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ART. XXXII.—THE FOSSIL INSECTS OF THE GREEN RIVER SHALES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

The following descriptions are published to afford some notion of the nature and extent of the insect remains found in the immediate vicinity of Green River Station on the Union Pacific Railroad in Wyoming. Illustrations of all of them have been prepared for a general work on the Tertiary insects of North America, to be published by this Survey.

With a very few exceptions, the specimens were found in a restricted basin, about six kilometres west of the town, exposed by a railway cutting called the "Petrefied Fish Cut", from the vast number of fish remains discovered here in building the road. The insects were obtained in the first instance by Dr. Hayden, who brought home a few specimens only; next, Mr. F. C. A. Richardson placed in my hands a considerable collection;* and last summer my untiring friend Mr. F. C. Bowditch and myself spent several days working the shales.

The mass of the specimens from this locality are irrecognizable, and those to the nature of which some clue can be obtained are generally fragmentary; wingless and often legless trunks are very common, and lead to the suggestion that the specimens had undergone long maceration in somewhat turbulent waters before final deposition. The zoological nature of the fauna will be fully considered at another time, and it need only be remarked now that one cannot avoid noticing the tropical aspect of the recognizable forms. More than eighty species are here enumerated. One or two only can be (doubtfully) referred to species described from the White River beds,† referred by Lesquereux to the same horizon.

I must here express my indebtedness to Mr. G. D. Smith of Cambridge, who, with great liberality, has enabled me at all times to use his rich collections of *Coleoptera*, which chance to be specially valuable for my purpose from the intercalation of Mexican forms in the North American series.

HYMENOPTERA.

FORMICIDÆ.

Lasius terreus.—A single specimen (No. 14692) obtained by Dr. Hayden at the "Petrefied Fish Cut", Green River (alluded to in his Sun Pictures of Rocky Mountain Scenery, p. 98), is probably to be referred to this

* See American Naturalist, vi, 665-668; Bulletin of this Survey, ii, No. 1, 77-87.

† See Bulletin of this Survey, iii, No. 4, 741-762.

genus, but is in rather a poor state of preservation. The head is small and rounded, with antennæ shaped as in *Lasius*, but of which the number and relative length of the joints cannot be determined, from their obscurity; the long basal joint, however, appears to be comparatively short and uniform in size, being not quite so long as the width of the head, while the rest of the antennæ is more than half as long as the basal joint, and thickens very slightly toward the apex. The thorax, preserved so as to show more of a dorsal than a lateral view, is compact, oval, less than twice as long as broad, with no deep separation visible between the meso- and metathorax, tapering a little posteriorly. The peduncle, as preserved, is a minute, circular joint, but from its discoloration appears to have had a regular, rounded, posterior eminence. The abdomen consists of five joints, is very short-oval, very compact and regular, and of about the size of the thorax, although rounder. The legs are long and slender, the femora of equal size throughout, and all the pairs similar. There is no sign of wings, and the specimen is probably a neuter.

Length of body 7.5^{mm}, of head 1.4^{mm}, of thorax 3.2^{mm}, of abdomen 2.9^{mm}; breadth of head 1.1^{mm}, of thorax 1.9^{mm}, of abdomen 2.2^{mm}; diameter of peduncle 0.55^{mm}; length of first joint of antennæ 1^{mm}, of rest of antennæ 1.65^{mm}(?).

MYRMICIDÆ.

Myrmica sp.—A species of this family was found by Mr. Richardson (No. 53), but a specific name is withheld in the hope of finding better material on which to base it. The head is rather small, circular; the thorax very regularly ovate and nearly twice as long as broad; the peduncle small, and composed of two adjoining circular masses, the hinder slightly the larger; the abdomen is much broken, but evidently larger than the thorax and pretty plump; no appendages are preserved.

Length of body 3.3^{mm}; diameter of head 0.4^{mm}; length of thorax 1.2^{mm}; width of same 0.75^{mm}; length of peduncle 0.25^{mm}; diameter of anterior joint of same 0.1^{mm}; width of abdomen 0.85^{mm}, its probable length 1.8^{mm}.

BRACONIDÆ.

Bracon laminarum.—A single specimen and its reverse (Nos. 4196, 4197) show a body without wings or other appendages. The head is quadrate, broader than long, and nearly as broad as the thorax. The thorax is subquadrate, either extremity rounded, about half as long again as broad, the sides nearly parallel, and the surface, like that of the head, minutely granulated; abdomen fusiform, very regular, in the middle as broad as the thorax, as long as the head and thorax together, tapering apically to a point, and composed apparently of six segments.

Length of body 2.8^{mm}, of head 0.6^{mm}, of thorax 0.85^{mm}, of abdomen 1.35^{mm}; breadth of head 1.1^{mm}, of thorax 1.2.

CHALCIDIDÆ.

Decatoma antiqua.—On the same stone (No. 4076) as *Lystra Richardsoni*, but at a slightly higher level, is a minute Chalcid fly. The wings are wanting, but the whole of the body is preserved, together with the antennæ. The head is large, arched, and otherwise well rounded, the face tapering below, the eyes large, deep, with their inner borders nearly parallel, leaving an equal front; the base of the antennæ cannot be made out, but beyond the long basal joint are six nearly equal quadrate joints, increasing very slightly indeed in size away from the head, scarcely so long as broad, the apical joint subconical, scarcely longer than the penultimate. Thorax compact, globose, minutely granulated, like the head; the abdomen also compact, arched, the tip rounded; beyond it, the ovipositor extends very slightly, apparently by pressure.

On a stone collected by Mr. Richardson (No. 86) is pretty certainly another specimen of this species, in which the abdomen is distorted by pressure; the abdomen shows this by the rupture of the integument, and the result is an apparently slenderer abdomen; it is also a female, with exactly the same parts preserved, with the addition of the other antenna; but both antennæ are more obscure than in the other specimen, especially at the apex; they appear, however, to enlarge more rapidly, and may be clavate at the tip, in which case the insect cannot be the same.

Length of body (of No. 4076) 1.85^{mm}, of abdomen 0.95^{mm}, of antennæ beyond basal joint 0.4^{mm}; width of penultimate antennal joint 0.045^{mm}.

DIPTERA.

CHIRONOMIDÆ.

Chironomus sp.—A minute specimen (No. 141), apparently of this family, was taken by Mr. Richardson. Unfortunately, it has no wings, and little can be said of it, more than to record its occurrence; it is 3^{mm} long, has large eyes, a stout thorax, and altogether resembles a *Chironomus*; it is, however, distinct from any found by Mr. Denton in the White River shales.

TIPULIDÆ.

Dicranomyia primitiva Scudd.—A single wingless male (No. 16), taken by Mr. Richardson, can be referred doubtfully to this species, originally described from White River.

About fifteen other specimens of *Tipulidæ* were collected by Mr. Richardson, Mr. Bowditch, and myself at the same spot, but, unfortunately, not one of them presents the vestige of a wing, and seldom anything more than the body; probably some of them also belong to the above-named species; others may with more doubt be referred to *D. stigmosa* Scudd.; but all are valueless for any precise determination, and, indeed, may not belong to *Dicranomyia* at all.

MYCETOPHILIDÆ.

Diadocidia? terricola.—This species is founded upon a single wing (No. 125) found by Mr. Richardson, differing to such a degree from *Diadocidia* that I only place it here because the only other reasonable course would be to refer it to a new genus, which would necessarily be conjectural, from the imperfection of the fragment. If a transverse vein exists in the middle of the wing, it must unite the fourth longitudinal vein with the second, and not, as in *Diadocidia*, with the third. The wing itself is shaped much as in *Diadocidia*, and, at least near its costal border, is covered with fine hairs arranged in rows parallel to the course of the neighboring veins; one of these rows in the costal cell is so distinct as to appear like a vein parallel to and lying within the auxiliary vein. The auxiliary vein terminates in the costal margin far beyond the middle of the wing, a feature apparently unknown in *Mycetophilidæ*; the first longitudinal vein terminates only a little further beyond, and, as in *Diadocidia*, there is no transverse vein connecting them; the second longitudinal vein terminates a little above the apex of the wing, curving downward at its extremity and apparently surpassed a little by the marginal vein; the third longitudinal vein originates from the second at only a short distance before the middle of the wing, and soon forks, or at about the middle of the wing; the fourth longitudinal vein is perhaps connected with the second at the point where it parts with the first by a cross vein perpendicular to the costal margin; at least, it is elbowed at this point, its basal portion running, parallel to the costal margin, to the fifth longitudinal vein, which, beyond this point, has a gently sinuous course, and diverges rather strongly from the fourth; the sixth vein cannot be traced, although the axillary field is broad, very much as in *Diadocidia*, and the inner margin distinct.

Probable length of wing 3.6^{mm}; its breadth 1.45^{mm}.

Sackenia sp.—No. 7 of Mr. Richardson's collection represents a species of *Mycetophilidæ* apparently belonging to this genus, so far as can be determined. It closely resembles *Sackenia arcuata* Scudd. from the White River shales, but differs from it in its smaller size and in possessing a proportionally larger and more arched thorax; the legs also appear to be shorter. Besides the body and (indistinctly) the antennæ and legs, only the upper portion of the wings remain, consisting of the costal margin and first and second longitudinal veins, with the cross vein uniting them; these wholly agree with the same features in *S. arcuata*, excepting that the second longitudinal vein terminates a little higher up.

Length of body 3.75^{mm}, of wings 2.9^{mm}.

Three other species of *Mycetophilidæ* occur among the specimens collected by Mr. Bowditch and myself, but they are indeterminable from their fragmentary condition. One of them, No. 4134, has indeed the

remnant of a wing, but the portion of the venation preserved is only sufficiently characteristic to enable us to judge that it belongs in this family. The thorax is strongly arched, and the full and tapering abdomen indicates a female; the head is gone; the thorax and abdomen are 3.5^{mm} long, and the wing probably 3^{mm} long.

Another of them, No. 4114, has a portion of the base of a wing, in which the forking of the fifth and sixth longitudinal veins is very close to the base, as in *Sackenia*, but nothing more can be said concerning it; the thorax is very globular and the abdomen short.

Length of thorax and abdomen 3.65^{mm}.

The third species is represented by two specimens on one stone (No. 4205) which came from the buttes opposite Green River Station, and is the only fly which had the slightest value found in four days' search. One of the specimens is a pupa and the other an imago, apparently of the same species and distinct from either of the preceding, with a longer thorax and slenderer abdomen, provided with large ovate anal lobes.

Length of thorax and abdomen 5^{mm}.

ASILIDÆ.

Stenocinclis (στενός, κίγκλις), nov. gen.

This genus of *Asilidæ* is founded wholly upon characters drawn from the neuration of the wing, the only portion of the insect preserved. It falls into the group of *Dasyopogonina*, in which the second longitudinal vein terminates in the margin apart from the first longitudinal vein, instead of uniting with it just before the margin. It is not very far removed from *Dioctria*, but differs from it and from all *Asilidæ* I have examined in that the third longitudinal vein arises from the first before the middle of the wing, instead of from the second longitudinal vein after its emission from the first; the first longitudinal vein has therefore two inferior shoots, giving the wing a very peculiar aspect, and causing it to differ radically from all other *Asilidæ*; indeed, it would be hard to know where to look for a similar feature among allied *Diptera*, unless it be in the anomalous group of *Cyrtidæ*. The wing is very slender, and all the cells unusually elongated, which also gives it a unique appearance.

Stenocinclis anomala.—This species is represented by a single fragment of a wing (No. 4143), which I found in the Green River shales. Nearly all the neuration is preserved; but the posterior margin is absent, and the length of the cells which border upon it cannot be accurately determined. The insect was evidently small, with a long and slender wing. The auxiliary vein terminates slightly beyond the middle of the costal margin; the first longitudinal vein runs up toward the margin where the auxiliary vein terminates, and follows along next the edge far toward the tip, as usual in this group; the second longitudinal vein originates from the first a little way before the middle of the wing,

and with an exceedingly gentle sinuous curve, turning upward apically, terminates a little way beyond the first longitudinal vein; the third longitudinal vein originates from the first as far before the origin of the second longitudinal vein as the distance apart of the tips of the first and second longitudinal veins, and running at first parallel and almost as close to it as the first longitudinal vein to the apical half of the costal margin, but distinctly separate throughout, it diverges slightly from it at the middle of the wing and terminates at the lower part of the apex of the wing, curving downward more strongly toward the margin; at the middle of the divergent part of its course, which is very regular, it emits abruptly a superior branch, which afterward curves outward and runs in a very slightly sinuous course to the margin, curving upward as it approaches it. The fourth longitudinal vein is seen to start from the root of the wing, and runs in a straight course until it reaches a point just below the origin of the second longitudinal vein, where it is connected with the vein below by the anterior basal transverse vein, and then bends a little downward, running nearly parallel to the third longitudinal vein, but continuing in a straighter course, terminates on the margin at nearly the same point; these two veins are connected by the small transverse vein midway between the anterior basal transverse vein and the forking of the third longitudinal vein; the fourth longitudinal vein is connected by the posterior transverse vein (which is scarcely as long as the small transverse vein) with the upper apical branch of the fifth longitudinal vein just beyond its forking, or opposite the forking of the third longitudinal vein; the fifth longitudinal vein forks previously to this, emitting a branch barely before the point where the anterior basal transverse vein strikes it, so that the branch almost appears to be a continuation of the transverse vein; and previous to this it has a distinct angle, where another vein is thrown off at right angles, directly opposite the upper extremity of the anterior basal transverse vein, and beyond the origin of the third longitudinal vein; the basal half only of the sixth longitudinal vein can be seen, but its direction shows that it unites with the lowest branch of the fifth at its apex, as in *Dasypogon*. All the cells throughout the wing are exceedingly narrow.

Length of wing 6.75^{mm}; probable breadth 1.6^{mm}.

SYRPHIDÆ.

Milesia quadrata.—A specimen (No. 14691) in a fine state of preservation, although not perfect, and with most of the neuration of the wing concealed under hard flakes of stone which cannot be wholly removed, was found by Dr. Hayden at the "Petrefied Fish Cut", Green River. It is the larger fly alluded to in Dr. Hayden's Sun Pictures of Rocky Mountain Scenery, p. 98. The head and thorax are black, the head large, nearly as broad as the thorax, the eyes large, globose, as broad as the summit of the head between them, the front very large, prominent, half as broad as the head, and half as long as broad. Thorax

globose, a little longer than broad, largest in the middle. Wings surpassing slightly the abdomen; the third longitudinal vein originates from the second in the middle of the wing, is very gently arcuate (the convexity backward) in its outer half, and appears to terminate just above the tip of the wing; the fourth longitudinal vein is united by an oblique cross-vein to the third very near the origin of the latter, and the spurious longitudinal vein cannot be made out, from poor preservation; the marginal vein between these two appears to be very simple, the fourth longitudinal vein bending downward at its tip to meet it. The abdomen is as broad as the thorax, fully as long as the rest of the body, broad-ovate, tapering slightly at the base and rapidly beyond the middle, broadest at the second segment; the first segment is longest, and half as long as broad, the second and third slightly shorter, the fourth still shorter, and the fifth minute; the abdomen is light-colored, probably yellow in life, and the first three segments are rather narrowly margined posteriorly with black; the first segment is also similarly margined in front, and besides has a median black stripe of similar width, which divides the segments into equal lateral quadrate halves,—whence the specific name; the whole abdomen is rather profusely covered with very brief, black, microscopic hairs, which are thickest in the black bands bordering the segments, and next the hind edge of the fourth and fifth segments, producing a dusky posterior margin, similar to but narrower than the dark belts of the preceding segments, and of course very inconspicuous.

Length of body 18^{mm}, of head 2.85^{mm}, of thorax 5.65^{mm}, of abdomen 9.5^{mm}; breadth of front 2.4^{mm}, of head 4.5^{mm}, of thorax 6^{mm}, of abdomen 6^{mm}; probable length of wing 14.5^{mm}; length of hairs on abdomen 0.04^{mm}; width of dark abdominal bands 0.5^{mm}.

Cheilosia ampla.—This species is primarily founded on a single specimen (No. 4112) which Mr. Bowditch and I found in the Richardson shales at Green River, and which preserves nearly all parts of the insect. There is also a specimen with its reverse (Nos. 4135, 4141) which we obtained at the same place, and another (No. 40) which Mr. Richardson sent me from these beds, agreeing with the first-mentioned specimen, but a little larger. As only the bodies are preserved, they are temporarily placed in this connection, until other material is at hand, while the species is described wholly from the more perfect individual. This has a body more nearly of the shape of an *Orhoneura*, the abdomen being broader and stouter than is usual in *Cheilosia*; but the wings are much longer than in the species of *Orhoneura* I have seen, and both the shape of the wing and its venation agree well with *Cheilosia*. The head is round and moderately large, the thorax stout and rounded ovate, the scutellum large, semilunar, twice as broad as long; all these parts are dark brown. The wings are very long and narrow, extending much beyond the tip of the abdomen, the costal edge very straight until shortly before the tip, where it

curves rapidly; all the veins are very straight, especially those of the upper half of the wing; the auxiliary vein terminates in the middle of the costal border, the first longitudinal at the extremity of the straight part of the costa, beyond the middle of the outer half of the wing, the third at the tip of the wing, and the second midway between the first and third; the third is united to the fourth by a straight cross-vein in the middle of the wing, directly beneath the tip of the auxiliary vein, and about its own length beyond the extremity of the long second basal cell; the extremity of the third basal cell is very oblique and reaches the tip of the lower branch of the fifth longitudinal vein; the marginal vein, uniting the third and fourth veins, strikes the former just before the tip, while that uniting the fourth and fifth, toward which the fourth bends to receive it, is removed further from the margin by about half the width of the first posterior cell. The legs are slender, scantily clothed with short, fine hairs. The abdomen is broad, oblong ovate, fully as broad as the thorax, broadly rounded at the apex, no longer than the rest of the body, of a light color, with darker incisures, and scantily covered with delicate hairs; it is composed of five segments, of which the second, third, and fourth are of equal length, the first shorter and suddenly contracted, the apical minute.

Length of body 7^{mm}; diameter of head 1.35^{mm}; length of thorax 2.5^{mm}; breadth of same 2^{mm}; length of abdomen 3.5^{mm}; breadth of same 2.2^{mm}; length of wing 6.4^{mm}; breadth of same 1.8^{mm}; length of hind femora 1.25^{mm}, of hind tibiæ 1.25^{mm}, of hind tarsi 1.25^{mm}.

Cheilosia sp.—Two specimens (Nos. 4113, 4150) of a smaller species of *Syrphidæ*, preserving the bodies, agree so completely with the last-mentioned species, excepting in their much smaller size, that they are referred to the same genus; but as the wings are almost entirely lost, the reference is only made to indicate the approximate place of the species, which need not be described until better material is at hand. The length of the body is 4.25^{mm}.

Syrphus sp.—A fourth species of this family, and second only to the *Milesia* in size, is represented by two specimens, reverse and obverse (Nos. 4110, 4132), which are too imperfect for description, only the body being preserved; the form and size of this agree best with the genus *Syrphus*. The length of the body is 10^{mm}.

MYOPIDÆ.

Poliomyia (πολιός, μυῖα), nov. gen.

This genus of *Myopidæ*, most nearly allied to *Myopa*, appears in the neuration of the wings to resemble closely some genera of *Syrphidæ*, especially *Xylota* and *Milesia*, but it altogether lacks the spurious longitudinal vein, and the third, fourth, and fifth longitudinal veins are not united at their extremities by marginal veins; indeed, they run, without swerving, and subparallel to one another, to the margin. In this

respect, the genus differs also from other *Myopidæ*, as it does also in the extreme length of the third basal cell, which is as long as in *Syrphidæ*. In these points of neuration, it would seem to agree better with the *Pipunculidæ*, which family, however, is entirely composed of very small flies, so that it seems better with our imperfect knowledge of the fossil to refer it to the *Myopidæ*. The body resembles that of *Syrphus* in general form. The wings are as long as the body, and slender, with very straight veins; the auxiliary and first to fourth longitudinal veins are almost perfectly straight, the third originating from the second longitudinal vein at some distance before the middle of the wing; the auxiliary vein terminates beyond the middle of the costal margin; directly beneath its extremity is the small transverse vein, and about midway between the latter and the margin the large transverse vein uniting the fourth and fifth veins; the extremity of the second basal cell is further from the base than the origin of the third longitudinal vein, and the third basal cell reaches very acutely almost to the margin of the wing.

Poliomyia recta.—The single specimen (No. 14696) referable to this species was obtained by Dr. Hayden at the "Petri-fied Fish Cut", and represents a dorsal view of the insect with the wings partly overlapping on the back. It is the smaller fly referred to in Dr. Hayden's Sun Pictures of Rocky Mountain Scenery, p. 98. The head is broken; the thorax is stout, rounded-ovate, and blackish; the scutellum large, semi-lunar, and nearly twice as broad as long, with long black bristles along either lateral edge and along the sides of the thorax posteriorly. The wings are long and narrow; the auxiliary vein runs into the margin just beyond the middle of the wing; the first longitudinal vein runs into the margin at about two-thirds the distance from the tip of the auxiliary vein to that of the second longitudinal vein, and scarcely turns upward even at the tip; the straight second and third longitudinal veins diverge from each other at the extreme tip after running almost parallel throughout the length of the latter, which originates from the second some distance before the middle of the wing; the small transverse vein between the third and fourth longitudinal veins lies just beyond the middle of the wing and perpendicular to the costal border, while the large transverse vein between the fourth and fifth longitudinal veins is perpendicular to the latter, and renders the discal and second posterior cells of about equal length. The abdomen is apparently lighter-colored than the thorax, regularly obovate, as broad as the thorax, and longer than it, its terminal (fifth) segment small, the others large and subequal.

Length of thorax and scutellum 4^{mm}; breadth of same 2.75^{mm}; length of abdomen 4.5^{mm}; breadth of same 2.75^{mm}; length of wing 6.5^{mm}; breadth of same 2.25^{mm}.

I am indebted to Mr. Edward Burgess for some critical remarks upon the affinities of this fly, and for a careful sketch of the neuration, which is very difficult to trace in certain places.

DOLICHOPIDÆ.

Dolichopus sp.—A specimen and its reverse (Nos. 4124, 4148) is to be referred to this family by the structure of the abdomen and its general aspect. The wings and head, however, are wanting. The thorax is globose, well arched, and, like the abdomen, of a light brown color, and ornamented with scattered, bristly, black hairs. The tip of the abdomen is recurved beneath. The length of the fragment is 3.65^{mm}.

TACHINIDÆ.

Tachina sp.—To this is referred provisionally a small but stout and densely hairy fly (No. 48^b, obtained by Mr. Richardson), with thick, slightly tapering abdomen, broadly rounded at the tip, long wings with heavily ciliated costal margin, the auxiliary vein terminating a little before the middle, and the first longitudinal vein not very far before the tip; the other veins of the wing cannot be determined. The legs are pretty stout and densely haired. About the fly are scattered many arcuate, tapering, spinous hairs 0.7^{mm} long, evidently the clothing of the thorax.

Length of body 4^{mm}; breadth of thorax 1.25^{mm}; length of wings 4^{mm} (?), of hind femora 0.6^{mm}; hind tibiæ 1.25^{mm}; hind tarsi 1.25^{mm} (?).

SCIOMYZIDÆ.

Sciomyza? manca.—This fly, extremely abundant in the Green River shales—in fact, outnumbering all the other *Diptera* together—is temporarily placed in this genus, because its characters seem to agree better with those of the family *Sciomyzidæ* than of any other; yet it cannot properly be placed in any of the genera known to me. I should be inclined to place it near *Blepharoptera* in the *Helomyzidæ*, but all the tibiæ are bristled throughout. Its general appearance is that of the *Ephydrinidæ*, but the bristly surface of the middle tibiæ would allow us to place it only in the *Notiphilina*, from which it is excluded by the want of pectinations on the upper side of the antennal bristle. The want of complete neuration prevents me from designating it at present by a new generic name, which it can hardly fail to require as soon as that is known; only two or three of the three score specimens before me have any important part of the wings, and this constant fragmentary condition of the fossils has suggested the specific name. The genus in which it would fall may be partially characterized as follows:—Body compact, stout; the head comparatively small, perhaps one-third the bulk of the thorax, about three-fourths its width, with large, naked eyes, the front between them nearly equal and pretty broad, obliquely sloped and slightly tumid on a side view, so as to project considerably below; a few curved bristles project from its summit. Antennæ with the flagellum subglobose, scarcely longer than broad, much larger than the joints of the scape, and bearing at its tip above a curved,

rather short, naked, tapering style, *scarcely longer than the flagellum* proper and bluntly pointed; in several specimens in which this part is pretty well preserved, this is invariably its character, and no terminal thread can be seen in any of them, nor any indication of joints in the style; this brevity of the style seems to be peculiar. As far as the neuration of the wing can be made out (there must remain some doubt upon this point until better examples are discovered), the course of the auxiliary vein cannot be determined; the first longitudinal vein appears to end before the middle of the costal border; the second originates abruptly from the middle of the first longitudinal vein, and terminates (certainly) only a little way before the tip of the wing; the third runs very nearly parallel to the second longitudinal vein, terminates at the tip of the wing, and is perhaps connected by a cross-vein with the fourth longitudinal vein scarcely within the extremity of the first longitudinal vein; the fourth longitudinal vein originates from the fifth or sixth a little before the origin of the second longitudinal vein, diverges rapidly from the third beyond this connection, and is arcuate, curving upward again before reaching the posterior border and running outward to the outer border; the fifth longitudinal vein curves still more strongly from the fourth, until it reaches the middle of the posterior border, to which it suddenly drops, and scarcely above which it is united with the fourth longitudinal vein by a long, oblique cross-vein. The femora are stout, the front pair largest at the base and tapering, the other pairs subequal throughout, all armed externally above and below with a row of very delicate, nearly straight spines, the upper row perhaps wanting on the middle femora, and the lower row developing into longer and stiffer bristles on the apical half of the fore femora. The tibiæ are equal, a little longer than the femora, considerably slenderer, but still rather stout, furnished alike with several straight, longitudinal rows of minute spines, and on the outer side with three or four distant, moderately stout, longer spines (less prominent on the fore tibiæ than on the other legs), and at the tip with a cluster or several similar spines or spurs. The tarsi are very much slenderer than the tibiæ, longer than they, the other joints slenderer than the metatarsus, all profusely armed with exceedingly delicate spines or spinous hairs, arranged regularly in longitudinal rows; at tip is a pair of very slender, pretty long, strongly curved claws, and apparently a pretty large pulvillus.

The brevity of the antennal style, the length of the first longitudinal vein of the wing, the approximation of the middle transverse vein to the base, the strong arcuation of the fourth longitudinal vein, the obliquity of the posterior, large, transverse vein, and its approach to the posterior margin, the bristly nature of the legs, and the length and comparative slenderness of the tarsi—all, excepting parts of the neuration, characters open to little question—render this fly peculiar and its exact location somewhat dubious. When, however, the neuration of the wing is sufficiently well known to enable us to understand more definitely

the character of the basal cells, and other parts of the base of the wing, the relation of the auxiliary to the first longitudinal vein, and to map unquestionably the whole course of the fourth longitudinal vein, we shall probably be able to arrive at very precise conclusions.

In addition to the features above mentioned, it may be added that the thorax is subquadrate, scarcely longer than broad, furnished with distant, long, curving bristles disposed in rows, but in no individual well enough preserved to give further details of distribution. The abdomen is composed of five visible, subequal joints; its mass compact, scarcely constricted at the base, regularly and pretty strongly arched on a side view, tapering rapidly on the apical half to a bluntly rounded apex, the surface abundantly clothed with rather delicate spinous hairs, those at the posterior edge of the segments longer, and forming a regular transverse row. The metatarsus of the middle leg is proportionally longer than in the others, where it is about half as long as the other joints combined.

Measurement of average individuals:—Length of body as curved 4.25^{mm} , of head 0.65^{mm} , of thorax 1.7^{mm} , of abdomen 2.2^{mm} ; breadth of head 0.85^{mm} , of thorax 1.25^{mm} , of abdomen 1.4^{mm} ; length of flagellum of antennæ 0.16^{mm} , of style 0.19^{mm} , of wing $3.4^{\text{mm}}?$; breadth of same 1.2^{mm} ; length of femora 0.75^{mm} , of tibiæ 0.95^{mm} , of fore tarsi 0.85^{mm} , of middle tarsi 1.5^{mm} , of hind tarsi 1.6^{mm} , of fore metatarsi 0.4^{mm} , of middle metatarsi 0.64^{mm} , of hind metatarsi 0.48^{mm} ; breadth of femora 0.28^{mm} , of tibiæ 0.12^{mm} , of metatarsus 0.08^{mm} , of tip of tarsi 0.05^{mm} ; length of claws 0.09^{mm} .

Sciomyza? disjecta.—A second species, apparently of the same genus as the last-mentioned, but smaller, is found in considerable numbers in the same bed, although in far less abundance than the last, a dozen specimens having been found by Mr. Richardson, Mr. Bowditch, and myself. The wings appear to be proportionally shorter than in the last species, with a rather broader space between the veins in the upper half of the wing, indicating perhaps a broader wing. The legs are slenderer, the disparity in the stoutness of the tibiæ and tarsi is not so great, and the tarsi are proportionally shorter; the legs are also as densely, though less coarsely, spined, and a similar delicacy is observable in the hairiness of the body. All the specimens are preserved on a side view, and the last species are in a like fragmentary condition.

Length of body of an average individual 3.2^{mm} , of head 0.55^{mm} , of thorax 1.2^{mm} , of abdomen 1.8^{mm} , of wing $2.4^{\text{mm}}?$, of hind femora 1.2^{mm} , of hind tibiæ 1.4^{mm} , of middle and hind tarsi 1^{mm} .

COLEOPTERA.

CARABIDÆ.

Cychrus testeus.—A single specimen (No. 4059) with its broken reverse (No. 4100) shows a pair of elytra slightly misplaced. They appear to represent a small species of *Cychrus* allied to *C. angusticollis* Fisch., but

without the irregularities which mark the furrow formed by the marginate outer edge in this species and its near allies. The elytra are almost precisely similar in form to those of *C. angusticollis*, but they are slightly broader at the base; they are covered with rather inconspicuous, closely crowded striæ, almost exactly as in the recent species mentioned, but even more closely crowded, numbering about twenty-five, including the frequent lines bordering the margin, which is simple and striate to the very edge, or, possibly, faintly marginate, as in some *Carabi*, but differing conspicuously from the species of *Cychrus* to which I have compared it. The form of the tip of the elytra is also exactly as in this species. The interspaces of the elytra do not exhibit the imbricated appearance common to most of the *Carabini*, but the surface has more of the nearly imperceptible waviness seen in *C. angusticollis*, although, if anything, the surface is less broken.

Length of elytron 7.5^{mm}; greatest breadth (behind the middle) 2.6^{mm}.

Platynus senex.—This species is represented by a single specimen and its reverse (Nos. 3998, 3992). The upper surface is shown with none of the slenderer appendages. The true form of the head cannot be determined, as the edges are not preserved. The prothorax is unusually square for a Carabid, resembling only certain forms of *Bembidium* and *Platynus*, and especially *P. variolatus* LeC. It is, however, still more quadrate than in that species, and differs from it in shape, being a little broader than long, broadest just behind the middle, tapering but little anteriorly, and scarcely more rapidly at the extreme apex; the elytra are together only about half as broad again at base as the thorax, and are furnished with eight very faint and feeble striæ, apparently unpunctured, the one next the margin interrupted by four or five foveæ on the posterior half of the elytra; the humeral region is too poorly preserved to determine the striæ at that point; the form of the elytra is as in *P. variolatus*.

Length of body 6.1^{mm}; breadth of thorax 1.5^{mm}, of base of elytra together 2.3^{mm}; length of elytra 4.1^{mm}.

HYDROPHILIDÆ.

Tropisternus saxialis.—One specimen and its reverse (Nos. 4023, 4027), found by me in the Green River shales, represent a species of *Tropisternus* nearly as large as *T. binotatus* Walk. from Mexico. The large size of the head and the shortness of the prothorax are doubtless due to the mode of preservation, the whole of the head, deflected in life, being shown, while the thorax is in some way foreshortened. In all other respects, it agrees with the *Hydrophiliidæ*, and especially with *Tropisternus*, having the form of the species mentioned. The head is broad and well rounded, with small, lateral, posterior eyes. The thorax is much broader and much more than twice as broad as long, with rounded sides, tapering anteriorly, the front margin broadly and rather deeply concave, the

hind border gently convex; the scutellum is large, triangular, a little longer than broad. The surface of the thorax and elytra is apparently smooth; at least, no markings are discoverable, excepting the line of the inner edge of the inferior margination of the sides of the elytra, which appears through the latter, as do also the abdominal incisures and the hind femora and tibiæ. These legs are longer and slenderer than in *T. binotatus*, the femora extending beyond the sides of the abdomen, and the tibiæ are armed beneath at tip with a pair of slender spines, which together with the tibiæ are about as long as the femora.

Length of body 6.65^{mm}, of elytra 4.45^{mm}; breadth of middle of body 3.25^{mm}; length of hind femora 2^{mm}, of hind tibiæ 1.25^{mm}.

Tropisternus sculptilis.—In a specimen (No. 3989) of which only the abdomen and elytra are preserved, we have a well-marked species of *Tropisternus* of about the size and shape of *T. mexicanus* Castln., but with rather frequent striæ, more distinct than in that species; and composed, not, as there, of rows of impressed points, but of continuous, faintly impressed lines; the lines are apparently eight in number and uniform in delicacy and distance apart; the base of the elytra, however, is poorly preserved; the elytra are rather slenderer than in the recent species mentioned, and the extreme tip is rounded and not acutely pointed. Distinct striation of the elytra is rare in *Tropisternus*, but it scarcely seems possible to refer this species elsewhere.

Length of elytra 6.5^{mm}; breadth of combined elytra 5^{mm}.

Berosus tenuis.—The single specimen (No. 4002) representing this species is preserved on a dorsal view, and is unusually slender for a *Berosus*, but seems to fall here rather than in any other of the Hydrophilid genera. It is of about the size of *B. cuspidatus* Chevr. from Mexico, and agrees generally in appearance with it, but is slenderer, and the tip of the elytra is simple; the punctured striæ are exactly as in that species, as far as they can be made out. The head is large and well rounded, with large, round eyes. The pronotum, the posterior edge of which is partly concealed by the overlapping base of the elytra, pushed a little out of place, is shorter than in *B. cuspidatus*, with rounded sides, broadly and shallowly concave front, and apparently smooth surface. The elytra are long and slender, with entire, bluntly pointed tips, and very delicate, finely impunctured striæ. The whole body is regularly obovate, broadest in the middle.

Length of body 5.65^{mm}, of elytra 4.15^{mm}; breadth of body 2.75^{mm}.

Berosus sexstriatus.—A single well-preserved elytron (No. 4079) represents a species scarcely smaller than *B. punctipennis* Chevr. (undescrib.) from Mexico, with the elytra of which it also agrees in the character of the tip and in the shape of the whole, unless in the fossil it tapers more toward the base; the latter is also remarkable for the absence of the two lateral striæ, the others retaining their normal position; for the delicacy of the striæ themselves, which are even more faintly impressed than in

B. cuspidatus Chevr., and, unlike all *Berosi* I have seen, are nearly devoid of any sign of punctuation; faint traces only can be seen when magnified twenty-five diameters. As not unfrequently happens in *Hydrophilidæ*, although I have not noticed it in *Berosus*, a short supplementary stria originates near the base of the second stria, pushing it a little to one side, and runs into the first stria a short distance from the base of the elytra.

Length of elytron 4.5^{mm}; breadth 1.4^{mm}.

Laccobius elongatus.—A single specimen and its reverse (Nos. 81^a, 136^g), collected by Mr. Richardson, but overlooked in my former paper on the Coleoptera of the Rocky Mountain Tertiaries,* exhibit the elytron of a slender species of *Laccobius*. It is more than two and a half times longer than broad, and is furnished with thirteen equidistant, delicately punctured, faintly impressed striæ, the punctures of which are more apparent on the basal than on the apical half; the inner stria is as distant from the sutural border as from the neighboring stria, while the outer is scarcely separate from the outer margin. The species is very large, and also very slender, for a *Laccobius*, in which genus, however, I am inclined to place it, from the large number of punctured striæ. The elytron has much the general appearance of that of a *Lebia*, but the number of striæ, of course, forbids such a reference.

Length of elytron 2.9^{mm}; breadth 1.1^{mm}.

Philhydrus primævus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 78.—A single specimen, found by Mr. Richardson.

Philhydrus spp.—Two specimens (Nos. 4033, 4042) of a second species of *Philhydrus* were found by Mr. Bowditch and myself, but neither of them very perfect, representing little else than elytra, and these rather obscurely preserved. The larger species has smooth elytra; the elytra of the other have eight delicate striæ, which apparently are not punctured. Possibly one or both should be referred to *Hydrobius*.

Length of elytra of larger species (No. 4033) 4^{mm}; breadth of body 3.2^{mm}.

Length of elytra of smaller species (No. 4042) 3.75^{mm}; breadth of body 3^{mm}.

Hydrobius decineratus.—A single specimen (No. 4007) exhibits the dorsal surface, but with part of the thorax gone. It represents a species a very little larger than *H. fuscipes* Curt. of California, and is apparently allied to it, though slenderer; the head and eyes are as in that species; the thorax shorter and the elytra longer, and more tapering at the tips, the extremities of which, however, are not preserved; they are furnished with eight delicate striæ, in which the punctures are scarcely perceptible, even when magnified; the surface otherwise appears to be smooth, but is not well preserved. The scutellum is as in the recent species mentioned.

Length of body 7.5^{mm}, of elytra 4.75^{mm}; breadth of body 3.6^{mm}.

* Bulletin of this Survey, ii, No. 1, 77-87.

STAPHYLINIDÆ.

Lathrobium abscessum Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 79.—Two specimens were found by Mr. Richardson, and since the description of the species three others by myself at the same locality.

Bledius adamus.—A rather poorly preserved specimen (No. 4081) shows the dorsal view of the body without the legs or antennæ. It is of about the size of *B. annularis* LeC., and resembles it in general appearance, but seems to have shorter tegmina, although these are obscure; it is also a rather slenderer species. The head is large, as broad as the thorax, with rather large eyes. The thorax is quadrate, and the elytra together quadrate, and of the same size as the thorax. The abdomen beyond the elytra is as long as the rest of the body; apically it expands somewhat, and the extremity is shaped as in the species mentioned.

Length of body 4.4^{mm}; breadth of thorax 0.75^{mm}.

Staphylinites obsoletum Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 78.—A single specimen found by Mr. Richardson.

NITIDULIDÆ.

Phenolia incapax Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 80.—One specimen and its reverse, found by Mr. Richardson.

CRYPTOPHAGIDÆ.

Antherophagus priscus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 79–80.—Several specimens, found by Mr. Richardson, Mr. Bowditch, and myself.

ELATERIDÆ.

Corymbites velatus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 81.—Found by Mr. Richardson.

PTINIDÆ.

Sitodrepa defuncta Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 82.—A single elytron and its reverse, found by Mr. Richardson.

Anobium? ovale.—A single specimen (No. 4038) exhibits the upper surface of the pronotum and elytra. The insect evidently appertains to a distinct genus of *Ptinidæ*, in which the sides of the body are not parallel, but the body tapers posteriorly much, though not to the same extent, as anteriorly. It is, however, most nearly allied to *Anobium*, in which it is provisionally placed. It is about as large as *Endecatomus rugosus* LeC. The prothorax, viewed from above, is bluntly conical, tapering rapidly. The body is broadest just behind the base of the elytra, and tapers slightly at first, more rapidly afterward, and is rounded posteriorly; thus the whole body has an ovate outline. The pronotum is minutely and very profusely punctulate in black, and appears to have been cov-

ered profusely with slight asperities or a coarse pile (much perhaps as in *Endecatomus rugosus*). The elytra, which are nearly three times as long as broad, and taper regularly from near the base to near the tip, show no mark of such asperities, but are profusely punctate in black, made up of scattered punctæ, about 0.03^{mm} in diameter, not altogether irregularly disposed, although at first sight having that appearance, but showing in many places, not uniformly, signs of a longitudinal distribution into from fourteen to sixteen rows. The elytra, indeed, resemble those of *Bostrychus capucinus* (Linn.), but I am not aware that similar markings occur on smaller *Ptinidæ*.

Length of body 4.3^{mm} ; breadth of same 2^{mm} ; length of elytra 3.15^{mm} .

Anobium? deceptum.—Another specimen (No. 4086), representing an elytron only, evidently belongs to the same genus as the last, and at first sight appeared to be of the same species, as it belongs to an insect of the same size, and the punctures on the elytra are similarly disposed; they are, however, if anything, more thickly crowded, so as to form about eighteen rows in the rather broader elytron; and not only is the elytron broader and shorter than in the preceding species, being less than two and a half times longer than broad, but it scarcely tapers at all in the basal three-fifths, and beyond that more rapidly than in the species last described.

Length of elytron 3^{mm} ; breadth of same 1.25^{mm} .

Anobium lignitum.—A third species of this family, with irregularly punctate elytra, is represented by a single specimen (No. 4082), giving a dorsal view of pronotum and elytra. It differs generically from the two preceding species, and agrees better with *Anobium* proper in having a more gibbous and less conical prothorax, and in having the sides of the elytra parallel through most of their extent. It is considerably smaller than either of the preceding species. The prothorax is one-third the length of the body, minutely punctate and scabrous, tapering only a little in its basal and considerably in its anterior half, the front well rounded. The elytra are about two and a half times longer than broad, equal on the basal two-thirds, and then rounding rapidly inward, so that the posterior outline of the body is more broadly rounded than the anterior outline; the elytra are profusely punctate with little pits, averaging scarcely more than 0.02^{mm} in diameter, distributed at pretty regular intervals, but not forming anything like longitudinal series, and so near together as to be equivalent to about fourteen rows. The whole body is uniformly black.

Length of body 3.75^{mm} , of elytra 2.5^{mm} ; width of body 1.9^{mm} .

EROTYLIDÆ.

Mycotretus binotata.—A single specimen with its reverse (Nos. 3990, 4015) represent the dorsal aspect of this species, which closely resembles *M. sanguinipennis* Lac. in shape. It is, however, a little smaller, the

thorax tapers less rapidly, and the elytra are not striate. The head is badly preserved, being crowded under the thorax; it appears, however, to be very small, about half as broad as the thorax, with a broadly rounded front, large eyes, and a dark color. The thorax is about two and a half times broader than long, with slightly convex sides, regularly tapering toward the apex, but not so rapidly as would seem to be required for so proportionally narrow a head; the front border broadly concave, the hind border very obtusely angulate, scarcely produced as a broad triangle in the middle; the surface is of a light color, very minutely and profusely punctulate, the hind borders faintly marginate, the margin black and punctate. The elytra are more elongate than, and do not taper so rapidly as, in *M. sanguinipennis*; they are of the color of the thorax, even more delicately punctulate than it, with two small, short, black, longitudinal, impressed dashes just outside the middle, and just before the end of the basal third; the basal edge of the elytra is marked in black, much as the posterior border of the pronotum; and the scutellum is small, owing to the encroachment of the median prolongation of the prothorax.

Total length 3.5^{mm}; length of thorax 0.6^{mm}, of elytra 2.5^{mm}; breadth of head 0.75^{mm}, of thorax in front 1.2^{mm}, behind 1.45^{mm}, of elytra at the spots 2.1^{mm}.

CHRYSOMELIDÆ.

Cryptocephalus vetustus.—This species is fairly represented by a pair of specimens with their reverses (Nos. 4003, 4004; 4039, 4044). One pair exhibits the front, and, by the drooping of the abdomen, the under surface of the insect with expanded elytra (one of them curiously foreshortened), the other the under surface only. The insect is broadly oval, and, except in being much stouter, closely resembles *C. venustus* Fabr., with which it agrees in size. The thorax, as seen on a front view, is arched, and the proportion of the head to the thorax is as in the recent species mentioned. The elytra, which are the part best preserved, are rounded at the extremity, and are furnished with ten slightly arcuate rows of gentle punctures, arranged inconspicuously in pairs, besides a sutural, slightly oblique row on the basal third of the elytra, terminating in the margin. This disposition of the punctures and the character of the head, sunken, as it were, into the thoracic mass, leave little doubt that the insect should be referred to *Cryptocephalus*. The elytra are of a uniform light horn-color, but the body is darker. The body is more oval than in the parallel-sided *C. venustus*.

Length of body 4–4.5^{mm}; breadth of same 2.6–3.2^{mm}; length of elytra 4^{mm}; breadth of one of them 1.8^{mm}.

RHYNCHITIDÆ.

Eugnampus decemsatus.—A single elytron (No. 4046) with a broken base is all that remains of this species. But this is peculiar on account of the supplementary humeral stria, which seems to be common in the *Rhyn-*

chitidæ, and at least very rare in the allogastral *Rhyncophora*, to which one would at first glance refer this fragment. So far as the material at hand permits determination, it appears to agree best with the genus to which it is referred, on account of the disposition of the punctuation and the form of the tip of the elytron. It represents, however, a very large species, and one whose punctuation is very delicate. The elytron is long and rather narrow, indicating an elongated form for the body, as in this genus, with parallel sides and a bluntly rounded tip. There are ten complete equidistant rows of delicate, lightly impressed punctures, those of the same row less distant than the width of the interspaces; the outer row lies close to the outer border and is seated in an impressed stria, as also is the apical half of the inner row; but the other rows show no such connection between the punctures which compose them; at the base the rows curve very slightly outward to make place for a very short humeral row of punctures, parallel to the inner complete row, and composed of only three or four punctures on the part preserved; the interspaces are smooth.

Length of fragment 4.5^{mm}; width of elytron 1.5^{mm}.

OTIORHYNCHIDÆ.

Epicærus saxatilis Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 84–85 (*Eudiagogus*).—Twenty-seven specimens of this species have been found by Mr. Richardson, Mr. Bowditch, and myself. This and the two following species cannot be referred to *Eudiagogus* on account of the length of the snout. Although very small for *Epicæri* (especially the present species), they agree so well with *Epicærus griseus* Schönh. from Mexico—one of the smallest of the group—that they would best be referred here, although they differ from this genus in the brevity and stoutness of the femora, all of which are swollen apically. It is possible that all three of the forms mentioned here should be referred to a single species, as there is certainly very little difference between them excepting in size; this is particularly the case with this and the next species. Together over one hundred of these species have been examined by me; they are, therefore, the most abundant fossils of the insect beds of the Green River shales.

Epicærus effossus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 85–86 (*Eudiagogus*).—Nearly fifty specimens of this species are at hand, all found in Richardson's shales by Mr. Richardson, Mr. Bowditch, and myself, besides two I found in beds at the same spot, but about thirty metres lower; these were the only *Coleoptera* found at that spot, excepting a single specimen of *Otiorhynchus dubius* Scudd., belonging to the same family.

Epicærus exanimis Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 58 (*Eudiagogus*).—Thirty-one specimens of this species have been examined.

Ophryastes compactus.—A single specimen (No. 4210), preserved so as

to show a lateral view of the insect, appears to indicate an Otiorhynchid allied to *Ophryastes*. The form of the elytra, indeed, does not well correspond, since, in place of their abrupt posterior descent, as seen in *O. cinereus* Schönh. from Mexico, with which it agrees best in general features as also in size, they slope very gradually, and appear to be tumid next the base. But the structure of the stout snout, enlarged apically, with very oblique descending antennal scrobes, the superior transverse furrow at its base giving an increased convexity to the vertex of the head, ally it closely to *Ophryastes*. The ovate eye is longitudinal, the front border of the pronotum nearly straight with no advance of the sides, the prothorax itself faintly rugulose, the elytra coarsely striate, the striæ with feeble, rather distant punctures (the reverse is shown on the stone); the tips of the elytra are right-angled or slightly produced at the extremity, as in recent species.

Length of body, measured from base of rostrum, 7.5^{mm}; height of same 3.5^{mm}; length of elytra 5.5^{mm}, of rostrum beyond front of eyes 1.2^{mm}; breadth of rostrum at base 0.9^{mm}, where largest 1.05^{mm}; length of eye 0.5^{mm}; breadth of same 0.3^{mm}; distance apart of the elytral striæ 0.35^{mm}.

Otiorhynchus perditus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 84.—A single specimen was found by Mr. Richardson; another, found by myself, is doubtfully referred here, but is so fragmentary as to add nothing to the characters already given.

Otiorhynchus dubius.—A cast of an elytron (No. 4204) resembles so closely the elytron of the preceding species, excepting in size, that it is referred to the same genus. Only nine striæ can be counted, but all of those at the outer side may not be seen; the inner stria is very close to the margin, and indeed is lost in it both above and below, but this may be due simply to the preservation. The stone in which they are preserved is coarser than usual, coming from beds about thirty metres directly below the shales which have furnished the other insect remains, and has a greater admixture of sand; consequently the character of the surface of the elytra cannot be determined, but the striæ are sharp and narrow, and filled with longitudinal punctures. With the exception of a couple of poor specimens of *Epicærus effossus* Scudd., this was the only recognizable insect found at this locality.

Length of elytron 4^{mm}; breadth of same 1.5^{mm}.

Eudiagogus terrosus.—This species, which seems more properly referable to *Eudiagogus* than those formerly so named by me, is represented by a single specimen and its reverse (Nos. 4024, 4078), preserved on a side view. The snout is short, as long as the eyes, scarcely so long as the head, and stout; the eyes transverse, rather large, subreniform. The thorax appears to be smooth, like the head, deep and short, its front border extending forward on the sides toward the lower part of the eye. The elytra, the lower surface of which does not appear to be in view, are broad and long, rectangular at tip, furnished with more than eight

rows of frequent, rounded, moderately large and shallow punctures, and between each pair of rows a similar row with smaller punctures.

Length of body 6^{mm}, of elytra 4.55^{mm}, of eyes 0.5^{mm}.

CURCULIONIDÆ.

Sitones grandævus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 83-84.—A single specimen, found by Mr. Richardson.

Hylobius provectus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 86.—A single specimen was found by Mr. Richardson. Another specimen (No. 4051), taken by Mr. Bowditch at the same locality, shows the character of the rostrum. The specimen is strangely preserved, as there appears to be a second rostrum, a perfect counterpart of the first, attached to it at the tip; perhaps this belongs to another individual, of which the rostrum only is preserved. The rostrum is about as long as the thorax, scarcely tapering as viewed laterally, gently curved, with a median, lateral, longitudinal groove, directed toward the middle of the eye, just as in *H. confusus* Kirb., besides the antennal scrobes, which are directed obliquely toward its base.

Gymnetron LeContei.—A single well-preserved specimen, with its reverse (Nos. 4030, 4047), lies in such a position as to show a partly lateral and partly dorsal view; the legs are also preserved, so that it is the most perfect of the Green River *Coleoptera*. The small head, long and slender, straight, and drooping snout, the tapering thorax, broad and short striate elytra, thickened femora, and long and slender tibiæ leave little doubt that it should be referred to *Gymnetron* or to its immediate vicinity. It is very nearly as large as *G. teter* Schönh., with which it closely agrees in almost every part. The third tarsal joint is similarly expanded. The real length of the rostrum cannot be determined from the position of the insect, but it is apparently as long as the head and thorax together, is very nearly straight, slender, scarcely enlarged, and obliquely docked at the tip; only a portion of the antennal scrobes can be seen; this is in the middle of the beak, where the groove is narrow, deep, sharply defined, and inclined slightly downward toward the base of the beak. The thorax is subrugulose, and the surface of the elytra smooth, with distinct, but not deeply impressed, very faintly punctured striæ. The whole specimen is piceous.

Length of body 3.15^{mm}, of snout 1^{mm}?, of head and thorax 0.9^{mm}, of thorax 0.75^{mm}, of elytra 2.25^{mm}, of hind tibiæ 1.5^{mm}; distance apart of elytral striæ 0.1^{mm}.

Cryptorhynchus annosus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 86-87.—A single specimen, found by Mr. Richardson.

SCOLYTIDÆ.

Dryocætes impressus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 83 (*Trypodendron*).—Mr. Richardson obtained a single specimen, upon

which the original description was based. Several additional specimens (Nos. 4009, 4048, 4091) were obtained by Mr. Bowditch and myself, and these help to show that the insect would better be referred to *Dryocætes* than to *Trypodendron* (= *Xyloterus* of LeConte's recent monograph). The species is of about the size of *D. septentrionalis* (Mann.), but has more of the markings of *D. affaber* (Mann.), although the punctuation of the elytra is not so distinctly separable into longitudinal series.

Dryocætes carbonarius.—Another species, not very closely allied to the last, is represented by a single, rather mutilated specimen (No. 3999), which is pitchy-black, and consists of part of the head, thorax, and elytra. The head is rather long, faintly and not very closely punctured, the eye moderately large and circular. The thorax is proportionally longer than in the preceding species; the front margin recedes a little on the sides, and the surface is subrugose by subconfluent punctures, the walls of which form wavy ridges having a longitudinal direction. The elytra are broken at the tip; their outer anterior angle is obliquely excised, and the outer margin behind it straight, not sinuate, as in the preceding species; the surface is rather coarsely, but very faintly granulate, more distinctly next the base, but even here very vaguely; and there are faint indications of three or four distant, simple, longitudinal striæ.

Length of the fragment as curved 4^{mm} , of head 1.1^{mm} ?, of thorax 1.3^{mm} ; probable length of elytra 3.15^{mm} ; width of same 1.5^{mm} ; diameter of eye 0.35^{mm} .

ANTHRIBIDÆ.

Cratoparis repertus.—A single specimen (No. 4035) shows the fragment of an elytron, which is referred to this genus from the character of the punctuation and the arrangement of the striæ. It closely resembles *C. lunatus* Fahr. in these points, but must have belonged to a slenderer insect, about as large as *C. lugubris* Fahr. There are eleven striæ or rows of pretty large, subconfluent, short, longitudinal dashes or oval punctures, deeply impressed, the outer of which follows the extreme margin, excepting apically; the inner stria also runs very near the border; the interspaces between the first and second and between the second and third striæ are equal, and a little broader than the interspaces between the other striæ; the inner margin is delicately grooved next the base, as in *C. confusus*.

Length of fragment 4.3^{mm} ; width of elytra 1.6^{mm} ; width of interspace between second and third striæ 0.21^{mm} , between third and fourth striæ 0.13^{mm} .

Cratoparis? elusus.—To this I refer doubtfully two specimens (Nos. 4012, 4060), neither of them very perfect, which appear to belong together, and to represent an insect allied at least to *Cratoparis*, and of about the size of *C. lunatus* Fahr. It appears to have a short rostrum,

a moderately small, but rather tumid head, with circular eyes; thorax not greatly attenuated anteriorly, but profusely punctate, with moderately large and rather shallow punctures; elytra arched, nearly three times longer than the thorax when measured over the curved back, furnished with slight and faintly impunctured striæ; the surface between the striæ also punctured, but very faintly.

Length of body 7.5^{mm}, of thorax 2.25^{mm}, of elytra 5.5^{mm}.

Brachytarsus pristinus Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. ii, 87.—A single specimen, obtained by Mr. Richardson.

HEMIPTERA.

(HETEROPTERA.)

PENTATOMIDÆ.

(CYDNINA.)

Cyrtomenus concinnus.—This species is represented by a single specimen (No. 4190), a little smaller than *C. mutabilis* (Perty), but closely resembling it in general form. It is broadly ovate; the head large, prominent, well rounded, nearly half the eyes protruding beyond the margin, the ocelli nearly one-fourth the diameter of the eyes, and situated next the hind border, very nearly half-way between the inner margin of the eyes and the middle line of the head. Thorax twice as broad as the head, exclusive of the projecting part of the eye, more than twice as broad as long, the front margin rather deeply and regularly concave, the sides considerably convex, especially on the front half, the hind margin very broadly convex. Scutellum longer than the thorax, scarcely less tapering on the apical than on the basal half, the apex rounded, half as broad as the base, the whole about as long as the breadth at base. Tegmina very faint, but the corium apparently terminating just before the tip of the scutellum. Extremity of the abdomen very broadly rounded. The whole surface of the head, thorax, scutellum, and probably of the corium, uniformly very profusely and minutely punctulate; otherwise smooth, excepting that there are also faint traces of a slight, transverse, median depression, and a similar longitudinal median depression on the thorax.

Length of body 5.25^{mm}, of head 1.2^{mm}, of thorax 1.3^{mm}, of scutellum 1.65^{mm}; breadth of head 2^{mm}, of thorax 3.5^{mm}; diameter of eye 0.25^{mm}.

Aethus punctulatus.—Five specimens of this species were found (Nos. 19^d, 67^c, 74^a, 172, and 4193). Body of nearly equal breadth throughout, the sides of the abdomen a little fuller. Head rounded, small, the part behind the eyes rounded, as deep as the portion in front of them; front, as seen from above, well rounded, well advanced, subangulate; eyes moderately large; ocelli large, situated close to, a little behind, and within the eyes, and about one-third their diam-

eter; surface of head minutely and obscurely granulate. Thorax nearly equal, slightly broadening posteriorly, the anterior angles well rounded, the front border very deeply and roundly excised, the hind border nearly straight; the whole fully twice as broad as the head, and twice as broad as long. Scutellum obscure, but apparently of about equal length and breadth, and regularly triangular. Abdomen well rounded, half as long again as broad. Tegmina obscure or lost in all the specimens seen. Thorax and scutellum minutely granulate, like the head. Posterior half, at least, of the abdomen profusely covered with shallow punctures.

Length of body 3.75^{mm} , of head 0.6^{mm} , of middle of thorax 0.75^{mm} ; breadth of head 0.8^{mm} , of thorax 1.8^{mm} , of abdomen 2.25^{mm} .

Cydnus? mamillanus.—An obscure specimen (No. 39) is of doubtful generic relations, but evidently belongs to the *Cydnidæ*. The body is broad and convex in front, with a rapidly tapering abdomen, scarcely at all rounded, even at the tip. The head, as seen from above, is nearly circular, shaped much as in *Aethus punctulatus*, but more broadly and regularly rounded in front, with the central lobe broad, and defined by rather strongly impressed furrows; the ocelli are large, situated just behind the anterior extension of the thoracic lobes; the surface of the head is rugulose. Thorax more than twice as broad as the head, and more than half as long again; the sides rounded, being broadest at the posterior border, narrowing in front and roundly excised at the anterior angles; front border very deeply hollowed behind the head, leaving prominent front lobes on either side, nearly as large as the head, and strongly mamillate; hind border nearly straight. The surface is minutely granulate; besides which there is a transverse belt of rather large and distant punctures midway between the mamillations and the hind border. The scutellum is very large, rounded-triangular, broader than long, and granulate like the thorax. Corium of tegmina, which occupies their greater portion, obscurely and distantly punctulate; abdomen triangular, the apex bluntly pointed.

Length of body 4^{mm} , of head 0.8^{mm} , of either lateral half of thorax 1.35^{mm} ; breadth of head, 1^{mm} , of thorax, 2.4^{mm} .

LYGÆIDÆ.

(MYODOCHINA.)

Rhyparochromus? terreus.—A single poor specimen (No. 4192) apparently belongs to this subfamily, but is too imperfect to locate with any precision. The body is of nearly equal width, but with a full abdomen. The head is broken, but is as broad at base as the tip of the thorax, has a rounded-angular front, and its surface most minutely punctulate. The thorax was broadest behind, the sides tapering slightly, and gently convex, the front border broadly and shallowly concave, the hind border straight, more than twice as broad as the median length, the surface,

like that of the head, with faint distant punctures. Scutellum rather small, triangular, pointed, of equal length and breadth, about as long as the thorax, its surface like that of the thorax, but with more distinct punctures. Abdomen full, well rounded, and very regular. Tegmina obscure (but perhaps extending only a little beyond the scutellum).

Length of body 4^{mm}, of head 0.6^{mm}, of thorax 0.6^{mm}, of scutellum 0.7^{mm}; breadth of head 1.1^{mm}, of thorax 1.5^{mm}, of abdomen 2.1^{mm}.

REDUVIIDÆ.

(REDUVIINA.)

Reduvius? guttatus.—Two specimens of this species have been found, one with reverses (No. 9^a, 96^b), by Mr. Richardson, the other (No. 4070) by myself. Mr. Richardson's specimens are very obscure and distorted, and without the aid of the other could not have been determined. The insect probably belongs to the genus *Reduvius* (*sens. str.*), or at all events falls in its immediate vicinity. The body has much the form of the common *R. personatus* Linn., of Europe, but is proportionally shorter. All parts are rather obscure, but the head evidently tapers and is roundly pointed in front, the thorax narrows gently from behind forward and is nearly as long as broad; the scutellum is rather small, triangular, the apex bent at a right angle and rounded. The abdomen is ovate, twice as long as broad. The species is marked with round, dark spots, about 0.2^{mm} in diameter, on either side, one at the outer edge of the front of each abdominal segment, and one in the middle of either transverse half of the thorax, a little removed from the outer border; the anterior ones half-way between the border and the middle line. The whole surface appears to be very minutely granulated. The tegmina cannot be seen.

Length of body 5.5^{mm}; breadth of thorax 1.4^{mm}, of abdomen 1.65^{mm}.

[HOMOPTERA.]

JASSIDÆ.

Acocephalus Adæ.—Two specimens (Nos. 72, 100) represent the body of apparently a species of *Acocephalus*. The head projects forward in a triangular form, is rounded at the extreme apex, a little broader than long, and nearly twice as broad between the small eyes as its length in advance of them. The body is slender, the abdomen slightly tapering, rounded at the apex. The tegmina extend a short distance beyond the body with parallel longitudinal veins.

Length of body 5.25^{mm}; breadth of head 1.4^{mm}, of middle of abdomen 1.3^{mm}.

FULGORIDÆ.

(FULGORIDA.)

Fulgora? granulosa.—A single specimen and its reverse (Nos. 49, 131) show only the thorax and abdomen of an insect belonging to the sub-

family of *Fulgorida*, but of which little more can be said. The thorax is large, globose, and black; the scutellum is about half as large as the thorax, longer than broad, and rounded at the apex; the abdomen tapers gently, its apex about half as broad as its base, and is provided with a pair of overlapping, black, roundish, oval plates, giving the appearance of an additional segment. The surface of the thorax and abdomen is thickly and uniformly granulate with circular, dark-edged elevations, averaging 0.04^{mm} in diameter; the scutellum lacks this marking, excepting at the edges, which are more minutely and profusely granulate.

Length of body 8.5^{mm} , of thorax 2.75^{mm} , of scutellum 1.4^{mm} , of appendages 1^{mm} ; breadth of thorax 2.5^{mm} , of scutellum 1.25^{mm} , of second segment of abdomen 2.2^{mm} .

Aphana rotundipennis.—This name is proposed for a single broken wing of an Homopteron (No. 175), with which another wing (No. 4187), still more imperfect, appears to agree; and which seem by their obscure venation to belong in the same group as the White River fossil which I have called *Aphana atava*. It differs, however, in having a strongly bowed costa, which is curved more apically than near the base, and continues very regularly the curve of the well-rounded apex; the commissural border is perfectly straight; the principal veins fork near the base, so that there are a number of longitudinal veins a short distance therefrom; no transverse veins are discernible, nor oblique veins at the costal margin, but the longitudinal veins all fork at a similar distance from the apex, so that the apical fifth of the wing is filled with still more numerous longitudinal veins; the tegmina are broadest just beyond the middle.

Length of tegmina 6.75^{mm} ; breadth of same 3^{mm} .

Lystra? Richardsoni.—I have before me a number of specimens (Nos. 67, 119, 4076, 4207, 4208, 4212, 4217) of a large Fulgorid, apparently belonging near *Lystra* and *Pæocera*, but which have only been preserved in a fragmentary condition. Enough, however, remains to show several features; the vertex between the eyes is half as broad again as the eyes, and at least as long as broad, projecting beyond the eyes by more than the diameter of the latter, and well rounded. The scutellum is large, fully as long as broad. The longitudinal veins of the tegmina are rather infrequent, forking rarely, and even toward the apex seldom connected by cross-veins; apparently, all the principal veins branch at about the same points, viz, near the middle of the basal and of the apical half; the tegmina somewhat surpass the abdomen. The body is broadest at the second or the third abdominal segment, and tapers rapidly to a point, the segments being equal in length.

Length of body 16^{mm} ; probable length of tegmina 15.5^{mm} ; breadth of abdomen 5.5^{mm} .

(CIXIINA.)

Cixius? hesperidum.—A single fragment (No. 38), representing a nearly perfect tegmen, with obscure venation, is probably to be referred to *Cix-*

ius, but is unsatisfactory; the costal border is gently and regularly convex, the tip well rounded, with no projecting apex; the tegmen appears to increase very slightly in size to a little beyond the middle, up to which point the borders are nearly parallel; the course and branching of the nervures, so far as they can be made out, seem to indicate an insect allied to *Cixius*, but no cross-veins can be seen.

Length of tegmen 6.2^{mm}; its greatest breadth 2.5^{mm}.

Mnemosyne terrentula.—A single specimen (No. 31^d) is preserved, with an indistinct body, broken in front, and the greater part of one of the tegmina, which show it to be very closely related to, if not a member of, this genus. The body is moderately broad, ovate, the tip of the abdomen rounded and slightly produced. The tegmina are regularly enlarged toward the apex and rounded at the extremity, not at all truncate; the interior branch of the radial vein forks near the middle of the wing, and just beyond the first subapical transverse vein; both its branches fork before they have passed more than half-way to the marginal row of elongate cells.

Estimated length of body 6.5^{mm}, breadth of same 2.25^{mm}; length of tegmina 7^{mm}, breadth of same 2.25^{mm}, their extent beyond the abdomen 2.2^{mm}.

(TROPIDUCHIDA.)

Lithopsis (λίθος, ὄψις), nov. gen.

Body oblong, stout, and apparently cylindrical anteriorly, tapering and probably compressed posteriorly. Head broad and short, the front not produced beyond the eyes, broad, transverse, very gently convex. The united thorax and scutellum of about equal length and breadth. Tegmina surpassing considerably the tip of the abdomen, two or three times as long as broad, beyond the middle barely tapering, the sides subequal, the tip obliquely subtruncate, the apex rounded, the costal margin gently convex; margino-costal area broad, broadening regularly toward the apex, and throughout its length traversed by very frequent transverse veinlets, which become more and more oblique toward the apex of the tegmina, where they are supplanted by the similarly close branches of the longitudinal veins; these are united at the origin of the forks by transverse veins in continuity with the costa itself. The radial vein is branched at the base of the tegmina, the inner ulnar vein at some distance before the middle of the wing; and both branches of this vein, and the lower branch of the radial, fork again at half the distance from the first fork of the inner ulnar vein to the tip of the wing, but they are not connected at this point by transverse veins. Wings as long as the tegmina.

This genus seems to belong nearest the South American genus *Alcestis* Stål, but differs decidedly from it in the form of the tegmina, the absence of oblique inferior ramuli to the inner ulnar vein, and the structure of the head.

Lithopsis fimbriata.—A tolerably well-preserved specimen, with its reverse (Nos. 4185, 4189), together with the fragment of a wing (No. 143^c), are the basis for this species. The vertex between the eyes is more than twice the width of the eyes, and is marked by a slight, median, longitudinal carina; the front of the vertex is nearly straight, does not protrude beyond the eyes, but is retracted next them, making it very broadly convex. The thorax is considerably broader than the head, but the condition of the specimens does not allow a more definite statement. The tegmina are the best-preserved remains of the animal, being perfect, although somewhat obscure, partly from the veins of the underlying wings; they are more than two and a half times longer than broad, the costal margin, especially its basal half, moderately curved, the commissural margin almost perfectly straight, the apex slightly and obliquely truncate, so as to throw its well-rounded apex below the middle; near its extremity the margino-costal field occupies more than a third of the breadth of the tegmina, being double its width near the base; the first branching of the inner ulnar vein is as far from the apex of the tegmina as the second branching is from the base; and the third branching, where, and where only, the longitudinal veins are united by cross-nervures, is midway between the second branching and the apex; close to the apical margin there is an inconspicuous fourth series of furcations.

Length of body 9^{mm}, of tegmina 9.75^{mm}; breadth of the same in the middle 3.65^{mm}, next the third branching of the longitudinal veins 3.25^{mm}.

ORTHOPTERA.

GRYLLIDES.

Nemobius tertiarius.—Two specimens (Nos. 18, 20) represent the hind femora (and No. 18 also the hind tibia and a femur and tibia of the front leg) of a small cricket. The insect must have been rather smaller than our common *N. vittatus* (Harr.), its hind femur being 7^{mm} long, broad and stout, especially near the base, where it measures 2.1^{mm}; its upper half is covered with exceedingly delicate, recumbent hairs, directed backward; there are also a few hairs upon the slender hind tibia, which is broken just where it begins to enlarge, showing signs of the upper spines; this portion is about three-fourths the length of the femur. The front femur and tibia, which are each only 2.25^{mm} long, also indicate a small species and one that is unusually free from spines, no hairs even being discernible on this front leg.

LOCUSTARIÆ.

The only other remains of *Orthoptera* noticed in the Green River shales is a tibia and fragment of the attached femur (No. 2) of what is apparently the middle leg of a Locustarian about the size of a *Phylloptera*.

NEUROPTERA.

ODONATA.

(LIBELLULINA.)

Fragments of an abdomen in obverse and reverse (Nos. 4175, 4176) are probably to be referred to a species of *Libellulina*, but they are insufficient to give further determination. They evidently represent four or five of the terminal segments of the body, there being first three segments of equal breadth and a similar length, a little longer than broad, with a slight median carina; and then three others without a median carina and with continually decreasing length, the first of them (probably the eighth segment) half as long as the preceding, but of the same width; the next half as long as the one which precedes it, but narrower, and the last still narrower (but imperfect).

Length of the fragment 20^{mm}, of its third (seventh? abdominal) segment 4.5^{mm}; breadth of same 3.5.

(AGRIONINA.)

Dysagrion Fredericii Scudd., Bull. U. S. Geol. and Geogr. Surv. Terr. 4, 534-537.—This has already been sufficiently mentioned in the paper cited.

Podagrion abortivum.—A second species of *Agrionina*, at first sight very different from the preceding, proves to belong to the same legion (*Podagrion*); and, so far as its meagre representation by the specimen (No. 4169) goes, to the genus *Podagrion* proper, agreeing with it in the character of the pterostigma and the supplementary sectors. The specimen represents the apical part of a wing with fragments of the middle portion. The pterostigma is a little more than twice as long as broad, and although less oblique on the inner than on the outer side, yet lies at an angle of forty-five degrees with the costal edge, and is therefore more oblique than usual in *Podagrion*; its outer side is arcuate as well as very oblique, but in its entire extent the pterostigma scarcely surmounts two cellules; the outer side is much thicker than the inner, and thickens below as it passes gradually into the lower border, which, like the costal, is much thickened, and appears the more so from being independent of, although in conjunction with, the median nervure. Beyond the pterostigma, the ultranodal approaches the principal nervure very closely, so that they are only half as far apart at the margin as below the pterostigma; there are two supplementary sectors, one between the ultranodal and the nodal, arising below the outer half of the pterostigma, the other between the nodal and subnodal, arising slightly further back; both of these supplementary sectors are straight, but the nodal is slightly undulated after the origin of the supplementary sectors; all the other veins,

excepting the extreme tip of the principal, are straight, and the reticulation tetragonal. The wing appears to be hyaline throughout, the pterostigma very slightly infumated, the nervures fusco-castaneous, those about the pterostigma deepening nearly to black. Apically the wing is well rounded, its apex falling in the middle and not at all produced. A species is indicated of about the size of *P. macropus* Sel.

Length of pterostigma along costal edge 1.5^{mm} , of same from inner lower angle to outer upper angle 2.1^{mm} ; breadth of pterostigma 0.65^{mm} , of wing in middle of apical half 5.5^{mm} .

ARACHNIDA.

Nos. 3, 4^a, 4199, 4200, represent legs of the same or allied species of spider of about the size of *Epeira riparia* Hentz; femora and tibiæ and the sides of the tarsi are abundantly supplied with longitudinal rows of fine, long, black spines, the claw double. No. 36 preserves the spines alone of the same sort of leg.

Length of femora 7^{mm} , of tibiæ 7.75^{mm} , of tarsi 3.25 , of claw 0.3^{mm} , of spines 0.75^{mm} .

No. 63 shows the hairy, subfusiform, ovate body of a spider apparently a little smaller than the above.

Length of abdomen 4.5^{mm} ; breadth of same 1.8^{mm} .

No. 4201 is the egg-cocoon of a spider, and is of exactly the same size, shape, and general appearance as those from British Columbia, which I have described under the name of *Aranea columbiæ*, excepting that, from a break in the stone, there is no trace of a pedicel.

Length of egg-cocoon 5^{mm} ; breadth 4^{mm} .

MYRIAPODA.

Iulus telluster.—A single Myriapod (No. 154^a) found by Mr. Richardson in the Green River bed is so fragmentary that it can only be referred to *Iulus* in a broad generic sense. The piece is composed of ten or twelve segments, probably from near the middle of the body, lying in a straight line and crushed, with no trace of any appendages. The segments appear to be composed of a short anterior and a larger posterior division, each independently and very slightly arched; the posterior division is about twice as long as the anterior, and each is transversely regularly and very finely striate parallel to the anterior and posterior margins of the segments. The foramina can be detected on some of the segments, and by their aid the width of the body can be more accurately determined. As crushed, the body is 2.3^{mm} broad, but its probable true width is 1.5^{mm} , while the segments are each about 0.8^{mm} long; the fragment preserved measures 8.5^{mm} long.

ART. XXXVII.—SYNONYMATIC LIST OF THE AMERICAN SCIURI,
OR ARBOREAL SQUIRRELS.

BY J. A. ALLEN.

Since the publication last year of my revision of the American *Sciuri*,* the "Neotropical" species of the group have been ably reviewed by Mr. E. R. Alston,† under unusually favorable circumstances. With his accustomed thoroughness, he has taken the trouble to seek out the types, so far as they are extant or accessible in several of the principal museums of Europe, of most of the species of former authors, and has thus been able to determine the character of many species so inadequately described, that in no other way could their proper allocation be satisfactorily determined. His careful elucidation of this obscure and perplexing group has not only placed his fellow-workers in the same field under lasting obligations to him, but must mark an era in the history of the subject. Of the fifty-nine nominal species of this group described by different authors, he informs us that he has examined the types of no less than forty-one! With the rich material of the British Museum at his command, he has been able to tell us exactly what the late Dr. Gray had for the basis of his *nineteen* "new species", described in a single paper in 1867, some of them so vaguely or inaccurately that the descriptions are sometimes misleading, and often inadequate indices of what he actually had before him. Mr. Alston has also been able to allocate the species described previously by the same author, and by Richardson, Bennett, Ogilby, and other British writers. In the Paris Museum, he found still extant the types of most of the species described many years since by Is. Geoffroy, Lesson, F. Cuvier, and Pucheran, and in the Berlin Museum types of the species described by Dr. Peters; so that the only important ones not seen by him are those of Brandt, Wagner, and Natterer. To assist him in collating my own work, I had the pleasure of sending him examples of the greater part of the species recognized by me in my recent monograph of the American *Sciuridae*. As I had not access to the types of the species described by foreign authors, I made, in some instances, my allocations of synonymy with doubt, and, in other cases, only provisionally, feeling conscious of the uncertainty with which refer-

* Coues and Allen's "Monographs of North American Rodentia", pp. 666-797, August, 1877.

† "On the Squirrels of the Neotropical Region", Proc. Zoöl. Soc. Lond. 1878, pp. 656-670, pl. xli. This highly important memoir gives excellent diagnoses of the species, with their synonymy in full, and a critical commentary on the species of previous authors.