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UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL, DIRECTOR

INSECT FAUNA

OF THE

RHODE ISLAND COAL FIELD

BY

SAMUEL HUBBARD SCUDDER



WASHINGTON
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CONTENTS.

	Page
Letter of transmittal.....	7
Arachnida	9
Anthracomartus woodruffi	9
Neuropteroidea	10
Rhaphidiopsis diversipenna	11
thopteroidea	11
Palæoblattaria	11
Mylacris packardii	11
Etoblattina illustris	12
Etoblattina sp.....	13
Etoblattina clarkii	14
Etoblattina scholfieldi	15
Etoblattina sp.....	16
Etoblattina gorhami	16
Etoblattina exilis.....	17
Etoblattina sp.....	18
Etoblattina reliqua	18
Gerablattina scapularis	19
Gerablattina fraterna	19
Protophasmida	20
Paralogus æschnoides.....	21

ILLUSTRATIONS.

Plate I. Arachnida, Neuropteroidea, Mylacroidæ, and Protophasmida of the Carboniferous beds of Rhode Island	24
Plate II. Blattinariæ of the Carboniferous beds of Rhode Island.....	26

LETTER OF TRANSMITTAL

DEPARTMENT OF THE INTERIOR,
U. S. GEOLOGICAL SURVEY,
DIVISION OF FOSSIL INSECTS,
Cambridge, Massachusetts, March 31, 1892.

SIR: Some years ago Rev. Edgar F. Clark, then of Providence, Rhode Island, discovered in the Coal-measures of the neighborhood of that city the wing of a cockroach. This stimulated further search by others as well as himself, with the result of finding a fair number and variety of insect types, some of special interest. Most of the discoveries have been made by Mr. Clark (part of them while in the service of the U. S. Geological Survey) and by two young men of Providence, Messrs. Frederick P. Gorham and Herbert Scholfield, who have been particularly encouraged in their work by Prof. A. S. Packard, of Brown University.

All of the specimens have passed under my eye and are herewith described and figured. They consist of *Anthracomartus*, the first discovered Arachnid in the Carboniferous deposits of the eastern United States; a new genus of Neuropteroidea and one of Protophasmida, each very different from any forms hitherto found in this country, but rather allied to some from the rich Carboniferous beds of Commeny, in France, presenting new features of alliance between the Carboniferous faunas of Europe and America; and a number of cockroaches, all represented by their wings alone. These last show considerable variety of form, both known subfamilies of Palæoblattariæ being present, including three genera and nearly a dozen species, the genus *Etblattina*, which is the prevalent Carboniferous type the world over, being represented by at least eight species, which again show unusual diversity in size, form, and distribution of the nervules that form the framework of the wing.

All the species without exception are new to science and unknown elsewhere.

A few additional stones have been submitted to me containing what are apparently parts of the wings of cockroaches, but they are too fragmentary to be of the least value. Nothing more can be said than that they are or may be portions of such wings.

It is hoped that the publication of this bulletin will excite further exploration and result in more extended discoveries.

Respectfully yours,

SAMUEL H. SCUDDER.

Hon. J. W. POWELL,

Director U. S. Geological Survey.

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INSECT FAUNA OF THE RHODE ISLAND COAL FIELD.

BY SAMUEL HUBBARD SCUDDER.

ARACHNIDA.

ANTHRACOMARTUS Karsch.

ANTHRACOMARTUS WOODRUFFI.

Pl. I, f.

Anthracomartus sp. Scudd., Frankl. Soc. Rep. Geol. R. I., 114, Pl. I, Fig. 1 (2 figs.).

A single specimen with its reverse shows the larger part of the abdomen of a species of *Anthracomartus* distinct from any known, but without any definite margin, though its general form is well indicated as similar to that of *A. trilobitus* Scudd., from Arkansas, but with a relatively broader base. The original relief of the central portion has entirely disappeared by pressure, but it can be seen to have occupied almost exactly the central half, and the whole abdomen, except posteriorly, to have been almost exactly equal in width throughout and strongly rounded behind. Eight segments are shown, and the surface, besides being covered almost uniformly and profusely, but most distinctly in the lateral areas, with rounded or slightly oval slight lenticular elevations of which there are six or eight on either side of each segment, has also lying on the outer edge of the central area a series of larger, slightly more prominent, similar circular bosses, one on either side of each segment, occupying the whole width of the segment. Nothing of this sort appears in any known species of *Anthracomartus*, and sufficiently distinguishes the present one. The division lines of the segments are gently arcuate on the central area, opening backward, nearly straight, and transverse on the lateral areas.

Length of abdomen, 10^{mm}; breadth, slightly more.

The specimen was found by Rev. Edgar F. Clark, at Pawtucket, and by his request is named for the late Julia M. Woodruff.

NEUROPTEROIDEA.

RHAPHIDIOPSIS, gen. nov.

Known only by its wings, which differ considerably in form, the fore wing being slender, nearly or quite three times as long as broad, the apex produced and roundly pointed, the costal margin gently and rather regularly arcuate, the lower margin more strongly and regularly but not greatly arcuate; the hind wing is much broader and less produced, not much more than twice as long as broad, the apex hardly in the least produced and broadly rounded, the costal margin strongly arcuate apically, but very gently before that, the lower margin regularly and strongly arcuate throughout. The neuration is essentially similar in the two wings, though varying a little. The mediastinal and scapular veins are both simple, the former running to beyond the middle of the wing and terminating in the margin, the latter to the apex, and both close together and to the margin throughout their course. The externomedian is the principal vein, occupying with its branches the apical half of the lower margin; a principal superior branch is thrown off well before the middle of the wing, and runs subparallel to but distant from the scapular vein and so has an arcuate course; from it fall two or three inferior distant branches (two in the fore wing, three in the hind) which run parallel to the main stem. The internomedian and anal veins are simple straight divergent veins, which have an apical arcuate or declivent fork, connected at base by straight cross veins with the veins on either side, forming large apical cells much after the manner of *Rhaphidia*, the further general resemblance to which is heightened by a more or less distinctly and distantly scalari-form series of submarginal distant cross veins; other cross veins, straight or faintly sinuous, sometimes transverse, sometimes considerably oblique, are scattered distantly over the wings, giving them a very widely open reticulation of polygonal, triangular, or rhomboidal cells.

This genus is plainly allied most closely to Brongniart's genus *Corydaloides*, so far known only from the Coal Measures of Europe, but differs from it in the nonfalcate form of the relatively shorter wings, the excessive breadth of the hind wings, and the less numerous and much more distant scapular branches. It evidently belongs to his family *Megasecopterida*, though I should not place therein all the genera which he refers to it. It can not fall in any of the family groups of *Neuropteroidea* hitherto recorded from America, nor in any family of insects now extant. It is specially interesting as forming a new link between the Carboniferous insect fauna of Europe and America.

RHAPHIDIOPSIS DIVERSIPENNA.

Pl. I, c, d.

The wings as preserved show no markings whatever, nor any special structure in the veins, which practically lie at the same level by crushing, though there are signs of difference between the internomedian vein and those on either side of it. In the fore wing there is an intercalary vein connected by oblique cross veins with the externomedian and internomedian veins between which it falls, which does not occur in the hind wing. The cells are all very large and the cross veins mostly straight and transverse, except in the interspace between the scapular vein and the upper externomedian branch, where they are strongly oblique and more or less sinuous.

Length of fragment of fore wing, 22^{mm}; probable length of wing, 26^{mm}; breadth of same, 8.6^{mm}; length of fragment of hind wing, 18^{mm}; probable length of wing, 23^{mm}; breadth of same, 10^{mm}.

The single specimen with its reverse was found by Rev. Edgar F. Clark, June 22, 1888, at the Locknosett mine, in Cranston, while engaged under Prof. R. Pumpelly in work for the U. S. Geological Survey. The specimens bear the field Nos. 179a, 179b.

ORTHOPTEROIDEA.

PALÆOBLATTARIÆ.

MYLACRIDÆ.

MYLACRIS Scudder.

MYLACRIS PACKARDII.

Pl. I, e, g.

Blatta americana Clark, Proc. Newp. Nat. Hist. Soc., 11: 12 (undescribed).

Mylacris packardii —, Rand. Notes Nat. Hist., 11: 64 (undescribed); Scudd., Frankl. Soc. Rep. Geol. R. I., 79, Pl. I, Fig. 2.

This species is described first from a single incomplete wing (Pl. I, e), preserving only a gently curved fragment of one (the costal) margin and apparently belonging to the genus *Mylacris*; it differs considerably, however, from all the known species, but most nearly approaches *M. bretonensis*. The wing is of very large size for a *Mylacris*, being longer than even *M. antiqua* but slenderer than it and is remarkably like *M. heeri* in the narrowness of the mediastinal area, which forms a rather narrow and nearly equal belt, which must extend nearly or quite to the middle of the wing, and has five or six elongated, scarcely diverging nervules, the outer of which spring from near the base of the main stem. The scapular vein is divided at the very base into two stems, and is remarkable for its straightness as well as for its unusual extent, for, notwithstanding the small breadth of the mediastinal area, the scapular

vein terminates as usual at or below the apex of the wing; it has seven or eight nearly equidistant branches, with a disproportionate space between the bases of the third and fourth, which may be simple or deeply forked, occasionally with two branches. The externomedian branches are three or four in number, and most of them compound and tolerably regular and longitudinal; in consequence of a break along its inner edge it is impossible to tell how far it extends, and the feeble, moderately distant, forked, and nearly straight branches of the gently arcuate internomedian vein, lying as they do at a lower level, appear to indicate that in deposition the wing was folded at this point. A mere fragment of the anal furrow is preserved, indicating that this area was extremely small and brief, not extending to the middle of the basal half of the wing.

Length of fragment, 40^{mm}; probable length of wing, 42^{mm}; breadth of fragment, 16^{mm}; possible breadth of wing, 18.5^{mm}.

This wing is interesting because it is the first fossil insect found in the New England coal field. It comes from the Carboniferous deposits of Bristol, and was found and sent to me by Rev. Edgar F. Clark. I take pleasure in acceding to his request that I should name it in honor of my life-long friend and fellow student, Prof. A. S. Packard, of Providence, R. I., whose studies in American zoology and paleontology are known to everyone. It is preserved in the Museum of Brown University.

Another specimen of the same species (Pl. I, *g*) differs considerably in the apparent breadth of the mediastinal area, but the outer limit as figured (to which the nervules do not extend) may be not the true margin of the wing. In all other particulars it very closely resembles the other specimen, and, curiously, has the same apparent folding of the wing between the externomedian and internomedian areas. It was found at Pawtucket and seems to be the specimen figured in the Franklin Society's report, although that purports to come from Bristol. It is of the same size.

BLATTINARIÆ.

ETOBLATTINA Scudder.

ETOBLATTINA ILLUSTRIS.

Pl. II, *i*.

This largest of the Rhode Island cockroaches is represented by a fore wing which apparently has the normal form, though the broken nature of the tip renders this somewhat uncertain, the course of the margins preserved tending to show the inner margin nearly straight throughout, the costal well arched so that the wing narrows apically by the recession of the outer margin, the breadth being probably contained about two and a fourth times in the length. The mediastinal

area is broad and tapers only in its apical third, the main vein terminating at about the end of the middle fifth of the wing, the branches, some of them deeply forked, being more and more and at last strongly longitudinal. The scapular area appears to extend from the mediastinal to the tip of the wing, and is divided at base into two stems, the upper of which has four widely and equally distinct longitudinal branches, the last arising just beyond the middle of the wing and simple, the first forked opposite the origin of the third, and its forks together with the second and third branches forked nearly opposite the origin of the last; the lower stem has also four superior, subequidistant, longitudinal branches, the first arising opposite the second branch of the upper stem, the fourth opposite the fourth; the second of these is simple, the first forks opposite the origin of the second and its lower fork again divides opposite the single fork of the third, which on its part is midway between the origin and fork of the fourth; there may, of course, be other forks in the part of the wing which is here broken, but if so they are probably not far from the margin. The externomedian vein is very unimportant; it first forks a little before the middle of the wing, its lower branch again forking less than halfway to the tip, but all three diverge but little and must occupy but a narrow space on the margin. The internomedian area, on the contrary, is more important, narrowing rather gradually in the basal half of the wing, very gradually beyond the main vein, terminating not very far before the tip of the wing, and having about half a dozen generally forked or doubly forked; divergent, nearly straight branches dividing the area with great regularity. The anal furrow is rather strongly bent and a little arcuate, and terminates before the end of the basal third of the wing, the anal veins apparently parallel to the furrow.

Length of fragment, 46.5^{mm}; probable length of wing, 61^{mm}; breadth, 26.8^{mm}.

This species seems to show a number of points of resemblance to the European *E. primavera* Gold. sp., but differs from it strikingly in the basal division of the scapular vein. It also resembles not a little the European *E. steinbachensis* Kliver, but has quite another form and differs in every detail.

The specimen was found by Mr. J. E. Clark, but at what exact locality is unknown. It is presumed by Mr. H. Scholfield, through whom it came to my hands, to have come from Pawtucket.

ETOBLATTINA sp.

Pl. II, c.

This species, certainly distinct from any of the other Rhode Island forms, but too imperfect for anything like a full description of the wing, is represented by a fragment from the middle of the fore wing; only a very small part of the natural border exists, lying outside the mediastinal area. It is evidently one of the broader types. The mediastinal

area is narrow and rather short, with numerous short, straight, oblique branches. The scapular vein terminates some distance before the tip, and has three equidistant, gently arcuate, upturned branches, the outer two simple, the inner doubly forked. The remainder of the fragment is filled with a multitude of slightly diverging, mostly simple, occasionally forked, straight, longitudinal nervules, the division of which among the lower stems there are no means of determining.

Length of fragment, 10^{mm}; breadth, 7.5^{mm}.

The species would seem to fall somewhere in the vicinity of *E. primæva* Gold. sp. It was obtained by Mr. Herbert Scholfield at Silver Spring, East Providence.

ETOBLATTINA CLARKII.

Pl. II, j.

The fore wing has the normal form, the inner border being straight to near the tip, the outer delicately-margined border pretty strongly and regularly convex, so that the wing tapers rather rapidly in the outer half to the rounded tip at the end of the inner half of the wing; it is broadest just before the middle and about two and three-eighths times longer than broad. The mediastinal area is very large and long, extending nearly to the apical fourth of the wing and beyond the basal third narrowing very gently, acuminate at apex; there are seven or eight mostly forked, gently sinuate, increasingly longitudinal, oblique branches. The scapular area reaches nearly to the apex and has usually longitudinal branches; there are three branches, all inferior and arising at great distances apart, the first near the base, the third a little beyond the middle of the wing; all are forked, the first and second near the origin of the third. The externomedian vein is strongly sinuate and has four superior equidistant branches almost confined to the second fourth of the wing, the third and fourth simple, the second simply the first doubly forked, the apical forking being near the middle of the apical half of the wing. The main internomedian vein is similarly sinuate and terminates considerably farther out than the mediastinal; it has three subequidistant, forked or doubly forked, strongly arcuate, sweeping basal branches, besides a simple (?), nearly longitudinal apical branch a little beyond the middle of the wing. Anal furrow strongly bent and arcuate, well within the basal third of the wing, the anal veins few, distant, simple or singly forked, and subparallel to it. The apical half of the wing shows a very close and delicate cross venation between the nervules, breaking the surface up into quadrangular cells several times broader than long.

Length of fragment, 41^{mm}; probable length of wing, 45^{mm}; breadth, 19^{mm}.

This species somewhat resembles the European *E. russoma* Gold. sp. and also *E. mazona* Scudd., from Illinois, but the greater longitudinality

and basal extension of the scapular branches and the rapid basal narrowing of the internomedian area by the strong sinuation of the main internomedian vein easily distinguish it. These are, indeed, its marked features in contradistinction from all known forms.

The single specimen with its reverse was discovered by Rev. Edgar F. Clark at Pawtucket. It is now in the Museum of Brown University. I take pleasure in naming it after Mr. Clark, who was the first to discover insect remains in the Rhode Island coal field.

ETOBLOTTINA SCHOLFIELDI.

PL. II, b.

So much of both the apex and base of the single fore wing preserved is lost that the form of the wing can not be determined, but the costal margin was very gently arcuate, and the probability is that the wing had rather an oval form and was not much more than twice as long as broad. The mediastinal area is broad and equal in the basal, regularly narrowing in the apical half, reaching to less than the extremity of the middle third of the wing, with nearly straight, strongly oblique, simple branches. The scapular vein nearly reaches the apex, repeats the general appearance of the mediastinal, but with closer and more subdivided branches, most of them being compound; it begins to branch at the end of the basal third of the wing, and has in all about five branches, the earlier ones the more compound. The externomedian vein courses in a nearly straight line through the middle of the wing, and begins to branch as soon as the scapular, but its branches, though compound, are distantly so and diverge but little, so that they only occupy on the margin the very apex of the wing; their forkings are subparallel and subequidistant. The internomedian area is broad, and, though the main vein is a little sinuous, the area narrows pretty regularly and gradually, reaching about as near the apex as the scapular area; there are seven subequidistant, nearly straight, oblique, simple, or compound branches, the last just beyond the middle of the wing, besides one simple one considerably farther out. The anal furrow is not pronounced and is gently arcuate, terminating at the end of the basal third of the wing.

Length of fragment, 14^{mm}; probable length of wing, 18^{mm}; breadth, 9^{mm}.

There are many points of resemblance between this species and the European *E. labachensis* Gold. sp., but the far earlier and more profuse branching of both scapular and externomedian veins separates our species distinctly from it.

This specimen was obtained at East Providence by Mr. Herbert Scholfield, to whom it is dedicated.

ETOBLATTINA sp.

Pl. II, k.

A single hind wing of a cockroach has been found in the Rhode Island beds, nearly perfect, the tip and an insignificant part of the base only being lost. The wing expands in size to the middle of the apical half and then begins rapidly to narrow, and probably had a rounded, perhaps angulated tip. The narrow scapular area is nearly uniform in breadth, tapering only next the apex, which is at the end of the middle third of the wing; there are three or four simple oblique apical branches. The scapular vein has four branches arising in the basal half of the wing, the first one near the base, all deeply forked and slightly divergent, but not expanding the area at the tip of the wing. The externomedian occupies just about as large a fan-shaped area, and shows a somewhat similar disposition of its branches, but does not begin to branch quite so early and the branches are more longitudinal. The internomedian is a reverse of the scapular if its basal branch be omitted. The anal is widely separated from the preceding, and differs in toto from the same in the fore wings of Palæoblattariae, being a more basal reversed repetition of the mediastinal vein; it extends nearly to the middle of the wing and has two or three distant, straight, oblique branches.

Length of fragment, 15^{mm}; probable length of wing, 18^{mm}; breadth, 8^{mm}.

A comparison with the fore wings of the other cockroaches from the same deposit makes it very probable that this is the hind wing of *E. scholfieldi*, but until they are found together this can not be determined.

The single specimen and its reverse were found by Messrs. Frederick P. Gorham and Herbert Scholfield at Fenner's ledge, in Cranston, "near the extreme western upturned edge of the Carboniferous in the plumbago mining district, and therefore probably older than the others."

ETOBLATTINA GORHAMI.

Pl. II, a.

The fore wing is apparently of a very regular oval shape, slenderer apically than toward the base, broadest at about the end of the basal third, and scarcely two and a half times longer than broad. The mediastinal area is ribbon-shaped, tapering only at the apex, reaching to the end of the middle third of the wing, the veins simple and arcuate. The scapular area is broad and reaches almost to the apex of the wing, and is filled with numerous regular, parallel, and arcuate, deeply-forked veins. The main externomedian vein runs almost straight through the middle of the wing with a slight sinuation, has two longitudinally oblique branches in the second fourth of the wing, simple so far as visible, but the apical half of the wing in this area is lost. The

internomedian area appears to extend slightly farther than the mediastinal, and the main vein is sinuate and declivent, with, so far as can be seen, three simple parallel, oblique, and slightly arcuate branches, their convexity, when any, toward the anal area. The anal furrow is distinctly impressed, arcuate, and slightly bent, terminating a little before the middle of the wing; the anal veins are mostly simple, one medially forked, few in number, and subparallel to the furrow.

Length of fragment, 17.5^{mm}; probable length of wing, 21.5^{mm}; breadth, 9^{mm}.

This species seems to resemble the European *E. parvula* Gold. sp. more than any other, but differs from it considerably.

A single specimen was collected at Pawtucket, by Mr. Frederick P. Gorham, after whom it is named. It was sent to me by Dr. Packard.

ETTOBLATTINA EXILIS.

Pl. II, e.

This is an exceptionally slender species, resembling in that respect the following species from the same beds, the fore wing being very elongate subfusiform oval, almost three times longer than broad; the costal margin is very regularly and not inconsiderably arcuate. The mediastinal area broadens a little beyond the base, and narrows again and rather rapidly only in its apical fifth, terminating a little beyond the end of the middle third of the wing; the branches are few, longitudinally oblique, straight, and simple. The scapular area reaches almost to the tip of the wing; the main vein begins to branch before the middle of the wing, and has four simple or deeply forked gently arcuate branches closely crowded together. The externomedian vein occupies the entire apex; it begins to branch as soon as the scapular and its branches are longitudinal and compound, and is but slightly divergent, a half dozen or more veinlets striking the margin. The internomedian area reaches beyond the middle of the apical half of the wing and is peculiar for its nearly uniform width, which is about the same as that of the mediastinal area, and for the few and distant, mostly compound, very longitudinally oblique, and straight branches. The anal area is extraordinarily narrow, the furrow slight and almost longitudinal, hardly arcuate, and terminating before the end of the basal fourth of the wing.

Length, 14.25^{mm}; breadth, 4.6^{mm}.

This species shows most resemblance to the European *E. flabellata* Germ. sp., and especially the form described by Deichmüller as var. *stelzneri*, but differs in the complete longitudinality of the externomedian branches, and the lack of any sinuosity in the internomedian vein.

It was obtained by Mr. Herbert Scholfield in a boulder lying on the beach, near Kettle Point, in East Providence.

ETOBLOTTINA sp.

Pl. II, *h*.

This species is represented by a single very obscure and somewhat imperfect fore wing, which hardly permits more than to say that it differs from any known form, but closely resembles the preceding species, *E. exilis*. It is, however, somewhat slenderer, but with otherwise a similar form, the breadth being contained about 2.8 times in the length. The mediastinal area is apparently shorter and relatively broader than in *E. exilis*, and the scapular area does not so closely approach the apex. The externomedian vein has few branches, and these are very longitudinal, the main vein coursing through the middle of the wing, but apically passing above the extreme apex. The internomedian vein evidently extends further out than in *E. exilis*, reaching the middle of the apical half, and a few branches of the vein appear to be simple and rather strongly arcuate, the area tapering considerably. The anal furrow seems to be quite as in *E. exilis*.

Length of fragment, 17^{mm}; probable length of wing, 18.5^{mm}; breadth, 6.5^{mm}.

A single specimen was obtained by Mr. Herbert Scholfield, at Pawtucket.

ETOBLOTTINA RELIQUA.

Pl. II, *g*.

The fore wing is very regularly long-oval and slender, being fully three times as long as broad. The mediastinal area is just two-thirds the length of the wing and very slender, tapering very regularly and gently, the veins simple and oblique. The scapular vein is very peculiar for an Etoblattina; the main stem is nearly straight, and runs parallel and near to the mediastinal, terminating, after sending out close to the tip a couple of short superior branches, about half way between the tip of the mediastinal and the apex of the wing; but at about the middle of the wing it sends off an important inferior branch which runs longitudinally to the apex, and from its upper surface emits one quarter way to the tip a medially forked branch. The externomedian vein is also very peculiar, for it is so closely united throughout its basal fourth with the scapular as scarcely to be distinguished from it, and then parts from it at the same angle as the inferior branch of the same and is simple except for a short apical fork. The internomedian vein is not completely preserved, but by the limitations of the externomedian extends nearly to the tip of the wing and appears to be nearly longitudinal with very long, longitudinal, and infrequent offshoots. The anal vein is not deeply impressed, moderately arcuate, and apparently terminates at the end of the basal third of the wing.

Length, 20.5^{mm}; probable breadth, 6.75^{mm}.

This is a very anomalous form of Etoblattina. It was collected by Mr. Frederick P. Gorham at Pawtucket, and sent to me for study by Prof. A. S. Packard.

GERABLATTINA Scudder.

GERABLATTINA SCAPULARIS.

Pl. II, l.

The larger part of a fore wing, showing all the principal neuration, but with the tip lost, is all that remains of this species. It appears to be of a pretty regular long oval form with the costal margin strongly arched at the base but very gently beyond, probably fully two and a half times longer than broad. The mediastinal area is rather broad and tapers very gently, reaching well beyond the middle of the apical half of the wing; the nervules are simple or singly and rather deeply forked, one near the middle trebly forked, and all longitudinally oblique and gently arcuate. The scapular vein is longitudinally branched, beginning at the middle of the basal half of the wing, its lowermost fork striking the tip of the wing; the forks are rather distant and about seven nervules reach the margin. The externomedian vein is strongly sinuous, superiorly branched with three forked or doubly and very deeply forked longitudinal slightly arcuate nervules, the first arising nearly as far back as in the scapular area. The internomedian area terminates just beyond the middle of the wing, sending a few simple, obliquely, and gently arcuate branches from the strongly sinuate main stem. The anal region is not preserved.

Length of fragment, 33.5^{mm}; probable length of wing, 41^{mm}; breadth of fragment, 14.5^{mm}; probable breadth of wing, 16^{mm}.

This species differs from all previously known, and resembles the other species from the same coal field in the early branching of the scapular and the relative brevity of the internomedian vein.

It was obtained by Mr. Herbert Scholfield, at Pawtucket.

GERABLATTINA FRATERNA.

Pl. II, d, e.

The form and proportions of the fore wing are much as in *G. scapularis*, but it tapers rather more in the apical half and is a little slenderer, besides being much smaller; it is about two and two-thirds times longer than broad, the costal margin rather gently arcuate and not greatly more so next the base, the inner nearly straight. The mediastinal area is moderately broad and equal, except apically, and reaches well beyond the middle of the apical half of the wing; the nervules are arcuate and either single or singly and deeply forked, one near the middle doubly forked. The scapular includes on the margin almost the whole of the tip of the wing, and is composed of two main stems which separ-

ate near the middle of the basal half of the wing, the lower the more important, with many deeply forked, very longitudinally arcuate, superior, much upcurved nervules of which more than ten strike the margin. The externomedian vein is rather strongly sinuate with two superior branches thrown off before the middle of the wing, the first simple, the second very deeply forked, all nearly longitudinal. The internomedian vein is gently sinuate and reaches nearly to the middle of the apical half of the wing, with somewhat differently directed inequidistant, mostly simple branches, the basal doubly forked and occupying nearly half the area. The anal furrow is rather gently and regularly arcuate and terminates at about the end of the basal third of the wing. The surface is traversed between the nervules by tremulous delicate close cross lines, and in part by a delicate reticulation (*d*).

Length of fragment, 15^{mm}; probable length of wing, 18^{mm}; breadth, 6.75^{mm}.

This species resembles only the preceding of all the known species of *Gerablattina*, but besides much being smaller, it has a much stronger upcurving of the apical scapular branches and a less important development of the externomedian area, made up for by the greater extension of the internomedian.

It was found by Mr. Herbert Scholfield at Silver Spring, East Providence.

PROTOPHASMIDA.

PARALOGUS (*παράλογος*) gen. nov.

Fore wings long and slender, a little more than three times as long as broad, the costal margin nearly straight, the hinder margin rather strongly arcuate, much the broadest in the middle. Mediastinal vein simple, running very close to the margin in the outer half of the wing, and probably terminating about its middle; the marginal area relatively broad in the middle of the basal half by the convexity of the margin in this region. Scapular vein throughout its course parallel to and not distant from first the mediastinal vein and then the margin, emitting its only inferior offshoot before the middle of its basal half; this almost immediately divides, its upper branch with a few longitudinal offshoots reaching the margin probably above the apex, the other with many arcuate sublongitudinal offshoots in the apical half of the wing falling below the apex. The strongly sinuate externomedian vein is simple, and strikes the hinder margin a little beyond the middle of the apical half of the wing. The internomedian and anal veins originate from a single stem, part from each other a little nearer the base than the scapular division, and each sends numerous equidistant arcuate branches to the margin, the anal area extending beyond the middle of the wing. The reticulation is almost exclusively quadrangular by straight transverse cross veins, and there are very few intercalaries, and these brief.

The most remarkable thing about the neuration of this wing is the simplicity of the externomedian vein which runs in a sinuous course through the middle of the wing between the numerous branches of the adjoining veins. The wing evidently belongs to one of the Protophasmida, but does not at all agree with any of the genera known to me from American rocks, though it shows some strong resemblance to the European *Spilaptera* Brongn., known only through an illustration which does not permit one to see the details of the neuration except along the lower margin of the wing. It is plain, however, that the internomedian and anal areas occupy a considerably broader basal area in *Spilaptera* than in *Paralogus* and the externomedian vein is apparently branched.

PARALOGUS ÆSCHNOIDES.

Pl. I, a, b.

The fore wing has much the same general form as that of a dragon fly of the genus *Æschna*. In the marginal field of the basal half of the wing, the middle portion of the interspace between the scapular vein and its branch and in the interspaces bordering either side of the externomedian vein in more than the basal half of the wing, the cells are higher than long; in nearly all the rest of the wing they are quadrate or approximately so. The united internomedian and anal vein has in the basal third of the wing a sinuous course nearly parallel to that of the externomedian vein and breaks up into three principal stems, two of which divide the anal area about equally between them with pretty regular branches, those of the extreme base not united by cross veins, those of the distal portion of the proximal anal stem usually forked next the margin, those of the distal anal stem similar but the alternate branches more or less zigzag and as if intercalary, uniting indirectly with the stem, their apical forks attached also to the neighboring stem, forming brief intercalaries; the externomedian stem first forks a little before the middle of the wing, then divides into three branches, the proximal simply forked, the middle throwing off one or two superior compound branches, the distal many simple inferior branches.

Length of fragment, 54^{mm}; probable length of wing, 62^{mm}; width in middle of wing, 19^{mm}; at base of fragment, 5^{mm}.

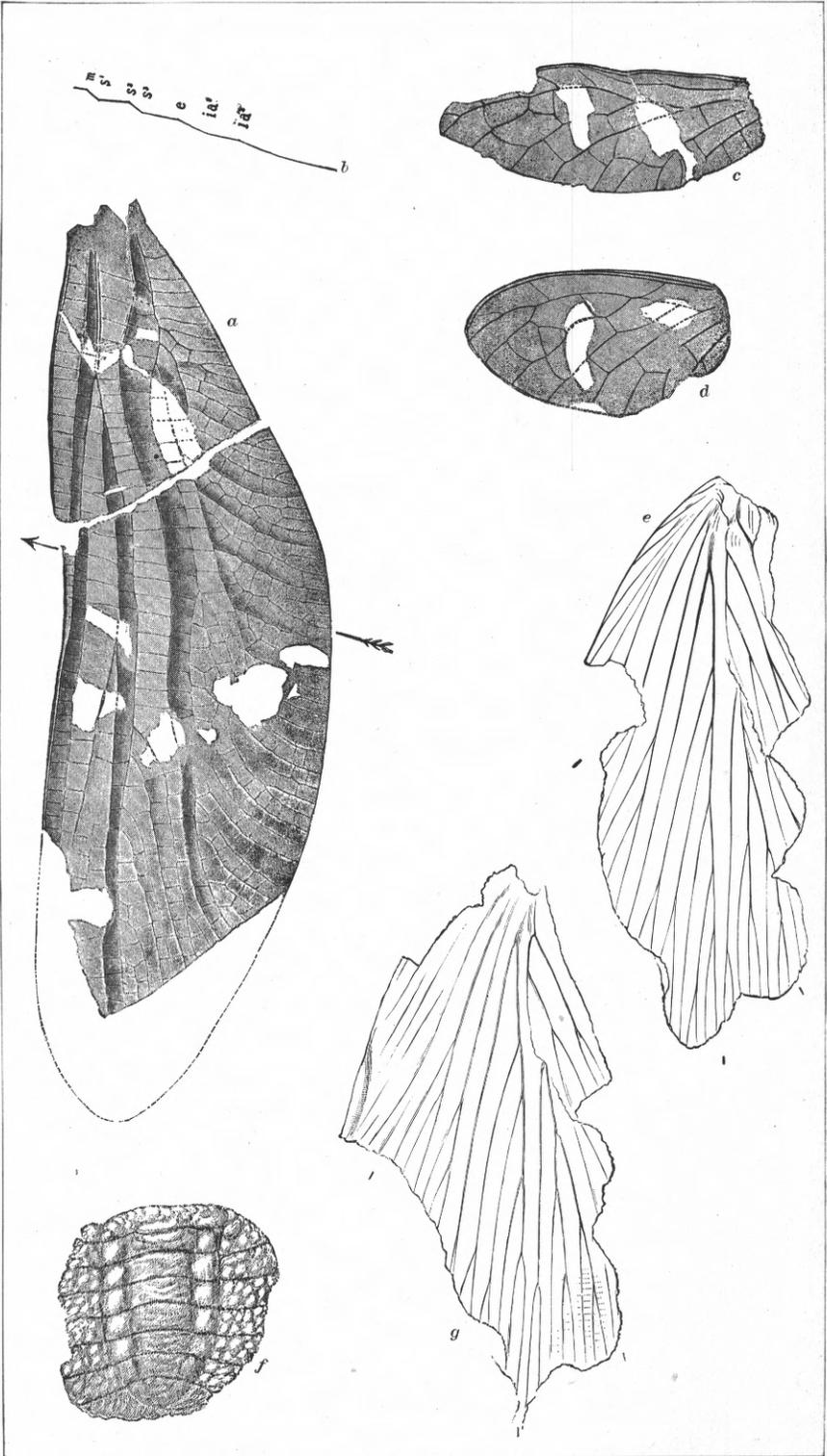
The specimen and its reverse were found by Mr. Frederick P. Gorham, November 2, 1889, in the Carboniferous rocks of Silver Spring, in East Providence.

PLATE I.

EXPLANATION OF PLATE I.

All the drawings are by J. Henry Blake, and, excepting *f*, are magnified 2 diameters.

- a.* *Paralogus æschnoides*; the dotted tip is purely conjectural.
- b.* The same; cross section at the point indicated by the arrow: *m*, mediastinal vein; *s*¹, *s*², *s*³, scapular vein and branches; *e*, externomedian vein; *i*¹, *i*², internomedian vein and branch; *a*, anal vein.
- c.* *Rhaphidiopsis diversipenna*; upper wing.
- d.* The same; lower wing.
- e.* *Mylacris packardii*, from Bristol.
- f.* *Anthracomartus woodruffi*; magnified 3 diameters.
- g.* *Mylacris packardii*, from Pawtucket.



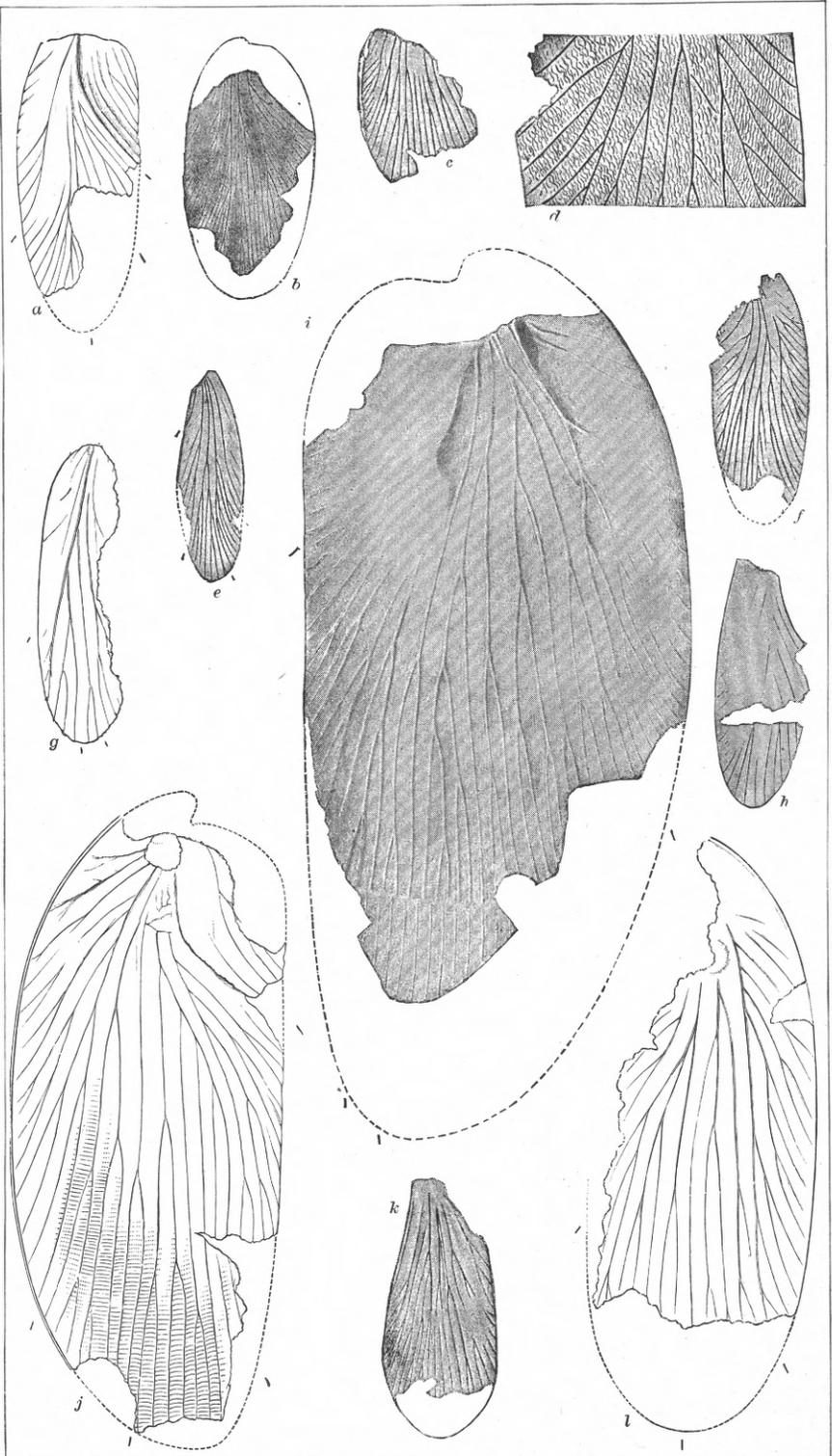
ARACHNIDA, NEUROPTEROIDEA, MYLACRIDÆ, AND PROTOPHASMIDA OF THE CARBONIFEROUS BEDS OF RHODE ISLAND.

PLATE II.

EXPLANATION OF PLATE II.

All the drawings are by J. Henry Blake, and, excepting *d*, are magnified 2 diameters.

- a.* *Etoblattina gorhami*; fore wing; the dotted tip conjectural.
- b.* *Etoblattina scholfieldi*; fore wing; the dotted tip conjectural.
- c.* *Etoblattina* sp.; fore wing.
- d.* *Gerablattina fraterna*; a part of the surface, magnified about 5 diameters
- e.* *Etoblattina exilis*; fore wing.
- f.* *Gerablattina fraterna*; fore wing; the dotted tip conjectural.
- g.* *Etoblattina reliqua*; fore wing.
- h.* *Etoblattina* sp.; fore wing.
- i.* *Etoblattina illustris*; fore wing; the dotted base and tip conjectural.
- j.* *Etoblattina clarkii*; fore wing; the dotted base and tip conjectural.
- k.* *Etoblattina* sp.; hind wing; the dotted tip conjectural.
- l.* *Gerablattina scapularis*; fore wing; the dotted tip conjectural.



BLATTINARIÆ OF THE CARBONIFEROUS BEDS OF RHODE ISLAND.

INDEX.

	Page		Page.
<i>æschnoides</i> , <i>Paralogus</i>	21	<i>fraterna</i> , <i>Gerablattina</i>	19
<i>Anthracomartus</i>	7, 9	<i>Gerablattina</i>	19
<i>Anthracomartus trilobitus</i>	9	<i>Gerablattina fraterna</i>	19
<i>woodruffi</i>	9	<i>scapularis</i>	19
<i>Arachnida</i>	9	<i>gorhami</i> , <i>Etoblattina</i>	16
<i>Blatta americana</i>	11	<i>illustris</i> , <i>Etoblattina</i>	12
<i>Blattinariæ</i>	12	<i>Megasecopterida</i>	10
<i>clarkii</i> , <i>Etoblattina</i>	14	<i>Mylacridæ</i>	11
<i>Corydaloides</i>	10	<i>Mylacris</i>	11
<i>diversipenna</i> , <i>Rhaphidiopsis</i>	11	<i>Mylacris antiqua</i>	11
<i>Etoblattina</i>	7, 12	<i>bretonensis</i>	11
<i>Etoblattina clarkii</i>	14	<i>heeri</i>	11
<i>exilis</i>	17, 18	<i>packardii</i>	11
<i>flabellata</i>	17	<i>Neuropteroidea</i>	10
<i>flabellata</i> , var. <i>stelzneri</i>	17	<i>Orthopteroidea</i>	11
<i>gorhami</i>	16	<i>packardii</i> , <i>Mylacris</i>	11
<i>illustris</i>	12	<i>Paralogus</i>	20
<i>labachensis</i>	15	<i>Paralogus æschnoides</i>	21
<i>mazona</i>	14	<i>Protophasmida</i>	20
<i>parvula</i>	17	<i>reliqua</i> , <i>Etoblattina</i>	18
<i>primæva</i>	13, 14	<i>Rhaphidia</i>	10
<i>reliqua</i>	18	<i>Rhaphidiopsis</i>	10
<i>russoma</i>	14	<i>Rhaphidiopsis diversipenna</i>	11
<i>scholfieldi</i>	15, 16	<i>scapularis</i> , <i>Gerablattina</i>	19
<i>sp</i>	13, 16, 18	<i>scholfieldi</i> , <i>Etoblattina</i>	15, 18
<i>steinbachensis</i>	13	<i>Spilaptera</i>	21
<i>exilis</i> , <i>Etoblattina</i>	17, 18	<i>woodruffi</i> , <i>Anthracomartus</i>	9