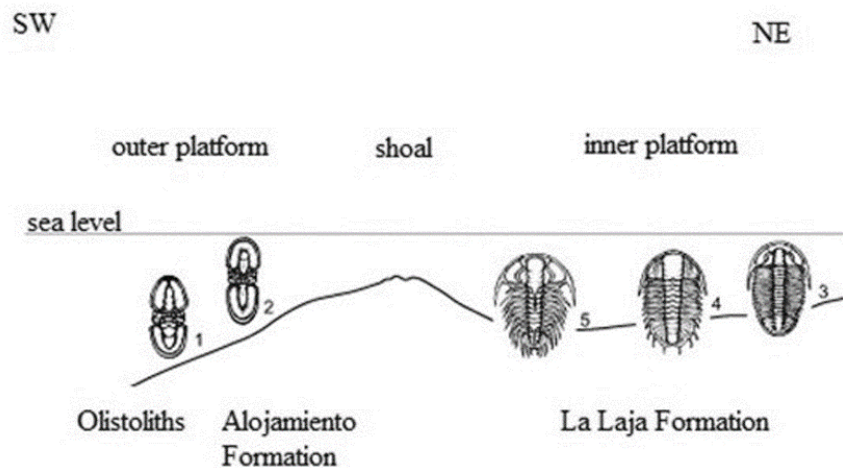


Figure 7. Environmental distribution of trilobites (including agnostoids) included in this dataset across the Precordillera inner and outer platform. 1 and 2, *Bathyriscus mendozanus*, *Ptychagnostus intermedius*, *Elrathiella domensa*, *Athabaskia anax*, *Peronopsis bonnerensis*, *Pagetia walcotti*; 3, 4 and 5, *Blainia gregaria*, *Eokochaspis nodosa*, *Ptychobaba buttsi*, *Amecephalus arrojoseensis*, *Kochiella maxeyi*, *Mexicella mexicana*, *Kochaspis coosensis* (modified from Bordonaro et al. 2008).

During the Cambrian, Laurentia was characterized by endemic species of trilobite fauna that could not cross the Great American Carbonate Bank and disperse into deep seas. However, *Blainia gregaria* Walcott, 1916, an endemic Laurentian species that inhabited the internal carbonate platform, was recognized in the Precordillera of western Argentina (Bordonaro et al., 2013).

The main limitation of both autochthonous - parautochthonous and allochthonous models was the impossibility of internal platform trilobites being able to disperse. According to this, Bordonaro (2016, 2017) revised the different models and proposed a new model that complements other hypotheses, claiming that Precordillera was attached to Laurentia, but while the rifting event started in the southwest, the northeast was still fixed and could therefore share the same inner platform. During the Cambrian, Precordillera and Laurentia would have maintained an environmental connection of their carbonate shelf. This connection occurred

through northeast coast of Ouachita Bay and allowed the dispersion of trilobite endemic fauna. The trilobites from La Laja Formation points out a marked endemism associated to its isolation. Although this fauna was distributed around different platforms in North America, it was always within the limits of the carbonate barrier. The Precordillera stratigraphic units would point to a connection between Precordillera and Laurentia. Figure 6 shows the biogeographic model of Laurentia – Cuyania during the Cambrian.

This dataset compiles seven of the 14 endemics species of polymeroid ptychoparioid trilobites recognized in La Laja Formation: *Blainia gregaria* (Walcott, 1916); *Kochaspis coosensis* Resser 1938; *Mexicella mexicana* Lochman, 1948; *Ptychobaba buttsi* (Resser, 1938); *Kochiella maxeyi* Rasetti, 1951; *Eokochaspis nodosa* Sundberg & McCollum, 2000 and *Amecephalus arrojoseensis* (Lochman in Cooper et al., 1952) (Bordonaro et al. 2013; Pratt & Bordonaro, 2014). This fauna, which is typically Laurentian, has never been registered

in other continents. Figure 7 shows an environmental distribution of trilobites (including agnostoids) included in this data set.

## ACKNOWLEDGMENTS

The authors are grateful to Esperanza Cerdeño, Anabela Ploss, Paula Zermoglio and Melisa Paris for their contributions. Grateful acknowledgment is extended to the reviewers for their useful comments.

## REFERENCES

- Aceñolaza, F.G. & Toselli, A.J. (1988) El sistema de Famatina: su interpretación como orógeno de margen activo. 5° Congreso Geológico Chileno, 1, A55-A67.
- Adrain, J.M. (2011) Class Trilobita Walch, 1771. In: Zhang, Z.-Q. (Ed.) Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. Zootaxa, 3148, 104-109. DOI: 10.11646/zootaxa.3148.1.2.
- Angelin, N.P. (1854) Palaeontologia Scandinavica. I, Crustacea formationis transitionis. Fasc. 2, I-IX, Stockholm, 21-92. DOI: 10.5962/bhl.title.14890
- Banchig, A. L. (2006) Formación Alojamiento (Cámbrico) en su localidad tipo. Paleoambiente sedimentario del margen continental eopaleozoico, Precordillera mendocina. Revista de la Asociación Geológica Argentina, 61(3), 301-312.
- Beecher, C. E. (1897) Outline of a natural classification of the trilobites. American Journal of Science, Series 4, 3, 89-106, 181-207. DOI: 10.2475/ajs.s4-3.14.89
- Benedetto, J.L. (1993) La hipótesis de la Aloctonía de la Precordillera argentina: un test estratigráfico y biogeográfico. 12° Congreso Geológico Argentino. Actas, 3, 375-384.
- Beresi, M., Bordonaro, O., Heredia, S., Mestre, A. & Toro, B. (2017) El Darriwiliense inferior (Ordovícico Medio) en el extremo norte de Mendoza Argentina: implicaciones estratigráficas y bioestratigráficas. Boletín Geológico y Minero, 128 (1), 93-110. DOI: 10.21701/bolgeomin.128.1.005
- Bignon, A.M., Waisfeld, B.G., Vaccari, N.E. & Chatterton, B.E. (2020) Reassessment of the Order (Trilobita). Journal of Systematic Paleontology, 18, 1061-1077. DOI: 10.1080/14772019.2020.1720324
- Bodenbender, G. (1902) Contribución al conocimiento de la "Precordillera de San Juan, de Mendoza y de las sierras centrales de la República Argentina. Academia Nacional de Ciencias, Boletín, 19, 1-220.
- Bordonaro, O. (2003) Review of the Cambrian stratigraphy of the Argentine Precordillera. Acta Geológica Hispánica, 1, 11-21.
- Bordonaro, O. (2014a) Nuevos datos sobre *Athabaskia anax* (Walcott 1916) (Trilobita Corynexochida) del Cámbrico medio de la Precordillera de Mendoza Argentina. Boletín Geológico y Minero, 125 (4), 561-571.
- Bordonaro, O. (2014b) Hallazgo de Trilobites olenéllidos (Cámbrico Inferior) en la Precordillera de Mendoza. XIX Congreso Geológico Argentino. Actas, S2-7- III Simposio de Bioestratigrafía y Eventos del Paleozoico Inferior, Córdoba.
- Bordonaro, O. (2016) Trilobites laurénticos de la Formación La Laja (Cámbrico), Precordillera de San Juan, Argentina: un aporte biogeográfico al modelo alóctono de Precordillera. Revista de la Asociación Geológica Argentina, 73 (4), 457-467.
- Bordonaro, O. (2017) Biogeografía de trilobites cámbricos de la Formación La Laja, Precordillera de San Juan, Argentina. XX Congreso Geológico Argentino. San Miguel de Tucumán.
- Bordonaro, O.L. & Banchig, A.L. (2007) Biofacies de trilobites cámbricos en la Formación Alojamiento, Precordillera de San Juan y Mendoza. Ameghiniana, 44 (1), 91-107.
- Bordonaro, O.L. & Fojo, C.F. (2011) *Bathyriscus mendozanus* (Rusconi, 1945), trilobites del Cámbrico Medio de la Precordillera Argentina. Revista Española de Paleontología, 26 (1), 11-23. DOI: 10.7203/sjp.26.1.18466

- Bordonaro, O.L., Beresi, M.S. y Keller, M. (1993) Reinterpretación estratigráfica del Cámbrico del área de San Isidro, Precordillera de Mendoza. 12° Congreso Geológico Argentino y 2° Congreso de Exploración de Hidrocarburos. Actas 2,12-19. Mendoza.
- Bordonaro, O. 2003. Review of the Cambrian stratigraphy of the Argentine Precordillera. Acta Geológica Hispánica, 1, 11-21.
- Bordonaro, O., Banchig, A., Pratt, B. & Raviolo, M. (2008) Trilobite based biostratigraphic model (biofacies and biozonation) for the Middle Cambrian carbonate platform of the Argentine Precordillera. Geologica Acta, 6 (2), 115-129. DOI: 10.1344/105.000000246
- Bordonaro, O., Pratt, B. & Robledo, V. (2013) Systematic morphometric and palaeobiogeographic study of *Blania gregaria* Walcott 1916 (Trilobita, Ptychopariida) Middle Cambrian of the Precordillera of western Argentina Geological Journal, 48, 126-141. DOI: 10.1002/gj.1344
- Borrello, A.V. (1963) *Fremontella inopinata* n. sp. del Cámbrico de Argentina. Ameghiniana, 3, 51-55.
- Borrello, A.V. (1964) Sobre la presencia del Cámbrico Inferior olenellidiano en la Sierra de Zonda, Precordillera de San Juan, Argentina. Ameghiniana, 3, 313-317.
- Borrello, A.V. (1971) The Cambrian of South America. In: Holland C.F. (edit.) Cambrian of the new world (Lower Paleozoic Rocks of the world) vol 1. Wiley Interscience: 385-438.
- Bradley, J.H. (1925) Trilobites of the Beekmantown in the Phillipsburg region of Quebec. Canadian Field Naturalist, 39, 5-9.
- Burmeister, H. (1876) Description physique de la République Argentine, d'après des observations personnelles et étrangères. F.Sav. y I: 1-395. Paris. DOI: 10.5962/bhl.title.39139
- Chapman, A.D. & Wieczorek, J.R. (2020) Georeferencing Best Practices. Global Biodiversity Information Facility, Copenhagen
- Cooper, G.A., Arellano, A. R., Johnson, J.H., Okulitch, V. J. Stoyanow, A. & Lochman, C. (1952) Cambrian Stratigraphy and Paleontology near Caborca, Northwestern Sonora, Mexico. Smithsonian Miscellaneous Collections, 111 (1), 1-84. DOI: 10.1086/400428
- Darwin Core Maintenance Group. (2020). List of Darwin Core terms. Biodiversity Information Standards (TDWG). <http://rs.tdwg.org/dwc/doc/list/>
- Devincenzi, S. (2018) Indicadores de crecimiento y uso para las colecciones paleontológicas del IANIGLA. Revista del Museo de La Plata, 3 (2), 324-334. DOI: 10.24215/25456377e062
- Devincenzi, S.M. & Bordonaro, O.L. (2022) Registros de la clase Trilobita de la Precordillera de San Juan y Mendoza, Argentina. Centro Científico Tecnológico (CCT) CONICET Mendoza. Occurrence dataset DOI: 10.15468/apwnqn accessed via GBIF.org on 2022-08-23.
- Fortey, R.A. (1997) Classification. In: Kaesler, R.L. (Ed.) Treatise on invertebrate paleontology. Part O. Arthropoda 1, Trilobita, 289–302. Geological Society of America and University of Kansas Press, Lawrence, Kansas.
- Fortey, R.A. & Chatterton, B.D.E. (1988) Classification of the trilobite suborder Asaphina. Palaeontology, 31, 165-222.
- Fortey, R.A. & Owens, R.M. (1975) Proetida: A new order of trilobites. Fossils and Strata, 4, 227-239.
- Hall, J. (1861) Supplementary note to the thirteenth report of the Regents of the State Cabinet, 113-119. In 15th Annual Report of the New York State Cabinet for Natural History. Albany, New York.
- Harrington, H.J. (1956) Olenellidae with advanced cephalic spines. Journal of Paleontology, 30 (1), 56-61.
- Howell, B.F. (1935) Cambrian and Ordovician trilobites from Hérault, southern France. Journal of Paleontology, 9, 222-238.
- Hawle, I. & Corda, A.J. (1847) Prodom einer Monographie der böhmischen Trilobiten. Abhandlung der Konigliche Böhmischen Gesellschaft Wissenschaften 5, 176 p.
- Jaekel, O. (1909) Über die Agnostiden Zeitschrift Deutschen Geologischen Gesellschaft, 61, 380-401.

- Kobayashi, T. (1935) The Cambro-Ordovician formations and faunas of South Chosen. *Palaeontology*. Part 3: Cambrian faunas of South Chosen with a special study on the Cambrian trilobite genera and families. *Journal of the Faculty of Science, Imperial University of Tokyo, Section II*, 4 (2), 49-344.
- Kobayashi, T. (1939) On the Agnostids. Part 1. *Journal of the Faculty of Science, Imperial University of Tokyo*, 5 (5), 70-198.
- Leanza, A. (1947) El Cámbrico Medio de Mendoza. *Revista del Museo de La Plata. Nueva Serie. Sección Paleontología*, 3, 223-235.
- Lochman, C. (1948) New Cambrian trilobite genera from northeast Sonora Mexico. *Journal of Paleontology*, 22, 451-464.
- Mansuy, H. (1916) Faunes cambriennes de l'Extrême Orient meridional Mémoire. *Servis Géologie Indochine*, 5, 48 p.
- Marek, L. (1952) Contribution to the stratigraphy and Fauna of the uppermost part of the Králuv Dvůr Shales (Ashgillian). *Rozpravy Ústředního Ústavu Geologického*, 28, 1-84.
- Palmer, A.R. (1973) Cambrian Trilobites. In: A. Hallam (Edit), *Atlas of Palaeobiogeography*. Elsevier Scientific Publishing Company.
- Poulsen, C. (1927) The Cambrian, Ozarkian and Canadian faunas of the Northwest Greenland. *Meddel om Gronland*, 70, 237-343. DOI: 10.1017/s0016756800104431
- Poulsen, V. (1958) Contributions to the Middle Cambrian paleontology and stratigraphy of Argentina. *Matematisk Fysiske Meddelelser Danske Videnskabernes Selskab*, 31 (8), 1-22.
- Pratt, B. & Bordonaro, O. (2014) Early Middle Cambrian Trilobites from La Laja Formation Cerro El Molle Precordillera of western Argentina. *Journal of Paleontology*, 88(5), 906-924. DOI: 10.1666/13-083
- Ramos, V.A. (1999) Las provincias geológicas del territorio argentino. En: *Geología Argentina, Anales*, 29 (3), 41-96 (ed. R.Caminos).
- Rasetti, F. (1951) Middle Cambrian stratigraphy and faunas of the Canadian Rocky Mountains *Smithsonian Miscellaneous Collections*, 116 (5): 277 p.
- Rasetti, F. (1966) Revision of the North American species of the Cambrian trilobite genus *Pagetia*. *Journal of Paleontology*, 40 (3), 502-511.
- Raymond, P.E. (1913) On the genera of the Eodiscidae. *The Ottawa Naturalist* 27:101-6. [Superfamilies Condylopygoidea, Eodisoidea; Families Condylopygidae, Eodiscidae].
- Raymond, P.E. (1924) New Upper Cambrian and Lower Ordovician trilobites from Vermont: *Proc. Boston Society Natural History*, 37, 389-466.
- Raymond, P.E. (1937) Upper Cambrian and Lower Ordovician Trilobita and Ostracoda from Vermont. *Geological Society of America Bulletin*, 48, 1079-1146. DOI: 10.1130/gsab-48-1079
- Resser, C.E. (1937) Third contribution to nomenclature on Cambrian trilobites. *Smithsonian Miscellaneous Collections*, 95, 1-59.
- Resser, C.E. (1938) Cambrian System (restricted) of the southern Appalachians *Geological Society of America Special Paper* 15, 140 p. DOI: 10.1130/SPE15
- Resser, C.E. (1939) The Ptarmigania strata of the northern Wasatch Mountains. *Smithsonian Miscellaneous Collections*, 98 (24), 1-86.
- Richter, R. (1932) Crustacea (Paläontologie). In *Handwörterbuch der Naturwissenschaften*. Dittler, R., Joos, G., Korschelt, E., Linek, G., Oltmanns, F. & Schaum, K. (eds.), 2nd Edition. *Gustav Fisher, Jena*, 2, 840-864.
- Ross, R.J. (1975) Early Paleozoic trilobites, sedimentary facies, lithospheric plates and ocean currents. *Fossils and Strata*, 4, 307-329. DOI: 10.1306/83D915B0-16C7-11D7-8645000102C1865D
- Rusconi, C. (1945) Trilobites silúricos de Mendoza. *Anales de la Sociedad Científica Argentina*, 139, 216-219.
- Rusconi, C. (1950a) Notas sobre faunas cámbricas de Mendoza. *Anales de la Sociedad Científica Argentina*, 149, 157-177.
- Rusconi, C. (1950b) Trilobita y otros organismos del Cámbrico de Canota. *Revista del Museo de Historia Natural de Mendoza*, 4, 71-84.

- Rusconi, C. (1951a) Más trilobitas cámbricos de San Isidro, Cerro Pelado y Canota. *Revista del Museo de Historia Natural de Mendoza*, 5, 3-30.
- Rusconi, C. (1951b) Fósiles cámbricos de Salagasta. *Anales de la Sociedad Científica Argentina*, 152, 255-264.
- Rusconi, C. (1952a) Fósiles cámbricos del cerro Áspero, Mendoza. *Revista del Museo de Historia Natural de Mendoza*, 6, 63-122.
- Rusconi, C. (1952b) Los fósiles cámbricos de Salagasta. *Revista del Museo de Historia Natural de Mendoza*, 6, 19-62.
- Salter, J.W. (1864) A monograph of British trilobites. Part 1. *Monograph of the Palaeontographical Society*, 1-80. DOI: 10.1080/02693445.1864.12113212
- Stelzner, A. (1876) Geologie der Argentinischen Republik. In: Napp, R., *Die argentinischen Republik*, 71 ff.
- Sundberg, F.A. (1994) Corynexochida and Ptychopariida (Trilobita, Arthropoda) of the Ehmaniella Biozone (Middle Cambrian), Utah and Nevada. *Natural History Museum of Los Angeles County, Contributions in Science*, 446, 137 p. DOI: 10.5962/p.208082
- Sundberg, F.A. & McCollum, L.B. (2000) Ptychopariid trilobites of the Lower-Middle Cambrian boundary interval, Pioche Shale southwestern Nevada. *Journal of Paleontology*, 74, 604-630. DOI: 10.1666/0022-3360(2000)074<0604:PTOTLM>2.0.CO;2
- Sundberg, F.A. & McCollum, L.B. (2002) Kochiella Poulsen 1927 and Hadrocephalites new genus (Trilobita: Ptychopariida) from the early Middle Cambrian of western North America. *Journal of Paleontology*, 76, 76-94. DOI: 10.1666/0022-3360(2002)076<0076:KPAHNG>2.0.CO;2
- Swinnerton, H.H. (1915) Suggestions for a revised classification of trilobites. *Geological Magazine (New Series)*, 6, 487-496. DOI: 10.1017/S0016756800203634
- Tullberg, S.A. (1880) Om Agnostus arterna i de Kambriska aflagringarne vid Andrarum. *Sveriges Geologiska Undersökning*, 42, 1-37.
- Walch, J.E.I. (1771) Die Naturgeschichte der Versteinerungen zur Erläuterung der Knorr'schen Sammlung von Merkwürdigkeiten der Natur. Dritter Theil. P. 1-8, 1-235, Taf. 1-85. Nurnberg: Felssecker.
- Walcott, C.D. (1888) Cambrian fossils from Mount Stephens, Northwest Territory of Canada. *American Journal of Science*, 36 (213), 163-166. DOI: 10.2475/ajs.s3-36.213.161
- Walcott, C.D. (1889) Description of new genera and specimens of fossils from the Middle Cambrian. *Proceedings of the United States National Museum*, 11, 441-446. DOI: 10.5479/si.00963801.11-738.441
- Walcott, C.D. (1890) The fauna of the Lower Cambrian or Olenellus Zone. 509-774 in Tenth Annual Report of the Director, 1888-1889, United States Geological Survey. DOI: 10.1017/S0016756800188594
- Walcott, C.D. (1916) Cambrian geology and paleontology, III n° 5. Cambrian trilobites. *Smithsonian Miscellaneous Collections*, 64, 303-456.
- Walcott, C.D. (1924) Cambrian and Lower Ozarkian trilobites. *Smithsonian Miscellaneous Collections*, 75, 53-60.
- Westergård, A.H. (1936) Paradoxides oelandicus beds of Öland with the account of a diamond boring through the Cambrian at Mossberga. *Sveriges Geologiska Undersökning, Series C. no. 394, Årsbok*, 30(1), 1-66. DOI: 10.1017/s0016756800094140
- Wieczorek, C. & Wieczorek, J. (2019) Georeferencing Calculator. Rauthiflor LLC. Available: <http://georeferencing.org/georefcalculator/gc.html> [Accessed 21 Nov 2019].
- Wieczorek, J., Guo, Q. & Hijmans, R. (2004) The point-radius method for georeferencing locality descriptions and calculating associated uncertainty. *International Journal Geographical Information Science*, 18 (8), 745-767. DOI: 10.1080/13658810412331280211
- Wieczorek, J., Bloom, D., Guralnick, R., Blum, S., Döring, M., Giovanni, R., Robertson, T. & Vieglais, D. (2012). Darwin Core: An Evolving Community-Developed Biodiversity Data

Standard. PLoS ONE, 7(1), e29715. DOI:  
10.1371/journal.pone.0029715

Yrigoyen, M.R. (1999). Situación de la Argentina  
en el marco geológico de América del Sur. In:  
Geología Argentina, Anales, 29 (2), 35-39 (ed.  
R. Caminos).

*Submitted: 14 September 2022*

*First decision: 26 October 2022*

*Accepted: 4 January 2023*

*Edited by Federico Marrone*