

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Riek, E. F., 1954. Further Triassic insects from Brookvale, New South Wales (orders Orthoptera Saltatoria, Protorthoptera, Perlaria). *Records of the Australian Museum* 23(4): 161–168, plate xi. [25 June 1954].

doi:10.3853/j.0067-1975.23.1954.630

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

Australian Museum science is freely accessible online at
www.australianmuseum.net.au/publications/
6 College Street, Sydney NSW 2010, Australia



FURTHER TRIASSIC INSECTS FROM BROOKVALE, N.S.W.
(ORDERS ORTHOPTERA SALTATORIA,
PROTORTHOPTERA, PERLARIA.)

By E. F. RIEK.

Commonwealth Scientific and Industrial Research Organization—Division of Entomology, Canberra, A.C.T.

(Plate xi; text-figures 1-5.)

An earlier paper on the fossil insects of this series dealt with the Mecoptera, while this paper covers the remainder of the insects, with the exclusion of the Homoptera-Copeognatha and Blattaria and some doubtful fragments.

As with the Mecoptera, some of the specimens are beautifully preserved, notably the forewing of *Prohagla superba*, which shows clearly the wing pigmentation pattern.

The Orthopteroid fauna is dominated by the very large and highly modified *Clathrotitan* which, although considered within the Orthoptera Saltatoria, has a most curious stridulatory apparatus. It is very interesting also to record two quite distinct Protorthoptera from Triassic strata. Perlaria are recorded from the Upper Permian strata of Belmont, so it is not surprising to find them in this Triassic fauna, particularly as these two localities are less than one hundred miles apart.

Order PROTORTHOPTERA.

Family IDELIDAE Zalessky.

Protorthoptera with an enlarged, arched Cu and more or less straight anal veins.

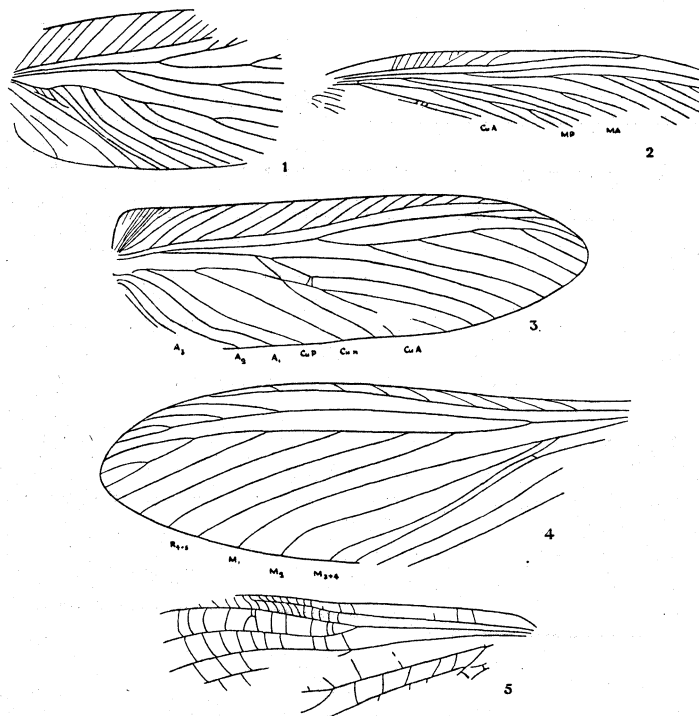
Genus **Austroidelia** nov.

Genotype, *Austroidelia perplexa*, sp. nov.

Forewing.—Resembling *Metidelia* Martynov, 1937, from the Russian Permian but differing in the shorter anal veins and more angled base of Cu.

Sc with numerous anterior branches; Rs arising towards the base of the wing; M forking before the origin of Rs with MA, forked at least once and MP apparently simple, CuA large, strongly sigmoidally curved near base, giving off a large series

of pectinate branches on the lower side, the proximal three or four short and not reaching the wing margin; CuP straight, simple, forming a "vena dividens"; anals short, straight, slightly divergent.



FIGURES 1-5

1. F. 39179, holotype of *Austroidelia perplexa*, sp. nov., x 2.25 ca.; 2. F. 30970, holotype of *Mesacridites elongata* x 1 ca.; 3. F. 38264, holotype forewing of *Prohagla superba*, sp. nov., x 1.5 ca.; 4. F. 41290, hindwing of *Prohagla superba*, x 2.25 ca.; 5. F. 35877, holotype of *Mesonotoperla sinuata*, x 4.5 ca.

***Austroidelia perplexa*, sp. nov.**

(Plate xi, figure 6; text-figure 1.)

Forewing.—Apical third and extreme base not preserved; costal space rather wide; Sc with numerous, oblique veinlets to the costal margins, apex not preserved; Rs arising in the basal half with at least three branches preserved; M arising from base, branching into MA and MP somewhat before the origin of Rs, with MA forking at least once and MP apparently simple; Cu occupying a large portion of the wing, CuA strongly sigmoidally curved near the base, giving off a large series of at least ten pectinate branches on its lower side, the basal ones closely spaced and the basal three or four not reaching the wing margin, those immediately following curving towards CuP, apical branching quite open; CuP a rather short, simple, strong straight vein; anals straight, 1A almost parallel to CuP, succeeding ones shorter, diverging slightly from one another. Archedictyon very reticulate with some straighter cross-veins between Sc and R₁.

Length of holotype fragment 17 mm. indicating a total length of about 26 mm.; greatest width 9 mm.

Type.—Holotype forewing F.39179 and counterpart F.39190 in the Australian Museum Collection.

Type Locality.—Beacon Hill, Brookvale, New South Wales.

Horizon.—Lenticular shale, Hawkesbury Sandstone Series, Triassic.

This species is considered to be a Protorthopteron which are more typical of Permian and Upper Carboniferous than of Triassic strata.

Family STENARÖPODIDAE Handlirsch.

Protorthoptera with both M and Cu well branched and with marked fusion between MP and CuA₁.

This family is more typical of Palaeozoic strata but a new genus is described from these Triassic beds.

Genus *Mesacridites* nov.

Genotype, *Mesacridites elongata*, sp. nov.

Forewing.—Similar to *Permacridites* Martynov from the Permian of Russia but with less expanded costal area, shorter Sc and less angling at the fusion of MP and CuA₁. Anal veins and portion of Cu not preserved; Sc ending well before the apex; R₁ apparently simple and Rs with numerous pectinate branches.

Mesacridites elongata, sp. nov.

(Plate xi, figure 3; text-figure 2.)

Forewing.—Sc long, gently sigmoidally curved, extending into the apical third of the wing, a complete series of costal veinlets, mostly simple but occasionally forked or anastomosed; R₁ almost parallel to Sc, closest at base, apparently simple; Rs arising near the basal third of the wing, with a series of pectinate branches (six preserved, possibly three more), all branches long and simple; M arising from the base of the wing, forking early, MA four-branched, pectinate, first forking obscure but before the origin of Rs, the other two after it; MP fused almost immediately to CuA₁, apical free portion not clearly demarcated, either simple or with an apical fork; Cu only partially preserved, CuA with at least three branches; cross-veins not well preserved.

Length of preserved portion 55 mm. indicating a wing length of about 65 mm.

Type.—Holotype F.30970 in the Australian Museum Collection.

Type Locality.—Beacon Hill, Brookvale.

Order ORTHOPTERA SALTATORIA.

Suborder ENSIFERA.

Superfamily GRYLLACRIDOIDEA.

Family PROPHALANGOPSIDAE Zeuner, 1935.

This is one of the most primitive families of the Ensifera and is probably ancestral to all families, with the possible exception of the Gryllacrididae.

The family is well represented in the Jurassic and persists with three Recent species belonging to two genera. Only one of the nine fossil genera (excluding the Geinitziidae) is recorded from the Triassic. A new genus *Prohagla*, considered the most primitive representative of the family, is described from these Triassic beds. This genus is placed in the new subfamily Prohaglinae. *Notopamphagopsis*, from the Triassic of South America, is considered to belong to this new subfamily. The subfamily Haglinae then contains only the genus *Hagla* from the Lias of England. In this genus both sexes have been recognized. The subfamilies Cyrtophyllitinae and Prophalangopsinae contain species with more specialized wings, with the two Recent genera included in the latter subfamily.

Subfamily PROHAGLINAE nov.

Forewing of the male similar to that of the Haglinae, but without the strongly curved MA₁; anals only slightly curved and 1A not thickened. However, there is sexual dimorphism in the shape of the anal veins. They are longer and straighter in the female. The new genus *Prohagla* is considered to belong to the Prophalangopsiidae because of this sexual dimorphism. The female, at least, could almost as readily be placed in the Gryllacrididae. *Notopamphagopsis* Cabrera 1928 from the Triassic of South America, although very imperfectly known, is removed from the Haglinae and considered in this subfamily.

Genus *Prohagla* nov.

Genotype, *Prohagla superba*, sp. nov.

The genus shows a close affinity to *Hagla* but there is practically no stridulatory modification in the male. The hindwing differs very little from that of *Pamphagopsis maculata* Martynov, 1925, except for the more primitive branching of R₁. The genus can be compared with the most primitive Gryllacrididae such as *Palaeorhenia*, particularly *P. scotica* Zeuner from the early Tertiary of Scotland.

Prohagla retains the very primitive features of a long Sc, reduced branching of R₁ and gently curved anals. It is more specialized than the Palaeozoic Sthenaropodidae in having only a two-branched MA, reduced fusion between MP and Cu and in having the anals gently sigmoid instead of slightly arched. It also exhibits sexual dimorphism which allies it to the Prophalangopsiidae. *Palaeorhenia* shows a more advanced condition with shortened Sc, many branched R₁, less fusion between MP and Cu and longer anals running parallel to the hind margin for some distance.

Forewing.—Male: Costal vein with a number of weak branches in the expanded base of the costal space; Sc extending well towards the apex and with numerous anterior branches which shorten rapidly to the apex; R₁ with limited anterior branches to the wing margin; Rs arising at the middle of the wing, with a number of pectinate branches; M three-branched, forking early, with MP fused to CuA for a short distance and MA two-branched, with MA₁ not sigmoidally curved; CuA₁ with a number of branches (three in the genotypic species); CuA₂ long and straight; CuP arched away from CuA₂, simple; anals simple, gently curved, rather transverse to the wing. Female forewing differs in the more oblique anals and straighter CuP.

Hindwing.—Differs from the forewing in the narrow costal space, no distinct costal vein, three-branched media with MP connected to CuA by a cross-vein and with Cu and anals apparently branching from base.

Prohagla superba, sp. nov.

(Plate xi, figures 1-2; text-figures 3-4.)

Forewing.—Wing of rather large size, strongly expanded at base and with apex rather rounded, costal space strongly expanded over basal half, markedly narrow towards apex; costal vein represented by several (seven or more) weak branches radiating from the base of the wing; Sc long, reaching to the apical fifth of the wing, with numerous, simple, oblique branches to the anterior border; R₁ sigmoidally curved, parallel to Sc for most of its length, near apex giving off anteriorly a series of three oblique branches to the wing margin, ending only very slightly before the apex of the wing; Rs arising at the middle of the wing, with a series of five pectinate branches, all branches long; M arising from R very close to the base, three-branched, forking early, before the origin of Rs and with MP near its origin fused to CuA for

some distance, MA two-branched, with MA₁ gently convex and not sigmoidally curved over its basal quarter with CuP arising close to the base and curved away from CuA in the male but less so in the female; CuA₁ three-branched, CuA₂ long and straight, CuP simple; three simple, curved anal veins preserved, with indications of a smaller fourth vein; cross-veins strong, abundant, mostly simple but between the forks of Rs and MA forming a double-cell structure.

Length of holotype 42 mm., greatest breadth 12 mm. A pigmentation pattern is preserved as illustrated in the plate.

Hindwing.—Wing of rather large size, narrowed at base but expanded somewhat over the apical third; costal vein, if present, very reduced; Sc long as in forewing, with a gentle sigmoidal curvature, with a series of short oblique branches to the anterior margin, R₁ parallel to Sc over its basal half but diverging slightly apically, with three oblique branches to the wing margin from near its apex; Rs arising before the middle of the wing, with a series of six pectinate branches, all branches long and one with a terminal twigging; origin of M obscure, close to the base, three-branched, all branches very long, both forks before the origin of Rs; MP connected from near its origin to CuA by a strong, oblique cross-vein, Cu and anals not clearly preserved but with numerous branches folded on one another and apparently mostly simple from base.

Length of wing 38 mm., width 11 mm.

Type.—Holotype male forewing F.38264 in the Australian Museum Collection. Typical hindwing F.41290.

Type Locality.—Beacon Hill, Brookvale, near Manly, New South Wales.

Horizon.—Lenticular Shale, Hawkesbury Sandstone Series, Triassic.

The holotype is a beautifully preserved, perfect wing showing pigmentation-pattern. The hindwing, also, is very well preserved.

These two wings were associated originally on the structure of the anterior halves of the wings and on their general size. The anterior halves are very similar except for the costal space which is greatly expanded over the basal half (forewing) in one case and very narrow (hindwing) in the other. There is one extra branch and a small twigging on Rs in the hindwing but the number of branches very probably varies with the individual. The media differ to a greater extent with MP connected to CuA only by a cross-vein in the hindwing. The hindwing retains the primitive feature of a distinctly branched media. This also occurs in the Recent *Prophalangopsis*.

More recently an additional specimen, F.43339, has been discovered and it shows an associated fore and hindwing of a female but the forewing lacks the apical half and the hindwing is crumpled behind.

Order ORTHOPTERA SALTATORIA.

Suborder INCERTAE SEDIS.

Family CLATHROTITANIDAE.

Mesotitanidae Tillyard, 1925, in part; McKeown, 1937.

The family contains only one genus, *Clathrotitan* McKeown, 1937. The genus *Mesotitan* Tillyard, 1916, is a quite distinct genus most probably referable to the Homoptera. The holotype and only known specimen of the genotype, *giganteus*

Tillyard, 1916, from the Triassic of St. Peters, Sydney, New South Wales, is very badly preserved. Subsequently Tillyard (1925) described *Mesotitan scullyi* from the Brookvale Triassic. McKeown (1937) described additional specimens of *scullyi* and erected the genus *Clathrotitan* for the male with genotype *andersoni* McKeown (= *Mesotitan scullyi* Tillyard, 1925). In the same paper McKeown described *Mesotitan tillyardi*, from a fragmentary specimen, considered to be *scullyi*.

This is a most interesting family in which the male has a remarkable stridulating organ developed from the thickened and expanded cross-veins between Rs, MA and MP. These form a large central disc in the wing. In some respects this reminds one of the more primitive subfamilies of the Prophalangopsiidae, such as the Haglinae, but the structure is different. The female wing is more like that of the Sthenaropodidae of the Upper Carboniferous and Permian.

The family very probably represents a side-branch derived from some Sthenaropodid stock and is not referable to either the Ensifera or the Acridodea, but possibly belongs to a distinct suborder.

Genus **Clathrotitan** McKeown, 1937.

Genotype *Mesotitan scullyi* Tillyard, 1925 (= *Clathrotitan andersoni* McKeown, 1937).

Mesotitan Tillyard, 1916 (in part); McKeown, 1937.—*Clathrotitan* McKeown, 1937.

Forewing.—Wing of very large size, with somewhat pointed apex, rather narrow in female, distinctly expanded in the middle in the male due to the well-developed stridulating organ developed discally from the cross-veins between Rs and MP; Sc very long, reaching almost to the apex of the wing, with numerous costal veinlets, transverse at the base of the wing but becoming progressively more oblique towards the apex; R₁ simple or with slight apical forking, subparallel to Sc; Rs rising rather close to the base of the wing; MA two-branched, MP with a short branch fusing with CuA₁ which is a strong, simple vein, CuA₂ arising towards the base, with a number of pectinate branches to the wing margin, CuP arising from CuA almost at the base of the wing, with limited apical branches; 1A a strong, simple vein, other anals weaker, branched, particularly 2A; cross-veins simple, transverse over most of the wing but forming an irregular archdictyon towards the margin.

Clathrotitan scullyi (Tillyard), 1925.

(Plate xi, figure 4.)

Mesotitan scullyi Tillyard, 1925, *Proc. Linn. Soc. N.S.W.*, 50: 376.—*Clathrotitan andersoni* McKeown, 1937, *REC. AUSTR. MUS.*, 20: 32.—*Mesotitan tillyardi* McKeown, 1937, *REC. AUSTR. MUS.*, 20: 34.—*Mesotitan scullyi* McKeown, 1937, *REC. AUSTR. MUS.*, 20: 35.

Forewing.—Of both sexes was described by McKeown.

Hindwing.—Based on F.43741 Australian Museum Collection. Wing with extreme base and apex missing and costal margin incomplete. Anal fan folded back over the wing. Sc very strong, R forked close to the base, with R₁ arched slightly, Rs forking not before its middle, possibly three-branched, M forking at a level with R, into MA and MP, MA forking again almost immediately and branches running more or less parallel to the wing margin, MP fusing with Cu just after the forking of MA but becoming free after some distance and continuing as a long simple vein to the wing margin, Cu with three distinct branches, CuA₁ forked after the separation

of MP, CuA₂ very close to CuA₁, decidedly concave, three branched near the wing margin, CuP well separated, with a three-branched condition, similar to that on CuA₂, towards the wing margin, 1A rather close to CuP, apparently branched pectinately towards the wing margin, succeeding veins simple till close to the wing margin, anal field somewhat expanded, but no distinct anal-fan.

Type.—The fragmentary type is in the collection of the Australian Museum, Sydney (No. F.37189). The types of *andersoni* and *tillyardi* are in the Australian Museum and the Geology Department, University of Sydney, respectively.

There are a number of additional specimens in the Australian Museum Collection but they add nothing to our knowledge of this most interesting species.

Order PERLARIA.

Family EUSTHENIIDAE.

It is with some doubt that the fossil described below is placed in this family. Unfortunately the venation is not complete but cross-veins are well-developed over most of the preserved portions.

Genus *Mesonotoperla* nov.

Genotype, *Mesonotoperla sinuata*, sp. nov.

Rs simple or if forked only so as a terminal twigging; Sc extending well towards the apex of the wing; CuA apparently only two-branched; M two-branched; cross-veins between M and CuA and between CuA and CuP well separated; no cross-veins between R and M over their basal halves.

In the reduced branching of Rs and CuA the genus approaches *Dinotoperla* and other Leptoperlidae but Sc and the costal space and the origin of Rs differ. The genus differs quite markedly from *Stenoperlidium* from the Upper Permian of Belmont, New South Wales.

Mesonotoperla sinuata, sp. nov.

(Plate xi, figure 5; text-figure 5.)

The single specimen of this species shows all four wings attached to the two thoracic segments and also portions of three legs. Unfortunately the two folded hindwings and one forewing overlie one another and so the venation is very obscure. The other forewing is out-stretched but it lacks most of the anals and the posterior border. The scuta of both meso and meta thorax, which are longer than wide, show an antero-lateral pair of large rounded protuberances. The first two abdominal segments are visible; they are wider than the scutum and wider than long. The preserved portions of the legs show no distinctive features.

Forewing.—Sc long, extending into the apical quarter of the wing, costal space with a complete series of costal veinlets, very close together over its apical quarter; R₁ long, extending almost to the apex of the wing, strongly curved near its apex, giving off over its apical half a close series of cross-veins to Sc and to the wing margin beyond the end of Sc; Rs arising from slightly beyond the middle of the wing, strongly curved parallel to R₁, simple or, if branched, with only a very small end-twigging, spaced cross-veins to R₁ over its whole length; origin of M from base of wing, two-branched, branching at a level of the origin of Rs, branches not as strongly curved as Rs, a series of cross-veins from the forking to Rs but none to R; Cu arising from base, quickly forking, with CuP curved away from CuA for a short distance and then continuing

almost parallel to it, CuA two-branched near apex, if a third branch is present on CuA it is very small; CuP simple, a complete series of cross-veins between CuA and CuP but between CuA and M cross-veins are only obvious after the forking of M; a cubito-median cross-vein from CuA almost at its origin to M; 1A arising from base, very close to CuP near its origin, rest of vein obscured, a number of cross-veins from CuP to 1A at the middle of its length, 2A preserved only at the cross-vein to 1A at the level of the origin of CuP, and there 2A is strongly angled.

Hindwing.—Very crumpled and imperfectly preserved. R_1 strong, R_s appears to arise from the base or close to the base of the wing, connected to R_1 by strong cross-veins.

Type.—Holotype specimen F. 35877 and counterpart F. 35955 in the Australian Museum Collection.

Type Locality.—Beacon Hill, Brookvale.

SELECTED REFERENCES

- McKeown, K. C., 1937.—New Fossil Insect Wings (Protohemiptera, Family Mesotitanidae) REC. AUSTR. MUS., 20 : 31–37.
- Martynov, A. V., 1925.—To the Knowledge of Fossil Insects from Jurassic Beds in Turkestan. 2. Raphidioptera, Orthoptera. (S.L.), Odonata, Neuroptera. *Bull. Acad. Sc. Russie*, 19 : 569–598.
- , 1937.—Permian Fossil Insects from Kargala and their Relationships. *Trav. Inst. paleontol. Acad. Sci. U.R.S.S.*, 7 : 1–92.
- , 1938.—Etudes sur l'histoire geologique et de phylogenie des Ordres des Insectes (Pterygota). 1. Palaeoptera et Neoptera-Polyneoptera. *Trav. de l'Inst. Paleont. U.R.S.S.*, 7 (4) : 1–149.
- Tillyard, R. J., 1916.—Mesozoic and Tertiary Insects of Queensland and New South Wales. *Qld. Geol. Surv. Publ. No.* 253 : 11–47.
- , 1918.—A Fossil Insect Wing from the Roof of the Coal Seam in the Sydney Harbour Colliery. *Proc. Linn. Soc. N.S.W.*, 43 : 260–264.
- , 1925.—A New Fossil Insect Wing from Triassic Beds near Deewhy, N.S.W. *Proc. Linn. Soc. N.S.W.* 50 : 374–377.
- , 1935.—Upper Permian Insects from New South Wales. 5. The Order Perlaria or Stoneflies. *Proc. Linn. Soc. N.S.W.*, 60 : 385–391.
- Zeuner, F. E., 1935.—The Recent and Fossil Prothalangopsidae (Saltatoria). *Stylops*, London, 4 : 102–108.
- , 1939.—Fossil Orthoptera, Ensifera. London Br. Mus. 13, 321 pp.

EXPLANATION OF PLATE XI.

1. *Prohagla superba*, gen. et sp. nov., hindwing, F. 41290, x 2 ca.; 2. *Prohagla superba*, gen. et sp. nov., holotype forewing, F. 38264, x 1.6 ca.; 3. *Mesacridites elongata*, gen. et sp. nov., holotype, F. 30970, x 1.6 ca.; 4. *Clathrotitan scullyi* (Tillyard), hindwing, F. 43741, x 0.8 ca.; 5. *Mesonotoperla sinuata*, gen. et sp. nov., holotype, F. 35877, x 2.4 ca.; 6. *Austroidelia perplexa*, gen. et sp. nov., holotype, F. 39179, x 2 ca.

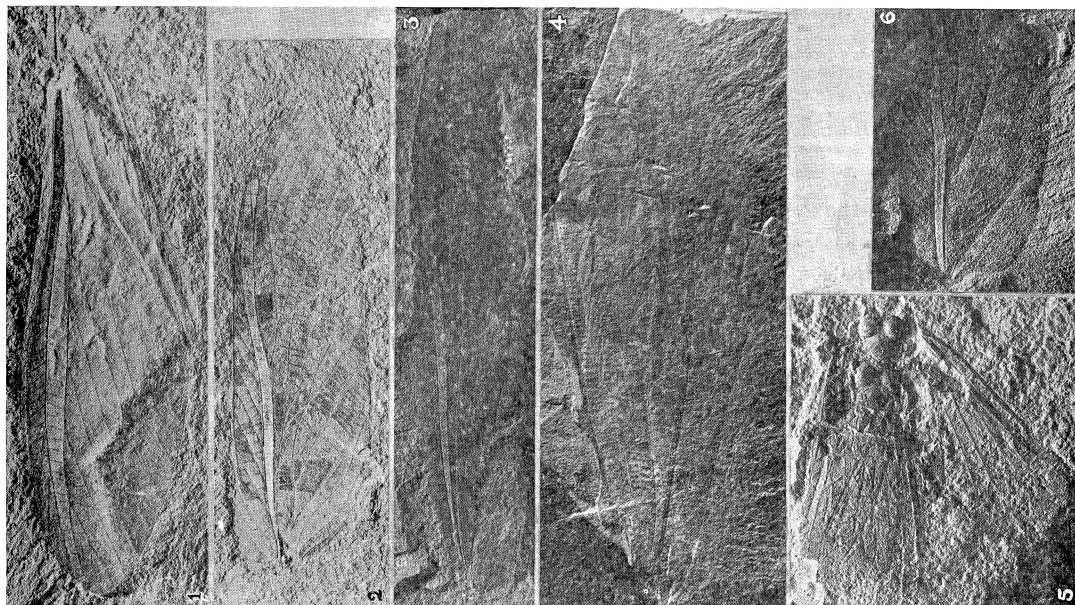


PLATE XI.

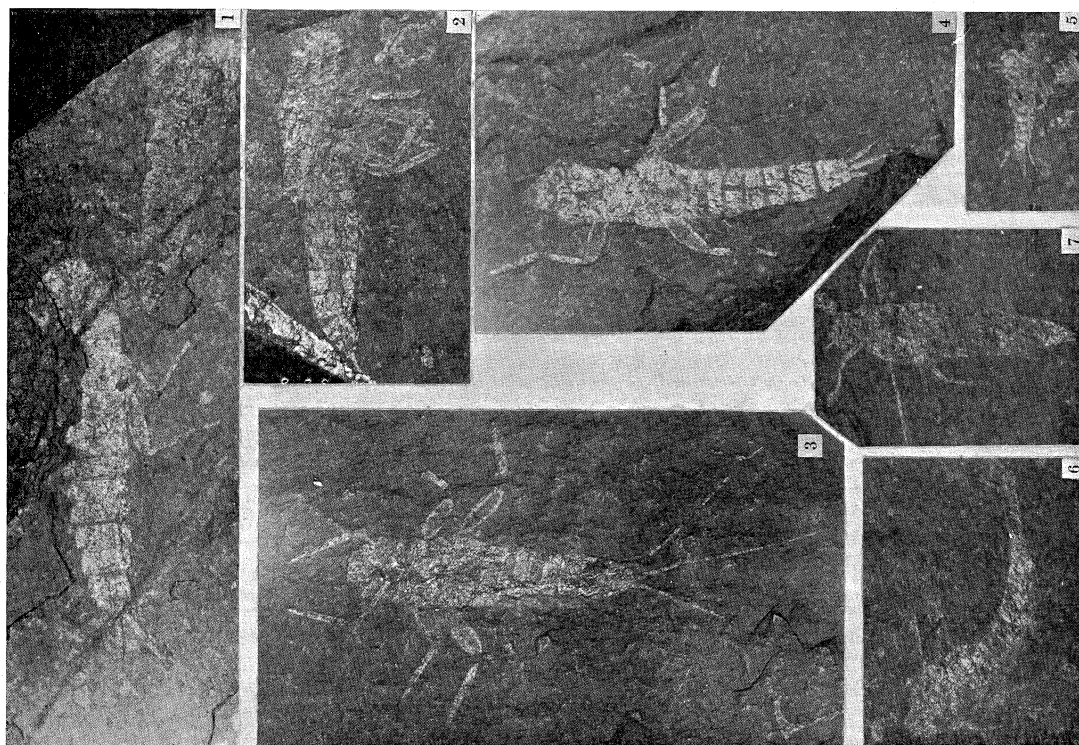


PLATE X.