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New Triassic Mesorthopteridae

(Insecta, Plecopteroidea, Grylloblattida)

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New Triassic taxa of the family Mesorthopteridae from Central Asia are described and a key to the genera of the family is given. New taxa: *Parastenaropodites*, gen. nov.; *P. fluxa*, spec. nov.; *P. longiuscula*, spec. nov.; *P. nervosa*, spec. nov.; *Mesorthopterina*, gen. nov.; *M. pulchra*, spec. nov.; *M. bona*, spec. nov.; *Austroidelia asiatica*, spec. nov.; *Mesoidelia*, gen. nov.; *M. ignorata*, spec. nov.; *M. faceta*, spec. nov.; *M. semota*, spec. nov.

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Introduction

The family Mesorthopteridae is known from two species of the genus *Mesorthopteron* Tillard, 1916 from the Upper Triassic of Australia and South Africa (Tillard 1916, 1922, Riek 1974) and one species of the genus *Austroidelia* Riek, 1954 from the Upper Triassic of Australia (Riek 1954, Rasnitsyn 1980). The present study is based on the rich collection of the Paleontological Institute of the Russian Academy of Sciences, Moscow. This material was collected by the expeditions of the Laboratory of Paleontomology of the Paleontological Institute from two well-known Triassic localities: Madygen in the South Ferghana region of Kirghizia and Kizyl-Tam in the Ketmenky Mts., Kazakhstan. Unfortunately imprints from Madygen are distorted by postsedimentational deformation of rock and therefore length of wings is calculated by a method proposed by A. Rasnitsyn (1982).

Family Mesorthopteridae Tillard, 1922

Diagnosis. Body slender. Head small, narrower than pronotum. Antennae multisegmented. Pronotum elongate, broadened posteriorly; with distinct paranota. Legs unmodified, femur and tibia without spines; tarsus 5-segmented, apical segment of tarsus with two claws and large arolium between them. Cerci multisegmented. Last tergite large. Last sternite of female with triangular posterior margin. Ovipositor relatively short, stout. Fore wing membranous or slightly coriaceous, without hairs. The subcosta (Sc) terminating on costa (C) near apical third or quarter of wing; costal area from broad to narrow, with numerous simple veinlets or without veinlets. The radius (R) strongly convex, extending well to the apex of wing, simple or with 3-6 branches near the apex. Its sector (RS) arising before the middle of wing, with 3-12 branches directed upwards or to the apex of wing. The base of media (M) is deposited between R and CuA or closely related to R; M divided on a main anterior convex branch (MA) and main posterior concave branch (MP), which is completely sclerotized or desclerotized near the middle. CuA with 5-24 branches; all branches reaching the wing margin. CuP simple, straight, weak and strongly concave. A1 and A2 simple or branched. Archediction or simple cross-veins present in all areas. Hind wings with or without anastomoses between RS and MA. M fused shortly with CuA in basal part. CuA with two branches. A1 simple, desclerotized. A2 strongly pectinate. Anal area large.

Genera included. Five genera from the Triassic of Central Asia, South Africa and Australia, three of them are described below.

Relations. The family Mesorthopteridae is closely related to Ideliidae, but distinguished in that all branches of CuA reach the fore wing margin and by very narrow area between CuA and CuP.

Key to genera of Mesorthopteridae

1. Fore wing with simple cross-veins in almost all areas, except radial and anal areas 2.
 – Fore wing with archedictyon in all areas 3.
2. M forks proximally to origin of RS. CuA with 8-12 branches *Parastenaropodites*, gen. nov.
 – M forks distally to origin of RS. CuA with 18-24 branches *Mesorthopterina*, gen. nov.
3. Main stem of CuA giving off anteriorly a series of about six anterior branches, very regularly arranged, most of which fork dichotomically; total number of branches of CuA is 16-17. (Two species from Upper Triassic of Australia and South Africa) *Mesorthopteron* Tillard, 1916
 – Main stem of CuA giving of a series of irregularly arranged branches; CuA with 5-11 branches 4.
4. Costal area very broad, its width 3.3-4.2 times less than width of wing *Austroidelia* Riek, 1954
 – Costal area relatively narrow, its width 7.1-13.5 times less than total width of wing *Mesoidelia*, gen. nov.

Parastenaropodites, gen. nov.

Type species: *Parastenaropodites fluxa*, spec. nov. Middle or Upper Triassic of Kirghizia.

Description

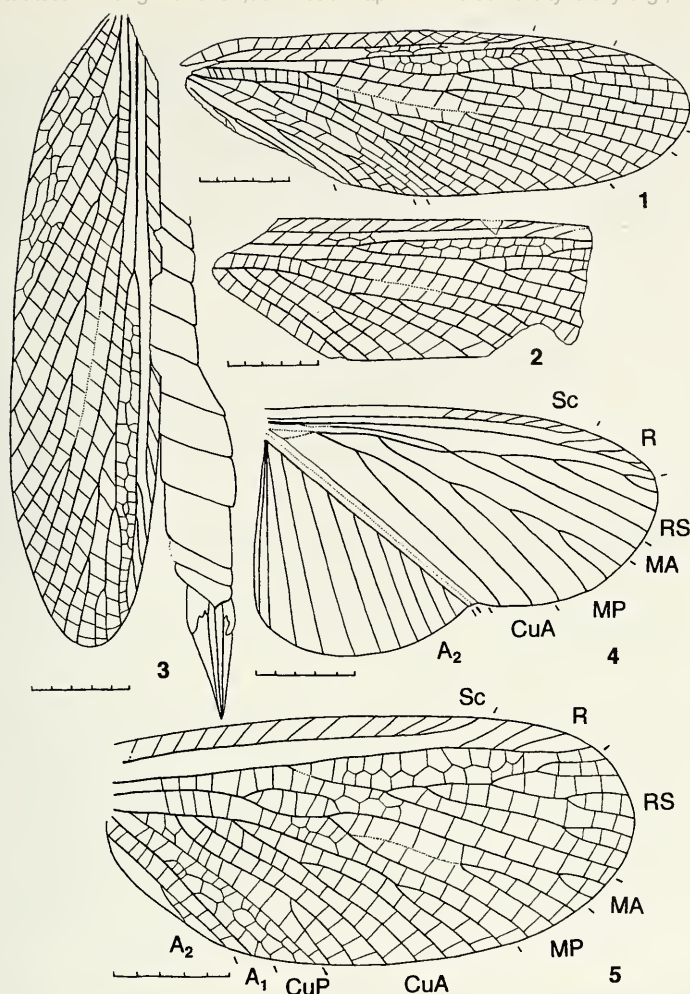
Body slender. Head small, antennae multisegmented. Pronotum elongate, broadened posteriorly. Legs unmodified, femur and tibia without spines; tarsus 5-segmented, apical segment of tarsus with two claws and large arolium between them. Cerci multisegmented. Last tergite large. Last sternite, or subgenital plate, of female with triangular posterior margin. Ovipositor relatively short, stout.

Fore wing membranous, without hairs. Sc terminating on C near apical third or quarter of wing; costal area from broad to narrow; with numerous simple veinlets. R simple, with 3-6 mostly simple veinlets. RS with 5-12 branches directed upwards or to the apex of wing. The main fork of M proximal to origin of RS; MA simple or with 2-3 branches; MP simple or with 2-7 branches, completely sclerotized or desclerotized near the middle. The base of M in proximal third of wing has an intermediate position between R and CuA. CuA with 5-12 branches; all branches reaching the wing margin. CuP simple, straight, weak. Cross-veins simple in most areas; in subcostal, radial and anal areas cross-veins forming a row of two cells. A1 and A2 simple or branched.

Species included. Three species from the Middle or Upper Triassic of Central Asia.

Key to the species of *Parastenaropodites*

1. MP with 5-7 branches *P. nervosa*, spec. nov.
 – MP simple or with 2-3 branches 2.
2. Fore wing dark with light stripes across main longitudinal veins. Radial area narrower than costal area. Costal area 1.8-2.5 times broader than subcostal area *P. longiuscula*, spec. nov.
 – Fore wing light, without stripes. Radial area broader than costal area. Costal area as broad as subcostal area *P. fluxa*, spec. nov.

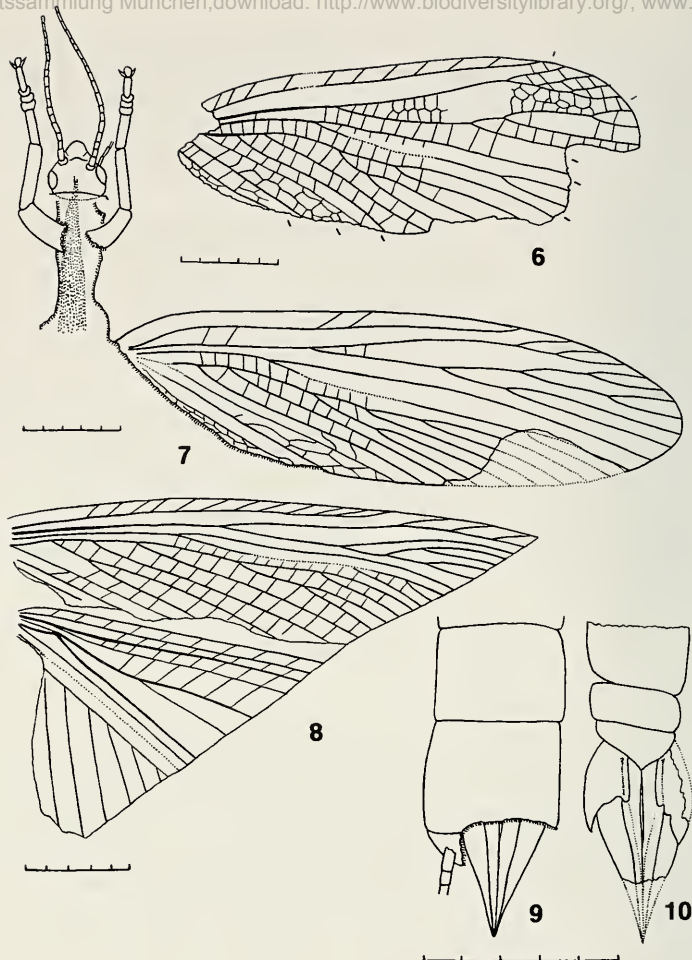


Figs 1-5. *Parastenaropodites fluxa*, spec. nov. 1. Fore wing, holotype, spec. No 2555/985. 2. Fore wing without basal and apical parts, paratype, spec. No 2240/1932. 3. Fore wing and abdomen of female, paratype, spec. No 2785/2104. 4. Hind wing, paratype, spec. No 2785/2125. 5. Fore wing, paratype, spec. No 2069/1338. For abbreviations see text. Scales: 5 mm.

Parastenaropodites fluxa, spec. nov.

Figs 1-10

Types. Holotype: Imprint and counter-imprint of fore wing, specimen No 2555/985; Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage (Paleontological Institute, Moscow). – Paratypes: imprints and counter-imprints of body and wings or isolated fore and hind wing, specimens No 2069/1388, 2069/1489, 2069/1576, 2069/1663, 2069/1697, 2069/1716, 2069/1758, 2069/1779, 2069/1786, 2069/1792, 2069/1803, 2069/1817, 2069/1823, 2069/1824, 2069/1873, 2240/1850, 2240/1856, 2240/1860, 2240/1861, 2240/1928, 2240/1931, 2240/1932, 2240/1951, 2240/2031, 2240/2058, 2240/2060, 2240/2068, 2240/2120, 2240/2125, 2555/789, 2555/842, 2555/906, 2555/911, 2785/2102, 2785/2104, 2785/2108, 2785/2110, 2785/2114, 2785/2116, 2785/2125, 2785/2130, 2785/2132, 2785/2134,



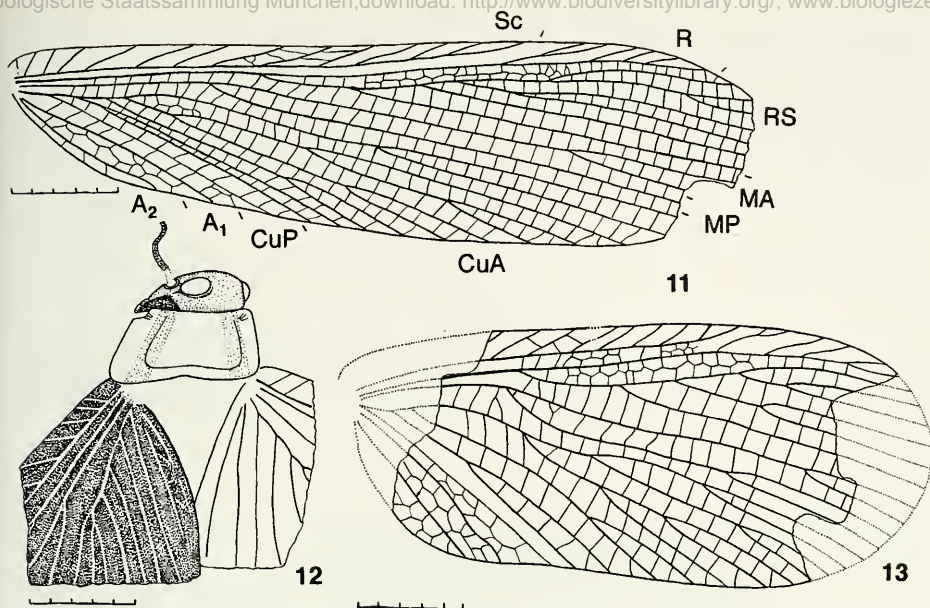
Figs 6-10. *Parastenaropodites fluxa*, spec. nov. 6. Fore wing, paratype, spec. No 2240/1951. 7. Head, legs and fore wing, paratype, spec. No 2555/911. 8. Fore and hind wings, paratype, spec. No 2785/2131. 9, 10. Apex of female abdomen, paratype, spec. No 2785/2176. 9. Dorsal view. 10. Ventral view. Scales: 5 mm.

2785/2143, 2785/2151, 2785/2158, 2785/2165, 2785/2176, 2785/2181, 2785/2185, 2785/2186, 2785/2188, 2785/2189 & 2785/2197, 2785/2192, 2785/2203, 2785/2216, 2785/2217, 2785/2218, 2785/2220, 2785/2221, 2785/2226, 2785/2227, 2785/2236, 2785/2238, 2785/2239, 2785/2254, and 2785/2258 from same locality.

Description

Body slender. Head considerably shorter than pronotum. Pronotum large, elongate, widened posteriorly, with broad patanota. Ovipositor straight.

Fore wing with broadly rounded apex. Costal area narrow, with series of 11-17 simple veinlets; ratio of its width to maximum width of wing 10-14. Subcostal area relatively broad, equal or 1.1-1.3 times broader than width of costal area. R with 3-5 veinlets near apex of wing. RS originating in basal third of wing or slightly proximally, with 5-7 branches directed to anterior margin and apex of wing. Maximum width of radial area 1.5-2.5 times more than width of costal area. M forks before the origin



Figs 11-13. *Parastenaropodites longiuscula*, spec. nov. 11. Fore wing, holotype, spec. No 2785/2150. 12. Head, pronotum and wings, paratype, spec. No 2069/1840. 13. Fore wing, paratype, spec. No 2785/2175. Scales: 5 mm.

of RS; MA simple or with 2 branches; in specimen No 2069/1388 and 2785/2134 MA anastomosed with MP, in specimens No 2785/2114 and 2785/2181 MA anastomosed with RS. MP simple or with 2-3 branches, desclerotized near the middle. CuA with 5-8 branches. A1 simple or with 1-4 branches. A2 simple or with 2-3 branches. Cross-veins simple in most areas, but forming a row of two cells in radial area; in anal area cross-veins mostly irregular. Fore wing light, without any spots or stripes.

Hind wing with rounded apex. Costal and subcostal areas narrow; radial area relatively broad, 1.4-1.7 times broader than costal area. RS with 4-5 branches, in specimen No 2785/2125 RS anastomosed with MA. M fused shortly with CuA near base. CuA with 2 branches; CuP simple. Anal lobe enlarged. A1 weakly sclerotized. A2 with 11 branches, pectinate. Hind wing light.

Length of body 30-35 mm, length of pronotum 5-6.5 mm, length of fore and hind wings 25-30 mm, length of ovipositor 4.5-5 mm.

Locality and horizon. Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage.

Parastenaropodites longiuscula, spec. nov.

Figs 11-13

Types. Holotype: Imprint and counter-imprint of fore wing, specimen No 2785/2150; Kirghizia: Madygen; Middle or Upper Triassic: Madygenian Stage (Paleontological Institute, Moscow). – Paratypes: imprints and counterimprints of head, pronotum and wing, specimens No 2069/1434, 2069/1671, 2069/1692, 2069/1728, 2069/1840, 2069/1870, 2240/2042, 2240/2081, 2555/887, 2555/983, 2785/2103, 2785/2112, 2785/2119, 2785/2175, 2785/2235, 2785/2244 from same locality.

Description

Head relatively small, narrower than pronotum. Pronotum widened posteriorly, with broad patanota. Head dark, pronotum light, with two longitudinal dark stripes.

Fore wing large, with broadly rounded apex. Costal area relatively narrow, with series of 12-14

simple veinlets; ratio of its width to maximum width of wing 6.1-9.3. Subcostal area narrow, its width 1.1-1.3 times less than width of costal area. R with 5-6 veinlets near apex of wing. RS originating in basal third of wing with 6-7 branches. Maximum width of radial area 1.1-1.65 times less than width of costal area. M forks before the origin of RS; MA with 2 branches; MP simple or with 2-3 branches, desclerotized near the middle. CuA with 9-11 branches. A1 and A2 simple. Cross-veins simple in most areas, but forming a row of two cells in subcostal, radial and anal areas. Fore wing dark, with light stripes across main veins. Length of fore wing 30.5-38 mm.

Locality and horizon. Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage.

Parastenaropodites nervosa, spec. nov.

Figs 14-17

Types. Holotype: Imprint of fore wing, specimen No 2240/2123; Kirghizia: Madygen; Middle or Upper Triassic: Madygenian Stage (Paleontological Institute, Moscow). – Paratypes: imprints and counterimprints of fore and anterior margin of hind wing, specimens No 2069/1577, 2069/1706, 2069/1707, 2555/668, 2785/2105, 2785/2106, 2785/2159 and 2785/2230 from same locality.

Description

Fore wing large, with broadly rounded apex. Costal area broad, with series of 13-15 mostly simple veinlets; ratio of its width to maximum width of wing 3.8-5.4. Subcostal area narrow, its width 2-3.5 times less than width of costal area. R with 2-5 oblique veinlets near apex of wing. RS originating in basal third of wing with 7-12 branches directed to anterior margin and apex of wing. Maximum width of radial area 1.9-2.4 times less than width of costal area. M forks before the origin of RS; MA simple or with 2-3 branches; MP with 5-7 branches, desclerotized near the middle; in specimen No 2069/1707 proximal branch of MP anastomosed with distal branch of CuA. CuA with 8-11 branches. Cross-veins simple in most areas, but forming a row of two cells in subcostal and radial areas. Fore wing dark, with light stripes across main veins. Anterior margin of hind wing similar with fore wing, but costal area narrower. Subcostal area 1.8 times narrower than costal area. Maximum width of radial area 2.5 times less than width of costal area. Length of fore and hind wing 35-42 mm.

Locality and horizon. Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage.

Mesorthopterina, gen. nov.

Type species: *Mesorthopterina pulchra*, spec. nov.; Upper Triassic of Kazakhstan.

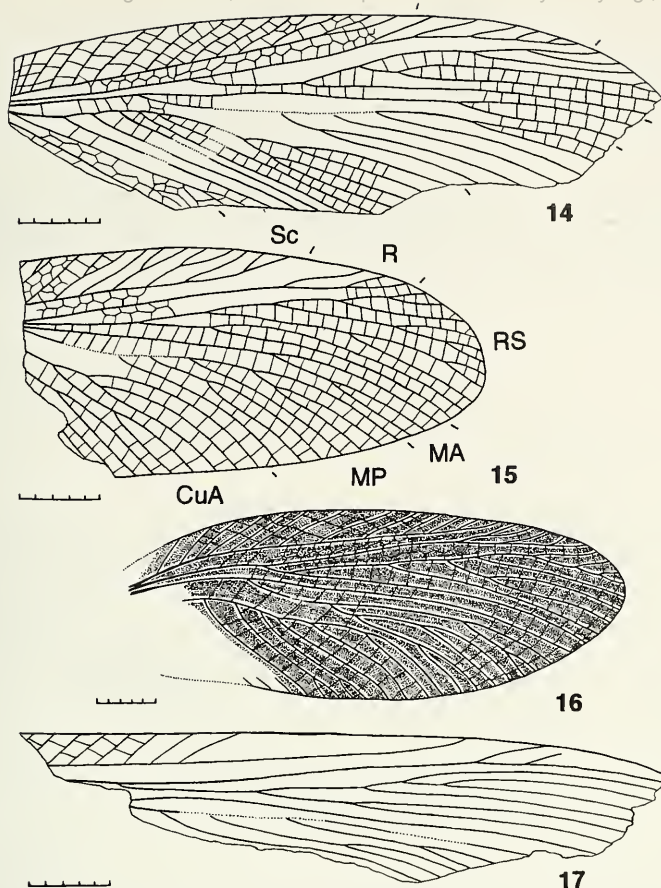
Description

Fore wing slightly coriaceous, without hairs. Sc terminating on C; costal area broad, 1.7-3.3 times broader than maximum width of radial area; with numerous partly branched veinlets. R simple; RS at least with 3 branches. M fork distally to origin of RS. The base of M closely related to R in proximal third of wing. CuA with 18-24 branches; CuA-CuP area narrow, without branches of CuA directed to CuP. CuP simple, straight, weak. Cross-veins simple in most areas, but forming rows of two irregular cells only in radial and M-CuA areas.

Species included. Two species from the Upper Triassic of Kazakhstan.

Key to the species of *Mesorthopterina*

1. Costal area of fore wing very broad, its width 3.5-3.8 times less than total width of wing; veinlets in costal area mostly branched *M. pulchra*, spec. nov.
- Costal area of fore wing broad, its width 6.8 times less than total width of wing; veinlets in costal area mostly simple *M. bona*, spec. nov.



Figs 14-17. *Parastenaropodites nervosa*, spec. nov. 14. Fore wing, holotype, spec. No 2240/2123. 15. Fore wing, paratype, spec. No 2555/668. 16. Fore wing, paratype, spec. No 2785/2106. 17. Hind wing, paratype, spec. No 2069/1707. Scales: 5 mm.

Mesorthopterina pulchra, spec. nov.

Figs 18, 19

Types Holotype: Imprint and counter-imprint of fore wing without apical half and anal area, specimen No 1361/162; Kazakhstan, Ketmensky Mts., Kizyl-Tam; Upper Triassic, Tologoiskian Stage (Paleontological Institute, Moscow). – Paratypes: imprints and counter-imprints of fragment of fore wing, specimen No 1361/161 and 1361/156 from same locality.

Description

Fore wing probably broad. Costal area with mostly branched veinlets. Subcostal area narrow, its width 6.0-6.5 times less than width of costal area. CuA with 20-24 branches. Fore wing dark, without any spots or stripes. Length of fore wing probably about 55-60 mm.

Locality and horizon. Kazakhstan: Kizyl-Tam; Upper Triassic, Tologoiskian Stage.

Mesorthopteria bona, spec. nov.

Fig. 20

Holotype: Imprint and counter-imprint of fore wing without apical part and anal area, specimen No 1361/157; Kazakhstan, Ketmensky Mts., Kizyl-Tam; Upper Triassic, Tologoiskian Stage (Paleontological Institute, Moscow).

Description

Fore wing relatively narrow. Costal area with mostly simple veinlets. Subcostal area relatively broad, its width 3.1 times less than width of costal area. R simple, in apical part with simple veinlets directed to anterior margin of wing; Rs at least with 3 branches. MA at least with 2 branches. CuA with 18 branches. Fore wing dark, without any spots or stripes. Length of fore wing probably about 45-50 mm.

Locality and horizon. Kazakhstan: Kizyl-Tam; Upper Triassic, Tologoiskian Stage.

Austroidelia Riek, 1954

Type species: *Austroidelia perplexa* Riek, 1954; Upper Triassic of Australia.

Redescription

Head narrower than pronotum. Pronotum widened posteriorly, with broad paranota. Fore wing slightly coriaceous, without hairs. Sc terminating on C near apical third of wing; costal area broad, 3.5-3.6 times broader than maximum width of radial area; with 13-19 simple veinlets. R dichotomous, with 4 branches directed to anterior margin of wing. RS with 4-5 branches directed to the apex of wing. M forks proximally to origin of RS; MP simple, completely sclerotized. The base of M closely related to R in proximal third of wing. CuA stout in basal quarter, with 8-11 branches; all branches reaching the wing margin. CuP simple, straight, weak. Large archdictyon present, but in apical third of wing cross-veins forming rows of two cells in most areas. Anal area short and narrow.

Species included. Two species from Triassic.

Key to the species of *Austroidelia*

1. Width of costal area 4.2 times less than the total width of wing. The main fork of MA distal to main fork of RS..... *A. perplexa* Riek, 1954
- Width of costal area 3.3-3.7 times less than total width of wing. The main fork of MA proximal to main fork of RS *A. asiatica*, spec. nov.

Austroidelia asiatica, spec. nov.

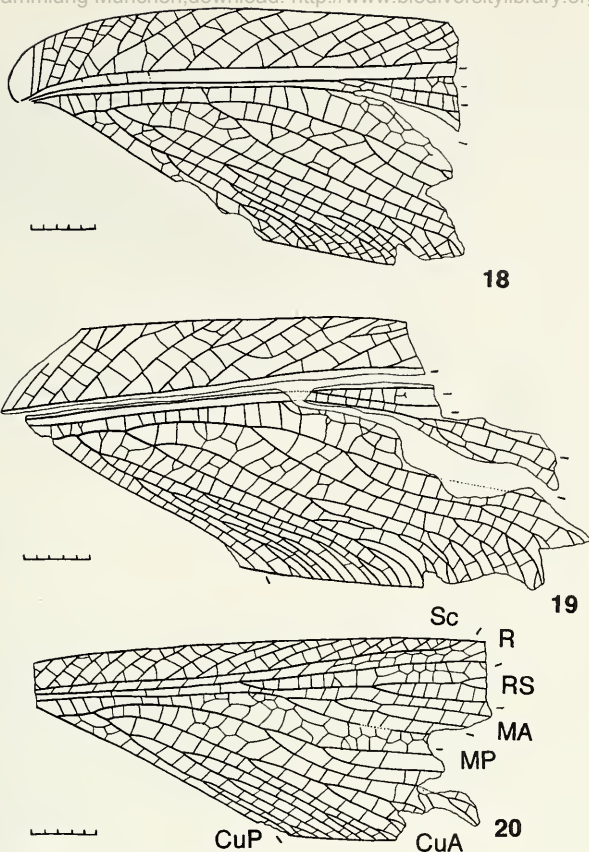
Figs 21-24

Types. Holotype: Imprint of fore wing, specimen No 2785/2253; Kirghizia: Madygen; Middle or Upper Triassic: Madygenian Stage (Paleontological Institute, Moscow). – Paratypes: imprints and counter-imprints of pronotum and fore wing, specimens No 2069/1411, 2240/1828, 2240/1913, 2555/993, 2555/697 from same locality.

Description

Fore wing medium-size, with broadly rounded apex. Costal area broad; ratio of its width to maximum width of wing 3.3-3.7. Subcostal area very narrow, 5.0-6.2 times less than width of costal area. RS originating before the middle of wing. Maximum width of radial area 3.5-3.6 times less than width of costal area. MA with 2-6 branches. A1 simple, A2 with 2-3 branches. Fore wing light, without spots or stripes. Length of fore wing 26-32 mm.

Locality and horizon. Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage.



Figs 18-20. Fore wings of *Mesorthopterina*. 18, 19. *M. pulchra*, spec. nov. 18. Holotype, spec. No 1361/162. 19. Paratype, spec. No 1361/161. 20. *M. bona*, spec. nov., holotype, spec. No 1361/157. Scales: 5 mm.

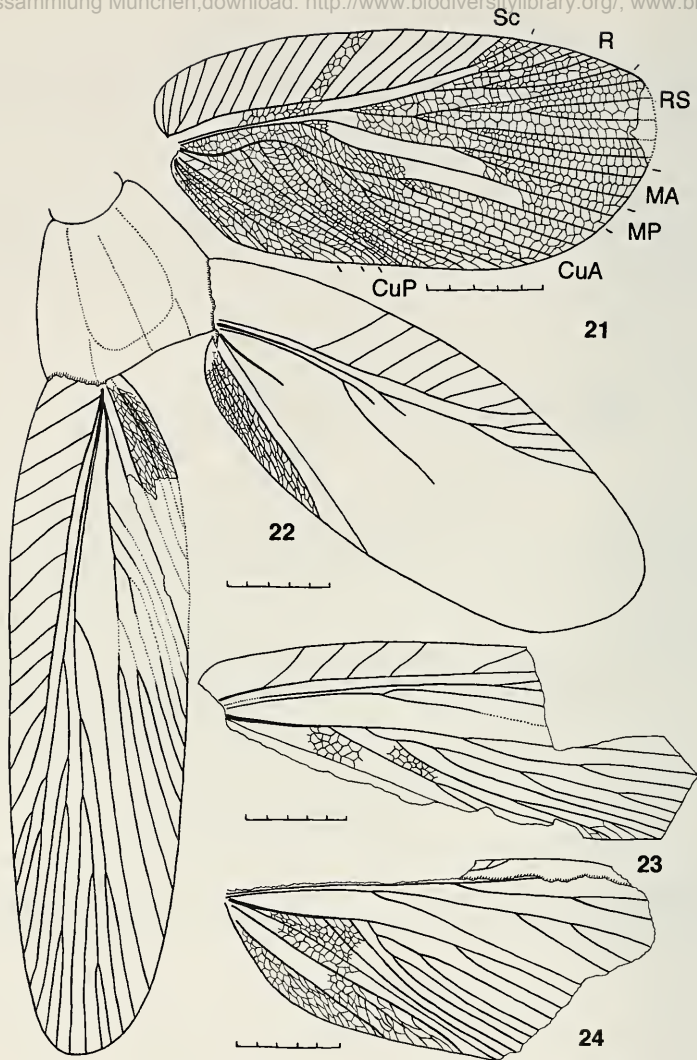
Mesoidelia, gen. nov.

Type species. *Mesoidelia ignorata*, spec. nov.; Middle or Upper Triassic of Kirghizia.

Description

Pronotum widened posteriorly, with broad paranota. Fore wing membranous, without hairs. Sc terminating on C near apical third or quarter of wing; costal area narrow: equal, 1.1-1.3 times broader or 1.6 times narrower than maximum width of radial area; without veinlets or only with indistinct ones. R simple, in apical half S-shaped; RS with 3-5 branches directed upwards. M forks proximally to origin of RS; MP desclerotized near the middle, simple or with short fork near apex of wing. The base of M closely related to R or placed between R and CuA in proximal third of wing. CuA with 5-9 branches; all branches reaching the posterior margin of wing; CuA-CuP area narrow, without branches of CuA directed to CuP. CuP simple, straight, weak. Large archedictyon present in all areas. Anal area short and narrow.

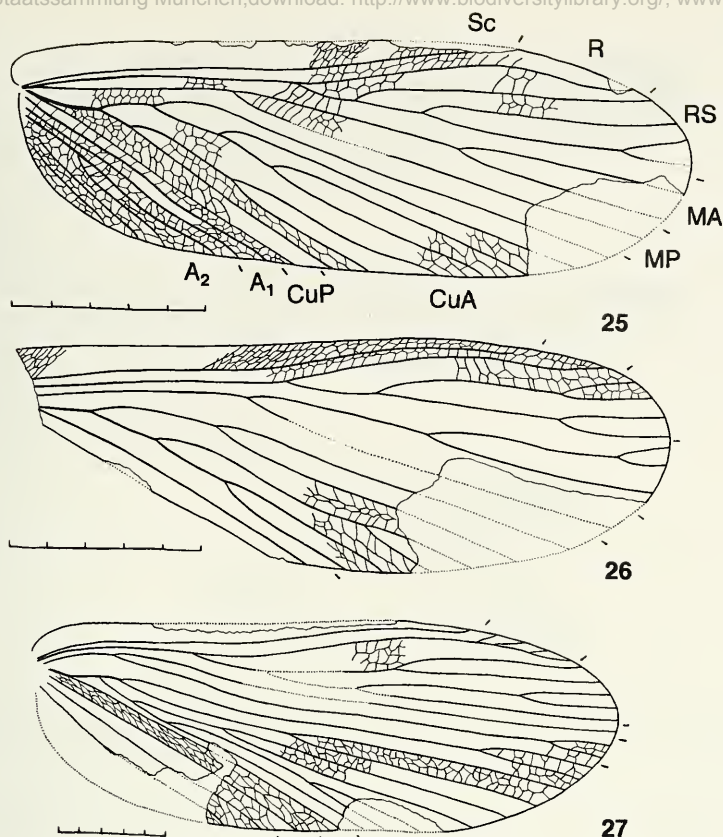
Species included. Three species from the Middle or Upper Triassic of Central Asia.



Figs 21-24. *Austroidelia asiatica*, spec. nov. 21. Fore wing, holotype, spec. No 2785/2253. 22. Pronotum and fore wings, paratype, spec. No 2240/1828. 23. Fore wing, paratype, spec. No 2069/1411. 24. Fore wing, paratype, spec. No 2555/697. Scales: 5 mm.

Key to the species of *Mesoidelia*

1. M forks near the base of wing. MP with fork. Radial area broader than costal area *M. semota*, spec. nov.
- M forks in basal third of wing. MP simple. Radial area equal or narrower than costal area 2.
2. Costal area of fore wing without veinlets. Area between R and M in basal quarter of wing with double row of cells *M. ignorata*, spec. nov.



Figs 25-27. Fore wings of *Mesoidelia*. 25, 26. *M. ignorata*, spec. nov. 25. Fore wing, holotype, spec. No 2555/991. 26. Fore wing, paratype, spec. No 2555/676. 27. *M. semota*, spec. nov., holotype, spec. No 2240/1837. Scales: 5 mm.

- Costal area of fore wing with traces of veinlets. Area between R and M in basal quarter of wing with three rows of cells *M. faceta*, spec. nov.

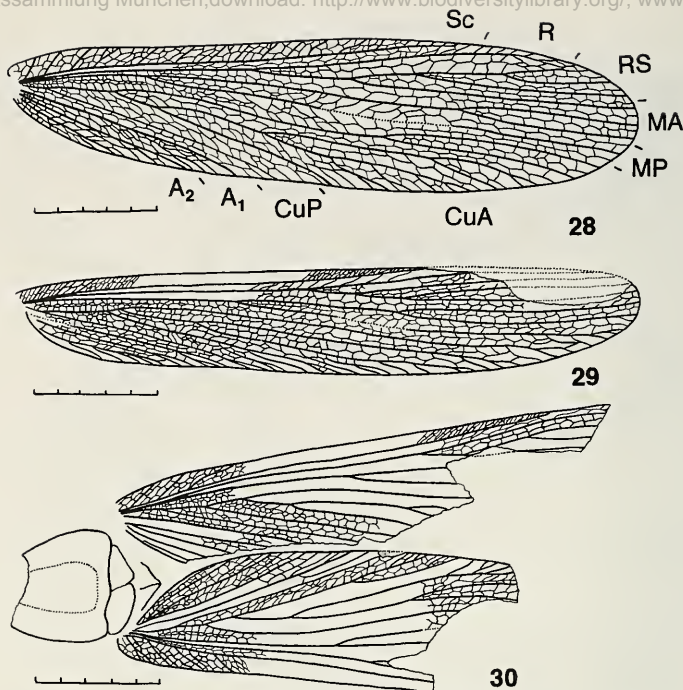
Mesoidelia ignorata, spec. nov.

Figs 25, 26

Types. Holotype: Imprint of fore wing, specimen No 2555/991; Kirghizia: Madygen; Middle or Upper Triassic: Madygenian Stage (Paleontological Institute, Moscow). — Paratype: imprint and counter-imprint of fore wing, specimens No 2555/676 from same locality.

Description

Fore wing medium-size, with broadly rounded apex. Costal area narrow; ratio of its width to maximum width of wing 7.7-8.5. Subcostal area relatively narrow, its width 1.75-2.0 times less than width of costal area. RS originating at about the middle of wing, with 4 branches directed upwards. The base of M placed near the middle between R and CuA. Maximum width of radial area equal to



Figs 28-30. *Mesoidelia faceta*, spec. nov. 28. Fore wing, holotype, spec. No 2240/1962. 29. Fore wing, paratype, spec. No 2785/2234. 30. Pronotum and fore wings, paratype, spec. No 2240/1810. Scales: 5 mm.

width of costal area. MA with 2-3 branches; MP simple. CuA with 7-8 branches. A1 simple, weakly sinuate. A2 with 5 branches. Fore wing light, without spots or stripes. Length of fore wing 17.2-18.6 mm.

Locality and horizon. Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage.

Mesoidelia semota, spec. nov.

Fig. 27

Holotype: Imprint of fore wing, specimen No 2204/1827; Kirghizia: Madygen; Middle or Upper Triassic: Madygenian Stage (Paleontological Institute, Moscow).

Description

Fore wing medium-size, with broadly rounded apex. Costal area narrow; ratio of its width to maximum width of wing 13.5. Subcostal area relatively broad, its width 1.5 times less than width of costal area. RS originating at about the first quarter of wing, with 5 branches directed upwards. The base of M related to R. Maximum width of radial area 1.6 times broader than width of costal area. MA simple; MP with short fork near the apex of wing. CuA with 9 branches. A1 simple, straight. A2 with at least 2 branches. Fore wing light, without spots or bands. Length of fore wing 27.2 mm.

Locality and horizon. Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage.

Mesoidelia faceta, spec. nov.

Figs 28-30

Types. Holotype: Imprint of fore wing, specimen No 2240/1962; Kirghizia: Madygen; Middle or Upper Triassic: Madygenian Stage (Paleontological Institute, Moscow). – Paratypes: imprints and counter-imprints of pronotum, fore wing and anterior part of hind wing, specimens No 2069/1485, 2240/1810, 2240/1960, 2240/1970, 2555/686, 2785/2107, 2785/2167, 2785/2234 from same locality.

Description

Fore wing medium-size, relatively narrow, with broadly rounded apex. Costal area narrow; ratio of its width to maximum width of wing 7.1-8.4. Subcostal area narrow, its width 2.0-2.3 times less than width of costal area. RS originating at about the middle of wing, with 3-4 branches directed upwards. The base of M related to R. Maximum width of radial area equal or 1.1-1.3 times less than width of costal area. MA with 2 branches; MP simple. CuA with 5-7 branches. A1 simple or bifurcate, almost straight. A2 with 2-3 branches. Anterior margin of hind wing similar with fore wing. Wings unicolor light. Length of fore wing 21-25 mm.

Locality and horizon. Kirghizia: Madygen; Middle or Upper Triassic, Madygenian Stage.

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