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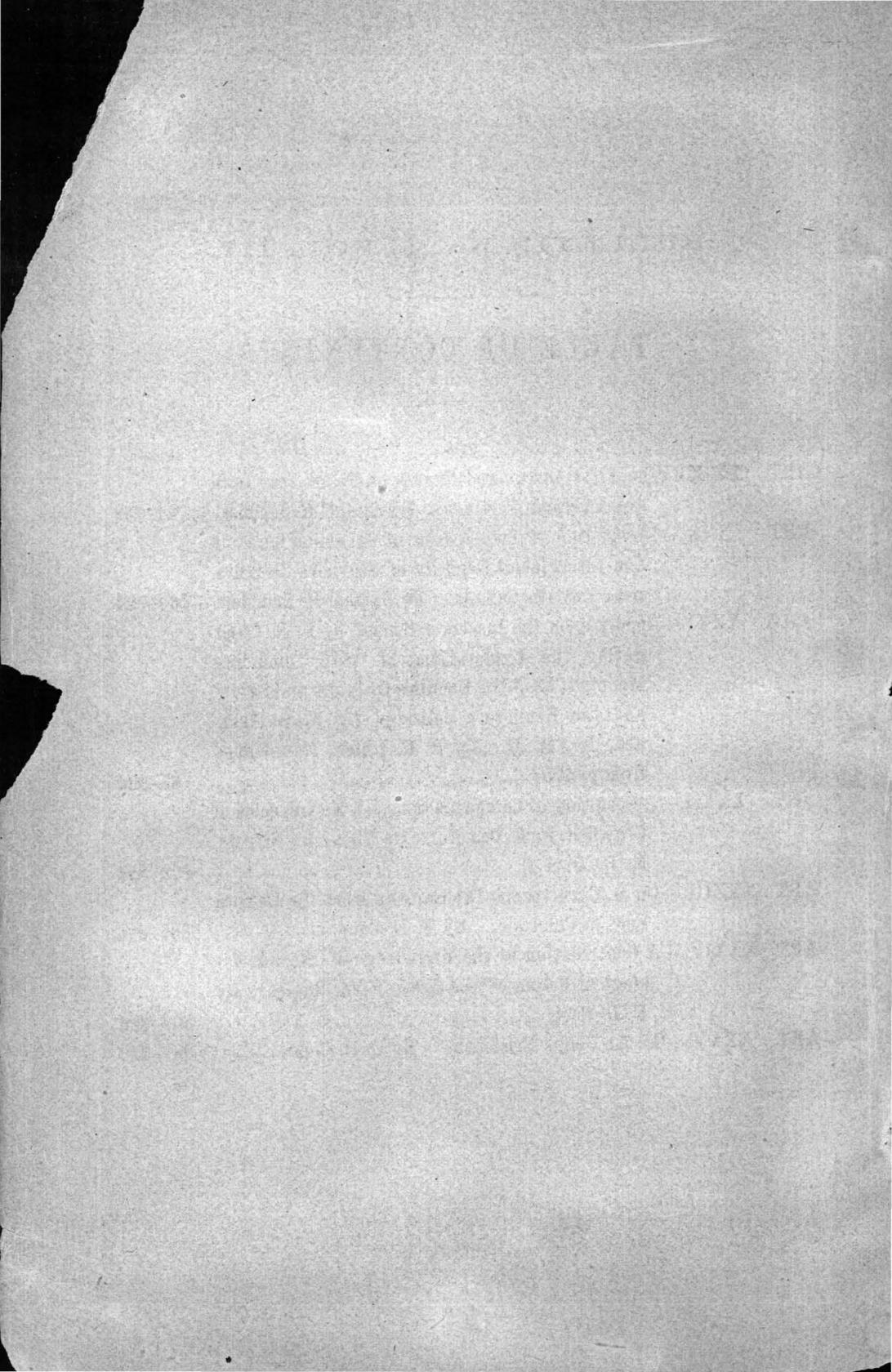
GEOLOGICAL AND GEOGRAPHICAL SURVEY

OF

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ART. XXIX.—THE FIRST DISCOVERED TRACES OF FOSSIL INSECTS IN THE AMERICAN TERTIARIES.

BY SAMUEL H. SCUDDER.

Ten years have elapsed since I published the first results of a small collection of insects, found by Prof. William Denton in the Tertiary beds of White River.* With the possible exception of four insects, described in 1868 by Dr. Oswald Heer, from the Miocene of North Greenland,† they are the first insects found in the Tertiary strata of America. Since that time, many others have been found and a few described, but they have not lessened the interest with which these should be regarded. In the earlier volumes of this publication, the *Coleoptera* and *Physopoda* of Mr. Denton's collection have already been described,‡ and in this place we offer descriptions of the remainder, all of which will be fully illustrated in a general work on the fossil insects of the American Tertiaries, to be published by the Survey.

Some obscurity attaching to the precise locations at which the specimens were obtained, it may be well to remark that, since the issue by this Survey of the new drainage map of Colorado, it is possible to indicate them with better accuracy. Both localities are on the Lower White River; the lower, "Fossil Cañon", so near the mouth that, from the plateau above the cañon, one may see the valley of the Green River; this locality is, therefore, in Utah. The other locality, "Chagrin Valley", is about 60 miles farther up the river, and, therefore, is doubtless in Colorado. The former is on the northern, the latter on the southern side of the river. The larger part of the collection is from the upper locality.

Concerning the collection as a whole, there is little to add to what I have stated on former occasions. One or two corrections may, however, be made. There are no *Lepidoptera* in the collection (nor have I yet seen any from America), the supposed Noctuid proving to be one of the *Syrphidae*, badly preserved, and the possible Slug-caterpillar, a Dipterous larva; the "*Myrmica*" proves to be one of the *Formicidae*. There are also no *Orthoptera* in the collection. A more careful study shows that a single probable exception, *Dicranomyia stigmosa*, must be made to my former statement, that the insects of one locality are completely distinct from

* See Proc. Bost. Soc. Nat. Hist. x, 305-306, xi, 117-18; Amer. Nat. i, 56, vi, 665-68; Geol. Mag. v, 220-22.—Hollister, The Mines of Colorado, 378-387.

† Flora Fossilis Arctica, 129-130.

‡ See Bulletin, vol. i, 2d series, 221-223, vol. ii, 77-87.

those of the other. It is possible that better specimens may prove that the individuals from the two localities, which have here been combined, belong to distinct forms; but, at present, we see no valid reason for their separation.

Besides the insects mentioned under the families, but not referred to genera, the collection contains forty-six species. Of these, the *Diptera* claim twenty-five, or more than one-half. The proportion in specimens is still greater, since the species belonging to the other suborders are rarely represented by more than a single specimen. Nine different families of *Diptera* occur, six of them with more than one representative; and of these, so far as the perfect forms are concerned, the *Tipulidæ* and *Mycetophilidæ* are richest, including several genera which must be considered as new. It will be remarked that, while *Tipulidæ* are more abundant in this collection than any other family of insects, they are entirely absent from the collection made by Mr. George M. Dawson in the Tertiary beds at Quesnel, British Columbia,* while the latter collection contains more *Mycetophilidæ*, the next family, than Mr. Denton's.

The writer is greatly indebted to Professor Denton for permission to retain the collection for so long a period. Where no habitat for a species is mentioned, it is uncertain from which of the two localities it was taken.

HYMENOPTERA.

Family FORMICIDÆ.

Camponotus vetus.—A single specimen, very fairly preserved, lying upon the side; a remnant of one wing is left, and a faint indication of the antennæ, but the legs are wanting. The head has a flat summit, the upper half of the sides roundly protuberant, the lower half rather broad, and tapering but little; the thorax is long and moderately slender, compacted into a single mass, with a low arch, more than twice as long as high. The first segment of the abdomen increases rapidly in size posteriorly, and has a rounded knob above at its hinder end; the abdomen is long and slender, composed of five joints, the second the largest, gradually tapering to the pointed tip. It seems to agree better with *Camponotus* than with any other genus, but has a differently shaped head and first abdominal joint, and is smaller than the species of that genus, so that it is only placed here provisionally until other and better specimens are obtained. Length of body 3.75^{mm}; of thorax 1.15^{mm}; of abdomen 2^{mm}.

Liometopum pingue.—The single specimen representing this species is a male, as the number of abdominal segments show; but the wings are wanting. The insect is viewed from above. The head and thorax are slightly darker than the abdomen, but otherwise the whole body is uniformly fuscous, somewhat darker than the stone. The head is very small, subquadrate, slightly broader behind, and the posterior angles

* See my paper in the Report of Progress, 1875-76, Geol. Surv. Canada.

nearly rectangular; the anterior margin of the head is broadly and pretty regularly rounded, and the whole head is of about equal length and breadth. The thorax is very regularly ovate, broadest next the insertion of the front wings (traces of the origin of which can be seen), nearly twice as long as broad, rapidly tapering on the metathorax. The peduncle, as seen from above, is square, half as broad as the head, the hinder edge showing by its thickening that it was probably elevated at this point. The abdomen is plump, rounded ovate, scarcely less rounded posteriorly than in front, only one quarter longer than broad, broader than the thorax, composed of six segments, of which the first, third, and fourth are about equal in length, and the second half as long again. Length of whole body 7.5^{mm}; of thorax 3^{mm}; breadth of same 1.8^{mm}; of peduncle 0.9^{mm}; of abdomen 2.3^{mm}; length of hind femora 4.3^{mm}; breadth of same 0.36^{mm}. Fossil Cañon.

On account of the smallness of the head, I venture to place this insect in the genus *Liometopum*. It has the aspect of a *Hypoclinea*, but the head is only half as broad as the thorax.

Family ICHNEUMONIDÆ.

Ichneumon petrinus.—A fragmentary specimen, preserved on a dorsal aspect; parts of the front wings, the thorax, and basal half of the abdomen are preserved. The body is blackish and the wing-veins testaceous; the wing, excepting the fusco-testaceous stigma, is hyaline, covered sparsely with very delicate and moderately long hairs; the stigma is long and slender, the heavier main portion about two and a half times longer than broad, the slender basal extension as long again. Unfortunately, the wing is preserved only so far as, but not including, the areola, so that many characteristic parts are wanting; the second median and first subcostal cells are united, the vein separating them being present only below, where it is directed parallel to the principal longitudinal veins; the vein from which it springs is bent at an angle of about 70°, so that the part representing the first subcostal cell tapers rather rapidly in its apical half, while its basal half (if the cross-vein were continued) would be of the same size and shape as the second median cell or a parallelogram nearly twice as long as broad; the vein separating the first and second median cells is continued in a nearly direct line below; the third median cell is long and rather slender, with somewhat produced angles basally. The first segment of the depressed abdomen is fully half as long again as broad, increases a little and regularly in size toward the extremity, at its base is about half as broad as the extremity of the thorax, and at its tip less than half as broad as the broadest part of the thorax; the second segment is considerably larger, and also enlarges apically, but its length is indeterminate. Length of thorax 2.6^{mm}; breadth of same 1.5^{mm}; length of wing to tip of stigma 4.25^{mm}; breadth of base of abdomen 0.5^{mm}. Chagrin Valley.

DIPTERA.

Family CULICIDÆ.

Culex proavitus.—A poorly preserved specimen, in which only fragments of the legs can be seen, and the wings are so crumpled and folded as to prevent tracing the neuration. What can be seen resembles the neuration of the *Culicidæ*, and the veins and borders are heavily fringed with long hairs. The body is slender and the insect minute; the proboscis is about as long as the head and thorax combined, and the last joint of the equally long palpi is cuneate, the base rounded. Length of body 2.2^{mm}; of proboscis 0.9^{mm}. Fossil Cañon.

Corethra exita.—A specimen, viewed from above, with expanded wings, and destitute of legs, palpi, and all but the basal joints of the antennæ. The broad head, stout basal joint of antennæ, general form and size, with such of the neuration of one wing as can be determined, indicate the genus; seven of the abdominal segments are very clearly marked, and the specimen appears to be a male. The body is slender; the head, thorax, and abdomen of equal width; the wings slender and of about equal length with the body. The fourth longitudinal vein runs in a nearly straight line over the basal half of its course, but is gently arched beyond; the fifth originates from the fourth in the middle of its straight portion, runs nearly parallel with it so long as it continues straight, and afterward diverges considerably; the first longitudinal vein appears to run to the tip of the wing. Length of body 4.25^{mm}; of wing 4.25^{mm}; breadth of latter 0.8^{mm}. Chagrin Valley.

Family CHIRONOMIDÆ.

Chironomus depletus.—A single mutilated specimen of this insect remains, and is doubtfully referred to *Chironomus*. The thorax is moderately robust, and the abdomen rather plump for a *Chironomus*. The antennæ are broken, and only the costal border of one of the fore wings can be seen; this shows that the second longitudinal vein terminates in the middle of the apical, and the first longitudinal apparently in the middle of the basal, half of the wing. The legs are moderately long, slender, the tibiæ finely spined, the spines arranged on the middle legs in a somewhat verticillate manner, and terminating with two or three long spurs; the femora are rather short, the tibiæ considerably longer, but not so long as the tarsi. Length of body 3^{mm}; of wing 2.3^{mm}; of fore femora 0.68^{mm}; of fore tibiæ 0.6^{mm}; of fore tarsi 1^{mm}; of middle tibiæ 1^{mm}; of middle tarsi 1.25^{mm}. Chagrin Valley.

Chironomus patens.—A single specimen, very well preserved, represents a species which is provisionally referred to *Chironomus*. Nearly all the parts are present, and the neuration of one of the wings is nearly perfect, showing the structure of *Chironomidæ*, but differing apparently from any genus yet characterized. The antennæ are parted and bent, but apparently perfect; they seem to be fifteen-jointed, the joints square,

the apical no larger than the others, and all apparently furnished (as indicated at one point only) with a fringe of profuse, exceedingly delicate hairs, as long as the joints. The body is slender and the wings three times as long as broad; the costal vein runs only to the tip of the wing, and the margin beyond it is very faint; the first longitudinal vein runs uninterruptedly to the middle of the apical fourth of the wing; the second longitudinal nearly to the tip; the third longitudinal vein takes its rise from the second in the middle of the basal half of the wing, and parts widely from the second, leaving an unusual space devoid of neuration next the apex of the wing; the fourth arises from the third rather abruptly a little beyond its base, and has close beneath it the remnant of a vein or a fold in the wing; the next vein forks just beneath the origin of the fourth longitudinal vein, and leaves beneath it, next the posterior margin, a broad space without veins; the two basal cells are very short, and there appear to be no other transverse veins in the whole wing; all the veins are hirsute. The legs are long and slender, and covered with spinous hairs arranged in exact longitudinal rows, giving the legs a striped appearance under the microscope; the femora are rather short, and the tibiæ and tarsi of very unequal length, excepting on the hind legs; the tibiæ and all the joints of the tarsi are furnished apically with small spurs. Length of body 3^{mm}; antennæ 1^{mm}; wings 2.1^{mm}; fore femora 0.5(?)^{mm}; middle femora 0.6^{mm}; hind femora 0.8^{mm}; fore tibiæ 0.8^{mm}; middle tibiæ 0.9^{mm}; hind tibiæ 1.4^{mm}; fore tarsi 1.8^{mm}; middle tarsi 2.3^{mm}; hind tarsi 2.1^{mm}. Chagrin Valley.

An indeterminate species of this family, whose generic affinities cannot be discovered, from the entire absence of neuration in the wings and the loss of every other characteristic feature, presents a side view of the body with fragments of legs. The insect is minute, measuring but 2.75^{mm} long. It may possibly belong to the *Cecidomyiidae*. Chagrin Valley.

Another similar specimen, but distinct from the above, exhibits a dorsal aspect, and little besides the trunk is left. The thorax is comparatively stout, the head nearly as broad as the thorax, and the abdomen very slender and equal. The body is 3.25^{mm} long. Chagrin Valley.

A third indeterminate species probably belongs to this group, but the specimen is too indistinct to be of much value. It is a female. The antennæ are a little longer than the head; the head a little narrower than the abdomen, the latter tapering to a point. The costa of one wing is present, and the rather short and moderately stout legs of the opposite side. Length of body 1.8^{mm}; of middle femur 0.8^{mm}; of same tibiæ 0.5^{mm}. Fossil Cañon.

Family CECIDOMYIDÆ.

Lasioptera recessa.—A single specimen of a minute fly, with the antennæ perfect, the body preserved on a side view, with parts of the legs and the wings folded together over the back, raised from the body. The head is moderately large, and appears to be a little narrower than

the thorax. The antennæ show fourteen joints, without counting the basal joint, and perhaps one or two more next the base, where the antennæ are parted; the joints are submoniliform, slightly broader than long, subequal; the last joint subconical, twice as long as broad. The wings show a principal vein, which strikes the costa about the middle, and apparently another, striking the costa half-way between this and the tip, a feature which does not accord with the structure of the *Cecidomyiæ* generally; but the wing at this point is very obscure, so that the appearance may be accidental. The legs are apparently about as long as the body, and rather slender. Length of body 1.4^{mm}; of antennæ 0.6^{mm}; wings 1^{mm}.

Lithomyza (λίθος, μύζω), nov. gen.

Ocelli present. Antennæ nine-jointed, scarcely longer than the thorax, the first joint cylindrical, the remainder submoniliform, ovate, about twice as long as broad, minutely and sparsely pubescent. Wings resembling those of *Anarete* in neuration, but differing considerably in shape, being broadest beyond the middle and tapering toward the base. The first longitudinal vein extends beyond the middle of the wing; the auxiliary vein runs close beside the first longitudinal vein, but only half as far, terminating independently; the second longitudinal vein extends to the tip of the wing, curving downward in the distal part of its course; the third longitudinal vein forks as in *Anarete*, but the independent or fourth longitudinal vein beneath it in *Anarete* is absent from *Lithomyza*. The tibiæ are destitute of spurs, but furnished with a posterior row of slight recumbent spines.

Lithomyza condita.—Represented by a single specimen in an unusually perfect condition, although somewhat indistinct. The joints of the antennæ are difficult to determine, but with little doubt are nine in number; although short, they are not so abbreviated as in *Anarete*, the joints being twice as long as broad; toward the tip, they grow smaller. The legs are long and bristly. The fork of the third longitudinal vein is at the centre of the wing, and nearer the base than the extremity of the first longitudinal vein. There is a faint indication of a transverse vein between the first and second longitudinal veins, about midway between the fork of the third longitudinal vein and its separation from the second. There is also a faint and very doubtful indication of an oblique cross-vein just beyond the transverse vein mentioned, running from the first longitudinal vein to the costa. Length of body 2.7^{mm}; of antennæ 0.75^{mm}; of wings 2^{mm}; fore legs 0.7(?)^{mm}; middle legs 2^{mm}; hind legs 2.4^{mm}; hind tibiæ 0.56^{mm}; hind tarsi 1.28^{mm}. Chagrin Valley.

Family TIPULIDÆ.

Dicranomyia stigmosa.—The neuration and the presence of a stigma in a fine, nearly perfect specimen of this species indicate a form closely

allied to *D. pubipennis* O. S., but the absence of any pubescence at the tip of the wing at once distinguishes it from the recent species. At first, I supposed that it differed from other species of *Dicranomyia* in the absence of the auxiliary vein; but, after careful study, a faint trace of its apical portion was found in the same position relative to the origin of the second longitudinal vein as in *D. pubipennis*; as there, also, the first longitudinal vein curves downward to, and terminates on, the second longitudinal vein, directly opposite the cross-vein, uniting the discal cell with the third longitudinal vein, instead of on the costa; the subcostal cross-vein arises before the deflection of the first longitudinal, runs parallel with it until it curves, when it turns in the opposite direction to the costa. The discal cell is closed, but the cross-vein separating it from the second posterior cell is very faint, in which respect it agrees better with other *Dicranomyia* than with *D. pubipennis*. The stigma is confined to that part of the space between the first and second longitudinal veins which lies beyond the origin of the third longitudinal vein, but it also extends upward to the costa; it is nearly circular and faintly fuliginous. An oblique supernumerary vein runs obliquely to the centre of the stigma from a point in the first longitudinal vein directly above the origin of the third; that is, from the inner edge of the stigma. The outer and posterior margins of the wing are profusely fringed with very delicate hairs, longer than the thickness of the stout costal vein. The antennæ are fourteen-jointed, about twice as long as the head, the basal joints of the flagellum subglobular, the others obovate, the apical one more than twice as long as broad; they are delicately verticillate, the hairs being but half as long as the width of the joints. The male anal lobes are broadly obovate, deeply and abruptly excised externally at the base, so as to leave a sharp right angle outwardly and a narrow peduncle on the inner side. Together the lobes are broader than the tip of the abdomen, and each is about half as long again as broad. Length of body, including the lobes, 6.5^{mm}; antennæ 1.2^{mm}; wings 7.5; anal lobes of male 0.55^{mm}. Fossil Cañon.

A second specimen of what is apparently the same species, judging from the anal lobes, is somewhat stouter, but is destitute of all other appendages, excepting indeterminate fragments of the rostrum, so that no further knowledge of the species can be gained from it. The rostrum, however, would seem to be scarcely longer than the head. Chagrin Valley.

In another specimen, also a male, the body, one of the wings, and part of the legs of one side are preserved; the whole is much fainter than in the other specimens, but the auxiliary vein can be traced midway between the costal and first longitudinal veins throughout nearly its whole length. What is apparently the rostrum is a very little longer than the basal joint of the antennæ, and a very little shorter than the head. The character of the male appendices adds to the proof that this belongs to the same species as those previously mentioned, but the

stigma of the wing is lost by the incompleteness of the preservation. The legs are very slender and delicately hairy throughout, with no sign of spurs, although it should be remarked that the extremities of the tibiæ are not well preserved. Length of middle femora 5.25^{mm}; middle tibiæ 4.5^{mm}; hind femora 5.75^{mm}; hind tibiæ 5.5^{mm}. Chagrin Valley.

Another specimen is a female, with remnants of wings, having most of the veins scarcely traceable; enough of the right wing remains to be sure that it is this species, with which the size agrees. Fossil Cañon.

Still another is similarly preserved; but, on account of the partial folding of the wing, no stigma can be seen, and the first longitudinal vein seems to unite, or almost unite, with the second, so far from the branching of the latter, that I was at first inclined to separate it, but the difference proves to be very slight. The antennæ of this specimen are pretty well preserved, but so bent as not to allow of direct measurement; the size agrees well with other specimens, although it is slightly smaller than the second specimen mentioned, which, however, is rather larger than the average. The specimen is a female. Fossil Cañon.

A head preserved on the same stone as the last specimen probably also belongs to this species.

In the last specimen to be mentioned, we have the upper surface of an abdomen of a male *Dicranomyia*, apparently of this species, twisted so as to present a lateral view of the tip, showing the structure of the under surface of the appendices. The under inner edge is evidently thickened, and a slight hook projects a little beyond the broad lobe; as the lobe itself is preserved in a different view from what holds in the other specimens, and therefore has a slightly different contour, the specimen is judged to belong to this species only from the size of the abdomen and of its anal lobes. Chagrin Valley.

Dicranomyia primitiva.—Two specimens, a little smaller than *D. stigmosa*, but still more closely resembling *D. pubipennis*, together with a third, which is simply a body, to which is attached the costal outline of a wing, and near which lies a leg, represent the female of this species. The two first mentioned are rather faintly preserved, but permit the venation to be traced with certainty, though with difficulty, and with one of them a portion of a detached (middle or hind) leg may be seen. The neuration of the wing differs from that of *D. stigmosa* in the shape of the discal cell, the inner border of which is straight, and strikes the incomplete fifth longitudinal vein exactly where the lower cross-vein strikes it, so that the two are continuous, and produce no break of direction in the fifth longitudinal vein. The auxiliary vein is not preserved, and there is no adventitious vein in the stigma, which otherwise is as in that species. The wing is not so slender as in *D. stigmosa*. Length of body 5.5^{mm}; wing 5.5–6^{mm}; femur 5^{mm}; tibia 5.75^{mm}; first two joints of tarsi 3.5^{mm}. The measurements of the leg are doubtful. Fossil Cañon.

Another poorly preserved specimen, which, by the structure of the

male forceps, is plainly to be referred to this genus, is judged, from its size, to belong to this species, none of the characteristic parts of the neuration being preserved. The body is a very little smaller than in the females of this species, and the male forceps are ovate and rather large. Length of body without forceps 4.5^{mm}; forceps 0.35^{mm}; breadth of one of them 0.2^{mm}. On the same stone with this is a leg which probably belonged to it, though some distance from it; the length of the femur is 5^{mm}; tibia 4.5^{mm}; the tarsi are broken.

Dicranomyia rostrata.—A single specimen, larger than the other species of *Dicranomyia*, and about the size of *Tipula decrepita* Scudd., is provisionally referred to this genus. The head is very small, the thorax rather robust and very strongly arched, and the abdomen shows it to be a female. The antennal joints are fifteen in number, the basal one stout, the apical slender obovate, the others globular; the palpi are four-jointed, the last three joints equal, and together as long as the first, the whole rather longer than the head, and therefore rather long for a *Dicranomyia*. The legs are wanting, the single wing detached, broken at the base, and longitudinally folded. Such of the neuration as can be disentangled agrees wholly with the peculiarities of this genus. Length of fragment of body, without head, 6^{mm}; breadth of head 0.5^{mm}; length of antennæ 2^{mm}; palpi 0.9^{mm}. Fossil Cañon.

A second specimen is referred to this species, but with some doubt, as it only consists of a trunk, with no appendages, excepting the male forceps. The specimen is slightly smaller than the female, as we should expect, and the plates at the extremity of the body differ from those of the other fossil species described in being of a regular, short, obovate form. Length of body, without forceps, 6.25^{mm}; of forceps 0.6^{mm}; width of same 0.28^{mm}. Fossil Cañon.

Spiladomyia (σπιλάδης, μύια), nov. gen.

This genus is founded upon a peculiar form of fly allied to *Dicranomyia*. The palpi are no longer than the head; the thorax is comparatively slender, the legs very long and slender, and the wings shaped much as in *Dicranomyia*, with a peculiar neuration. The auxiliary vein terminates some way beyond the middle of the costal border; the first longitudinal vein terminates in the second, close to the tip of the wing; the second originates from the first beyond the middle of the wing, but some distance before the tip of the auxiliary vein; the third longitudinal vein originates from the second, near the middle of its course, beyond the tip of the auxiliary vein; a little distance beyond its origin, but much nearer the tip of the wing than usual, it is connected by a cross-vein with the fourth longitudinal vein; the first and second posterior cells are therefore very short; there is, then, but a single submarginal cell, three, or, if a very slight fork at the apex of the posterior branch of the fourth longitudinal vein be counted, four posterior cells, and no discal cell.

Spiladomyia simplex.—A single specimen and its reverse show nearly all the parts of the body, but all are faintly preserved, so as to be very difficult of study. The specimen is a female; nearly all the legs are preserved, and all but the base of the wings; the latter, however, trail along the abdomen, so that parts are obscured, and the neuration is exceedingly faint. The head is small, the eyes almost exactly circular, the palpi a little shorter than the head, the antennæ composed of cylindrical joints, a little longer than broad, the legs slender, with femora, tibiæ, and tarsi of nearly equal length, and the wings as long as the body. The anterior branch of the fourth longitudinal vein is abruptly bent at its base, so as nearly to connect with the cross-vein uniting it with the third longitudinal vein, and the first and second posterior cells are scarcely more than three times as long as broad. The third posterior cell is but very insignificant, as the posterior branch of the fourth longitudinal vein forks but slightly, and near its tip. The neuration of the lower part of the wing is uncertain. Length of body 7.5^{mm}; palpi 0.35^{mm}; fore femora 4.5^{mm}; middle femora 4.5^{mm}; hind femora 4.5^{mm}; fore tibiæ 4.65^{mm}; middle tibiæ 4.5^{mm}; hind tibiæ 4.5^{mm}; fore tarsi 4^{mm}; middle (or hind) tarsi 4.5^{mm}. Measurements of tarsi uncertain. C agrin Valley.

Pronophlebia (πρώω, φλέβιον), nov. gen.

This genus differs from all *Tipulidæ* known to me, in the early origin of the third longitudinal vein, which springs from the second almost immediately after its own separation from the first longitudinal vein, and some way before the tip of the auxiliary vein; the second longitudinal vein arises near the middle of the wing, and branches, the inner branch apparently forking near its tip. These characteristics readily serve to distinguish it from other *Tipulidæ*. The head is small, the antennæ long, very slender, and more than thirteen-jointed. They are too imperfect in the specimen studied to allow of any further statement. The palpi are not preserved, but the thorax is strongly arched, and the neuration indicates that the genus belongs to the *Tipulidæ brevipalpi*, and with other signs, that it is probably one of the *Limnophilina*, although the auxiliary cross-vein appears to be exactly opposite the origin of the second longitudinal vein. It is perhaps most nearly allied to *Trichocera*.

Pronophlebia rediciva.—The single specimen of this species is spread at full length, but the stone containing it is broken. The specimen is a male. The antennæ are considerably longer than the head and thorax together, and the joints are shaped and ornamented as shown in the figure of *Dolichopeza* in Walker's *Diptera Britannica*. The head is small, and the eyes so well preserved that they can be seen as in a living creature. The wings are very long and slender; the auxiliary vein terminates some distance beyond the middle of the wing; the first longitudinal vein about midway between that and the tip; the second longitudinal vein arises just within the middle of the wing, and the third longitudi-

nal vein less than half the distance from that to the tip of the auxiliary vein; the second longitudinal vein forks just beneath the tip of the auxiliary vein, its upper branch bends just beneath the tip of the first longitudinal, and its lower branch appears to fork just beyond the middle of its course. Cross-veins appear to divide the interspace between the second and third longitudinal veins (the second submarginal cell) into three equal parts; and there is certainly a cross-vein in the interspace between the fourth and fifth longitudinal veins (the second basal cell) directly opposite the origin of the third longitudinal vein. Length of body 9.25^{mm}; antennæ 2.6^{mm}; wings 9.25^{mm}.

Cyttaromyia (χύτταρος, μυΐα), nov. gen.

This genus of *Tipulidæ* differs somewhat remarkably from any known to me. It appears to belong among the *Tipulidæ brevipalpi*, the first longitudinal vein terminating in the second much in the manner of *Dicranomyia*, with which, however, this genus seems to have little else in common. Although the first longitudinal vein terminates in this way, no trapezoidal cell is formed near its extremity after the manner of the *Tipulidæ longipalpi*, but this portion is quite as in *Dicranomyia*. The position of the auxiliary vein is indeterminable from the fragment I have seen; but the "posterior intercalary vein" of Loew issues from the lower outer angle of the discal cell at a long distance from the great cross-vein, and indirect continuation of the fourth longitudinal vein. All these characteristics place it with the *Tipulidæ brevipalpi*; but the points wherein it differs from them, as indeed from all other *Tipulidæ*, are not a little extraordinary. Apparently, it has certain relations with the *Amalopina*, and has some resemblance to *Symplecta*, but it may be questioned whether it should not form a section by itself in the neighborhood of the *Ptychopterina*.

The first longitudinal vein terminates in the upper branch of the second at no great distance from the tip of the wing; at the same point, it is connected with the costa by an oblique cross-vein, running in continuity with its terminal portion. *There are three submarginal cells and a secondary discal cell.* The large number of submarginal cells is due to the forking of the posterior branch of the second longitudinal vein, just as two submarginal cells are formed in *Anisomera* by the forking of the anterior branch of the same vein. The secondary discal cell is formed by the division of the third submarginal cell by a cross-vein, which unites with the elbow of the basal portion of the lower branchlet of the fork of the second submarginal vein, and leaves two cells beyond the supplementary discal cell, just as there are two cells (the first and second posterior) beyond the true discal cell; the latter lies directly below the secondary discal cell, but is twice as large as it. This is an anomaly quite unique, so far as I am aware, among the *Tipulidæ*.

Cyttaromyia fenestrata.—This species is represented by the portion of a wing and its reverse, containing a little more than the distal portion with nearly all the important part of the neuration. The striking pecu-

liarities of this have been pointed out in the description of the genus; but a few minor points, probably of specific value, may be added. The second longitudinal vein originates far back toward (perhaps before) the middle of the wing, and half-way to the tip forks abruptly, the anterior branch immediately arching over and running to a point just above the extreme tip of the wing; the space between this portion of its course and the first vein is infuscated, forming a stigma; the posterior branch forks half-way toward the tip, the upper branchlet being in almost direct continuity with the main branch, while the lower diverges suddenly from it and unites with the cross-vein from the third longitudinal vein, after which it runs parallel to the other branchlet; the third longitudinal vein springs from the posterior branch of the second directly after its origin. The first and second posterior cells are of the same length as the lower two submarginal cells, and the discal cell is of a similar length. The lower part of the wing is confused from folding, but there is a cross-vein uniting the fourth and fifth longitudinal veins next the inner extremity of the discal cell; the discal cell extends further by its own width toward the base of the wing than the secondary discal cell, and there is a slight appearance on the stone, as if the middle of the cross-vein forming the inner limit of the discal cell were united by a cross-vein to the second longitudinal vein shortly before it branches, thus forming a prediscal cell of irregular shape and about as long as broad. Length of fragment 5.5^{mm}; width of middle of wing 2^{mm}. Fossil Cañon.

Tipula decrepita.—A single specimen, poorly preserved, is to be referred to the genus *Tipula* (s. str.). The head is small, the antennal joints very slender, obovate, between two and three times as long as broad, the thorax well arched, and the abdomen indicating a female; the legs are wanting; both the wings are present, but poorly preserved, and one of them imperfect; even the perfect one is badly folded longitudinally, but the costal border is nearly uninjured, and indicates the generic affinities, from the peculiar nature of the venation toward the apex; instead of forming toward the termination of the first longitudinal vein a large stigma-like cell, the second longitudinal vein appears to form, with a slight vein springing from below, a long and exceedingly slender cell, above and outside of which the wing is slightly clouded. Length of body without head 6^{mm}; diameter of head 0.6^{mm}; length of wings 8.5^{mm}.

Tipula tecta.—A single specimen, preserved on a dorsal aspect, is of a larger size than the other *Tipulida* from this locality; its precise relationship cannot be determined until other specimens are discovered, as it has no head nor legs, except a very slender fragment of a tibia; and the wings, being longitudinally folded and partially concealed by the body, along which they lie, show only that the neuration is not discordant with that of the crane-flies, with which its other features agree. The specimen is a female, with a slight, not greatly arched, thorax, and full and plump, though still slender, abdomen, nearly as

broad in the middle as the thorax. Length of thorax 1.4^{mm}; breadth of same 1.25^{mm}; length of abdomen 4.75^{mm}; breadth of same 1.15^{mm}; length of wings 7^{mm}. Fossil Cañon.

Family MYCETOPHILIDÆ.

Mycetophila occultata.—A single poorly preserved specimen and its reverse present an upper view of the insect, with the wings folded over the back, the legs crowded together, and the antennæ lying beside the body. The antennæ are about as long as the head and thorax, the joints scarcely longer than broad, nearly cylindrical, scarcely at all moniliform. The legs are comparatively slender, hairy, and unarmed, not very long. The character of the venation shows the insect to belong to the *Mycetophilidæ*, but what genus is represented is somewhat obscure from doubt about the exact location of some of the veins; neither the auxiliary vein nor any of the basal veins above it can be seen, nor can the axillary be traced; judging from the other veins, it is probably allied to *Mycetophila*, although, in the possible presence of a second cross-vein uniting the cubital vein with the extremity of the radial, it should be referred to a distinct genus, probably allied to *Empheria* and *Tetragoneura*. The presence of such a vein being doubtful, we have preferred to point out its affinity to *Mycetophila*. The radial vein ends in the middle of the outer two-thirds of the costa, and at its tip a distinct stigma, nearly three times as long as broad, occupies the space between the radial and costal veins. The tip of the wing is broken on one specimen and obscured on the other, so that the length of the costal vein cannot be determined, although it appears to extend slightly beyond the tip of the cubital vein; the cubital is connected by the cross-vein to the radial but a short distance from its origin, and bends but little upward from the medial vein to reach it; the middle discal vein, on the contrary, bends downward considerably, and forks at a distance from the base, less than half-way from the median cross-vein to the tip of the radial vein, and an unusually broad space is left between its upper branch and the cubital vein, while the fork of the hind vein is nearer the base than the separation of the cubital from the medial vein. Length of body 3.5^{mm}; antennæ 1.1^{mm}; wings 3.5^{mm}; tibiæ (of fore legs?) 0.75^{mm}; tarsi (of same legs) 0.4^{mm}. Chagrin Valley.

Sackenia, nov. gen.

Body shaped much as in *Boletina*. Antennæ longer than the thorax, one-fourth slenderer at the apex than near the base, gently curved, 2+14-jointed. Legs very long and slender; femora and tibiæ of about equal length; tarsi a little longer than the tibiæ; the hind tibiæ and tarsi together a little longer than the abdomen; the tibiæ with one or two apical spurs beneath and spined throughout. Wings rather broad-ovate; the smaller veins at the extreme base obliterated in the specimen ex-

aminated; auxiliary vein terminating on the costa beyond the end of the basal third, the first longitudinal vein in the middle of the outer half; the second longitudinal vein is unusually curved downward at the tip, so as almost to reach the apex of the wing; the united third and fourth longitudinal veins part from the second very near the base of the wing or within the small transverse vein; they divide near the center of the wing and the fifth and sixth longitudinal as near the base as the third and fourth; the sixth longitudinal vein is straight, and appears to reach the margin of the wing.

The genus resembles *Boletina* more than any of the genera figured by Winnertz, but differs strikingly from it in the approximation to the base of the forking of the third and fourth, and of the fifth and sixth longitudinal veins. In this particular, it closely resembles the *Sciarinae*, but differs from them still more in the length of the auxiliary and first longitudinal veins, and in that the former reaches the costa. The costal vein does not appear to pass beyond the tip of the second longitudinal vein, but this point is obscure. I have dedicated their genus to the distinguished dipterologist Baron Osten Sacken, to whom I am indebted for many suggestions in the determination of these fossils.

Sackenia arcuata.—This species is represented by a single female specimen, more than usually well preserved. The body is pale testaceous, the wings wholly hyaline, but the veins faint testaceous; the antennæ are a little longer than the head and thorax together, very slender, of the color of the thorax; the basal joints are subglobular, slightly broader than long, the remainder twice as long as broad, and beyond the middle of the antennæ slightly moniliform. In the wings, the base of the hinder cell, using Winnertz's terminology, lies within the base of the upper discal cell, both being nearer the base of the wing than the middle transverse vein, while the base of the middle discal cell is far outside of either of these, near the centre of the wing. The costal vein appears to terminate where the cubital reaches the margin, and the axillary vein nearly or quite reaches the border. The legs are partly detached, and the basal portion of the front pair obscure, but, apparently, the front tarsi are about three times as long as the front tibiæ. Length of body 5.65^{mm} ; antennæ 2^{mm} ; wings 4.25^{mm} ; hind femora 3^{mm} ; hind tibiæ 2^{mm} ; hind tarsi 2.4^{mm} ; fore tarsi 2^{mm} . Chagrin Valley.

A second specimen of the same species is similarly preserved, but wants the wings. The legs, however, are better preserved, and show a pair of apical spurs to the tibiæ. The antennæ are imperfect, but the proboscis is seen. The length of the curved body is a little more than 5.5^{mm} . The legs are detached and confused, so that it is impossible to separate the middle and hind legs; one leg (a front leg, to judge from its length) has the following measurements: femur 1.2^{mm} ; tibia 1.4^{mm} ; tarsi 1.7^{mm} ; another (probably a hind leg): femur $2.1(?)^{\text{mm}}$; tibia 2.25^{mm} ; tarsi 1.75^{mm} ; another (probably the opposite of the same): tibia 2.25^{mm} ; tarsi 1.75^{mm} . Apparently, all the tarsi are broken. The tibial spines,

both in this and the first mentioned specimen, are delicate, and a little more than half as long as the thickness of the tibiæ.

Gnoriste dentoni.—A single specimen, a little broken, but otherwise in good preservation. The head and thorax are nearly black, the abdomen dark fusco-castaneous. Legs and base of antennæ fuscous. Wings rather narrower at tip than in the European *G. apicalis* Hoffm., hyaline, covered with microscopic hairs, with a very slight and increasing infuscation toward the apex, the veins testaceous, the costal and second and third longitudinal veins much heavier than the others, and the fifth longitudinal vein with its lower fork scarcely heavier than the veins about it. The extreme tip of both wings is broken, so that the extent of the costal vein cannot be seen; but, in the approach of the proximal end of the fork of the fifth longitudinal vein to the root of the wing, the species agrees with the American *G. megarhina* O. S. more than with the European species mentioned, for it lies scarcely further from the base than the transverse vein connecting the first and second longitudinal veins, and slightly nearer than the separation of the third and fourth longitudinal veins. Only the basal four joints of the antennæ are preserved; the basal joint is obconic, broadly rounded at the apex, nearly twice as long as broad, the other three cylindrical, the second nearly half as long again as broad, the third and fourth less than a third longer than broad. The legs are profusely covered with hairs, but the hinder pair appear to be spineless, except at the apex of the tibia and of each tarsal joint, where there are three or four slender and rather short spines; the claws are very small and delicate, strongly curved, and delicately pointed; the short tibiæ of the front legs, however, have at least a single row of fine distant spines on the upper (?) edge. Length of body 4.4^{mm}; first joint of antennæ 0.2^{mm}; second joint 0.125^{mm}; third and fourth joints each 0.11^{mm}; wings 4.5^{mm}; middle (?) tarsi 2.2^{mm}; first joint of same 1.1^{mm}; second 0.45^{mm}; third 0.28^{mm}; fourth 0.2^{mm}; fifth 0.17^{mm}; claws 0.038^{mm}. Fossil Cañon.

Family CYRTIDÆ.

Acrocera hirsuta.—A single very fragmentary specimen appears to belong in the neighborhood of *Acrocera*, but is too imperfect to mention with any certainty. The size of the insect, the small head, robust and coarsely haired thorax, stout and abbreviated abdomen, indicate a form resembling that of *Acrocera*, and the tibiæ appear to be destitute of spurs; but the legs are not very slender, and the neuration of the fragment of the wing does not agree well with Westwood's figure of *A. globulus* Panz. in Walker's *Diptera Britannica*. There are, however, only a few longitudinal veins next the base, disconnected and faint, so that they afford very slight indication of the real character of the wings, and, the transverse veins being obliterated, nothing can be said of the basal cells. Length of body 4.5^{mm}; head 0.6^{mm}; height of same 1.3^{mm}; thorax and abdomen of about equal size. Fossil Cañon.

Family SYRPHIDÆ.

Eristalis lapideus.—A poorly preserved specimen, showing little that is characteristic, but which belongs near *Eristalis* or *Helophilus*. The body is preserved on a dorsal aspect, with wings partially expanded; the head is nearly wanting, the thorax without markings. The wings are distinct only on the basal half, and even here show no neuration at all beyond the general course of the principal veins at the very base; the alulæ, however, are very distinct, very large, their breadth (along the wing) fully equal to half the breadth of the thorax, dark, with obliquely transverse dark ridges, indicating that they were wrinkled in nature, much as in *Volucella* or *Oestrus*. Abdomen long, broadest in the middle of the basal half, beyond tapering considerably, the tip roundly pointed; apical half of basal joint black, forming a distinct transverse straight band; the number of abdominal joints appears to be five. Length of thorax 3.5^{mm}; breadth of same 3.25^{mm}; length of abdomen 6.5^{mm}; wings 12^{mm}; breadth of same 3.5^{mm}. Chagrin Valley.

Family MUSCIDÆ.

There are five species of Dipterous larvæ in the collection, all belonging to the *Muscidæ*, and representing at least two very different groups, each of which has more than one representative.

Musca ascarides.—First there is a species to which a considerable number of specimens belong, which may take the name here given. Some of the specimens are complete; others consist of emptied skins only. When contracted, the body is thick, especially on the anterior half, and about twice as long as broad, closely resembling the larva of a bot-fly. Both extremities are rounded, the anterior very broadly, while the posterior half tapers very regularly. In one specimen, which is not so much shrunken, the body is fusiform, and about three and a half times longer than broad; the head and hinder extremity tapering in a nearly equal degree. In the emptied skins, as in the others, it may be seen that the normal form is a blunt, squarely rounded head, behind which the body is nearly equal, and then tapers toward the tail. At the anterior extremity may be nearly always seen a portion of the mandibles, consisting of a pair of very slender rods or blades converging anteriorly and terminating in two attingent rounded lobes, attached to the inner edge of the blades. The anterior spiracles are seen in a single specimen as a simple, rounded, dark spot just outside the middle of either lateral half; the two lateral tracheal vessels may be seen in nearly all the specimens, and especially at the hinder extremity, and fragments of them are frequently scattered about on the stones; they are very large. The integument is generally rather dark, and more or less blotched, and covered profusely and almost uniformly with backward-directed hairs; these are short, tapering, and moderately stout, though minute. Length of contracted bodies 11.5^{mm};

breadth of same 6.25^{mm}; length of bodies not contracted 17.5^{mm}; breadth of same 5.75^{mm}; length of skins 25^{mm}; breadth of same 7.25^{mm}; length of blades of mandibles 3.25^{mm}; diameter of tracheæ 0.6^{mm}; of anterior spiracles 0.4^{mm}; distance of latter apart 2.75^{mm}. Chagrin Valley.

Musca bibosa.—Another species is represented by a single body, and one skin and its reverse, which seems to belong to the same. It is closely allied to *M. ascarides*, but differs from it in some essential features. When contracted, the body does not taper regularly from the middle of the front half to the tail, but the whole hinder half is much slenderer than the front, and toward the tip has nearly parallel sides, so that the body is flask-shaped, and about twice as long as broad. A similar, though not so abrupt, change of contour is seen in the skin. The structure of the mandibles and of the tracheæ may be seen to be the same as in the preceding species, but the integument is naked, being entirely destitute of any of the hairs which roughen the skin of *M. ascarides*. Length of contracted body 14^{mm}; breadth of same in front 7.5^{mm}; behind 3.75^{mm}; length of skin (a small one) 16^{mm}; greatest breadth of same 5.25^{mm}; length of mandible blade 2.75^{mm}; diameter of tracheæ 0.75^{mm}. Chagrin Valley.

A third species is represented by three or four contracted skins, which are too uncharacteristic to name, though it may be seen that they are distinct from the others. As preserved, they are almost black; the skin is much wrinkled and smooth; the body pretty regularly and bluntly obovate, nearly twice as long as broad; at the end of one, two colorless oval patches lie united, side by side, pressed against the extremity, and doubtless represent the head, and prove it to be different from the other species; it is, however, impossible to say what its affinities may be. Length of body 8.5^{mm}; breadth 4^{mm}. Chagrin Valley.

Musca hydropica.—A fourth species is represented by two bodies and a skin, which present an entirely different appearance from the preceding three species, but which may temporarily be given the same broad generic name. In this species, the form, even when contracted, is far more elongated than in the others; the body is nearly five times as long as broad, is broadest just behind the roundly pointed head, tapers rapidly toward it, but gently posteriorly to the middle, behind which it is equal. In the skin, the part of the body preserved is equal and very broad, excepting toward the head, where it rapidly narrows, the head being well rounded or slightly produced; the mouth-parts, instead of being withdrawn a little from the front extremity of the body, as in the species already described, lie at its very boundary, and the blades are parallel, instead of posteriorly divergent. The integument is covered rather profusely with very short, conical, tapering hairs, scarcely more than twice as long as their breadth at base. The larva is very distinctly banded with darker and lighter colors, as the empty skin shows, the posterior third of each segment being occupied by a very dark band, darkest on the dorsal surface, while a faint pale transverse line breaks

the anterior portion into two equal halves of the same width as the blackish band. Length of body 23^{mm}; greatest breadth of same 5^{mm}; breadth posteriorly 3^{mm}; breadth of skin 9.5^{mm}; length of segments on same 4^{mm}; length of mandible blades 3.5^{mm}. Chagrin Valley.

Musca vinculata.—There is still another species, allied to the last-mentioned, which may bear the name here proposed. It is represented only by part of emptied skins, all lying on the same stone, and which differ from the preceding species in being absolutely devoid of any hairs, and in having different and much fainter markings. The general color of the best-preserved specimen is a pale brown, and the markings are scarcely darker transverse bands, narrowing on the sides, but occupying nearly the entire length of a segment dorsally, and broken into equal parts by two transverse rows of very faint and minute pale dots. No specimen is sufficiently perfect to show the shape or the length, but the shape appears to be similar to that of *M. hydropica*, and the insect much smaller than it, for the breadth is 4.5^{mm}, and the length of one segment 2^{mm}. Chagrin Valley.

Nearly all of these species, and especially *Musca ascarides*, so closely resemble the larvæ of bot-flies, that I could scarcely persuade myself that they could not belong to the *Oestridæ*. The appendages of the skin, however, are much more delicate than is usual in *Oestridæ*, and are uniformly distributed over the surface or are altogether absent. The empty skins, too, have every appearance of belonging to the same insects as the complete bodies, and although these are not cast skins (in which case they would be proved natural inhabitants of the water), for they still contain the harder parts of the internal organs in many cases, but remains of partially decomposed larvæ, it would seem improbable that so large a number of Oestrid larvæ could be found, when the only way in which they could have reached their present condition would be through the droppings of animals affected by the bots standing in the water. Of course, the reference I have given them is only provisional.

Indeterminate remains of the imagines of three or four species of small *Muscidæ* also occur in the collection from both places.

Family HELOMYZIDÆ.

Heteromyza detecta.—A single specimen and a very poor reverse of it occur on the same stone with *Spiladomyia simplex*. Both wings and the thorax are preserved, with short fragments of moderately stout hairy legs. The venation is obscure, and the species referred provisionally to *Heteromyza* until better specimens decide more certainly to which of the groups of *Muscidæ* it belongs. The venation is very similar, so far as it can be determined, to *Het. senilis* Scudd. from the Tertiaries of British Columbia, but the former species is much smaller, and there is a peculiarity about it which is not quite clear: at the bend of the costa, in-

dicating the termination of the auxiliary vein, there is a short, distinct, oblique cross-vein nearly in continuation of the base of the costa, but bent slightly downward, which reaches the first longitudinal vein; the latter runs close to the costa and strikes it about midway between the tip of the auxiliary vein and the tip of the wing; the costa apparently runs exactly to the tip of the second longitudinal vein; the third and fourth longitudinal veins run parallel to each other to a very little way beyond the extremity of the auxiliary vein, where they are united by a short cross-vein, beyond which they both diverge from each other in opposing curves, equally turned aside from their former course; the third longitudinal vein runs to the tip of the wing; the fourth is united half-way to the border of the wing by a long oblique cross-vein, running at right angles to the fifth longitudinal vein. The extremity of the basal cells apparently lies about half-way from the base of the wing to the tip of the auxiliary vein, but this point is very obscure. Length of wing 1.65^{mm}; breadth of same 0.95^{mm}; length of thorax 0.75^{mm}; breadth of same 0.55^{mm}. Chagrin Valley.

COLEOPTERA.

Family CARABIDÆ.

Bembidium exoletum Scudd. Bull. Geol. Geogr. Surv. Terr. ii, 77-78.

Family DYTISCIDÆ.

Laccophilus sp.—The femur and tibia of the hind leg of a species allied to *L. maculosus* Germ. Fossil Cañon.

Family STAPHYLINIDÆ.

Gyrochæna saxicola Scudd. loc. cit. ii, 78. Chagrin Valley.

Leistotrophus patriarchicus Scudd. loc. cit. ii, 78-79.

Oxytelus pristinus Scudd. loc. cit. ii, 79. Chagrin Valley.

Family ELATERIDÆ.

Epiphanis deletus Scudd. loc. cit. ii, 80-81. Fossil Cañon.

Oxygonus mortuus Scudd. loc. cit. ii, 81. Fossil Cañon.

Family BRUCHIDÆ.

Bruchus anilis Scudd. loc. cit. ii, 82. Chagrin Valley.

Family CURCULIONIDÆ.

Entimus primordialis Scudd. loc. cit. ii, 84. Chagrin Valley.

HEMIPTERA.

Family FULGORIDÆ.

Aphana atava.—A single finely preserved specimen, giving the upper surface of the body, the displaced tegmina of one side, and a part of the middle leg of the opposite side, is referred provisionally to *Aphana*. It

plainly belongs to the true *Fulgorina*, and seems to agree better with *Aphana* than with any other genus concerning which information is at hand, but it is much smaller than the species of *Aphana* (as it is larger than those of *Pæocera*), and differs from it in the structure of the head and the brevity of the tegmina. The head is small, being scarcely more than one-third the width of the body, the eyes not prominent, the front scarcely angulated, and the vertex of about equal length and breadth; it is marked above with two longitudinal blackish stripes, and the thorax with a median, and, on either side, a broad lateral black stripe, all of them bordered by paler parts and the median marked with a median pale line. The front of the thorax is strongly and regularly convex, and the posterior border of the mesonotum is rectangular. The tegmina are about three times as long as broad, with nearly parallel borders, the tip roundly pointed. The apical fifth is filled with fine, closely parallel, longitudinal veinlets, extending from the tip of the radial vein to the inner border, forming an area of equal width throughout. The radial vein is parallel to the costa throughout. The ulnar veins originate almost exactly as in *Acræphia*, but the upper one does not fork before the middle of the wing, when it sends downward a single shoot, while the lower forks almost immediately, and again emits a vein beyond the middle of the wing. The wing itself is apparently diaphanous, but is mottled lightly with faint fuliginous along the costal border, and more heavily, but irregularly, with dark fuscous on the basal half of the wing, especially next the extreme base, and in a rather broad and straight but irregularly margined and oblique band, crossing the wing from just below the sutural angle equally backward and outward. Middle leg moderately stout; femur and tibia of equal width, straight, apparently with sharp edges. Abdomen full, rounded, broad, the extremity broadly rounded; it is dusky, especially beyond the base, the neighborhood of the spiracles darker, the fifth to the seventh segments with a medio-dorsal (or medio-ventral?) raised line marked in black. Length of body 9.5^{mm}; breadth of head 1.8^{mm}; of abdomen 5^{mm}; length of tegmina 10^{mm}; width of same 3.5^{mm}; length of femora (somewhat doubtful) 2^{mm}. Chagrin Valley.

Delphax senilis.—A fairly preserved specimen with spread wings, but with almost no characteristic sculpture. The head and exposed part of thorax are blackish; the rest of the body and the wings, especially the tegmina, dusky. The head is less than half as broad as the thorax, and short. The thorax is broad and rounded, and the body nearly equal, though enlarging slightly posteriorly. The tegmina are slightly narrower and considerably longer than the body, equal, and at the tip broadly rounded; they show no trace of neuration, but the preservation of the whole is perhaps too obscure to expect it. The wings are a little shorter than the tegmina, crumpled and folded, and show a few longitudinal veins, and others, which, from the nature of the preservation, cannot be traced. Legs and appendages of the head are wanting. Length of body 2^{mm}; tegmina 2.4^{mm}. Chagrin Valley (?).

Family TETTIGONIDÆ.

Tettigonia obtecta.—A single specimen, with the merest fragments of wings and no legs, but otherwise pretty perfect, belongs, with little doubt, to this family, although its generic affinities are uncertain. The head is not quite so broad as the body, bluntly angulated in front (at an angle of about 130°); the eyes are rather small, the beak stout and about as long as the head. The abdomen is moderately stout but long, tapering to a blunt tip; the segments eight in number, growing longer apically, the seventh being twice as long as the second. Length of body 7.6^{mm} ; breadth of same 2^{mm} ; length of rostrum 0.65^{mm} ; diameter of eyes 0.28^{mm} . Chagrin Valley.

Bythoscopus lapidescens.—A single specimen, broken at the edge of a stone, and so preserving only the abdomen and part of the wings. The abdomen is long and slender, composed of nine segments, the extremity indicating that it is a female. The wing (the tegmina appear to be entirely absent) reaches the tip of the abdomen, and the apical cells are from a third to nearly half as long as the wing, the upper the longer; the apex is produced but rounded. Probable length of body 5.5^{mm} ; length of fragment 3.5^{mm} ; breadth of abdomen 1.5^{mm} . Chagrin Valley.

Family LYGÆIDÆ.

Pachymerus petrensis.—A single specimen, of which most of the right half is destroyed, represents this species, which is placed here provisionally, principally because it appears to be closely related to fossil species put in this group by Heer. It seems to be a larva, and to belong either to the *Rhyparochromidæ* or the *Anthoconidæ* of the British Catalogue. The outline of the head is vague and broken, but the front is apparently bent at a right angle. The antennæ are about half as long as the body, four-jointed; the basal joint only about half as long again as broad, the others subequal, very slightly smaller at the base than at the apex, but otherwise equal, the second a very little the longest, the last pointed at the tip. Thorax and abdomen of about equal length, the former equally broad throughout (or nearly so); the fore and middle femora short and stout, about as long as their separation from each other. Abdomen expanding suddenly at the base, so that the second segment is broadest and apparently half as broad again as the thorax, beyond tapering rather rapidly to a rounded tip. This form of the abdomen does not appear consonant with *Pachymerus*. Length of body 3^{mm} ; antennæ 1.5^{mm} ; fore femora 0.35^{mm} . Fossil Cañon.

Family PHYSOPODA.

Melanothrips extincta Scudd. Bull. Geol. Geogr. Surv. Terr. i, ii, 221 Chagrin Valley.

Lithadothrips vetusta Scudd. loc. cit. i, ii, 222. Fossil Cañon.

Palæothrips fossilis Scudd. Geol. Mag. v, 221. Fossil Cañon.

NEUROPTERA.

Family PHRYGANIDÆ.

Phryganea aperta.—A single well-preserved specimen with its reverse; the wings are doubled beneath the body, and unfortunately are overlaid by the larva skin of a Dipterous insect, obliterating all the important parts of the neuration. The portion that remains resembles that of *Gera*, but it is impossible to determine with any certainty, while the structure of the antennæ is more as in *Phryganea* proper. The head is detached from the body, and faint traces of the antennæ are preserved, but detached; a single pair of spurs show at the end of the tibiæ, and the spines of the under edge of the same tibiæ are alternately long and short. The abdomen is very well preserved on a side view. Length of body 8^{mm}; (portion of) antennæ 7^{mm}; tarsi 3.5^{mm}; wings 10^{mm}. Chagrin Valley.

ART. XXX—DESCRIPTION OF TWO SPECIES OF CARABIDÆ FOUND
IN THE INTERGLACIAL DEPOSITS OF SCARBORO' HEIGHTS,
NEAR TORONTO, CANADA.

BY SAMUEL H. SCUDDER.

In the last number of the Canadian Journal of Toronto, Prof. G. J. Hinde describes the glacial and interglacial strata of various localities near Toronto, in one of which some coleopterous remains were found. These having been submitted to me for examination, the following descriptions are published:

Loricera glacialis, nov. sp.—Of this species, a pair of elytra are preserved, nearly complete, but cracked and flattened somewhat out of shape. It is allied to *L. neoscotica* Le C., but differs from it and from all other American species of *Loricera* in the much greater depth of the striæ and in the presence of distinct submarginal foveæ. The elytra are of a glistening, somewhat blue-black color. It is difficult to tell whether there are eleven or twelve punctured striæ; the striæ are strongly impressed, faintly though rather coarsely and profusely punctulate, the third interspace with three small, distinctly but not deeply impressed foveæ, arranged as in *L. neoscotica*, two near each other just above the middle of the elytra, and one behind the middle of the apical half; fifth interspace sometimes furnished with a pair of very faint foveæ near the middle of the elytra, much as in *L. decempunctata* Esch., about as far from each other as from the sutural border; and finally the ninth interspace, different from all the species of *Loricera* I have been able to examine, has eight or more small but distinct and deep foveæ, mostly situated in the apical half of the elytra, sometimes connected by oblique ridges with the next stria within. The interspaces are crossed by very fine wrinkles, scarcely visible with a simple lens. The elytra are shaped as in *L. decempunctata*, particularly at the apex. Length of elytron 4.4^{mm}; breadth 1.6^{mm}.

I had at first taken this for a *Diachila*, but the peculiar disposition of the foveæ on the third interspace is characteristic of *Loricera* (with the species of which it agrees in size) and is different from their relative position in all other *Carabidæ* with which it could be compared.

Loxandrus gelidus, nov. sp.—The following fragments of this species have been examined:—a very nearly perfect elytron, but badly cracked and pressed apart; the greater part of another; parts of three united

segments of the abdomen; the prothorax, slightly cracked; and a portion of one of the mandibles. A species is indicated a little larger than *L. agilis* LeC., and in many respects resembling it. The elytra are shaped as there, with the same apical sinuation; they are piceous, with a metallic-blue reflection, exactly as in many species of *Loxandrus*; there are nine distinctly and rather deeply and equally impressed striae, rather faintly and not very profusely punctate; the interspaces appear as if minutely cracked, and with a simulation of excessively faint and small foveae throughout, while the third has a more distinct, though still rather shallow and rather large, fovea considerably behind the middle of the apical half of the elytra; a second fovea appears in the third interspace, as far from the apical fovea as that is from the apex, but it is situated laterally, encroaching on the stria within it. It is perhaps due only to an excess of the simulating foveae that there is apparently a row of approximated punctures, quite like those of the neighboring striae, for a very short distance between the base of the sixth and seventh striae. The first stria turns outward next the base, apparently to make room for a scutellar stria, which does not appear to exist in this genus, but which may probably form in this species the limit of the minute portion of the elytron which passes beneath the scutellum in repose; plainly, however, it is correlated with the unusual basal curve of the first stria, in which respect the fossil differs from all the species of *Loxandrus* I have examined. The obliquely cut marginal foveae agree with those of *L. agilis*. The prothorax is quadrate, the front margin very slightly angled, quite as in *L. erraticus* Le C., the sides broadly rounded, fullest anteriorly, with an exceedingly slight median sulcus (indicated by a slender crack), and more distinct posterior sublateral sulci (indicated by wider cracks), and between which the hind border is scarcely convex, and not at all as in *L. erraticus*. The surface of the prothorax is smooth; the abdomen is also smooth. The part of the mandible remaining is only the basal "molar" portion, armed with six or seven mammilate conical teeth, or rather transverse ridges. Length of elytron 5.75^{mm}; breadth 2^{mm}; length of prothorax 2.25^{mm}; breadth 3.5^{mm}; breadth of abdomen 2.25^{mm}.

This species differs from all *Loxandri* known to me in the coarseness of the punctuation of the elytra, the roughness of the interspaces, the position of the fovea of the third interspace, the intercalated false stria at the base of the seventh interspace (which can hardly be entirely fortuitous, since it is correlated with unusual unevenness of the surface elsewhere), the basal deflection of the first stria, and the presence of an inconspicuous scutellar stria. Nevertheless, it has all the aspects of a *Loxandrus*, and disagrees in more essential points from other *Carabidae*.

ART XXXI.—REPORT UPON THE INSECTS COLLECTED BY P. R. UHLER DURING THE EXPLORATIONS OF 1875, INCLUDING MONOGRAPHS OF THE FAMILIES CYDNIDÆ AND SALDÆ, AND THE HEMIPTERA COLLECTED BY A. S. PACKARD, JR., M. D.

BY P. R. UHLER.

[Continued from p. 475.]

LEPIDOPTERA.
RHOPALOCERA.

Papilio daunus Boisd.

Seen flying in Clear Creek Cañon and in the gorge near the Ute Pass, August 6 to 13.

Pieris oleracea Harris.

Not uncommon near Denver, at Golden, and in the Clear Creek Cañon, August 5 to 18.

Pieris protodice Boisd.

Moderately common in Denver and on the plains west of the city, early in August.

Nathalis iole Boisd.

Not common; only two specimens seen, the one at Denver, August 5, and the other at Colorado Springs, August 12.

Colias philodice Godart.

Quite common in and near Denver, August 5 to 8.

Colias eurytheme Boisd.

Extremely abundant in and near Denver, also at Golden and in Clear Creek Cañon, August 5 to 8. It was not common at Colorado Springs, nor near Cañon City.

Danais archippus Cramer.

Very common on the plains and less so in the cañons, August 5 to 18.

Euptoieta claudia Cramer.

Not found in abundance. A few specimens were met with in the hilly region west of Denver, on August 18.

Argynnis hesperis Edwards.

Not uncommon in Beaver Brook Gulch and in Clear Creek Cañon, August 6 and 7.

Another and larger species was observed at the same time in Clear Creek Cañon, but it was so wild as to be unapproachable with the net, and flew most of the time over the rapids of the creek.

Melitæa nubigena Behr.

Not rare in Clear Creek Cañon and in Beaver Brook Gulch, August 6 and 7.

Melitæa mata Reak.

One specimen taken west of Colorado Springs, not far from the mountains, August 16. No others were seen.

Grapta hylas Edwards.

Two specimens of this insect were seen, August 16, on the cottonwood trees growing beside the irrigating canal which bounds Colorado Springs on the western side. Having laid my net down, while engaged in turning over chips and stones and examining the flowers, I was not able to recover it soon enough to capture these beauties. One of them lodged for a second on the trunk of a tree, in full view, but the next moment flew off to a distance, and, although I wasted about a quarter of an hour in trying to secure it, my labors were unsuccessful.

Vanessa antiopa Linn.

One specimen captured, August 6, in Beaver Brook Gulch; two others seen, but not taken.

Pyrameis huntera Drury.

One specimen seen on the plains west of Denver, August 5. It settled on the ground within full sight, but I was too busy with other insects to spend the time in following it up.

Pyrameis atalanta Linn.

One specimen from Clear Creek Cañon, August 6. Only one other specimen was seen, and that was torn and battered, like the one taken.

Limenitis weidemeyeri Edw.

This beautiful species was tolerably common in Clear Creek Cañon, and up the Beaver Brook almost to the top of the mountain; certainly at an altitude of more than 7,000 feet above sea-level. They generally flew in the bright sunshine, with moderate rapidity, over the water, and occasionally lodged upon the willows or other bushes projecting above the current. Some were dusky and much battered, while others were fresh and clean. I noticed that there was a marked difference in the width of the white band across the wings. Both sexes were present on August 6 to 8.

Satyris sp.

Two specimens captured, August 6, in Clear Creek Cañon. A few others were seen, but they kept beyond my reach.

Satyrus sp.

A pair from Manitou, August 14. They were captured in the midst of the bushes on the side of the hill adjoining the road leading up the Ute Pass. No others were noticed. It is interesting to observe that here are two parallel species, each frequenting a cañon of the Rocky Mountain belt, but occupying separate territory, and perhaps representative of two distinct faunal districts.

Thecla sp.

A specimen of this exquisitely beautiful butterfly occurred to me on the bank of the creek, near Manitou, on August 13.

Chrysophanus helloides Boisdu.

A few specimens occurred on the plains, near Denver, on August 5. It is very wary, hiding among the dense foliage of the flowers, and selects its resting places with such tact that it promptly becomes invisible to the collector who is following it.

Lycæna melissa Edw.

Found sparingly in Clear Creek Cañon, August 6; near Denver, August 5, and later; at Colorado Springs and Manitou, August 12 to 16, quite common on low plants and very variable; and one specimen from Cañon City, August 11. The latter specimen has an arcuated orange band on both front and hind wings, while one from Colorado Springs has a similar band on the hind wings alone.

Lycæna rapahoe Reakirt.

This modest bluet was seen in small numbers at Denver, August 5, but not much later, and near Colorado Springs on August 12 to 16.

Pholisora catullus (Fab.) Scud.

Taken in Clear Creek Cañon and west of Denver, August 6 and 18. Not common in either locality.

Hesperia tessellata Scudder.

On the low hills west of Denver and near Sloan's Lake on bare patches of ground in grass, August 18. A few specimens were met with at almost every interval of two or three rods.

Hesperia comus Edwards, MS.

In company with the preceding, and equally frequent. On being aroused, these species did not fly to the patches of flowering plants and weeds near by, but invariably alighted on the spaces between the buffalo-grass, where their colors sufficiently harmonized with the soil to give them a fair degree of protection.

Anthomaster uncas (Edw.) Scud.

Somewhat common on the hills west of Denver on August 18.

Pamphila manitoba Scud.

Uncommon in Clear Creek Cañon, August 6.

Pyrrhosidia napa Seud.

One specimen from the hills west of Denver, August 18.

These Hesperians were kindly determined for me by Mr. Samuel H. Scudder.

HETEROCERA.

The following list of moths, collected by me in Colorado, in 1875, was prepared by A. S. Packard, jr., M. D. :—

Fam. ZYGÆNIDÆ.

Gnophala vermiculata Grote & Robinson.

Common in Beaver Brook Gulch and in Clear Creek Cañon, August 6 and 7.—(P. R. U.)

Lycomorpha miniata Pack.

One specimen seen flying from the mountain heights into Beaver Brook Gulch, August 6.—(P. R. U.)

Lycomorpha palmeri Pack.

Found in the same place as the preceding, and also flying in the full sunlight. I have no doubt of these being but varieties of a single species.—(P. R. U.)

Fam. BOMBYCIDÆ.

Crocota ferruginosa Walker, and var. *brevicornis*.

From Clear Creek Cañon, August 7.

Fam. NOCTUIDÆ.

Erebus odora Drury.

Broken specimens of this insect were lying about in the hotel at Beaver Brook, showing the species to be not uncommon at that place.—(P. R. U.)

Tarache angustipennis Grote.

Inhabits the region of Colorado Springs.

Mamestra discalis Grote, n. sp.

From Clear Creek Cañon, August 6.

Mamestra olivacea Morrison.

Obtained at Beaver Brook, in Clear Creek Cañon, August 6.

Mamestra sp.

Indicates a species distinct from *M. illaudabilis* Grote. Collected in Clear Creek Cañon.

Mamestra (Dianthœcia) meditata Grote.

From Colorado Springs, August 13.

Hadena arctica (Boisd.).

Taken at night in Clear Creek Cañon, August 6.

Tribadium spumosum Grote.

On flowers in the tall grass at Bijou Creek, August 19.

Rhododipsa volupia (Fitch).

From the plains near Denver.

Porrina sanguinea (Geyer).

On sunflowers near Colorado Springs.

Eulencyptera cumatilis Grote.

Caught flying about the lantern of the hotel at the mouth of Beaver Brook.

Lygranthæcia jaguarina (Guenée).

Common on flowers of golden-rod, at Bijou, August 19. These insects were flying with great activity in the full daylight, settling upon the flowers and rolling themselves in the pollen. They were shy, and flew over long distances when approached.

Lygranthæcia packardi Grote.

Found with the preceding at Bijou August 19, and at Colorado Springs August 16.

Grotella septempunctata Harvey.

A few specimens were met with on bushes near the creek at Manitou, August 14.

Bleptina caradrinalis Guenée.

Captured in Clear Creek Cañon, August 7.

Fam. PHALÆNIDÆ.

Eupithecia sp.

Too much rubbed for identification. Caught around the lantern at Beaver Brook, August 6.

Glaucopteryx magnoliata (Guenée).

Obtained in the same locality as the preceding, but earlier in the evening.

Ochyria abrasaria (H.-Schf.).

Captured in the same locality and at the same time.

Phibalapteryx intestinata Guenée.

Taken in the vicinity of Colorado Springs, August 12.

Hydria undulata Hübner.

Found in the same place as the preceding.

Gnophos haydenata Pack.

Captured at the mouth of Beaver Brook, in Clear Creek Cañon, August 6.

Thamnonoma flavaria Pack.

Taken in the same place and at the same time as the preceding.

Eois gemmata Pack.

Collected in Clear Creek Cañon, August 7.

Acidalia quinquelineata Pack.

Also found in Clear Creek Cañon, August 7.

The above list comprehends all the species that reached Baltimore in good condition. Many specimens were destroyed by insects in the boxes while on the railway trains, among which were some forms not included in this list.

COLEOPTERA.*

Fam. CICINDELIDÆ.

Cicindela pulchra Say.

Vicinity of the mouth of the Cañon of the Arkansas, on dark, sandy soils, not common, August 11.

Cicindela punctulata Fab.

The black variety was common in many places near Denver and in the city; also in and near Clear Creek Cañon. Specimens of the green variety were found as far south as Cañon City, August 11.

Cicindela duodecemguttata Dej.

On dark, sandy loam adjoining Beaver Brook in the Gulch, August 6. One specimen from the banks of the South Platte, west of Denver.

Fam. CARABIDÆ.

Calosoma obsoletum Say.

One specimen from the plains west of Denver. No others seen.

Pasimachus elongatus Le C.

One specimen taken by Dr. Hayden near Larkspur, on the Denver and Rio Grande Railroad. Others were captured by myself in the vicinity of Colorado Springs and on the hills west of Denver, August 16 to 18.

Platynus sp.

From the hills west of Denver, August 18.

Evarthrus substriatus Le C.

Common under stones and about the roots of yucca, near Colorado Springs, August 16.

Pterostichus sp.

Under stones and dried dung in the suburbs of Denver, August 8.

Chlœnius sericeus Forst.

In damp situations west of Denver, August 9.

Cratacanthus dubius Beauv.

Quite common in Denver and the vicinity under stones and rubbish, August 5-18; also at Colorado Springs, August 16; and in Clear Creek Cañon.

* I am indebted to Dr. George H. Horn and Otto Lugger for the determination of many of the species enumerated in this list.

Piosoma setosum Le C.

Found only at Colorado Springs, August 13 to 16; not common; living beneath rubbish on the ground.

Harpalus caliginosus Fab.

Very common at Denver, running among the dense weeds, and sometimes concealed beneath stones and rubbish, August 6 to 18. One specimen from Clear Creek Cañon.

Harpalus oblitus Le C.

Distributed everywhere, as well upon the plains as up into the mountains. I took specimens at Denver, high up Beaver Brook, near Colorado Springs, in Manitou Park, and near Cañon City, August 5 to 18.

Harpalus fallax Le C.

In alluvial soil near Cañon City, August 11; not very abundant. A few specimens were also found under stones in the vicinity of Colorado City, August 16. Not seen near Denver.

Harpalus ochropus Kirby.

A few specimens occurred west of Colorado Springs and near the Garden of the Gods, August 13.

Harpalus sp.

Found on the hills west of Denver, August 8.

Bembidium bifossulatus Le C.

In Clear Creek Cañon and Beaver Brook Gulch, August 6 and 7; also near the South Platte River, west of Denver.

Bembidium americanum Dej.

Very common near Sloan's Lake, west of Denver; but I did not meet with it in any other locality.

Fam. DYTISCIDÆ.

Laccophilus decipiens Le C.

Common in pools of water near Denver, August 5 to 8. Later in the month, these pools had dried up, and their insect inhabitants were no longer to be seen.

Rhantus binotatus Harris.

Very abundant in the same pools as the preceding; also in Sloan's Lake, August 8.

Fam. HYDROPHILIDÆ.

Hydrophilus triangularis Say.

In the pools near Denver, August 8. None found elsewhere.

Tropisternus nimbatus Say.

Very common in the pools of water on the plains in the vicinity of Denver; also in Sloan's Lake, and in standing water near Colorado Springs.

Tropisternus glaber Hbst.

In company with the preceding near Denver, but not at Colorado Springs.

Philhydrus sp.

A few specimens taken from the same pools as the preceding.

Fam. NITIDULIDÆ.

Carpophilus pallipennis Say.

Swept from bushes in the entrance to the Cañon of the Arkansas, August 11; not abundant.

Phenolia grossa Fab.

On plants near Cañon City, August 11. Only a few specimens taken.

Pallodes silaceus Erich.

Beaten from shrubs near the entrance to the Cañon of the Arkansas, August 11.

Fam. EROTYLIDÆ.

Cypherotylus boisduvali Chev.

From the mountains adjoining Clear Creek Canon, August 6.

Fam. COCCINELLIDÆ.

Hippodamia quinquesignata Kirby.

Quite common in Clear Creek Cañon, in Beaver Brook Gulch, August 6 and 7. Not seen near Denver, nor southward outside of the higher mountains.

Hippodamia convergens Guer.

Abundant on various flowering plants on the plains near Denver and on the low hills west of that city; also at Colorado Springs, August 5 to 16. Not met with in the mountains.

Hippodamia parenthesis Say.

Very abundant on plants in damp situations away from the mountains, everywhere from Denver to Cañon City. It was particularly abundant on the plains in the vicinity of Colorado Springs, August 16. In the mountains, a few specimens were seen at low levels in Clear Creek Cañon.

Hippodamia lecontei Muls.

Not common at Denver, but more so on the hills west of the city. One specimen from Manitou Park, August 14.

Coccinella transversalis Muls.

Common at Denver, at Colorado Springs, and in the vicinity of Cañon City, August 8 to 18.

Coccinella novemnotata Hbst.

Common in Clear Creek Cañon, at Denver, and in the vicinity of Cañon City.

Fam. HISTERIDÆ.

Hister sp.

A few specimens found beneath dried dung, near Denver, and in the vicinity of Colorado Springs.

Saprinus lugens Er.

One specimen from beneath a stone in Beaver Brook Gulch, August 6.

Fam. SCARABÆIDÆ.

Canthon hudsonius Forst.

One specimen from the hilly region west of Denver, August 18.

Diplotaxis carbonata Le C.

A few specimens were found in shelter under the bunches of yucca near Colorado Springs, August 13.

Tostegoptera lanceolata Say.

Found creeping out of holes in the patches of buffalo-grass on the hills near the Garden of the Gods, August 13 and 16. A few specimens had taken shelter under the tufts of grass, but generally they were clumsily crawling over the surface of the ground. Each hill furnished a few specimens, and they were usually found on the exposed summits, rather than on the sides or in the valleys. A careful search on the hills at Manitou failed to disclose any of them, and none were found in any of the other localities visited.

Collops quadrimaculatus Fab.

Common on sunflowers, in the valley of the Arkansas, east of Cañon City, August 10.

Fam. CLERIDÆ.

Trichodes ornatus Say.

Taken upon a tall golden-rod overhanging the stream, in Beaver Brook Gulch, August 7. Not met with in any other locality.

Hydnocera humeralis Say.

Common upon bushes in the mouth of the Arkansas Cañon, August 11. Although usually common upon small oaks, I failed to find specimens at Manitou, where small oak trees abound on the hill-sides.

Fam. MALACHIDÆ.

Listrus senilis Le C.

Rare, and taken near Cañon City, upon bushes, August 11, and at Colorado Springs, August 16.

Fam. CERAMBYCIDÆ.

Batyle ignicollis Say.

Rare, and met with only in the entrance to Beaver Brook Gulch, where it was flying in the bright sunlight, August 6.

Crossidius discoideus Le C.

One specimen from Beaver Brook Gulch, taken from a small *Helian-*

thus. At Colorado Springs, it was very common and variable in size, being found embedded in the crown of the sunflowers, and remaining there over night. They were noticed to be more active in the early morning and in the afternoon than at other times, and then might have been seen flying from one flower to another. Usually their markings were red, but at Denver two or three yellow-marked specimens were taken.

Sphænothecus suturalis Le C.

Upon flowers at Cañon City, but not common, August 11.

Cremastochilus knockii Kirby.

A few specimens were found beneath rubbish, in the vicinity of Colorado Springs, August 13 to 17.

Euryomia inda Linn.

Found flying near Bijou, August 19.

Fam. BUPRESTIDÆ.

Buprestis maculiventris Say.

Caught while flying toward a wood-pile at the entrance to Beaver Brook Gulch, August 6.

Taphrocerus gracilis Say.

Very common upon plants in damp situations in the western suburbs of Denver, August 5 to 9.

Fam. ELATERIDÆ.

Monocrepidius vespertinus Fab.

Two specimens, swept from herbage near the Cañon of the Arkansas, August 11.

Fam. LAMPYRIDÆ.

Photinus pyralis Linn.

Near Denver, August 8. Not abundant.

Fam. TELEPHORIDÆ.

Chauliognathus basalis Le C.

Common in various places on the plains. Very abundant at Colorado Springs, Cañon City, and Bijou; less so near Denver, August 8 to 19.

Telephorus bilineatus Say.

On grass and weeds near the mouth of the Cañon of the Arkansas, August 11.

Fam. MALACHIIDÆ.

Collops bipunctatus Say.

A few specimens were swept from flowering plants near Colorado Springs, August 16; also at Cañon City, August 11.

Rhopulophora longipes Say.

On weeds in the vicinity of Denver, not common, August 8.

Leptura rubrica Say.

One specimen, taken on the wing, in Beaver Brook Gulch, August 6 and another near Cañon City, August 11.

Dectes spinosus Say.

A single specimen only was taken at Cañon City, August 11; a few others were beaten from weeds near Pueblo.

Tetraopes annulatus Le C.

A few specimens were swept from the *Asclepius*, on the hills west of Denver. Although the same and other kinds of milk-weed were met with in many other places, no further specimens were seen. Evidently the season was far advanced for them, and the flowers whose colors they so well matched were generally out of bloom or drying up. They were met with early in August.

Fam. CHRYSOMELIDÆ.

Babia quadriguttata Oliv.

Swept from rank growths near Manitou and adjacent to the creek flowing west of Colorado Springs, August 12 and 13.

Euryseopa lecontei Cr.

A few specimens were beaten from oak bushes in the vicinity of Manitou, August 13.

Cryptocephalus notatus Fab.

Not common; but a few specimens were swept from weeds, in the neighborhood of Manitou, August 13. One specimen was also taken in the valley of the Arkansas, near Cañon City.

Cryptocephalus guttulatus Oliv.

One specimen from the vicinity of Cañon City, August 10.

Pachybrachys tridens Mels.

From the region of Colorado Springs, August 16. Moderately common.

Chrysomela exclamationis Fab.

Taken from weeds in Clear Creek Cañon and near Denver, August 6 to 9. Not met with elsewhere.

Diabrotica tricincta Say.

Very common almost everywhere, especially where the soil was moist in the vicinity of streams and irrigating-canals.

Galerucella sp.

A few specimens somewhat related to *G. notata* Fab. were found on plants growing about the Beaver Brook, August 6.

Disonycha punctigera Le C.

Common on various plants near Colorado Springs, August 12.

Disonycha triangularis Say.

Not uncommon at Cañon City, August 11, and near Colorado Springs, August 13.

Graptodera plicipennis Mann.

Local, but quite common on a tall golden-rod growing near the stream in Beaver Brook Gulch, August 6, and also in the western part of Denver.

Graptodera punctipennis Le C.

Found abundantly at Denver, at Colorado Springs, and near Cañon City, August 8 to 13, on the willows, in wet situations.

Odontota inæqualis Web.

Common in Clear Creek Cañon and in the western suburbs of Denver, August 6 to 9.

Fam. TENEBRIONIDÆ.

Epitragus canaliculatus Say.

Found only near the mouth of the Cañon of the Arkansas, upon a species of slender, narrow-leaved *Euphorbia*, which grew upon a spot of white sand. The insects were thickly powdered with a white, mealy substance, which easily rubbed off. They loved to crawl into the axils of the flower-stems, and lay concealed there during the time of bright sunshine, but early in the morning and toward evening twilight they ran actively over the plants and pursued each other over the surface of the ground. They showed wonderful dexterity in gliding beneath the sand when I attempted to catch some of them, and they sometimes concealed themselves quite successfully by burrowing into the sand at the root of the plants. Neither the plant nor these insects were to be seen in any of the other localities that I visited.

Asida opaca Say.

Not rare, but found wide apart, scattered over the plains and lower hills, particularly in the vicinity of the Garden of the Gods. A few specimens occurred at Denver, August 18; others at Colorado Springs, and later at Bijou. Each hill west of Colorado Springs seemed to afford a variety peculiar to itself, but the whole series taken together exhibited such minute gradations that there was no reason to regard the extremes as distinct species. These variations are shown in the proportions of the thorax and elytra of the specimens, in the amount and prominence of their sculpture, and in the shape of their outline. No specimens occurred in the valley of the Arkansas, nor near its cañon.

Asida sordida Le C.

Met with only in the vicinity of Denver, August 18.

Asida elata Le C.

One specimen taken running among the grass in the evening, near Colorado Springs, August 16, and another from the vicinity of Cañon City, August 11.

Eusattus reticulatus Say.

Taken in considerable numbers on a dark sandy spot on the banks of the Arkansas River west of Cañon City, August 11. Some of them were snugly stowed away behind the loose bark around the base of a cottonwood tree, others were in the sand in holes or beneath chips, and still others were upon or around the roots of a species of *Euphorbia* growing abundantly at that spot. I could not find them in any other locality, although I searched carefully in many such places as seemed to be promising for their appearance. They hide during the bright part of the day, but run about with great activity upon the approach of evening twilight.

Eleodes tricostata Say.

This species was quite common upon the plains in the region near and west of Colorado Springs, August 10 to 16. No specimens occurred to me in any other locality. They were generally found beneath rubbish in the ground, or hid away around the roots of yuccas and other plants.

Eleodes hispilabris Say.

Not rare, but widely scattered. A large number of specimens might have been secured by searching over a large extent of surface, but it was quite rare to find more than two specimens at a single spot. It was met with at all points on the plains, from Colorado Springs to Cañon City, August 10 to 16.

Eleodes obsoleta Say.

Common on the plains, beneath cow-chips and rubbish, everywhere from Denver to Colorado Springs. I did not find it abundant south of the latter place, and it was only rarely to be seen in the vicinity of Cañon City. Found August 16 to 18.

Eleodes suturalis Say.

Met with only at Denver, August 8. But most likely the season was too far advanced for it to be found elsewhere and in the usual numbers.

Eleodes extricata Say.

Quite common beneath rubbish in the vicinity of Colorado Springs, August 13 to 16; but I failed to find a specimen of it north of this region.

Eleodes nigrina Le C.

Occurred sparingly beneath chips and rubbish in Manitou Park, August 14, but was not seen in any other locality.

Embaphion muricatum Say.

This monstrous-looking insect was found rarely, and only on the hillside near Colorado Springs, August 16.

Fam. MORDELLIDÆ.

Mordellistena arida Le C.

Common on various flowers growing near the mouth of the Cañon of the Arkansas, August 10.

Other small species were found at various points on the plains, most of them being of a black color, marked with sericeous pubescence.

No specimens of the larger forms, such as *Mordella* and *Rhipiphorus*, were found, although localities favorable to their appearance were frequently met with.

Fam. MELOIDÆ.

Epicauta ferruginea Say.

Very abundant upon the plains and in some places in Clear Creek Cañon, settling in the heads of many kinds of flowers, but especially in the various kinds of sunflowers, August 4 to 18. It was not only to be found upon the plains, but was far from uncommon in the parks of the mountains, as at Manitou Park and elsewhere, wherever sunflowers and golden-rod were in bloom.

Epicauta pensylvanica De G.

Occurred only at Bijou, chiefly on the flowers of a golden-rod, August 19.

Pyrota engelmanni Le C.

Common at Bijou, August 19, on the flowers of golden-rod, etc. Not met with in any other locality.

Cantharis nuttalli Say.

A dead specimen was picked up in Manitou Park, the only one I was able to find during the whole course of my excursion.

Cantharis biguttata Le C.

On flowers at Colorado City and also near Cañon City, August 10 to 16. Not abundant.

Zonitis atripennis Say.

Abundant at Cañon City, but rare at Colorado Springs, and only a little more common at Bijou; on sunflowers, etc.

Zonitis bilineata Say.

Rare, and found only at Cañon City, on sunflowers.

Nemognatha immaculata Say.

Common at Cañon City and at Bijou, on sunflowers, etc., August 10 to 19.

Nemognatha lurida Le C.

Found only at Cañon City, in small numbers, on flowers.

Gnathium minimum Say.

This very interesting species occurred in considerable numbers upon the heads of sunflowers, near Cañon City, August 10 and 11. It often lay bent together and buried in the mass of stamens and pollen of these

flowers. As its color agreed well with those organs, it was generally well concealed from view. It was not met with in any other locality.

Several minute forms of *Curculionidæ* were swept from various plants and flowers in the valley of the Arkansas, near Colorado Springs, and at Denver, but a larger number of specimens of them will have to be collected before the species can be determined with precision.

DIPTERA.*

Fam. TIPULIDÆ.

Dicranomyia longipennis Loew.

West of Denver, August 5.

Symplecta punctipennis St. Farg.

Observed on the plains near Denver, August 5 and later.

Ptychoptera lenis O. S.

Occurs in Clear Creek Cañon and in Beaver Brook Gulch, August 6.

Bittacomorpha clavipes Fab.

A few specimens were observed in the suburbs of Denver, flying over marshy patches of ground.

Pachyrrhina ferruginea Fab.

Captured on the plains, near Denver, August 8.

Fam. STRATIOMYIDÆ.

Nemotelus canadensis Loew.

Moderately common in the vicinity of Colorado Springs, and also in Manitou Park, August 10 and later.

Chloromyia viridis O. S.

Common in the vicinity of Denver, and also at Colorado Springs.

Odontomyia nigristrostris Loew.

Very common on sunflowers, on the heads of which they lodge and remain for hours. Colorado Springs and Denver, August 8 to 18.

Odontomyia binotata Loew.

This very beautiful species occurred at Colorado Springs August 17. It was the rarest of them all.

Two other species of *Odontomyia* were captured in the vicinity of Colorado Springs, but I am unable to cite their specific names.

All of these species were most abundant near Colorado Springs, and only one specimen of *O. nigristrostris* was found in Manitou Park.

* Kindly determined for me by Baron C. R. von Osten Sacken.

Fam. TABANIDÆ.

Pangonia incisa Wied.—*Pangonia incisuralis* Say.

Occurred at Colorado Springs, flying over the heads of sunflower, but not common, August 17.

Chrysops fulvaster O. S.

Common in the western suburbs of Denver, among the willow trees, August 5; one specimen was captured in the pine woods on the side of the mountain adjoining Clear Creek Cañon, August 7. They have the same vicious propensities common to our species of the Atlantic region, in flying upon the unprotected face or hands of human beings, and quickly inflicting a wound, which smarts keenly.

Fam. BOMBYLIDÆ.

Exoprosopa decora Loew.

Occurs on the plains near Denver City, August 5 and later.

Exoprosopa dorcadion O. S.

This beautiful species was moderately common on the low hills west of Denver, August 8 to 18. One specimen was also found at Cañon City.

Many of the specimens of this and other *Diptera* were more or less denuded of their fur by the driving winds, loaded with fine sand, which preceded the rain-storms. Sometimes after the showers, these and other hairy insects were found lying on the ground near plants soaked with wet, and with scarcely a hair or scale of the upper surface remaining. At Cañon City, the winds, loaded with fine sand, were more intolerable than at any other place that I visited; and at that point I saw many insects destroyed and denuded by their agency. No doubt, these sand blasts lend their influence in determining the various shapes of many of the sandstone pillars with which the plains and highlands of Colorado are studded near the mountains and in the parks.

Exoprosopa titubans O. S.

In the suburbs of the city of Denver, lodging upon bare sandy spots in the midst of the patches of flowers and weeds, August 5 to 8.

Exoprosopa dodians O. S.

Two specimens, one from Manitou and the other from the hill-side near Colorado Springs, August 13 to 16.

These very attractive insects were seen at almost every locality on the plains and foot-hills, and also in Clear Creek Cañon. They balance over the bare sandy spots in the bright sunshine, and then dash suddenly and settle upon the ground with their wings fully expanded. Doubtless many other species and varieties might have been captured if my time could have been so employed.

Dipalta serpentina O. S.

I met with it only in Clear Creek, where but a few specimens were seen flying near the road and lodging upon the rocks, August 6 and 7.

Anthrax sinuosa Wied.

Rather common in Clear Creek Cañon and Beaver Brook Gulch, August 6 and 7, but not seen in any other locality. At Denver it was replaced by another species, and at Colorado Springs and farther south still other species occurred.

Anthrax halcyon Say.

Not rare at Colorado Springs and Manitou, August 12 to 16.

Anthrax allied to *alternata* Say.

Rare in Clear Creek Cañon, August 6. A closely related, if not identical, species was common in the suburbs and vicinity of Denver, but only one dwarf specimen reached home in good condition.

Anthrax sp.

Other species were found at Colorado Springs, and one or perhaps two others were common on the highlands near and west of Denver.

Thereva sp.

Found in moderate abundance in the valley of the Arkansas near Cañon City, August 10 and 11.

Systoechus vulgaris Loew.

Extremely common on the plains from Denver to Colorado Springs, August 5 to 18; but no specimens occurred at Cañon City. It balances itself above the flowers and plants in sunny spots, and flits from place to place over short distances with such rapidity that the eye can scarcely trace its flight. It is admirably protected by the yellow flowers upon which it sometimes alights.

Lordotus gibbus Loew.

This exquisite species was rare. One specimen was captured in the act of settling on a sunflower at Colorado Springs, August 17, and another at Denver, August 18.

Sparnopolius coloradensis Grote.

One specimen from near Colorado Springs.

Phthiria sulphurea Loew.

Not uncommon in the vicinity of Colorado Springs.

Fam. ASILIDÆ.

Asilus sp.

A very large species is common on the low hills west of Denver, August 8 to 18. It and two other kinds of somewhat smaller size were seen seizing the different species of *Calopteni*, and destroying them. At Colorado Springs, one of this group was very useful in killing *Caloptenus spretus*, and, in the valley of the Arkansas, the same fact was observed on several occasions.

Species of *Mallophora*, *Stenopogon*, *Scleropogon*, *Machimus*, *Erax*, and *Diogmites* were found commonly on many parts of the plains and foot-

hills, and less numerous in the cañons of the mountains. The species and forms of this group must be very numerous in Colorado, and every large locality seems to have one or more local forms.

Stenopogon allied to *trifasciatus* Say occurs in numbers on damp sands near the Arkansas River, and also in Denver, near the South Platte and its affluents.

Ospriocerus wacus Wied.

This beautiful species, so strongly resembling a *Midas*, was found near Colorado Springs and in the vicinity of Cañon City, August 11 to 16.

Fam. DOLICHOPODIDÆ.

Dolichopus sp.

This vivid green insect was very common on the weeds of damp spots in the suburbs of Denver.

Fam. SYRPHIDÆ.

Eupeodes volucris O. S.

A few specimens were taken by me at Denver and in Clear Creek Cañon, but, to my surprise, it was not met with in any other locality that I visited, August 6 to 8.

Eristalis stipator O. S.

Found singly upon the white flowers of a low plant growing in the meadow at Manitou Park, Colorado, August 14.

Syrirta pipiens Linn.

Somewhat common at Denver and in Clear Creek Cañon, August 6 to 18, and less common near Colorado Springs.

Fam. TRYPETIDÆ.

Trypeta sparsa Loew.

Found in Manitou Park in very small numbers, August 14.

Trypeta alba Loew.

Common near Cañon City, August 11.

Trypeta humilis Loew.

Moderately common at Denver, August 8 and later.

Trypeta (Edicarena) persuasa O. S.

Two specimens obtained by sweeping the weeds in the valley of the Arkansas, near Cañon City, August 11. It has the same markings as seen on the wings of a group of this genus belonging to Central America, Cuba, Hayti, and Mexico, but is no doubt distinct from the species thus far described.

Trypeta sp.

Allied to *T. solaris* Loew. The specimens were taken in the vicinity of Colorado Springs.

Trypeta sp.

Allied to *T. palposa* Loew. Common at the same place as the preceding species.

Trypeta sp.

Allied to *T. æqualis* Loew. Common in the region around Cañon City, August 11.

Fam. CONOPIDÆ.

Several forms of genera, some of them new, were collected on the plains near Denver, at Colorado Springs, and at Cañon City, but their names cannot now be determined.

Fam. MUSCIDÆ.

Sarcophaga sp.

Two species were common in the region adjacent to Colorado Springs and Manitou at the time when the *Caloptenus spretus* was swarming. Both of them attacked the grasshoppers and laid eggs upon them.

Sepedon fumipennis Loew.

Very common at Denver and Colorado Springs upon plants in damp situations.

Sepedon armipes Loew.

Common in the same localities as the preceding.

Meromyza americana Fitch.

This was a very common species upon weeds in damp places near Denver, August 5 to 18.

Calobata, *Dexia*, *Miltogramma*, and *Anthomyia* of different species were found in many localities, but the species are as yet unknown to me.

HYMENOPTERA.*

Apis fasciata Lat.

A few specimens occurred on the flowers of *Malva* and on some other low plants at Cañon City, August 11.

Bombus ternarius Say.

One specimen from Beaver Brook Gulch, August 6.

Melissodes texana Cresson.

Common at Colorado Springs, August 17.

Melissodes pennsylvanica St. Farg.

Not rare near Cañon City, August 11.

Melissodes mennacus Cresson.

A few specimens were taken at Cañon City, August 11.

Melissodes new sp.

A few species occurred to me in Manitou Park, August 14. No specimens were found at any other point.

* The species of this order were kindly determined for me by Mr. E. T. Cresson.

Megachile coloradensis Cresson.

Not rare at Colorado City, August 13.

Megachile inimica Cresson.

Moderately common in the vicinity of Denver, August 5 to 9.

Megachile new sp.

A few specimens only were captured in Clear Creek Cañon, August 6.

Megachile new sp.

Three new species were found near Colorado Springs, on the flowers of the plains, August 13 and later.

Cœlixys editha Cresson.

Not rare in the region around Colorado Springs, August 13 and later.

Anthidium zebratus Cresson.

Moderately common near Colorado Springs.

Anthidium occidentale Cresson.

Found in the same place as the preceding. Generally captured while flying upon the heads of sunflowers and other kinds of flowers.

Anthidium maculifrons Smith.

This very neat insect was found upon the flowers of *Euphorbia* in the western suburbs of Denver. It was not abundant, but seemed rather tame and easy to capture, August 8.

Panurgus new sp.

Common on the white flowers of *Euphorbia*, in and near Denver, August 5 and later.

Panurgus new sp.

Two other new species were common on flowers in the region around Colorado Springs, August 13.

Panurgus new sp.

Common on a narrow-leaved *Euphorbia* in the vicinity of Cañon City, August 10 and 11.

Panurgus aethiops Cresson.

Not rare in the western suburbs of Denver, August 5 to 18. On the heads of several kinds of flowers.

Nomada new sp.

Two new species of this genus were common on flowers in the vicinity of Colorado Springs.

Epeolus new sp.

Found near Colorado Springs, August 17. Only a few specimens seen.

Sphcodes new sp.

Common near Cañon City, August 11.

Calliopsis new sp.

A few specimens were obtained both at Cañon City and at Colorado Springs, August 11 to 17.

Agapostemon tricolor St. Farg.

Not rare in the vicinity of Colorado Springs, August 13 to 17.

Agapostemon new sp.

A few specimens were taken near the foot-hills west of Colorado Springs, August 13.

Andrena polygama Davis.

Two specimens captured at Manitou, August 13.

Halictus new sp.

Not rare in the valley of the Arkansas west of Cañon City, August 11.

Colletes consors Cresson (?).

A few specimens occurred at Cañon City on flowers, August 11.

Fam. VESPIDÆ.

Polistes aurifer Sauss.

An exceedingly abundant species on various kinds of flowers, such as *Polanisia* and golden-rod, in the vicinity of Denver, in Beaver Brook Gulch, and in Clear Creek Cañon, early in August.

Eumenes occidentalis Cresson.

Moderately common in Beaver Brook Gulch and in Clear Creek Cañon, August 6.

Odynerus new sp.

Common in the vicinity of Colorado Springs, August 13 and later.

Polybia flavitarsis Sauss.

A few specimens were flying around flowers in Beaver Brook Gulch and in Clear Creek Cañon, August 6 and 7.

Fam. CRABRONIDÆ.

Cerceris new sp.

Moderately common in Clear Creek Cañon, August 7.

Eucerceris fulvipes Cresson.

Many specimens seen and a few captured in the vicinity of Colorado Springs, August 13 and later.

Philanthus laticinctus Cresson.

A few specimens were taken in the valley of the Arkansas, near Cañon City, August 11.

Philanthus new sp.

Not uncommon on the heads of *Polanisia* and other flowers in the western suburbs of Denver, August 8 and later.

Thyreopus coloradensis Pack.

Moderately scarce in Clear Creek Cañon, August 7.

Fam. NYSSONIDÆ.

Gorytes montanus Cresson.

Found in small numbers west of Colorado Springs, August 13.

Fam. BEMBECIDÆ.

Monedula fasciata Fab.

Extremely abundant on the sandy banks of a small stream in South-western Denver, August 5 and later. They had penetrated the ground in a few places, giving the surface the appearance of having been riddled with large shot.

Fam. SPHEGIDÆ.

Ammophila pruinosa Cresson.

Common on the plains in and near Denver, August 5 and later. This interesting species was most common in localities between the rankly growing flowers and weeds. Having thus a ready means to hide, it was rather difficult to detect.

Ammophila macra Cresson.

Not very common. Occurring in Clear Creek Cañon, and also in Beaver Brook Gulch, August 6 and 7. It is fond of alighting upon the flowers of golden-rod, and of embedding itself in the abundant pollen.

Priononyx atrata St. Farg.

Moderately common on flowers in the region of Colorado Springs, August 13 and later.

Priononyx thomæ Fab.

Found on the high grounds west of Denver, but not very common, August 18.

Pelopæus cementarius Dr.

A few specimens seen, and one captured in the street of Colorado City, August 17. I did not find any of the mud cells, but doubtless they were at hand in some of the wooden sheds or houses near. Some of them were nervously jerking themselves about on the surface of the damp soil near the Fountain Creek, but I did not actually observe them in the act of making the usual mud pellets.

Fam. POMPILIDÆ.

Pompilus æthiops Cresson.

Moderately common on the plains west of Colorado Springs, August 16. It struck me as remarkable that I did not find this common-looking form in other localities.

Pompilus formosus Say.

Several specimens of this very large and conspicuous wasp were found on the hill-side west of Cañon City, and two others were flying actively over and around the tall weeds and flowers in the mouth of the Grand

Cañon of the Arkansas, August 11. No specimens occurred to me in the region north of the Arkansas River; but in that valley it was to be seen singly in various places, from Pueblo westward to near the mountains.

Priocnemis flammipennis Smith.

Found singly on the highlands west of Denver, August 18.

Fam. SCOLIADÆ.

Tiphia albilabris St. Farg.

Seen in small numbers on flowers in the vicinity of Colorado Springs, August 13 and later.

Myzine hyalina Cresson.

This very slender relation of our eastern species was quite common on the flowers of golden-rod, in Clear Creek Cañon and in Beaver Brook Gulch, August 6 and 7. Two or three specimens were to be seen on each head of flowers, and they were enjoying themselves in the bright, hot sunshine by meandering through the florets and dusting their bodies with a good coating of the yellow pollen. Only males were seen.

Fam. MUTILLIDÆ.

Mutilla bioculata Cresson.

Common in and near the mouth of the Cañon of the Arkansas, August 10 and 11.

Mutilla occidentalis Drury.

One female of this large red species was found among the stones on sandy ground in the valley of the Arkansas east of Cañon City, August 10.

Fam. FORMICIDÆ.

Formica rufa Linn.

The neuters and females of my specimens correspond so closely with the descriptions and figures of *F. rufa* Linn., that I am impelled to refer them to that species. They abound on the plains in certain localities, extending all the way from near Denver to just a little distance from the valley of the Arkansas. It is the hillock-building species of the plains adjacent to the mountains, and seems to belong to most sandy situations not strictly within the limits of the alkaline soils. A closely allied, if not identical, species undermines the soil on the south bank of the Arkansas River, just inside the mouth of the Grand Cañon, and there exists in countless multitudes.

Many other kinds of the genus *Formica*, *Myrmica*, and allied genera inhabit the plains and mountains of Colorado, but it is not possible for me to give a list of their names. The houses in Denver City and Colorado Springs are infested with swarms of minute Myrmicas, just as we have them on the Atlantic side of the continent. In two or three places, I found it difficult to secure my collections from their insinuating propensities.

Fam. CHRYSIDIDÆ.

Chrysis new sp.

This beautiful little green-blue species occurred in small numbers at Colorado Springs, August 13.

Fam. ICHNEUMONIDÆ.

Agathis vulgaris Cresson.

Common in the vicinity of Colorado Springs, and chiefly in places near water, where the plants grew dense and tall, August 13 and later.

Microdus new sp.

Occurring singly among the tall weeds in the vicinity of Cañon City, August 11.

Ophion purgatum Say.

Rare in the western suburbs of Denver, August 8.

Campoplex laticinctus Cresson.

Taken singly beyond Colorado Springs, near the Fountain Creek, August 16.

Nototrachys reticulata Cresson.

Two specimens from Colorado Springs, August 13.

Nototrachys new sp.

Taken at Cañon City, August 11. Only two specimens seen.

Cryptus americanus Cresson.

Seen in many places on the highlands west of Denver, and also at Bijou, August 18 and 19.

Cryptus tejonensis Cresson.

Two or three specimens seen flying in Clear Creek Cañon, but only one captured, August 6.

From the above list of names, with the localities of the species, it will be readily seen that a most interesting contribution to the history of modern high types of insect life might be made by a careful and full survey of the territory of Colorado east of the mountains. Every large area yields forms peculiar to itself, and, when these shall have been all brought together, it will be possible to entertain a more adequate idea of the limits of each. We may fairly expect to find separate faunal districts north and south of the *Divide*.

NEUROPTERA.

Fam. HEMEROBINA.

Hemerobius sp.

Two or three species of this genus were swept from bushes in the Clear Creek Cañon and in the Cañon of the Arkansas.

Polystæchotes punctatus Fab.

Found flying around the city-lamps in Denver, and about the lantern at Beaver Brook station, August 6 to 18.

Chrysopa sp.

One species was common in and near Denver, and a second at Colorado Springs. Both are small, and appear to belong to the group of *Ch. nigricornis* Burm.

Myrmeleon sp.

One species allied to *M. immaculatus* De Geer was swept from the tall grass and plants west of Denver, and a specimen of the same was captured near Golden, August 6 to 18.

Myrmeleon sp.

Another species resembling *M. salvus* Hagen was common on the plains near Denver, on the highlands west of that city, at Golden, at Colorado Springs, and on the hills near the Garden of the Gods, August 8 to 19.

Fam. PHRYGANIDÆ.

Phryganea sp.

A species similar to *P. interrupta* Say was swept from a bush overhanging Beaver Brook, not far from its entrance into Clear Creek Cañon, August 6. It was to be expected that these mountain streams would furnish many varieties of this family; but my most ardent labors in beating every bush and sweeping every plant along the banks did not yield adequate results.

Setodes sp.

A pretty little insect of this genus was captured near Colorado Springs and near the Cañon of the Arkansas.

Hydropsyche sp.

One or two species of this group were common in the valley of the Arkansas, near and in the cañon, August 11.

PSEUDONEUROPTERA.

Fam. LIBELLULIDÆ.

Diplax vicina Hagen.

Two or three specimens were taken in the western suburbs of Denver, and the species also occurs at Sloan's Lake, on the highlands beyond Denver, August 8 to 18.

Diplax semicineta Say.

Very common in the western suburbs of Denver, near a marshy spot resulting from the overflow of the creek which empties into the South Platte River. Some of the specimens had only a small faint cloud of the brownish-yellow color upon the wings; while in others the deep color was quite distinct from the base to beyond the middle. A similar disparity was also observed in the size of specimens; the smallest being fully one-fourth less in expanse of wings than the largest. August 5 and later.

Diplax rubicundula Say.

Quite common in the suburbs of Kansas City, and at many points along the railroad leading through Kansas to Denver.

Mesothemis corrupta Hagen.

Moderately common near pools and streams on the plains in and beyond Denver, August 5 and 8. It seemed to have disappeared by the 18th of the month, as I then failed to see it in the same or similar localities.

Mesothemis longipennis Burm.

Observed in many places in Kansas, and one specimen seen in the valley of the Arkansas, near Pueblo.

Libellula pulchella Drury.

One specimen observed in the suburbs of Denver, August 5. It kept out of the reach of my net, and I was unable to secure it, although it flew sometimes within three or four feet of the point where I stood.

Libellula luctuosa Burm.

This species was very common all along the railroad through Kansas; but no specimens were to be seen at a distance from the streams and pools of water on the plains of Colorado.

Libellula forensis Hagen.

One specimen of this fine insect was met with on the road leading from Denver to Golden, and at a distance of about six miles from the former city. I obtained a full view of it, but could not get near enough to capture it.

Cordulia sp.

One, if not more, of the brilliant green species of *Cordulina* was seen in localities near the South Platte River; but none were in places where I could capture them. A similar insect was seen near buffalo-pools at several of the stopping-places along the line of the Kansas Pacific Railroad, within the limits of Colorado.

Æschna constricta Say.

Observed in many places in Kansas and Colorado, along the line of the Kansas Pacific Railroad, generally flying over pools of water. In Clear Creek Cañon, it was seen at intervals of every few rods flying over the creek or lodging on the rocks of the open spaces and around the openings of the gulches, August 6.

Æschna sp.

A larger species than the preceding was flying about near the mouth of Clear Creek Cañon, but it was beyond the reach of my net.

Anax junius Drury.

Very common along the Kansas Pacific Railroad, through Kansas and into Colorado. It was always seen on the wing, flying over the railroad ditches or pools.

Ophiogomphus severus Hagen.

Occurred singly, flying actively over Clear Creek in the cañon, or in Beaver Brook Gulch, August 6 and 7. It was seen at many intervals along the latter brook, even up toward the high levels, nearly 8,000 feet above the sea. Its color when living is a clear pea-green, with dark purplish-brown markings on the thorax and abdomen. The stripes of the legs are fuscous. Like many others of this group, it flies rapidly backward and forward for the distance of a few yards over the running water, and then lodges for a moment on a rock or projecting bush. Being very wary, it is quite difficult to capture.

Agrion hastatum Say.

A few specimens were captured in the western suburbs of Denver August 5.

Agrion saucium Burm.

One female taken at the same place.

Agrion civile Hagen.

A few specimens were seen on the highlands west of Denver, in the vicinity of Sloan's Lake, August 8 and 18.

Agrion sp.

A species closely allied to, if not identical with, *A. doubledayi* Selys, was very common around damp spots in the western suburbs of Denver, August 18.

Fam. PERLIDÆ.

Perla sp.

A small species was found upon tall weeds and plants in the mouth of the Grand Cañon of the Arkansas, August 10.

Chloroperla sp.

A beautiful little green species occurred at the same place as the preceding.

Fam. EPHEMERIDÆ.

Baetis sp.

One small species was common in Clear Creek Cañon, and two or more smaller species were abundant near the cañon of the Arkansas.

Fam. TERMITIDÆ.

Termes sp.

An insect closely related to *T. flavipes* Hagen, and of about the same size, was common under stones near Colorado Springs, and beneath chips and logs west of Cañon City, August 10 to 16.

ORTHOPTERA.

Fam. MANTIDÆ.

Mantis sp.

The nymph of a narrow, small species was found stowed away at the base of a yucca on the hill-side near Colorado Springs. It had taken refuge there from the heavy storm in company with other insects. A smaller specimen was swept from a sunflower at the same place.

Fam. GRYLLIDÆ.

Gryllus sp.

The larva of a black cricket was taken beneath stones and rubbish near Colorado Springs. A similar form occurred near Denver and in the entrance to the Grand Cañon of the Arkansas. Only one adult specimen was met with anywhere, and the young specimens were not common in either of the above-mentioned places.

Ecanthus niveus Serv.

One specimen was seen at Denver; but the species was comparatively common around Colorado City and in the valley of the Arkansas River.

Fam. LOCUSTIDÆ.

Ceuthophilus sp.

A form closely related to *C. maculatus* Harris was found beneath a decaying pine log and chips high up the mountain-side, beyond Beaver Brook, August 7. Young specimens of a similar species were detected beneath stones on the hill-side near Colorado Springs.

Phylloptera sp.

The young nymphs of this genus were not uncommon among the grape-vines and rank weeds in the valley of the Arkansas and near Colorado City.

Orchelimum sp.

A fine large species occurred among the grass and weeds in the valley of the Arkansas River, a mile or more east of Cañon City.

Xiphidium sp.

A species similar to *X. fasciatum* Serv. was common in Beaver Brook Gulch, also in Denver and beyond that city, on the farms, and in the entrance to the Grand Cañon of the Arkansas.

Fam. ACRIDIDÆ.

Stenobothrus latus new sp.

Ground-color above bright apple-green, including the upper part of the face; cheeks and labrum paler green, or tinged with rosy-testaceous. Antennæ longer than the head and prothorax united, dusky greenish, paler at base, flattened, tapering at tip. Wing-covers deeper green, narrow, the costal margin curved, a little expanded beyond the base; the discoidal area wide, having numerous quadrate areoles, and with about four black spots, the two intermediate of which are round and larger; costal and cubital fields dusky, the second with a series of about four irregular black dots; posterior field brown, with the bases of the thick veins black and the margin green. Head thick, convex on the sides, the sutures between the genæ and front black, and a triangular black spot behind each eye; the margins of the fastigium brown, and the ridge above the eye fuscous. Face oblique, but curved, the vertex

higher above the eyes than before or behind, lowest behind; fastigium of medium width, forming an equilateral triangle with the tip blunted; facial ridge narrow above, tapering toward the fastigium, sulcated from thence to below the middle, expanding toward the epistoma. Lateral foveolæ substituted by a flat, sunken continuation of the eye-sockets; above each eye is a lunate fovea, bounded exteriorly by a thickened, prominent margin. Prothorax curvedly contracted each side, the central carina distinct and prominent, the lateral ones arcuated and less distinct; all three embrowned, and exterior to the latter is a broad, black stripe expanded posteriorly; disk of the side-flaps with two or three cuneiform black marks, the middle ones placed on indented lines. Abdomen greenish-testaceous, with a dorsal row of small black spots, a row of somewhat larger ones each side, and with a series of still larger, cuneiform, transverse ones above the longitudinal sutures; the superior terminal segment submargined with black, and with a median black stripe. Anterior femora infuscated at tip superiorly; middle ones with two or three patches of fuscous dots on the upper sides, and posterior ones greenish, with three fuscous clouds on the inner face, the upper edge, an oblique band, and a cloud at each end of the outer face; the knees black; the tibiæ bright red and with yellow spines, which are widely terminated with black. Wing-covers a very little shorter than the body. ♂.

Length to tip of genital segments 15^{mm}; of antennæ 8^{mm}; of tegmina 9^{mm}; of hind femora 10^{mm}.

Occurring singly on bare sandy spots between Cañon City and the mouth of the Grand Cañon of the Arkansas. The colors decidedly change after death, some of the more delicate green parts becoming dull testaceous or pale brownish-yellow.

Stenobothrus sp.

Closely allied to *S. maculipennis* Scudder, and perhaps the same species; but I have no specimens now at hand to enable me to make a comparison. Not rare in the vicinity of Cañon City, August 11.

Stenobothrus sp.

Having somewhat the appearance of *S. curtipennis* Scud., but with arcuated lateral carinæ, and with tegmina nearly as long as the body. Common in Manitou Park, August 14.

Stenobothrus sp.

Allied to the preceding, but differing in details of marking. Colorado Springs, on the hill-sides west of the city, August 16.

Stenobothrus sp.

Same group as the foregoing two species, but more robust, and with shorter antennæ. Found on August 6 in Beaver Brook Gulch. Not common there.

Acrolophita hirtipes Say.

Inhabits the hilly country west of Colorado Springs. It was only found singly, and at remote intervals, in places where the grass was moderately thick and tall, August 16.

Tropidolophus formosus Say.

On the plains, in the tall grass, near Bijou, August 19. It was seen only one at a time, and at remote intervals, a few rods from the Bijou Creek.

Edipoda carolina Linn.

Extends across the continent, from the Atlantic coast to the foot-hills near the Rocky Mountains. It was not frequently seen on the great treeless plains, except near the water-courses, or where vegetation was luxuriant. At Denver, and all along the railroad as far as Cañon City, it was often to be seen flying in the air. Near Colorado Springs, it was common everywhere, and a single specimen was seen in the entrance to Clear Creek Cañon.

Edipoda carlingiana Thomas.

The black base of the wings of this species makes it quite conspicuous when flying. It is very wild, and found singly in the vicinity of Colorado Springs, August 16.

Arphia carinata Scudder.

Found singly at Colorado Springs, and westward to the Garden of the Gods, August 12 to 16. It occurs in single specimens at remote intervals.

Trimerotropis aequalis Say.

Common in most parts of Eastern Colorado, on the plains and foot-hills, as also in Clear Creek Cañon, and in the gulches near Manitou, August 6 to 18.

Psinidia eucerata Harris.

Exceedingly common south of Colorado City and in the vicinity of Cañon City. It is variable in colors and markings, just as we find it to be in Maryland and New Jersey. Specimens found on the white sands are very pale-colored, almost white, with wings varying from pale yellow to pale red-lead. Those of the dark soils and loams are dark-colored, fuscous or grayish brown, with darker mottlings on the tegmina, and with deep-red wings. August 10 to 17.

Near the cañon of the Arkansas, an allied species occurred, with more prominent eyes and somewhat shorter antennæ, but having the same peculiarities of coloring as the preceding. It is probably undescribed.

Circotettix undulata Thomas.

Somewhat uncommon at Colorado Springs and near Cañon City, August 10 to 17.

Hadrotettix trifasciata Say.

Very common in many places near Colorado Springs, in the valley of the Arkansas, from Pueblo as far west as to the mouth of the Grand Cañon, but not in it; also at Bijou, August 19. Around Cañon City it is extremely variable and very beautiful. On the pale sands at that place it is sometimes of a rosy yellowish, with narrow and very conspicuous brown bands on the wing-covers, while on the wet and dark soils it is pale fuscous, with dark fuscous markings. The face and sides of the prothorax inferiorly are sometimes white, occasionally bright ochreous, or dull dark gray.

Tomonotus tenebrosus Scudder.

A few specimens were seen between Cañon City and the mountains, August 11.

Dissosteira longipennis Scudder.

Found in the region west of Colorado Springs, but in very few individuals. The purplish-black color of the wings is very showy in the bright sunlight, and more brilliant than in the other species, which have a dark base to their wings. August 12 to 16.

Hesperotettix viridis Thomas.

This exquisitely beautiful little Acridioid occurred in Beaver Brook Gulch and near the mouth of the Grand Cañon of the Arkansas. It is also not uncommon in the cranberry-fields of Atlantic County, New Jersey. August 6 to 11.

When living, the stripes of the prothorax, the costal area of the tegmina, and the stripes and clouds upon the femora are of a coral red color, exceedingly clear and vivid. Varieties occur which are destitute of the red, and which have a very pale green line along the middle of the prothorax.

Specimens from Texas and Mexico have also passed through my hands.

Dactylotum bicolor Charp.—*Pezotettix picta* Thomas.

Large numbers of specimens of this most beautiful of all the *Calopteni* have passed through my hands. They were from Mexico, Texas, New Mexico, Arizona, Indian Territory, and Kansas. Specimens from Mexico were of both patterns of color, either with the bright red spots and bands between the greenish-black bands, or with the red color absent and replaced by yellow or greenish-yellow. The latter is the color figured by Charpentier, and is only a condition of the other. On the plains west of Colorado Springs I found great numbers of them in the tall grass, and in the damper situations they were of both styles in the same places. At Colorado Springs, they are chiefly of the red color, and only rarely did I meet with a pale one. There are no structural differences to separate the two varieties. It seems to me that the pale color is only a condition of the brighter-colored one, and that if we kept them under favorable conditions they would all remain dull-colored. At least, this was the case with some specimens of *Brachystola magna* which I kept for a

few days in a box at the hotel in Colorado Springs, and similar to my experience with *Phrynosoma cornutum*, kept in like manner. Two individuals of the latter, taken on the red soil near Manitou, were rust-red, but upon keeping them in a box of gray sand they became pale, and never returned to their original color.

Caloptenus bivittatus Say.

Common near Colorado Springs and in the valley of the Arkansas.

Caloptenus spretus Thomas.

Eastern Colorado, in many places; Denver, Clear Creek Cañon, Colorado Springs, Cañon City, and near Pueblo. Quite variable in color and structure.

Pezotettix dodgei Thomas.

On the mountain-sides in Clear Creek Cañon, August 6.

Brachystola magna Scudder.

Very common west of Colorado Springs, and near Manitou, and at Bijou, August 12 to 19. Both styles of color occurred together, and sometimes both were united sexually. They vary very much in length and thickness.

Batrachidea sp.

Common at Denver and near Cañon City, August 5 to 11.

The *Orthoptera* enumerated here are, I am sure, but a tithe of the great catalogue of forms which are distributed throughout the plains and mountains of Colorado. Wherever vegetation was growing, the numbers of kinds set in motion by the sweeping of my net filled me with surprise. My time was too limited to permit me to secure them, and a rich harvest in this field may yet be secured by the industrious collector who remains long enough in that interesting country.

APPENDIX.

BY A. R. GROTE.

A collection made by Mr. Uhler has been submitted to me containing the following species:—

Mamestra discalis n. s.

Allied to the eastern *Mamestra nimbosa*, of the same gray color and large size. It differs by the space between the stigmata being clouded with black, and by the reniform being wider inferiorly, much indented, and narrower superiorly. The transverse posterior line is dentate and not very distinct. The color is more purely bluish-gray, and the insect looks in this respect more like the European *nebulosa*, but also differs by the above characters. Claviform spot outlined in black. Hind wings clear fuscous-gray, pale, with terminal black broken line, beneath whitish, with faint median line, discal mark, and a distinct black terminal line. On primaries, above, the black terminal points are smaller, more cuneiform than in *nebulosa*.

Length of primary 25^{mm}. One specimen. Clear Creek Cañon.

Mamestra olivacea Morr., var.

A single specimen with the median space black, abdomen blackish, hind wings fuscous, from Beaver Brook. Though darker, it is evidently the same species as specimens sent me from Vancouver Island under the No. 5579, and that I cannot separate except by their darker color from eastern examples of *olivacea*.

Mamestra sp.

A single specimen from Clear Creek Cañon indicates a species distinct from *illaudabilis* Grote. Owing to the difficulty of the group, I am dissuaded from drawing up a description on this material.

Mamestra (Dianthæcia) meditata Grote.

Two specimens, Colorado Springs.

Hadena arctica (Boisd.).

One specimen, Clear Creek Cañon.

Stibadium spumosum Grote.

One specimen, Bijou.

RHODODIPSA VOLUPIA (Fitch).

In *Rhodophora florida* Guen., the fore tibiæ are provided with an outer claw and two inner spines; the joint is also furnished with

spinules. In *Rhododipsa*, the joint wants the spinules; there is an outer claw and two spines on the inside followed by a third paler colored and more slender, but nearly as long, much longer than the ordinary spinules. At the location of this third spine in *Rhodophora* is a spinule not noticeably longer than the rest, and not as long as one which follows the outer claw, and commences a series which is wanting in *Rhododipsa volupia*. The hind and middle tibiæ are armed. Eyes naked; palpi a little longer and less lengthily scaled than in *Rhodophora*. The lower half of the clypeus is shortly scaled. The specimen differs from Dr. Fitch's description in having the abdomen above ochre-yellow like the thorax, and the hind wings entirely crimson. The lines on the fore wings are also not pure "white", and are confusingly described by Dr. Fitch, who does not mention the pale and narrow terminal space. But I have no doubt of my determination of this species, which is smaller and more gaily colored than *florida*. One specimen. Colorado Spa.

Porrina sanguinea Geyer.

The fore tibiæ have an outer claw followed by two unequal slender spines; on the inside there is a series of four stout, rather short spines, of which the first two from the base of the joint are less thick. The middle and hind tibiæ are spinose, while there are no spinules on the fore tibiæ. The clypeus bulges and is mossily scaled. The eyes are naked. The palpi slender, oblique, less prominent than in allied genera and shortly scaled. The moth is whitish, with the basal and subterminal spaces dusty wine-color; the inner line arcuate; the median shade blackish, diffuse. The ovipositor is exerted. One specimen, Colorado Spa.

Euleucyptera cumatilis Grote.

The median lines vary in position in two specimens from Clear Creek Cañon. In another from Beaver Brook, the transverse posterior line is outwardly rounded opposite the cell, without the usual dentation at the middle.

Lygranthæcia jaguarina Guenée.

One specimen, Bijou.

Lygranthæcia packardi Grote.

Two specimens, Bijou. One from Colorado Spa has the secondaries suffused with black. In my "Check List of North American Noctuidæ", I have regarded *nobilis* and *mortua* as forms of this species, for which I have retained the above name, under which the usual form was described. I have as yet seen no larger material than that brought by Mr. James Ridings from Colorado, and a series is needed to decide whether my course in regard to *nobilis* and *mortua* is correct.

Grotella septempunctata Harvey.

One specimen, Manitou. This easily recognized species was originally described from Texas.

Bleptina earadrinalis Guenée.

One specimen, Clear Creek Cañon. The form in which the reniform is filled in with black.

Botis volupialis n. s.

Allied to *vinulenta*; of the same small size with the other species of the group *Rhodaria*. Vinous purple. Primaries with the median lines pale yellow, broad. Inner line dentate; outer line oblique, even, unbroken. Hind wings pale fuscous, subpellucid, with dusky borders. Beneath fuscous, slightly rosy, with darker borders and a yellow transverse line on primaries. The specific characters appear in the oblique, even, outer line, differing in shape from *vinulenta*, *diffissa*, etc. It is, though broad, much narrower than in *laticlavia* G. & R. One specimen, hills west of Denver.

Botis coloradensis G. & R.

One specimen, Colorado Spa.

Zophodia dentata n. s.

Allied to the Texan *Zophodia bollii* Zeller, but much stouter, larger and darker-colored. Blackish-gray; the costal whitish shading inconspicuous. The inner line with a median tooth twice more prominent than in its ally. The line is obsoletely geminate, the inner line appearing to run across the mouth of the tooth. The discal mark is obliterate. Costa ashen. The outer line is fine, black, joining an apical black shade. The line is exceedingly deeply dentate, a succession of deep waves, and differs at once from the same line in *bollii* by this character. A series of black terminal points; fringes dark. Primaries blackish fuscous beneath. Secondaries whitish hyaline, with smoky border; beneath the costal edge is blackish. Legs and breast ashen; tarsi blackish. One fresh specimen, Clear Creek Cañon. Length of primary 22^{mm}. Wings wider than in its Texan congener.

The following species of *Epantheria* was collected by Prof. F. H. Snow in Colorado:—

Epantheria reducta n. s.

♀.—A small form of the size of *Spilosoma*, differing by the shorter palpi and closely scaled body-parts. Head white; orbits of eyes and palpi blackish. Thorax white; collar with two central black spots; tegulae with a basal smaller and outer larger black spot; disk with a central black line emanating from an anterior spot. Abdomen white, yellowish at the sides; and with the terminal segments blackish above; beneath with a series of brown spots; laterally with brown dots. Antennæ white

above, blackish beneath. Legs brownish inwardly, white exteriorly; extremity of the tibiae dotted with whitish. Fore wings white, crossed by five series of black spots, outwardly bent along the centre of the wing. A terminal series of irregularly sized spots. Hind wings white, subpellucid, with a faded brown discal mark and series of terminal marks discontinued inferiorly. Beneath the markings repeated in brownish; on fore wings the spots about the discal cross-vein are larger, and form the usual mark; on hind wings the costal marks are more evident. Expanse 43^{mm}. Prof. Glover has figured a moth from Southern California which I think is this species.

Tortrix sp.

Allied to *algidana*, but larger and stouter, with pale lemon-yellow fore wings and thorax. Primaries with an oblique, broad, abbreviated, brown bar beyond the middle, over the median nervules, and a brown spot on submedian interspace centrally. Hind wings fuscous. Beneath fore wings fuscous; hind wings yellow white. Abdomen whitish fuscous. Length of primary 13^{mm}.

Oncoenemis homogena n. s.

At first sight, this species recalls the species of *Homohadexa*. Yellowish-gray. Median space narrow. Interior line thick, black, preceded by a yellowish stain; a trace of the claviform is seen in a thickening of the line at this point. Median space darker, more mixed with blackish scales. Orbicular, round, rather large, gray, with black annulus. Median shade inconspicuous. Reniform gray, of the usual kidney-shape, with black annulus, a little stained with yellowish. Exterior line pale, yellowish-gray, commencing on costa with a preceding black spot, as do the median shade and interior line. The t. p. line is exserted opposite the cell, obsoletely dentate. Subterminal line irregular broadly preceded by a blackish diffuse shade. A terminal black interrupted line; fringes grayish, cut by an indistinct dark line. Hind wings pale fuscous, with dark fuscous borders; beneath white, with discal dot, distinct fuscous borders and traces of a mesial line. Collar discolorous, pale brown, with a black line at base. Thorax fuscous-gray. Expanse of fore wing 17^{mm}. Manitou, Colo., August 19, Baron Osten Sacken (No. 7). A single specimen, in fine condition.

Arsilonehe absidum Harvey.

Webber Lake, Cal., July 22 (Osten Sacken, No. 5).

Agrotis sierræ Harvey.

Webber Lake, Cal., July 22 (Osten Sacken, No. 3).

Plusia sackenii n. s.

This fine species belongs to the group with yellow hind wings. It may be quickly distinguished from either *divergens* or *alticola* by the course of

the t. p. line, which is widely inwardly angulated. Inner line with a bright golden costal patch; the line itself is rounded and gilded below median vein. Median space rich dark brown (like *ampla*) below the median vein; above grayish, washed with pinkish over the faintly outlined orbicular. Reniform narrow, upright, with a fine gilded interior annulus. Metallic mark pale golden, somewhat as in *U-aureum*, with an elongated detached spot beyond it. Exterior or t. p. line running inwardly to median vein, thence outwardly again to near internal angle, where it is followed by a rusty spot; the line is narrow, geminate, gilded inferiorly. Subterminal line denticulate; terminal space lighter gray than subterminal. Fringes dark, cut with paler. Hind wings yellow, with rather broad black borders, dusky at base, with narrow, faint, discal lunule. Beneath hind wings yellowish, with costa purplish, border repeated; fore wings obscure, washed with yellowish, with discal lunule and exterior line less angulated than on upper surface. Body fuscous with purplish hairs. Expanse 36^{mm}.

Idaho Springs, Colo., August 15, Baron Osten Sacken, to whom the species is dedicated. It is the most beautiful of its group.

The Lepidopterous material hitherto collected by the different Government surveys has proved of high scientific interest. It is therefore hoped that it will be found convenient to afford facilities to entomologists to accompany the expeditions, or to attach one or more permanently in employ.

ART. XXXII.—DESCRIPTION OF CAMBARUS COUESI, A NEW SPECIES OF CRAWFISH FROM DAKOTA.

BY THOS. H. STREETS, M. D., U. S. N.

A small collection of Crustacea made by Dr. Coues in Dakota in 1873 contains the following new species:—

CRUSTACEA MACRURA.

Family ASTACIDÆ.

CAMBARUS COUESI, *n. sp.*

Rostrum broad; twice as long as broad; deeply excavated above; margins nearly parallel, slightly converging anteriorly; sides grooved; anterior portion in advance of the lateral teeth much produced, narrow, longer than the transverse measurement at the base between the lateral teeth; point and lateral teeth acute, prominent; tips corneous. The ridge on the upper surface of the carapace at the base of the rostrum on either side sulcate; externally spine at the anterior extremity prominent. Carapace subcylindrical; superior surface smooth, punctate; sides roughly granular; lateral spine long, acute; a minute spine on anterior edge of the carapace below the termination of the lateral fissure; areola narrow widening posteriorly. External antennæ nearly as long as the body; spine externally on first and second basal articles, that on the second article small and acute; lamina longer than the rostrum, broad; apex spinous; a long, acute spine on the under surface of the basal article of the internal antennæ, situated above the middle on the inner edge, hooked forward. Epistome broader than long; apex truncated or concave; sides oblique; margin straight or sinuous. External maxillipeds hairy below and internally. Abdomen smooth, sparsely punctate slightly longer than the cephalo-thorax.

Anterior feet long and slender; hands long, punctate externally, smooth, and sparsely punctate internally, spiny tuberculate above; tubercles arranged in a double row; fingers long, slender, compressed, more than half the length of the hand, internally and externally punctate, smooth, externally grooved. Movable finger spiny tuberculate on the superior edge; cutting edges closely approximated, toothed, tips curved, and corneous; immovable finger bearded at the base of the cutting edge internally. Carpus longer than broad, sulcate above; a row of tubercles on the inner edge of the sulcus; a stout spine on the middle of the inner surface, a smaller one more posteriorly; two spines on the under surface; the spines all long and acute; two small, acute spines on the superior surface of the arm, just behind the anterior

margin; a double row of spines on the under surface; the anterior ones and those on the outer row are the largest, those on the inner row smaller and of a greater number.

Third pair of legs hooked. First pair of abdominal legs long, deeply bifid; external part longer, and tapering to an acute point; internal part broadly compressed.

Closely allied to *Cambarus virilis* Hagen, but presents the following points of difference, which were observed to hold good in all the twenty-two specimens collected from one locality when compared with twenty-three specimens of *C. virilis* from the Souris or Mouse River:—Body more cylindrical, less depressed; sides less inflated; in fact, the general appearance of the species, in all its parts, is more slender and less robust than *C. virilis*. Rostrum narrower, longer, more deeply excavated above; anterior portion of the rostrum in advance of the lateral teeth narrower and more produced, longer than its transverse measurement at the base. In *C. virilis* the anterior portion of the rostrum is not longer than broad at its base between lateral teeth. Point of the rostrum, lateral teeth, the spines on the ridge at the base of the rostrum, and those on the sides of the carapace, are long, acute, and more prominent than in *C. virilis*; in the latter, the spines in these situations, except on sides of carapace, are short and obtuse. Finally, the hands of the anterior pair are longer and more slender, and the internal part of the first abdominal legs is more broadly compressed.

Length of body 2.7 inches; external antennæ 2.4 inches; anterior pair of legs 2.1 inches.

Locality, Red River of the North. Obtained from the stomach of a Pelican shot in May, 1873, on the Red River near Pembina. The bird was sick and unable to fly; the Crawfish must, therefore, have been secured in this locality. Collected by Dr. Elliott Coues, U. S. A., then Surgeon and Naturalist of the United States Northern Boundary Survey, to whom the species is dedicated.

A second species of the same genus was also taken by Dr. Coues in Dakota:—

CAMBARUS VIRILIS, Hagen.

Cambarus virilis, Hagen, Illustr. Catal. Mus. Comp. Zoölogy, No. 3; Monograph of the North American Astacidae, p. 63, pl. 1, figs. 23-25; pl. 2, figs. 128-132; pl. 3, fig. 155; pl. 8.

Locality, Souris or Mouse River, Dakota.

The following observations on the color of this Crawfish were furnished by Dr. Coues:—"In bed of stream among stones, in shallow water, very abundant. Carapace variegated with lighter and darker shades of brown: tail segment darker and more uniform brown, with large symmetrical dark brown spots, one on each side. Claws green, speckled with darker, with the protuberances yellow and reddish; other legs paler greenish. Below, including under side of the claws, greenish-white, the claws speckled with dark spots. Antennæ rich brown."

ART. XXXIII.—ON A CARNIVOROUS DINOSAURIAN FROM THE
DAKOTA BEDS OF COLORADO.

BY E. D. COPE.

The vertebrate fauna of the Dakota epoch of the regions west of the Mississippi having been heretofore unknown, it is satisfactory to be able to state that I have recently received, from a new locality, evidence of the existence of some colossal species of *Dinosauria* during this period. This is derived from a skeleton discovered near to the town of Canyon City, on the Arkansas River, near the point where the latter issues from the cañon through the Greenhorn Range of the Rocky Mountains.

At present, I only describe a portion of the right dentary bone, which supports eight teeth, and contains a cavity at the anterior extremity, from which one tooth was probably shed. The dentition is of the carnivorous type, and does not differ from that of the species of the genus *Laelaps*, to which have been referred numerous species from Cretaceous Nos. 5 and 6. The crowns exhibit the gradual modification of form in the succession from rear to front which I have already described in the *Laelaps incrassatus*.* There are subordinate characters exhibited by the present animal which show that it is quite distinct from any of the species heretofore known.

Five successional and two functional teeth exhibit crowns complete, or nearly so. The posterior exhibit a nearly straight posterior edge and an anterior one curved backward to a subacute erect apex. Both are denticulated, but the denticles of the anterior edge do not descend so near to the base of the crown as those of the posterior. The anterior series turns inward toward the base. The section of the crown is here (at the ninth tooth from before) not quite symmetrical, the internal face being the more convex near the apex. Soon the greater convexity of the outer side of the crown near the base becomes apparent, and as the inward curvature of the anterior denticulate edge increases, the convexity becomes more pronounced. On the second tooth, which is the first one preserved, the posterior edge is median; the anterior edge is on the inner side of a gently convex anterior face, which passes into the external face by an abrupt convexity. The long axis of the section of the crown does not connect the cutting edges, but passes from the posterior edge to the extero-anterior convexity mentioned, and parallel to the symphysis mandibuli. The enamel is smooth and with a fine silky luster. Two stages of succession are evident in these teeth. Successional crowns

* See Proceedings Academy Phila., January, 1877.

ART. XXXIV.—A CONTRIBUTION TO THE KNOWLEDGE OF THE
ICHTHYOLOGICAL FAUNA OF THE GREEN RIVER SHALES.

BY E. D. COPE.

The railroad-cut through the bluff on the west side of Green River, Wyoming, at Green River City, has been known for some years for the numerous fishes preserved in the shales through which it is excavated. An investigation into the ichthyology of this horizon and locality was undertaken by the writer, and a report published in the Annual Report of the United States Geological Survey of the Territories for 1870. Eight species of fishes were there described. Subsequently, in my expedition of 1872, I discovered a second locality, sixty miles north of the "Fish-cut", near the mouth of Labarge Creek, from which several species of fishes and insects were obtained. A third locality, nearer the main line of the Wasatch Mountains, has been more recently found, and a very fine collection of fishes procured and forwarded to me by my friend, H. Schoemaker. The specimens are mostly in a fine state of preservation, and are preserved on slabs of a calcareous shale, with leaves and insects. The mineral is of softer consistence than the slate of Green River, and thus permits of a more complete exposure of the bony structure of the fishes. In the following pages, sixteen species from this locality are described, all of which are new to science. Many of them are nearly allied to the species already known from the cut at Green River, belonging to the same genera, but none of them are identical. Three genera not previously represented in the fauna are added. General remarks follow the descriptions.

DAPEDOGLOSSUS TESTIS, Cope, *gen. et sp. nov.*

Char. gen.—Family *Osteoglossidæ*. A single row of elongate acute teeth on the premaxillary, maxillary, and dentary bones; vomer, tongue, and (?) basihyal bones closely studded with short conic grinding teeth. Mouth rather short. Pectoral fin with the anterior ray elongated; dorsal fin not elongate, with the anal well separated from the caudal. No beards.

This interesting genus presents the characters of the family to which I refer it in its segmented scales, posterior dorsal fin, etc., and does not differ widely in essentials from *Osteoglossum*. The principal differences

between the two genera are the small mouth in *Dapedoglossus*, the absence of barbels, and the generally abbreviated form. From *Arapema*, it differs in proportions, and in the abundance of teeth on the bones of the roof and floor of the mouth. To this genus is no doubt to be referred the fish found in the Green River Shales which I called* *Osteoglossum encaustum*, so that the name of that species will stand *Dapedoglossus encaustus*.

Char. specif.—Form oval, contracting subequally to the muzzle and caudal peduncle. The front is gently convex and the mouth is terminal. The depth is little less than half the length minus the caudal fin, and the length of the head enters the same 3.4 times. The dorsal fin is shorter than the anal, and its first ray stands over the sixth of the latter. The ventrals are small, and extend about one-half the distance from their base to the first anal ray, which equals the distance to the base of the pectoral. The latter is elongate, especially the first ray, which, although jointed, as in *Osteoglossum bicirrhosum*, reaches nearly to the end of the ventral. Radii: D. 22–23; A. 27–30. The caudal fin is slightly concave. Scales five or six series above the vertebral column and seven below it. Their exposed surface is rather wide, and is minutely granulated and without grooves. The cells are invisible except when this surface is removed, and they are rather large. Vertebrae: 21 dorsal; 25 caudal.

The orbit is rather large, and is reached by the end of the maxillary bone. The suborbital bones are not much enlarged, as is the case in the recent genera. Preoperculum entire; suboperculum very narrow. Branchiostegals slender, rather numerous; coracoid wide, forming a vertical keel, which is not produced. Length of the longest specimen 0^m.230; of the shortest, 0^m.165.

The five specimens of this fish which I possess do not differ widely in size, and are one-third and less of the dimensions of the *D. encaustus*. A scale of this or of another large species occurs in the present collection.

DIPLOMYSTUS DENTATUS, *gen. et sp. nov.*

Char. gen.—Family *Clupeidae*, and nearly related to the genus *Clupea*. It differs from *Clupea* in the presence of a series of dorsal scuta, which extend from the supraoccipital region to the base of the dorsal fin, corresponding in position with those of the ventral surface. Unlike these, they have no costal processes. The dorsal fin originates in front of the anal. In the typical forms, teeth are well developed in a single series on the dentary, premaxillary, and maxillary bones; but, in the small forms, they are invisible. Mouth moderate.

There are two sections of this genus, the species of which differ in the form of the dorsal scuta. In section I, these shields are transverse, and their posterior borders are pectinate, a median tooth being especially

* Annual Report U. S. Geol. Surv. Terr., 1870, p. 430.

prominent. In section II, the scuta are not wider than long, and have but one, a median tooth, which is the extremity of a median longitudinal carina. The species of section I are *D. dentatus*, *D. analis*, and *D. pectorosus*; those of section II are *D. humilis* and *D. altus*.

Char. specif.—Fin-radii: D. I—13; A. I. 35. Vertebrae: dorsal, 18; caudal, 21. The greatest depth enters the length without the caudal fin two and a half times, and the head enters the same nearly three and one-third times. The eye is large, its horizontal diameter a little exceeding the length from its border to the inferior edge of the premaxillary bone, and a little greater than one-fourth the length of the head. The premaxillary and dentary bones are short and deep, the latter with a deep notch on the anterior border; both are directed upward. The maxillary bone is long and narrow, and curved backward at its lower end, which reaches a point below the anterior border of the orbit. The profile behind the premaxillary bone is nearly horizontal; above the posterior part of the orbit, it rises, and a compressed supraoccipital crest carries it to the gently convex dorsal line. The abdomen is convex, and is about as long as the caudal region. The last dorsal ray rises above a point anterior to the first anal ray. The caudal is deeply forked. The ventrals originate at a point barely in advance of a vertical line from the first dorsal ray. The pectoral fins are short. The scuta of the inferior median line are large and acute. The scales are rather small, and are delicately grooved; twenty rows may be counted between the vertebral column and the dorsal fin.

Measurements.

	M.
Total length.....	0.365
Length of head.....	0.083
Length (axial) to below first dorsal ray.....	0.145
Length to above first anal ray.....	0.185
Length to base of external caudal rays.....	0.285
Depth at orbit.....	0.055
Depth at occiput.....	0.093
Depth at first dorsal ray.....	0.118
Depth at middle anal ray.....	0.050
Depth at base of caudal fin.....	0.030

This species is represented by a single specimen of the size of a small Shad and exceeding the Herring. It is in fine preservation.

DIPLOMYSTUS ANALIS, Cope, *sp. nov.*

Radial formula: D. I. 11; A. I. 40. Vertebrae: dorsal, 17–18; caudal, 23–24. This species is more elongate in proportion to its depth than either of the other species, the length being three times the greatest depth. The anal portion of the body is considerably longer than the abdomen, and the anal fin is long and with short rays. The ventral fin commences well in front of the dorsal, whose last ray is considerably in advance of the first anal ray. The pectoral fin reaches the ventral, and

contains thirteen rays. The greatest depth is at the pectoral region, the outlines contracting to the base of the anal fin. The dorsal outline is convex. The profile descends gently. The muzzle is half as long as the diameter of the orbit, which enters the length of the head three times. The latter enters the length without the caudal fin three and three-fourths times. There is a row of short, conical teeth along the middle line of the mouth, which is not on the vomer, but is on the parasphenoid or axial hygal bones. Similar teeth exist in the mouth of *D. dentatus*. The jaws may be furnished with minute teeth, or they may be wanting. The scales are thin and difficult to count; there are fifteen rows between the vertebral column and the anterior anal rays.

Measurements.

	M.
Total length.....	0.195
Length of head.....	0.040
Axial length to below first dorsal ray.....	0.073
Axial length to above first anal ray.....	0.092
Axial length to base of external caudal rays.....	0.149
Depth at orbit.....	0.030
Depth at occiput.....	0.044
Depth at first dorsal ray.....	9.047
Depth at middle anal ray.....	0.027
Depth at base of caudal fin.....	0.016

This Herring is represented by a great number of well-preserved specimens, and was, next to the *D. humilis*, the most abundant fish of the waters of the ancient Green River lake-basin. It is distinguished from the *D. dentatus* by the larger number of anal and smaller number of dorsal radii, and by the shorter head and relatively more slender body. The specimen measured represents the average size; the largest obtained is half as large again, and much smaller than the type of *D. dentatus*.

DIPLOMYSTUS PECTOROSUS, Cope, *sp. nov.*

This Clupeoid is represented by small specimens of a deeper form than that seen in the two preceding species. It is also characterized by a smaller number of dorsal radii than either of them. Formula: D. I. 8-9; A. I. 40-44. Vertebrae: dorsal, 16-17; caudal, 22. The greatest depth is in the pectoral region, and enters the length minus the caudal fin a little less than three times. The outlines contract from the ventral fins, and the anal region is longer than the abdominal. The eye is a little more than one-fourth the length of the head, and the latter enters the total minus the caudal fin three and a half times. The ventral fins are small, and commence well in advance of the line of the dorsal. The last dorsal ray is nearly above the first anal; the caudal is deeply forked. As in the two preceding species, the neural spines in front of the interneurals present a laminar antero-posterior expansion. The

dorsal scuta are furnished in the *D. pectorosus* with an especially prominent median keel.

Measurements.

	M.
Total length.....	0.020
Length (axial) to below D. I.....	0.038
Length (axial) to above A. I.....	0.043
Length (axial) to base of caudal fin.....	0.070
Length of head.....	0.022
Depth at orbit.....	0.017
Depth at pectoral fin.....	0.026
Depth at dorsal fin.....	0.024
Depth at caudal peduncle.....	0.008

This species is represented by several specimens.

DIPLOMYSTUS HUMILIS, Leidy.

Clupea humilis, Leidy, Final Report U. S. Geol. Surv. Terr. i, p. 195, pl. xvii, fig. 1.

This and the following species, already referred to a distinct section of the genus *Diplomystus*, differ from those above described in several points. They have a much shorter anal fin, and the caudal part of the vertebral column is thus shorter. The anterior neural spines do not present the antero-posterior laminar expansion. The ventral fin commences a little behind the origin of the dorsal. The formulæ for the *D. humilis* are as follows:—Radii: D. I—11; A. I—14. Vertebrae: D. 21; C. 13. Depth to length as 3 : 8. 5. The *Diplomystus theta* (*Clupea theta* Cope, Ann. Rep. U. S. Geol. Surv. Terr. 1873, p. 461) is intermediate between the species of the two sections in the structure of its anal fin, which includes twenty-six rays.

As at the Green River locality, so at this one, this Herring is the most abundant species. One-third the entire number of specimens are referable to it.

DIPLOMYSTUS ALTUS, Leidy.

Clupea alta, Leidy, *loc. cit.* p. 196, pl. xvii, fig. 2.

Also abundant. Formulæ:—Radii: D. I. 11; A. 1. 13–15. Vertebrae: D. 22; C. 12. Depth to length (without caudal fin) as 4:8.

ERISMATOPTERUS ENDLICHI, *sp. nov.*

This fish displays the characters of the genus to which it is referred, and of which a description will be found in the Annual Report of the United States Geological Survey of the Territories for 1870, p. 427. The ventral fins are neither abdominal nor pectoral, but intermediate, and the dorsal fin is above the abdomen. Both it and the anal are short, and are supported in front by two or three strong appressed spines. The vertebrae are hourglass-shaped, and the scales cycloid. The ventral rays are seven in number in *E. endlichi* and *E. rickseckeri*.

The radial formula in this fish is: D. III—11; C. 6—19—6; A. III—7. V. 7. The vertebræ are: D. 13; C. 17. Centra between the lines of the first interneural and first interhæmal spines, 10. Ten rows of small scales visible above the vertebral column.

The general form of the fish is stout, and the caudal peduncle is deep. The top of the head is convex, and the eye large. The front descends abruptly to the rather projecting muzzle in the specimen, but whether this is a distortion or not is uncertain. The coracoid is wide and well produced backward, while the clavicle is, as usual, directed forward. The femur* is slender, and connected with its fellow by a posterior transverse bar. The greatest depth is a little less than one-fourth the length without the caudal fin. The diameter of the eye is one-fourth the length of the head. The origin of the ventral fin is in advance of the first dorsal ray; the origin of the anal is below the penultimate dorsal ray. The caudal fin is openly forked.

Measurements.

	M.
Total length.....	0.061
Length of head.....	0.016
Length to line of ventral fin	0.020
Length to line of dorsal fin.....	0.022
Length to line of anal fin	0.031
Length to base of caudal fin.....	0.048
Depth at caudal peduncle.....	0.008
Depth at dorsal spine.....	0.011

The more numerous rays of the dorsal fin and more numerous scales are among the characters which distinguish this species from the two heretofore known. It is dedicated to Dr. Frederick M. Endlich, geologist in charge of one of the parties of the United States Geological Survey of the Territories under Dr. F. V. Hayden.

AMPHIPLAGA BRACHYPTERA, Cope, *gen. et sp. nov.*

Char. gen.—Generally as in *Erismatopterus*, but with strongly ctenoid scales. The dorsal fin is over the abdomen, and is supported by a few strong, adherent spines in front, which rest on stout interneurals; the soft rays have no interneurals, either in this fin or the anal. They are present in *Erismatopterus*. The ventrals originate a little in advance of the line of the dorsal, and the caudal fin is deeply forked. This genus approximates *Aphrodedirus*.

Char. specif.—Radii: D. II—8; A. III—4. Vertebræ of the caudal series 15. Scales: transverse row, 22; longitudinal row behind first interneural bone, 40. The only specimen I possess lacks the head, so that various characters cannot be ascertained. The depth of the body at the first dorsal spine enters the length from that point to the base of the caudal fin two and a half times, giving a general form of medium proportions.

*Before the homologies of these bones were studied, authors frequently called them *pubes*.

Caudal peduncle stout. The vertebræ are contracted medially, and not shortened; they have two or three longitudinal keels, which are somewhat irregular in their connections. This species is larger than any of the *Erismatopteri* yet known.

Measurements.

	M.
Length from first dorsal spine	0.073
Length from first anal spine	0.051
Length of anal fin	0.023
Length of second dorsal spine	0.015
Length of third anal spine	0.013
Depth at first anal spine	0.018

ASINEOPS PAUCIRADIATUS, Cope, *sp. nov.*

This Perch is represented by a single specimen, which is larger than any of those of the *A. squamifrons*, which have yet been found, and which is of more robust proportions. It differs materially in the radial and vertebral formulæ, and in the greater relative shortness of the dorsal spines. I observe at the base of these a series of short subhorizontal basilar interneural bones.

Formulæ:—Radii: D. IX—12; A. II. 7. Vertebræ: D. 9; C. 13. One or two vertebræ may be concealed behind the epiclavicle, but these, as in the description of *A. squamifrons*, are uncounted. The depth enters the length 2.25 times, the caudal fin being omitted. The length of the head is little less than the depth. The dorsal spines are not very robust, and are (excepting the first) of subequal length. The longest equals only half the depth of the body at the middle of the second dorsal fin. The caudal is rounded, and the ventrals are below the pectorals. The origin of the latter is a little in advance of that of the first dorsal spine. Its base is attached to four short basilar bones, of which the inferior two are stout in proportions. There are about ten rows of cycloid scales below the vertebral column. Scales extend on the top of the head as far as the orbits. The mouth is terminal. The total length of the type-specimen is 0^m.243, of which the head constitutes 0^m.075. The longest (ninth) dorsal spine measures 0^m.027, and the second anal spine 0^m.024.

MIOPILOSUS ABBREVIATUS, Cope, *gen. et sp. nov.*

Char. gen.—Allied to *Labrax* and *Perca*. Branchiostegal rays, 7 or 8; ventral rays, I. 5.; scales ctenoid. Two dorsal fins slightly connected at base; only two anal spines. Operculum rounded, without spines or emargination. Preoperculum without spine, and smooth on the posterior border; inferior border with teeth. Premaxillary and dentary with small uniform teeth in a narrow series. Clavicle unarmed. Vertebræ with two lateral fossæ. Caudal fin emarginate.

The discovery of this genus in the Green River Shales is of no small importance to fossil ichthyology, proving the existence, at that early

period, of the type, which is one of the highest among the true fishes. It probably belongs to the *Percidae*, although I have not ascertained the presence of teeth on the vomer, and there may be eight branchiostegal rays. As compared with the genera, recent and extinct, which are allied to *Perca*, it differs in the unarmed operculum and the preoperculum with teeth only on the lower limb, and in the presence of but two anal spines. It is therefore a weaker form than they, and, though of a higher type, less strongly protected by spines than the cotemporary *Asineops*. *Mioplosus* embraces the largest Physoclostous fishes yet known from this formation, and specimens are not rare at the locality from which they have been procured. They are often in a state of excellent preservation. The type of the genus is the *M. labracoides*.

Char. spec.—The *M. abbreviatus* is represented by but one specimen, from which the muzzle has been broken away. It is the stout species of the genus, and the others succeed it in this enumeration in the order of their greater elongation of form. The depth at the first dorsal fin enters the total length (including caudal fin) three and a half times; and the depth at the first anal ray enters the length of the vertebral column two and eight-tenths times. Vertebrae visible behind clavicle: D. 9; C. 14. Radii: D. IX—I. 11; A. II—11; P. 14. Ventral with a very weak spine. The last dorsal spines, as in all the other species, are very short, the anterior ones slender and moderately long; in this species, they are curved. The anal spines are short and slender, the first a rudiment. There are six rows of scales above and six below the vertebral column on the caudal peduncle.

Measurements.

	M.
Length of vertebral column.....	0.125
Length of third dorsal spine.....	0.025
Length of ninth dorsal spine.....	0.007
Depth at middle of first dorsal fin.....	0.060
Depth of caudal peduncle.....	0.025

MIOPLONUS LABRACOIDES, sp. nov.

This Perch is represented by five specimens, mostly in good preservation. They have much the proportions of the Rock-fish. The origins of the pectoral and ventral are in nearly the same vertical line, and that of the first dorsal is not far behind them. That of the first ray of the anal is below the second or third ray of the second dorsal. The rays of none of the fins are prolonged; the dorsal spines are slender and nearly straight, the longest (third), when depressed, reaches but four-tenths the distance to the first ray of the second dorsal. The last dorsal spine is very short. The soft dorsal rays are rather longer than the spinous. Formulæ:—Rays: D. IX—I. 12; C. 8—17—8; A. II—14; V. I. 5. Vertebrae: D. 10; C. 15.

The depth at the first dorsal fin enters the total four times; the depth at the first anal ray enters the length of the vertebral column three times.

The length of the head enters the total four times, and that of the orbit enters the head 4.66 times, and into the length of the muzzle one and one-third times. The profile of the top of the head is slightly convex, and the dorsal line is also slightly convex. The mouth opens somewhat obliquely upward. The end of the maxillary bone reaches a point below the middle of the orbit. The teeth of the inferior border of the preoperculum are strong, and are directed forward; they number five. The angle of the lower jaw is not produced, but the inferior edge of the ramus is laminar and acute; the symphysis is shortly truncate. The superior edge of the maxillary bears a supernumerary bone at its distal portion. There are six branchiostegal rays preserved, with impressions of two others: the anterior three are slender; the others wide, as in allied genera. There is a low supraoccipital crest. The abdomen bears fourteen rows of scales below the vertebral column, and six rows may be counted above it; on the caudal peduncle I count 5—5.

Measurements.

	M.
Total length.....	0.280
Axial length of head.....	0.070
Axial length to line of first dorsal spine.....	0.085
Axial length to line of first ray of second dorsal.....	0.143
Axial length to line of first anal spine.....	0.152
Axial length to base of caudal.....	0.232
Depth at orbit.....	0.051
Depth at first anal ray.....	0.055
Depth of caudal peduncle.....	0.030
Length of third dorsal spine.....	0.030
Length of second anal spine.....	0.016

Mioplosus longus, *sp. nov.*

I have questioned the right of the form to which the above name is given to be maintained as a species distinct from the *M. labracoides*. It is represented by two individuals of much smaller size than those of the latter, and which are of a more elongate form. They have also two anal radii fewer.

The formulæ are:—D. IX—12; A. II. 12. Vertebrae: D. 10; C. 15. The depth at the first dorsal fin enters the total length five times, and the depth at the first anal ray three and one-half to three and eight-tenths times. The dorsal spines are straight and slender, the posterior ones very short. The caudal is forked. The teeth of the inferior border of the preoperculum are strong and acute; there are three large and two small ones.

Measurements.

	M.
Total length.....	0.175
Length of head.....	0.042
Length to line of first dorsal.....	0.054
Length to line of second dorsal.....	0.085
Length to line of anal.....	0.091

Length to caudal.....	0.140
Depth at orbit.....	0.025
Depth at first dorsal.....	0.037
Depth at second dorsal.....	0.034
Depth of caudal peduncle.....	(?)0.020

The scales are similar to those of the *M. labracoides*.

Mioplosus beani, *sp. nov.*

The most slender species of the genus is represented by one specimen, which is the smallest obtained, which is referable to this genus. The depth enters the total length six times, and the depth at the first anal spine enters the length of the vertebral column a little more than four times. Radii: D. IX—I. 13; A. II—12; P. 13. Vertebrae: D. 10; C. 15. The general characters are as in *M. labracoides*, but the scales are not preserved. The form of the head is that of a younger fish, but its proportions as compared with the body are not those of immaturity. The length enters the total 4.2 times, and the orbit enters it 4.5 times. The profile of the front is descending. The teeth of the inferior limb of the preopercle are obtuse and not well defined. There are impressions of seven branchiostegals preserved.

This perch is named in honor of my friend Dr. T. H. Bean, of the United States Fish Commission.

Measurements.

	M.
Total length.....	0.131
Length of head.....	0.031
Length to line of first dorsal.....	0.040
Length to line of second dorsal.....	0.064
Length to line of anal fin.....	0.070
Length to line of caudal fin.....	0.109
Depth at orbit.....	0.020
Depth at first dorsal ray.....	0.023
Depth at first anal ray.....	0.019
Depth of caudal peduncle.....	0.011

Priscacara serrata, *gen. et sp. nov.*, *Chromididid* vel *Pomacentridis affinis*.

Char. gen.—This type might be included in the *Pomacentridae*, but it differs from the genera now known in the possession of vomerine teeth, and apparently in having eight branchiostegal rays.

In general, *Priscacara* may be characterized as *Pharyngognathi*, with ctenoid scales and well-developed spinous rays. The preoperculum is, in the typical species, sharply serrate on both borders. There are three anal spines, and the lateral line is well developed, not extending near the dorsal line. The caudal fin is rounded. The jaws are toothless. The pharyngeal bones, both superior and inferior, are closely studded with short, sessile, conical, teeth; a row of small ones stands on the external border of the inferior pharyngeal. One dorsal fin.

Char. specif.—Form a regular wide oval, with a subequal contraction at both extremities. The spinous dorsal rays become longer than the

soft ones, but the posterior spines are shorter than the anterior soft rays, so as to produce a wide emargination in the superior outline. The spines are very robust, especially those of the pectoral and anal fins. The first anal spine is near two-thirds the length of the second. The pectoral fin does not extend to the anal, and the soft parts of the anal and dorsal, which are equal, do not overlap the base of the caudal. Radii: D. X—11; A. III—10; C. ?—17—?. Vertebræ: D. 9; C. 14. The centra have a strong median lateral ridge, which separates two fossæ.

The greatest depth is at the base of the ventral fins, or the third dorsal spine; it enters the total length (with caudal fin) two and four-tenths times. The length of the head enters the same three and four-tenths times. The orbit is large, its diameter exceeding the muzzle and entering the length of the head a little over four times. The mouth is terminal, and the premaxillary extends obliquely downward and backward; the maxillary reaches the line of the anterior border of the orbit.

The scales are longer than deep, and the rough surface has but a small extent, and is finely granulated. The remainder of the scale is marked with strong concentric grooves. Those on the gular region are small. On the belly, there are seventeen rows (about) below the vertebral column. A row of scales extends along the postero-inferior edge of the operculum. This part is well preserved in only one of the three specimens which represent the species.

Measurements.

	M.
Total length	0.217
Length of head	0.064
Length to line of first spine of first dorsal	0.070
Length to line of first spine of second dorsal	0.121
Length to line of anal	0.122
Length to base of caudal	0.173
Depth at first dorsal spine	0.093
Depth at first dorsal soft ray	0.070
Depth of caudal peduncle	0.027
Length of fourth dorsal spine	0.030
Length of second anal spine	0.027

This species is about the size of the Crappie, *Pomoxys annularis*.

PRISCACARA CYPHA, *sp. nov.*

This species is nearly related to the last, but presents a number of differences which require its separate consideration. These are:—(1) The more arched or convex dorsal outline; (2) The relatively longer head; (3) The presence of an additional dorsal spine; (4) The entire covering of the operculum with scales. There is also probably a smaller number of dorsal vertebræ, but this is not certain, as that region has been somewhat disturbed. Formulæ:—Rays: D. XI—10—11; A. III—9; P. 15. Vertebræ, 6—14.

The greatest depth enters the total length 2.6 times; the length of the head enters the same 3.3 times. The spines are more robust, and the serrature of the preopercle more produced in the individual now described than in any of those of the *P. serrata* in my possession. The size is about the same as that of the latter species.

PRISCACARA LIOPS, *sp. nov.*

A smaller fish than either of the preceding is referred to this genus, although it differs in one feature, regarded as important among the *Pomacentridæ*, *i. e.*, the preopercular border is entire. It conforms closely to the *P. serrata* in other respects, as the form of the dorsal fin, three anal spines, form of caudal fin, character of scales and lateral line, edentulous jaws, and, indeed, in form to such an extent as to lead me to suspect that in this genus, as in *Lepomis*, etc., the serration of the preopercle is not of much systematic value. One character by which the *P. liops* may be distinguished from *P. serrata*, in addition to the smooth preoperculum and small size, is the constantly larger number of rays in the second dorsal fin.

Formulae:—Rays: D. X—13—14; C. 5—19—6; A. III. 10—11. Vertebrae: D. 9; C. 13. The form is characterized by the downward production of the muzzle, or a descending slope of the front. One specimen does not present this character, perhaps on account of distortion. The pectorals originate below the first dorsal spine, and the ventrals a little behind it. The spines are moderately stout, and the emargination of the dorsal fin is not deep. There are twenty-five rows of ctenoid scales traversed by a vertical line from the middle of the spinous dorsal, and smaller scales cover the operculum and more or less of the preoperculum.

Measurements.

	M.
Total length	0.113
Length of head	0.032
Length to first dorsal spine	0.034
Length to first dorsal soft ray	0.057
Length to first anal spine	0.057
Length to base of caudal	0.086
Depth at orbit	0.030
Depth at first dorsal spine	0.043
Depth at first dorsal soft ray	0.035
Depth of caudal peduncle	0.014

Five specimens of this fish have been received.

GENERAL OBSERVATIONS.

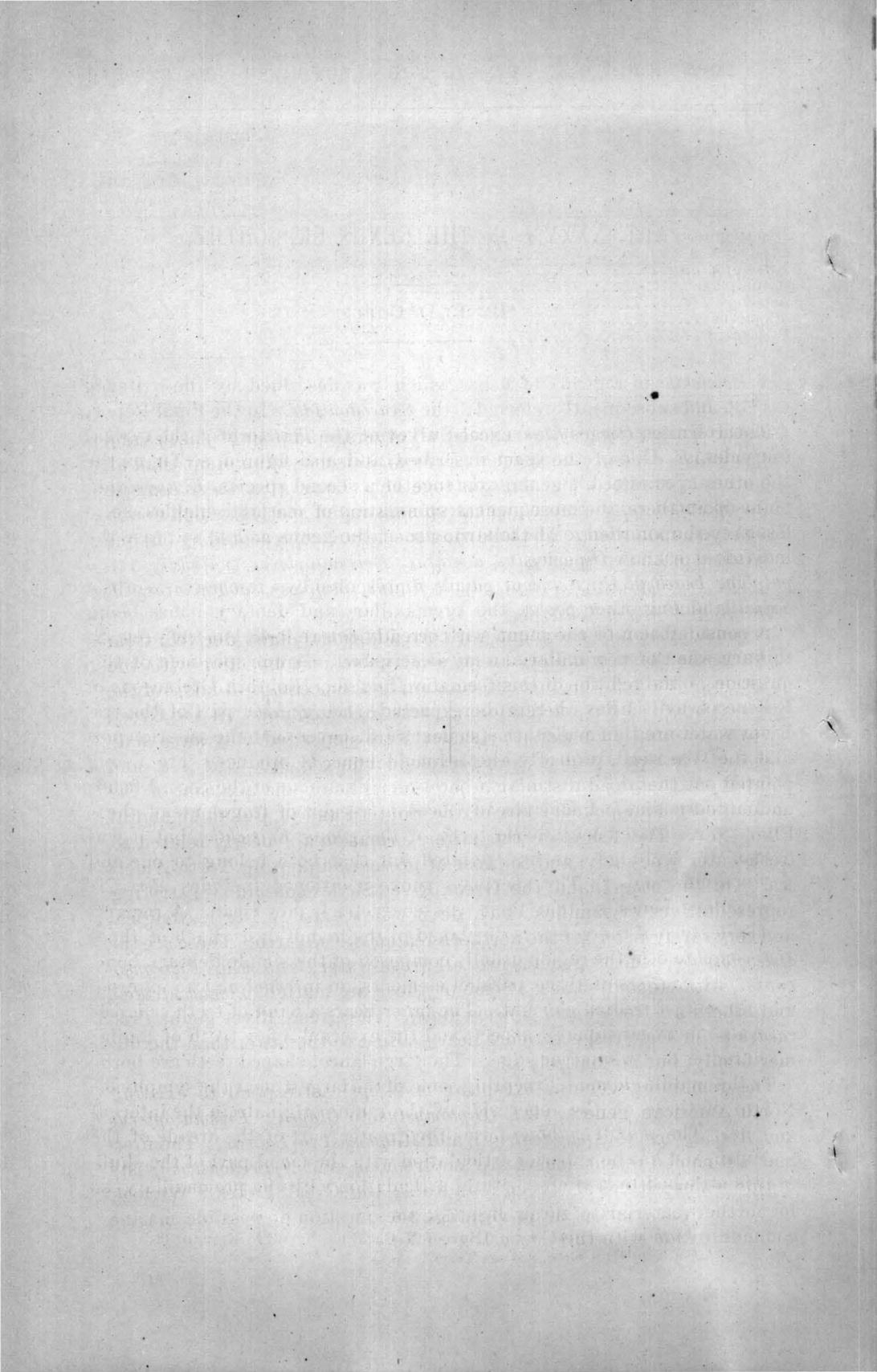
The species of this locality are distributed as follows, in their respective genera. A corresponding list of all the species known from the Green River Shale is also given:—

	Number of species.	
	This locality.	Entire formation.
Dapedoglossus	1	2
Diplomystus	5	7
Erismatopterus	1	3
Amphiplaga	1	1
Asineops	1	3
Mioplosus	4	4
Priscacara	3	3
	16	23

The Herring (*Diplomystus*) exceed all others in number of species and individuals. One of the species (*D. humilis*) is more abundant than all the other species of all genera put together. Long after these come, in point of numbers, the more typical spinous-rayed species, which doubtless preyed upon them. The following species are represented by but one individual each:—*Diplomystus dentatus*, *Erismatopterus endlichii*, *Amphiplaga brachyptera*, *Asineops pauciradiatus*, *Mioplosus abbreviatus*, *M. beanii*, and *Priscacara cypha*.

A consideration of the fauna with the additional light derived from this accession of new material is of some value in connection with the question of the relation of this formation to the oceans and lakes of the Eocene period. I have heretofore expressed the opinion that the Green River water-area in which the shales were deposited may have had, like the Wasatch Lake of New Mexico, connection with the sea, and pointed out the broad distinction between its fish-fauna and that of the undoubtedly land-locked lakes of the South Park of Colorado and of Elko, Nev. The fishes of the latter formation are nearly related to fresh-water types only, and to those at present inhabiting North America. On the other hand, the Green River Shales contain two striking representatives of families which do not now exist in North America, and very rarely in any of the northern realms of the earth. These are the *Osteoglossidæ*, whose genera are all fresh-water, and the *Pharyngognathi*, with ctenoid scales. Some of these are marine (*Pomacentridæ*), and others are fresh-water (*Chromididæ*). The Green River genus *Priscacara* is, in some respects, more nearly allied to the latter than the former family, but not entirely so.

The remaining genera (excepting *Asineops*) correspond to existing North American genera, viz:—*Diplomystus*, to *Clupea*; *Erismatopterus* and *Amphiplaga*, to *Aphredodirus*; and *Mioplosus*, to *Labrax*. The first and last-named recent genera are anadromous, and *Aphredodirus* exists in tide-water; it has also been found near the Great Lakes. We look for further material to throw light on the question of possible marine communication with the Green River lake.



ART. XXXV.—ON THE GENUS ERISICHTHE.

BY E. D. COPE.

Erisichthe is a genus of fishes which was described by the writer in 1873, and subsequently referred to the *Saurodontidae*. In the Final Report of the United States Geological Survey of the Territories,* the typical species, *E. nitida*, was again described, and also figured, so far as the material permitted, and the existence of a second species, *E. angulata*,† was pointed out. Subsequent accumulation of material enables me to add to the knowledge of the structure of the genus and to increase the number of known species.

The *E. nitida* Cope was originally represented by a few portions of the skull; among other pieces, the premaxillary and dentary bones being present. The latter element was correctly determined, but the premaxillary was called maxillary in my description. A fine specimen of this species, obtained the present season from the Niobrara Cretaceous of Kansas, by Charles H. Sternberg, includes the greater part of the cranium. From this and other specimens I discover that the anterior portion of the skull, probably the ethmoid bone, is produced into a long beak, in general form similar to the sword-like snout of the Sword-fishes of modern seas. I had already been in receipt of fragments of these beaks, associated with loose teeth of the genus *Erisichthe*, but it was Prof. B. F. Mudge who first pointed out that both belong to one and the same genus.‡ The specimen above mentioned includes also the maxillary bones, so that their true character is now clear. A remarkable feature of the genus is displayed in the mandibles. Each of these is compound in the region usually composed of the simple dentary bone. It there consists of three parallel elements, an internal and an external embracing a median element. The inner bears a band of teeth *en brosse* on its inner and superior aspect, and the external a few teeth of similar character on its superior edge. The large lancet shaped teeth are borne by the middle element, excepting some of the largest near the symphysis. Two of these on the inner side of the ramus originate in the internal bone. The maxillary bone forms the greater part of the arcade of the mouth, and has no superior articulation with the facial part of the skull. It is attached by a simple sutural articulation with the premaxillary, so

* Vol. ii, 1875, p. 217, pl. xlviii, figs. 3-8.

† *Portheus angulatus*, Geolog. Survey N. Carolina, by W. C. Kerr, p. 32.

‡ Bulletin U. S. Geol. Survey Terrs.

as to permit some lateral motion. The premaxillary also has no superior condyle articulating with the cranium, but the entire length of its superior margin is applied in a groove of the ethmoid bone, so as to be immovable. Anterior to the premaxillary bones, on the inferior aspect of the ethmoid, is situated a pair of large, compressed, double-edged teeth, whose alveoli are close together. Only one of these teeth is in functional service at a time. In the *Erisichthe penetrans*, the superior surface of the skull is swollen above the fundus of this alveolus, while no such enlargement marks the position of its young companion.

The compound character of the mandible, and the peculiar mode of articulation of the premaxillary and maxillary bones, entitle this genus to recognition as the type of a family distinct from the *Saurodontidae*, which may accordingly be called the *Erisichtheidae*. It is allied to the *Saurodontidae* in the mode of implantation of its teeth and in the relative extent of the bones of the maxillary arch.

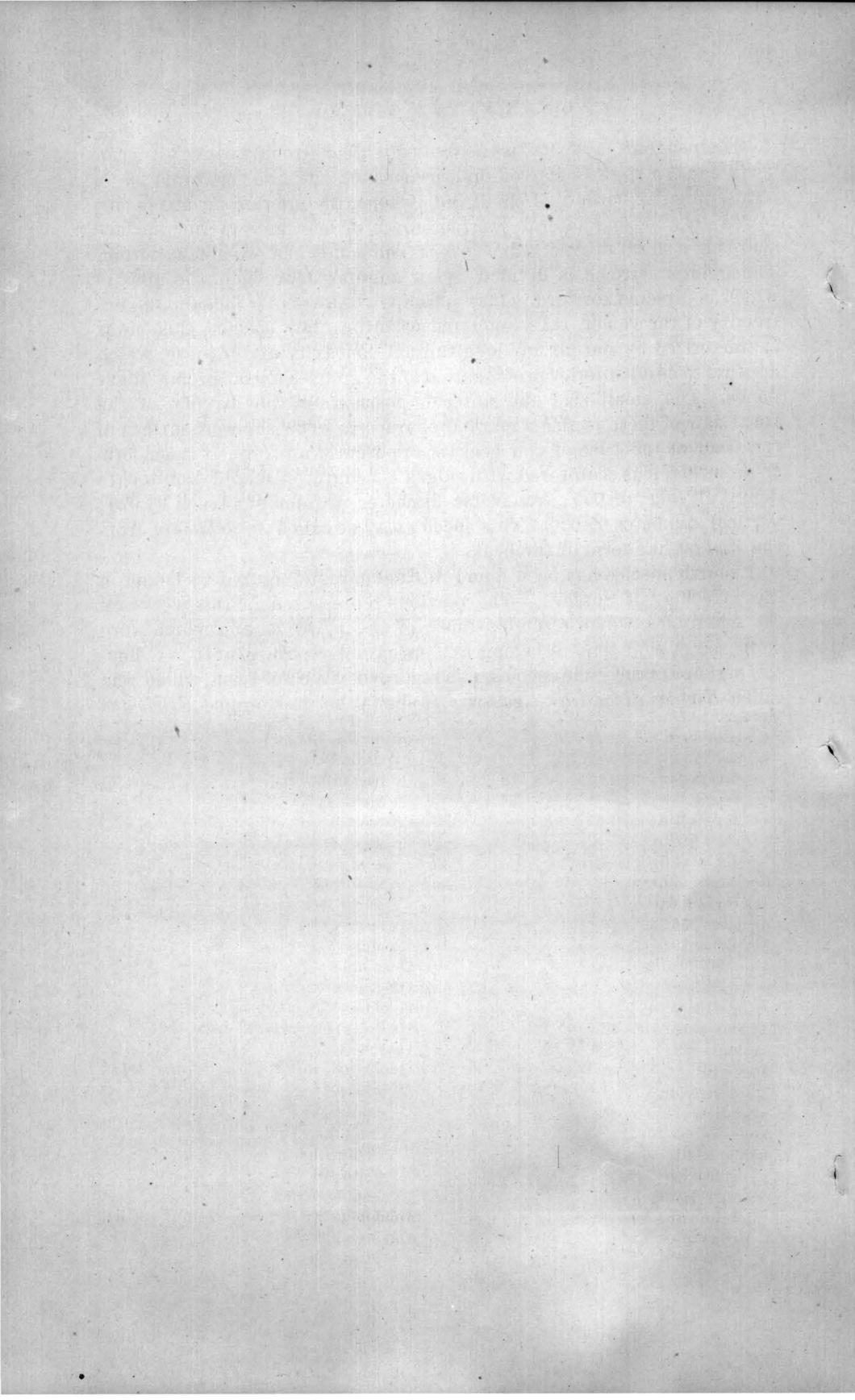
Three species are represented by the specimens received. They are readily distinguished by the forms of the beaks. In the *E. nitida*, this weapon is distinguished by the flat superior surface of its distal half. The section in this region is semicircular, a strong angle on each side bounding the superior plane, while at the base the section is a transverse oval. The flat surface is only finely rugose, while the remainder is closely marked with raised ridges, which are generally parallel, but which send off many lateral free or inosculating branchlets. This beak is stout, and contracts abruptly at the tip. It is also recurved, and the form does not appear to be due to distortion. Length from the inferior pair of large basal teeth 0^m.155; transverse diameter at base 0^m.025; depth at base 0^m.021.

The second species, which I call *Erisichthe penetrans*, has a snout of uniformly oval section at all points. The long diameter of the section is transverse. The axis is straight and the form acuminate, the contraction being uniform and gradual to acute apex. Thus it follows that a beak of greater diameter at the base than one of the *E. nitida* has a more slender shaft. The teeth of the inferior basal pair are, in the specimen described, of large size, and, as in other species, smooth, compressed, and with opposite fore and aft cutting edges. The surface of the beak is thrown into numerous sharply defined longitudinal ridges, which more or less inosculate with each. There is no difference between the superior and inferior surfaces in this respect. Length of beak from basal teeth 0^m.150; transverse diameter at base 0^m.035; vertical diameter at the same point 0^m.020; width at middle of the fossæ for the premaxillary bone 0^m.060.

The third species of *Erisichthe* is represented by a muzzle of an old individual, which has lost a good deal of its apex by attrition. Its surface lacks the sculpture of the other species; but whether this smoothness is due to attrition or not is uncertain. The alveolæ for the basilar teeth are empty and almost filled up with bone. The form of the muzzle

is quite peculiar. Its shaft is depressed, with a strongly convex inferior surface and a slightly convex superior surface, the two separated by an obtuse angular border. Behind the alveolæ, the inferior surface is narrowed by a strong lateral contraction, in which the superior surface shares in a slight degree. The latter is continued in a prominent border. The inferior surface is divided by an angular depression, the apex of which is directed forward. It is perhaps the articular face for the extremity of the vomer. As compared with the other species, this one is characterized by the lateral longitudinal concavity at the base, which appears to be an anterior prolongation of the grooves for the premaxillary bones. The small size and anterior position of the alveolæ of the basal pair of teeth is also a marked character. The superior surface of the skull at the base of the beak is apparently unworn; it is smooth. In *E. nitida*, it is sculptured with ridges. Length preserved, anterior to dental alveolæ, 0^m.045; transverse diameter in front of alveoli 0^m.025; vertical diameter 0^m.020. This species may be called *E. ziphioides*, from the *Ziphius*-like form of the beak.

A fourth species has been found in England, and figured by Dixon in the "Geology of Sussex". The portions represented in this work are the mandibles, which resemble those of the *E. nitida*, and which were supposed at that time to belong to a species of *Saurocephalus*. A muzzle, perhaps of the same species, was regarded as a Sword-fish, which was called *Xiphias dixonii* by Agassiz. It should be now termed *Erisichthe dixonii*.



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