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ARTHROPODA 4

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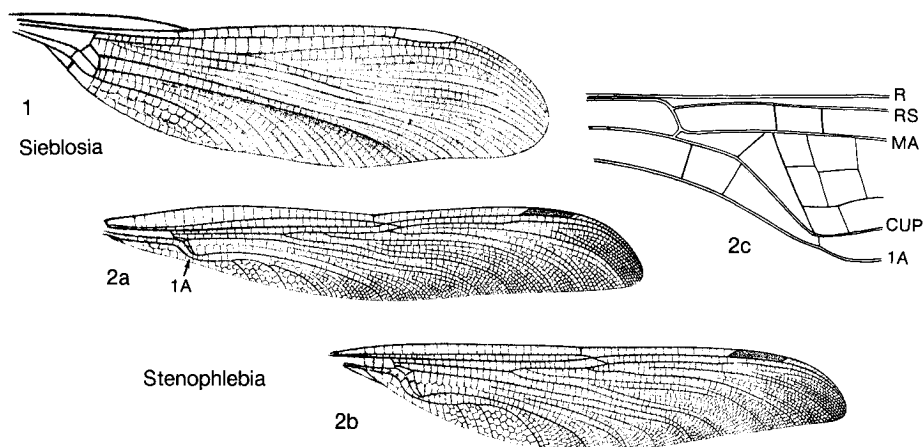


FIG. 54. Stenophlebiidae and Uncertain (p. 88–89).

tenevi; OD]. Wing fragment, with few crossveins and weak pterostigma. Probably protozygopterous. [Type of family Kaltanoneuridae ROHDENDORF.] *Perm.*, USSR (European RSFSR).

Kargalotypus ROHDENDORF, 1962a, p. 72 [**Megatypus kargalensis* MARTYNOV, 1932, p. 19; OD]. Little-known genus, based on apical wing fragment. SC extending about two-thirds wing length from base; pterostigma absent. PRITYKINA, 1981. *Perm.*, USSR (Asian RSFSR).

Magnasupplephlebia ZEISSIN, 1982, p. 105 [**M. kallweita*; OD]. Little-known genus, based on apical wing fragment. *Jur.*, Europe (Germany).

Mesonetopsis PING, 1935, p. 112 [**M. zeni*; OD]. Little-known nymph, probably anisopterous. *Jur.*, China (Xinjiang).

Mesophlebia TILLYARD in TILLYARD & DUNSTAN, 1916, p. 24 [**M. antinodalis*; OD]. Little-known genus, based on small wing fragment, including nodal area. [Type of family Mesophlebiidae TILLYARD, 1916; originally placed in Anisoptera.] PRITYKINA, 1981. *Trias.*, Australia (New South Wales).

Orthaeschnites HAUPT, 1956, p. 31 [**O. primus*; OD]. Little-known genus, based on small wing fragment. *Eoc.*, Europe (Germany).

Palaeophlebia BRAUER, REDTENBACHER, & GANGLBAUER, 1889, p. 6 [**P. synlestoides*; OD]. Little-known wing fragment. *Jur.*, USSR (Asian RSFSR).

Samarura BRAUER, REDTENBACHER, & GANGLBAUER, 1889, p. 7 [**S. gigantea*; SD COWLEY, 1934b, p. 253]. Little-known nymphs. HANDLIRSCH, 1906b. *Jur.*, USSR (Asian RSFSR).

Sieblosia HANDLIRSCH, 1907, p. 896 [**Heterophlebia jucunda* HAGEN, 1858a, p. 121; OD]. Little-known genus, based on poorly preserved wing, with closed discoidal cell and weakly developed nodus much nearer to arculus than to pterostigma. [Type of family Sieblosiidae HANDLIRSCH,

1907; placed by HANDLIRSCH in the Anisozygoptera.] *Oligo.*, Europe (Germany).—FIG. 54, 1. **S. jucunda* (HAGEN); fore(?) wing, $\times 1.8$ (Hagen, 1858a).

Syrrhoë BODE, 1953, p. 69 [**S. commissa*; OD]. Wing fragment. *Jur.*, Europe (Germany).

Infraclass PALAEOPTERA Order UNCERTAIN

The following genera, apparently belonging to the infraclass Palaeoptera, are too poorly known to permit assignment to orders.

Aedoeophasma SCUDDER, 1885g, p. 265 [**A. anglica*; OD]. Little-known genus, based on distal fragment of wing. [Placed by SCUDDER (1885g), HANDLIRSCH (1906b, 1919b), and BOLTON (1916, 1917b) in the Palaeodictyoptera, *incertae sedis*, but transferred to the Protodonata, *incertae sedis*, by HANDLIRSCH (1922).] *U. Carb.*, England.

Archaeoptilites HANDLIRSCH, 1919b, p. 534 [**Archaeoptilus lucasi* BRONGNIART, 1885a, p. 60; OD]. Little-known genus, based on very small fragment of wing. [Originally placed in the Palaeodictyoptera.] BRONGNIART, 1893; HANDLIRSCH, 1922. *U. Carb.*, Europe (France).

Archaeoptilus SCUDDER, 1881b, p. 295 [**A. ingens*; OD]. Little-known genus, based on small fragment of large wing. [Type of the family Archaeoptilidae HANDLIRSCH, 1906b. Originally considered by SCUDDER to be "neuropterous," this genus was subsequently (1883b) placed by him in the orthopteroid complex. However, HANDLIRSCH (1906b) and BOLTON (1925) were of the opinion that it was more likely a member of the Palaeodictyoptera.] *U. Carb.*, England.

Bardapteron ZALESSKY, 1944a, p. 342 [**B. ovale*;

- OD]. Little-known genus, based on fragment of wing. [Type of the family Bardapteridae ZALESSKY, 1944a. Originally placed in a new order, Permodyctoptera, but transferred by ROHDENDORF (1962a) to the Palaeodictyoptera.] *Perm.*, USSR (European RSFSR).
- Breyeriodes** HANDLIRSCH, 1906b, p. 118 [**B. klivieri*; OD]. Little-known genus, based on small fragment of wing. [Originally placed in the Palaeodictyoptera, *incertae sedis*.] HANDLIRSCH, 1919b, 1922. *U. Carb.*, Europe, (Germany).
- Campteroneura** HANDLIRSCH, 1906a, p. 685 [**C. reticulata*; OD]. Little-known genus, based on small fragment of wing. HANDLIRSCH, 1906b, 1922. *U. Carb.*, USA (Alabama).
- Campyloptera** BRONGNIART, 1893, p. 406 [**C. eatoni*; OD]. Little-known genus, based on incomplete wing. [The generic name *Campyloptera* was first used in 1885 (BRONGNIART, 1885a), but no species was mentioned until 1893. Placed in the Megaseoptera by BRONGNIART (1885a), HANDLIRSCH (1906b), CARPENTER (1943b), and LAURENTIAUX (1953); in the Protodonata by BRONGNIART (1893) and TILLYARD (1928d); and in a new order, Campylopteroidea, by ROHDENDORF (1962a).] *U. Carb.*, Europe (France).
- Cryptovenia** BOLTON, 1912, p. 315 [**C. moysseyi*; OD]. Little-known genus, based on wing fragment. [Originally placed in the Palaeodictyoptera. Type of the family Cryptoveniidae BOLTON, 1912]. LAMEERE, 1917b; HANDLIRSCH, 1919b, 1922. *U. Carb.*, England.
- Dictyoneurella** LAURENTIAUX, 1949b, p. 207 [**D. perfecta*; OD]. Little-known genus, based on incomplete wing. [Type of the family Dictyoneurellidae KUKALOVÁ-PECK, 1975. Placed in the Palaeodictyoptera by LAURENTIAUX (1949b); transferred to the Megaseoptera by KUKALOVÁ-PECK (1975).] *U. Carb.*, Europe (France).
- Dyadentomum** HANDLIRSCH, 1904b, p. 7 [**D. permense*; OD]. Little-known genus, based on a body fragment thought by HANDLIRSCH to be that of an ephemerid nymph. *Perm.*, USSR (European RSFSR).
- Eohymen** MARTYNOV, 1937b, p. 9 [**E. maculipennis*; OD]. Little-known genus, based on poorly preserved wing. [Type of the family Eohymenidae MARTYNOV, 1937b. Placed in the Megaseoptera (Protohymenoptera) by MARTYNOV (1937b), in the Palaeodictyoptera by ROHDENDORF (1962a), and in the Caloneuroidea by RASNITSYN (1980b).] *Perm.*, USSR (European RSFSR).
- Erasipterella** BRAUCKMANN, 1983, p. 9 [**E. piesbergensis*; OD]. Little-known genus, based on fragments of fore and hind wings. [Almost certainly a member of the odonate complex, but order doubtful.] *U. Carb.*, Europe (Germany).
- Erasipteron** PRUVOST, 1933a, p. 151 [**E. larischii*; OD]. Little-known genus, based on incomplete wings. [Type of the family Erasipteridae CARPENTER, 1939. Placed in the Odonata by PRUVOST (1933a) and KUKALOVÁ (1964b); transferred to the Protodonata by CARPENTER (1939), LAURENTIAUX (1953), WHALLEY (1979), and PRITYKINA (1980b).] *U. Carb.*, Europe (Czechoslovakia), England.
- Eurytaenia** HANDLIRSCH, 1906a, p. 674 [**E. virginica*; OD]. Little-known genus, based on small fragment of wing. [Originally placed in the Palaeodictyoptera.] HANDLIRSCH, 1906b, 1922. *U. Carb.*, USA (West Virginia).
- Frankenholzia** GUTHÖRL, 1962c, p. 227 [**F. culmanni*; OD]. Little-known genus, based on wing fragment. [Originally placed in the Palaeodictyoptera, but transferred to the Megaseoptera by KUKALOVÁ-PECK (1975).] *U. Carb.*, Europe (Germany).
- Gerephemera** SCUDDER, 1880, p. 12 [**G. simplex*; OD]. Little-known genus, based on small fragment of wing. [Originally placed in the order Ephemeroptera by SCUDDER, but later (1890) transferred to the Orthoptera; assigned to the Odonata by HAGEN (1881a, 1881b, 1885) and to the Palaeodictyoptera by HANDLIRSCH (1906a, 1906b).] *U. Carb.*, Canada (Nova Scotia).
- Hypermegethes** HANDLIRSCH, 1906a, p. 672 [**H. schucherti*; OD]. Little-known genus, based on a small, proximal fragment of very large wing. [Type of the family Hypermegethidae HANDLIRSCH, 1906a. Placed in the Palaeodictyoptera by HANDLIRSCH (1906a, 1906b, 1922), but transferred to the Protohemiptera by LAMEERE (1917c).] *U. Carb.*, USA (Illinois).
- Kuloja** MARTYNOV, 1928b, p. 7 [**K. expansa*; OD]. Little-known genus, based on distal fragment of wing. [Type of the family Kulojidae MARTYNOV, 1928b. Originally placed in the Megaseoptera, but transferred to the Diaphanopteroidea by ROHDENDORF (1962a).] MARTYNOV, 1932. *Perm.*, USSR (European RSFSR).
- Leipsanon** HANDLIRSCH, 1906b, p. 120 [**L. reticulatum*; OD]. Little-known genus, based on minute wing fragment. [Originally placed in the Palaeodictyoptera, *incertae sedis*.] HANDLIRSCH, 1919b. *U. Carb.*, Europe (Belgium).
- Lithentomum** SCUDDER, 1868c, p. 206 [**L. bartti*; OD]. Little-known genus, based on small fragment of wing. [Originally placed in the Palaeodictyoptera.] SCUDDER, 1880; HANDLIRSCH, 1906a, 1922. *U. Carb.*, Canada (New Brunswick).
- Litoneura** SCUDDER, 1885a, p. 169 [**Dictyoneura anthracophila* GOLDENBERG, 1854, p. 35; SD HANDLIRSCH, 1906b, p. 77]. Little-known genus, based on fragment of small wing. [Originally placed in the Palaeodictyoptera.] *U. Carb.*, Europe (Germany).
- Litophlebia** HUBBARD & RIEK, 1978, p. 260, *nom. subst. pro Xenophlebia* RIEK, 1976e, p. 150, *non*

- DEMOULIN, 1968 [**Xenophlebia optata* RIEK, 1976e, p. 150; OD]. Little-known genus, based on incomplete wing. [Type of the family Lito-phlebiidae HUBBARD & RIEK, 1978. Placed in the Ephemeroptera by RIEK (1976e) and HUBBARD & RIEK (1978) and in the Megaseoptera by HUBBARD & KUKALOVÁ-PECK (1980).] *Trias.*, South Africa.
- Megathentomum** SCUDDER, 1868b, p. 570 [**M. pustulatum*; OD]. Little-known genus, based on distal fragment of very large wing. SCUDDER, 1891; HANDLIRSCH, 1906a, 1906b, 1922. *U. Carb.*, USA (Illinois).
- Melanoblattula** COCKERELL, 1927g, p. 415 [**M. nigressens*; OD]. Little-known genus, based on fragment of small wing. [Originally placed in the Protorthoptera.] *U. Carb.*, USA (Maryland).
- Microblattina** SCUDDER, 1895c, p. 57 [**M. perdita*; OD]. Little-known genus, based on wing fragment. [Originally placed in the Blattaria, but transferred by HANDLIRSCH (1906a, 1906b) to the Protoblattoidea.] *U. Carb.*, USA (Rhode Island).
- Orthogonophora** HANDLIRSCH, 1906a, p. 686 [**O. distincta*; OD]. Little-known genus, based on distal fragment of wing. [Originally placed in the Palaeodictyoptera, *incertae sedis*.] HANDLIRSCH, 1906b, 1922. *U. Carb.*, USA (West Virginia).
- Palaeodictyopteron** HANDLIRSCH, 1906a, p. 688 [collective group]. Little-known nymphal forms. HANDLIRSCH, 1906b; CARPENTER, 1948a. *U. Carb.*, USA (Illinois, West Virginia), Europe (Germany).
- Palaeopalara** HANDLIRSCH, 1904a, p. 10 [**P. gracilis*; OD]. Little-known genus, based on small fragment of wing. [Placed in the Megaseoptera by HANDLIRSCH (1906b) and KUKALOVÁ-PECK (1975).] *U. Carb.*, Europe (Belgium).
- Parapaolia** HANDLIRSCH, 1906a, p. 687 [**Paolia superba* SCUDDER, 1885a, p. 173; OD]. Little-known genus. [Placed, with some doubt, by HANDLIRSCH (1906b) in the Palaeodictyoptera.] *U. Carb.*, USA (Illinois).
- Perissophlebia** TILLYARD, 1918c, p. 422 [**P. multiseriata*; OD]. Little-known genus, based on small wing fragment. [Placed in the Odonata by TILLYARD (1918c) and PRITYKINA (1981).] *Trias.*, Australia (Queensland).
- Permoneura** CARPENTER, 1931b, p. 124 [**P. lameerei*; OD]. Little-known genus, based on complete hind wing. [Type of the family Permoneuridae CARPENTER, 1931b. Placed in the order Palaeodictyoptera by CARPENTER (1931b) and TILLYARD (1937); transferred to a new order, Permoneurodea (allied to the Palaeodictyoptera), by LAURENTIAUX (1953); and included in a new order, Archodonata (along with several other genera formerly in the Palaeodictyoptera), by ROHDENDORF (1962a). The ordinal name Archodonata was changed by SINITSHENKOVA (1980a, 1980b) to Permothemistida. CARPENTER (1976) proposed that the genus *Permoneura* be assigned to the Palaeoptera, *incertae sedis*.] *Perm.*, USA (Kansas).
- Piroutetia** MEUNIER, 1907, p. 522 [**P. liassina*; OD]. Little-known genus, based on wing fragment and placed in the Odonata. MEUNIER, 1908b. *Jur.*, Europe (France).
- Progonopteryx** HANDLIRSCH, 1904a, p. 5 [**P. belgica*; OD]. Little-known genus, based on wing fragment. [Originally placed in the Palaeodictyoptera (family Dictyoneuridae).] HANDLIRSCH, 1906b, 1919b. *U. Carb.*, Europe (Belgium).
- Protagrion** BRONGNIART, 1893, p. 403 [**P. audouini*; OD]. Little-known genus, based on incomplete wing. [Type of the family Protagrionidae HANDLIRSCH, 1906b. The generic name *Protagrion* was first used in 1885 (BRONGNIART, 1885a), but no species was mentioned until 1893. Placed in the Protodonata by BRONGNIART (1893), HANDLIRSCH (1906b), and MARTYNOV (1932); transferred to the Palaeodictyoptera by CARPENTER (1943b) and ROHDENDORF (1962a).] *U. Carb.*, Europe (France).
- Pseudohomothetus** HANDLIRSCH, 1906a, p. 685 [**Homothetus erutus* MATTHEW, 1895a, p. 95; OD]. Little-known genus, based on small wing fragment. [Originally placed in the Palaeodictyoptera, *incertae sedis*.] HANDLIRSCH, 1906b, 1919b. *U. Carb.*, Canada (New Brunswick).
- Pseudopalingenia** HANDLIRSCH, 1906b, p. 124 [**Palingenia feistmanteli* FRITSCH, 1882, p. 1; OD]. Little-known genus, based on part of body, including cerci. [Originally placed, with some uncertainty, in the Palaeodictyoptera, *incertae sedis*.] HANDLIRSCH, 1922. *U. Carb.*, Europe (Czechoslovakia).
- Pseudopaolia** HANDLIRSCH, 1906a, p. 687 [**Paolia lacoana* SCUDDER, 1885a, p. 173; OD]. Little-known genus. [Placed by HANDLIRSCH (1906b), with uncertainty, in the order Palaeodictyoptera, *incertae sedis*.] *U. Carb.*, USA (Pennsylvania).
- Rectineura** BOLTON, 1934, p. 181 [**R. lineata*; OD]. Little-known genus, based on poorly preserved wing fragment. [Originally placed in the Palaeodictyoptera.] *U. Carb.*, England.
- Reisia** HANDLIRSCH, 1909c, p. 81, *nom. subst. pro Handlirschia* REIS, 1909, p. 693, *non* KOHL, 1896 [**Handlirschia gelasii* REIS, 1909; OD]. Little-known genus, based on small fragment of wing. [Placed by HANDLIRSCH (1909c, 1920) and REIS (1909) in the Protodonata.] *Trias.*, Europe (Germany).
- Severinula** PRUVOST, 1930, p. 151 [**S. leopoldi*; OD]. Little-known genus, based on wing fragment. [Placed in the Palaeodictyoptera by PRUVOST (1930) and ROHDENDORF (1962a).] *U. Carb.*, Europe (Belgium).
- Sherborniella** HANDLIRSCH, 1919b, p. 535

- [**Palaeodictyopteron* (collective group) *bigginsi* HANDLIRSCH, 1906b, p. 125; OD]. Little-known genus, based on small basal fragment of wing. [Originally placed in the Palaeodictyoptera, *incertae sedis*.] BOLTON, 1921, 1934. *U. Carb.*, England.
- Sypharoptera** HANDLIRSCH, 1911, p. 372 [**S. pneuma*; OD]. Little-known genus, based on incomplete wings. [Originally placed in the new order Sypharopteroidea by HANDLIRSCH (1911); transferred to order Diaphanopteroidea by ROHDENDORF (1962a).] HANDLIRSCH, 1919b, 1922. *U. Carb.*, USA (Illinois).
- Titanoptera** BRONGNIART, 1893, p. 379 [**T. maculata*; OD]. Little-known genus, based on small fragment of wing; probably a palaeodictyopteron. HANDLIRSCH, 1906b; LAMEERE, 1917b. *U. Carb.*, Europe (France).
- Triadologus** RIEK, 1976b, p. 793 [**T. biseriatus*; OD]. Little-known genus, based on small fragment of wing. [Placed in the Protodonata by RIEK (1976b) and in the Odonata by PRITYKINA (1981).] *Trias.*, South Africa.
- Wulasua** TAN, 1980, p. 159 [**W. maculata*; OD]. Little-known genus, based on a poorly preserved, small fragment of a wing. [Originally placed in the Diaphanopteroidea.] *Perm.*, China (Inner Mongolia).
- Xenoneura** SCUDDER, 1868c, p. 206 [**X. antiquorum*; OD]. Little-known genus, based on wing fragment. [Type of the family Xenoneuridae SCUDDER, 1885b. Originally placed in the Palaeodictyoptera.] SCUDDER, 1880; HANDLIRSCH, 1906b, 1922. *U. Carb.*, Canada (New Brunswick).

Infraclass NEOPTERA

Martynov, 1923

[Neoptera MARTYNOV, 1923, p. 89]

Wings articulated to thorax by sclerotized plates (axillaries), not fused or rigidly connected; third axillary Y-shaped and attached to second axillary and posterior notal process, and connected by flexor muscle to thorax; venation basically as in Palaeoptera, but vein MA flat or nearly so or absent; cerci commonly present but vestigial or absent in higher orders. Immature stages very diverse in structure and development. *U. Carb.—Holo.*

This infraclass has been the predominant one since the Permian. It includes 25 existing

orders and about 98 percent of the existing species of insects.

Division EXOPTERYGOTA

Sharp, 1899

[Exopterygota SHARP, 1899, p. 247]

Immature stages typically resembling the adults in general form, living in the same kind of environments, and having similar feeding habits; metamorphosis to adults gradual, wings developing within an externally visible cuticular sheath; pupal stage absent. *U. Carb.—Holo.*

Fifteen existing orders are generally recognized in this division, including about 11 percent of the existing species of insects. The orders are usually grouped into two categories, the orthopteroids and the hemipteroids, which have basic structural differences and which appear to represent two distinct lines of exopterygote evolution, although there is some doubt that either one is monophyletic (RICHARDS & DAVIES, 1977; I. M. MACKERRAS, 1970). The orthopteroids have mandibulate mouthparts; the fore wings are commonly tegminous or rarely elytrid; the hind wings commonly have a large fan-shaped anal area; cerci are present and are commonly well developed. These insects are known from the Upper Carboniferous to the present. Four very small, existing orders (Grylloblattodea, Zoraptera, Mallophaga, and Anoplura) belonging here are the only existing orders of insects absent from the geological record. They are discussed briefly below, within the Exopterygota.

The hemipteroids have haustellate mouthparts and feed on liquid food; the fore wings are diverse in structure, membranous or modified to hemelytra or elytra. The hind wings are broad, commonly with an anal fan in the more primitive families, but are small or very small in the more specialized families. Cerci are absent. These orders are known from the Permian to the present.