

NEW SPECIES OF NORTH AMERICAN FOSSIL BEETLES, COCKROACHES, AND TSETSE FLIES.

By T. D. A. COCKERELL,
Of the University of Colorado, Boulder.

The following notes upon new American fossil insects are the result of studies upon several small lots of specimens submitted to me by the United States Geological Survey. All of these specimens have been transferred to the United States National Museum and the catalogue numbers of the types will be found given under the descriptions of these species. For convenience of reference the paper has been divided into three headings, as noted below.

1. FOSSIL COCKROACHES FROM THE PENNSYLVANIAN.

The insects described below were collected for the United States Geological Survey by Dr. Harvey Bassler, of the Maryland Geological Survey, during 1916. Two localities are represented, and the material adds considerably to our knowledge of the subject.

(A) Rock quarry one mile northeast of Mercer Court House, Pennsylvania, above State hospital. (Bassler.) The horizon is 10' below top of Conoquenessing.

(1) Blattoid pronotum, slightly over 13 mm. broad and about 10.3 long; the posterior portion shows transverse striae, as in the living *Archimandrita marmorata* Stoll, from Guatemala. Such striae have also been observed in a pronotum obtained by Schlechtendal in the Upper Carboniferous of Saxony.

(2) Blattoid tegmen, with the following characters:

ATIMOBLATTA REDUCTA, new species.

Tegmen about 32 mm. long and 13 broad; interneural structure obscure, appearing rugose, but in the cubital field it can be seen that it consists of cross-veins, variably united by transverse veins in the middle, producing a reticulation of the same general character as that

in the living *Blaberus trapezoides* Burmeister. Venation and shape of tegmen like that of *Atimoblatta curvipennis* Handlirsch; anal field long; cubitus with five simple veins below; media with three branches above, the middle one forked, the forks of the middle branch and that produced by the last branch leaving the stem both more remote from the apex than in *A. curvipennis*; radius not well preserved, but with three branches, more or less divided distally; subcostal venation obliterated. Probably the pronotum described above belongs to this species; its size is such as would be expected. This insect is considerably smaller than *A. curvipennis*, from the "Upper Pottsville" at Scranton, but the structure is scarcely different.

Holotype.—Cat. No. 64342, U.S.N.M.

(3) Fragment of an apparently new Blattoid genus, probably related to *Adeloblatta* from Mazon Creek and *Mesitoblatta* from Commeny. There is not enough to justify a description and name.

(4) Smaller, unrecognizable fragments of Blattoid tegmina

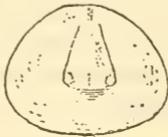


FIG. 1.—PRONOTUM OF BLATTOID PROBABLY *ATIMOBLATTA REDUCTA*.

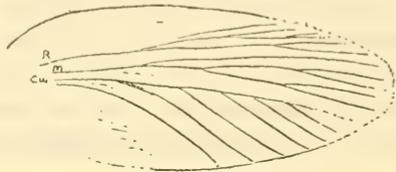


FIG. 2.—*ATIMOBLATTA REDUCTA* R.=RADIUS. M.=MEDIA. CU.=CUBITUS.

(B) Humphreys Clay Pit, Port Barnett, one mile east of Brookville, Pennsylvania. (Bassler.) In the Brookville Clay horizon 10'-15' above Homewood shales. The insects are in shale. All the insects are Blattoids.

(1) Blattoid tegmen, lacking the apex and anal area.

PHOBEROBLATTA RETICULATA, new species.

Plate 54, fig. 4.

Tegmen about 44 mm. long, the subcosta ending about 24 mm. from base; surface between the veins finely reticulated, as in *P. grandis* Handlirsch. Costa somewhat less convex than in *P. grandis*; costal area 4.3 mm. wide at level of first fork of radius; subcosta with a short apical fork, then (counting backward) three oblique branches which have branchlets from their upper side (the second with two, the others each with one), then a simple branch, then a branch forked near base, then a few weak strongly diverging branches (no distinct basal division as is described for *P. grandis*); radius with two main divisions, the upper with a small apical fork and two other branches from its upper side, the first (counting backward) with a small apical fork, the second with a very long fork, the upper branch

of which forks near margin; lower branch of radius forking a little before level of fork of upper, both divisions again forking, the upper by its branching enclosing six cells on margin, the lower with each division at least once forked, the inferior much sooner than the superior; media very straight, forked a little beyond origin of third branch of cubitus, the lower division soon forking again, the two together by their branching enclosing at least seven cells on margin; primary branches of media four, all except the first distinctly above; cubitus long, not rapidly descending, ending far beyond middle of wing, with no distinct superior appendage, but the last three forks are symmetrical, the branches are six, very oblique, the first, third, and fourth with long forks.

Differs from *P. grandis* by the smaller size and the structure of subcosta and cubitus, but is evidently congeneric. *P. grandis* came from an unknown horizon at Fishing Creek Gap, Pennsylvania, in the lower part of the Anthracite series. There is also a hind wing which I refer to *P. reticulata*.

Holotype.—Cat. No. 64343, U.S.N.M.

(2) Blattoid tegmina, representing a new genus.

COBALOBLATTA, new genus (Archimylacridae).

Large insects with broad elongated tegmina; costa convex, rapidly descending to apex, which is either in lowest fork of radius or in interval between radius and media; surface between the veins with very distinct and numerous cross-nervules, which anastomose to form a reticulation, but the general effect is that of very many cross lines, not the distinct polygonal reticulation of *Phoberoblatta*; costal area narrower than in *Phoberoblatta*, only about 3.6 mm. wide at level of first fork of radius; some of the branches of subcosta forked; radius with two main divisions, the first with four primary branches above, the first of these branches forking, with each branchlet forking again near margin, the second and third branches forking once; second division of radius forking, with each division again forking, and the first, second, and fourth of the branchlets so formed again forking; media nearly straight, little complicated, its branches essentially below, the main branches two, the second simple, the first forking, and its upper branchlet forking again; cubical field large and broad, the cubitus rapidly descending, with no appendix; branches of cubitus five, the last forming one side of the short apical fork, the second to fourth once forked, the first forked, with each branchlet again forked; and area broad and short, with six veins, the second, fourth, fifth, and sixth branched, the fifth with its lower branchlet again branched.

Type of the genus.—*Cobaloblatta simulans*, new species.

COBALOBLATTA SIMULANS, new species.

Plate 54, figs. 1, 2.

Tegmina about 44 mm. long, 18 wide; anal field about 15.5 mm. long; end of subcosta about 28 mm. from base of wing.

There are two specimens, each with reverse.

This fine insect is close to *Pachyblatta* Cockerell, from the Mount Savage clay, but it is much larger;¹ the costa presents a regular curve, the branching of the subcosta is much more simple (in the basal part of the costal area there is merely a vague reticulation), and the media is less complicated. In my tables it runs near *Kinklidoblatta*, from Pittston, Pennsylvania, but it is very much larger, with the cubitus entirely different. The cubitus is suggestive of *Olethroblatta*, from Germany, but the subcosta is quite unlike that genus. Superficially the species looks like *Phoberoblatta reticulata* from the same locality, but it shows many differences in detail.

Holotype.—Cat. No. 64344, U.S.N.M.

(3) Tegmen lacking apex.

BRACHYMYLACRIS BASSLERI, new species.

Plate 54, fig. 3.

Probable length of tegmen 14.5 mm., width about 8 mm.; length of anal area 8 mm.; end of subcosta from base of wing 8 mm.; interneural structure consisting of very fine cross-veins, which occasionally unite laterally. Subcosta with four branches above, the second with two branchlets above; radius early dividing into an upper and a lower part, the upper with three branches, the first of which again divides near its origin; lower division of radius forking, each division again forking, the upper branchlet of the lower division forking (there may be more complexity, the apex of the wing being missing); media dividing early, each division with two branches below; cubitus very simple, with only one main branch, which soon divides, and each division again forks, the fork of the upper division very long, that of the lower very short; anal area with 13 veins on margin, these forming two groups, that of the first four (counting backward or from above) and that of the others, separated by a wide interval basally; in the lower division of the anal veins are three forks.

Allied to *B. cordata* Handlirsch, but differing in the more simple cubitus and other details. *B. cordata* is from Tremont, Pennsylvania (Anthracite series).

Holotype.—Cat. No. 64345, U. S.N.M.

(4) Tegmen representing a new genus.

¹ *Pachyblatta convexa* Cockerell has the tegmen 30.5 mm. long, the subcosta ending 23 mm. from base of tegmen and 7.5 mm. from level of apex.

PTILOMYLACRIS, new genus (Mylacridae).

Medium-sized insects with broad subparallel-sided tegmina; surface between the veins without visible structure. Costal and radial areas reduced, approximately equal, the radius ending near the middle of the costal margin. Media greatly expanded, much branched, enclosing ten cells on margin; cubitus long, with nine branches, of which only the eighth is forked; anal area with seven nervures, the lowest forked.

I have been much perplexed concerning the interpretation of this tegmen, but after close examination in various lights and with different instruments, the above seems correct. The natural question is, whether all of the apparently extended and complicated media belongs to it, but it seems to do so. The genus is evidently related to *Promylacris* Scudder and *Paromylacris* Scudder, both from Mazon Creek, Illinois.

Type of genus.—*Ptilomylacris medialis*, new species.

PTILOMYLACRIS MEDIALIS, new species.

Plate 54, fig. 7.

Length of tegmen about 17.5 mm., width 9.5; length of anal area 8 mm.; end of subcosta about 8 mm. from base of wing. Subcostal branches obliterated; radius apparently very simple, with three simple branches from its upper side (compare *Goniomylacris* Handlirsch); media complex, with four branches from upper side, the first two (arising close together) each once forked, the third and fourth each with two simple branches from upper side; cubitus with nine branches, only the eighth forked. The media is not wholly unlike that of *Mylacris*; it also resembles that of *Paromylacris* in its general features.

Holotype.—Cat. No. 64346, U.S.N.M.

(5) Fragments of another mylacrid species, insufficient for recognition

(6) The following fragment of a tegmen.

STENOMYLACRIS, species.

A fragment having exactly the characters of this genus, so far as the material shows, but the median and radial fields are wholly missing. Subcostal region broad, ordinary for Mylacridae; branches of cubitus exceedingly oblique and close together, the branching, if any, close to their origin; anal area long and rather narrow (length, 10.5 mm.), with numerous veins which form exceedingly acute angles with the margin. The type of *Stenomylacris* came from the Mammoth vein, Sharp Mountain Gap, Pennsylvania.

(7) Part of tegmen of unknown Blattoid, costal and anal regions and apex missing. Remarkable for the very long simple cells in forks of radius and media; interneural surface finely reticulated.

(8) Tegmen representing a new species.

PHTHINOMYLACRIS (?) PAUPER, new species.

Plate 54, fig. 5.

Probable length of tegmen (the apical part is missing) about 17.5 mm.; apparent width 7.5 mm., but a little of the lower margin is concealed, so that the width was probably fully 8 mm.; interneural structure a fine reticulation, very distinctly preserved. Subcosta straight, ending about or nearly 10 mm. from base of wing, with four branches arising separately, the two middle ones each forked, the last, with the end of the main stem, enclosing a long cell; radius gently curved upward beyond the middle, with four branches above, the first forking early, producing a very long cell; the second also forking early, but each division again forked; the third forking only toward the apex; the fourth forking before the middle; media with two long branches, each forked, below and toward the apex two branches above; cubitus with four branches, the first soon forked, the others simple. The anal field is not preserved.

I have been much puzzled where to place this species. In my key to the Mylacrid genera it runs to *Phthinomylacris*, but differs from that genus in the strong interneural reticulation, the narrower tegmen, and the more complicated media. It can be made to run nearly as well to *Hemimylacris*, as typified by *H. ramificata* Handlirsch, but unfortunately the type of *Hemimylacris* is *H. clintoniana* (Scudder), which has Archimylacrid characters and is surely not congeneric. Very probably *P. pauper* should be regarded as the type of a new genus, but the single specimen is imperfect, and it may suffice to leave it in *Phthinomylacris* for the present. It is much smaller than the previously described species of that genus.

Holotype.—Cat. No. 64347, U.S.N.M.

(9) Tegmen of a new species.

ATIMOBLATTA (?) FLEXUOSA, new species.

Plate 54, fig. 6.

Probable length of tegmen (the apical part is missing) about 28 mm., width 12.5 mm.; anal area 13 mm. long, its greatest width a little over 6 mm.; interneural structure consisting of very fine close transverse veinlets, which frequently anastomose laterally. Subcosta long, the inclosed region narrow and bandlike, but the subcostal branches can not be made out; radius with four branches above, the first twice forked, the third and fourth once forked (there is doubtless more complexity, now obliterated); media little curved, with three branches above, the first forked a little beyond the level of

origin of the third; cubitus gently curved, with seven long simple branches, which are strongly curved apically; anal field with nine veins, the first dividing near base and each division forked, the second forked near apex, the eighth forked.

This differs conspicuously from the type of *Atimoblatta* in the broader tegmen and the flexuose branches of cubitus, but it does not seem advisable to propose a new generic term at present. There is also some resemblance to *Parellthoblatta*. These forms are related in a general way to *Archimyliacris* and appear to represent an early type of Archimyliacridae.

Holotype.—Cat No. 64348, U.S.N.M.

2. BEETLES FROM THE EARLY TERTIARY ROCKS OF COLORADO.

Recent investigations have shown that in the region of North Park, Colorado, there exist rocks of early Tertiary age containing elytra of beetles. Two of these insects were described under the names *Calandrites hindsii* and *Ophryastites hendersoni*.¹ Additional material recently received from the United States Geological Survey includes two species, one of which proves to be *O. hendersoni*, while the other is considered new. At the same time I find two more new species in the museum of the University of Colorado, and these are herewith described. The fauna or faunæ represented by these remains must be considerably older than the beds from which Scudder obtained his Eocene beetles. With the elytra alone, accurate generic determinations are impossible; and indeed, considering the antiquity of the fossils, they probably belong to other than the modern genera which they most resemble. The deposits are doubtless of fresh-water origin.



FIG. 3.—*CARABITES* ARAPAHOENSIS.

CARABITES (?) ARAPAHOENSIS, new species.

Elytron 5.7 mm. long, 2 mm. broad; truncate basally, nearly parallel-sided except apically, where it is pointed; surface only slightly convex, with eight longitudinal striae, not punctured.

Type.—University of Colorado Museum 5822: "Eocene, one mile west of Spicer, Arapahoe Pass Road, North Park, Colorado, 2½ miles south of fork of road; August 2, 1911 (N. E. Hinds)."

The elytron rather closely resembles *Carabites exanimus* Scudder, from the bank of White River, Utah, but it is much smaller.

BALANINUS (?) BEEKLYI, new species.

Elytron 2.6 mm. long, a little over 1 mm. broad; convex, acutely pointed, with eleven punctured striae.

¹ Proc. U. S. National Museum, vol. 51, 1916, p. 105, pl. 2, figs. 2 and 3.

U.S.G.S. locality 7120. "NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ sec. 7, T. 9 N., R. 80 W., east of Lake, one-half mile east of Higho, North Park, Colorado. (A. L. Beekly and H. Bassler.)" This is evidently Locality 54 of Bulletin 596, U.S.G.S., p. 63, and is in the Coalmont formation. This elytron has the general form of the acorn weevils of the genus *Balaninus*, and it is to be noted that species of *Quercus* occur in the Coalmont formation. The elytron is more acute than in the Florissant species, of very much later date, described by Seudder.

Holotype.—Cat. No. 64349, U.S.N.M.

OPHYRSTITES HENDERSONI Cockerell.



FIG. 4.—BALANINUS
BEEKLYI.

Two elytra. U.S.G.S. 7287. "NE. $\frac{1}{4}$, NE. $\frac{1}{4}$ sec. 9, T. 7 N., R. 81 W., west end of bluff 3 miles northwest of Coalmont, North Park, Colorado. (A. L. Beekly and H. Bassler.)" Collected August 21, 1911. This is locality 73 in the Coalmont formation, recorded on p. 65, Bull. 596, U.S.G.S. *Glyptostrobos* is recorded from the same place.

CALANDRITES (?) URSORUM, new species.

Elytron 8.6 mm. long, 2 or very slightly over wide, with nine sharp striae, and no punctures; the scutellum appears to have been large.

Type.—University of Colorado, 5817. "Eocene; south of Grizzly Creek, about 4 miles southwest of Spicer, North Park, Colorado, July 31, 1911 (F. F. Grout)."

This looks something like *C. hindsii*, but is remarkably long and narrow, with entirely different sculpture. It presumably represents an extinct genus, which can not be properly defined from the elytra alone. The reference even to the blanket-genus *Calandrites* is unsatisfactory.

3. FOSSIL TSETSE FLIES.

Plate 55.

The tsetse flies, the genus *Glossina* of Wiedemann, constitute a very distinct group of the higher Diptera, with rather numerous species. Although they are generally referred to the family Muscidae, which contains the house fly and other common species, they have so many peculiar characters that they may well be regarded as representing a distinct family. The formidable proboscis, ensheathed in the palpi, is directed forward and is always conspicuous. The wings, when at rest, are closed one over the other in a manner observed in no other similar flies—a character which

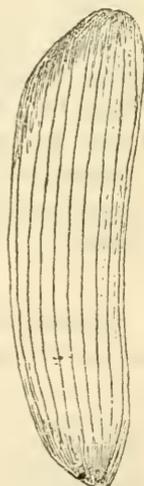


FIG. 5.—CALANDRITES
URSORUM.

makes it easy to distinguish tsetse flies in the field from various other blood-sucking Diptera. The venation of the wings is unique, the fourth vein (so-called) being abruptly bent or looped up in the middle, where the anterior cross-vein meets it. The mode of reproduction is also very remarkable, since the females lay no eggs, but each one produces a single full-grown larva, which almost immediately becomes a pupa.

Thus the tsetse flies would attract the attention of entomologists on account of their structure and habits alone, were they of no special importance to mankind in general. Thanks to the labors of Sir David Bruce and many others in tropical Africa, we now know that various species of *Glossina* are carriers of parasitic Protozoa of the genus *Trypanosoma*, which cause fatal diseases in man and animals. The nagana disease of cattle, due to a parasite carried by *Glossina morsitans*, is absolutely ruinous to the stock interests in certain districts. The parasite exists also in the wild hoofed animals, which do not become diseased, but serve as reservoirs from which domestic cattle and horses may be infected, provided the proper fly is present. This fact has led to an agitation in some quarters for the destruction of the larger wild animals, such as zebras and antelopes; but it is to be hoped that better means will be found to avoid the spread of the disease. Even more serious is the sleeping sickness of man, due to a trypanosome conveyed principally, at least, by *Glossina palpalis*. Owing to the opening up of trade routes through tropical Africa, this disease has spread far beyond its original area and has destroyed countless numbers of human beings. Medical men have labored incessantly, and no expense has been spared to find remedies and means of prevention. But while the white man is now able to take care of himself in nearly every case, it is an enormous problem to protect the native people all over central Africa. Up to the present time 17 species and 4 recognizable varieties of tsetse flies are known from Africa. The following chronological table shows when and by whom they were described. Synonyms are omitted.

1830. *longipalpis* Wiedemann; *palpalis* Robineau-Desvoidy.

1849. *fusca* Walker.

1850. *tachinoides* Westwood; *morsitans* Westwood; *tabaniformis* Westwood.

1891. *pallicera* Bigot.

1895. *longipennis* Corti.

1903. *pallidipes* Austen.

1905. *palpalis wellmani* Austen.

1910. *fuscipes* Newstead; *morsitans submorsitans* Newstead; *nigro-fusca* Newstead; *brevipalpis* Newstead.

1911. *caliginea* Austen; *fuscipleuris* Austen; *medicorum* Austen.

1912. *austeni* Newstead; *ziemanni* Grünberg.

1913. *morsitans pallida* Shircore; *morsitans paradoxa* Shircore.

There is only one exception to the rule that these flies are peculiar to the African Continent; *G. tachinoides* has been found in southern Arabia, as recorded by Captain R. Markham Carter in 1906.

In 1892 (Bull. U. S. Geol. Survey, No. 93) S. H. Scudder described a remarkable fossil fly from the miocene shales of Florissant, Colorado, at that time supposed to be of oligocene age. He considered it to belong to the Oestridae, which contains the bot-flies and warble-flies. The head was unfortunately missing, but Scudder correctly noted the singular course of the fourth vein, which found no counterpart among living Oestrids. It naturally never occurred to him to compare the insect with an African genus, so he described it as a new genus and species, *Paloestrus oligocenus*. In 1907 Mr. Geo. N. Rohwer found a good specimen of this species at Florissant, showing the proboscis, and I was able to determine without difficulty that it was a genuine tsetse fly, astonishing as that might seem. An enlarged figure appeared in the Popular Science Monthly (August, 1908, p. 117). A figure was also published by Bland-Sutton in the Middlesex Hospital Journal (London) for December, 1907. Mr. E. E. Austen, of the British Museum, the principal authority on tsetse flies, quite agreed with the reference of the fossil to *Glossina*.

Thus it appeared that a million years ago, more or less, tsetse flies inhabited Colorado. Prof. Henry F. Osborn had shortly before discussed the possible causes of the disappearance of so many large mammals which formerly inhabited America, and had suggested that there might have been some flies carrying disease-producing organisms, such as the tsetse fly. If at various times and places such diseases as the nagana invaded the herds of Tertiary horses and other animals, these creatures might abruptly disappear, leaving no trace of the cause of the phenomenon. It is naturally out of the question to determine whether these ancient species of *Glossina* did actually carry trypanosomes, but their occurrence in the shales is certainly suggestive.

In 1909 I had occasion to describe a second species of tsetse fly from the Florissant fossil-beds, and named it *Glossina osborni*. It was published in Nature for April 1 of that year (p. 128).

In 1916 Mr. George Wilson was so fortunate as to find two additional specimens of *Glossina* at Florissant, representing additional species. The specimens are now in the United States National Museum. One of them, *Glossina veterna* Cockerell (Nature, Sept. 28, 1916, p. 70) is a truly marvelous specimen, showing not only the proboscis, wings, and body, but even the characteristic hairs on the body. The accompanying plate, kindly made by Dr. R. S. Bassler, shows it enlarged. It is actually 12.5 mm. long, the wings 10.9 mm.

The other species, which I have named *Glossina armatipes*, is not so well preserved, but its salient characters can be made out. The

armature of the legs, as the name suggests, is striking. It is a relatively small form, with the wings about 7.5 mm. long. The outer side of the discal cell is curved, more or less S-like, an exaggeration of the condition found in the living *Glossina fusca*. The wings are perfectly clear, the veins very pale.

The largest of the fossil species is *G. oligocena* (Scudder), which has the wings about 16 mm. long; next in order is *G. veterna*; while *G. osborni* and *G. armatipes* are smaller insects, with the wings less than 8 mm. In *G. armatipes* the hind basitarsus carries a pair of stout longitudinally striated spines; similar spines exist in the modern *G. fusca*.

Whether *Glossina* originated in the Eastern or Western Hemisphere may be considered doubtful. There are no closely related genera known, and it is a singular thing that no true Muscidae have been found in the Florissant shales. Grünberg (Zool. Anzeiger, 1906) described *Glossinella schillingsi* from East Africa; a genus and species supposed to be allied to *Glossina*. It is, however, actually very different, with quite different venation. Bezzi in the year following stated that *Glossinella* was not to be separated from *Lype-rosia* Rondani, which is now known by the earlier name *Haematobia*.

EXPLANATION OF PLATES.

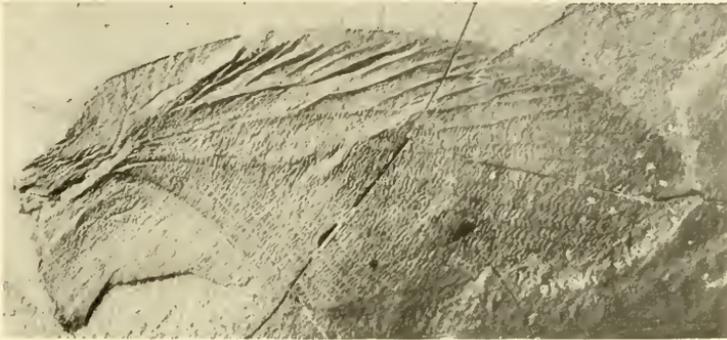
PLATE 54.

Fossil Cockroaches from the Pennsylvanian.

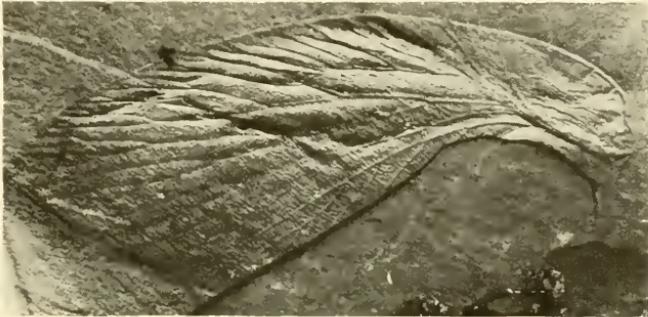
- FIG. 1. *Cobaloblatta simulans*. Type $\times 2$.
 2. *Cobaloblatta simulans*. Reverse of type $\times 2$.
 3. *Brachymylacris bassleri*. Type $\times 2$.
 4. *Phoberoblatta reticulata*. Type $\times 2$.
 5. *Phthinomylacris pauper*. Type $\times 2$.
 6. *Atimoblatta flexuosa*. Type $\times 2$.
 7. *Ptilomylacris medialis*. Type $\times 2$.

PLATE 55.

Fossil tsetse fly. *Glossina veterna* Cockerell.



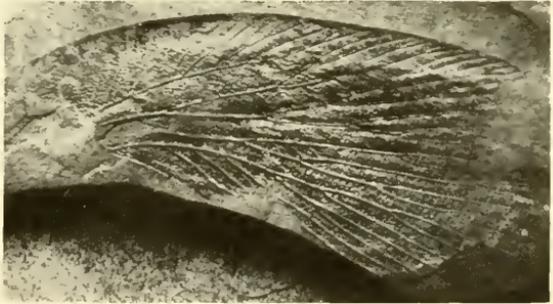
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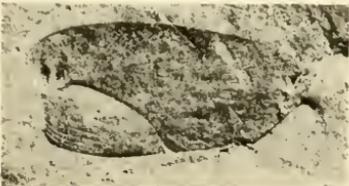
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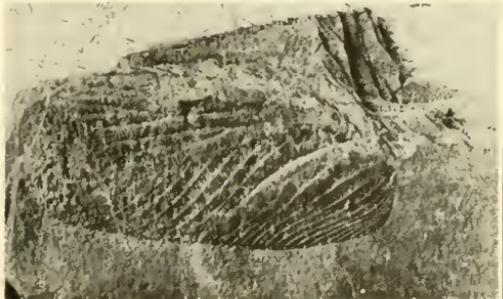
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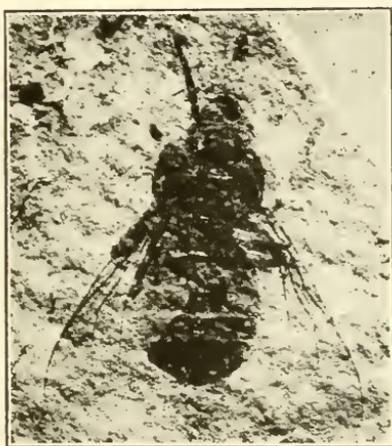
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6

FOSSIL COCKROACHES FROM THE PENNSYLVANIAN.

FOR EXPLANATION OF PLATE SEE PAGE 311.



FOSSIL TSETSE FLY, *GLOSSINA VETERNA* COCKERELL.

FOR EXPLANATION OF PLATE SEE PAGE 311.

