

ART. VI.—*Descriptions of Tertiary Insects*; by T. D. A. COCKERELL.

PART IV. [Continued from p. 312.]

(9) *Dragonflies from Florissant, Colorado.*

Melanagrion nigerrimum sp. nov.

WINGS hyaline basally, to about three cells beyond the quadrangle; beyond that black to apex (owing to the partial destruction of the membrane, the black is patchy and irregular; the apical field was perhaps dark brown rather than pure black); first row of costal cells broad, as in *Lithagrion*; at the tenth cell before stigma the costal cell is half size of subcostal, the latter being twice as deep; apex of quadrangle to tip of wing about $24\frac{1}{2}^{\text{mm}}$ ($26\frac{3}{4}$ in *M. umbratum*), but the ten costal cells before stigma measure together about $7\frac{1}{2}^{\text{mm}}$ (six in *M. umbratum*). Stigma large, about $3\frac{1}{2}^{\text{mm}}$ long, bounding five cells below; costa obtusely bent at stigma, the margin beyond rapidly descending to apex; eight poststigmatal sectors; vein Cu_{2a} a little before medioanal link; base of wing agreeing in general with *M. umbratum*.

Florissant: one specimen, with reverse; Station 14 (W. P. Cockerell, 1907). Holotype in Peabody Museum, Yale.

Lithagrion hyalinum Scudder. Figure 1.

A specimen was obtained by Mr. S. N. Rohwer at Station 17, on a slab with *Typha lesquereuxi* Ckll.,* showing some characters heretofore obscure. There are certainly only two antenodal sectors. The stigma is swollen, and bounds $3\frac{1}{2}$ cells below. The total length of the wing is 28^{mm} ; from nodus to stigma $14\frac{2}{3}^{\text{mm}}$; nodus to base 9^{mm} ; breadth of wing in middle 7^{mm} . These dimensions are uniformly less than in Scudder's type, but that was probably an upper wing, while ours is apparently a lower; there may also be a difference of sex. (In *Enallagma civile*, male, I find anterior wing $19\frac{2}{3}^{\text{mm}}$, posterior $18\frac{1}{2}$). There are 17 sectors on costa between nodus and stigma (16 in type *L. hyalinum*), and 14 in the same distance in the subcostal series; the costal cells beyond the stigma are doubled, which is not at all the case in *Melanagrion nigerrimum* (in *M. umbratum* there is a slight tendency to doubling). There are three simple cells between M_1 and M_2 before the doubling begins.

These new materials make the genus *Melanagrion* appear less distinct than when it was proposed, *M. nigerrimum* being in some respects intermediate between *Melanagrion* and *Lith-*

* On the other side of the slab is *Planorbis florissantensis* Ckll. (Peabody Museum, Yale).

agrion. Characteristic of both is the position of vein M_3 , originating a long way before the level of the nodus, though not half-way to the arculus;—a condition found to-day in *Megaloprepus*, one of the Anormostigmatini. The question was raised, whether *Lithagrion* and *Melanagrion* could represent the stem which gave rise to the Anormostigmatini; but altogether against this is the position of the long sector between veins M_1 and M_2 . Mr. E. B. Williamson writes that he regards the latter character as of considerable significance, and for this and other reasons would support Scudder's reference of the insects to the *Podagrion* series. He adds, with reference to

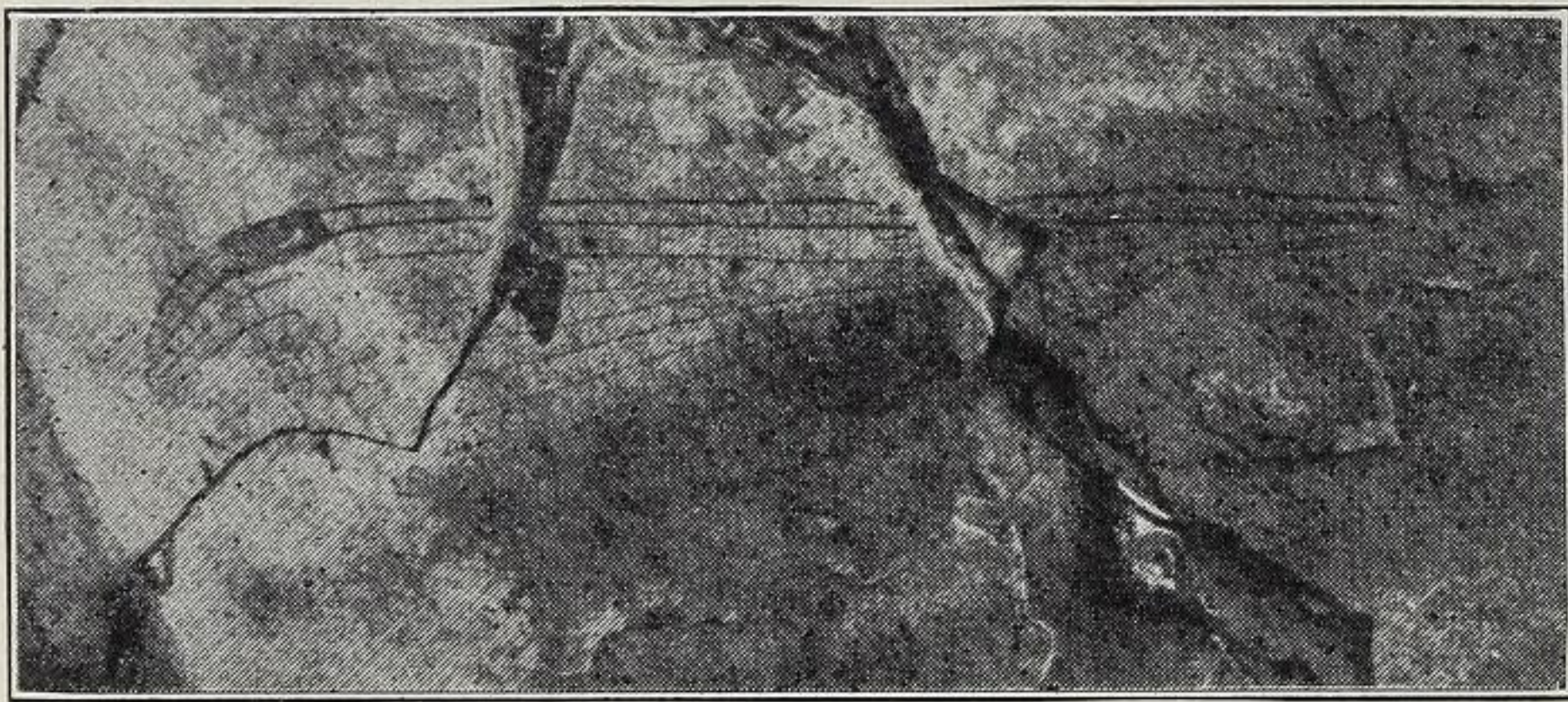


FIG. 1. *Lithagrion hyalinum*.

M. umbratum: "it is not specialized by reduction, and the nodus is retracted as in *Paraphlebia* (but not so much as in Anormostigmatini), with which compare the more specialized *Argiolestes* and *Nesolestes*, for example."

The following table separates the three Florissant species:

Wings hyaline; stigma bounding $3\frac{1}{2}$ – $3\frac{3}{4}$ cells below.	
	<i>Lithagrion hyalinum</i> Scudd.
Wings strongly infuscated; stigma bounding 5 cells below. 1.	
1. Apex of wings hyaline; costal cells narrow.	
	<i>Melanagrion umbratum</i> (Scudd.).
Apex of wings dark; costal cells broad.	
	<i>Melanagrion nigerrimum</i> Ckll.

Enallagma florissantella sp. nov. Figure 2.

Wing hyaline, about 23^{mm} long (base gone); nodus to stigma $12\frac{1}{2}^{mm}$; nervures and stigma dark sepia brown; subnodus oblique; subquadrangle not crossed; 14 costal sectors between nodus and stigma; stigma bounding one cell below; costal cells beyond stigma large; only one double cell in the series between M_1 and the sector M_{1a} , this immediately below stigma, separated therefrom by a single cell; three cells between quadrangle and level of nodus, the third very long, and represented by two cells in the series immediately below;

upper side of quadrangle not or barely longer than inner side; six cells on lower margin before Cu_2 begins to zigzag, and ten cells in the zigzag portion, making 16 cells in all from subquadrangle and end of Cu_2 ; three cells between M_1 and M_2 before the doubling begins; costa before nodus scarcely at all arched.

Florissant: one specimen; Station 14 (*T. D. A. Cockerell*). A poorly preserved leaf of *Ficus arenaceæformis* Ckl. is on the same slab. The figured specimen is in Peabody Museum,

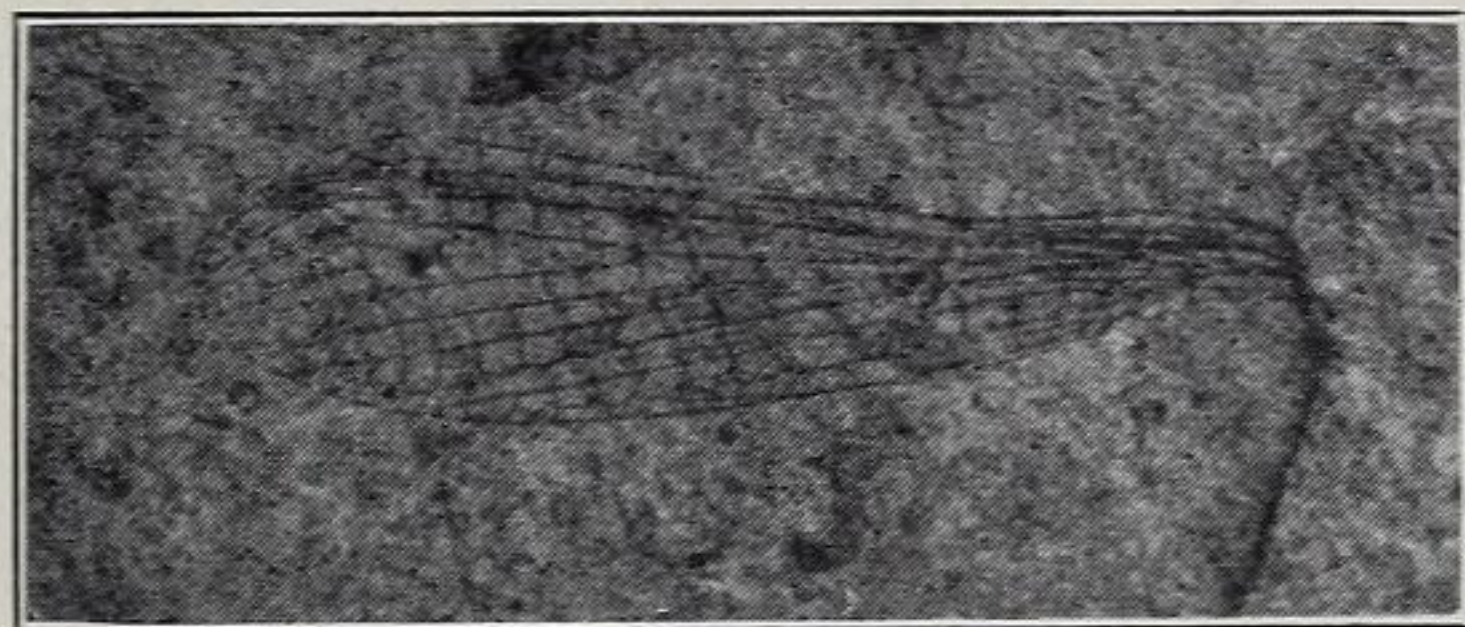


FIG. 2. *Enallagma florissantella*.

Yale. Some of the characters used to separate fossil Agriornines are so variable in recent species as to be of small value. This was pointed out to me by Dr. Calvert, and is very clearly indicated by a series of *Enallagma* very kindly given to me by Mr. E. B. Williamson. Thus:

- (1) Cells between M_1 and M_2 before doubling begins. A specimen of *E. antennatum* (*fischeri*) has three in anterior wing, four in posterior.
- (2) Cells between quadrangle and level of nodus (supposed to separate the fossil *Agriorn exsularis* Scudd. from *A. masce-scens* Scudd., the first having three, the second four). Three is the usual number in *Enallagma*, but *E. traviatum* may have four, and in a male *E. carunculatum* one wing has four, the other three wings three each.
- (3) Length of upper side of quadrangle. It is much shorter in anterior than posterior wings of *Enallagma civile*, *E. antennatum*, *E. exsulans*, and *E. traviatum*.

On the other hand, many undoubtedly distinct recent species are so similar in the wings that it is exceedingly difficult, to say the least, to separate them by these organs alone. In dealing with the fossils, therefore, one may well hesitate to assert that species are synonymous, although some of their assigned characters are likely to be of less than specific significance.

The Florissant species of this group may be separated as follows:

Subquadrangle with a cross-nervure in the middle; sub-nodus almost vertical; first postnodal cell considerably longer than second; eleven postnodal sectors.

“*Trichocnemis*” *aliena* Scudder.

Subquadrangle without a cross-nervure ; subnodus oblique. . . . 1.

1. Nervures and stigma pale ferruginous ; ten postnodal sectors ; stigma very oblique, with the inner side as long as the outer. *Hesperagrion prævolans* Ckll.

Nervures dark brown or black ; stigma ordinary. . . . 2.

2. Costa before nodus conspicuously arched ; 11 postnodal cross-veins ; curved basal section of M_3 very short. . . .

Agrion exsularis Scudd.

Costa before nodus hardly arched ; curved basal section of M_3 longer. 3.

3. Postnodal cross-veins 10 to 11 ; upper side of quadrangle longer than inner. *Agrion mascescens* Scudd.

Postnodals 14 ; upper side of quadrangle a little shorter than inner. *Enallagma florissantella* Ckll. (probably upper wing).

The postnodals in living *Enallagma* are from 9 to 11, at least in the species examined. I find the upper side of quadrangle much longer than inner in *E. fischeri* and *E. exsulans* ; but in an upper wing of *E. carunculatum* the inner is longer than the upper. The difference between the quadrangles of *A. mascescens* and *E. florissantella* cannot be due to their representing different wings, for the upper wing of *mascescens* is known, and has the upper side of the quadrangle very long.

The position of the base of the quadrangle seems to be of some significance :

- (1) Base of quadrangle conspicuously before level of midmost point between antenodal cross-veins. *A. mascescens*.

- (2) Base of quadrangle at or near level of midmost point.

E. florissantella, *A. exsularis*, *E. fischeri* ;
E. signatum, *E. hageni*.

- (3) Base of quadrangle far beyond level of midmost point, not far from level of first cross-vein.

E. carunculatum, *E. civile*.

Trichocnemis aliena Scudder. Figure 3.

A wing was obtained at Station 13 B (*W. P. Cockerell*). The most striking character, the crossed subquadrangle, is unfortunately not visible in our specimen, but there is no reason to doubt that it exists, as represented in Scudder's figure. Mr. Williamson writes :

"*Paraphlebia* is the only Agrionine genus known to me with crossed subquadrangle. It is a character that disappears with reduction in the Calopteryginæ ; e. g., *Diphlebia* has it rarely crossed. *Cyanocharis* has quadrangle but not subquadrangle crossed ; *Devadatta* has both quadrangle and subquadrangle

crossed; *Micromerus* has quadrangle usually crossed and subquadrangle with one or two cross-veins. *Paraphlebia*, mentioned above, of course is entirely different from *Trichocnemis* in all other characters."

With regard to the vertical subnodus, Mr. Williamson writes: "*Xanthagrion erythroneurum* has it vertical; *Erythromma najas* (especially the hind wing) nearly or practically so; it is nearly vertical in the American *Oxyagrion*, *Argia*, *Hyponeura* and *Ischnura* (at least some of the species). This character, I believe, appears independently many times, and is no criterion in itself" of generic relationships.

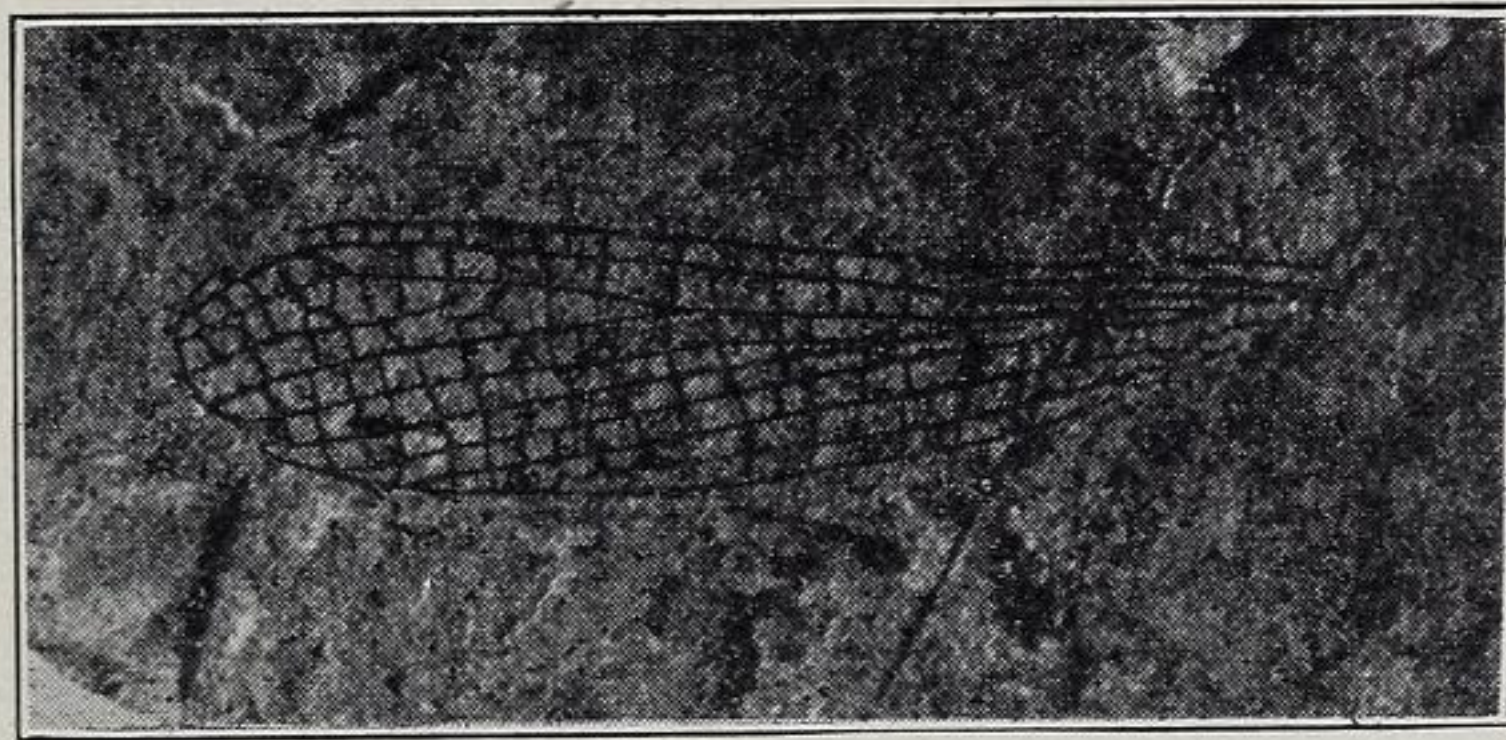


FIG. 3. *Trichonemis aliena*.

Except for the crossed subquadrangle, Mr. Williamson says that he sees no objection to referring *T. aliena* to *Hesperagrion*. "The form of wing is similar; the quadrangle, subquadrangle and the relations of their parts to the antenodals are similar; the origin of M_2 is similar; and the length and direction of the subnodus are not far out of the way. I believe, in this view, that *T. aliena* [Scudder's type] is a hind wing." Mr. Williamson further adds:

"I have compared Scudder's figure with wings of *Calicnemis*, *Hemicnemis* (*Leptocnemis*), *Platycnemis* and *Tatocnemis*,—some of the genera usually associated with *Trichocnemis*. If Scudder's figure of wing is correct in outline, *T. aliena* is not similar to any of the above genera. In arrangement of veins at distal end of quadrangle, *T. aliena* is most similar to *Hemicnemis* (which genus, of the whole group, has the quadrangle most dissimilar) and *Calicnemis*. In arrangement of veins at base of quadrangle it most resembles *Platycnemis*. Moreover, in above genera, only in *Platycnemis* is the subnodus nearly or quite vertical. In *Tatocnemis* (which is very dissimilar in many characters), the subnodus is very short."

Our specimen, like Scudder's, has eleven postnodal cross-nervures. The first cross-nervure beyond the stigma is forked below. There are three cells between M_1 and M_2 before the doubling begins (four in Scudder's type). There is a very dis-

tinct brace-vein. The figured specimen is in Peabody Museum, Yale.

Hoplonæschna separata (Scudder).

Two specimens, representing the hind wing, were obtained at Station 14, one by my wife, the other by myself. Scudder's type, an anterior wing, was referred to *Basiæschna*; but Needham expressed the opinion that it belonged to *Hoplonæschna* (Pr. U. S. Nat. Mus., xxvi, p. 761). The new specimens are far from perfect, but they show that the hind wing has the following characters:

- (1) Triangle with a double cell at base, and then four simple cells, varying to a double and three simple cells.
- (2) Anal triangle of three cells.
- (3) M_4 , after running parallel with M_3 , separated by a single row of cells, is suddenly bent downwards, and is separated by two and three rows of cells; a character of *Hoplonæschna*.

In my table in Bull. Amer. Mus. Nat. Hist., xxiii, pp. 133, 134, the insect runs to *Basiæschna*; but the anal triangle agrees with *Hoplonæschna*, and not so well with *Basiæschna*. On the other hand, as to the stigma *H. separata* is like *Basiæschna*, not like *Hoplonæschna*. The region about the triangle agrees almost exactly with *Gynacantha*.

The number of cells in the triangle is variable in *Æschnids*. Mr. Williamson, to illustrate this point, has very kindly sent statistics of three very closely allied forms of *Æschna*, based on males. In order to make them clear, I have constructed cell formulæ, enumerating the cells in order, beginning from the base. Thus 2, 1, 1, means a double cell and then two simple ones; 1, 1, 1, three cells, all simple.

Front Wing.

- 1, 1, 1, . . . Indiana species (2 specimens).
 2, 1, 1, . . . *Multicolor* (seven).
 2, 1, 1, 1, *Multicolor* (eleven), Indiana sp. (18), Jalapa sp. (7).
 2, 2, 1, 1, *Multicolor* (two), Jalapa sp. (1).

Hind Wing.

- 2, 1, *Multicolor* (one).
 2, 1, 1, . . . *Multicolor* (17), Jalapa sp. (4), Indiana sp. (2).
 2, 1, 1, 1, *Multicolor* (two), Jalapa sp. (4), Indiana sp. (18).

The number of cells in the anal triangle Mr. Williamson states is also not of generic importance. He adds: "The kink in M_4 is a character generally associated with the curving

backwards of radial and median supplements (see *Coryphæschna ingens* for maximum of both characters, and *Nasiæschna*, e. g., for minimum).” Mr. Williamson concludes that *separata* cannot go in *Basiæschna*; and unless a new genus is proposed for it, *Hoplonæschna* seems to be the only genus to receive it.

Phenacolestes parallelus Ckll.

This species was described from the apical part of the wing. The base of a wing, probably belonging to *P. parallelus*, is from Station 14 (*Geo. N. Rohwer*). It differs from *P. mirandus* Ckll., in having six antenodal cross-nervures, the nervure from subquadrangle to lower margin arising from almost the apex of the former, and cross-nervure in fork of M_{1+2} and M_3 before level of nodus. The part visible (as far as separation of M_1 from M_2) is hyaline.

(10) *A Longicorn Beetle from Florissant.*

Saperda (?) *submersa* sp. nov. Figure 4.

Length about 22^{mm}; width of head about 4½; width of thorax about 4; of insect in humeral region of elytra about 7½; length of head and thorax about 6½^{mm}; antennæ rather thick, probably about 16^{mm} long, but the extreme tip missing. Head dark above, but face and mouth pallid; thorax pallid, darker posteriorly; elytra black at base (especially on humeri), after which comes a broad (about 4½^{mm} long) light area, forming a broad band across both elytra, the remaining portion of the elytra black. Abdomen extending a little beyond tips of elytra.

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In general build and appearance, this is like *Saperda*. I cannot demonstrate any lateral spines on thorax and believe there were none, but this part is not very clearly visible. The transverse light area on the elytra recalls *Oncideres cingulatus*, although more basal than in that insect; the antennæ are like those of *Saperda*, not like *Oncideres*. The rather broad head suggests *Mecas* rather than *Saperda*. Type from the Miocene shales of Florissant, Colorado, collector unknown. Mr. G. L. Cannon, who kindly placed it in my hands for description, informs me that it has been in the collection at the State Capitol for at least 25 years.

Four fossil species of *Saperda* have been described from Europe. Three are from the Miocene, but one of these (*S. valdensis* Heer) is not identifiable.

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ART. VII.—*New Fossil Elateridæ from Florissant:* by
H. F. WICKHAM.

Corymbites Latr.

C. granulicollis (figure 1).—Body rather short and stout. Head about equal in length and breadth, front apparently transversely rugose; antennæ broken, but the remaining portion shows them to have been rather slender and only very little serrate, probably not attaining the hind angles of the

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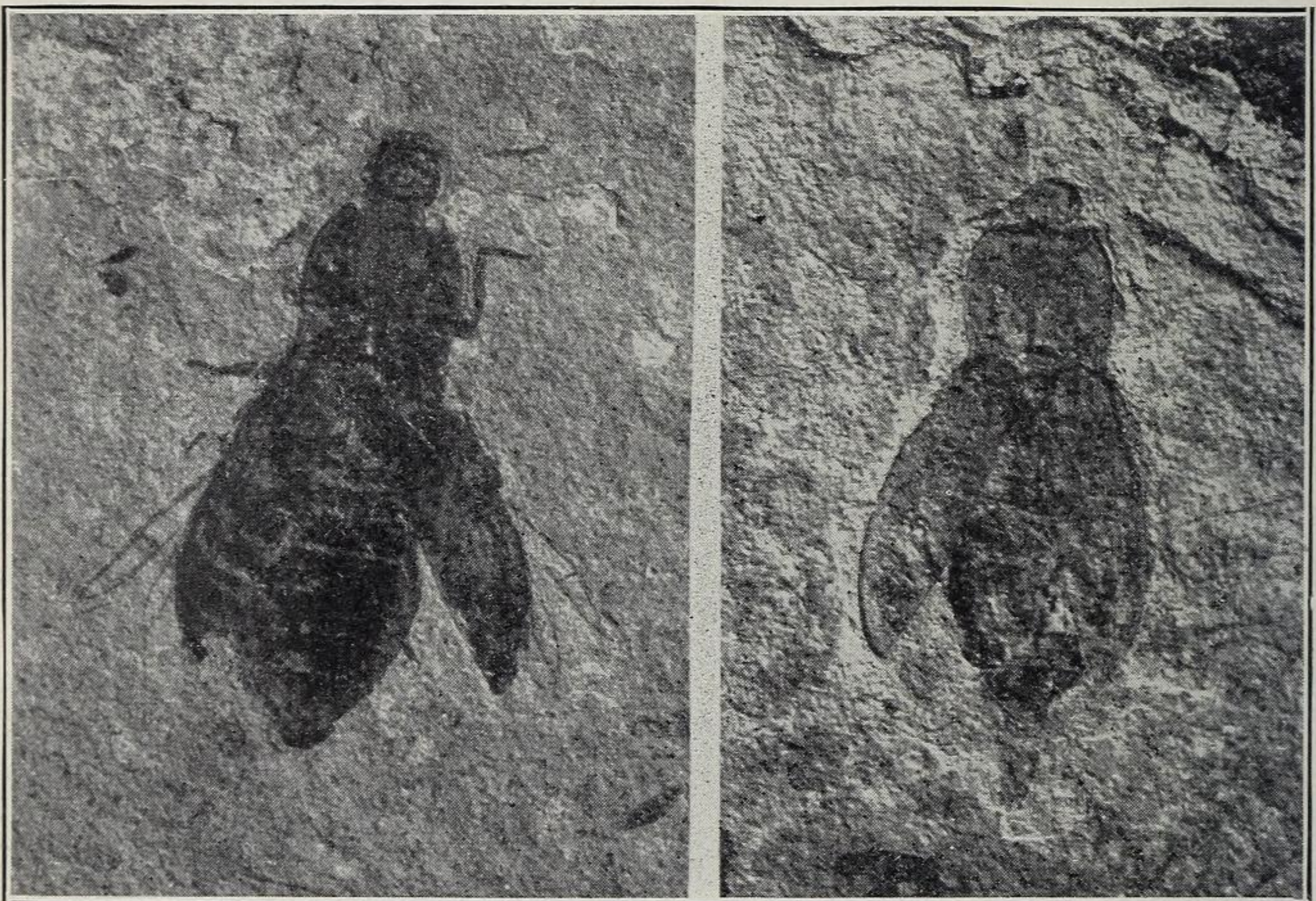


FIG. 1. *Corymbites granulicollis*, n. sp. $\times 2$.

FIG. 2. *Corymbites primitivus*, n. sp. $\times 2$.

thorax. Prothorax emarginate and narrower at apex, growing broader with equal lateral curve to about the middle, then arcuately narrowing to a point just anterior to the posterior angles, which are rather markedly divergent and distinctly uncarinate; the disk with small closely placed granules, each with a minute central puncture. These granules become much finer and more crowded near the sides, and a median basal area (which may have been canaliculate) is nearly devoid of them. Elytra finely alutaceous, finely and sharply striate but not punctured. Anterior leg (the only one visible) short, second, third and fourth tarsal joints about equal.

Length (of entire insect) .96 in., of elytron about .60 in., of prothorax about .23 in.; width of prothorax about .26 in.

I place this insect in *Corymbites* from the general form; the shape of the prothorax strongly recalls that of *C. carbo* Lec., and *C. æreipennis* Kby.

One specimen (Cat. No. 1, Peabody Museum, Yale), Station 14; S. A. Rohwer.

C. primitivus (figure 2).—Form rather stout, head finely and rather closely punctured. Prothorax emarginate at apex, front angles obtuse, sides broadly arcuate, more sharply in front of the middle, the greatest width being at about one-third of the length, hind angles distinctly carinate but rather short and not strongly divergent; disk finely densely subrugosely punctate, less closely along the middle. Elytra with fine sharp impunctate striæ, interstitial spaces finely irregularly punctured. Legs and antennæ invisible.

Length, entire, .87 in., of elytron .50 in., of prothorax along median line .20 in.; width of thorax .23 in., of elytron about .13 in.

One specimen (Cat. No. 2, Peabody Museum, Yale), Station 13; Geo. N. Rohwer.

Here, again, I have placed the species by its general appearance, the truly generic characters all being obscured.

Melanactes Le Conte.

M. cockerelli (figure 3).—Body moderately elongate. Head narrower than thoracic apex, antennæ attaining base of thorax, basal joints obscured, the seven distal ones subequal in width and but slightly serrate, each very little longer than wide, front fairly closely but not coarsely punctured. Prothorax slightly broader than long, narrowest at apex, arcuately wider to a point a little behind the middle, thence slightly narrowed to near the hind angles which are somewhat (but not markedly) divergent, disk finely and closely punctate towards the sides but much more sparsely and a trifle more coarsely about the middle; the marginal bead of the pronotum is very distinct, but it is uncertain whether the hind angles are carinate or not. Elytra apparently distinctly alutaceous, striate, the striæ fine and marked at their bottoms with rows of moderately deep slightly elongate punctures which are separated by intervals arranging approximately the lengths of the punctures. Legs invisible.

Length, entire, .94 in., width of prothorax, slightly behind the middle, .26 in., of elytron .37 in.

One specimen (obverse and reverse, Cat. No. 3, Peabody Museum, Yale), Station 14; Mrs. W. P. Cockerell.

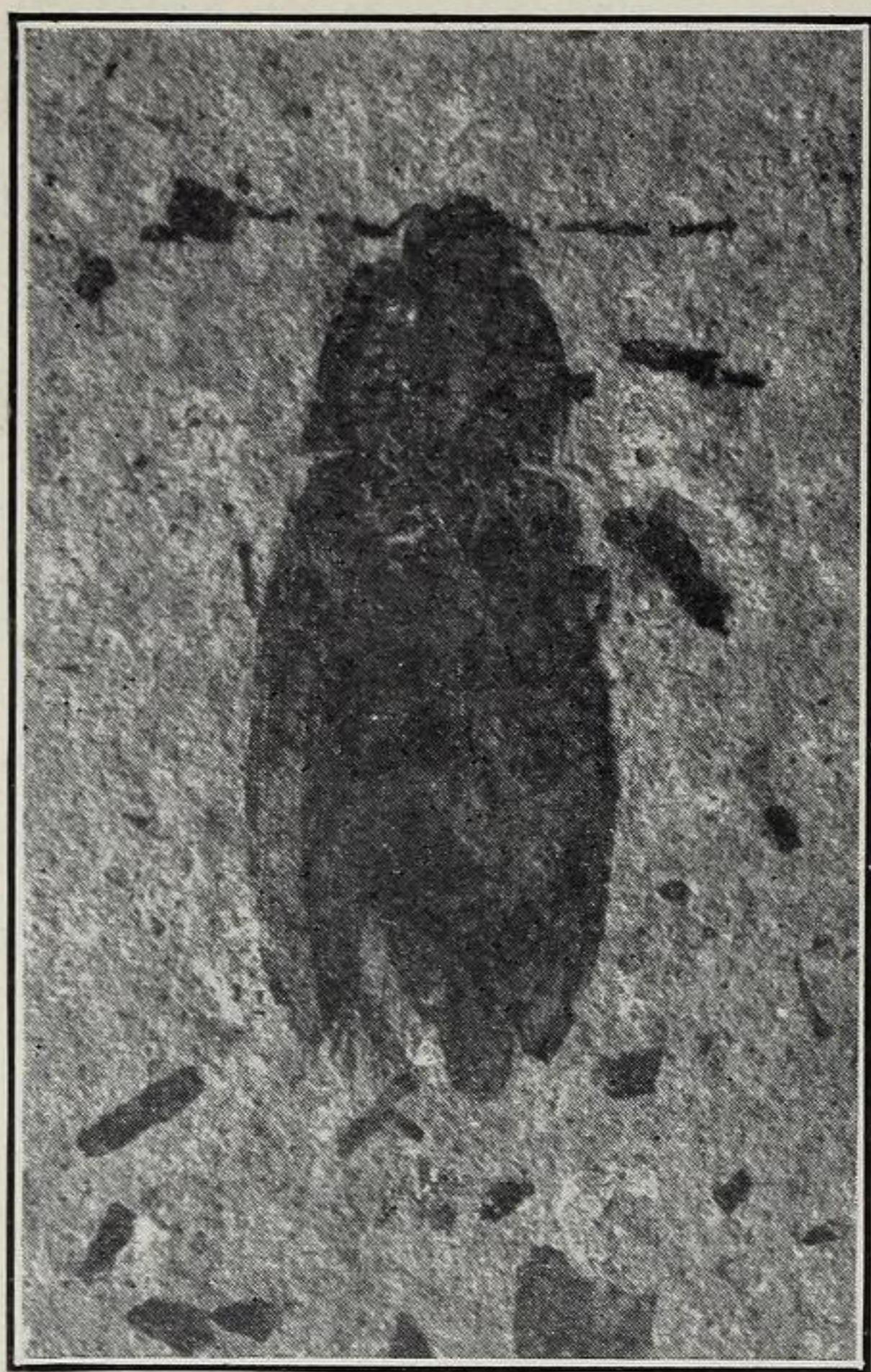


FIG. 3. *Melanactes cockerelli*, n. sp. $\times 2$.

In life, this insect must have been about the size of *M. densus* Lec., or *M. piceus* De G., resembling the former very closely in thoracic and elytral sculpture.

Named after a good friend and ardent entomologist, Professor Cockerell, from whose hands the foregoing species were received.

Iowa City, Iowa.