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Diplopoda in the world fossil record

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Abstract  We present a comprehensive catalog with an updated database of the fossil record of Diplopoda in the world. Taxonomic data was collected from descriptions and reports published from 1854 to the present. We also include new records from the Lower Miocene Mexican amber, counting 83 unknown fossil inclusions, with the first records of the orders Polyxenida, Platydesmida, and Julida, as well as the families Sphaeriodesmidae and Trichopolydesmidae within Polydesmida. According to our results, Diplopoda comprises 217 fossil records from the Middle Silurian to Upper Pleistocene, representing three subclasses, six superorders, 25 orders, one superfamily, 54 families, 90 genera, and 156 fossil species. To date, no fossils of the order Siphonocryptida have been reported. The fossil record extends over three geological eras: the Paleozoic, with 156 records; the Mesozoic, with 51; and the Cenozoic, with 77. The fossil preservation includes 87 impressions, 68 compressions, 108 amber inclusions, and 19 ichnites. Thus, this catalog allows us to estimate the size and taxonomic composition of Diplopoda in the fossil record worldwide.

Key words Millipedes, Paleozoic, Mesozoic, Cenozoic, New records, Catalog.

1 Introduction

Millipedes (Arthropoda: Myriapoda: Diplopoda) are one of the most successful animal forms in terrestrial environments. Diplopoda in the fossil record extends from the Mid-Paleozoic to the Upper Cenozoic (Wilson & Anderson, 2004; Shear & Edgecombe, 2010). Paleozoic forms include the oldest known land animals from the Middle to Upper Silurian, such as Casiogrammus ichthyeros (Wilson, 2005b), Kampecaris obanensis (Brookfield et al., 2020), Cowiedesmus eroticopodus, Albadesmus almondi, Pneumodesmus newmani (Wilson & Anderson, 2004), and Eoarthropleura ludfordensis (Shear & Selden, 1995). Other Paleozoic millipedes of the genus Arthropleura from the Upper Carboniferous are considered one of the largest known terrestrial arthropods (Davies et al., 2021). In the Permian, at the end of the Paleozoic, a single fossil record is found in North America (Hannibal, 2006; Hannibal & May, 2020). Mesozoic forms are often assigned within existing orders and families (Sierwald & Bond, 2007; Shear et al., 2009; Shear & Edgecombe, 2010; Edgecombe, 2015). The Triassic is represented by Tomiulus angulatus (Dzik, 1981) and Hannibaliulus wilsonae (Shear et al., 2009). Little is known about the Jurassic fossil record, there are a few poorly preserved specimens, and their taxonomic identity still needs to be determined (Shear & Edgecombe, 2010). Only the species Decorotergum warrenae Jell, 1983 from the Lower Jurassic of Australia is known. From the Upper Mesozoic (Cretaceous) and through the Cenozoic, fossil millipedes are predominantly modern forms preserved as amber inclusions (Shear & Edgecombe, 2010; Edgecombe, 2015). Cretaceous amber inclusions...
come from different strata, including the most emblematic amber sites, such as Lebanon (Nguyen Duy-Jacquemin & Azar, 2004), France (Nguyen Duy-Jacquemin & Azar, 2004), and Myanmar (Rasnitsyn & Ross, 2000; Grimaldi et al., 2002; Ross & Sheridan, 2013; Liu et al., 2017; Zhang, 2017; Ross, 2018; Wesener & Moritz, 2018; Jiang et al., 2019; Moritz & Wesener, 2019, 2021; Stoev et al., 2019; Su et al., 2019, 2020). In the Cenozoic, most fossil materials are also preserved as amber inclusions from exceptional conservation sites, such as those in the Baltic region (Koch & Berendt, 1854; Menge, 1854; Hoffman, 1969; Wesener, 2019), India (Srivastava et al., 2006), Dominican Republic (Shear, 1981; Santiago-Blay & Poinar, 1992), and Mexico (Riquelme et al., 2013; 2014; 2021; Riquelme & Hernández-Patricio, 2018).

Several authors have previously reviewed the taxonomic composition of the Diplopoda fossil record (Almond, 1985; Shear, 1997; Wilson, 2006; Shear & Edgecombe, 2010; Edgecombe, 2015). Initially, Almond (1985) listed the fossil record of Myriapoda, including Diplopoda, establishing a geochronological sequence from the Silurian to the Devonian. Subsequently, Shear (1997) documented the fossil record of Diplopoda, focusing on the most representative higher taxa, also including a geochronological sequence. In addition, Wilson (2006) performed a stratocladogram of Myriapoda, including Diplopoda, combining data from the fossil record with a cladistic analysis (Sierwald et al., 2003). Shear & Edgecombe (2010) then chronologically reviewed the fossil record of Diplopoda. Finally, a summary taxonomic list has been presented by Edgecombe (2015).

Other authors have also listed millipedes or have published inventories of specific geological sites. Santiago-Blay & Poinar (1992) reported the orders Polyxenida, Glomeridesmida, Stemmiulida, Spirostreptida, Polyzonida, Siphonophorida, and Polydesmida from Miocene Dominican amber. Štamb& Žajic (2008) recorded the Permian-Carboniferous fossil fauna of the Czech Republic, including millipedes. Wesener & Moritz (2018) published an inventory of the Myriapoda, including Diplopoda, from the lowermost Upper Cretaceous amber of Myanmar. Riquelme & Hernández-Patricio (2018) published the first inventory of Diplopoda from the Lower Miocene Chiapas amber. They initially listed 34 records in four orders, six families, five genera, and three species.

This work aims to critically review the Diplopoda fossil record literature to provide a global catalog with an up-to-date database. Taxonomic data were compiled from descriptions and reports published since 1854. We have new data on the fossil record of Diplopoda in Mexican amber from the Miocene, which is presented here as new records added to the catalog. We also include a revised stratocladogram and summary taxonomic list of the worldwide fossil record.

2 Materials and methods

The fossil species (valid/named) were compiled from literature published up to November 2023. Also included here are other fossil records not determined to the species level or considered Incertae sedis. Each record provides the data of the original description with the author, year, pages, figures, referred material, preservation, repositories, and comments associated with their current status. Referred material identified as adult female ♂, male ♂, and juvenile is indicated in the catalog and database. Undetermined adults and no declared status are shown only in the database. Taxonomic treatment follows the expanded traditional Linnaean classification ranks. The nomenclature and taxonomy follow Sierwald & Bond (2007), Shear (2011), Golovatch (2013); Enghoff et al., 2015; and Edgecombe (2015). Nomenclature and terminology of geological ages follows the International Chronostratigraphic Chart. Additional information about the fossiliferous localities is also presented, including strata, quarries, mines, and geological horizons. Taxonomic references are listed in chronological order. The catalog database is continuously updated on a website (www.riquelmelab.org.mx), which will be helpful to different users and provide a nested system as a basis for future consultation on any taxa of interest within Diplopoda. Therefore, we would appreciate readers’ corrections and additions to this online database. Microsoft Office Excel 2010 was used to analyze the information in the database. Photomicrographs of Mexican amber inclusions were collected by applying multiple image stacking (Z ≥ 30) on a CARL ZEISS® AXIO ZOOM.V16 microscope coupled to an Axiocam MRc5 camera. The ZEN 2012® software and Corel PHOTO-PAINT® were used for image processing and editing (Riquelme et al., 2014).

Institutional acronyms and other abbreviations are as follows:

AM.CH—Ámbar de Chiapas, Mexico;
AMNH—American Museum of Natural History, New York, USA;
AMS—Australlan Museum, Sydney, Australia;
ANSP—Academy of Natural Sciences of Drexel University, Pennsylvania, USA;
BGS—British Geological Survey, England, UK;
BIRUG—Lapworth Museum of Geology University of Birmingham, England, UK;
BMB—Collection of Writhlington Geological Nature Reserve, England, UK;
PC—Private Collection of Patrick Craig, localization unknown;
PIN—Babi Kamen (PIN collection 1062), Kemerovo, Russian Federation;
PPC—Private Collection of Martin Pavela, Opava, Czech Republic;
QMF—Queensland Museum Geosciences Collection, Queensland, Australia;
QM—Queensland Museum, Queensland, Australia;
RGM—Rijks Geologisch Mineralogische, Leiden, Netherlands;
RO—Private Collection of Rainer Ohlhoff, Saarland, Germany;
SMNS—Staatliches Museum für Naturkunde Stuttgart, Baden-Württemberg, Germany;
SMU—Southern Methodist University collection, Texas, USA;
SSM—Springfield Science Museum, Massachusetts, USA;
SUCCINUM.INAH—Private Collection certified by the Instituto Nacional de Antropología e Historia (INAH), San Cristóbal de las Casas, Chiapas, Mexico;
UCMP—University of California Museum of Paleontology, California, USA;
USMN—Smithsonian Institution, National Museum of Natural History, Washington DC, USA;
WPM—Museum für Naturkunde und Vorgeschichte, Saxony-Anhalt, Germany;
Wu—Private Collection of Jörg Wunderlich, Baden-Württemberg, Germany;
YPM—Peabody Museum of Natural History, Yale University, Connecticut, USA;
ZCM—National History Museum of the Pilsen Region, Pilsen, Czech Republic;
ZFMK-MYR—Myriapoda Collection of the Zoological Research Museum Alexander Koenig, North Rhine-Westphalia, Germany;
ZPAL—Palaeozoological Institute of the Polish Academy of Sciences, Warsaw, Poland.

3 Catalog

3.1 General

This updated catalog comprises three subclasses, six superorders, 25 orders, one superfamily, 54 families, 90 genera, and 156 fossil species in 217 records worldwide (Tables 1-3, Figs 1-2). The fossil record extends over three geological eras: Paleozoic (156 records), Mesozoic (51 records), and Cenozoic (77 records). Fossil preservation consists of compressions, impressions, and ichnites found primarily in Paleozoic and Mesozoic sediments and amber inclusions from late Mesozoic and Cenozoic sites (Table 1, Fig.2).

Table 1. Current count of millipedes in the worldwide fossil record.

<table>
<thead>
<tr>
<th>Era</th>
<th>Fossil record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paleozoic</td>
<td>156</td>
</tr>
<tr>
<td>Mesozoic</td>
<td>51</td>
</tr>
<tr>
<td>Cenozoic</td>
<td>77</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rank</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Subclass</td>
<td>3</td>
</tr>
<tr>
<td>Superorder</td>
<td>6</td>
</tr>
<tr>
<td>Order</td>
<td>25</td>
</tr>
<tr>
<td>Superfamily</td>
<td>1</td>
</tr>
<tr>
<td>Family</td>
<td>54</td>
</tr>
<tr>
<td>Genus</td>
<td>90</td>
</tr>
<tr>
<td>Species</td>
<td>156</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preservation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amber inclusion</td>
<td>108</td>
</tr>
<tr>
<td>Compression</td>
<td>68</td>
</tr>
<tr>
<td>Impression</td>
<td>87</td>
</tr>
<tr>
<td>Ichnites</td>
<td>19</td>
</tr>
</tbody>
</table>
Paleozoic. The earliest fossil forms of Diplopoda are found in the Middle to Upper Silurian rocks. It mainly comprises species within extinct higher taxa (Table 2, Fig.2). One of the oldest fossil records is *Casiogrammus ichthyeros* from the Middle Silurian Fish Bed Formation in Scotland, ca. 430 Ma (Wilson, 2005b). This is a putative millipede of the order Zosterogramida whose record was questioned (Brookfield *et al*., 2020); see below specific comments in the list section.

Another oldest uncontroversial fossil record is *Kampecaris obanesis* Peach, 1889 (superorder Archipolypoda) from the Upper Silurian Kerrera Sandstone Formation in Scotland, ca. 425 Ma (Brookfield *et al*., 2020). Other ancient Archipolypoda records are *Albadesmus almondi*, *Cowiedesmus eroticopodus*, and *Pneumodesmus newmani* from the Upper Silurian Cowie Formation in Scotland, ca 414 Ma (Wilson & Anderson, 2004), and *Eoarthropleura ludfordensis* (order Eoarthropleurida) from the Upper Silurian Downton Castle Sandstone Formation in England, ca. 420 Ma (Shear & Selden, 1995).

Table 2. The fossil record of the class Diplopoda: orders, families, genera, and species, except Siphonocryptida.

<table>
<thead>
<tr>
<th>Order</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Polyxenida</td>
<td>Verhoeff, 1934</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>2 †Arthropleurida</td>
<td>Waterlot, 1934</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3 †Eoarthropleurida</td>
<td>Shear &amp; Selden, 1995</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4 †Microdececmpicida</td>
<td>Wilson &amp; Shear, 2000</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5 †Zosterogrammida</td>
<td>Wilson, 2005</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6 †Amylnyspedida</td>
<td>Hoffman, 1969</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7 Glomeridesmida</td>
<td>Cook, 1895</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8 Glomerida</td>
<td>Brandt, 1833</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9 Sphaerotheriida</td>
<td>Brandt, 1833</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>10 †Archidesmida</td>
<td>Wilson &amp; Anderson, 2004</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11 †Cowiedesmida</td>
<td>Wilson &amp; Anderson, 2004</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12 †Eupheroberiida</td>
<td>Hoffman, 1969</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>13 †Palaeosomatida</td>
<td>Hannibal &amp; Krzeminski, 2005</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14 †Pleurojulida</td>
<td>Schneider &amp; Wernburg, 1998</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15 Platysmida</td>
<td>Cook, 1895</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16 Polyzonida</td>
<td>Cook, 1895</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>17 Siphonophorida</td>
<td>Newport, 1844</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18 Julida</td>
<td>Brandt, 1833</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19 Spirobolida</td>
<td>Cook, 1895</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>20 Spiristreptida</td>
<td>Brandt, 1833</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>21 Callipodida</td>
<td>Pocock, 1894</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>22 Chordeumatida</td>
<td>Pocock, 1894</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>23 Stemmiulida</td>
<td>Cook, 1895</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>24 Siphoniulida</td>
<td>Cook, 1895</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>25 Polydesmida</td>
<td>Leach, 1815</td>
<td>9</td>
<td>16</td>
</tr>
</tbody>
</table>

Devonian diplopods comprise two superorders, three orders, one superfamily, four families, eight genera, and 10 species (Table 3, Fig.2), such as Archipolypoda: *Kampecaris dinmorensis* from the Lower Devonian Herefordshire in England, *Kampecaris forfarensis* from the Lower Devonian Old Red Sandstone in Scotland (Almond, 1985), and *Palaeodesmus tuberculata* from the Lower Devonian Dunure in Scotland (Wilson & Anderson, 2004); the extinct order Microdecempicida: *Microdecemplex rolfei* from the Middle Devonian Panther Mountain Formation in the USA (Wilson & Shear, 2000); the extinct order Eoarthropleurida: *Eoarthropleura devonica* from the Lower Devonian Nellen Koeplef Beds in Germany (Størmer, 1976) and *Eoarthropleura hueberi*, described from the Upper Devonian Onteora Red Beds Formation in the USA (Kjellsvig-Waering, 1986); Archidesmida: *Orsadesmus rubecollus* from the Upper Devonian Catskill Formation in USA and *Zancloadesmus willetti* from the Upper Devonian Escuminac Formation in Canada (Wilson *et al*., 2005); the extinct superfamily Xyloiuloidea (superorder Juliformia): *Sigmastria dilate* from the Lower Devonian Onteora Red Beds Formation in Scotland and *Gaspestria genselorum* from the Lower Devonian Battery Point Formation in Canada (Wilson, 2006).

The Carboniferous has the most extensive fossil diversity of millipedes compared to any other period, with 73 species,
20 genera, 12 families, one superfamily, six orders, and two superorders (Table 3, Fig.2). The orders Arthropleurida, Zosterogrammida, Amylinypedida, Euphoberiida, Palaeosomatida, Pleurojulida, and the superfamily Xyloxiuloidea were recorded. In the Lower Carboniferous, three helminthomorph species have been described: \textit{Anhracodesmus macconochiei} from the Lower Carboniferous Lennel Braes strata in Scotland (Peach, 1899), \textit{Woodesmus sheari} from Lower Carboniferous Ballagan Formation in Scotland (Ross et al., 2018) and \textit{Palaeosoma robustum} from Lower Carboniferous Walbrzych Formation in Poland (Jackson et al., 1919). The Upper Carboniferous is characterized by a diverse array of higher taxa, including several extinct orders and families. Among the orders, Arthropleurida, Zosterogrammida, Amylinypedida, Euphoberiida, Palaeosomatida, and Pleurojulida are recorded, and families include Nyrianaidae, Proglomeridae, Archiulidae (order \textit{Incertae sedis}), and the superfamily Xyloxiuloidea. The Upper Carboniferous has significant fossil diversity of genera and species. Arthropleurida counts one family, one genus (\textit{Arthropleura}), and eight species from the Lower Carboniferous to Lower Permian (Davies et al., 2021). In contrast, only four species of helminthomorph millipedes are found in the Permian: \textit{Dolesea subtita}, \textit{Oklahomosoma richardsspurense}, \textit{Karstiusis fortissilensis} from the Lower Permian Richards Spur in the USA (Hannibal & May, 2020), and \textit{Archiulus brassi} from the Lower Permian Saarlouis Lebach strata in Germany (Guthörl, 1934).

### Table 3. Diplopoda fossil species.

<table>
<thead>
<tr>
<th>Period</th>
<th>Silurian</th>
<th>Devonian</th>
<th>Carboniferous</th>
<th>Permian</th>
<th>Triassic</th>
<th>Jurassic</th>
<th>Cretaceous</th>
<th>Eocene</th>
<th>Oligocene</th>
<th>Miocene</th>
<th>Pliocene</th>
<th>Pleistocene</th>
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<tbody>
<tr>
<td>Species</td>
<td>7</td>
<td>10</td>
<td>73</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>22</td>
<td>2</td>
<td>9</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

**Mesozoic.** The fossil record of Diplopoda is limited to four species from the Triassic to Jurassic (Fig.2): \textit{Tomius angulatus} from the Lower Triassic Maltesvo Formation in Russia (Martynov, 1936), \textit{Hannibalius wilsomae} from the Middle Triassic Grès à Voltaia Formation in France (Shear et al., 2009), \textit{Sinosoma luopingense} from the Middle Triassic Guanling Formation in China (Huang & Hannibal, 2018) and the only species found in the Jurassic, \textit{Decorotergum warrae} from the Lower Jurassic Evergreen Formation in Australia (Jell, 1983).

However, diversity increases significantly with family-level radiation in the Upper Cretaceous to the end of this era. The records of families, genera, and species expanded considerably in the Cretaceous. The order Polyxenida is recorded in the Lower Cretaceous amber of Lebanon, with one family, two genera, and two species: \textit{Electroxenus jezzinensis} and \textit{Libanoxenus hammanaensis} (Nguyen Duy-Jacquemin & Azar, 2004). The genus \textit{Phryssonotus} (family Synxenidae) is recorded from the Upper Cretaceous amber of France (Nguyen Duy-Jacquemin & Azar, 2004). Lowermost Upper Cretaceous (Upper Albian/Lower Cenomanian) amber of Myanmar recorded 14 orders, one suborder, 15 families, 14 genera, and 13 species (Cockerell, 1917; Liu et al., 2017; Zhang, 2017; Ross, 2018; Wesener & Moritz, 2018; Jiang et al., 2019; Moritz & Wesener, 2019; Stoev et al., 2019; Su et al., 2020; Moritz & Wesener, 2021; Su et al., 2022).

**Cenozoic.** The modern forms are generally found in this era. The variation is observed at the genus and species level. In the Eocene, six orders, eight families, ten genera, and 22 species are recorded (Fig.2). The Upper Eocene from Baltic amber comprises six orders, six families, nine genera, and, 20 species. Other two species were described from the Upper Eocene Florissant Formation in the USA: \textit{Julius florissantellus} (Cockerell, 1907) and \textit{Parajulus cockerelli} (Miner, 1926).

In the Oligocene, two juliiform species have been described: \textit{Berktaulpolyx antiquus} (Julida: Julidae) from the Upper Oligocene Rott Formation in Germany (Hoffman, 1969) and \textit{Protosilvestria sculpta} (Spirostreptida: Cambalidae) from the Upper Oligocene in France (Mauries, 1992).

In the Miocene, \textit{Polyxenus mioenica} is described from the Lower Miocene amber of India (Srivastava et al., 2006). In this period, the most remarkable fossil diversity is found predominantly in amber sites from southern Mexico and the Dominican Republic. The superorder Juliformia, the orders Siphonophorida, Spirobolida, Stemmiulida, and Polydesmida, the families Siphonophoridae, Stemmiulidae, Xystodesmidae, Platyhyacidae, Chelodesmidae, and Pyrgodesmidae, the genera \textit{Siphonophora}, \textit{Parastemmides}, \textit{Anbarrassuc}, \textit{Maatidesmus}, \textit{Mymecodesmus}; and the species \textit{Parastemmides}, \textit{Anbarrassuc}, \textit{Maatidesmus}, \textit{Mymecodesmus}, from the Lower Miocene Mexican amber (Riquelme & Hernández-Patricio, 2018; Riquelme et al., 2021). This work adds 83 fossil inclusions that were recently recovered in Mexican amber. Polyxenida, Platydesmida, and Julida are reported for the first time, as well as new records of two Polydesmida families: Sphaeriodesmidae and Trichopolysmidae (Figs 3-4). Thus, the current inventory in Mexican amber includes 117 fossils in one superorder, seven orders, eight families, five genera, and four species (Fig.5). On the other hand, five orders, seven families, eleven genera, and three species: \textit{Siphonophora hoffmani}, \textit{Siphonophora velezi} (Santiago-Blay & Poinar, 1992), and \textit{Docodesmus brodzinfski} (Shear, 1981), are recorded from the Lower Miocene amber of the Dominican Republic. There is only one record from the Upper Miocene, a juliiform species \textit{Julus suevicus} from the Upper Miocene Thermalsinterkalk Formation in Germany (Dietlen, 1902).
In the Pliocene, *Parajulus onychis* is the sole record from the Lower Pliocene Onyx Marble Formation in the USA (Pierce, 1951). Finally, the youngest fossil diversity in Pleistocene sites consists of 11 records, with three orders, six families, seven genera, and five species: *Julus caviola*, *Julus occidentalis*, and *Hiltonius australis* from the Upper Pleistocene Rancho La Brea in the USA (Grinnell, 1908); as well as *Caraibodesmus verrucosus* (Donovan & Veltkamp, 1994) and *Cyclodesmus porcellanus* (Baalbergen & Donovan, 2013) from the Upper Pleistocene Red Hills Road Cave in Jamaica (Table 3).

### 3.2 Systematic Palaeontology

Phylum Arthropoda Gravenhorst, 1843  
Clade Mandibulata *sensu* Snodgrass, 1938  
Subphylum Myriapoda Latreille, 1802  
Class Diplopoda de Blainville *in*: Gervais, 1844

#### 3.2.1 Subclass Penicillata Latreille, 1831

Order *Polyxenida Verhoeff, 1934*

Polyxenida indet: Wesener & Moritz, 2018: 1132; Álvarez-Rodríguez et al., 2023, Fig.3A (this work).  

Superfamily *Polyxenoidea Lucas, 1940*

Family *Lophoproctidae Silvestri, 1897*

*Genus Lophoproctus Pocock, 1894*

*Lophoproctus* sp.: Santiago-Blay & Poinar, 1992: 363, Fig.1.  

Family *Polyxenidae Lucas, 1840*

Polyxenidae indet: Zhang, 2017: 144-145. Wesener & Moritz, 2018: 1137. Álvarez-Rodríguez et al., 2023, Fig.3C (this work).  
Referred material: No stated. BuB634; BuB2612; BuB2961; BuB2966; Wu F3358/Bu/CJW; Wu F3384/Bu/ CJW; Wu F3389/Bu/CJW; Wu F3394/Bu/CJW. Preservation: Amber inclusions. Repository: NHML. BuB; Wu. Locality: Myanmar, Kachin, Hukawng Valley, Noije Bum mine. Horizon: No stated, lowermost Upper Cretaceous, Upper Albian/Lower Cenomanian.  
Comments: Zhang (2017: 144-145) tentatively identified the genera *Unixenus*, *Propolyxenus*, and *Polyxenus* within Polyxenida. After analyzing Zhang's (2017: 154-155) photomicrographs, Wesener and Moritz (2018) found a misidentification, but consider the record of the family Polyxenidae to be valid.

†Genus *Electroxenus* Nguyen Duy-Jacquemin & Azar, 2004

(1) †*Electroxenus jezzinensis* Nguyen Duy-Jacquemin & Azar, 2004


† *Libanoxenus* Nguyen Duy-Jacquemin & Azar, 2004

(2) † *Libanoxenus hammanaensis* Nguyen Duy-Jacquemin & Azar, 2004


*Genus Polyxenus* Latrielle, 1802

*Polyxenus* sp.: Hoffman, 1969: 583, Fig.368; Ross, 2018: 38.


(3) † *Polyxenus caudatus* Menge, 1854

*Polyxenus caudatus* Menge, 1854: 12.


(4) † *Polyxenus colurus* Menge, 1854

*Polyxenus colurus* Menge, 1854: 12.


(5) † *Polyxenus coniformis* Koch & Berendt, 1854

*Polyxenus coniformis* Koch & Berendt, 1854: 11, Fig.133.


(6) † *Polyxenus lophurus* Menge, 1854

*Polyxenus lophurus* Menge, 1854: 12.


(7) † *Polyxenus miocenica* Srivastava et al., 2006

*Polyxenus miocenica* Srivastava et al., 2006: 717, Figs 3-4, 718.


(8) † *Polyxenus ovalis* Koch & Berendt, 1854

*Polyxenus ovalis* Koch & Berendt, 1854: 12, Fig.3.

Genus *Propolyxenus* Silvestri, 1948

*Propolyxenus* sp.: Ross, 2018: 38.


Genus *Pauropsxenus* Silvestri, 1948

(9) † *Pauropsxenus extraneus* Su et al., 2020

*Pauropsxenus extraneus* Su et al., 2020: 4, Figs 4, 6.


(10) † *Pauropsxenus ordinatus* Su et al., 2020

*Pauropsxenus ordinatus* Su et al., 2020: 2, Figs 1-3, 3-5.


Genus *Unixenus* Jones, 1944

*Unixenus* sp.: Ross, 2018: 38.


Superfamily Synxenoidea Silvestri, 1923

Family Synxenidae Silvestri, 1923


Genus *Phryssonotus* Scudder, 1885

*Phryssonotus* sp.: Menge, 1854: 12; Ross & Sheridan, 2013: 50, Figs 15, 50; Nguyen Duy-Jacquemin & Azar, 2004: 636, Figs 5-6, 638-639.


(11) † *Phryssonotus hystrix* (Menge, 1854)

*Lophonotus hystrix* Menge, 1854: 731.

(12) *†Phryssonotus burmiticus* (Cockerell, 1917)  
*Polyxenus burmiticus* Cockerell, 1917: 40-41, Fig.1; Conde, 1954: 75; Conde & Jacquemin, 1963: 69; Zherikhin, 1978: 114; Ross & York, 2000: 15, Fig.18; Nguyen Duy-Jacquemin & Geoffroy, 2003: 101; Wesener & Moritz, 2018: 1132; Su et al., 2019: 221, Figs 1-6, 217-222.


3.2.2. *†Subclass Arthropleuridea Waterlot, 1934*

*†Order Arthropleurida Waterlot, 1934*

*†Family Arthropleuridae Scudder, 1885*

*Arthropleura* sp.: Andrée, 1913: 298. Sterzel, 1918: 211, taf. 14, Figs 5-7, 10; Rößler & Schneider, 1997: 20, Figs 16-18; Pruvost, 1919: 70-84, pl XXV, Figs 10, 20; Pruvost, 1930: 177; Richardson, 1956: 72-76, Figs 39-40; Novozhylov, 1962: 11, Figs 12A-B; De La Comble, 1963: 6; Ferguson, 1966: 130, Fig.2; Calder *et al.*, 2005: 152. Briggs *et al.*, 1979: 276, pl 28; Briggs *et al.*, 1984: 852, table 1; Falcon-Lang *et al.*, 2015: 62, table 2; Ryan, 1986: 156; Ryan & Boehner, 1994: 10; Walter & Gaytaczek, 1988: 73-84; Pearson, 1992: 129, Figs 2-3; Briggs & Almond, 1994: 127-135; Perrier & Charbonnier, 2014: 11, Fig.4M: Anderson *et al.*, 1997: 203, Figs 3d-f; Castro, 1997: 20, Lám. I, Figs 1, 1a, 2, and 2a; Schneider & Barthel, 1997: 191, Fig.3; Schneider *et al.*, 2010: 55, Figs 7E, 8; Langiaux & Sotty, 1977: 74-91; Briggs, 1986: 141-147; Schneider & Wernegub, 1998: Fig.15; Proctor, 1998: 92, table 1, Figs 2-3; Mangano *et al.*, 2002: 35, Figs 32A-C; Lucas *et al.*, 2005a: 152, Fig.6; Lucas *et al.*, 2005b: 279, Fig.2; Falcon-Lang *et al.*, 2006: 566, Fig.6, tables 2-3; Falcon-Lang & Miller, 2007: 949, table 2; Štamberg & Zajíc, 2008: 81; Martino & Greb, 2009, 141, Figs 3-4, 6-7; Nelikhov, 2010: 60-69; Pacyna *et al.*, 2012: 122, Fig.3A-C; Rößler *et al.*, 2012: 819, Fig.12D; Chaney *et al.*, 2013: 64, Fig.2; Getty *et al.*, 2017: 188, Fig.3; Pavela, 2018: Figs 1, 5-6; Whyte, 2016: 63, Figs 2-3; Dernov *et al.*, 2019: 51, Figs 6-7; Moreau *et al.*, 2019: 5, Figs 4-6, table 3; Davies *et al.*, 2021: 6, Figs 1-2.

Referred material: No stated. Preservation: Impressions. Repository: No stated. Locality: UK, Yorkshire, Barnsley; Poland, Lower Silesia, Chwalowice; Germany, Saarland, Saarbrücken. Horizon: Pennine Middle Coal Measures Formation, Upper Carboniferous, Bashkirian; Ruda Beds, Upper Carboniferous, Bashkirian; Saarbrucker Subgroup, Upper Carboniferous, Moscovian.

Referred material: MfNC F 1128; MfNC F 1129. MfNC F 439a, b; MfNC F 447; MfNC 445; MMG SaKa 11/3; MfNC F 442; MMG SaKa 2; MMG SaKa 5; MMG SaKa 10. Preservation: Compressions. Repository: MfNC. Locality: France, Nord-Pas-de-Calais, Saint-Charles vein, Lens mines, pit 7 (n° 1874), Douchy mines, Douchy pit, 248 m depth (n° 1876), Lens mines, pit 11, bowette 115 (n° 1877). Horizon: Lower Carboniferous, Viséan.


Referred material: No stated. Preservation: Ichnite. Repository: No stated. Locality: Canada, Gardner Creek, New
Brunswick. Horizon: Tynemouth Creek Formation, Upper Carboniferous, Bashkirian.
Referred material: No stated. Two specimens. No stated. Preservation: Impressions. Repository: No stated. Locality: Spain, Cifera-Matallana, El León; Carrocera, El León; Ciudad Real, Puertollano. Horizon: Pastora Formation, Upper Carboniferous, Stephanian; La Magdalena Coalfield, Upper Carboniferous, Gzhelian; Upper Carboniferous, Stephanian C.
Referred material: MMRB2010.06.16/527/0.00/a-b; MMRB 2010.07.25/564/0.00. Preservation: Impressions. Repository: MMRB. Locality: Poland, Lower Silesia, Nowa Ruda mine. Horizon: Shale strata, Upper Carboniferous.
Referred material: No stated. Preservation: Impressions (fragmentary). Repository: PPC. Locality: Poland, KWK Boleslaw, Przygorze; Czech Republic, Dül Starič; Chlebovice; Czech Republic, Dül Austria, Zblüch. Horizon: Lower Silesian Basin, Upper Carboniferous, Serpukhovian; Upper Silesian Basin, Upper Carboniferous, Serpukhovian; Plzeň Basin, Upper Carboniferous, Moscovian.

Referred material: GR1; GR2; GR3; GR4; GR5; GR6; GR7. Preservation: Ichnites. Repository: GR1-GR6 (in situ); ML. Locality: France, Hérault, Graissessac. Horizon: Graissessac Formation, Upper Carboniferous, Gzhelian.


Comments: Salter (1863) recorded *Eurypterus pulicaris* from the Upper Carboniferous Lancaster Formation in Canada. But Falcon-Lang and Miller (2007) consider this fossil instead a representative of *Arthropleura*. Davies *et al.* (2021) recorded the largest fossil specimen of *Arthropleura* from the Upper Carboniferous, Stainmore Formation in UK; they mention two other unpublished records: the ichnite NBMG15084 from the Upper Carboniferous Grand Anse Formation in Canada and another from the Upper Carboniferous Limestone Coal Formation in Glasgow, UK.

(13) †*Arthropleura armata* (Jordan & Meyer, 1854)

*Arthropleura armata* Jordan & Meyer, 1854: 1-15; Goldenberg, 1873: 21, pl 1, Fig.2; Kliver, 1883: 262, pl 36, Fig.2; Woodward, 1907: 547; Vernon, 1912: 302, Fig.4; Pruvost, 1919: 76, pl 25, Figs 7-9, text-fig 19; Guthörl, 1934: 179, pl 24, Fig.2; Castro, 1997: 20, Lám I, Fig.3; Proctor, 1998: 94, Fig.1; Štamberg & Zajíc, 2008: 81, Fig.72; Pillola & Zoboli, 2021: 51, Fig.3.

*Halonia irregularis* Geinitz, 1855: 38, pl 4, Fig.5.

*Arthropleura affinis* Goldenberg, 1873: 22, pls 1, 3, Fig.12.

*Arthropleura zeilleri* Boule, 1893: 619-638.


(14) †*Arthropleura britannica* Andree, 1913

*Arthropleura britannica* Andree, 1913: 302, pl 23, Fig.2; Pruvost, 1930: 174, pl 9, Figs 6.


(15) †*Arthropleura cristata* Richardson, 1959


Referred material: Holotype: FMNH PE 5262. CaMNH 33853; YPM-PU 88076; FMNH PE 26148. Preservation:
Impressions. Repository: FMNH. CaMNH; YPM. Locality: USA, Illinois, Mazon Creek; USA, Pennsylvania, Cannelton. Horizon: Francis Creek Shale, Upper Carboniferous, Moscovian; Kittanning Formation, Upper Carboniferous, Moscovian.

(16) †Arthropleura fayoli Boule, 1893

Arthropleura fayoli Boule, 1893: 636, pl LV.


(17) †Arthropleura maillieuxi Pruvost, 1930

Arthropleura maillieuxi Pruvost, 1930: 174, pl 10, Figs 1-3.


(18) †Arthropleura mammata (Salter, 1863)

Eurypterus (Arthropleura) mammatus Salter, 1863: 85, Figs 1-7.

Arthropleura mammata: Pruvost, 1919: 74, pl 25, Fig.6; text-fig 18; Pruvost, 1930: 172, pl 9, Figs 1-5.


Comments: Hahn et al. (1986) stated that A. monyseyi is a synonym of A. armata.

(19) †Arthropleura moyseyi Calman, 1914

Arthropleura moyseyi Calman, 1914: 541, pl XXXVIII.


Comments: Hahn et al. (1986) stated that A. moyseyi is a synonym of A. armata.

(20) †Arthropleura punctata Goldenberg, 1873

Arthropleura punctata Goldenberg, 1873: 22, pl 1, Fig.14.


†Order Eoarthropleurida Shear & Selden, 1995

†Family Eoarthropleuridae Størmer, 1976

†Genus Eoarthropleura Størmer, 1976

(21) †Eoarthropleura devonica Størmer, 1976


(22) †Eoarthropleura hueberi Kjellsvig-Waering, 1986

Eoarthropleura hueberi Kjellsvig-Waering, 1986: 126, pls 5-8, text-fig 50.

Referred material: Holotype: USNM 252629; Paratype: USNM 252630; accession USNM 251091. Preservation:

(23) †Eoarthropleura ludfordensis Shear & Selden, 1995


†Order Microdecemplicida Wilson & Shear, 2000
†Family Microdecemplicidae Wilson & Shear, 2000

†Genus Microdecemplex Wilson & Shear, 2000

(24) †Microdecemplex rolfei Wilson & Shear, 2000


3.2.3 Subclass Chilognatha Latrielle, 1802

†Order Zosterogrammida Wilson, 2005
†Family Zosterogrammidae Wilson, 2005

†Genus Casiogrammus Wilson, 2005

(25) †Casiogrammus ichthyeros Wilson, 2005
Casiogrammus ichthyeros Wilson, 2005b: 1104, pl 1, Figs 1-2.


Comments: Preliminarily, Rofle (1980: 550) states that the oldest terrestrial arthropod was a probable myriapod named Archidesmus loganensis from the Middle Silurian Fish Bed Formation. According to Rofle (1980: 550, Fig.4A), A. loganensis resembles a possible juliform with 20 ornate segments. However, as this fossil is fragmented and poorly preserved, its taxonomic identity must be clarified. Almond (1985: 229-230, Fig.1) placed A. loganensis in the Middle Silurian (ca. 438 Ma) before K. obanensis from the Upper Silurian (ca. 408 Ma). But, he claimed that A. loganensis is not a myriapod. It is more like a form of alga. Wilson & Anderson (2004) also concluded that A. loganensis is more of a plant or alga. Wilson (2005b) later described another fragmentary fossil specimen from the Fish Bed Formation: Casiogrammus ichthyeros. According to Wilson (2006), C. ichthyeros belongs to the order Zosterogrammida. In a stratocladogram, Shear & Edgecombe (2010) placed C. ichthyeros in the oldest fossil record of Myriapoda, including other Diplopora genera: Albadesmus, Cowiedesmus, and Pneumodesmus (Wilson & Anderson, 2004). Edgecombe (2015) included C. ichthyeros in a summary taxonomic list of Diplopora. Selden (2019) stated that C. ichthyeros is the oldest known millipede. It is recognized as having a regular series of similar short and broad tergites resembling a Polyzonida. However, Brookfield et al. (2020) questioned the identity and provenance of C. ichthyeros. According to Brookfield et al. (2020), the geologic setting of the Middle Silurian Fish Bed Formation (ca. 430 Ma) is associated with a freshwater environment where fossil fish and aquatic arthropods are typically found. These later authors then concluded that if C. ichthyeros is considered a millipede, it could have come from other strata that must have been about the same age as the Upper Silurian Kerrera Sandstone Formation. Thus, C. ichthyeros must be as old as K. obanensis (Brookfield et al., 2020).

†Genus Purkynia Fritsch, 1899

(26) †Purkynia lata Fritsch, 1899
Purkynia lata Fritsch, 1899: 41, pl 144, Figs 1-3; text-fig 346; Wilson, 2005b: 1106; Štamberg & Zajíc, 2008: 86, Fig.87.


†Genus Zosterogrammus Wilson, 2005

(27) †Zosterogrammus stichostethus Wilson, 2005
Zosterogrammus stichostethus Wilson, 2005b: 1103-1104, Figs 1-2.


Infraclass Pentazonia Brandt, 1833
†Order Amynilypedida Hoffman, 1969
†Family Amynilyspedidae Hoffman, 1969

†Genus Amynilyspes Scudder, 1882

Amynilyspes sp.: Scudder, 1895: 59, pl IV., Figs 1-2; Racheboeuf et al., 2004: 222.


(28) †Amynilyspes crescens Fritsch, 1899
Amynilyspes crescens Fritsch, 1899: 35, pl 146, Fig.1; Štamberg & Zajíc, 2008: 84.


(29) †Amynilyspes fatimae Racheboeuf et al., 2004
Amynilyspes fatimae Racheboeuf et al., 2004: 224, Figs 2-6.


(30) †Amynilyspes springhillensis Copeland, 1957
Amynilyspes springhillensis Copeland, 1957: 52, pl 15, Fig.2.


(31) †Amynilyspes typicus Fritsch, 1899
Amynilyspes typicus Fritsch, 1899: 34-35, Fig.340, pl 145, Figs 1-2, pl 147, Figs 1-3; Hoffman, 1969: 586, Fig.370/1; Racheboeuf, Hannibal & Vannier, 2004: 222; Štamberg & Zajíc, 2008: 84, Fig.82.


(32) †Amynilyspes wortheni Scudder, 1882
Amynilyspes wortheni Scudder, 1882: 178, pl 13, Figs 1-4, 9; Hannibal & Feldmann, 1981: 735, pl 1, Figs 1-6, pl 2, Figs 1-6, text-figs 3-6, 9.

†Family Sphaerherpestidae Fritsch, 1899

†Genus Glomeropsis Fritsch, 1895

(33) †Glomeropsis crassa Fritsch, 1899
Glomeropsis crassa Fritsch, 1899: 40, pl 150, Figs 2-3; Štamberg & Zajíc, 2008: 85, Fig.84.


(34) †Glomeropsis magna Fritsch, 1899
Glomeropsis magna Fritsch, 1899: 40, pl 152, Figs 1-5, text-fig 344; Štamberg & Zajíc, 2008: 85, Fig.85.


(35) †Glomeropsis multicarinata Fritsch, 1899
Glomeropsis multicarinata Fritsch, 1899, Fig.358; Fritsch, 1901: 97, pl 165, Figs 1-2; Štamberg & Zajíc, 2008: 85.


(36) †Glomeropsis ovalis Fritsch, 1895
Glomeropsis ovalis Fritsch, 1895: 2; Fritsch, 1899: 38, pl 149, Figs 1, 2, 4-7, pl 150, Fig.1, text-figs 343-345; Štamberg & Zajíc, 2008: 85, Fig.83.

Referred material: M 1000; M 1072; and other uncoded material deposited at NMP. Preservation: Compressions. Repository: NMP. Locality: Czech Republic, Pilsen, Nýřany. Horizon: Kladno Formation, Upper Carboniferous.

Superorder Limacomorpha Pocock, 1894
Order Glomeridesmida Cook, 1895
Family Glomeridesmidae Latzel, 1884

Glomeridesmidae indet: Wesener & Moritz, 2018: 1133, Fig.1A.


Genus Glomeridesmus Gervais, 1844


Superorder Oniscomorpha Pocock, 1887
Order Glomerida Brandt, 1833

Glomerida indet: Zhang, 2017: 154-155; Wesener & Moritz, 2018: 1133, Fig.1B.

Referred material: No stated. CG-My7276: ♂; CG-BURMA11119; CG-BURMA11127; BuB992: 3 specimens; BuB1821: 3 specimens; BuB2438; BuB2603; BuB2604; BuB2703; BuB2704: 3 specimens; BuB2705; BuB2706; BuB2707; BuB2718; BuB2957; BuB2990; BuB2995; BuB2996; BuB3013; BuB 3014; BuB3015; BuB3016; BuB3053; BuB3058; BuB3257: ♂; BuB3259; ZFMK MYR06116; ZFMK MYR07365; ZFMK MYR07371; ZFMK MYR07372; ZFMK

Comments: After analyzing Zhang's (2017: 154-155) photomicrographs, Wesener and Moritz (2018) found a misidentification, but consider the record of Glomerida to be valid.

Family Glomeridellidae Cook, 1896

Genus Glomeridella Brölemann, 1895

Glomeridella sp.: Ross, 2018: 38.


Family Glomeridae Leach, 1816

Genus Glomeris Latreille, 1802

(37) †Glomeris denticulata Menge, 1854
Glomeris denticulata Menge, 1854: 12.


Genus Hyleoglomeris Verhoeff, 1910

(38) †Hyleoglomeris groehni Wesener, 2019
Hyleoglomeris groehni Wesener, 2019: 41, Figs 1-3.


Order Sphaerotheriida Brandt, 1833
Family Zephroniidae Gray In: Jones, 1843


Infraclass Helminthomorpha Pocock, 1887
Superorder Incertae sedis
Order Incertae sedis
Family Incertae sedis

Genus Archicambala Cook, 1895

(39) Archicambala dawsoni (Scudder, 1868)
Xylobius dawsoni Scudder, 1868; Scudder, 1895: 61, pl 5, Fig.3.


†Genus Dolesea Hannibal & May, 2020
(40) †Dolesea subtila Hannibal & May, 2020


†Genus Sinosoma Huang & Hannibal, 2018

(41) †Sinosoma luopingense Huang & Hannibal, 2018

Sinosoma luopingense Huang & Hannibal, 2018: 3, Figs 2-3.


†Family Archiulidae Scudder, 1873

†Genus Archiulus Scudder, 1868

(42) †Archiulus brassi (Dohn, 1868)

Julus brassi Dohn, 1868: 335: Taf. VI. Fig.2a u. b; Goldenberg, 1877: 33.


Archiulus brassi: Guthörl, 1934 (in McClennen et al., 2017).


(43) †Archiulus euphoberioides Scudder, 1895

Archiulus euphoberioides Scudder, 1895: 59, pl. IV, Figs 5-6.


(44) †Archiulus glomeratus Scudder, 1890

Archiulus glomeratus Scudder, 1890: 436, pl 37, Figs 2-3.


(45) †Archiulus lyelli Scudder, 1895

Archiulus lyelli Scudder, 1895: 60, pl 4, Figs 3, 7.


(46) †Archiulus xylobioides Scudder, 1868

Archiulus xylobioides Scudder, 1868: 496, Fig.151b; Scudder, 1895: 59; Copeland, 1957: 53.


†Family Oklahomasomatidae Hannibal & May, 2020

†Genus Oklahomasoma Hannibal & May, 2020
(47) †Oklahomasoma richardsspurense Hannibal & May, 2020


†Superorder Archipolypoda Scudder, 1882
Order Incertae sedis
Family Incertae sedis

†Genus Albadesmus Wilson & Anderson, 2004

(48) †Albadesmus almondi Wilson & Anderson, 2004


†Genus Anaxeodesmus Wilson, 2005

(49) †Anaxeodesmus diambonotus Wilson, 2005

Anaxeodesmus diambonotus Wilson, 2005a: 1099, Figs 1-2.


†Genus Anthracodesmus Peach, 1899

(50) †Anthracodesmus macconochiei Peach, 1899

Anthracodesmus macconochiei Peach, 1899: 121, pl 3, Figs 3; Wilson & Anderson, 2004: 177, Figs 10.4-10.5.


†Genus Kampecaris Page, 1856

(51) †Kampecaris dinmorensis Clarke, 1951

Kampecaris dinmorensis Clarke, 1951 (in McClennen et al., 2017); Almond, 1985: 16, Fig.1.


(52) †Kampecaris forfarensis Peach, 1882

Kampecaris forfarensis Peach, 1882: 179, pl 2, Figs 1a-g; Almond, 1985: 231, pl 1, Figs 5, 7.


(53) †Kampecaris obanesis Peach, 1889

Kampecaris obanesis Peach, 1899: 122, pl IV, Fig.2.


Comments: Brookfield et al. (2020) claimed that it is the oldest terrestrial animal fossil.
†Genus *Palaeodesmus* Brade-Birks, 1923

(54) †*Palaeodesmus tuberculata* (Brade-Birks, 1923)

*Kampecaris tuberculata* Brade-Birks, 1923: 277, pl 33; Almond, 1985: 233, pl 1, Fig.8.


†Genus *Pneumodesmus* Wilson & Anderson, 2004

(55) †*Pneumodesmus newmani* Wilson & Anderson, 2004


†Family *Woodesmidae* Ross et al., 2008

†Genus *Woodesmus* Ross et al., 2018

(56) †*Woodesmus sheari* Ross et al., 2018

*Woodesmus sheari* Ross et al., 2018: 4, Figs 6-7.


†Order *Archidesmida* Wilson & Anderson, 2004

†Family *Archidesmidae* Scudder, 1885

†Genus *Archidesmus* Peach, 1882

(57) †*Archidesmus macnicoli* Peach, 1882

*Archidesmus macnicoli* Peach, 1882: 182, pl 2, Fig.2; Almond, 1985: 231, pl 1, Fig.4; Wilson & Anderson, 2004: 172, Figs 2-6.


†Family *Zanclodesmidae* Wilson et al., 2005

†Genus *Orsadesmus* Wilson et al., 2005

(58) †*Orsadesmus rubecollus* Wilson et al., 2005

*Orsadesmus rubecollus* Wilson et al., 2005a: 743, Figs 2-3.


†Genus *Zanclodesmus* Wilson et al., 2005

(59) †*Zanclodesmus willetti* Wilson et al., 2005
Zanclodesmus willetti Wilson et al., 2005a: 743, Fig.4.


†Order Cowiedesmida Wilson & Anderson, 2004
†Family Cowiedesmidae Wilson & Anderson, 2004

†Genus Cowiedesmus Wilson & Anderson, 2004

(60) †Cowiedesmus eroticopodus Wilson & Anderson, 2004
Cowiedesmus eroticopodus Wilson & Anderson, 2004: 174, Fig.7.


†Order Euphoberiida Hoffman, 1969
†Family Euphoberiidae Scudder, 1882

†Genus Acantherpestes Meek & Worthen, 1868

(61) †Acantherpestes foveolatus Fritsch, 1899
Acantherpestes foveolatus Fritsch, 1899: 21, pl 137, Figs 1-6, text-figs 329-330; Štamberk & Zajíc, 2008: 83, Fig.77.


(62) †Acantherpestes gigas Fritsch, 1895
Acantherpestes gigas Fritsch, 1895: 2; Fritsch, 1899: 16, pl 134, Figs 1-7, text-figs 323, 324; Štamberk & Zajíc, 2008: 82.


(63) †Acantherpestes inequalis Scudder, 1890
Acantherpestes inequalis Scudder, 1890: 424, pl 33, Figs 2, 4.


(64) †Acantherpestes major (Meek & Worthen, 1868)
Euphoberia major Meek & Worthen, 1868: 26.
Acantherpestes major: Scudder, 1882: 150, pl 10, pl 11, Figs 1-4, 6-8, 10-11; Scudder, 1890: 424.


(65) †Acantherpestes ornatus Fritsch, 1899
Acantherpestes ornatus Fritsch, 1899: 19, pl 136, Figs 1-9, text-figs 327-328; Štamberk & Zajíc, 2008: 83.


(66) †Acantherpestes vicinus Fritsch, 1899
Acantherpestes vicinus Fritsch, 1899: 18, pl 135, Figs 1-6, text-figs 325-326.

†Genus Euphoberia Meek & Worthen, 1868

(67) †Euphoberia absens Fritsch, 1899

Euphoberia absens Fritsch, 1899: 25, pl 135, Fig. 9, text-fig 334.


(68) †Euphoberia anguilla Scudder, 1882

Euphoberia anguilla Scudder, 1882: 177, pl 12, Fig. 20; Scudder, 1890: 435, pl 36, Fig.3.


(69) †Euphoberia armigera Meek & Worthen, 1868

Euphoberia armigera Meek & Worthen, 1868: 26; Scudder, 1882: 160, pl 12, Figs 1-3, 5-6, 13, pl 13, Figs 7-8, 10; Scudder, 1890: 427, pl 34, Figs 2, 4, 8, pl 35, Fig.3; Baldwin, 1911: 77, pl 5, Fig.4; Jackson et al., 1919: 408, pl 9, Fig.2, text-fig 3.


(70) †Euphoberia brownii Woodward, 1871

Euphoberia brownii Woodward, 1871: 102, pl 3, Figs 6a-c; Scudder, 1882: 167, pl 12, Figs 7-8, 21.


(71) †Euphoberia carri Scudder, 1882

Euphoberia carri Scudder, 1882: 171, pl 12, Figs 4, 9-12, 14-19, pl 13, Figs 16, 18; Scudder, 1890: 429.


(72) †Euphoberia cuspidata Scudder, 1890

Euphoberia cuspidata Scudder, 1890: 429, pl 34, Figs 3, 7.


(73) †Euphoberia ferox (Salter, 1863)

Eurypterus (Arthropleura) ferox Salter, 1863: 86, Fig.8.
Acantherpestes brodiei Scudder, 1882: 156, pl 11, Fig.5.

Euphoberia ferox: Scudder, 1882: 157, pl 12, Fig.23; Woodward, 1887: 6, pl 1, Figs 1-13, text-figs 1-2; Pruvost, 1930: 168, pl 7, Fig.3.


(74) †Euphoberia flabellata Scudder, 1882

Euphoberia flabellata Scudder, 1882: 174, pl 13, Fig.15.

†Euphoberia granosa Scudder, 1882

Euphoberia granosa Scudder, 1882: 168, pl 12, Figs 22, 24-26, pl 13, Fig.13; Scudder, 1890: 427, pl 34, Figs 5-6, pl 36, Fig.2.


†Euphoberia histrix Fritsch, 1899

Euphoberia histrix Fritsch, 1899: 23, pl 138, Fig.8, text-figs 332-333; Štamberg & Zajíc, 2008: 81, Figs 73-74.


†Euphoberia horrida Scudder, 1882

Euphoberia horrida Scudder, 1882: 158, pl 13, Figs 11-12, 14.


†Euphoberia hystricosa Scudder, 1890

Euphoberia hystricosa Scudder, 1890: 426, pl 33, Figs 1, 3.


†Euphoberia lithanthracis (Jordan & Meyer, 1854)

Chonionotus lithanthracis Jordan & Meyer, 1854: Taf. I, Fig.19; Goldenberg, 1873: 21, pl 1, Fig.19.


†Euphoberia simplex Scudder, 1890

Euphoberia simplex Scudder, 1890: 432, pl 35, Figs 2, 6-7.


†Euphoberia spinulosa Scudder, 1890

Euphoberia spinulosa Scudder, 1890: 430, pl 34, Fig.1, pl 35, Figs 1, 4-5, pl 36, Figs 7-8.


†Euphoberia tracta Scudder, 1890

Euphoberia tracta Scudder, 1890: 433, pl 36, Figs 1, 4-6.


†Euphoberia varians Fritsch, 1899

Euphoberia varians Fritsch, 1899: 23, pl 138, Figs 1-7, text-fig 331; Štamberg & Zajíc, 2008: 82, Fig.75.


†Genus Myriacantherpestes Burke, 1979

†Order Palaeosomatida Hannibal & Krzeminski, 2005
†Family Palaeosomatidae Hannibal & Krzeminski, 2005

†Genus Paleosoma Jackson et al., 1919

(84) †Paleosoma giganteus (Baldwin, 1911)
Acantherpestes giganteus Baldwin, 1911: 76, pl 4, Fig.1.
Palaeosoma giganteum: Jackson et al., 1919: 406, pl 9, Fig.1, text-figs 1-2.


(85) †Palaeosoma robustum Jackson et al., 1919
Euphoberia robusta Baldwin, 1911: 77, pl 5, Fig.3.
Euphoberia woodwardi Baldwin, 1911: 78, pl 4, Fig.2.
Palaeosoma robustum Jackson et al., 1919: 409, pl 9, Fig.3; Hannibal & Krzeminski, 2005: 208, Figs 2-10.


Subterclass Colobognatha Brandt, 1834
†Order Pleurojulida Schneider & Werneburg, 1998
†Family Pleurojulidae Schneider & Werneburg, 1998

†Genus Pleurojulus Fritsch, 1899

(86) †Pleurojulus biornatus Fritsch, 1899
Pleurojulus biornatus Fritsch, 1899, pl 139, Figs 1-9, pl 143, Fig.9; Wilson & Hannibal, 2005: 1107, Figs 2.5-2.6; Štamberg & Zajíc, 2008: 83, Figs 79-80.


(87) †Pleurojulus levis Fritsch, 1899
Pleurojulus levis Fritsch, 1899: 28, pl 141, Figs 1-11; Wilson & Hannibal, 2005: 1107, Figs 2.1-2.4; Štamberg & Zajíc, 2008: 84, Fig.81.
Pleurojulus aculeatus Fritsch, 1899: 28, pl 141, Figs 12-14.
Pleurojulus pinguis Fritsch, 1899: 29, pl 140, Figs 8-9.


†Genus Isojulus Fritsch, 1899

(88) †Isojulus constans (Frič, 1875)
Julus constans Frič, 1875: 74.
Archijulus constans: Fritsch, 1895: 2.
Isojulus constans: Fritsch, 1899: 25, pl 142, Figs 1-3, text-fig 335; Wilson & Hannibal, 2005: 1109, Figs 7-8; Štamberg & Zajíc, 2008: 83, Fig.78.
Isojulus marginatus Fritsch, 1899: 26, pl 140, Figs 1-2, pl 142, Figs 9, 16.

Isojulus setipes Fritsch, 1899: 26, pl 142, Figs 4-8.


Pleurojulus falcifer Fritsch, 1899: 29, pl 140, Fig.10.


Order Platydemsida Cook, 1895

Platydemsida indet: Álvarez-Rodríguez et al., 2023, Fig.3D (this work).


Family Androganathidae Cope, 1869

Androganathidae indet: Wesener & Moritz, 2018: 1134, Fig.1E.


Genus Brachycybe Wood, 1864

Brachycybe sp.: Ross, 2018: 38.


Genus Androganathus Cope, 1869

Androganathus burmiticus Moritz & Wesener, 2019

Androganathus burmiticus Moritz & Wesener, 2019: 425, Figs 1-4.


Order Polyzoniida Cook, 1895

Polyzonium sp.: Hoffman, 1969: 589, Fig.375, 1.

Comments: Hoffman (1969: 589) stated that *Polyzonium* sp. is probably *P. germanicum*.

**Family Siphonotidae Cook, 1895**

*Siphonotidae* indet: Zhang, 2017: 182. Wesener & Moritz, 2018: 1134, Fig.1D.


**Genus Siphonotus Brandt, 1837**

*Siphonotus* sp.: Santiago-Blay & Poinar, 1992: 366, Fig.7.


**Order Siphonophoridae Newport, 1844**

*Siphonophora* Brandt, 1837

*Siphonophora* spp. are known from amber inclusions in the Baltic region and Dominican Republic. The genus was originally described by Brandt in 1837.


(90) †Siphonophora hui Jiang et al., 2019
Siphonophora hui Jiang et al., 2019: 35, Figs 1-4; Su et al., 2021: 280, Figs 1-7.

(91) †Siphonophora hoffmani Santiago-Blay & Poinar, 1992

(92) †Siphonophora velezi Santiago-Blay & Poinar, 1992
Siphonophora velezi Santiago-Blay & Poinar, 1992: 369, Fig. 21.

Genus Siphonocybe Pocock, 1903
Siphonocybe sp.: Shear, 1981: 54.

Family Siphonorhinidae Cook, 1895

Subterclass Eugnatha Attems, 1898
Superorder Juliformia Attems, 1926
Juliformia indet: Riquelme & Hernández-Patricio, 2018: 639, Figs 3A-B.
Referred material: MALM.306; AM.CH.Id34; AM.CH.Id35. Preservation: Amber inclusions. Repository: MALM; AM.CH. Location: Mexico, Chiapas, Simojovel, La Pimienta mine (MALM.306), Los Pocitos mine (AM.CH.Id34; AM.CH.Id35). Horizon: Uppermost Simojovel Formation, Lower Miocene.

Order Incertae sedis
†Family Proglomeridae Fritsch, 1899

†Genus Archiscudderia Fritsch, 1899

(93) †Archiscudderia coronata Fritsch, 1899
Archiscudderia coronata Fritsch, 1899: 36, pl 149, Figs 4-5, pl 149, Fig.3; Štamberg & Zajíc, 2008: 88, Fig.92.


(94) †Archiscudderia paupera Fritsch, 1899
Archiscudderia paupera Fritsch, 1899: 35, pl 147, Fig.4, text-fig 341; Štamberg & Zajíc, 2008: 88, Fig.91.


(95) †Archiscudderia problematica Fritsch, 1899
Archiscudderia problematica Fritsch, 1899: 37, pl 151, Figs 1-6; Štamberg & Zajíc, 2008: 89, Fig.94.


(96) †Archiscudderia regularis Fritsch, 1899
Archiscudderia regularis Fritsch, 1899: 37, pl 148, Figs 1-3; Štamberg & Zajíc, 2008: 88, Fig.93.


(97) †Archiscudderia tapeta Fritsch, 1899


†Superfamily Xyloiuloidea Attems, 1926

Family Incertae sedis

†Genus Karstiulus Hannibal & May, 2020

(98) †Karstiulus fortsillensis Hannibal & May, 2020
Karstiulus fortsillensis Hannibal & May, 2020: 589, Fig.1.


†Family Gaspestriidae Wilson, 2006

†Genus Sigmastria Wilson, 2006

(99) †Sigmastria dilata Wilson, 2006
Sigmastria dilata Wilson, 2006: 640, Fig.3.


†Genus Gaspestria Wilson, 2006

(100) †Gaspestria genselorum Wilson, 2006

†Family Nyrianiidae Hoffman, 1969

†Genus Nyrianius Frič, 1875

(101) †Nyrianius costulatus (Frič, 1875)

_Julius costulatus_ Frič, 1875: 74.
_Xylobius costulatus_ Fritsch, 1895: 2; Fritsch, 1899: 31, pl 144, Figs 4-5.
_Nyrianius costulatus_ Hoffman, 1963: 172; Štamberg & Zajíc, 2008: 87, Fig.89.


(102) †Nyrianius tabulatus (Fritsch, 1899)

_Xylobius tabulatus_ Fritsch, 1899: 32, pl 144, Figs 9-12.
_Nyrianius tabulatus_ Hoffman, 1963: 172; Štamberg & Zajíc, 2008: 87, Fig.90.


†Family Xyloiulidae Cook, 1895

†Genus Blanziulus Langiaux & Sotty, 1976

(103) †Blanziulus parriati Langiaux & Sotty, 1976

_Blanziulus parriati_ Langiaux & Sotty, 1976: 43, pl 4, text-figs 1-2; Lheritier _et al._, 2023:11, Figs 2D-H, 4B, D, F, 5, 8I, K-M, 9D, 10C-D, 11D, 13C.


†Genus Xyloiulus Cook, 1895


(104) †Xyloiulus bairdi Hoffmann, 1963

_Xyloiulus bairdi_ Hoffmann, 1963:171, pl 24, Figs 2-3, text-figs 1-4.


(105) †Xyloiulus fractus Scudder, 1868


(106) †Xyloiulus frustulentus (Scudder, 1890)
Xylobius frustulentus Scudder, 1890: 438, pl 37, Figs 4-6.


(107) †Xyloiulus mazonus (Scudder, 1890)
Xylobius mazonus Scudder, 1890: 439, pl 37, Figs 7-11.


(108) †Xyloiulus platti (Baldwin, 1911)
Xylobius platti Baldwin, 1911: 79, Fig.1.


(109) †Xyloiulus pstrossi (Fritsch, 1899)
Xylobius pstrossi Fritsch, 1899: 31, pl 144, Figs 6-8; Hoffman, 1963: 172; Štumberg & Zajíc, 2008: 86, Fig.88.


(110) †Xyloiulus renieri Pruvost, 1930
Xyloiulus renieri Pruvost, 1930: 169, pl 7, Figs 5, text-fig 4.


(111) †Xyloiulus sellatus (Fritsch, 1899)
Xylobius sellatus Fritsch, 1899: 32, pl 140, Fig.11.


(112) †Xyloiulus sigillariae (Dawson, 1860)
Xylobius sigillariae Dawson, 1860: 271; Scudder, 1868: pl 16, Fig.4; Scudder, 1895: 61; Copeland, 1957: 53, pl 11, Fig.6.


(113) †Xyloiulus similis (Scudder, 1868)
Xylobius similis Scudder, 1868: Scudder, 1895: 61, pl 5, Figs 1-2.


Order Julida Brandt, 1833
Julida indet: Duncan et al., 1988: 848. Álvarez-Rodríguez et al., 2023, Fig.3B (this work).

Superfamily Juloidea Leach, 1814
Family Julidae Leach, 1814

†Genus Bertkaupolypus Verhoeff, 1926

(114) †Bertkaupolypus antiquus (Bertkau, 1878)
Julus antiquus Bertkau, 1878: 360, pl 5, Fig.8.
Pseudoiulus antiquus: Verhoeff, 1897: 280.

Genus Julus Linnaeus, 1758


(115) †Julus badius Menge, 1854
Julus badius Menge, 1854: 13.

(116) †Julus cavicola Grinnell, 1908
Julus cavicola Grinnell, 1908: 210, pl 15, Figs 1, 5, 10, 12.

(117) †Julus florissantellus Cockerell, 1907
Julus florissantellus Cockerell, 1907: 605, Fig.1.

(118) †Julus laevigatus Koch & Berendt, 1854
Julus laevigatus Koch & Berendt, 1854: 12, pl 1, Fig.4.

(119) †Julus occidentalis Grinnell, 1908
Julus occidentalis Grinnell, 1908: 209, pl 15, Figs 9, 11.
(120) †\textit{Julus peii} Chia & Liu, 1950

\textit{Julus peii} Chia & Liu, 1950: 25, pl 1, Figs 9-10.


(121) †\textit{Julus politus} Menge, 1854

\textit{Julus politus} Menge, 1854: 13.


(122) †\textit{Julus rubens} Menge, 1854

\textit{Julus rubens} Menge, 1854: 13.


(123) †\textit{Julus suevicus} Dietlen, 1902

\textit{Julus suevicus} Dietlen, 1902: 84.


(124) †\textit{Julus terrestris} Linnaeus, 1758

\textit{Julus cf. terrestris} Chia & Liu, 1950: 24, pl I, Figs 1-8.


Superfamily Parajuloidea Bollman, 1893

Family Parajulidae Bollman, 1893

Genus \textit{Parajulus} Humbert & Saussure, 1869

(125) †\textit{Parajulus cockerelli} Miner, 1926

\textit{Parajulus cockerelli} Miner, 1926: 3, Figs 1-5.


(126) †\textit{Parajulus onychis} Pierce, 1951


Order Spirobolida Cook, 1895

Spirobolida indet: Riquelme & Hernández-Patricio, 2018: 638, Figs 1D-E, Figs 2A-C; Wesener & Moritz, 2018: 1136, Fig.2E.


Referred material: BuB830: ♀; BuB916: ♂ (head missing); BuB1795: ♂; BuB1840: ♀; BuB2616; BuB3020; BuB3000: ♂; BuB3260: ♀; ZFMK MYR7373: ♂. Preservation: Amber inclusions. Repository: BuB; ZFMK-MYR. Locality:

Suborder Spirobolidea Cook, 1895
Family Atopetholidae Chamberlin, 1918

†Genus Gobiulus Dzik, 1975

†Gobiulus sabulosus Dzik, 1975
Gobiulus sabulosus Dzik, 1975: 18, Figs 1-5.


Family Spirobolidae Bollman, 1893
Genus Hiltonius Chamberlin, 1918

(128) †Hiltonius australis (Grinnell, 1908)
Spirobolus australis Grinnell, 1908: 210, pl 15, Figs 13-14.


Family Rhinocricidae Brölemann, 1913
Genus Rhinocricus Karsch, 1881


Order Spirostreptida Brandt, 1833
Suborder Cambalidea Cook, 1895

Cambalidea indet: Zhang, 2017: 172. Wesener & Moritz, 2018: 1136, Fig.2D.


Family Cambalidae Cook, 1895


†Genus Protosilvestria Handschin, 1944
†Protosilvestria sculpta Handschin, 1944
Protosilvestria sculpta Handschin, 1944: 4, pl 1, Figs 1-6, text-fig 1; Mauries, 1992: 24, Figs 1, 6-8, 11-15.


†Family Electrocambalidae Moritz & Wesener, 2021


†Genus Electrocambala Moritz & Wesener, 2021

Electrocambala sp.: Moritz & Wesener, 2021: 32.


†Electrocambala cretacea Moritz & Wesener, 2021
Electrocambala cretacea Moritz & Wesener, 2021: 30, Fig.3.


†Electrocambala ornata Moritz & Wesener, 2021
Electrocambala ornata Moritz & Wesener, 2021: 26, Figs 1-2.


†Genus Kachincambala Moritz & Wesener, 2021

Kachincambala sp.: Moritz & Wesener, 2021: 38.


†Kachincambala distorta Moritz & Wesener, 2021
Kachincambala distorta Moritz & Wesener, 2021: 35, Fig.5.


†Kachincambala muelleri Moritz & Wesener, 2021
Kachincambala muelleri Moritz & Wesener, 2021: 33, Fig.4.


Family Pseudonannolenidae Silvestri, 1895
Genus *Epinannolene* Brölemann, 1903

*Epinannolene* sp.: Santiago-Blay & Poinar, 1992: 366, Fig.6.


Superorder Nematophora Verhoeff, 1913
Order Callipodida Pocock, 1894

Callipodida indet: Wesener & Moritz, 2018: 1136, Fig.2C.


Family *Incertae sedis*

†Genus *Hannibaliulus* Shear et al., 2009

(134) †*Hannibaliulus wilsonae* Shear et al., 2009

*Hannibaliulus wilsonae* Shear et al., 2009: 6, Figs 2-8.

Referred material: Holotype: MYR1 a, b; Paratype: MYR10 a, b; other material: MYR2a; MYR3a, b; MYR4; MYR5; MYR6; MYR7a, b; MYR8a, b; MYR9a, b. Preservation: Compressions. Repository: IUT. Locality: France, Moselle, Bust-Hangviller, locality 238. Horizon: Grès à Voltzia Formation, Middle Triassic.

†Suborder Burmanopetalidea Stoewer & Wesener, 2019
†Family Burmanopetalidae Stoewer & Wesener, 2019

†Genus *Burmanopetalum* Stoewer & Wesener, 2019

(135) †*Burmanopetalum inexpectatum* Stoewer, Moritz & Wesener, 2019

*Burmanopetalum inexpectatum* Stoewer et al., 2019: 83, Figs 1-3.


Order Chordeumatida Pocock, 1894

Chordeumatida indet: Wesener & Moritz, 2018: 1135.


Suborder Craspedosomatidea Cook, 1895
Superfamily Craspedosomatoidea Gray in Jones, 1843
Family Craspedosomatidae Gray in Jones, 1843

Genus *Craspedosoma* Leach, 1814

(136) †*Craspedosoma aculeatum* Menge, 1854

*Craspedosoma aculeatum* Menge, 1854: 14.

Formation, Upper Eocene.

(137) †*Craspedosoma affine* Koch & Berendt, 1854
*Craspedosoma affine* Koch & Berendt, 1854: 13, pl 1, Fig.5a.

(138) †*Craspedosoma angulatum* Koch & Berendt, 1854
*Craspedosoma angulatum* Koch & Berendt, 1854: 13, pl 1, Fig.5.

(139) †*Craspedosoma armatum* Menge, 1854
*Craspedosoma armatum* Menge, 1854: 14.

(140) †*Craspedosoma cylindricum* Menge, 1854
*Craspedosoma cylindricum* Menge, 1854: 14.

(141) †*Craspedosoma obtusangulum* Menge, 1854
*Craspedosoma obtusangulum* Menge, 1854: 14.

(142) †*Craspedosoma setosum* Menge, 1854
*Craspedosoma setosum* Menge, 1854: 14.

†Genus *Euzonus* Menge, 1854

(143) †*Euzonus collulum* Menge, 1854
*Euzonus collulum* Menge, 1854: 14.

Suborder Heterochordeumatidea Shear, 2000
Superfamily Heterochordeumatoidea Pocock, 1894
Family Heterochordeumatidae Pocock, 1894

Heterochordeumatidae indet: Wesener & Moritz, 2018: 1135.
Referred material: Wu F2806/Bu/CJW: ♀; BuB0642: ♀; BuB0833: two ♂; BuB0899: ♂; BuB1141: ♂; BuB1410: ♂; BuB1411: ♀; BuB1412: ♀; BuB1823: ♂; BuB1827; BuB2685: ♂; BuB3022: ♂; BuB3030; BuB3051: ♀; BuB3056; ZFMK MYR05545: ♂; ZFMK MYR06123: ♂; ZFMK MYR06624: ♂; ZFMK MYR07367: ♀. Preservation: Amber inclusions. Repository: Wu; BuB; ZFMK-MYR. Locality: Myanmar, Kachin, Hukawng Valley, Noije Bum mine. Horizon: No stated,
lowermost Upper Cretaceous, Upper Albian/Lower Cenomanian.

**Order Stemmiulida Pocock, 1895**

Stemmiulida indet: Wesener & Moritz, 2018: 1135, Fig.2B.


**Family Stemmiulidae Pocock, 1894**


†**Genus Parastemmiulus Riquelme et al., 2013**

(144) †**Parastemmiulus elektron Riquelme et al., 2013**

Parastemmiulus elektron Riquelme et al., 2013: 6, Figs 3-9.


**Order Siphoniulida Cook, 1895**

**Family Siphoniulidae Pocock, 1894**

**Genus Siphoniulus Pocock, 1894**

(145) †**Siphoniulus muelleri Liu et al., 2017**

Siphoniulus muelleri Liu et al., 2017: 102, Figs 1-2.


(146) †**Siphoniulus preciosus Liu et al., 2017**

Siphoniulus preciosus Liu et al., 2017: 104, Figs 3-5.


**Superorder Merochaeta Cook, 1895**

**Order Polydesmida Pocock, 1887**

Polydesmida indet: Riquelme & Hernández-Patricio, 2018: 640, Figs 3A-B, F; Wesener & Moritz, 2018: 1136, Fig 2;
Álvarez-Rodríguez et al., 2023, Figs 4D-E (this work).

Referred material: CPAL.103: juvenile; CPAL.106: ♂; CPAL.107: juvenile; CPAL.108: juvenile; CPAL.113: juvenile; MACH.21; MALM.301: juvenile; MALM.302: juvenile; MALM.310; MALM.311: juvenile; MALM.312: juvenile. Preservation: Amber inclusions. Repository: CPAL-UAEM; MACH; MALM. Location: Mexico, Chiapas, Simojovel, Guadalupe Victoria mine (CPAL.106, CPAL.107), La Pimienta mine (CPAL.103, CPAL.113, MALM.301, MALM.302, MALM.310, MALM.311, MALM.312), Los Pocitos mine (MACH.21); Totolapa, Río Salado mine (CPAL.108). Horizon: Uppermost Simojovel Formation, Lower Miocene.

Referred material: BuB600; BuB672; BuB818; BuB902: 6 specimens; BuB909; BuB911: ♂; BuB912: 4 specimens; BuB915; BuB975: ♂; BuB976: ♂; BuB980: ♂; BuB983: ♂; BuB993: ♂; BuB995; BuB1029: ♂; BuB1031-A: ♂; BuB1035: ♂; BuB1084: ♂; BuB1146: ♂; BuB1148: ♂; BuB1149: ♂; BuB1154: 2 ♂, 5 ♂; BuB1155: ♂; BuB1156: ♂; BuB1414; BuB1548: ♂; BuB1794: ♂; BuB1830: 2 ♂; BuB1832: ♂; BuB1836: ♂; BuB1844: ♂; BuB1847: ♂; BuB1848: ♂; BuB1850: ♂; BuB1852: ♂; BuB1954A; BuB1957: 3 ♂; BuB1958; BuB1964: 2 ♂; BuB1967; BuB1975: ♂; BuB1985: ♂; BuB1986; BuB1987: ♂; BuB1989B; BuB1992; BuB2346; BuB2437; BuB2613; BuB2662; BuB2624; BuB2631; BuB2632: 2 ♂; BuB2639; BuB2640; BuB2645; BuB2646; BuB2647: ♂; BuB2648: ♂; BuB2653; BuB2672; BuB2683: ♂; BuB2684; BuB2686; BuB2687: ♂; BuB2688; BuB2960; BuB2967; BuB2968; BuB2969; BuB2970; BuB2972: 2 specimens; BuB2976: ♂; BuB2982: ♂; BuB2983: 2 ♂; BuB2987; BuB2988: ♂; BuB2992: ♂; BuB2994; BuB2999; BuB3001: ♂; BuB3002: ♂; BuB3003: ♂; BuB3004: ♂; BuB3008: ♂; BuB3011; BuB3021; BuB3023; BuB3025: ♂; BuB3029; BuB3032; BuB3034: ♂; BuB3039: ♂; BuB3040: ♂; BuB3028; BuB3049: ♂; BuB3055: ♂; BuB3238: ♂; BuB3246: ♂; BuB3251: ♂; BuB3252: ♂; BuB3253: ♂; BuB3254: ♂; BuB3256: ♂; BuB3267: 2 ♂; BuB3269; BuB3270; BuB3274; BuB3275: 2 specimens; BuB3276; BuB3277: ♂; BuB3278; BuB3279; BuB3285; BuB3286: ♂; BuB3293: ♂; ZFMK MYR06118: ♂; ZFMK MYR06120: ♂; ZFMK MYR07374: ♂; ZFMK MYR07377: ♂, 1 specimen; ZFMK MYR07375; ZFMK MYR07379: ♂; Wu F2817/Bu/CJW: ♂; Wu F3385/Bu/CJW; Wu F3396/Bu/CJW; Wu F3397/Bu/CJW; RO my249: ♂; RO my301: ♂; RO my304: ♂. Preservation: Amber inclusions. Repository: BuB; ZFMK-MYR; Wu; RO. Locality: Myanmar, Kachin, Hukawng Valley, Noije Bum mine. Horizon: Uppermost Cretaceous, Upper Albian/Lower Cenomanian.

New records: CPAL.125.1; CPAL.125.2; CPAL.135; CPAL.139; CPAL.148; CPAL.149; CPAL.156; CPAL.172; CPAL.199; CPAL.215; CPAL.219; MACH.22). Horizon: Uppermost Simojovel Formation, Lower Miocene.

Suborder Leptodesmidea Brölemann, 1916

Superfamily Chelodesmoidea Cook, 1895

Family Chelodesmidae Cook, 1895

Chelodesmidae indet: Santiago-Blay & Poinar, 1992: 366, Fig.8; Riquelme & Hernández-Patricio, 2018: 644, Fig.3E; Álvarez-Rodríguez et al., 2023 (this work).


†Genus Maatidesmus Riquelme & Hernández-Patricio, 2014

(147) †Maatidesmus paachtun Riquelme & Hernández-Patricio, 2014

Maatidesmus paachtun Riquelme et al., 2014: 5, Figs 2-3, 5A.


Genus Caraibodesmus Chamberlin, 1918
(148) †Caraibodesmus verrucosus Pocock, 1894

*Caraibodesmus verrucosus* Donovan & Veltkamp, 1994: 359, Fig.4.


**Genus Chondrotropis** Loomis, 1936


**Superfamily Platyrhacoidea** Pocock, 1895

**Family Platyrhacidae** Pocock, 1895


†Genus *Anbarrhacus* Riquelme & Hernández-Patricio, 2014

(149) †*Anbarrhacus adamantis* Riquelme & Hernández-Patricio, 2014

*Anbarrhacus adamantis* Riquelme et al., 2014: 8, Fig.4.


**Genus Nyssodesmus** Cook, 1896

*Nyssodesmus* sp.: Laurito & Valerio, 2018: 182, Figs 4C-D.


**Superfamily Sphaeriodesmoidea** Humbert & DeSaussure, 1869

**Family Sphaeriodesmidae** Humbert & DeSaussure, 1869

*Sphaeriodesmidae indet*: Álvarez-Rodríguez et al., 2023, Fig.4B (this work).


**Genus Cyclodesmus** Humbert & De Saussure, 1869

(150) *Cyclodesmus porcellanus* Pocock, 1894

*Cyclodesmus porcellanus* Baalbergen & Donovan, 2012: 7, Fig.4.


**Superfamily Xystodesmoidea** Cook, 1895

**Family Xystodesmidae** Cook, 1895

*Xystodesmidae indet*: Riquelme & Hernández-Patricio, 2018: 642, Figs 2D-F.
Álvarez-Rodríguez et al.


Suborder Strongylosomatidea Brölemann, 1916
Family Paradoxosomatidae Daday, 1889

Genus Orthomorpha Bollman, 1893

(151) Orthomorpha coarctata (De Saussure, 1860)
Polydesmus coarctata De Saussure, 1860: 297.
Orthomorpha coarctata: Li et al., 2021: 304, Figs 1b-g.


Suborder Polydesmidea Pocock, 1887
Infraorder Incertae sedis
Superfamily Incertae sedis
Family Incertae sedis

Genus Dasyodontus Loomis, 1936

Dasyodontus sp.: Santiago-Blay & Poinar, 1992: 367, Fig.16.


Infraorder Oniscodesmoides Simonsen, 1990
Superfamily Pyrgodesmoidea Silvestri, 1896
Family Pyrgodesmidae Silvestri, 1896

Pyrgodesmidae indet: Álvarez-Rodríguez et al., 2023, Fig.4F (this work).


Genus Docodesmus Cook, 1896

Docodesmus sp.: Santiago-Blay & Poinar, 1992: 367, Fig.11.


(152) †Docodesmus brodzinskiyi Shear, 1981


Genus Iomus Cook, 1911


**Genus Lophodesmus** Pocock, 1894

*Lophodesmus* sp.: Santiago-Blay & Poinar, 1992: 367, Fig.14.

**Genus Myrmecodesmus** Silvestri, 1910

(153) †*Myrmecodesmus antiquus* Riquelme & Hernández-Patricio, 2021

*Myrmecodesmus antiquus* Riquelme *et al*., 2021: 3, Figs 1-5.

**Genus Psochodesmus** Cook, 1896

*Psochodesmus* sp.: Santiago-Blay & Poinar, 1992: 367, Fig.15.

**Infraorder Polydesmoides** Pocock, 1887

**Superfamily Haplodesmoidea** Cook, 1895

**Family Haplodesmidae** Cook, 1895

**Genus Inodesmus** Cook, 1896

*Inodesmus* sp.: Santiago-Blay & Poinar, 1992: 367, Fig.17.

**Superfamily Polydesmoidea** Leach, 1815

**Family Polydesmidae** Leach, 1815

**Genus Polydesmus** Latreille, 1802

*Polydesmus* sp.: Hoffman, 1969: 595, Fig.378.

**Superfamily Trichopolydesmoidea** Verhoeff, 1910

**Family Trichopolydesmidae** Verhoeff, 1910

Trichopolydesmidae indet: Álvarez-Rodríguez *et al*., 2023, Figs 4A-C (this work).

**Genus Monstrodesmus** Golovatch, Geoffroy & VandenSpiegel, 2014
3.2.4 Subclass **Incertae sedis**

**Order Incertae sedis**

†**Family Proiulidae** Fritsch, 1899

†**Genus Tomiulus** Martynov, 1936

(155) †*Tomiulus angulatus* Martynov, 1936

*Tomiulus angulatus* Martynov, 1936: 1258.


**Family Incertae sedis**

†**Genus Decorotergum** Jell, 1983

(156) †*Decorotergum warrenae* Jell, 1983


3.2.5 Diplopoda Indeterminate

Diplopoda indet: Pickford & Andrews, 1981: 32; Slaughter, 1966: 79; Shear et al., 1992: 136; Janossy, 1986: 20; Montoya et al., 2001: 388; Rasnitsyn & Ross, 2000: 24; Rößler et al., 2012: 819, Fig.12A; Ross et al., 2016: 3; Huang et al., 2018: 5, Fig.4; Riquelme & Hernández-Patricio, 2018: 643, Figs 3A-B, 642; Álvarez-Rodríguez et al., 2023 (this work).


Referred material: LPI-63009. Preservation: Compression. Repository: CDCGS. Locality: China, Yunnan, Luoping County, Luoping biota. Horizon: Member II of the Guanling Formation, Anisian, Middle Triassic.


3.2.6 Summary taxonomic list of Diplopoda fossil record

Phylum Arthropoda Gravenhorst, 1843

Clade Mandibulata sensu Snodgrass, 1938

Subphylum Myriapoda Latreille, 1802

Class Diplopoda de Blainville in Gervais, 1844

Subclass Penicillata Latreille, 1831 (1 order)

Order Polyxenida Verhoeff, 1934 (2 superfamilies)

Superfamily Polyxenoidea Lucas, 1940 (2 families)

Family Lophoproctidae Silvestri, 1897 (1 genus)

Genus Lophoproctus Pocock, 1894

Family Polyxenidae Lucas, 1840 (6 genera)

† Genus Electroxenus Nguyen Duy–Jacquemin & Azar, 2004 (1 species)

† Electroxenus jezzinensis Nguyen Duy–Jacquemin & Azar 2004

† Genus Libanoxenus Nguyen Duy–Jacquemin & Azar, 2004 (1 species)

† Libanoxenus hammanaensis Nguyen Duy–Jacquemin & Azar, 2004

Genus Polyxenus Latrielle, 1802 (6 species)

† Polyxenus caudatus Menge, 1854

† Polyxenus colurus Menge, 1854

† Polyxenus coniformis Koch & Berendt, 1854

† Polyxenus lophurus Menge, 1854

† Polyxenus miocenica Srivastava et al., 2006

† Polyxenus ovalis Koch & Berendt, 1854

Genus Propolyxenus Silvestri, 1948

Genus Pauropsxenus Silvestri, 1948 (2 species)

† Pauropsxenus extraneus Su et al., 2020
Genus *Unixenus* Jones, 1944

Superfamily *Synxenoidea* Silvestri, 1923 (1 family)

Family *Synxenidae* Silvestri, 1923 (1 genus)

Genus *Phryssonotus* Scudder, 1885 (2 species)

† *Phryssonotus hystrix* Menge, 1854

† *Phryssonotus burmiticus* (Cockerell, 1917)

† Subclass *Arthropleuroidea* Waterlot, 1934 (3 orders)

† Order *Arthropleurida* Waterlot, 1934 (1 family)

† Family *Arthropleuridae* Scudder, 1885 (1 genus)

† Genus *Arthropleura* Jorden & Meyer, 1854 (8 species)

† *Arthropleura armata* (Jordan & Meyer, 1854)

† *Arthropleura britannica* Andree, 1913

† *Arthropleura cristata* Richarson, 1959

† *Arthropleura fayoli* Boule, 1893

† *Arthropleura maillieuxi* Pruvost, 1930

† *Arthropleura mammata* (Salter, 1863)

† *Arthropleura moyseyi* Calman, 1915

† *Arthropleura punctata* Goldenberg, 1873

† Order *Eoarthropleurida* Shear & Selden, 1995 (1 family)

† Family *Eoarthropleuridae* Størmer, 1976 (1 genus)

† Genus *Eoarthropleura* Størmer, 1976 (3 species)

† *Eoarthropleura devonica* Størmer, 1976

† *Eoarthropleura hueberi* Kjellsvig–Waering, 1986

† *Eoarthropleura ludfordensis* Shear & Selden, 1995

† Order *Microdecemplicida* Wilson & Shear, 2000 (1 family)

† Family *Microdecemplicidae* Wilson & Shear, 2000 (1 genus)

† Genus *Microdecemplex* Wilson & Shear, 2000 (1 species)

† *Microdecemplex rolfei* Wilson & Shear, 2000

Subclass *Chilognatha* Latrielle, 1802 (2 infraclasse)
† Order **Zosterogrammida** Wilson, 2005 (1 family)

† Family **Zosterogrammidae** Wilson, 2005 (1 genus)

† Genus **Casiogrammus** Wilson, 2005 (1 species)

† **Casiogrammus ichthyeros** Wilson, 2005

† Genus **Purkynia** Fritsch, 1899 (1 species)

† **Purkynia lata** Fritsch, 1899

† Genus **Zosterogrammus** Wilson, 2005 (1 species)

† **Zosterogrammus stichostethus** Wilson, 2005

Infraclass **Pentazonia** Brandt, 1833 (2 superorders)

† Order **Amynilypedida** Hoffman, 1969 (2 families)

† Family **Amynilypedidae** Hoffman, 1969 (1 genus)

† Genus **Amynilyspes** Scudder, 1882 (5 species)

† **Amynilyspes crescens** Fritsch, 1899

† **Amynilyspes fatimae** Racheboeuf et al., 2004

† **Amynilyspes springhillensis** Copeland, 1957

† **Amynilyspes typicus** Fritsch, 1899

† **Amynilyspes wortheni** Scudder, 1882

† Family **Sphaerherpestidae** Fritsch, 1899 (1 genus)

† Genus **Glomeropsis** Fritsch, 1895 (4 species)

† **Glomeropsis crassa** Fritsch, 1899

† **Glomeropsis magna** Fritsch, 1899

† **Glomeropsis multicarinata** Fritsch, 1899

† **Glomeropsis ovalis** Fritsch, 1895

Superorder **Limacomorpha** Pocock, 1894 (1 order)

Order **Glomeridesmida** Cook, 1895 (1 family)

Family **Glomeridesmidae** Latzel, 1884 (1 genus)

Genus **Glomeridesmus** Gervais, 1844

Superorder **Oniscomorpha** Pocock, 1887 (2 orders)

Order **Glomerida** Brandt, 1833 (2 families)

Family **Glomeridellidae** Cook, 1896 (1 genus)
Genus *Glomeridella* Brölemann, 1895

Family *Glomeridae* Leach, 1816 (2 genera)

Genus *Glomeris* Latreille, 1802 (1 species)

† *Glomeris denticulata* Menge, 1854

Genus *Hyleoglomeris* Verhoeff, 1910 (1 species)

† *Hyleoglomeris groehni* Wesener, 2019

Order *Sphaerotheriida* Brandt, 1833 (1 family)

Family *Zephroniidae* Gray in Jones, 1843

Infraclass *Helminthomorpha* Pocock, 1887 (2 subterclasses)

Superorder *Incertae sedis*

Order *Incertae sedis*

Family *Incertae sedis*

† Genus *Dolesea* Hannibal & May, 2020 (1 species)

† *Dolesea subtila* Hannibal & May, 2020

† Genus *Sinosoma* Huang & Hannibal, 2018 (1 species)

† *Sinosoma luopingense* Huang & Hannibal, 2018

Superorder *Incertae sedis*

Order *Incertae sedis*

Family *Incertae sedis*

Genus *Archicambala* Cook, 1895 (1 species)

*Archicambala dawsoni* (Scudder, 1868)

Superorder *Incertae sedis*

Order *Incertae sedis*

Family *Incertae sedis*

† Genus *Archiulidae* Scudder, 1873 (1 genus)

† Genus *Archiulus* Scudder, 1868 (5 species)

† *Archiulus brassi* (Dohrn, 1868)

† *Archiulus euphoberioides* Scudder, 1895

† *Archiulus glomeratus* Scudder, 1890

† *Archiulus lyelli* Scudder, 1895

† *Archiulus xylobioides* Scudder, 1868
Superorder *Incertae sedis*

Order *Incertae sedis*

† Family *Oklahomasomatidae* Hannibal & May, 2020 (1 genus)

† Genus *Oklahomasoma* Hannibal & May, 2020 (1 species)

† *Oklahomasoma richardsspurense* Hannibal & May, 2020

† Superorder *Archipolypoda* Scudder, 1882 (5 orders)

Order *Incertae sedis*

Family *Incertae sedis*

† Genus *Albadesmus* Wilson & Anderson, 2004 (1 species)

† *Albadesmus almondi* Wilson & Anderson, 2004

Order *Incertae sedis*

Family *Incertae sedis*

† Genus *Anaxeodesmus* Wilson, 2005 (1 species)

† *Anaxeodesmus diambonotus* Wilson, 2005

Order *Incertae sedis*

Family *Incertae sedis*

† Genus *Anthracodesmus* Peach, 1899 (1 species)

† *Anthracodesmus macconochiei* Peach, 1899

Order *Incertae sedis*

Family *Incertae sedis*

† Genus *Kampecaris* Page, 1856 (3 species)

† *Kampecaris dinmorensis* Clarke, 1951

† *Kampecaris forfarensis* Peach, 1882

† *Kampecaris obanesis* Peach, 1889

Order *Incertae sedis*

Family *Incertae sedis*

† Genus *Palaeodesmus* Brade–Birks, 1923 (1 species)

† *Palaeodesmus tuberculata* (Brade–Birks, 1923)
† Genus *Pneumodesmus* Wilson & Anderson, 2004 (1 species)

† *Pneumodesmus newmani* Wilson & Anderson, 2004

**Order Incertae sedis**

† Family *Woodesmidae* Ross *et al*., 2008 (1 genus)

† Genus *Woodesmus* Ross *et al*., 2018 (1 species)

† *Woodesmus sheari* Ross *et al*., 2018

† Order *Archidesmida* Wilson & Anderson, 2004 (2 families)

† Family *Archidesmidae* Scudder, 1885 (1 genus)

† Genus *Archidesmus* Peach, 1882 (1 species)

† *Archidesmus macnicoli* Peach, 1882

† Family *Zanclodesmidae* Wilson *et al*., 2005 (2 genera)

† Genus *Orsadesmus* Wilson *et al*., 2005 (1 species)

† *Orsadesmus rubecollus* Wilson *et al*., 2005

† Genus *Zanclodesmus* Wilson *et al*., 2005 (1 species)

† *Zanclodesmus willetti* Wilson *et al*., 2005

† Order *Cowiedesmida* Wilson & Anderson, 2004 (1 family)

† Family *Cowiedesmidae* Wilson & Anderson, 2004 (1 genus)

† Genus *Cowiedesmus* Wilson & Anderson, 2004 (1 species)

† *Cowiedesmus eroticopodus* Wilson & Anderson, 2004

† Order *Euphoberiida* Hoffman, 1969 (1 family)

† Family *Euphoberiidae* Scudder, 1882 (3 genera)

† Genus *Acantherpestes* Meek & Worthen, 1868 (6 species)

† *Acantherpestes foveolatus* Fritsch, 1899

† *Acantherpestes gigas* Fritsch, 1895

† *Acantherpestes inequalis* Scudder, 1890

† *Acantherpestes major* (Meek & Worthen, 1868)

† *Acantherpestes ornatus* Fritsch, 1899

† *Acantherpestes vicinus* Fritsch, 1899

† Genus *Euphoberia* Meek & Worthen, 1868 (17 species)

† *Euphoberia absens* Fritsch, 1899
† *Euphoberia anguilla* Scudder, 1882

† *Euphoberia armigera* Meek & Worthen, 1868

† *Euphoberia brownii* Woodward, 1871

† *Euphoberia carri* Scudder, 1882

† *Euphoberia cuspidata* Scudder, 1890

† *Euphoberia ferox* (Salter, 1863)

† *Euphoberia flabellata* Scudder, 1882

† *Euphoberia granosa* Scudder, 1882

† *Euphoberia histrix* Fritsch, 1899

† *Euphoberia horrida* Scudder, 1882

† *Euphoberia hystricosa* Scudder, 1890

† *Euphoberia lithanthracis* (Jordan & Meyer, 1854)

† *Euphoberia simplex* Scudder, 1890

† *Euphoberia spinulosa* Scudder, 1890

† *Euphoberia tracta* Scudder, 1890

† *Euphoberia varians* Fritsch, 1899

† Genus *Myriacantherpestes* Burke, 1979

† Order *Palaeosomatida* Hannibal & Krzeminski, 2005 (1 family)

† Family *Palaeosomatidae* Hannibal & Krzeminski, 2005 (1 genus)

† Genus *Paleosoma* Jackson et al., 1919 (2 species)

† *Paleosoma giganteus* (Baldwin, 1911)

† *Paleosoma robustum* (Jackson et al., 1919)

Subterclass *Colobognatha* Brandt, 1834 (3 orders)

† Order *Pleurojulida* Schneider & Werneburg, 1998 (1 family)

† Family *Pleurojulidae* Schneider & Werneburg, 1998 (2 genera)

† Genus *Pleurojulus* Fritsch, 1899 (2 species)

† *Pleurojulus biornatus* Fritsch, 1899

† *Pleurojulus levis* (Fritsch, 1899)

† Genus *Isojulus* Fritsch, 1899 (1 species)

† *Isojulus constans* (Frič, 1875)
Order **Platydesmida** Cook, 1895 (1 family)

Family **Andrognathidae** Cope, 1869 (2 genera)

Genus **Brachycebe** Wood, 1864

Genus **Andrognathus** Cope, 1869 (1 species)

† **Andrognathus burmiticus** Moritz & Wesener, 2019

Order **Polyzoniida** Cook, 1895 (2 families)

Family **Polyzoniidae** Newport, 1844 (1 genus)

Genus **Polyzonium** Brandt, 1837

Family **Siphonotidae** Cook, 1895 (1 genus)

Genus **Siphonotus** Brandt, 1837

Order **Siphonophorida** Newport, 1844 (2 families)

Family **Siphonophoridae** Newport, 1844 (2 genera)

Genus **Siphonophora** Brandt, 1837 (3 species)

† **Siphonophora hui** Jiang *et al.*, 2019

† **Siphonophora hoffmani** Santiago–Blay & Poinar, 1992

† **Siphonophora velezi** Santiago–Blay & Poinar, 1992

Genus **Siphonocybe** Pocock, 1903

Family **Siphonorhinidae** Cook, 1895

Subterclass **Eugnatha** Attems, 1898 (3 superorders)

Superorder **Juliformia** Attems, 1926 (3 orders, 1 superfamily)

Order **Incertae sedis**

† Family **Proglomeridae** Fritsch, 1899 (1 genus)

† Genus **Archiscudderia** Fritsch, 1899 (5 species)

† **Archiscudderia coronata** Fritsch, 1899

† **Archiscudderia paupera** Fritsch, 1899

† **Archiscudderia problematica** Fritsch, 1899

† **Archiscudderia regularis** Fritsch, 1899

† **Archiscudderia tapeta** Fritsch, 1899

† Superfamily **Xyloiuloidea** Attems, 1926 (4 families)

Family **Incertae sedis**
† Genus *Karstiulus* Hannibal & May, 2020 (1 species)

† *Karstiulus fortsillensis* Hannibal & May, 2020

† Family *Gaspestriidae* Wilson, 2006 (2 genera)

† Genus *Sigmastria* Wilson, 2006 (1 species)

† *Sigmastria dilata* Wilson, 2006

† Genus *Gaspestria* Wilson, 2006 (1 species)

† *Gaspestria genselorum* Wilson, 2006

† Family *Nyraniidae* Hoffman, 1969 (1 genus)

† Genus *Nyranius* Frič, 1875 (2 species)

† *Nyranius costulatus* (Frič, 1875)

† *Nyranius tabulatus* (Fritsch, 1899)

† Family *Proglomeridae* Fritsch, 1899

† Family *Xyloiulidae* Cook, 1895 (1 genus)

† Genus *Blanziulus* Langiaux & Sotty, 1976 (1 species)

† *Blanziulus parriati* Langiaux & Sotty, 197

† Genus *Xyloiulus* Cook, 1895 (10 species)

† *Xyloiulus ba índi* Hoffman, 1963

† *Xyloiulus fractus* Scudder, 1868

† *Xyloiulus frustulentus* (Scudder, 1890)

† *Xyloiulus mazonus* (Scudder, 1890)

†*Xyloiulus platti* (Baldwin, 1911)

† *Xyloiulus pstrossi* (Fritsch, 1899)

† *Xyloiulus renieri* Pruvost, 1930

† *Xyloiulus sellatus* (Fritsch, 1899)

† *Xyloiulus sigillariae* (Dawson, 1860)

† *Xyloiulus similis* (Scudder, 1868)

Order *Julida* Brandt, 1833 (2 superfamilies)

Superfamily *Juloidea* Leach, 1814 (1 family)

Family *Julidae* Leach, 1814 (2 genera)

† Genus *Bertkaupoly pus* Verhoeff, 1926 (1 species)
† *Bertka Lumpur antiquus* (Bertkau, 1878)

Genus *Julus* Linnaeus, 1758 (10 species)

† *Julus badius* Menge, 1854

† *Julus cavicola* Grinnell, 1908

† *Julus florissantellus* Cockerell, 1907

† *Julus laevigatus* Koch & Berendt, 1854

† *Julus occidentalis* Grinnell, 1908

† *Julus peii* Chia & Liu, 1950

† *Julus politus* Menge, 1854

† *Julus rubens* Menge, 1854

† *Julus suevicus* Dietlen, 1902

† *Julus terrestris* Chia & Liu, 1950

Superfamily *Parajuloidea* Bollman, 1893 (1 family)

Family *Parajulidae* Bollman, 1893 (1 genus)

Genus *Parajulus* Humbert & Saussure, 1869 (2 species)

† *Parajulus cockerelli* Miner, 1926

† *Parajulus onychis* Pierce, 1951

Order *Spirobolida* Cook, 1895 (1 suborder)

Suborder *Spirobolidea* Cook, 1895 (3 families)

Family *Atopetholidae* Chamberlin, 1918 (1 genus)

† Genus *Gobius* Dzik, 1975 (1 species)

† *Gobius sabulosus* Dzik, 1975

Family *Spirobolidae* Bollman, 1893 (1 genus)

Genus *Hiltonius* Chamberlin, 1918 (1 species)

† *Hiltonius australis* (Grinnell, 1908)

Family *Rhinocricidae* Brölemann, 1913 (1 genus)

Genus *Rhinocricus* Karsch, 1881

Order *Spirostreptida* Brandt, 1833 (1 suborder)

Suborder *Cambalidea* Cook, 1895 (2 families)

Family *Cambalidae* Cook, 1895 (1 genus)
† Genus *Protosilvestria* Handschin, 1944 (1 species)
   † *Protosilvestria sculpta* Handschin, 1944

† Family *Electrocambalidae* Moritz & Wesener, 2021 (2 genera)
   † Genus *Electrocambala* Moritz & Wesener, 2021 (2 species)
      † *Electrocambala cretacea* Moritz & Wesener, 2021
      † *Electrocambala ornata* Moritz & Wesener, 2021
   † Genus *Kachincambala* Moritz & Wesener, 2021 (2 species)
      † *Kachincambala distorta* Moritz & Wesener, 2021
      † *Kachincambala muelleri* Moritz & Wesener, 2021

Family *Pseudonannolenidae* Silvestri, 1895 (1 genus)
   Genus *Epinannolene* Brölemann, 1903

Superorder *Nematophora* Verhoeff, 1913 (4 orders)

Order *Callipodida* Pocock, 1894 (1 suborder)
   Family *Incertae sedis*
      † Genus *Hannibaliulus* Shear *et al*., 2009 (1 species)
         † *Hannibaliulus wilsonae* Shear *et al*., 2009
      † Suborder *Burmanopetalidea* Stoev, Moritz & Wesener, 2019 (1 family)
         † Family *Burmanopetalidae* Stoev, Moritz & Wesener, 2019 (1 genus)
         † Genus *Burmanopetalum* Stoev, Moritz & Wesener, 2019 (1 species)
            † *Burmanopetalum inexpectatum* Stoev, Moritz & Wesener, 2019

Order *Chordeumatida* Pocock, 1894 (2 suborders)
   Suborder *Craspedosomatidea* Cook, 1895 (1 superfamily)
      Superfamily *Craspedosomatidea* Gray in Jones, 1843 (1 family)
      Family *Craspedosomatidae* Gray in Jones, 1843 (2 genera)
         Genus *Craspedosoma* Leach, 1814 (7 species)
            † *Craspedosoma aculeatum* Menge, 1854
            † *Craspedosoma affine* Koch & Berendt, 1854
            † *Craspedosoma angulatum* Koch & Berendt, 1854
            † *Craspedosoma armatum* Menge, 1854
            † *Craspedosoma cylindricum* Menge, 1854
† *Craspedosoma obtusangulum* Menge, 1854

† *Craspedosoma setosum* Menge, 1854

† Genus *Euzonus* Menge, 1854 (1 species)

† *Euzonus collulum* Menge, 1854

Suborder *Heterochordeumatidea* Shear, 2000 (1 superfamily)

Superfamily *Heterochordeumatoidea* Pocock, 1894 (1 family)

Family *Heterochordeumatidae* Pocock, 1894

Order *Stemmiulida* Pocock, 1895 (1 family)

Family *Stemmiulidae* Pocock, 1894 (1 genus)

† Genus *Parastemmiulus* Riquelme *et al*., 2013 (1 species)

† *Parastemmiulus elektron* Riquelme *et al*., 2013

Order *Siphoniulida* Cook, 1895 (1 family)

Family *Siphoniulidae* Pocock, 1894 (1 genus)

Genus *Siphoniulus* Pocock, 1894 (2 species)

† *Siphoniulus muelleri* Liu *et al*., 2017

† *Siphoniulus preciosus* Liu *et al*., 2017

Superorder *Merochaeta* Cook, 1895 (1 order)

Order *Polydesmida* Pocock, 1887 (2 suborders)

Suborder *Leptodesmidea* Brölemann, 1916 (4 superfamilies)

Superfamily *Chelodesmoidea* Cook, 1895 (1 family)

Family *Chelodesmidae* Cook, 1895 (3 genera)

† Genus *Maatidesmus* Riquelme & Hernández–Patricio, 2014 (1 species)

† *Maatidesmus paachtun* Riquelme & Hernández–Patricio, 2014

Genus *Caraibodesmus* Chamberlin, 1918 (1 species)

† *Caraibodesmus verrucosus* Pocock, 1894

Genus *Chondrotropis* Loomis, 1936

Superfamily *Platyrhacoidea* Pocock, 1895 (1 family)

Family *Platyrhacidae* Pocock, 1895 (2 genera)

† Genus *Anbarrhacus* Riquelme & Hernández–Patricio, 2014 (1 species)

† *Anbarrhacus adamantis* Riquelme & Hernández–Patricio, 2014
Genus **Nyssodesmus** Cook, 1896

Superfamily **Sphaeriodesmoidea** Humbert & DeSaussure, 1869 (1 family)

Family **Sphaeriodesmidae** Humbert & DeSaussure, 1869 (1 genus)

Genus **Cyclodesmus** Humbert & De Saussure, 1869 (1 species)

**Cyclodesmus porcellanus** Pocock, 1894

Superfamily **Xystodesmoidea** Cook, 1895 (1 family)

Family **Xystodesmidae** Cook, 1895

Suborder **Strongylosomatidea** Brölemann, 1916 (1 family)

Family **Paradoxosomatidae** Daday, 1889 (1 genus)

Genus **Orthomorpha** Bollman, 1893 (1 species)

**Orthomorpha coarctata** (Saussure, 1860)

Suborder **Polydesmidea** Pocock, 1887 (2 infraorders)

Infraorder **Incertae sedis**

Superfamily **Incertae sedis**

Family **Incertae sedis**

Genus **Dasyodontus** Loomis, 1936

Infraorder **Oniscodesmoides** Simonsen, 1990 (1 superfamily)

Superfamily **Pyrgodesmoidea** Silvestri, 1896 (1 family)

Family **Pyrgodesmidae** Silvestri, 1896 (5 genera)

Genus **Docodesmus** Cook, 1896 (1 species)

† **Docodesmus brodzinskyi** Shear, 1981

Genus **Iomus** Cook, 1911

Genus **Lophodesmus** Pocock, 1894

Genus **Myrmecodesmus** Silvestri, 1910 (1 species)

† **Myrmecodesmus antiquus** Riquelme & Hernández-Patricio, 2021

Genus **Psochodesmus** Cook, 1896

Infraorder **Polydesmoides** Pocock, 1887 (3 superfamilies)

Superfamily **Haplodesmoidea** Cook, 1895 (1 family)

Family **Haplodesmidae** Cook, 1895 (1 genus)

Genus **Inodesmus** Cook, 1896
Superfamily **Polydesmoidea** Leach, 1815 (1 family)

Family **Polydesmidae** Leach, 1815 (1 genus)

Genus **Polydesmus** Latreille, 1802

Superfamily **Trichopolydesmoidea** Verhoeff 1910 (1 family)

Family **Trichopolydesmidae** Verhoeff, 1910 (1 genus)

Genus **Monstrodesmus** Golovatch, Geoffroy & VandenSpiegel, 2014 (1 species)

† **Monstrodesmus grimaldii** Su et al., 2022

**Incertae sedis**

Subclass **Incertae sedis**

Order **Incertae sedis**

† Family **Proiulidae** Fritsch, 1899 (1 genus)

† Genus **Tomius** Martynov, 1936 (1 species)

† **Tomius angulatus** Martynov, 1936

Family **Incertae sedis**

† Genus **Decorotergum** Jell, 1983 (1 species)

† **Decorotergum warrenae** Jell, 1983

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**References**


**FIGURES**

Figure 1. Fossil record of millipedes around the world. Schematic map showing geological sites.

Figure 2. Stratocladogram of the class Diplopoda showing the fossil record from the Middle Silurian to the Upper Pleistocene. Time scale adapted from the ICS International Chronostratigraphic Chart. Phylogenetic position of the higher taxa, including those extinct, follows Wilson (2006), Sierwald & Bond (2007), and Shear & Edgecombe (2010). Range extension is indicated by bold lines and ghost lineages by narrow lines. Taxa are shown on the branches by a number associated with the taxonomic list.

Figure 3. New records of Diplopoda from Mexican amber, Simojovel Formation, Lower Miocene. A. CPAL.143: Polyxenida. B. CPAL.124: Julida. C. CPAL.111: Polyxenidae. D. CPAL.157: Platysmesidae. Scale bars: A = 0.5 mm; B = 0.3 mm; C = 0.2 mm; D = 1.0 mm.

Figure 4. New records of Diplopoda from Mexican amber, Simojovel Formation, Lower Miocene. A. CPAL.121: Trichopolydesmidae (Polydesmida). B. CPAL.130: Sphaeriodesmidae (Polydesmida). C. CPAL.150: Trichopolydesmidae (Polydesmida). D. CPAL.125.1: Polydesmida indet. E. CPAL.137: Polydesmida indet. F. CPAL.138: Pyrgodesmidae (Polydesmida). Scale bars: A, E = 0.5 mm; B, F = 1 mm; C–D = 0.2 mm.

Figure 5. Diplopoda from Mexican amber, Simojovel Formation, Lower Miocene. A. Orders. B. Families of Polydesmida. C. First inventory (2018) and updated (2023).
Figure 1.
Figure 2.
Figure 3.
Figure 4.
Figure 5.