

ARTHROPODA (AGLASPIDIDA, PYCNOGONIDA AND CHELICERATA)

P. A. Selden

Class AGLASPIDIDA Walcott, 1911 (see Fig. 17.1)

Aglaspidida were removed from Chelicerata by Briggs *et al.* (1979).

F. PALEOMERIDAE Størmer, 1955 €. (SOL) Mar.

First and Last (monotypic family): *Paleomerus hamiltoni* Størmer, 1955, Kinnekulle, Sweden.

Comments: This animal was described in detail by Størmer (1956), in a paper communicated to the *Kungliga Svenska Akademien* in 1955 but not published until 5 December 1956; meanwhile, Størmer had included the new family, genus and species in the *Treatise*, published in 1955, so the latter publication included the first description of the new taxa. Bergström (1971) has expressed doubts that this family belongs in the Aglaspidida.

F. AGLASPIDIDAE Miller, 1877 €. (MEN-DOL) Mar.

First: *Beckwithia typa* Resser, 1931, probably upper Weeks Formation, Weeks Canyon, Utah, USA. This form was reviewed by Hesselbo (1989), who removed it from (thereby suppressing) the monotypic family Beckwithiidae.

Last: *Aglaspis spinifer* Raasch, 1939, *A. simplex* Raasch, 1939, *Aglaspella granulifera* Raasch, 1939, *A. eatoni* Whitfield, 1880, *Glypharthrus thomasi* (Walter, 1924), *Aglaspoides sculptilis* Raasch, 1939, *Uarthrus instabilis* Raasch, 1939, *Cyclopites vulgaris* (Raasch, 1939), *Craspedops modesta* Raasch, 1939, *Setaspis spinulosa* Raasch, 1939, Lodi Shale, St Lawrence Formation, Point Jude, Richland County, Wisconsin, USA.

F. STRABOPIDAE Gerhardt, 1932
€. (DOL)-O. (PUS) Mar.

First: *Strabops thacheri* Beecher, 1901, Potosi Dolomite, St Lawrence Formation, St François County, Missouri, USA.

Last: *Neostrabops martini* Caster and Macke, 1952, Maysville Formation, Ohio, USA.

Comment: Bergström (1971) doubted that this family belonged in the Aglaspidida.

F. SINAGLASPIDAE Hong and Niu, 1981 P. (ASS) Mar.

First and Last (monotypic family): *Sinaglaspis xiashanensis* Hong and Niu, 1981, lower Shanxi Formation, Gancaoshan, Xiangning County, Shanxi Province, China.

Class PYCNOGONIDA Latreille, 1810

The classification of Bergström *et al.* (1980) is used here.

First?: A larval form (D), more comparable with pycnogonids than any other arthropod group, was described by Müller and Walossek (1986) from Upper Cambrian Orsten of Sweden, €. (MNT).

Order PALAEOISOPODA Bergström *et al.*, 1980

F. PALAEOISOPODIDAE Dubinin, 1957
D. (PRA) Mar.

First and Last (monotypic family and order): *Palaeoisopus problematicus* Broili, 1928, Hunsrückschiefer, Bundenbach, Germany.

Order PALAEOPANTOPODA Broili, 1930

F. PALAEOPANTOPODIDAE Hedgpeth, 1955
D. (PRA) Mar.

First and Last (monotypic family and order): *Palaeopantopus maucheri* Broili, 1929, Hunsrückschiefer, Bundenbach, Germany.

Order PANTOPODA Gerstaecker, 1863
D. (PRA)-Rec. Mar.

First: *Palaeothea devonica* Bergström *et al.*, 1980, Hunsrückschiefer, Bundenbach, Germany. **Extant**

Comment: Bergström *et al.* (1980) declined to place this form in a family; it has *incertae sedis* status as the only known fossil in the order Pantopoda.

Phylum CHELICERATA Heymons, 1901
Sanctacaris €. (MEN) Mar.

First: *Sanctacaris uncatata* Briggs and Collins, 1988, Burgess Shale, British Columbia, Canada. Plesion: plesiomorphic sister taxon to all other Chelicerata.

Comment: The traditional division of the Chelicerata into primarily marine Merostomata and primarily terrestrial Arachnida is untenable. Most authors consider Xiphosura to be a sister group to all other Chelicerata (except *Sanctacaris*) and not to Eurypterida alone. Many authors place Scorpionida as a sister group to Eurypterida, while others consider Eurypterida to be the sister group of all other chelicerates except Xiphosura and *Sanctacaris* (i.e. Arachnida). Recently, a novel phylogeny was put forward by Shultz (1990). See Selden (1990) for a discussion.

A particular problem with the terrestrial arachnid groups, such as pseudoscorpions, spiders and mites, is that the majority of fossils are known from Tertiary ambers, the dating of which is insecure. Apart from the difficulty of dating the amber pieces, many specimens which come to be

QU.	HOL				<p style="text-align: center;"><u>Key for both diagrams</u></p> <p>AGLASPIDIDA 27. Hughmilleriidae</p> <p>1. Paleomeridae 28. Carcinosomatidae</p> <p>2. Aglaspididae 29. Adelophthalmidae</p> <p>3. Strabopidae 30. Mixopteraeidae</p> <p>4. Sinaglaspidae 31. Lanarkopteridae</p> <p>PYCNOGONIDA 32. Megalograptidae</p> <p>5. Palaeoisopodidae 33. Eurypteridae</p> <p>6. Palaeopantopodidae 34. Dolichopteridae</p> <p>7. Pantopoda 35. Erieopteridae</p> <p>CHELICERATA 36. Stylonuridae</p> <p>XIPHOSURA 37. Drepanopteridae</p> <p>8. <u>Sanctacaris</u> 38. Parastylonuridae</p> <p>9. Eolimulidae 39. Laurieopteridae</p> <p>10. Chasmataspidae 40. Kokomopteridae</p> <p>11. Diploaspidae 41. Hardieopteridae</p> <p>12. Heteroaspidae 42. Brachyoptereidae</p> <p>13. Weinberginidae 43. Rhenopteridae</p> <p>14. Bunodidae 44. Mycteropidae</p> <p>15. Pseudoniscidae 45. Woodwardopteridae</p> <p>16. Elleriidae 46. Pterygotidae</p> <p>17. Bellinuridae 47. Jaekelopteridae</p> <p>18. Euproopidae 48. Hibbertopteridae</p> <p>19. Liomesaspidae 49. Cyrtoctenidae</p> <p>20. Rolfeidae SCORPIONIDA</p> <p>21. Moravuridae 50. Protoscorpiones</p> <p>22. Paleolimulidae 51. Proscorpioidea</p> <p>23. Austrolimulidae 52. Archaeoctonoidea</p> <p>24. Heterolimulidae 53. <u>Praearcturus</u></p> <p>25. Limulidae 54. Mesoscorpionina</p> <p>EURYPYTERIDA 55. Paleosterni</p> <p>26. Slimoniidae 56. Orthosterni</p>
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	CRN		23		
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	ANS			24	
SCY	7	22	25	54 56	

Fig. 17.1

described have an unspecified provenance, thus rendering their dating by fossils in associated sediments impossible. Dominican amber occurs at numerous sites, spanning an interval of possibly 25–40 Ma BP (Lambert *et al.*, 1985), but probably the majority are at the younger end of that range. There is no consensus regarding the relative ages among Tertiary ambers, and correlation is understandably difficult. For the purposes of this work, Baltic amber is taken to be T. (RUP) in age, and Dominican, Mexican and most other Tertiary ambers with arachnids are placed as T. (CHT) in age.

Class XIPHOSURA Latreille, 1802

Recent ideas on the phylogeny and classification of the

class Xiphosura were discussed by Selden and Siveter (1987), and their classification is followed here.

F. EOLIMULIDAE Bergström, 1968
 € (LEN) Mar.

First and Last (monotypic family): *Eolimulus alatus* (Moberg, 1892), Ekerum, Öland, Sweden (Bergström, 1968).

Comment: The carapace only is known, so the xiphosuran identity of this animal is uncertain; if confirmed, this would be the oldest known xiphosuran.

Order CHASMATASPIDIDA Caster and Brooks, 1956

A large arthropod from the Devonian (GIV/FRS?) of

F. PSEUDONISCIDAE Packard, 1886
S. (TEL-PRD) Mar.

First: *Cyamocephalus loganensis* Currie, 1927, Patrick Burn Formation, Logan Water, Lesmahagow, Scotland, UK.

Last: *Pseudoniscus clarkei* Ruedemann, 1916, and ?*Bunaia woodwardi* Clarke, 1919, Bertie Waterlime, New York, USA.

Intervening: GOR

Infraorder LIMULICINA Richter and Richter, 1929

Superfamily BELLINUROIDEA Zittel and Eastman, 1913

Most authors (e.g. Eldredge, 1974; Fisher, 1982; Raymond, 1944; Selden and Siveter, 1987) agree that this group is the paraphyletic stem group which gave rise to the Euprooidea and the Limuloidea. Eldredge (1974) put the 'primitive' bellinuroids (e.g. *Bellinuroopsis rossicus* Chernyshev, 1933, *Bellinurus bellulus* König, 1851) in an unnamed family within the Pseudoniscoidea, but later work, shown in the phylogenetic diagrams of Fisher (1982, fig. 1; 1984, fig. 2) and Selden and Siveter (1987, fig. 2) depict their relationships more clearly.

Intervening (species not included in families below): D. (?FRS, *Bellinuroopsis rossicus* Chernyshev, 1933, top horizons of Devonian section, right bank of River Don, near Lebedian, former USSR ?FAM, '*Paleolimulus?*' *randalli* (Beecher, 1902), Chemung Sandstone, Pennsylvania, USA.

F. ELLERIIDAE Raymond, 1944
D. (?FRS) Mar./FW

First and Last (monotypic family): *Elleria morani* (Eller, 1938), Salamanca Sandstone, North Warren, Pennsylvania, USA.

Comment: Elleriidae was placed in Bellinuroidea by Bergström (1975) and Fisher (1982), but Siveter and Selden (1987) considered this placement unsupported on the basis of the morphological evidence.

F. BELLINURIDAE Zittel and Eastman, 1913 D.(?GIV)-C. (KSK) Mar./FW

First: *Bellinurus carteri* Eller, 1940, lower Cattaraugus Beds, Bradford, Pennsylvania, USA.

Last: *Bellinurus trechmanni* Woodward, 1918, Clauxheugh, County Durham, England, UK.

Intervening: FRS, FAM, FAM/HAS, IVO, CHE, MEL, VRK.

Superfamily EUPROOPOIDEA Eller, 1938

F. EUPROOPIDAE Eller, 1938
C. (CHD/BRI)-P. (ART) Mar./FW

First: *Euproops thompsoni* Raymond, 1944, Windsor Group, Cumberland County, Nova Scotia, Canada.

Last: *Anaontium carpenteri* Raymond, 1944, *A. brevis* Raymond, 1944, Wellington Formation, Noble County, Oklahoma, USA.

Intervening: ALP, YEA-CHE, CHE, MEL, VRK, KSK, POD, MYA, MYA/KRE, KLA.

F. LIOMESASPIDAE Raymond, 1944
C. (CHE-MYA) Mar./FW

First: *Pringlia birtwelli* (Woodward, 1872), ?Soapstone Bed, above Lower Mountain Mine, Cornfield Pit, Padiham, Lancashire, England, UK.

Last: *Prolimulus woodwardi* Frič, 1899, Nýřany, Czechoslovakia.

Superfamily LIMULOIDEA Zittel, 1885

F. ROLFEIIDAE Selden and Siveter, 1987
C. (IVO) Mar.

First and Last (monotypic family): *Rolfeia fouldeensis* Waterston, 1985, Foulden, Berwickshire, Scotland, UK.

F. MORAVURIDAE Přibyl, 1967 C. (PND) Mar.

First and Last: *Moravurus rehoi* Přibyl, 1967, Kyjovice Formation, Tichá, Czechoslovakia; *Xaniopyramis linseyi* Siveter and Selden, 1987, above Great Limestone, Weardale, England, UK.

F. PALEOLIMULIDAE Raymond, 1944
C. (ALP)-J. (HET) Mar./FW

First: *Paleolimulus? longispinus* Schram, 1979, Bear Gulch Limestone, Fergus County, Montana, USA.

Last: *Limulitella cf. bronni* Schimper, 1850, Helmstedt, Germany.

Intervening: KRE-NOG, MYA, ASS, SAK, ART, GRI-SPA, ANS, NOR, RHT.

F. AUSTROLIMULIDAE Riek, 1968 Tr. (LAD) FW

First and Last (monotypic family): *Austrolimulus fletcheri* Riek, 1955, Hawkesbury Sandstone, Brookvale, New South Wales, Australia.

F. HETEROLIMULIDAE Via Boada and Villalta, 1966
Tr. (LAD) Mar.

First and Last (monotypic family): *Heterolimulus gadeai* Via Boada and Villalta, 1966, Canteras de Montral-Alcover, Tarragona Province, Spain.

F. LIMULIDAE Zittel, 1885 Tr. (SPA)-Rec.
Mar./FW

First: *Psammolimulus gottingensis* Lange, 1922, Göttingen, Germany.

Intervening: LAD, HET-TOA, OXF/KIM, TTH, APT, CEN, CMP, MAA, BUR. **Extant**

Class EURYPTERIDA Burmeister, 1843

The classification of Tollerton (1989) is used here. A number of genera were excluded from the Order Eurypterida by Tollerton, but their removal has no overall effect on the ranges given below. Tollerton (1989) also excluded the hibbertopteroids, which had been returned to the Order Eurypterida by Waterston *et al.* (1985); here, they are included in the Order Cyrtoctenida, a taxon originally proposed by Størmer and Waterston (1968) for these unusual forms. Eurypterids occur mainly in marginal marine facies, lacking good marine, stratigraphically useful, fossils; therefore, the dating of many of the horizons is under constant review.

Order EURYPTERIDA Burmeister, 1843

Suborder EURYPTERINA Burmeister, 1843

Superfamily SLIMONIOIDEA Novojilov, 1962

F. SLIMONIIDAE Novojilov, 1962 S. (TEL-PRD)
Mar./FW

First: *Slimonia dubia* Laurie, 1899, Reservoir Formation,

Gutterford Burn, Pentland Hills, Scotland, UK; *Slimonia acuminata* (Salter, 1856), Patrick Burn and Kip Burn Formations, Lesmahagow, Scotland, UK.

Last: *Salteropterus abbreviatus* (Kjellesvig-Waering, 1951), Temeside Shale Formation, Perton, Herefordshire, England, UK.

Intervening: LDF

Comment: A *Slimonia* specimen from Lochkov, Czechoslovakia (Prantl and Přibyl, 1948), D. (GED) was studied by Kjellesvig-Waering (1973) who doubted the identification.

Superfamily HUGHMILLERIOIDEA
Kjellesvig-Waering, 1951

F. HUGHMILLERIIDAE Kjellesvig-Waering, 1951
O. (ARG)–D. (FRS) Mar.

First: *Waeringopterus? priscus* (Ruedemann, 1942) Deepkill Formation, Mt. Merino, Hudson, New York, USA.

Last: *Grossopterus? inexpectans* (Ruedemann, 1919), Oneonta Formation, Gilboa, New York, USA.

Intervening: COS–ONN, GED, SIG.

F. CARCINOSOMATIDAE Størmer, 1934
O. (ARG)–D. (EMS, possibly GIV/FRS?) Mar.

First: *Eocarcinosoma ruedemanni* (Flower, 1945), Deepkill Formation, Rensselaer County, New York, USA.

Last: *Carcinosoma* sp., Alken-an-der-Mosel, Germany (Størmer, 1974).

Intervening: COS–ONN, HIR, RHU–GLE, FRO, TEL, SHE, GLE, GOR, LDF, PRD, GED.

Comment: A probable carcinosomatid, referred to under Chasmataspida above, was reported by Janvier *et al.* (1989) from the Grey Devonian of Dô Son, Haiphong, Vietnam, which these authors considered may be D. (GIV/FRS).

F. ADELOPHTHALMIDAE Tollerton, 1989
S. (RHU/FRO)–P. (ART) Mar./FW

First: *Parahughmilleria maria* (Clarke, 1907), Tuscarora Formation, Swatara Gap, Pennsylvania, USA.

Last: *Adelophthalmus sellardsi* (Dunbar, 1924) Wellington Formation, Dickinson County, Kansas, and Red Rock, Oklahoma, USA.

Intervening: TEL, SHE, LDF, PRD, LOK, PRA, EMS, FAM, HLK, MRD, CHE, MEL, VRK, KSK, POD, MYA, NOG, ASS, SAK.

Superfamily MIXOPTEROIDEA Caster and Kjellesvig-Waering, 1955

F. MIXOPTERIDAE Caster and Kjellesvig-Waering, 1955 S. (SHE/GLE–PRD) Mar.

First: *Mixopterus? sp.*, Lower Sintan Formation, Hsin Tan, Hubei, China (Chang, 1957).

Last: *Mixopterus multispinosus* (Clarke and Ruedemann, 1912), Vernon Shales, New York, USA; *M. kiaeri* Størmer, 1934, Sundvolle Formation, Ringerike, Norway; *M. sp.*, Perton, Herefordshire, England, UK (Kjellesvig-Waering, 1951).

Intervening: LDF.

F. LANARKOPTERIDAE Tollerton, 1989
S. (GLE/GOR) Mar.

First and Last (monotypic family): *Lanarkopterus*

dolichoschelus Ritchie, 1968, Fish Beds of Hagshaw Hills and Lesmahagow, Scotland, UK.

Superfamily MEGALOGRAPTOIDEA Caster and Kjellesvig-Waering, 1955

F. MEGALOGRAPTIDAE Caster and Kjellesvig-Waering, 1955 O. (COS/ONN–HIR) Mar.

First: *Echinognathus clevelandi* Walcott, 1882, Utica Shales, Oneida County, New York, USA; *Megalograptus alveolatus* Caster and Kjellesvig-Waering, 1964, Martinsburg Formation, Walker Mountain, Virginia, USA.

Last: *Megalograptus ohioensis* Caster and Kjellesvig-Waering, 1964, Elkhorn Formation, Manchester, Ohio, USA.

Intervening: CAU, RAW.

Superfamily EURYPTEROIDEA Burmeister, 1843

F. EURYPTERIDAE Burmeister, 1843
O. (LLO)–D. (FRS) Mar./FW

First: *Eurypterus? decipiens* Ruedemann, 1942, Normanskill Grit, Albany County, New York, USA.

Last: *Eurypterus? sp.* Bergisch Gladbach, Germany (Jux, 1967).

Intervening: COS–ONN, TEL, SHE, WHI, GLE, GOR, LDF, PRD, LOK, EMS.

F. DOLICHOPTERIDAE Kjellesvig-Waering and Størmer, 1952 O. (ARG)–D. (SIG) Mar.

First: *Dolichopterus antiquus* Ruedemann, 1942, Deepkill Formation, Merino, Hudson, New York, USA.

Last: *Strobilopterus princetonii* Ruedemann, 1935, Beartooth Butte, Wyoming, USA.

Intervening: COS–ONN, FRO–LDF, SHE, GOR, PRD, LOK.

F. ERIOPTERIDAE Tollerton, 1989
O. (LLO)–D. (SIG) Mar./?FW

First: *Eriopterus chadwicki* Clarke and Ruedemann, 1912, Normanskill Shale, Catskill, New York, USA.

Last: *Eriopterus stazii* Størmer, 1936, upper Siegener Sandstone, Wahnachtal, Siegburg, Germany; *Eriopterus latus* Ruedemann, 1935, Beartooth Butte, Wyoming, USA.

Intervening: MRB, RHU, GOR, PRD, LOK.

Superfamily STYLONUROIDEA Diener, 1924
(=DREPANOPTEROIDEA Kjellesvig-Waering, 1966)

F. STYLONURIDAE Diener, 1924
O. (LLO)–D. (FAM) Mar./?FW

First: *Stylonurella? modestus* (Clarke and Ruedemann, 1912), Normanskill Shale, Catskill, New York, USA.

Last: *Stylonurus? shaffneri* Willard, 1933, Canadaway Formation, Galeton, Pennsylvania, and *Stylonurella? arnoldi* (Ehlers, 1935), Chadakoin Formation, Bush Hill, Pennsylvania, USA.

Intervening: TEL, SHE, WHI, GLE, GOR, LDF, LOK, EMS, ?EIF.

F. DREPANOPTERIDAE Kjellesvig-Waering, 1966
O. (COS/ONN)–D. (FAM) Mar./?FW

First: *Drepanopterus? ruedemanni* (O'Connell, 1916), Schenectady Formation, Schenectady, New York, USA.

Last: *Drepanopterus abonensis* Simpson, 1951, Portishead, Somerset, England, UK.

Intervening: TEL, PRD, GED, EMS.

F. PARASTYLONURIDAE Waterston, 1979
O. (HAR)–D. (?FAM) Mar./?FW

First: *Brachyopterus stubblefieldi* Størmer, 1951, Bausley House Shales, Abberley, Montgomeryshire, Wales, UK.

Last: *Parastylonurus? beecheri* (Hall, 1884), ?Conewango Formation, Warren, Pennsylvania, USA.

Intervening: COS–ONN, TEL, GOR, LDF, PRD.

F. LAURIEOPTERIDAE Kjellesvig-Waering, 1966
S. (TEL)–C. (MYA) Mar./FW

First: *Laurieopterus elegans* (Laurie, 1899), Reservoir Formation, Gutterford Burn, Pentland Hills, Scotland, UK.

Last: *Mazonipterus cyclophthalmus* Kjellesvig-Waering, 1963, Francis Creek Shale, Mazon Creek, Illinois, USA.

Intervening: FRO–LDF, GED, LOK/PRA, FRS, FRS/FAM.

Superfamily KOKOMOPTEROIDEA Kjellesvig-Waering, 1966

F. KOKOMOPTERIDAE Kjellesvig-Waering, 1966
S. (TEL–PRD) Mar./?FW

First: *Lamontopterus knoxae* (Lamont, 1955), Reservoir Formation, Gutterford Burn, Pentland Hills, Scotland, UK.

Last: *Kokomopterus longicaudatus* (Clarke and Ruedemann, 1912), Kokomo Formation, Kokomo, Indiana, USA.

F. HARDIEOPTERIDAE Tollerton, 1989
S. (RHU/FRO–PRD) Mar.

First: *Hardieopterus myops* (Clarke, 1907), Tuscarora Formation, Swatara Gap, Pennsylvania; Shawangunk Formation, Delaware Water Gap, Pennsylvania, USA.

Last: *Hardieopterus megalops* (Salter, 1859), Downton Castle Sandstone Formation, Ludlow, Shropshire, England, UK.

Intervening: RHU–GLE, TEL, FRO–LDF.

Superfamily BRACHYOPTERELLOIDEA Tollerton, 1989

F. BRACHYOPTERELLIDAE Tollerton, 1989
O. (COS/ONN)–S. (PRD) Mar.

First: *Brachyoptera? magna* (Clarke and Ruedemann, 1912), Schenectady Formation, Schenectady, New York, USA.

Last: *Brachyoptera? pentagonalis* (Størmer, 1934), Sundvolle Formation, Ringerike, Norway.

Intervening: GOR.

Superfamily RHENOPTEROIDEA Størmer, 1951

F. RHENOPTERIDAE Størmer, 1951
D. (SIG–FRS) Mar./FW

First: *Rhenopterus tuberculatus* Størmer, 1936, Overath, Eifel, Germany.

Last: *Rhenopterus? sp.*, Gogo Formation, Kimberley, Australia (Rolfe, 1966).

Intervening: EMS, GIV.

Superfamily MYCTEROPIDEA Cope, 1886

F. MYCTEROPIDAE Cope, 1886
C. (PND–MYA) FW

First: *Mycterops? blairi* Waterston, 1968, below Johnstone Shell Bed, Limestone Coal Group, Midlothian, Scotland, UK.

Last: *Mycterops* fragments, Francis Creek Shale, Mazon Creek, Illinois, USA (Kjellesvig-Waering, 1963).

Intervening: MEL.

F. WOODWARDOPTERIDAE Kjellesvig-Waering, 1959
D. (FAM)/C. (HAS)–C. (MEL/MYA) FW

First: *Woodwardopterus scabrosus* (Woodward, 1887), Kiltorcan, Republic of Ireland.

Last: *Vernonopterus minutisculptus* (Peach, 1907), Coal Measures of Airdrie, Scotland, UK.

Suborder PTERYGOTINA Caster and Kjellesvig-Waering, 1964

Superfamily PTERYGOTOIDEA Clarke and Ruedemann, 1912

F. PTERYGOTIDAE Clarke and Ruedemann, 1912
O. (ARG)–D. (FAM) Mar.

First: *Pterygotus? deepkillensis* Ruedemann, 1934, Deepkill Formation, Deepkill, New York, USA.

Last: *Pterygotus (Pterygotus) montanensis* Ruedemann, 1935b, Three Forks Shale, Montana, USA.

Intervening: LLO, COS–ONN, RHU–GLE, RHU–FRO, FRO–LDF, TEL, SHE, GLE, GOR, LDF, PRD, GED, SIG, EMS, EIF, GIV.

F. JAEKELOPTERIDAE Størmer, 1974
D. (PRA–EMS) Mar.

First: *Jaekelopterus rhenaniae* (Jaekel, 1914), Overath, Eifel, Germany.

Last: *Jaekelopterus rhenaniae* (Jaekel, 1914), Alken-an-der-Mosel, Germany.

Order CYRTOCTENIDA Størmer and Waterston, 1968

Although highly specialized forms, cyrtoctenids may be derived from primitive eurypterids (Waterston *et al.*, 1985).

Superfamily HIBBERTOPTEROIDEA Kjellesvig-Waering, 1959

F. HIBBERTOPTERIDAE Kjellesvig-Waering, 1959
D. (?FRS)–P. (?KAZ) Mar./FW

First: *Hibbertopterus? sewardi* (Strand, 1928), Wagon Drift Formation, Witteberg Group, Grahamstown, South Africa.

Last: *Campylocephalus oculatus* (Kutorga, 1838), Copper-bearing Sandstones, Dourassoff, Urals, former USSR; *Hibbertopterus permianus* Ponomarenko, 1985, Intinskaya Suite, Inta, Komi, former USSR.

Intervening: FAM/HAS, ASB, BRI, PND–MEL, ARN, MEL, UFI–TAT.

F. CYRTOCTENIDAE Waterston *et al.*, 1985
D. (?FRS)–P. (?SAK) Mar./FW

First: *Dunsopterus? wrightianus* (Dawson, 1881), Portage Sandstone, Italy, Yates County, New York, USA.

Last: *Hastimima whitei* White, 1908, Rio Bonito Formation, Minas, Santa Catarina, Brazil, and Tatui Formation, Sao Paulo, Brazil.

Intervening: FAM, IVO, HLK, ASB, BRI, ARN.

Class SCORPIONIDA Latreille, 1810

A major new classification of Scorpionida was proposed by Kjellesvig–Waering (1986), but this posthumous publica-

tion was marred by compilation defects, and updating is required in the light of more recent work by Jeram (1990) and Stockwell (1989). The classification of Stockwell is used here without comment (it has yet to be published formally), because it conveys current understanding of the classification of scorpions in the light of unpublished work and is likely to become more widely adopted in the future than that of Kjellesvig-Waering (1986). The monotypic families and superfamilies of Kjellesvig-Waering (1986) are not used here.

A number of fossil scorpions cannot be assigned to categories of lower rank within the Scorpionida, and most of these were listed as Scorpionida *incertae sedis* by Stockwell (1989). In addition, *Hubeiscorpio gracilitarsis* Walossek *et al.*, 1990, from the Devonian of China is added to the list, and *Tiphoscorpio hueberi* Kjellesvig-Waering, 1986 is removed from Scorpionida (Selden and Shear, 1992). They range through the following stages: S. (PRD), D. (FRS), C. (HLK, MEL, KSK, POD, MYA, DOR), Tr. (ANS).

Order PROTOSCORPIONES Petrunkevitch, 1949
S. (TEL)–D. (PRA) Mar./Terr.?

First: *Dolichophonus loudonensis* (Laurie, 1899), Reservoir Formation, Gutterford Burn, Pentland Hills, Scotland, UK.
Last: *Palaeoscorpion devonicus* Lehmann, 1944, Hunsrückschiefer, Bundenbach, Germany.
Intervening: SHE, GOR/LDF.

Order PALAEOSCORPIONES Stockwell, 1989

Superfamily PROSCORPIOIDEA Scudder, 1885
S. (PRD)–C. (ALP/CHE) Mar./?FW/Terr.

First: *Proscorpius osborni* (Whitfield, 1885), *Archaeophonus eurypterooides* Kjellesvig-Waering, 1966, *Stoermeroscorpion delicatus* Kjellesvig-Waering, 1986, Bertie Waterlime, New York, USA.

Last: *Labriscorpio alliedensis* Leary, 1980, Milan, Illinois, USA.

Intervening: EMS.

Superfamily ARCHAEOCTONOIDEA
Petrunkevitch, 1949 C. (HLK) ?Terr.

First and Last: *Archaeoctonus glaber* (Peach, 1883), *Pseudoarchaeoctonus denticulatus* (Kjellesvig-Waering, 1986), *Loboarchaeoctonus squamosus* (Kjellesvig-Waering, 1986), Glencartholm Volcanic Beds, Langholm, Scotland, UK.

Order SCORPIONES Hemprich and Ehrenberg, 1829
Praearcturus D. (PRA) Terr.

First: *Praearcturus gigas* Woodward, 1871, Rowlestone, Herefordshire, England, UK (placed as Scorpiones *incertae sedis* by Stockwell (1989)).

Intervening: many fossil scorpions cannot be assigned to categories of lower rank within the Scorpiones, and were listed as Scorpiones *incertae sedis* by Stockwell (1989). They range through the following stages: PRA, HLK, BRI, ALP, CHE, KSK, MEL, MYA, KLA, ANS, TOA.

Suborder MESOSCORPIONINA Stockwell, 1989
C. (HLK)–J. (MET/TOA) Terr.

First: *Phoxiscorpio peachi* Kjellesvig-Waering, 1986, Dalmeny, Edinburgh, Scotland, UK.

Last: *Mesophonus? maculatus* Brauer *et al.*, 1889, Ust-Balei, Irkutsk, Siberia, former USSR.

Intervening: CHE, MEL, VRK, KSK, MYA, KLA, ANS.

Suborder NEOSCORPIONINA Thorell and
Lindström, 1885

Infraorder PALEOSTERNI Stockwell, 1989
C. (MEL–DOR) Terr.

First: *Allobuthiscorpius major* (Wills, 1960), Kilburn Coal, Trowell Colliery, Nottinghamshire, England, UK.

Last: *Buthiscorpius pescei* Vachon and Heyler, 1985, shales above First Blanzly-Montceau Coal, Montceau-les-Mines, France.

Intervening: VRK, KSK.

Infraorder ORTHOSTERNI Pocock, 1911
(see Fig. 17.2) C. (MEL)–Rec. Terr.

First: *Compsoscorpion elegans* Petrunkevitch, 1949, Coseley, Staffordshire, England, UK. **Extant**

Intervening: MYA, and others assigned to families below.

Superfamily BUTHOIDEA Simon, 1880

F. BUTHIDAE Simon, 1880 T. (RUP)–Rec. Terr.

First: *Tityus eogenus* Menge, 1854, Baltic amber. **Extant**

Intervening: CHT.

Superfamily SCORPIONOIDEA Peters, 1861

Araripescorpio

First: *Araripescorpio ligabuei* Campos, 1986, Santana Formation K. (APT), Chapado de Araripe, Brazil.

F. SCORPIONIDAE Peters, 1861 T. (RUP)–Rec.
Terr.

First: *Scorpio schweiggeri* Holl, 1829, Baltic amber. **Extant**

Intervening: TOR/MES.

Class PSEUDOSCORPIONES Latreille, 1817

Intervening: undescribed pseudoscorpions were reported from Lebanese amber, K. (BER–APT), by Whalley (1980).

F. DRACOCHELIDAE Schawaller *et al.*, 1991
D. (GIV) Terr.

First and Last (monotypic family): *Dracochela deprehendor* Schawaller *et al.*, 1991 (protonymph and tritonymph), Gilboa Mudstones, New York, USA (Shear *et al.*, 1989; Schawaller *et al.*, 1991).

Comment: Only protonymph and tritonymph are known, which, although modern in many aspects, cannot be assigned with confidence to extant taxa because both diagnostic characters in the fossils and cladistic assessment of extant forms are lacking (Shear *et al.*, 1989; Schawaller *et al.*, 1991).

Suborder CHTHONIINA Beier, 1932

Superfamily CHTHONIOIDEA Beier, 1932

F. CHTHONIIDAE Hansen, 1894 T. (RUP)–Rec.
Terr.

First: *Chthonius mengei* Beier, 1937, Baltic amber. **Extant**

Intervening: CHT.

F. DITHIDAE Chamberlin, 1931 T. (RUP)–Rec.
Terr.

First: *Chelignathus kochii* (Menge, 1854), Baltic amber.

Extant

First: Unnamed specimen, East Kirkton Limestone, near Bathgate, Scotland, UK (Wood *et al.*, 1985).

Intervening: Unnamed opilionid Koonwarra Fossil Bed, Lower Gippsland, Victoria, Australia (BRM/APT) (Jell and Duncan, 1986).

F. KUSTARACHNIDAE Petrunkevitch, 1913
C. (MYA) Terr.

First and Last (monotypic family): *Kustarachne tenuipes* Scudder, 1890, *K. conica* Petrunkevitch, 1913, *K. extincta* (Melander, 1903), Francis Creek Shale, Mazon Creek, Illinois, USA.

Comment: The order Kustarachnida was erected by Petrunkevitch (1913) for *Kustarachne*. The specimens have been reassessed by Beall (1986) who considered them to belong to Opiliones, an assignment with which other arachnologists who have seen the specimens (P. A. Selden, W. A. Shear) concur.

Suborder PALPATORES Thorell, 1876

Superfamily TROGULOIDEA Sundevall, 1833

F. EOTROGULIDAE Petrunkevitch, 1955
C. (KLA/NOG) Terr.

First and Last (monotypic family): *Eotrogulus fayoli* Thévenin, 1901, Commentry, France.

F. NEMASTOMATIDAE Simon, 1879
T. (RUP)–Rec. Terr.

First: *Nemastoma denticulatum* Koch and Berendt, 1854, *N. tuberculatum* Koch and Berendt, 1854, *N. clavigerum* Menge, 1854, *N. succineum* Röwer, 1939, Baltic amber. **Extant**

F. NEMASTOMOIDIDAE Petrunkevitch, 1955
C. (MYA)–(KLA/NOG) Terr.

First: *Nemastomoides longipes* (Petrunkevitch, 1913) and *N. depressus* (Petrunkevitch, 1913), Francis Creek Shale, Mazon Creek, Illinois, USA.

Last: *Nemastomoides elaveris* Thévenin, 1901, Commentry, France.

F. ISCHYROPSALIDAE Simon, 1879
T. (RUP)–Rec. Terr.

First: *Sabacon bachofeni* Röwer, 1939, Baltic amber.

Extant

Superfamily PHALANGIOIDEA Thorell, 1876

F. PHALANGIIDAE Thorell, 1876
T. (RUP)–Rec. Terr.

First: *Caddo dentipalpus* (Koch and Berendt, 1854), *Cheiomachus coriaceus* Menge, 1854, *Dicranopalpus ramiger* (Koch and Berendt, 1854), *D. corniger* Menge, 1854, *D. palmnickensis* Röwer, 1939, *Liobunum sarapum* Menge, 1854, *L. inclusum* Röwer, 1939, *Opilio ovalis* Koch and Berendt, 1854, Baltic amber. **Extant**

Intervening: CHT.

Suborder LANIATORES Thorell, 1876

F. GONYLEPTIDAE Sundevall, 1833
T. (RUP)–Rec. Terr.

First: *Gonyleptes nemastomoides* Koch and Berendt, 1854, Baltic amber. **Extant**

F. PHALANGODIDAE Simon, 1879
T. (CHT)–Rec. Terr.

First: *Pellobunus proavus* Cokendolpher, 1987, *Philacarus hispaniolensis* Cokendolpher and Poinar, 1992, *Kimula?* sp., Dominican amber. **Extant**

Class PHALANGIOTARBIDA Petrunkevitch, 1949

Kjellesvig-Waering left a posthumous monograph on this group in which he drastically reduced in number the genera and species erected by Petrunkevitch (1913–1949). This work was being readied for publication but has yet to appear in print. Thus, the classification used is that of Petrunkevitch (1955).

F. ARCHITARBIDAE Karsch 1882
C. (MEL–MYA) Terr.

First: *Goniotarbus tuberculatus* (Pocock, 1911), *G. angulatus* (Pocock, 1911), *Mesotarbus intermedius* Petrunkevitch, 1949, *M. hindi* (Pocock), *M. angustus* (Pocock, 1911), *M. eggintoni* (Pocock, 1911), *Leptotarbus torpedo* (Pocock, 1911), Coseley, Dudley, England, UK.

Last: *Orthotarbus nyransensis* Petrunkevitch, 1953, Nýřany, Czechoslovakia. *Geratarbus bohemicus* Petrunkevitch, 1953 may also come from this horizon in the Coal Measures of Nýřany.

Intervening: VRK.

F. OPILIOTARBIDAE Petrunkevitch, 1945
C. (MYA) Terr.

First and Last (monotypic family): *Opiliotarbus elongatus* (Scudder, 1890), Francis Creek Shale, Mazon Creek, Illinois, USA.

Comment: Petrunkevitch (1953) considered that *Opiliotarbus kliveri* Waterlot, 1934, C. (KSK/POD), did not belong in this family.

F. HETEROTARBIDAE Petrunkevitch, 1913
C. (MYA) Terr.

First and Last (monotypic family): *Heterotarbus ovatus* Petrunkevitch, 1913, Francis Creek Shale, Mazon Creek, Illinois, USA.

Class RICINULEI Thorell, 1892

Suborder NEORICINULEI Selden, 1992

Comment: No fossil record.

Extant

Suborder PALAEORICINULEI Selden, 1992

F. CURCULIOIDIDAE Cockerell, 1916
C. (MRD–MYA) Terr.

First: *Curculioides adompha* Brauckmann, 1987, Hagen-Vorhalle, Ruhr, Germany.

Last: *Curculioides scaber* (Scudder, 1890), *Amarixys sulcata* (Melander, 1903), *A. gracilis* (Petrunkevitch, 1945a). Francis Creek Shale, Mazon Creek, Illinois, USA.

Intervening: MEL.

F. POLIOCHERIDAE Scudder, 1884
C. (MEL–MYA) Terr.

First: *Terpsicron alticeps* (Pocock, 1911), Coseley, Dudley, England, UK.

Last: *Poliochera punctulata* Scudder, 1884, *P. glabra* Petrunkevitch, 1913, Francis Creek Shale, Mazon Creek, Illinois, USA.

Class ACARI Latreille, 1802

A review of the classification of the mites in relation to the fossil record was given by Bernini (1986). Acari are divided fundamentally into two major divisions: Actinotrichida and Anactinotrichida, which some authors (e.g. van der Hammen, 1989) considered to be separate arachnid lineages whose common features (small size, modes of life) are due to convergence. For convenience, they are treated as a whole here; the classification of Lindquist (1984) is followed, with the alternative names used by van der Hammen and others in parentheses.

Intervening: Undescribed mites were reported from Lebanon amber, K. (BER-APT), by Whalley (1980).

Order ACTINOTRICHIDA Oudemans, 1931
(ACARIFORMES Zachvatkin, 1952)

Suborder ACTINEDIDA van der Hammen, 1968
(PROSTIGMATA Kramer, 1877)

F. NANORCHESTIDAE Grandjean, 1937
D. (PRA)-Rec. Terr.

First: *Protospeleorchestes pseudoprotacarus* Dubinin, 1962, Rhynie Chert, Aberdeenshire, Scotland, UK. **Extant**

F. PACHYGNATHIDAE Kramer, 1877
D. (PRA)-Rec. Terr.

First: *Protacarus crani* Hirst, 1923, *Pseudoprotacarus scoticus* Dubinin, 1962, *Palaeotydeus devonicus* Dubinin, 1962, *Paraprotacarus hirsti* Dubinin, 1962, Rhynie Chert, Aberdeenshire, Scotland, UK. **Extant**

Comment: These mites were scattered across three families by Dubinin (1962), but Kethley (in Kethley *et al.*, 1989 and Norton *et al.*, 1989) suggested the need for restudy of this material, and considered them all to belong in the Pachygnathidae.

F. ALICORHAGIIDAE Grandjean, 1939
D. (GIV)-Rec. Terr.

First: *Archaeacarus dubinini* Kethley and Norton, 1989, Gilboa mudstones, Gilboa, New York, USA. **Extant**

F. TYDEIDAE Kramer, 1877
K. (CON/SAN)-Rec. Terr.

First: Possible tydeid larva, amber of Taimyr Peninsula, former USSR (Bulanova-Zakhvatkina, 1974). **Extant**

F. BDELLIDAE Dugès, 1834 K. (CMP)-Rec. Terr.

First: *Bdella vetusta* Ewing, 1937, Manitoban amber, Canada. **Extant**

Intervening: RUP.

F. ERYTHRAEIDAE Oudemans, 1902
T. (RUP)-Rec. Terr.

First: *Erythraeus foveolatus* Koch and Berendt, 1854, *E. longipes* Koch and Berendt, 1854, *E. illustris* Koch and Berendt, 1854, *E. incertus* Koch and Berendt, 1854, *E. hirsutissimus* Koch and Berendt, 1854, *E. raripilus* Koch and Berendt, 1854, *E. lagopus* Koch and Berendt, 1854, *E. proavus* Koch and Berendt, 1854, *Arythaena troguloides* Menge, 1854, Baltic amber. **Extant**

F. TROMBIDIIDAE Leach, 1815
T. (RUP)-Rec. Terr.

First: *Trombidium clavipes* Koch and Berendt, 1854, T.

saccatum Koch and Berendt, 1854, *T. scrobiculatum* Menge, 1854, *T. heterotrichum* Menge, 1854, *T. crassipes* Menge, 1854, *T. granulatum* Menge, 1854, Baltic amber. **Extant**

F. ANYSTIDAE Oudemans, 1902
T. (RUP)-Rec. Terr.

First: *Anystis venustula* Koch and Berendt, 1854, Baltic amber. **Extant**

F. CHEYLETIDAE Leach, 1815
T. (AQT)-Rec. Terr.

First: *Cheyletus burmiticus* (Cockerell, 1917), Burmese amber. **Extant**

F. TETRANYCHIDAE Donnadieu, 1875
T. (RUP)-Rec. Terr.

First: *Tetranychus gibbus* Koch and Berendt, 1854, Baltic amber. **Extant**

F. ERIOPHYIDAE Nalepa, 1898
T. (CHT)-Rec. Terr. (phytoparasites)

First: *Eriophyes daphnogene* Ambrus and Hably, 1979, Hungary. **Extant**

Suborder ACARIDIDA Latreille, 1802
(ASTIGMATA Canestrini, 1891)

F. ACARIDAE Ewing and Nesbitt, 1942
T. (RUP)-Rec. Terr., parasitic

First: *Acarus rhombeus* Koch and Berendt, 1854, Baltic amber. **Extant**

Intervening: CHT, TOR.

F. LISTROPHORIDAE Canestrini, 1892
T. (CHT)-Rec. Terr. (ectoparasitic)

First: unnamed listrophorid, Dominican amber (Poinar, 1988). **Extant**

Suborder ORIBATIDA Michael, 1884
(CRYPTOSTIGMATA Canestrini, 1891)

The vast majority of known fossil mites belong to this suborder. These animals are characterized by a hard cuticle which allows their preservation, often in large numbers, in certain sedimentary environments. Many are known from Quaternary deposits (especially freshwater forms), but for the most part these have not been included here; the families to which they belong generally have a pre-Quaternary history.

Division ENARTHRONOTA Grandjean, 1947

F. DEVONACARIDAE Norton, 1988
D. (GIV) Terr.

First and Last (monotypic family): *Devonacarus sellnicki* Norton, 1988, Gilboa mudstones, New York, USA.

F. PROTOCHTHONIIDAE Norton, 1988
D. (GIV) Terr.

First and Last (monotypic family): *Protochthonius gilboa* Norton, 1988, Gilboa mudstones, New York, USA.

Division MIXONOMATA Grandjean, 1969

Superfamily PHTHIRACAROIDEA Perty, 1841

F. PHTHIRACARIDAE Perty, 1841
T. (RUP)-Rec. Terr.

- First:** *Hoploclerema multipunctatum* Sellnick, 1918, Baltic amber. **Extant**
- Superfamily** EUPHITHIRACAROIDEA Jacot, 1930
- F. ORIBOTRITIIDAE Grandjean, 1954
T. (RUP)–Rec. Terr.
- First:** *Oribotritia translucida* Sellnick, 1931, *O. pyropus* (Sellnick, 1918), Baltic amber. **Extant**
- Division** DESMONOMATA Woolley, 1973
- Superfamily** CROTONIOIDEA Thorell, 1876
- F. NOTHRIDAE Berlese, 1896
T. (RUP)–Rec. Terr.
- First:** *Nothrus illautus* Sellnick, 1918, Baltic amber. **Extant**
- F. CAMISIIDAE Oudemans, 1900
K. (CON/SAN)–Rec. Terr.
- First:** *Eocamisia sukatshevae* Bulanova-Zakhvatkina, 1974, amber of Taimyr Peninsula, former USSR. **Extant**
- Intervening:** RUP, PLE/HOL, HOL.
- F. TRHYPOCHTHONIIDAE Willmann, 1931
J. (OXF/TTH)–Rec. Terr.
- First:** *Palaeochthonius krasilovi* Krivolutsky and Ryabinin, 1976, *Juracarus serratus* Krivolutsky and Ryabinin, 1976, Burea River, Far East of former USSR. **Extant**
- Intervening:** RUP.
- Superfamily** HERMANNIOIDEA Sellnick, 1928
- F. HERMANNIIDAE Sellnick, 1928
Q. (PLE)–Rec. Terr.
- First:** *Hermannia gigantea* Sitnikova, 1975, Anabar River, Siberia, former USSR. **Extant**
- Intervening:** HOL.
- Division** BRACHYPYLINA Hull, 1918
- Superfamily** HERMANNIELLOIDEA Grandjean, 1934
- F. HERMANNIELLIDAE Grandjean, 1934
T. (RUP)–Rec. Terr.
- First:** *Hermannella concamerata* Sellnick, 1931, *H. tuberculata* Sellnick, 1918, Baltic amber. **Extant**
- Superfamily** LIODOIDEA Grandjean, 1934
- F. LIODIDAE Grandjean, 1934
T. (RUP)–Rec. Terr.
- First:** *Liodes quadriscutatus* Sellnick, 1918, *Platyliodes ensigerus* (Sellnick, 1918), *Embolocarus pergratus* Sellnick, 1918, Baltic amber. **Extant**
- Superfamily** PLATEREMAEOIDEA Trägårdh, 1931
- F. GYMNODAMAEIDAE Grandjean, 1954
K. (SAN/CMP)–Rec. Terr.
- First:** Unnamed gymnodamaeid, Canadian amber (McAlpine and Martin, 1963). **Extant**
- Intervening:** RUP.
- F. PLATEREMAEIDAE Trägårdh, 1931
K. (CON/SAN)–Rec. Terr.
- First:** *Rasnitsynella punctulata* Bulanova-Zachvatina, 1974, Taimyr Peninsula, former USSR. **Extant**
- F. DAMAEIDAE Berlese, 1896
T. (RUP)–Rec. Terr.
- First:** *Damaeus? genadensis* Sellnick, 1931, Baltic amber. **Extant**
- Intervening:** CHT, TOR, ?PLE/HOL.
- Superfamily** CEPHEOIDEA Berlese, 1896
- F. CEPHEIDAE Berlese, 1896
T. (RUP)–Rec. Terr. (see Fig. 17.3)
- First:** *Cepheus implicatus* (Sellnick, 1918), Baltic amber. **Extant**
- Superfamily** EREMAEOIDEA Sellnick, 1928
- F. EREMAEIDAE Sellnick, 1928
T. (RUP)–Rec. Terr.
- First:** *Eremaeus oblongus* C. L. Koch, 1836, Baltic amber. **Extant**
- Intervening:** CHT, ?PLE/HOL.
- Superfamily** GUSTAVIOIDEA Oudemans, 1900
- F. XENILLIDAE Woolley and Higgins, 1966
T. (RUP)–Rec. Terr.
- First:** *Xenillus tegeocraniformis* (Sellnick, 1918), Baltic amber. **Extant**
- F. ASTEGISTIDAE Balogh, 1961
J. (OXF–TTH)–Rec. Terr.
- First:** *Cultroribula jurassica* Krivolutsky and Ryabinin, 1976, Burea River, Far East of former USSR. **Extant**
- Intervening:** RUP.
- F. METRIOPPIIDAE Balogh, 1943
T. (RUP)–Rec. Terr.
- First:** *Ceratoppia bipilis* (Hermann, 1804), Baltic amber. **Extant**
- Intervening:** PIA, PLE, HOL.
- Superfamily** CARABODOIDEA C. L. Koch, 1837
- F. CARABODIDAE C. L. Koch, 1837
T. (RUP)–Rec. Terr.
- First:** *Carabodes gerberi* Sellnick, 1931, *C. dissonus* Sellnick, 1931, *C. coriaceus* C. L. Koch, 1836, *C. labyrinthicus* (Michael, 1879), *Plategeocranus sulcatus* (Karsch, 1884), *Scutoribates perornatus* Sellnick, 1918, *Odontocephus? sp.*, Baltic amber. **Extant**
- Intervening:** TOR.
- F. OTOCEPHEIDEA Balogh, 1961
T. (RUP)–Rec. Terr.
- First:** *Otocephus niger* Sellnick, 1931, *O. praesignis* Sellnick, 1931, Baltic amber. **Extant**
- Superfamily** TECTOCEPHEOIDEA Grandjean, 1954
- F. TECTOCEPHEIDAE Grandjean, 1954
T. (RUP)–Rec. Terr.
- First:** *Tectocephus similis* Sellnick, 1931, Baltic amber. **Extant**
- Superfamily** OPPIOIDEA Grandjean, 1951
T. (RUP)–Rec. Terr.

- First:** *Jureremus foveolatus* Krivolutsky and Ryabinin, 1976, Burea River, Far East of former USSR. **Extant**
Intervening: RUP, CHT.
- F. MICREREMIDAE Grandjean, 1954
 T. (RUP)–Rec. Terr.
- First:** *Micreremus scrobiculatus* Sellnick, 1931, *M. reticulatus* Sellnick, 1931, Baltic amber. **Extant**
- Superfamily** LICNEREMAEOIDEA Grandjean, 1931
- F. LICNEREMAEIDAE Grandjean, 1931
 T. (RUP)–Rec. Terr.
- First:** *Licneremaeus fritschi* Sellnick, 1931, Baltic amber. **Extant**
- Superfamily** ORIPODOIDEA Jacot, 1925
- F. ORIPODIDAE Jacot, 1925
 T. (RUP)–Rec. Terr.
- First:** *Oripoda baltica* Sellnick, 1931, Baltic amber. **Extant**
Intervening: CHT.
- F. SCHELORIBATIDAE Grandjean, 1933
 T. (RUP)–Rec. Terr.
- First:** *Scheloribates areatus* Sellnick, 1931, *S. setatus* Sellnick, 1931, Baltic amber. **Extant**
- F. ORIBATULIDAE Thor, 1929
 K. (CMP)–Rec. Terr.
- First:** Unnamed oribatulid, Manitoban amber, Canada (McAlpine and Martin, 1963). **Extant**
Intervening: YPR–PRB, RUP, CHT, PLE.
- F. HAPLOZETIDAE Grandjean, 1936
 T. (RUP)–Rec. Terr.
- First:** *Protoribates longipilis* Sellnick, 1931, Baltic amber. **Extant**
- F. PARAKALUMNIDAE Grandjean, 1936
 T. (RUP)–Rec. Terr.
- First:** *Neoribates borussicus* Sellnick, 1931, Baltic amber. **Extant**
- Superfamily** CERATOZETOIDEA Jacot, 1925
- F. CHAMOBATIDAE Grandjean, 1954
 T. (RUP)–Rec. Terr.
- First:** *Chamobates difficilis* Sellnick, 1931, Baltic amber. **Extant**
- F. EUZETIDAE Grandjean, 1954
 T. (RUP)–Rec. Terr.
- First:** *Euzetes convexulus* (Koch and Berendt, 1854), Baltic amber. **Extant**
- F. CERATOZETIDAE Jacot, 1925
 T. (RUP)–Rec. Terr.
- First:** *Melanozetes foderatus* Sellnick, 1931, *M. mollicomus* (C. L. Koch, 1839), *Sphaerozetes convexulus* (Koch and Berendt, 1854), *S. primus* Sellnick, 1931, Baltic amber. **Extant**
Intervening: PLE, HOL.
- F. MYCOBATIDAE Grandjean, 1954
 Q. (PLE)–Rec. Terr.
- First:** *Mycobates* sp., Anabar River, former USSR (Golosoვა et al., 1985). **Extant**
Intervening: HOL.
- Superfamily** PHENOPELOPOIDEA Petrunkevitch, 1955
- F. PHENOPELOPIDAE Petrunkevitch, 1955
 T. (RUP)–Rec. Terr.
- First:** *Phenopelops punctulatus* (Sellnick, 1931), *Notaspis* sp., Baltic amber. **Extant**
- F. UNDULORIBATIDAE Kunst, 1971
 Q. (PLE)–Rec. Terr.
- First:** *Scutozetes lanceolatus* (Hammer, 1952), Anabar River, Siberia, former USSR. **Extant**
Intervening: HOL.
- Superfamily** ORIBATELLOIDEA Jacot, 1925
- F. ORIBATELLIDAE Jacot, 1925
 T. (RUP)–Rec. Terr.
- First:** *Oribatella mirabilis* Sellnick, 1931, *Tectoribates parvus* Sellnick, 1931, Baltic amber. **Extant**
- Superfamily** ACHIPTERIOIDEA Thor, 1929
- F. ACHIPTERIIDAE Thor, 1929
 J. (OXF–TTH)–Rec. Terr.
- First:** *Achipteria? obscura* Krivolutsky and Ryabinin, 1976, Far East of former USSR. **Extant**
Intervening: PLE, HOL.
- Superfamily** GALUMNOIDEA Jacot, 1925
- F. GALUMNIDAE Jacot, 1925
 T. (RUP)–Rec. Terr.
- First:** *Galumna clavata* Sellnick, 1931, *Galumna diversa* Sellnick, 1931, Baltic amber. **Extant**
- Order** ANACTINOTRICHIDA Oudemans, 1931
- Suborder** OPILIOACARIDA With, 1902 (NOTOSTIGMATA With, 1904) Terr.
 No fossil record. **Extant**
- Suborder** HOLOTHYRIDA Reuter, 1909 (TETRASTIGMATA Evans et al., 1961) Terr.
 No fossil record. **Extant**
- Suborder** IXODIDA Leach, 1815 (METASTIGMATA Canestrini, 1891)
- F. IXODIDAE Leach, 1815
 T. (YPR/LUT)–Rec. Terr. (ectoparasites)
- First:** *Ixodes tertiarius* Scudder, 1890, Green River Formation, Wyoming, USA. **Extant**
Intervening: PLE.
- Suborder** GAMASIDA Leach, 1815 (MESOSTIGMATA Canestrini, 1891)
- F. PHYTOSEIIDAE Berlese, 1916
 T. (RUP)–Rec. Terr.
- First:** *Seius bdelloides* Koch and Berendt, 1854, Baltic amber. **Extant**

F. DIGAMASELLIDAE Evans, 1956

T. (CHT)–Rec. Terr.

First: *Dendrolaelaps fossilis* Hirschmann, 1971, Chiapas amber, Mexico. **Extant**

Class PALPIGRADI Thorell, 1888

F. STERNARTHRONIDAE Haase, 1890

J. (TTH) Terr.

First and Last (monotypic family): *Sternarthron zitteli* Haase, 1890, Lithographic Limestone, Solnhofen, Germany.

Comment: These fossils require restudy to check their identification as palpigrades (Rowland and Sissom, 1980).

F. EUKOENENIIDAE Petrunkevitch, 1955

T. (?ZAN/PIA)–Rec. Terr./?Mar.

First: *Paleoekoenenia mordax* Rowland and Sissom, 1980, 'Onyx Marble', Bonner Quarry, Ashfork, Arizona, USA. **Extant**

Class HAPTOPODIDA Pocock, 1911 (see Fig. 17.4)

F. PLESIOSIRONIDAE Pocock, 1911

C. (CHE)–(MEL) Terr.

First: *Plesiosiro madeleyi* Pocock, 1911, Sparth Bottoms, Rochdale, England, UK.

Last: *Plesiosiro madeleyi* Pocock, 1911, Coseley, Dudley, England, UK.

Class ANTHRACOMARTIDA Karsch, 1882

F. ANTHRACOMARTIDAE Haase, 1890

C. (CHE–KLA/NOG) Terr.

First: *Cryptomartus?* sp., Kohlscheid-Schichten, Grube Carolus Magnus, Palenberg bei Aachen, Germany (Guthörl, 1964).

Last: *Pleomartus palatinus* (Ammon, 1901), Breitenbach-Schichten, Grube Steinbach bei Brücken, Pfalz, Germany.

Intervening: MEL, VRK, KSK, POD, MYA, DOR.

Class PULMONATA Firstman, 1973

Intervening: *Echosis pulchribothrium* Selden and Shear, 1991, D. (GIV), was placed as *Pulmonata incertae sedis*.

Order TRIGONOTARBIDA Petrunkevitch, 1949

S. (PRD)–C. (DOR) Terr.

First: Unnamed trigonotarbid from Ludlow Bone Bed Member, Ludford Lane, Ludlow, Shropshire, England, UK (Jeram *et al.*, 1990).

Intervening: D. (EMS), *Alkenia mirabilis* Størmer, 1970, Alken-an-der-Mosel, Germany. This was removed from Palaeocharinidae by Shear *et al.* (1987).

F. PALAEOCHARINIDAE Hirst, 1923

D. (PRA–GIV) Terr.

First: *Palaeocharinus rhyniensis* Hirst, 1923, *P. scourfieldi* Hirst, 1923, *P. calmani* Hirst, 1923, *P. kidstoni* Hirst, 1923, *P. hornei* Hirst, 1923, Rhynie Chert, Aberdeenshire, Scotland, UK.

Last: *Gilboarachne griersoni* Shear *et al.*, 1987, *Gelasinotarbus reticulatus* Shear *et al.*, 1987, *G. bonamae* Shear, *et al.*, 1987, *G. bifidus* Shear *et al.*, 1987, *G. heptops* Shear *et al.*, 1987, *Aculeatarbus depressus* Shear *et al.*, 1987, Gilboa Mudstones, Gilboa, New York, USA.

F. ANTHRACOSIRONIDAE Pocock, 1903b

C. (MEL–KSK) Terr.

First: *Anthracosiro woodwardi* Pocock, 1903, *A. fritschi* Pocock, 1903b, Shipley Clay Pit, Ilkeston, England, UK and Coseley, Dudley, England, UK.

Last: *Anthracosiro woodwardi* Pocock, 1903, Crawcrook, Ryton-on-Tyne, England, UK.

Intervening: VRK.

F. EOPHRYNIDAE Karsch, 1882

C. (HAS–MYA) Terr.

First: *Pocononia whitei* (Ewing, 1930), lower part of Pocono Formation, Allegheny, Virginia, USA.

Last: *Hemiphrynus longipes* Frič, 1901, *H. hofmanni* Frič, 1901, Nýřany, Czechoslovakia; *Gondwanarachne argentinensis* Pinto and Hünicken, 1980, Bajo de Veliz Formation, San Luis Province, Argentina.

Intervening: PND, ARN, MRD, YEA, CHE, MEL, VRK, KSK, POD.

F. TRIGONOTARBIDAE Petrunkevitch, 1949

D. (EMS)–C. (MEL) Terr.

First: *Archaeomartus levis* Størmer, 1970, and *A. tuberculatus* Størmer, 1970, Alken-an-der-Mosel, Germany.

Last: *Trigonotarbus johnsoni* Pocock, 1911, Coseley, Dudley, England, UK.

Intervening: MRD.

F. APHANTOMARTIDAE Petrunkevitch, 1945

C. (PND/ALP–KRE) Terr.

First: *Aphantomartus?* sp., Namurian A, Upper Silesian Coal Basin, Czechoslovakia (Příbyl, 1960).

Last: *Aphantomartus areolatus* Pocock, 1911, Prado Formation, borehole, Cerezal, Léon Province, Spain.

Intervening: CHE, MEL, VRK, KSK, POD, MYA.

Order ARANEAE Clerck, 1757

The classification used here is essentially the consensus scheme given in Shear (1986). The vast majority of families are first known from Baltic amber; many of the original specimens described by Koch and Berendt (1854) and Menge (*in* Koch and Berendt, 1854) have been lost or were poorly described so that available specimens cannot be matched to the descriptions (Petrunkevitch, 1958). Consequently, only those early specimens which were studied by Petrunkevitch have been included in the already lengthy lists of 'firsts'. It should be noted, too, that Petrunkevitch's work itself is in need of review, in the light of new ideas on classification, and the realization that some supposed Baltic amber is now thought to be pieces of comparatively Recent copal.

Attercopus D. (PRA) Terr./FW

First: *Attercopus fimbriunguis* (Shear, *et al.*, 1987), Gilboa Mudstones, New York, USA. Plesion: plesiomorphic sister taxon of all other spiders.

Intervening: Undescribed spiders were reported from Lebanese amber, K. (BER–APT), by Whalley (1980).

Suborder LIPHISTIOMORPHAE Pocock, 1892

F. ARTHROLYCOSIDAE Frič, 1904

C. (MEL–MYA) Terr.

First: *Eecteniza silvicola* Pocock, 1911, Coseley, Dudley, England, UK.

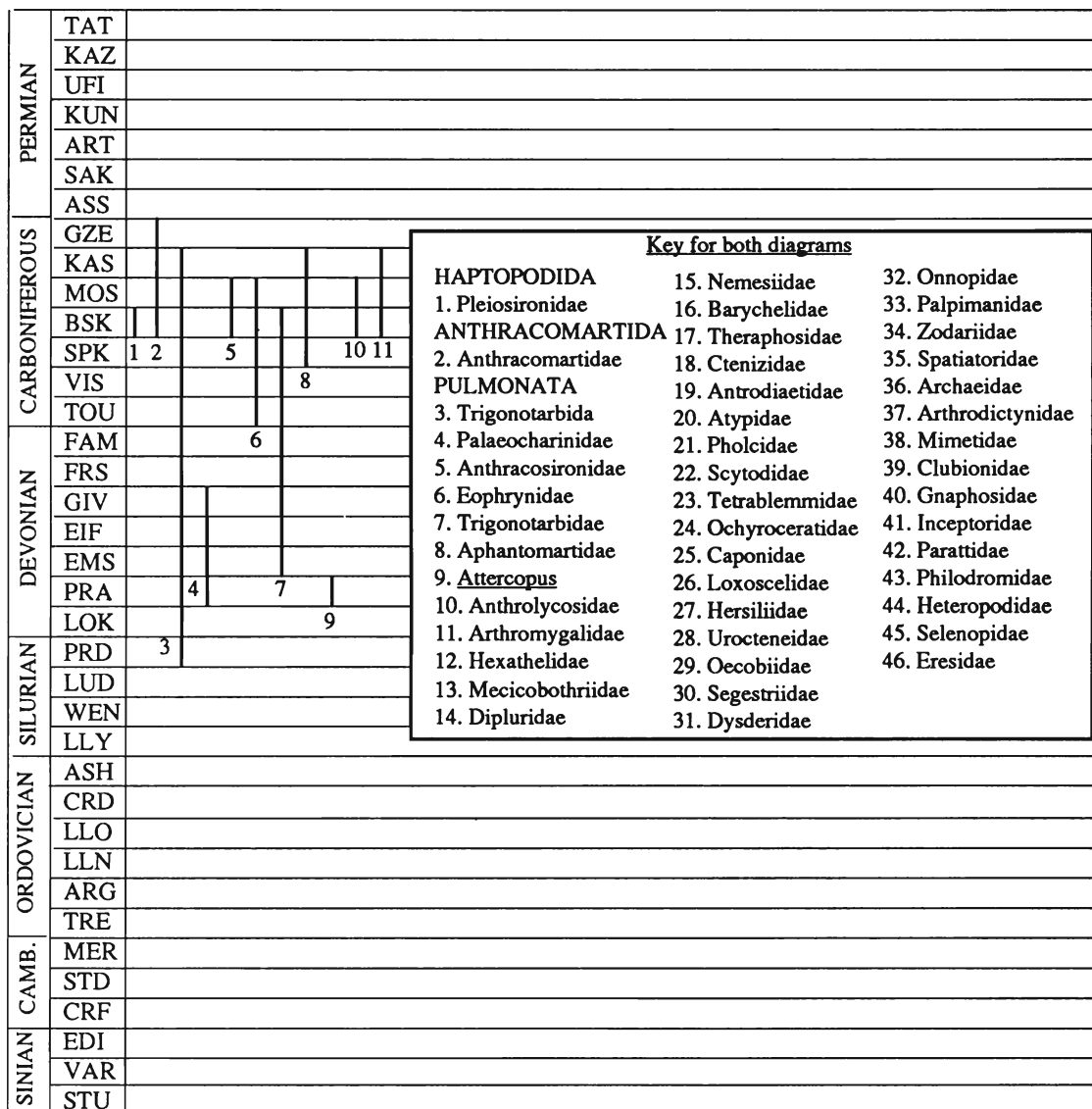


Fig. 17.4

USSR; *Cretomegahexura platnicki* Eskov and Zonshtein, 1990, Bon-Tsagan Lake, central Mongolia. **Extant**

F. DIPLURIDAE Simon, 1889
T. (RUP)–Rec. Terr.

First: *Clostes priscus* Menge, 1869, Baltic amber. **Extant**
Intervening: CHT.

F. NEMESIIDAE Simon, 1889
T. (CHT)–Rec. Terr.

First: Unnamed pycnotheline, Dominican amber (Schawaller, 1981). **Extant**

F. BARYCHELIDAE Simon, 1889
T. (CHT)–Rec. Terr.

First: *Plasistops hispaniolensis* Wunderlich, 1988, Dominican amber. **Extant**

F. THERAPHOSIDAE Thorell, 1869
T. (CHT)–Rec. Terr.

First: *Ischnocolinopsis acutus* Wunderlich, 1988, Dominican amber. **Extant**

F. CTENIZIDAE Thorell, 1887
T. (CHT)–Rec. Terr.

First: *Bolostromus destructus* Wunderlich, 1988, Dominican amber. **Extant**

F. ANTRODIAETIDAE Gertsch, 1940
K. (?ALB)–Rec. Terr.

First: *Cretacattyma raveni* Eskov and Zonshtein, 1990, Bon-Tsagan Lake, central Mongolia. **Extant**

F. ATYPIDAE Thorell, 1870 K. (?ALB)–Rec. Terr.
First: *Ambiortiphagus ponomarenkoi* Eskov and Zonshtein, 1990, Bon-Tsagan Lake, central Mongolia. **Extant**
Intervening: RUP.

Infraorder ARANEOMORPHAE Smith, 1902

The records of araneomorph spiders from Palaeozoic strata do not hold up under close scrutiny (Shear *et al.*, 1989; Selden *et al.*, 1991). These are: *Archaeometa devonica* Størmer, 1976, D. (EMS); *Archaeometa nephilina* Pocock, 1911,

Arachnometa tuberculata Petrunkevitch, 1949, C. (KSK); and *Eopholcus pedatus* Frič, 1904, C. (POD).

Superfamily PHOLCOIDEA Simon, 1874

F. PHOLCIDAE Simon, 1874

T. (RUP)–Rec. Terr.

First: *Micropholcus heteropus* Petrunkevitch, 1942, Baltic amber. **Extant**

Intervening: CHT.

F. SCYTODIDAE Blackwall, 1864 T. (CHT)–Rec. Terr.

First: *Scytodes piliformis* Wunderlich, 1988, *S. stridulans* Wunderlich, 1988, *S. planithorax* Wunderlich, 1988, Dominican amber. **Extant**

F. TETRABLEMMIDAE O. Pickard-Cambridge, 1873 T. (CHT)–Rec. Terr.

First: *Monoblemma(?) spinosum* Wunderlich, 1988, Dominican amber. **Extant**

F. OCHYROCERATIDAE Fage, 1912 T. (CHT)–Rec. Terr.

First: *Arachnolithus pygmaeus* Wunderlich, 1988, Dominican amber. **Extant**

F. CAPONIDAE Simon, 1887 T. (CHT)–Rec. Terr.

First: *Nops lobatus* Wunderlich, 1988, *N. segmentatus* Wunderlich, 1988, Dominican amber. **Extant**

F. LOXOSCELIDAE Gertsch, 1949 T. (CHT)–Rec. Terr.

First: *Loxosceles deformis* Wunderlich, 1988, *L. defecta* Wunderlich, 1988, Dominican amber. **Extant**

Superfamily HERSILIOIDEA Thorell, 1869

F. HERSILIIDAE Thorell, 1869 T. (RUP)–Rec. Terr.

First: *Hersilia miranda* Koch and Berendt, 1854, *Gerdia myura* Menge, 1854, Baltic amber. **Extant**

Intervening: CHT.

F. UROCTEIDAE Simon, 1875 T. (RUP)–Rec. Terr.

First: *Paruroctea blauvelti* Petrunkevitch, 1942, Baltic amber. **Extant**

F. OECOBIIDAE Blackwall, 1862 T. (CHT)–Rec. Terr.

First: Unnamed oecobiid, Dominican amber (Schawaller, 1981). **Extant**

Intervening: CRD.

Superfamily DYSDEROIDEA C. L. Koch, 1837

F. SEGESTRIIDAE Petrunkevitch, 1933 T. (RUP)–Rec. Terr.

First: *Segestria succinei* Berland, 1939, *S. cylindrica* Koch and Berendt, 1854, *S. cristata* Menge, 1854, *S. elongata* Koch and Berendt, 1854, *S. exarata* Menge, 1854, *S. nana* Koch and Berendt, 1854; *S. pusilla* Menge, 1854, *S. undulata* Menge, 1854; *S. tomentosa* Koch and Berendt, 1854, *S. elongata* Koch and Berendt, 1854, *S. plicata* Petrunkevitch, 1950, Baltic amber. **Extant**

Intervening: CHT.

F. DYSDERIDAE C. L. Koch, 1837

T. (RUP)–Rec. Terr.

First: *Dysdera glabrata* Menge, 1854, *D. hippopodium* Menge, 1854, *D. scobiculata* Menge, 1854, *D. tersa* Koch and Berendt, 1854, *Dasumia subita* Petrunkevitch, 1950, *Harpactes extinctus* Petrunkevitch, 1950, *Thereola petiolata* Koch and Berendt, 1854, Baltic amber. **Extant**

Intervening: CHT, ZAN/PIA.

F. OONOPIDAE Simon, 1892 T. (RUP)–Rec. Terr.

First: *Orchestina baltica* Petrunkevitch, 1942, Baltic amber. **Extant**

Intervening: CHT.

Superfamily PALPIMANOIDEA Forster and Platnick, 1984

F. PALPIMANIDAE Thorell, 1870

T. (YPR)–Rec. Terr.

First: *Protochersis spinosus* Gourret, 1886, Aix-en-Provence, France. **Extant**

Intervening: CHT.

F. ZODARIIDAE Simon, 1892

T. (RUP)–Rec. Terr.

First: *Anniculus balticus* Petrunkevitch, 1942, *Eocydrele mortua* Petrunkevitch, 1958, Baltic amber. **Extant**

F. SPATIATORIDAE Petrunkevitch, 1942

T. (RUP) Terr.

First and Last: *Spatiator praeceps* Petrunkevitch, 1942, *Adorator brevipes* Petrunkevitch, 1942, *A. samlandicus* Petrunkevitch, 1942, Baltic amber.

F. ARCHAEIDAE Koch and Berendt, 1854

(CLV–KIM)–Rec. Terr.

First: *Jurarchaea zherikhini* Eskov, 1987, Karatau Mountains, Kazakhstan, former USSR. **Extant**

Intervening: RUP.

F. ARTHRODICTYNIDAE Petrunkevitch, 1942

T. (RUP) Terr.

First and Last (monotypic family): *Arthrodictyna segmentata* Petrunkevitch, 1942, Baltic amber.

F. MIMETIDAE Simon, 1895

T. (RUP)–Rec. Terr.

First: *Ero permunda* Petrunkevitch, 1942, *E. aberrans* Petrunkevitch, 1958, *E. carboneana* Petrunkevitch, 1942, Baltic amber. **Extant**

Intervening: MES.

Superfamily CLUBIONOIDEA Simon, 1895

F. CLUBIONIDAE Simon, 1895 T. (RUP)–Rec. Terr.

First: *Ablator triguttatus* Koch and Berendt, 1854, *A. lanatus* Petrunkevitch, 1958, *Abligurator niger* Petrunkevitch, 1942, *A. felix* Petrunkevitch, 1958, *A. plumosus* Petrunkevitch, 1942, *Machilla setosa* Petrunkevitch, 1958, *Eomazax pulcher* Petrunkevitch, 1958, *Phrurolithus ipseni* Petrunkevitch, 1958, *P. extinctus* Petrunkevitch, 1958, *P. fossilis* Petrunkevitch, 1958, *Eodeter magnificus* Petrunkevitch, 1958, *Cryptoplanus? paradoxus* Petrunkevitch, 1958, *Concursator nudipes* Petrunkevitch, 1958, Baltic amber. **Extant**

Intervening: CHT, MES.

F. GNAPHOSIDAE Pocock, 1898

T. (RUP)–Rec. Terr.

First: *Eomactator mactatus* Petrunkevitch, 1958, *Captrix lineata* Koch and Berendt, 1854, Baltic amber. **Extant****Intervening:** CHT.

F. INCEPTORIDAE Petrunkevitch, 1942

T. (RUP) Terr.

First and Last (monogeneric family): *Inceptor aculeatus* Petrunkevitch, 1942, *I. dubius* Petrunkevitch, 1942, Baltic amber.

F. PARATTIDAE Petrunkevitch, 1922

T. (RUP) Terr.

First and Last (monogeneric family): *Parattus evocatus* Scudder, 1890, *P. latitatus* Scudder, 1890, *P. oculatus* Scudder, 1890, *P. resurrectus* Scudder, 1890, Florissant Shales, Colorado.**Superfamily** PHILODROMOIDEA Thorell, 1970

F. PHILODROMIDAE Thorell, 1970

T. (RUP)–Rec. Terr.

First: *Syphax asper* Petrunkevitch, 1942, *S. crassipes* Petrunkevitch, 1942, *S. fuliginosus* Koch and Berendt, 1854, *S. gracilis* Koch and Berendt, 1854, *S. hirtus* Menge, 1854, *S. megacephalus* Koch and Berendt, 1854, *Eothanatus diritatis* Petrunkevitch, 1942, Baltic amber. **Extant****Intervening:** CHT.

F. HETEROPODIDAE Thorell, 1873

T. (RUP)–Rec. Terr.

First: *Adulatrix fusca* Petrunkevitch, 1942, *A. decumana* (Koch and Berendt, 1854), *A. fusca* Petrunkevitch, 1942, *A. rufa* Petrunkevitch, 1942, *A. parva* Petrunkevitch, 1942, *Zachria restincta* Petrunkevitch, 1958, *Z. peculiata* Petrunkevitch, 1942, *Z. desiderabilis* Petrunkevitch, 1942, *Caduceator minutus* Petrunkevitch, 1942, *C. quadrimaculatus* Petrunkevitch, 1942, *Collacteus captivus* Petrunkevitch, 1942, *Eostaianus succini* Petrunkevitch, 1942, *Eostasina aculeata* Petrunkevitch, 1942, *Eoprychia succini* Petrunkevitch, 1958, Baltic amber. **Extant****Intervening:** CHT.

F. SELENOPIDAE Simon, 1897

T. (CHT)–Rec. Terr.

First: *Selenops beynai* Schawaller, 1984, Dominican amber. **Extant****Superfamily** ERESOIDEA C. L. Koch, 1837

F. ERESIDAE C. L. Koch, 1837

T. (RUP)–Rec. Terr.

First: *Eresus curtipes* Koch and Berendt, 1854, *E. monachus* Koch and Berendt, 1854, Baltic amber. **Extant****Superfamily** DICTYNOIDEA Simon, 1874

F. DICTYNIDAE Simon, 1874 T. (YPR)–Rec.

Terr. (see Fig. 17.5)

First: *Sinodictyna fushunensis* Hong, 1982, Guchengzi Formation, Fushun Coalfield, Liaoning Province, China. **Extant****Intervening:** RUP.

F. ARGYRONETIDAE Menge, 1869b

T. (BUR)–Rec. (FW)

First: *Elvina antiqua* (von Heyden, 1859) Brown Coal of Siebengebirge, Germany; *Argyroneta longipes* Heer, 1865, Switzerland. **Extant****Comment:** von Heyden placed *Elvina antiqua* in the Argyronetidae on the basis of the freshwater nature of the enclosing sediment; Petrunkevitch (1946) doubted this family assignment.

F. ANYPHAENIDAE Bertkau, 1878

T. (RUP)–Rec. Terr.

First: *Anypaena fuscata* Koch and Berendt, 1854, Baltic amber. **Extant****Intervening:** CHT.

F. HAHNIIDAE Bertkau, 1878

T. (RUP)–Rec. Terr.

First: *Eohahnia succini* Petrunkevitch, 1958, Baltic amber. **Extant****Superfamily** AGELENOIDEA Simon, 1898

F. AGELENIDAE Simon, 1898

T. (RUP)–Rec. Terr.

First: *Eocryphoea gracilipes* (Koch and Berendt, 1854), *E. distincta* (Petrunkevitch, 1942), *E. fossilis* (Petrunkevitch, 1942), *Myro extinctus* Petrunkevitch, 1942, *M. hirsutus* Petrunkevitch, 1942, *Mastigusa acuminata* Menge, 1854, *M. Modesta* Wunderlich, 1986 Baltic amber. **Extant****Intervening:** CHT, TOR/MES, MES.

F. AMAUROBIIDAE L. Koch, 1868

T. (RUP)–Rec. Terr.

First: *Amaurobius succini* Petrunkevitch, 1942, *Auximus succini* Petrunkevitch, 1942, *A. fossilis* Petrunkevitch, 1942, Baltic amber. **Extant****Intervening:** CHT.

F. INSECUTORIDAE Petrunkevitch, 1942

T. (RUP) Terr.

First and Last (monogeneric family): *Insecutor aculeatus* Petrunkevitch, 1942, *I. mandibulatus* Petrunkevitch, 1942, *I. rufus* Petrunkevitch, 1942, Baltic amber.**Superfamily** LYCOSOIDEA Sundevall, 1833

F. LYCOSIDAE Sundevall, 1833

T. (RUP)–Rec. Terr.

First: *Lycosa florissanti* Petrunkevitch, 1922, Florissant Shales, Colorado, USA. **Extant****Intervening:** TOR/MES.

F. PSECHRIDAE Simon, 1892

T. (RUP)–Rec. Terr.

First: *Eomatachia latifrons* Petrunkevitch, 1942, Baltic amber. **Extant**

F. CTENIDAE T. (CHT)–Rec. Terr.

First: *Nanoctenus longipes* Wunderlich, 1988, Dominican amber. **Extant**

F. OXYOPIDAE Thorell, 1870 T. (RUP)–Rec. Terr.

First: *Oxyopes succini* Petrunkevitch, 1958, Baltic amber. **Extant****Intervening:** CHT.

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	ART	
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CARBONIFEROUS	ASS	
	GZE	
	KAS	
	MOS	
	BSK	
	SPK	
DEVONIAN	VIS	
	TOU	
	FAM	
	FRS	
	GIV	
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Key for both diagrams

1. Dictynidae	13. Pisauridae	25. Anapidae
2. Argyronetidae	14. Thomisidae	26. Juraraneidae
3. Anyphaenidae	15. Salticidae	27. Theridiidae
4. Hahniidae	16. <u>Palaeouloborus</u>	28. Nesticidae
5. Agelenidae	17. Uloboridae	29. Adjutoridae
6. Amaurobiidae	18. Araneidae	30. Ephalmatoridae
7. Insecutoridae	19. Linyphiidae	31. Thelyphonidae
8. Lycosidae	20. Metidae	32. Calcitronidae
9. Psechridae	21. Acrometidae	33. Schizomidae
10. Ctenidae	22. Tetragnathidae	34. <u>Graeophonus</u>
11. Oxyopidae	23. Theridiosomatidae	35. Phrynidae
12. Zoropsidae	24. Symphytognathidae	36. Electrophrynidae

Fig. 17.5

Superfamily DEINOPOIDEA C. L. Koch, 1851
Palaeouloborus K. (BER/VLG) Terr.

First: *Palaeouloborus lacasae* Selden, 1990, lithographic limestone, Sierra de Montsech, Lérida Province, Spain.

Comment: Although not assigned to a family, this fossil bears a greater similarity to the Uloboridae than to any other extant spider family.

F. ULOBORIDAE Simon, 1892
 T. (CHT)–Rec. Terr.

First: *Miagrammopes* sp., Dominican amber (Schawaller, 1982; Wunderlich, 1988). **Extant**

Superfamily ARANEOIDEA Latreille, 1806

Intervening: *Cretaraneus vilaltae* Selden, 1990a, K. (BER/VAL), lithographic limestone, Sierra de Montsech, Lérida Province, Spain, was referred to Araneidea but without a family assignation; it probably belongs in Theridiidae or Linyphiidae.

F. ARANEIDAE Leach, 1819 T. (LUT)–Rec. Terr.
First: unnamed Araneidae, oil shales, Grube Messel, Darmstadt, Germany (Wunderlich, 1986).
Intervening: RUP, CHT, TOR/MES, MES, ZAN/PIA.

Extant

F. LINYPHIIDAE Dahl, 1913 T. (RUP)–Rec. Terr.
First: *Impulsor neglectus* Petrunkevitch, 1942, *I. mutilus*

Petrunkévitch, 1958, *Liticen setosus* Petrunkevitch, 1942, *Mystagogus glaber* Petrunkevitch, 1942, *Custodela cheiracantha* (Koch and Berendt, 1854), *Eopopino longipes* Petrunkevitch, 1942, *Linyphia oblonga* Koch and Berendt, 1854, *Malleator niger* Petrunkevitch, 1942, *Meditrina circumvallata* Petrunkevitch, 1942, *Mystagogus dubius* Petrunkevitch, 1942, *M. glaber* Petrunkevitch, 1942, *Obnisus tenuipes* Petrunkevitch, 1942, Baltic amber. **Extant**

Intervening: CHT, MES.

F. METIDAE Simon, 1892 T. (RUP)–Rec. Terr.

First: *Memoratrix rydei* Petrunkevitch, 1942, *Eometa samlandica* Petrunkevitch, 1958, *E. longipes* Petrunkevitch, 1958, *E. aberrans* Petrunkevitch, 1958, *E. robusta* Petrunkevitch, 1958, *Priscometa tenuipes* Petrunkevitch, 1958, Baltic amber. **Extant**

Intervening: CHT.

F. ACROMETIDAE Wunderlich, 1979
T. (RUP) Terr.

First: *Acrometa cristata* Petrunkevitch, 1942, *A. samlandica* (Petrunkevitch, 1942), *A. minutum* (Petrunkevitch, 1942), *A. robustum* (Petrunkevitch, 1942), *E. succini* Petrunkevitch, 1942, *A. setosus* (Petrunkevitch, 1942), *Pseudoacrometa gracilipes* Wunderlich, 1986, *Anandrus inermis* (Petrunkevitch, 1942), *A. redemptus* (Petrunkevitch, 1958), *A. quaesitus* (Petrunkevitch, 1958), *Cornuanandrus maior* Wunderlich, 1986, Baltic amber.

F. TETRAGNATHIDAE Menge, 1866
K. (BER/VAL)–Rec. Terr.

First: *Macryphantes cowdeni* Selden, 1990a, lithographic limestone, Sierra de Montsech, Lérida Province, Spain. **Extant**

Intervening: CHT.

F. THERIDIOSOMATIDAE Simon, 1895
T. (RUP)–Rec. Terr.

First: *Cyclososoma succini* Petrunkevitch, 1958, Baltic amber. **Extant**

Intervening: CHT.

F. SYMPHYTOGNATHIDAE Hickman, 1931
T. (CHT)–Rec. Terr.

First: Unnamed symphytognathid, Dominican amber (Schawaller, 1981). **Extant**

F. ANAPIDAE T. (CHT)–Rec. Terr.

First: *Palaeoanapis nana* Wunderlich, 1988, Dominican amber. **Extant**

F. JURARANEIDAE Eskov, 1984 (AAL/BAJ) Terr.

First and Last (monotypic family): *Juraraneus rasnitsyni* Eskov, 1984, Mukhor-Shibir, near Novospasskoye, Buryat, Siberia, former USSR.

F. THERIDIIDAE Sundevall, 1833
T. (RUP)–Rec. Terr.

First: *Theridion simplex* Koch and Berendt, 1854, *T. alutaceum* Koch and Berendt, 1854, *T. detersum* Koch and Berendt, 1854, *T. granulatum* Koch and Berendt, 1854, *T. hirtum* Koch and Berendt, 1854, *T. ovale* Koch and Berendt, 1854, *T. ovatum* Koch and Berendt, 1854, *Flegia longimana* Koch and Berendt, 1854, *F. succini* Petrunkevitch, 1942, *Mysmena succini* (Petrunkevitch, 1942), *Municeps minutus* Petrunkevitch,

1942, *M. pulcher* (Petrunkevitch, 1942), *Mictodipoena stridula* (Petrunkevitch, 1958), *Dipoena infulata* (Koch and Berendt, 1854), *Eomysmena moritura* Petrunkevitch, 1942, *E. bassleri* (Petrunkevitch, 1942), *E. baltica* (Petrunkevitch, 1946), *E. stridens* Petrunkevitch, 1958, *Nactodipoena dunbari* Petrunkevitch, 1942, *Steatoda succini* Petrunkevitch, 1942, *Eodipoena oculata* Petrunkevitch, 1942, *E. consultata* Petrunkevitch, 1958, *E. germanica* Petrunkevitch, 1958, *E. kaestneri* Petrunkevitch, 1958, *E. nielseni* Petrunkevitch, 1958, *E. regalis* Petrunkevitch, 1958, *Nanomysmena gracilis* Petrunkevitch, 1958, *N. aculeata* Petrunkevitch, 1958, *N. munita* Petrunkevitch, 1958, *Astodipoena crassa* Petrunkevitch, 1958, *Lithyphantes anticus* Berland, 1939, Baltic amber. **Extant**

Intervening: CHT, MES.

F. NESTICIDAE T. (RUP)–Rec. Terr.

First: *Eopopino inopinatus* Wunderlich, 1986, *E. rarus* Wunderlich, 1986, *E. longipes* Petrunkevitch, 1942, *Balticonesticus flexuosus* Wunderlich, 1986, *Heteronesticus magnoparacymbialis* Wunderlich, 1986, Baltic amber. **Extant**

Intervening: CHT.

F. ADJUTORIDAE Petrunkevitch, 1942
T. (RUP) Terr.

First and Last: *Adjutor mirabilis* Petrunkevitch, 1942, *A. deformis* Petrunkevitch, 1958, *Ajunctor similis* Petrunkevitch, 1942, *Admissor aculeatus* Petrunkevitch, 1942, Baltic amber.

F. EPHALMATORIDAE Petrunkevitch, 1958
T. (RUP) Terr.

First and Last (monotypic family): *Ephalmator eximius* Petrunkevitch, 1958, *E. fossilis* Petrunkevitch, 1958, Baltic amber.

Order UROPYGI Thorell, 1882

F. THELYPHONIDAE Lucas, 1835
C. (MRD)–Rec. Terr.

First: *Prothelyphonus naufragus* Brauckmann and Koch, 1983, Hagen-Vorhalle, Ruhr, Germany. **Extant**

Intervening: CHE, MEL, KSK, MYA, ?ZAN/PIA.

Order SCHIZOMIDA Petrunkevitch, 1945

F. CALCITRONIDAE Petrunkevitch, 1945
T. (?ZAN/PIA) Terr.

First and Last: *Calcitro fisheri* Petrunkevitch, 1945, *Onychothelyphonus bonneri* Pierce, 1950, 'Onyx Marble', Bonner Quarry, Ashfork, Arizona.

F. SCHIZOMIDAE Chamberlin, 1922
T. (?ZAN/PIA)–Rec. Terr.

First: *Calcoschizomus latisternum* Pierce, 1951, 'Onyx Marble', Bonner Quarry, Ashfork, Arizona, USA. **Extant**

Order AMBLYPYGI Thorell, 1882

First: *Graeophonus anglicus* Pocock, 1911, C. (MEL) Coseley, near Dudley, England, UK.

Intervening: KSK, MYA.

Suborder APULVILLATA Quintero, 1986

F. PHRYNIDAE Wood, 1863 T. (CHT)–Rec. Terr.

First: *Phrynus resinae* Schawaller, 1979, Dominican amber. **Extant**

Suborder PULVILLATA Quintero, 1986**F. ELECTROPHRYNIDAE** Petrunkevitch, 1971

T. (CHT) Terr.

First and Last (monotypic family): *Electrophrynus mirus* Petrunkevitch, 1971, Chiapas amber, Mexico.**REFERENCES**

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