

Article XXIV.—SOME FOSSIL ARTHROPODS FROM FLORISSANT, COLORADO.

BY T. D. A. COCKERELL.

MYRIAPODA.

JULIDÆ.

Iulus florissantellus sp. nov.

Body rings about 41 or 42, longitudinally striate below the middle, the striæ coarse and not numerous, the upper ones about $170\ \mu$ apart, the lower about $85\ \mu$. Depth of body near middle about $1275\ \mu$; length of a middle segment dorsally about 680; length of legs at middle of body about 1190; caudal end pointed. The specimen is curled up, and in this position has a diameter of $7\frac{1}{2}$ mm. Station 14 (*W. M. Wheeler*). (Fig. 1.)

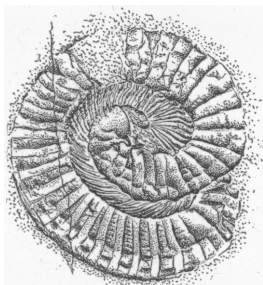


Fig. 1. *Iulus florissantellus* sp. nov.

This is the only Myriapod yet found at Florissant.

ARACHNIDA.

PHALANGIDÆ.

Leptobunus atavus sp. nov.

Similar to the modern *L. grandis* (Say). Body of the usual shape, about 7 mm. long, dorsally pallid, the posterior half with a broad dark lateral stripe, tapering at either end; this stripe is about $3\frac{1}{2}$ mm. long. Palpi normal; last joint more slender than penultimate one, and obviously longer; the last two joints together measure about $2\frac{1}{2}$ mm. Three legs are preserved, apparently the first pair and one of the second ones. Anterior (?) femur about 8 mm., their tibiæ 6 mm.; their tarsi 11. Second (?) femur 7 mm., tibia $4\frac{1}{2}$, tarsus $9\frac{1}{2}$. Some doubt is cast on the identification of these legs as belonging to the first and second pairs, owing to their relative measurements; the first should be shorter. (Fig. 2.)

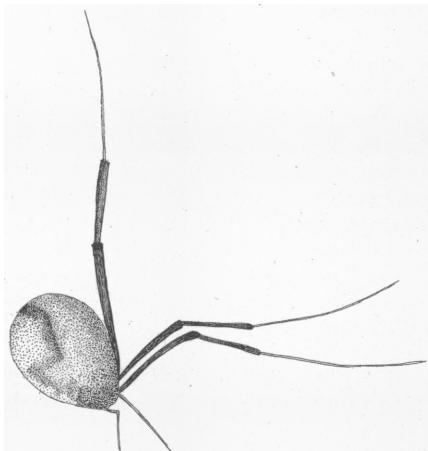


Fig. 2. *Leptobunus atavus* sp. nov.

pairs, owing to their relative measurements; the first should be shorter. (Fig. 2.)

One good specimen, with reverse; Station 14 (*W. P. Cockerell*). This is the first harvest-spider from Florissant.

Leptobunus Banks is part of *Liobunum*, as formerly understood. The antiquity of the group, as here indicated, favors the segregation.

NEUROPTERA.

RAPHIDIIDÆ.

Megaraphidia gen. nov.

Anterior wing, compared with the same wing of *Raphidia oblita*, as figured by McClendon in 'Entomological News,' April, 1906, p. 117, shows the following resemblances and differences:—

Costal region, subcosta and pterostigma all normal.

R¹ with two branches beyond pterostigma (one in *Raphidia*).

Cross-vein from R¹ to R² before stigma normal.

Second cross-vein arising from near beginning of apical fifth of pterostigma (beyond it in *Raphidia*), and R¹ not at all bowed at its origin. It enters R² at point of origin of last branch of that nervure.

R² with five branches (three in *Raphidia*), of which all but the third fork near end, the forks normal in form.

R³ arising beyond the first cross-vein (instead of before it) — about as far beyond as length of cross-vein — and ending in a very long fork, longer than its stem (a very short fork in *Raphidia*).

No cross-vein from R³ to R²; but a cross-vein to R⁴⁺⁵, as in *Raphidia*, this cross-vein however near to origin of R³, not far from it as in *Raphidia*.

R⁴⁺⁵ separating into a long fork, as long as that of R³, its lower branch having a short apical fork.

A cross-vein to M just beyond cross-vein between R³ and R⁴⁺⁵ (before it in *Raphidia*).

From position of R³, and the absence of a cross-vein between R³ and R², it results that there is a single large pentagonal cell in the forks of R² and RS.

Radius, media and Cu¹ separating normally, at a single point.

Media with four apical forks in succession from the first (three in *Raphidia*); the stem of the third arises normally from a cross-vein.

Last fork of media very small (large in *Raphidia*).

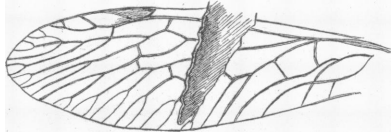
Cu¹ and Cu² normal.

Anal veins normal basally, but meeting at a point (not approaching, and joined by a cross-vein), so as to make an X, and the apical vein not forked.

Many of the above characters are very likely not even of specific value, but several of them are so distinctive as to quite alter the appearance of the wing, and the combination appears to justify a new generic name.

Megaraphidia elegans sp. nov.

Represented by a single anterior wing, perfectly hyaline, with very distinct nervures, its length about 14 mm., or slightly more; greatest breadth about $4\frac{1}{2}$ mm. The pterostigma is pale. A small leaf covers a portion of the middle of the wing, but fortunately does not hide anything of much importance. Station 13, Florissant, 1906. (W. P. Cockerell.) (Fig. 3.)

Fig. 3. *Megaraphidia elegans* sp. nov.

Easily distinguished from any of the Raphidiidæ described by Scudder by its much larger size.

TRICHOPTERA.

The fossil Trichoptera of Florissant are quite numerous, and have been discussed at length by Scudder, who recognized three genera and three species of Phryganeidæ, one genus with one species of Limnephilidæ, one genus with two species of Leptoceridæ, and eight genera and sixteen species of Hydropsychidæ. Unfortunately, however, many of the specimens are poorly preserved, so that accurate and detailed descriptions are impossible; and several species have not been figured. I have been allowed to examine the types (belonging to the Museum of Comparative Zoölogy) of several of the most obscure species described by Scudder, and the results are given herewith.

PHRYGANEIDÆ.

Phryganea labefacta Scudder.

At Station 4 I found a very good specimen, showing most of the anterior wing. The characters agree with *Phryganea*, though the wing is quite broad, herein approaching *Neuronia*. The branches of the sector agree with *P. minor*, not with *P. grandis*, except that the second is closer to the third than to the first, at point of origin.

Wing reddish brown; radius with the bend distinct, about as in *P. minor*; first apical branch of sector parts from discoidal cell about $2\frac{1}{2}$ mm. from apex, and $3\frac{1}{2}$ from base (thus not at middle, as Scudder says — but his figure agrees with our specimen); lower border of discoidal cell straight or practically so (not as full as the upper, as Scudder says, but his figure agrees sufficiently with our insect); tip to base of first fork 9 mm.; length of discoidal cell 6 mm.; tip to base of discoidal cell almost 13 mm.; length of third fork 7 mm., of fifth, 6 mm. Probable length of wing about 20 mm; breadth $7\frac{1}{2}$ mm.

LIMNEPHILIDÆ.

Platyphylax (Eopteryx n. subg.) florissantensis sp. nov.

Station 14, one good wing, with a less perfect reverse (Fig. 4). (The station is a little in doubt; it may have come from 13).

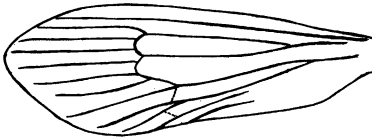


Fig. 4. *Platyphylax (Eopteryx) florissantensis* subg. et sp. nov.

Anterior wing of a uniform warm brown, 21 mm. long, $7\frac{1}{2}$ broad, venation in most respects normal, but the following peculiarities are noteworthy:—

(1) The radius is perfectly straight to the end, not in the least bent; at apex it is only half as far from the uppermost branch of the sector as the latter is from the second branch.

(2) The discoidal cell is extremely long, a trifle over 9 mm.; its base is $5\frac{1}{2}$ mm. from base of wing.

(3) The fifth apical fork is quite regular, its lower side not bent.

(4) The inferior cubitus runs to the margin parallel with the lower branch of the fifth fork, and is not suddenly or abruptly directed downwards; it forms a very acute angle with the margin of the wing. The transverse vein uniting it with the lowermost branch of the upper cubitus is so faint that I cannot be quite sure of its position. The postcosta is independent of the inferior cubitus.

The apical cells are of about equal width; apical forks 1, 2, 3, 5 present; cellula thyridii about 8 mm. long; base of seventh and eighth apical cells 3 mm. basad of base of fourth. The first branch of the sector is arched as it leaves the discoidal cell, as in *Halesus*. The seventh apical cellule is narrowly very obliquely truncate basally.

This seems nearest to *Platyphylax* in its characters, including the venation, the large size (probable expanse about 47 mm.) and the color. The straight radius, very long discoidal cell, and regular fifth fork, etc., are however peculiar, and all may be regarded as primitive characters, *i. e.*, as tending to a condition of simple radiating veins.

Mr. Nathan Banks and Dr. Cornelius Betten, whom I have consulted on the subject, both regard the fossil as representing a new genus; but since the characters are only moderately divergent from some forms of *Platyphylax*, and the leg-characters, so important in the classification of Trichoptera, are totally unknown, I think it may suffice to treat it as representing a distinct subgenus only. This subgenus (or genus)? may be termed **Eopteryx**.

LEPTOCERIDÆ.

Setodes abbreviata Scudder.

I have examined Scudder's type No. 5218. I had taken it for a moth,

probably an Elachistid, until I came to examine it minutely. The wings are black, pointed, and are covered with longitudinal cracks, which have nothing to do with the venation, the latter being obsolete; length of anterior wing about $4\frac{1}{2}$ mm. Antennæ thick and very long (at least 6 mm.); their thickness near the base is about 119 μ , near the middle about 85 μ .

Abdomen pale, extending about 1870 μ beyond tips of wings.

The generic reference is necessarily provisional.

HYDROPSYCHIDÆ.

Tinodes paludigena Scudder.

The specimen examined is Scudder's No. 2142 — not the one figured.

It is quite a doubtful insect. Length of anterior wing 6 mm.; costal region having a golden lustre; subcosta and radius would do for *Tinodes*, also base of median cell, but not the apparent first fork — but this is indistinct and dubious. The radius bends upwards at the end.

Polycentropus exesus Scudder.

Scudder's No. 3143 examined. All that can be seen agrees exactly with *Polycentropus*. Length of head and body 7 mm., of anterior wing 8 mm. Veins hardly infuscated; no dark subcostal shade (such as is seen in *P. æternus*); radius turning up a little at end, and exactly as in *P. flavomaculatus*; bases of discoidal and median cells exactly as in *P. flavomaculatus*; length of fifth fork $2\frac{1}{2}$ or $2\frac{1}{2}$ mm., with the bulging base exactly as in *P. flavomaculatus*; base of discoidal cell about $3\frac{1}{4}$ mm. from base of wing, and $4\frac{3}{4}$ from apex; length of first apical fork on its lower side 1190 μ ; second fork about $2\frac{1}{2}$ mm. long; distance between second and third branches of sector at level of middle of first fork about 238 μ .

Scudder's doubtful *Polycentropus* (?) *eviratus* I have not seen. The figure looks much like a moth; the wings heavily scaled, and no venation visible.

Polycentropus æternus (Scudder).

Derobrochus æternus Scudder; type = specimen No. 5308. I examined this very carefully, and do not see any reason for separating it from *Polycentropus*.

Length of anterior wing about $9\frac{1}{2}$ mm.; a dark shade above the discoidal cell; the discoidal and median cells, and all the forks, are plainly visible. Apex of dis-

coidal cell about 3 mm. from end of wing (in straight line) and five from base; apex of median cell about $2\frac{3}{4}$ mm. from end of wing, and 6 or nearly from base; apex of median cell about 850 μ more apical than that of discoidal; fifth fork about $2\frac{1}{2}$ mm. long, broad toward base.

The following measurements are in μ :—

Length of discoidal cell, about	2550.
Width of discoidal cell near end	510.
Beginning of fork of first two branches of sector (first apical fork) beyond end of discoidal cell	1020.
Length of hairs, as seen in first fork, about	85.
Distance between discoidal and median cells	391.
Width of median cell near end	340.
Origin of last nervure from median cell from (basad of) origin of the one before (<i>i. e.</i> , fourth fork on median cell)	765.
Length of fourth fork about	2295.
Length of third fork over 2550, but its apex about 680 less basad than that of fourth.	
Length of first fork on its lower side	1020 (<i>i. e.</i> , equalling its stem).
Width of first fork at level of termination of its upper side	425.
Distance between second and third branches of sector:—	
(1) At level of end of first branch	306.
(2) At level of end of second branch	476.
Distance between third and fourth branches of sector:—	
(1) At level of end of second branch	408.
(2) At level of end of third branch	476.
Width of fourth apical cellule:—	
(1) At 1700 from tip of wing	425.
(2) At level of termination of its lower side on margin	510.
Width of fifth apical cellule (third fork):—	
(1) At 1700 from margin on its upper side	340.
(2) At level of termination of its lower side on margin	544.

The last branch of the sector ends almost exactly at tip of wing, as is the case in *Hydropsyche*.

I have given the above elaborate measurements partly to show that in this species, at least, the peculiar characters assigned to *Derobrochus* are not found; and partly because these fossils have to be determined frequently from imperfect material, and in such cases an exact knowledge of the various proportions is essential.

***Derobrochus commoratus* Scudder.**

Specimen examined, Scudder's No. 14171. This is not precisely a *Polycentropus*, but perhaps hardly a distinct genus. Scudder says the neuriation is as in *D. æternus*, but it is not so exactly; the fourth branch of the sector arises much more basad, the first apical fork has a very much shorter stem, and the third fork has a short but distinct stem. It is also a

more slender winged species; anterior wings about 9 mm. long and $2\frac{1}{4}$ broad. The base of the third apical fork is on a level with that of first. Length of first fork on its lower side about 1 mm., or slightly more. Discoidal cell long. Third nervure from median cell a little nearer to fourth than to second.

Derobrochus cænulentus Scudder.

Specimen examined, Scudder's type, No. 14444.

Length of head and body just over 8 mm.; anterior wing long and narrow, 9 mm. long, $2\frac{1}{4}$ broad; wing strongly hairy; apex a *little* above middle. First apical fork about $\frac{2}{3}$ mm. long on its lower side; second apical fork about $2\frac{1}{2}$ mm. long on its lower side, but its base cannot be exactly located; end of fourth branch of sector at apex of wing or just above; length of third apical fork $1\frac{2}{3}$ mm.; length of nervure from middle of apical side of median cell $1\frac{1}{2}$ mm.

Forks 1 and 2, as also the shape of the wing, would agree with *Triænodes*.

However, I seem to see a median cell, much as in *Hydropsyche*, but its outer border straight, giving off a nervure in middle of border as in *Hydropsyche*; I also see third fork from its upper corner, as in *Hydropsyche*.

The insect is nearer to *Hydropsyche* than to *Polycentropus*, and may be a slender species of the former genus.

Derobrochus abstractus Scudder.

Specimen examined, Scudder's type, No. 9377. This is the first species of *Derobrochus*, and must be considered its type, no statement being made to the contrary.

Shape of wings agrees fairly well with *Polycentropus*. Discoidal cell evidently very long, probably about 4 mm.; apex of discoidal cell from apical margin in straight line 3 mm., but to apical point 4 mm., and to base about 7 mm. Scudder says, "the first apical cell is remarkably long"; so it is, the first fork having a length of 2805 μ on its lower side.

The following measurements are in μ .

Width of first apical cellule at level of the termination on margin of its upper side	340.
Width of second apical cellule at level of termination of upper side	425.
Width of third apical cellule at level of termination of upper side of second	510.
Width of fourth apical cellule:—	
(1) At level of termination of upper side of second	510.
(2) At 1700 from apex of wing	340.
Width of fifth apical cellule a short distance from end	510.
Width of sixth apical cellule 850 from margin (counting on its upper side)	510.

The rest of the wing is obscured, partly by overlapping. The insect

seems not to be a Hydropsychid; according to the character of the first apical cell it could come near *Lepidostoma* (Sericostomatidæ) or *Stenophylax* (Limnephilidæ). It is safe to say that it is not congeneric with the other three species described above.

There remain three species of *Derobrochus* which I have not seen. Scudder's figures of *D. crateræ* and *D. frigescens* plainly show the fifth apical cell (third fork), which is supposed to be absent. Some of the venational characters shown in the figures appear to be inaccurate.

HYMENOPTERA.

CHALCIDIDÆ.

Chalcis prævolans sp. nov.

♀. Length 5 mm.; expanse of wings 7 mm.; head and thorax black, legs dark brown, abdomen somewhat reddish, apparently with linear light transverse bands;

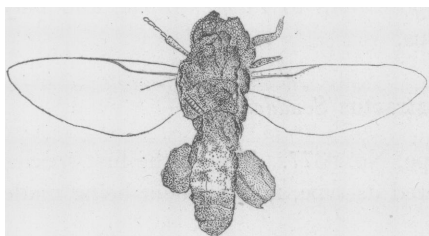


Fig. 5. *Chalcis prævolans* sp. nov.

wings slightly infuscated, reddish; head broad, its breadth about $1\frac{1}{4}$ mm.; thorax stout, globose, almost 2 mm. broad, with very large strong punctures, close together; abdomen nearly 3 mm. long, narrow (like some *Haltichella*), its breadth about or scarcely over 1 mm., the sides subparallel, the ovipositor slightly exerted, its apex broad and rounded; hind femora very stout, about $525\ \mu$ diam. in middle; length of hind femur about $1200\ \mu$; hind tibiæ stout, quite $255\ \mu$ broad; veins all very pale, submarginal $1125\ \mu$ long, marginal 375 , stigmal 135 , postmarginal 240 . (Fig. 5.)

Station 12 (*S. A. Rohwer*). One example, with reverse. I learn from Mr. Brues that this is also represented from Florissant in the Scudder collection.

TENTHREDINIDÆ.

Subf. EMPHYTINÆ.

Pseudosiobla megoura sp. nov.

Length 16 mm.; head and thorax were apparently black, small compared with abdomen, which is nearly 12 mm. long and 5 broad, pale, with a broad dark band on each segment; wings hyaline, with dark nervures.

Venation of anterior wings almost as in *P. excavata* (MacGillivray, Pr. U. S. Nat. Mus., XXIX, pl. xxviii, f. 48), but differing in slight particulars, as follows:—

- (1.) Stigma narrower, hardly so bulging below.
- (2.) Costal cell more evident, more as in *Eriocampa*.
- (3.) Cross nervure of marginal cell entirely as in *Pseudosiobla*, but third t. c. (R_4) joining marginal nervure much further (850 μ) beyond it.
- (4.) First submarginal cell a little more produced basally.
- (5.) Interval between origin of cubital nervure and insertion of basal somewhat greater (510 μ).

(6.) Basal bend of third (second, Norton) anal nervure very light. The oblique of lanceolate cell is normal, except that it is less oblique; it is 510 μ long, the distance straight across the cell at this point being 425 μ . Its upper end is 1462 μ from lower end of transversomedial.

The following measurements are in μ :—

Length of first submarginal cell	884.
Length of basal nervure	1275.
Length of first discoidal cell (diagonally)	2652.
Basal nervure from transversomedial	374.
Lower side of first discoidal (b. n. to origin of first r. n.)	1734.
Length of second recurrent nervure	1275.
First s. m. on cubital nervure	850.
First t. c. to insertion of first r. n.	510.

The venation of the posterior wing cannot be ascertained.

Station 13.

The genus is represented in the modern fauna by a species of the northern States, from Illinois to Massachusetts.

Subf. TENTHREDININÆ.

Tenthredo submersa sp. nov.

Length about 13 mm.; of the usual form; head and thorax apparently black; the abdomen was probably red, its width is about $3\frac{1}{2}$ mm.; venation light brown.

Anterior Wing.

Lanceolate cell. In general like *Tenthredo*, with straight cross-nervure, the cell contracted to the cross-nervure, so that the latter is only about as long (102 μ) as broad; apical part of lanceolate cell (*i. e.*, beyond the cross-nervure) about 2720 (this and the following measurements in μ) long and 425 broad in the middle; nervure $M_4 + Cu_1$ (t. m.) entering about 1309 from apex.

Median cell large, 595 high, its apex not much produced, the basal nervure (about 595 long) at an angle of more than 45°. This is more like *Stromboceros*.

Costal cell widest (340 wide) opposite insertion of basal nervure, the cross-nervure indistinct, but placed as in *Tenthredo*, that is, not very far from basal.

Submedian cell shaped as in *Tenthredo*, but there is a distinct bend in the externo-medial nervure about 850 from the origin of the basal. From l. n. to t. m. is about 340, and t. m. is about 731 long.

First discoidal cell large, shaped as in *Tenthredo*, but base blunter; about 2771 long.

Second discoidal as in *Tenthredo*, but the apex rather more produced.

Third discoidal as in *Tenthredo*, the upper basal side 1020 long, lower basal 680.

First submarginal cell cuneate, much longer than in *Tenthredo*, 1105 long, about 476 broad at broadest point, the first t. c. about 289 long.

Second submarginal on marginal nervure 1530. Insertion of second t. c. to junction of cross-nervure of marginal cell with marginal nervure, 850.

Posterior Wing.

Lanceolate cell shaped as in *Tenthredo*, about 561 broad in middle, but not touching first apical cell, being separated from it by a nervure about 170 long, thus more like *Macrophya*.

Agrees in all important respects with *Tenthredo* as figured by MacGillivray, Proc. U. S. Nat. Mus., XXIX, pl. xxxi, f. 56.

Station 14, a good specimen, with reverse. A small leaf of *Planera longifolia* is on the same slab, about 10 mm. from the insect.

VESPIDÆ.

Palæovespa scudderi Ckll.

At Station 13 I found a good example referred to this species (Fig. 6). It is about 22 mm. long; anterior wing about 14 mm.; eyes visible, and as in type.

This is larger than the type, and I think a queen.

The following wing measurements are in μ , unless the contrary is stated:

Length of first discoidal cell about $6\frac{1}{2}$ mm.; marginal cell pointed; insertion of third t. c. to tip of marginal 1200; third s. m. on marginal about 840; second s. m. on marginal about 570; marginal nervure to insertion of basal, 600; basal nervure inserted at base of stigma; first (apical) section of b. n. 1200; insertion of first t. c. to stigma, that is first s. m. on marginal, about 1125; lower side (on discoidal) of first s. m. about 2250; lower edge of second s. m. (from lower corner of apex to discoidal) about 1050; insertion of second r. n. to beginning of second t. c., 300. The end of first discoidal is scarcely more oblique than in *Vespa*.

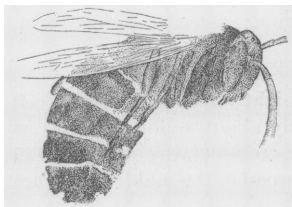


Fig. 6. *Palæovespa scudderi* Ckll.

SPHECIDÆ.

Subf. SCELIPHRONINÆ.

***Chalybion mortuum* sp. nov.**

Length 18 mm., of which 10 is head and thorax; the abdomen is retracted and directed downwards, if it were fully extended the insect would doubtless measure 20 mm.; anterior wing about or nearly 11 mm.; hind femora 4 or slightly more; hind tibiæ $4\frac{1}{2}$, the spines very little if at all developed; hind tarsi about 7, without evident spines; claws with a single tooth beneath. Black, as preserved, but possibly originally metallic; wings subhyaline, with a large diffused cloud extending from the marginal to the apical part of the third discoidal cell. Prothorax with striæ; metathorax with transverse striæ; petiole of abdomen 2 mm. long or slightly more, rather thick, rest of abdomen oval, short. Antennæ not preserved.

Venation normal, with slight exceptions. *The marginal cell extends conspicuously beyond the third submarginal*; the second submarginal is narrow, higher than broad, and receives both recurrent nervures, but the second at extreme apex; the second recurrent nervure is arched, *and the outer lower corner of the third discoidal cell is not produced, but forms an obtuse angle within*. The characters italicised may be regarded as primitive, that is, as approaching the more normal type of venation for the aculeate Hymenoptera.

The following wing measurements are in μ :—

Length of marginal cell	2516.
Breadth " " "	680.
Depth of stigma "	340.
Marginal cell beyond level of apex of third s. m.	about 306.
Third s. m. on marginal	680.
Second " " "	357.
First " " "	561.
" " " basal nervure	357.
Total length of first s. m.	2550.
Lower side of second s. m.	680.

First r. n. joining second s. m. about 240 from base; second joining at extreme apex, practically meeting second t. c.

Basal nervure falling about 153 μ short of transverse-medial.

The venation is not very unlike that of *Hoplisus sepultus*, also fossil at Florissant, but it will be easily distinguished by the form of the second submarginal cell. From *Ceropalites*, the present insect is easily known by the character of the region of the basal nervure. The lower section of the b. n. in *C. mortuum* is many times longer than the upper, as is normal for the genus.

Kohl makes *Chalybion* a mere group of *Sceliphron*. The evidence of its antiquity herewith presented may be regarded as favoring its validity as a genus.

Station 14; one very good example.

CHRYSIDIDÆ.

Chrysis rohweri sp. nov.

Robust, of ordinary size and form, with the normal venation (very well preserved) of the genus; apex of abdomen broadly truncate, the edge slightly concave. Length about 6 mm.; anterior wing 4. The wings hyaline, with dark nervures; marginal cell rather narrow, the bend of the marginal nervure hardly perceptible, the curve of the nervure not far from uniform; thorax and first abdominal segment with very strong large punctures (preserved as raised warts), about eight in a straight line transversely between the parapsidal grooves, about six in a straight line from anterior to posterior margin of scutellum, those on scutellum and meta-thorax somewhat larger than those on mesothorax and first abdominal segment; on the apical half of the first abdominal segment the punctures are weaker, and the rest of the abdomen is merely finely roughened.

Florissant, Station 14, June, 1907 (*S. A. Rohwer*).

Type in American Museum of Natural History.