

Article VII.—FOSSIL INSECTS FROM FLORISSANT,
COLORADO.

By T. D. A. COCKERELL.

PLATE XVI.

DIPTERA.

TABANIDÆ.

***Tabanus parahippi* sp. nov.**

Plate XVI, Figs. 1, 1a.

♂. Length 18½ mm.; wings 12; width of head 4; width of thorax 5; length of thorax 5½; length of abdomen 10½; width of second segment about 5½; of fourth a little over 4 mm. Head and thorax black or almost; abdomen conical, as preserved dull ferruginous, without markings, but with the sutures broadly hyaline (the chitinous rings being partly separated, making the abdomen longer than in life). Legs dark brown or black. Abdomen with fine hair (no bristles). Wings brownish hyaline, not at all spotted; nervures pale reddish, obscure. Venation quite normal for *Tabanus*.

Eyes holoptic, wholly without hair, the upper facets about twice as large as the outer (lower) ones. The antennæ have short fuscous hair on the basal part; the apical part is not visible.

The venation, compared with Williston's figure of *Tabanus* (N. A. Dipt. p. 179), differs thus:

(1.) The second vein has its apical portion quite strongly sinuous, with a double curve. (I find this character in *Chrysops lupus* Whitn., a recent species collected at Florissant.)

(2.) The first basal cell is a little shorter, being somewhat shorter than the second.

(3.) The first branch of fourth vein is not arched as it leaves the discal cell. In Hine's table of *Tabanus* of Western U. S., this runs to *T. agrotus*. In his table of *Tabanus* of Ohio it runs to *T. americanus*, except that the costal cells are not darkened.

Hab.—Miocene shales of Florissant, 1907. It is named after a genus of Miocene Equidæ occurring in Colorado, which it probably tormented.

***Tabanus hipparionis* sp. nov.**

Plate XVI, Figs. 2, 2a.

Length about 16½ mm.; wing about 12; width of abdomen at third segment 5½ mm. Eyes not hairy; head and thorax black; abdomen dark reddish brown, wholly without bristles, as preserved with the rings separated and the sutures broadly hyaline; legs dark reddish brown; middle tibiæ with two apical spurs (a

character of all Tabanidæ), hind tibiæ without spurs; tarsi exactly normal for *Tabanus*, with the same claws, pulvillus, fine bristle-like hairs, deeply emarginate penultimate joint, etc.

Wings dusky, subhyaline; first vein strong and dark, the others pale ferruginous. The second vein is not sinuous, but is as in Williston's figure (N. A. Dipt., p. 179). Second and third posterior cells much shorter than in Williston's figure, the discal cell ending nearer the margin (the upper side of the second cell is about equal to the marginal or outer sides of second and third combined; *T. reinwardtii* Wied., found living at Boulder, Colorado, has these cells short, though not quite so short as in *T. hipparionis*). The fourth posterior cell is extremely narrow basally, and its side on discal cell is about twice as long as that on third posterior. The anal and basal cells are normal.

Hab.— Miocene shales of Florissant, collected 1907.

THEREVIDÆ.

Psilocephala hypogæa sp. nov.

Plate XVI, Figs. 3, 3a.

♀. Length 10 mm.; wing about $6\frac{1}{2}$, hyaline; head, thorax and abdomen black, shining; width of abdomen $2\frac{3}{4}$ mm., its length about $5\frac{1}{2}$ mm. Abdominal segments 2 to 5 are practically equal in length, whereas in *P. platancala* Lw. they are successively shorter. Eyes widely separated on vertex; antennæ less than 1 mm. long, slender, not hairy; face not at all hairy; legs ferruginous, perhaps black basally.

Anterior cross-vein about middle of discal cell; fourth posterior cell widely open. Discal cell about 2 mm. long; second submarginal cell about 2 mm. long and half a mm. wide at apex.

Compared with *P. platancala* Lw. (Boulder, Colorado, June, 1905, *W. P. Cockerell*, det. Johnson) it differs as follows:—

- (1.) The second submarginal cell is much narrower, and the discal cell is longer.
- (2.) The second vein reaches the margin of the wing a little *beyond* the middle of second submarginal cell (much *before* middle in *P. platancala*). The subcosta or auxiliary vein is not shifted, hence it results that the terminations of the auxiliary and first veins are much wider apart.
- (3.) The anterior cross-vein is somewhat more oblique; and the third vein is not at all deflected or bent to meet it, as it is in *P. platancala*.

It differs from *P. scudderi* Ckll. by the perfectly clear wings; and from both *scudderi* and *platancala* by the fourth posterior cell, which is almost as widely open as the second. This is not considered a generic character; Coquillett enumerates many living North American species having the fourth cell open.

Hab.— Miocene shales of Florissant, 1908.

A second specimen, found by Mr. Geo. N. Rohwer, presents the insect in lateral view (the type shows the dorsal aspect), and brings out the fact that the thorax in profile is very convex above; much more so than in *P. platancala*. It also shows that the claws are large, about 255μ long, not allowing for the curve. I cannot distinctly see pulvilli or empodia; but

pulvilli are indicated, small and narrow. The wings are not quite so long as in the type, and the specimen is probably a male. The abdomen, except for the practically equal segments 2 to 5, agrees exactly in shape and appearance with *Psilocephala*.

Meunier's *Psilocephala agilis*, from Baltic amber, has the fourth posterior cell closed; it differs greatly (according to the figure) from the modern genus by the excessive length of the second and third veins. Perhaps it should form a distinct genus. The genus *Psilocephala* lives to-day at Florissant, where I took a specimen of *P. munda* Lw. (det. Coquillett).

ASILIDÆ.

***Asilus peritulus* sp. nov.**

Wing about 13 mm. long, pale reddish, the nervures ferruginous. Other parts not preserved. In Williston's tables (N. A. Dipt.) it runs to *Asilus*, and compared with *Asilus (Tolmerus) notatus* Wied. (Vinton, Ohio, *Hine*) it is practically the same, except in the following particulars:

(1.) In *A. peritulus* the apex of marginal cell is more acute, the lower nervure scarcely at all bowed or curved subapically.

(2.) The second submarginal cell is longer (length $3\frac{1}{2}$ mm.), and very much longer than the part of R_{4+5} from the anterior cross-vein to the fork, the latter being 2 mm. long.

(3.) The second posterior cell bulges more at the sides.

(4.) The anterior cross-vein is conspicuously beyond the middle of the discal cell.

(5.) The fourth posterior cell is broader (higher); its apical width is 1 mm. or slightly more.

Hab.—Miocene shales of Florissant, Sta. 13 B, collected in 1907. *Fagus longifolia* occurs on the same piece of shale.

From *Proctacanthus* it is easily separated by the lower branch of third vein being below the tip of the wing; from *Erax* by the total absence of any spur on the basal part of the upper branch of the third vein.

LEPTIDÆ.

***Leptis mystacæformis* sp. nov.**

Length 9 mm., expanse about 14; width of abdomen near base fully 2 mm. Abdomen with fine appressed dark brown hairs, not at all dense. Anal cell about $100\ \mu$ broad at apex, but actually closed, the bounding nervures being continuous around the apex. Antennæ not visible.

Head and mesothorax black, the latter apparently without any stripes; scutellum and sides of thorax ferruginous; legs light ferruginous, the tarsi fuscous; wings reddish hyaline, not spotted, but the marginal cell darkened; abdomen pale ferruginous, with darker ferruginous markings, viz. a triangle on second segment, triangles

with lateral expansions (forming bands) on third and fourth, a large quadrate mark, broader than long, but broadly excavated behind, on fifth, and smaller marks on sixth.

Very different from *L. florissantina* Ckll. by the tapering abdomen (which has dark markings almost exactly as in *L. mystacea* Macq.); the shorter marginal cell (which is strongly clouded, and wider in the middle than at the apex); the strongly elbowed base of upper branch of third vein (which is exactly as in *L. mystacea*); the first basal cell not longer, but a trifle shorter, than the second (also as in *L. mystacea*); and the broader (deeper) anal cell. The wings are much broader (deeper) than in *L. florissantina*, their breadth being about 3 mm.

Hab.— Miocene shales of Florissant, Sta. 13 B (*S. A. Rohwer*, 1908).

BOMBYLIIDÆ.

Melanderella gen. nov.

Rather small flies, with cylindrical abdomen, which extends a short distance beyond the wings. Mouth parts exerted, stout but long, about as long as the thorax, bifid at the end, the labella large and quite broad. Antennæ not hairy, about 680 μ long, the terminal joint occupying nearly half the length, fusiform in shape narrowed basally and apically, about 100 μ diameter in middle; the general structure of the antennæ being essentially as in *Lordotus* (cf. Williston's figure, N. A. Dipt.), except that they are less slender, and not hairy. The form of the last joint is not as in *Dolichomyia*.

The mouth-parts recall those of *Lepidophora*. The venation is nearly as in *Systropus*, but the form of the body is entirely different.

Wings hyaline, with three posterior and two submarginal cells; in Williston's tables (N. A. Dipt.) it runs to *Dolichomyia*, which it closely resembles in venation, differing as follows:—

- (1.) The second vein leaves the third at the same point as the latter leaves first.
- (2.) The lower median angle or corner of discal cell is nearly on a level with (*i. e.* below) the anterior cross-vein.
- (3.) The basal side of the third posterior cell is straight (strongly bowed in *Dolichomyia*).
- (4.) The anal cell is large and complete, being just closed on the wing margin.

The upper side of the second submarginal cell has an even double curve, with no angle or projecting vein. The first posterior cell is very widely open. If it had four posterior cells it would run in Williston's tables to *Acreotrichus* or *Phthiria*. It is not at all like *Phthiria*.

The genus is dedicated to Prof. A. L. Melander, in recognition of his work on Diptera and on fossil insects.

Melanderella glossalis sp. nov.

Length about 7 mm.; abdomen not quite $4\frac{1}{2}$; wing 5; proboscis 2; hind femora 3; hind tibia $2\frac{3}{5}$; hind tarsi about $2\frac{1}{4}$ mm. Head broad; head and thorax black; abdomen dark reddish-brown, as preserved with the sutures colorless; legs reddish-

brown, the hind femora rather stout, their tibiæ and tarsi slender; wings hyaline, nervures reddish-brown, area between first vein and costa darkened; antennæ black or almost.

Anterior cross-vein 850 μ from base of discal cell, and 561 from its apex.

Breadth of labella (each) about 170 μ ; breadth of proboscis near middle about 340 μ .

Hab.— Miocene shales of Florissant, Sta. 13 B. (*Melford Smith*, 1908.) On the same slab, close to the fly, is a leaf of *Fagus longifolia*.

Lithocosmus gen. nov.

Runs in Williston's table (N. A. Dipt.) to 26, where the next dichotomy depends on the anal cell. The anal cell appears to be very narrowly open, having a width at apex of about 70 μ , but the nervures actually circle around the margin, closing it. If the anal cell is regarded as closed, it runs to *Oncodocera*, which it does not resemble at all. If the cell is regarded as open, it appears to run to *Metacosmus*, but I cannot see an ocellar tubercle. The antennæ will not do for *Lepidophora*. There is no sign of any elongate proboscis.

Lithocosmus agrees with *Metacosmus* in its elongated form and naked body, and in the tip of the second vein meeting the costa at an acute angle. *Metacosmus* has the second submarginal cell nearly straight along its upper edge; this is not at all the case in *Lithocosmus*. *Metacosmus* has the small or anterior cross-vein beyond the middle of discal cell; it is a little before the middle in *Lithocosmus*.

Lithocosmus has two submarginal and four posterior cells, the first posterior narrowed apically; the usual spurious vein below the fifth is present. The antennæ are peculiar, the last joint being broad-oval about 200 μ long, with a short but conspicuous terminal spiniform process, about 35 μ long. The other joints are short and broad. This type of antenna seems to be between those of *Spogostylum* and *Pachysystropus*.

Lithocosmus coquilletti sp. nov.

Plate XVI, Figs. 4, 4a.

Length about 9 mm., wing a little over 7 mm.; head and thorax black, head rather large; abdomen dark reddish-brown, with (as preserved) the sutures colorless; wings dusky, but not very dark; abdomen long and parallel-sided, the width near base about 2 mm.; whole insect apparently hairless, but with a microscope it can be seen that the hind margins of the abdominal segments are sparsely beset with black bristles, about 250 μ long, directed backwards; tarsi pale ferruginous, with very fine ferruginous hair; tibiæ apparently also ferruginous, but femora dark.

First posterior cell about 187 μ wide at apex, and 374 in middle; base of second submarginal cell obliquely truncate, the bend in the bounding nervure being abrupt; second vein leaving third about 500 μ from origin of latter, but as the third runs very close to the first, this is not apparent without a microscope; a fine extra or spurious vein leaves the second very near its origin, and runs parallel with and very close to

the third for more than 1700 μ ; second vein entering costa at an angle little smaller than a right angle, and 425 μ from end of upper branch of third, the latter, at its apex, being practically parallel with the second (this arrangement is practically as in *Systoechus*, though in *Systoechus* the upper branch of third is not abruptly bent); subcosta entering costa at a very acute angle. The basal cells are nearly as in *Lordotus*, but the second is considerably longer in proportion to its breadth.

By a curious aberration on the left side there are two small or anterior cross-veins, bounding a little cell about 220 μ broad and 170 deep. The first of these cross-veins is 1020 μ from the base of discal cell, the second 1070 from the apex of that cell. On the other side, the anterior cross-vein is single and normal (a little oblique) and 1020 μ from base of discal cell.

Hab.— Miocene shales of Florissant 1908.

Named after Mr. Coquillett whose writings on Bombyliidæ have been of great service in this investigation.

SYRPHIDÆ.

Chilosia miocenica sp. nov.

Plate XVI, Figs. 5, 5a.

Length about 9½ mm.; width of thorax 4; abdomen oval, its width 3½ mm., the widest point being at the junction of second and third segments; length of wing 9 mm., wings faintly dusky, with dark veins, stigmal area slightly yellowish; head and thorax black, shining; legs apparently dark reddish, and rather short and stout; abdomen very dark reddish, with broad but suffused light basal or subbasal bands on segments 2 and 3, that on 2 interrupted in the middle by a narrow but very distinct longitudinal dark band, that on 3 with the middle third suffusedly darkened, thus it cannot be said that the abdomen has any *entire* light bands; first abdominal segment with long dark hairs, lacking on the following segments.

The form of the insect is that of *Chilosia*; the marking of the abdomen is suggestive of *Melanostoma*.

The venation almost agrees with Williston's figure of *Chilosia* (N. A. Dipt., p. 250, f. 8), but differs as follows:—

- (1.) The cross-vein between costa and subcosta is vertical, *i. e.* at right angles to costa.
- (2.) The subcosta or auxiliary vein enters the costa at a very acute angle, its terminal part not being abruptly bent (*i. e.* it is as in *Didea*).
- (3.) The apical part of the second longitudinal vein has a more distinct double curve.
- (4.) The third longitudinal is quite strongly curved, and ends on the margin (the apical section being in a line with that before) *below* the tip of the wing (nearly as in *Rhingia nasica*).
- (5.) The lower apical corner of the first posterior cell is less prominent.

Hab.— Miocene shales of Florissant, 1908. Another specimen, collected at Station 14 (*S. A. Rohwer*, 1907), differs from the type by the shorter wings, not quite 8 mm. long. It has the abdomen dark-banded along the sutures.

Scudder has described a *Chilosia* from the Green River beds, Wyoming. Williston (Synops. N. A. Syrphidæ, p. 282) has referred to the occurrence of species of *Chilosia* in the Florissant shales, without naming or describing them.

Mr. H. E. Burke has shown that the larvæ of *Chilosia* injure the timber of various coniferous trees; evidence of their work may be expected to be found in the fossil wood (*Sequoia*) of Florissant.

NEUROPTERA.

RAPHIDIIDÆ.

Raphidia exhumata sp. nov.

Represented by an anterior wing, with the usual large costal area.

Wing $12\frac{1}{2}$ mm. long, 4 broad; hyaline, nervures piceous; stigma rather dark ferruginous, with an oblique cross-vein. Length of stigma about 2 mm.

Cross-nervures of costal area, counting from the one above the branching of R and M apicad, are seven, unevenly spaced, the fourth and fifth approaching below. Subcosta reaching costa at a distance from pterostigma less than the length of the lower side of the latter. R_1 (as in *Megaraphidia*) with two branches beyond pterostigma (one in *Raphidia oblita* and *R. rhodopica*). Cross-vein from R_1 to R_2 before stigma normal but second cross-vein arising from near beginning of apical fourth of stigma, practically as in *Megaraphidia* (beyond stigma in *R. oblita* and *rhodopica*); it enters R_2 (which is bent at this point, as in *R. rhodopica*) some distance before the next branch of the latter (also as in *R. rhodopica*). Lower side of stigma long, as in *R. oblita*, and very different from *R. rhodopica*. R_2 with three branches in its terminal part, the two uppermost forking (three branches in *R. rhodopica*, the uppermost one forking; five branches in *Megaraphidia*). R_3 arising practically as in *Megaraphidia*, but not forked; from its point of origin arises a cross-vein to R_{4+5} . R_{4+5} with a single long fork as in *R. oblita* (in *R. rhodopica* the branches are forked at end.) Three cross-veins from Rs to M; (1.) near origin of Rs, (2.) at first forking of Rs. (3.) about half way between cross-vein to R_3 and separation of R_{4+5} , (this is different from *Megaraphidia* or *R. oblita* or *R. rhodopica*). The three cells below media as in *R. oblita* and *R. rhodopica*, except that the second is longer, and the third longer than the second; this is nearer to *R. oblita* than to *rhodopica*. Six forks on lower margin of wing, not counting that of R_{4+5} ; these are all large except the fourth, which is small; the fifth is larger than the sixth, (four forks in *R. oblita*, fewer in *R. rhodopica*). Cells below Cu_1 practically as in *R. rhodopica*, but sides of first cell parallel; no long cell next to (beyond) the second, such as there is in *Megaraphidia* and *R. oblita*. Cells below Cu_2 as in *Raphidia*. Cells below anal as in *R. oblita*, except that the last cross-nervure to margin is lacking.

Hab.— Miocene shales of Florissant, Sta. 13 B (*S. A. Rohwer*, 1908).

This does not agree with any of Scudder's Florissant species; it is larger than his largest, which has the wing $10\frac{1}{2}$ mm. long and 2.7 broad.

TRICHOPTERA.

In Bull. Amer. Mus. N. H., XXIII, p. 611, I proposed to regard *Dero-brochus abstractus* as the type of *Derobrochus* Scudder. However, *D. frigescens* Scudd. was figured in Zittel's Handbuch several years before the other species were published, and although no description was offered, I think this entitles it to be regarded as the type of the genus.

HETEROPTERA.

PENTATOMIDÆ.

Teleoschistus rigoratus Scudder.

Station 14 (*S. A. Rohwer*, 1907.) The specimen shows the antennæ, which were wanting in Scudder's examples. They are 7 mm. long, or very nearly; the last four joints have the apical half, more or less, darkened, the basal part pale. In form they resemble those of *Euschistus*.

I designate as the type of *Teleoschistus* Scudder the first species, *T. antiquus* (Scudd.).

HOMOPTERA.

APHIDIDÆ.

Anconatus gillettei Ckll.

This was briefly noticed in *Nature*, Aug. 6, 1908, p. 319.

Head and thorax dark reddish brown, abdomen very pale ochreous; femora reddish-brown, tibiæ black; stigma reddish-brown; third discoidal vein colorless or almost before the fork. Length of body $5\frac{3}{4}$ mm., of wing about 9 mm.; anterior femora about $2\frac{1}{2}$ mm.; anterior tibiæ over 3 (apex lost); middle tibiæ about $3\frac{1}{2}$ mm.

The following wing-measurements are in μ :—

Origin of first discoidal vein to origin of second discoidal about 561.

Origin of second discoidal to origin of third discoidal (base of third invisible, however), about 850.

Forking of third discoidal before level of origin of stigmatic, about 714.

Depth of marginal cell at end of stigma 595

Stigma on marginal cell 1580

Depth of stigma 425

Width of cell between forks of third discoidal vein 850.

Hab.— Miocene shales of Florissant, Sta. 13 B (1908).

Aphidopsis lutaria Scudder.

Station 13 (*S. A. Rohwer*). Head and thorax dark brown; abdomen very light, with a series of large mid-dorsal dark transverse patches or spots, which have about one-third the diameter of the abdomen. Femora brown; tibiæ and tarsi black. Antennæ 6 mm. long or almost. Apical margin of wings broadly suffused with dusky.

Anterior wings 5 mm. long, or a fraction over; hind femora 2380 μ long, anterior femora 1700 μ . The marginal cell is like that of *Pemphigus*, which is otherwise different. There is a certain resemblance to *Lachnus* in venation, but the long antennæ are totally different.

The following wing measurements are in μ :—

Origin of first discoidal or transverse vein to origin of second	238.
Origin of second discoidal to origin of third	561
Origin of third to origin of stigmatic or stigmal vein (which is at middle of stigma)	1326
Length of marginal cell	2040
Origin of third discoidal vein to first fork	765
Origin of first fork to origin of second	1326
Length of lower branch of first fork	1904
Length of upper branch of second fork	1360
Length of lower branch of second fork	1054

FULGORIDÆ (CIXIIDÆ).

Florissantia elegans Scudder.

A good specimen was found by Mr. S. A. Rohwer at Station 13 B. It shows more of the venation than Scudder's type, and so permits a more precise diagnosis. Venation in most respects agreeing with that of *Oliarus*. Compared with that of *O. tamehameha* Kirkaldy (*Faun Hawaiiensis*, Hemiptera, Pl. IV, f. 4) it differs as follows: Costa not so full basally; Subcosta branching from radius earlier (6 mm. from tip and $5\frac{1}{2}$ from base of tegmen); apical part of radius with three branches to costa; radial cell extremely long (about $5\frac{1}{4}$ mm.) and reaching to within $1\frac{1}{2}$ mm. of base of tegmen; median cell similar to radial, scarcely surpassing it basally, and falling less than half a mm. short of it apically; lower apical corner of radial cell emitting two long veins to the outer margin, distinct from the base, the upper long-forked, the lower simple. The cell in the forks of the cubitus is like that of the *Oliarus*. There is a very distinct dark stigma. The abdomen appears to be entirely as in *Oliarus*.

The numerous living species of *Oliarus* differ in the details of their venation, and it may be that some nearly agree with *Florissantia*.

ORTHOPTERA.

BLATTIDÆ.

Ischnoptera brunneri (sp. nov.?).

This seems to be Scudder's *Zetobora brunneri*; a better specimen than his type. I only doubt the identity because the insect seems to me to be a typical *Ischnoptera*, and the measurements do not wholly agree. Provisionally, I treat it as a distinct species, but apply the specific name *brunneri*, so that if it proves identical with Scudder's no change will be necessary.

The middle and hind femora are spined beneath. The venation, so far as visible, agrees with *Ischnoptera*; so also the legs, and the broad rounded pronotum, which is dark in the middle, but very broadly light laterally, the extreme margin with a fine black line. The humeral areas of the tegmina are light, exactly as in *Ischnoptera*. The tegmina surpass the abdomen by about $5\frac{1}{2}$ mm.; antennæ with 16 mm. preserved, the apex wanting; cerci large, about $3\frac{1}{4}$ mm. long.

Body 20 mm. long (Scudder's *Zetobora* was 17); pronotum 6 mm. across (Scudder's the same), its length in middle about $3\frac{1}{3}$; length of hind femora $5\frac{2}{3}$; of tegmina about $21\frac{1}{2}$. Counting from the first (the one bounding the humeral space), twelve nervures reach the margin in 10 mm. length of that margin.

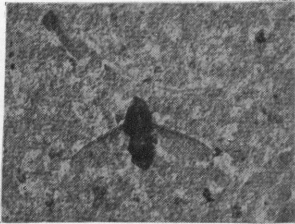
Hab.— Miocene shales of Florissant, Sta. 13 B (*T. D. A. Cockerell*, 1908).



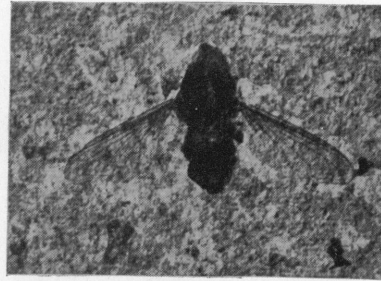
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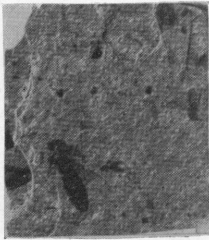
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5



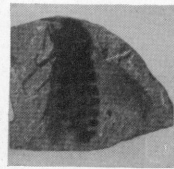
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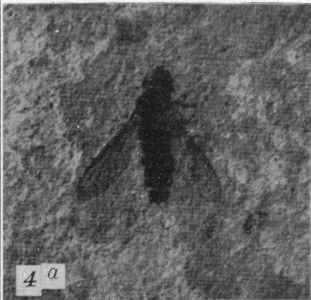
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3a



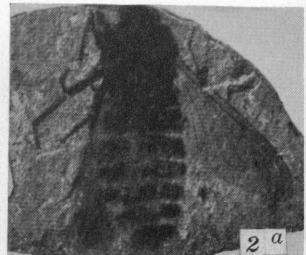
2



4a



4



2a

FOSSIL INSECTS, FLORISSANT, COLORADO.

- 1 ($\frac{1}{2}$) and 1a ($\frac{2}{3}$). *Tabanus parahippi* sp. nov. 2 ($\frac{1}{2}$) and 2a ($\frac{2}{3}$). *Tabanus hipparionis* sp. nov.
 3 ($\frac{1}{2}$) and 3a ($\frac{2}{3}$). *Psilocephala hypogaea* sp. nov. 4 ($\frac{1}{2}$) and 4a ($\frac{2}{3}$). *Lithocosmus coquilletti* sp. nov.
 5 ($\frac{1}{2}$) and 5a ($\frac{2}{3}$). *Chilosia miocenica* sp. nov.

