

GEOLOGICAL SURVEY OF CANADA
GEORGE M. DAWSON, C.M.G., LL.D., F.R.S., DIRECTOR

CONTRIBUTIONS

TO

CANADIAN PALÆONTOLOGY

VOLUME II.

PART I.

CANADIAN FOSSIL INSECTS

Myriapods and Arachnids

BY

SAMUEL H. SCUDDER

1895

1. *The Tertiary Hemiptera of British Columbia*
2. *The Coleoptera hitherto found fossil in Canada*
3. *Notes on Myriapods and Arachnids found in Sigillarian stumps in the Nova Scotia Coal Field*



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The first part of this, the second, volume of Contributions to Canadian Paleontology, consists of three illustrated papers by Dr. S. H. Scudder, of Cambridge, Mass., to whom the Survey is greatly indebted for his gratuitous labours in the interests of science.

Two of these papers are devoted to descriptions and illustrations of Tertiary and Post-Tertiary insects from British Columbia, and the third to descriptions, also illustrated, of Myriapods and Arachnids from the Carboniferous rocks of Nova Scotia.

Although begun under the title "Canadian Fossil Insects," it has been found convenient to include the third paper on Myriapods and Arachnids in this part of volume II. of the "Contributions."

The specimens upon which the descriptions are based are for the most part in the Museum of the Survey.

The drawings for the five plates which accompany this publication were made by Mrs. Katherine P. Ramsay and Mr. J. H. Blake, under Dr. Scudder's supervision.

A small separate edition of each of these papers has previously been supplied to the author and distributed by him.

GEORGE M. DAWSON.

GEOLOGICAL SURVEY OF CANADA,
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CONTRIBUTIONS TO CANADIAN PALEONTOLOGY.

VOLUME II.

CANADIAN FOSSIL INSECTS.

BY SAMUEL H. SCUDDER.

1. *The Tertiary Hemiptera of British Columbia.*

The tertiary Hemiptera so far found in British Columbia are all due to the explorations of Dr. G. M. Dawson. They have been found at three different localities,—Quesnel on the Fraser, the north fork of the Similkameen River, and Nine-Mile Creek flowing into Whipsaw Creek, a tributary of the Similkameen; but in Dr. Dawson's view the two latter deposits undoubtedly formed different portions of a single lake, so that really only two basins are concerned. Curiously, these two basins afford specimens of very different character, for two family groups are represented only at Quesnel, four in the Similkameen basin only*. The only other known locality for fossil insects, Nicola, has yielded no Hemiptera.

Nineteen species in all have been found, and notwithstanding the small number, they prove very interesting. Only two of them, a water-strider and a shield bug, belong to the heteropterous division, the remainder being homopterous, an extraordinary disproportion. So, too, the families of Homoptera are very unevenly represented, the Cercopidæ with eleven species being out of all proportion to the others,—the Jassidæ with one, the Aphididæ with two, and the Fulgoridæ with three species. The Cercopidæ therefore give the character to the fauna.

One of the first things that impresses the student is the great variety among these insects. In every case, at least among the Homoptera, every specimen must be referred to a distinct species, and in only one case can two species be referred to one genus. In the Fulgoridæ each of the three species belongs to a different subfamily; and though such a difference is impossible in the here more numerous but everywhere less varied Cercopidæ, the range of genera is very considerable. Given the number of species allotted to the different families as here, one could hardly devise a more extreme case than here presents itself.

* The two basins are separated by about three degrees of latitude and may prove to represent somewhat different stages in the tertiary. If so, that of Quesnel is probably the newer.—G. M. D.

But the most striking feature in the fauna is the size of the individuals which compose it. Four fifths of the Homoptera belong to the families normally containing, except for the Cicadidæ (Stridulantia), the most bulky species, and even for these families they are exceptionally large or would class among the largest, while the two Heteroptera belong also to the larger types. It is only the single member of the Jassidæ and the two species of Aphididæ which are microtypic. The average length indeed of these tertiary species of Fulgoridæ and Cercopidæ is not less than two centimetres, and there are some among them which are probably double that length.

From the insect data one can make no strong assertion regarding the relative age of the deposits in which they occur, but there are one or two points to which it may be well to direct attention. One is the fact that nearly all the generic groups represented are so far as known extinct; even the few which are here placed in existing genera,—*Enchophora*, *Ricania*, *Cœlidia*, *Cercopis*, *Aphrophora*,—are in nearly every case so placed only provisionally from the incompleteness of the specimens found; this would surely seem to indicate a relatively great age, at least as old as the oligocene. Another is the reference of a few, generally with certitude, to genera,—*Gerancon*, *Sbenaphis*, *Palecphora*, *Palaphrodes*,—known otherwise only from American beds referred to the oligocene; and besides these the only species elsewhere recorded is found likewise in the oligocene. The last fact, however, looks in a different direction, for the cercopid element of the fauna, and as we have seen its most important component, shows a distinct resemblance to that of *Radoboj* in Croatia, which is regarded as middle miocene.

HOMOPTERA.

Family APHIDIDÆ.

In 1877 and 1878 I described from the British Columbia tertiaries two species of plant-lice, temporarily referring each to *Lachnus*. None have since been added to them, but the study of a considerable series of these insects from the American tertiaries shows a remarkable variety of fossil forms and compels the establishment of a large number of genera; these two species are now found to fall into distinct and extinct groups, each having one or two other representatives in the American rocks. Both belong to the sub-family Aphidinaæ.

GERANCON Scudder.

Gerancon SCUDD., Tert. Ins. N. A., 248 (1890).

Wings only known. Fore wing with the stigmatic vein arising from the middle of the stigma. Cubital vein twice forked, the first time very far from its origin, which is near the middle of the proximal half of the space between the base of the first oblique and the stigmatic veins, the second time scarcely behind the base of the stigmatic vein. Second oblique vein arising many times nearer the first oblique than the cubital vein and close to the former, the first discoidal cell between them about ten times broader on the hind margin than at the base.

Two species of this genus are known, one from Florissant, Colorado, the other that described below.

Gerancon petrorum.

Lachnus petrorum SCUDD., Rep. Progr. Geol. Surv. Can., 1875-76, 279 (1878).

Gerancon petrorum SCUDD., Tert. Ins. N. A., 249-250, pl. 11, fig. 6 (1890).

A fragment of a wing is sufficiently preserved to show that it should be referred here. The wing is unusually slender; the postcostal vein thickens apically as it merges in the stigma; the first oblique vein is straight; the second originates very close to the first, runs parallel to it only at the very base, and then bends pretty strongly outward, striking the margin of the wing nearly as far from the tip of the first oblique vein as half its own length; the origin of the cubital vein is not clear, but it is apparently not far out, in which case it runs parallel with the second oblique vein until it branches in the middle of the wing; the lower of these branches almost retains the course of the basal part of the veins, but diverges slightly from the second oblique vein, terminating very far from it on the border of the wing; the main stem, diverging from the first branch rather widely at first, almost at once runs parallel to the lower branch, and when it has continued a less distance than the main vein before its furcation, divides, the two forks diverging but slightly at base, and then very gradually converging until they are no farther apart than the bases of the first and second oblique veins, and the upper fork almost touches the stigmatic vein (probably by some displacement); together they diverge a little from the lower branch of the cubital vein; the stigmatic vein is very conspicuous, passing by a broad sweep into the heart of

the wing, diverging from the stigma at a greater angle than does the second oblique; unfortunately the tip of the wing is broken, and more than the apical half of the outer border is also wanting.

Length of fragment, 4^{mm}; estimated length of wing, 5^{mm}; width of same, 1.65^{mm}.

Quesnel,—One specimen, No. 19, Dr. G. M. Dawson, 1875.

SBENAPHIS Scudder.

Sbenaphis SCUDD., Tert. Ins. N. A., 250 (1890).

Head without frontal tubercles, the front transverse. Antennæ very slender, at least nearly as long as the body. Fore wings with the stigmatic vein arising from the middle of the stigma. Cubital vein twice forked, the first time at a moderate distance from its origin, which is at or a trifle outside the middle of the space between the first oblique and stigmatic veins, the second time opposite or scarcely beyond the base of the stigmatic vein. Second oblique vein arising nearer the first oblique than the cubital vein but at varying relative distances, always close to the first oblique vein, the first discoidal cell between them being four or five times broader on the hind margin than at base. Legs slender, varying in length but shorter than the fore wings. Abdomen ovate.

Some specimens seem to show a short stout cauda, which others appear to lack, and occasionally short cornicles may be detected which are apparently of uniform diameter.

Three species of the genus have been described, all found at Florissant, Colorado, but one of them first published from British Columbia. It is re-described with some changes below.

Sbenaphis quesneli.

Lachnus quesneli SCUDD., Rep. Progr. Geol. Surv. Can., 1876-'77, 461-462 (1878).

Sbenaphis quesneli SCUDD., Tert. Ins. N.A., 250-262, pl. II, figs. 4-5, (1890).

The remains which are preserved are a pair of overlapping fore wings with torn edges, but with all the important parts of the neuration, and some of the veins of the hind wings. The body is completely crushed and all other members are absent. The parts which can be studied are thus very similar to those found in *Gerancon petrorum* from the same bed. Owing to the absence of the margin, the shape of the wing

cannot be determined. The postcostal vein is thick throughout, but broadens apically; the first and second oblique veins are both perfectly straight, originating scarcely further apart than the width of the postcostal vein and diverging considerably. From the position in which the wings are preserved (one fore wing almost exactly covering the other, and the two enclosing between them both hind wings, also almost exactly superimposed) the first and second discoidal veins of the two fore wings and the two oblique veins of each hind wing form a medley of almost confluent lines, so that it is a little difficult to determine to which of the four wings and to what part of that wing each of the eight veins belongs; regarding the veins of the hind wings there may, therefore, be some error in the statement to be made, but there can be little doubt of the position and relation of the veins of the fore wing which appears to lie uppermost. The cubital vein originates at a distance beyond the base of the second oblique barely greater than the distance at which the latter is placed from the first; it makes an angle with the postcostal vein of less than forty-five degrees; is nowhere in the least degree sinuous, but is bent very slightly forward at each forking, rather more at its first than at its second; sends off its first branch at slightly less than a millimeter from its base; forms with it an angle of twenty-five degrees, and at an equal distance farther on emits its second branch at a similar or slightly smaller angle; both the branches are perfectly straight, and the upper branch of the last fork lies midway between the lower branch and the stigmatic vein; the latter is similar to that of *G. petrorum* from the same beds, but is not so strongly curved; the first branch of the cubital vein also divides equally the space between the second oblique and the lower branch of the last fork of the cubital vein. The oblique veins of the hind wing (see above) originate at no greater distance apart than the first and second oblique veins of the fore wings, are a little less divergent than they, and equally straight.

Length of fragment of wing, 5^{mm}; its probable complete length, 6^{mm}; breadth of same, 1.35^{mm}; distance from base of front wing to the origin of the stigmatic vein, 4.1^{mm}.

Quesnel,—One specimen, No. 34a, Dr. G. M. Dawson, 1876.

Family FULGORIDÆ.

The species of this family which have been found in British Columbia are few in number but varied in structure, each belonging to a distinct sub-family, and of considerable interest; all are very large.

Sub-family FULGORINÆ.

This group is much better represented in American than European tertiaries, and it is only on this continent that we find the lantern-flies proper, or those genera which have a strongly projecting frontal process, usually recurved. These are represented at Florissant, Colorado, by two species of *Nyctophylax*, and in British Columbia we find a species of *Enchophora* or allied form.

ENCHOPHORA Spinola.

The living members of this genus are all inhabitants of tropical South America, notably Brazil, and form one of the group of so-called lantern-flies of the tropics, the projecting frontal horn being at least in some instances presumably luminiferous. The species here brought to view, though very imperfect, plainly belongs in this near vicinity, and was larger than all but the largest of the existing lantern flies.

Enchophora sp.

Pl. 1, fig. 5.

A very characteristic but very small fragment of a large insect is particularly interesting as it has an unmistakable tropical aspect. It is simply the cephalic process of one of the Fulgorinæ, and is apparently to be referred to this genus or its near vicinity. It is large and stout, and though no other part of the head is preserved, it is pretty certainly the entire process, showing it to have been roundly bent upward at a right angle a little before the middle, with the faintest sign of enlargement apically; the tip is well and regularly rounded, and shows no sign whatever of being trilobed, so that it probably belongs to a distinct genus. The insect bearing it must have been a large one, probably not less than four centimetres long.

Length of the process measured along the curved middle line, 12^{mm}; breadth near apex, 3.65^{mm}.

North Fork of Similkameen River. One specimen, No. 90, Dr. G. M. Dawson, 1888.

Sub-family DELPHACINÆ.

Fossil species of this group are but two or three in number and all have been referred to existing genera excepting that described below, which appears to be a very extraordinary insect with unusually aberrant venation in the tegmina.

PLANOPHLEBIA Scudder.

Planophlebia SCUDD., Rep. Progr. Geol. Surv. Can., 1877-'78, 185-186 B (1879); *Id.*, Tert. Ins. N.A., 296 (1890).

This name is proposed for a genus of Fulgoridæ apparently belonging to the Delphacinae, but differing from all Homoptera I have seen in the remarkable trend of the principal veins of the tegmina, nearly all of which, and certainly all the branches of the radial, as well as most of the branches of the ulnar vein, terminate upon the costal margin, the costal areole being very brief, or less than one-third the length of the tegmina. The radial vein branches very near the base of the tegmina, and its lower branch again a very little way beyond, all three of the branches running in a straight course parallel to one another, and embracing at tip the middle third of the margin. The ulnar vein forks near the outer branching of the radial vein, the upper branch soon dividing again, the lower dividing beyond the middle of the tegmina, all the branches running parallel to those of the radial vein.

I know of no homopteron the veins of whose tegmina trend as in this genus; indeed it appears to be quite abnormal in this particular. Nor can Mr. Uhler, to whom I submitted a drawing, find any form whose branched veins run toward the costal margin; but I have in vain attempted to believe that I have interchanged the two margins of the tegmina. In point of neurulation the tegmina approach most closely, as Mr. Uhler has pointed out to me, to those of *Amphiscepa bivittata* (Say), but even from this it differs widely.

Planophlebia gigantea.

Planophlebia gigantea SCUDD., Rep. Progr. Geol. Surv. Can., 1877-'78, 186 B (1879); *Id.*, Tert. Ins. N.A., 296-297, pl. II, fig. 16 (1890).

The specimen is very fragmentary, consisting of an upper wing, of which the whole of the costal border as far as the tip, and the basal half of the inner margin can be made out; but only three patches of the surface with its accompanying veins are preserved—a piece next the base, crossing the wing; another near the middle, which crosses rather more than three-quarters of it from the costal margin backward; and a greatly broken patch at the upper half of the tip; but from these pieces nearly the whole of the neurulation, as given in the generic description, can be determined. The costal vein appears to be forked

close to the base, with branches running close and sub-parallel to each other. There are five branches of the ulnar vein, terminating above the middle of the apical margin of the tegmina, but below that the veins are wholly obliterated. The sutura clavi must be very brief (as we should, perhaps, expect it to be in a wing with so short a costal areole), since no sign of it appears on the basal patch; it must terminate before the branching of the ulnar vein. The tegmina are of very large size, the costal margin regularly and gently arched, the inner margin almost straight, and the apex very regularly convex, at least on the upper half.

Length of fragment, 23.75^{mm}; estimated length of the tegmina, 25^{mm}; breadth in middle, 9.5^{mm}.

Similkameen River.—One specimen, No. 77, Dr. G. M. Dawson, 1877.

Sub-family RICANIINÆ.

It is only in this country that members of this sub-family have been found in the rocks, Hammapteryx, an extinct type, having been found in Wyoming, and a species temporarily referred to Ricania, occurring in British Columbia.

RICANIA Germar.

The species here recorded under this name is given it only provisionally until more perfect specimens for its better placing are found. The only other fossil before referred here is one recorded by Giebel from amber, which is imperfectly described but agrees with this in the multiplicity of the nervules in the tegmina.

Ricania antiquata.

Pl. I, fig. 3.

I place temporarily in this genus a species of Ricaniinæ allied to Deraulax which must evidently fall into a distinct group. It is only known, however, from a portion of one of the tegmina. In this the costal field is expanded, much the broadest a little beyond the base and tapering gently, and is filled with numerous transverse more or less oblique simple veinlets. From a break in the stone it cannot be told whether the reticulated membrane near the base of the fragment belongs to the tegmina or the wings, but the portion beyond is plainly one of the tegmina and shows apparently that the upper radial branch is simple and straight, the lower nearly as straight and sub-parallel to

the costal vein, but gradually approaching it (the upper radial dividing evenly the intermediate space and bound to each by distant cross-veins) and throwing off from its under surface very frequent, closely parallel, oblique and slightly curved branches, which must fill all the apex of the tegmina and which are nowhere connected by cross-veins; most of them, however, fork about midway in their course upon the fragment so as to crowd the margin with oblique rays.

Length of fragment, 18^{mm}; greatest breadth of costal area, 1.2^{mm}.

North Fork of Similkameen River.—One specimen, No. 91 ab, Dr. G. M. Dawson, 1888.

Family JASSIDÆ.

This family is still represented in the British Columbia tertiaries only by the single specimen long ago described by me; this is the more surprising as in the other tertiaries of North America it is nearly as well represented as the Cercopidæ.

CÆLIDIA Germar.

The only known fossil species of this genus, which is an existing American type best developed in the tropics but not unknown in the southern United States, are one from the Wyoming tertiaries and that described below.

Cælidia columbiana.

Cælidia columbiana SCUDD., Rep. Progr. Geol. Surv. Can., 1877-78, 185 B (1879); *Id.*, Tert. Ins. N. A., 313, pl. 11, fig. 13 (1890).

A pair of tegmina, in which most of the venation can be made out, with a crushed body and crumpled wings, represent a species of *Cælidia* or an allied genus, with rather broad tegmina. The veins of the tegmina are nearly parallel to the gently arcuate costal margin, are equidistant from one another, and are united by cross-veins near the middle of the apical half of the tegmina, the lower ulnar vein, which runs only a little below the middle of the wing, forking at this point; the upper of the apical areolets, however, is considerably shorter than the others; the two ulnar veins are united by a cross-vein in the middle of the basal half of the tegmina, while not far from the middle of the tegmina the ulnar and radial veins are similarly united. The tegmina do not taper apically, the extremity is rounded and obliquely truncate, and the sutura clavi is short. The hind wings are provided with an unusual number of cross-veins.

Length of tegmina, 8^{mm}; breadth, 3.25^{mm}.

Similkameen River.—One specimen, No. 75, Dr. G. M. Dawson, 1877.

Family CERCOPIDÆ.

By far the greatest number of the British Columbia fossil Homoptera belong to this family, and notwithstanding that a considerable number (more than twice as many as are recorded below) have been found in the tertiaries of Wyoming and Colorado not a single species and hardly a single genus is the same. As in the United States the Cercopinæ are in the majority, but in both the Cercopinæ and Aphrophorinæ we are struck by the great size of the insects. Moreover, half of the genera have not been found elsewhere, not even in the United States tertiaries.

Sub-family CERCOPINÆ.

The large number, great variety, and striking size of the Cercopinæ are salient features of the tertiary Homoptera of British Columbia. With possibly a single exception, there is not one of them that would not be a striking object in any temperate fauna. Their average length with closed wings could hardly have been less than two centimetres. No less than six genera occur, three of which it is necessary to characterize as new; the others occur in the tertiaries of Colorado and Wyoming.

CERCOPITES Scudder.

Cercopites SCUDD., Tert. Ins. N. A., 316 (1890).

This genus was established for two species from the Wyoming tertiaries, varying considerably in size. The one here added is considerably larger than either of them.

Cercopites torpescens.

Pl. I, fig. 1.

A single specimen and its reverse shows the dorsal view of an insect in which the tegmina are destroyed or so poorly preserved that the veins of the wings show through them. The undate anterior margin of the prothorax determines its place in this genus though it is almost as much larger than the larger of the two species known as that is than the smallest. The head is less than half as broad as the thorax, suborbicular but broader than long. The thorax almost immediately attains its full width, the front margin slightly and angularly emarginate in the middle, a point which does not show in the figure. The tegmina are apparently at least three and a half times longer than

broad and have rather a pointed apex. The veins of the wings show only enough to make clear their cercopid structure.

Length of body, 9^{mm}; of same, including closed wings, 14.5^{mm}; of tegmina, 12^{mm}; breadth of head, 1.8^{mm}; of thorax, 4^{mm}.

North Fork of Similkameen River.—One specimen, No. 89ab, Dr. G. M. Dawson, 1888.

CERCOPIS Fabricius.

This genus is here used in the sense employed in my Tertiary Insects of North America. As there stated, a number of species have been referred to it from the European tertiaries and, notably, from Radoboj; but most of them do not belong here. One of the species here recorded has before been published; the other is new.

Cercopis selwyni.

Cercopis selwyni SCUDD., Rep. Progr. Geol. Surv. Can., 1877-'78, 184-185 B (1879); *Id.*, Tert. Ins. N. A., 318, pl. II, figs. 14, 15 (1890).

A pair of nearly perfect tegmina, reverses of each other, represent a species allied, but rather distantly, to the gigantic species of *Cercopinæ* described by Heer from Radoboj. It differs from them all in neuration, in the form of the costal border and of the apex. The portion of the wing below the straight sutura clavi is broken away. The basal half of the costal margin is strongly and rather uniformly arcuate, but more strongly close to the base; the apical half of the same is nearly straight; the apical margin is a little obliquely and roundly excised, gently convex, the tip roundly angulated. The costal vein parts from the common trunk close to the base and follows close to the margin, terminating at about one-third way to the tip; the radial vein is directed toward the middle of the outer half of the costal border, until it forks, a little before the middle of the wing, when both straight branches run subparallel toward the tip; the ulnar vein also forks once, half-way between the base and the fork of the radial vein, and its straight branches, with those of the radial vein, subdivide the outer half of the wing subequally, all being evanescent toward the apical margin; the sutura clavi reaches as far as these veins are visible.

Length of wing, 16.5^{mm}; breadth of wing at tip of sutura clavi, 5^{mm}; length of sutura clavi, 14^{mm}.

Nine Mile Creek.—One specimen, with its reverse, Nos. 64 and 65, Dr. G. M. Dawson, 1877.

Cercopis grandescens.

Pl. 1, fig. 2.

A stouter species than *C. selwyni* and somewhat larger. Only one of the tegmina is preserved, but that is nearly complete. It is more shouldered near the base, the costa beyond less arched, and at apex is apparently more symmetrically rounded, the extreme apex apparently lying at just about the middle of the wing. The radial and ulnar veins fork considerably earlier than there, the radial a little beyond, the ulnar a little before, the middle of the basal half of the wing; as in *C. selwyni*, the principal veins become obsolete or subobsolete before their termination, but both branches of the radial may be seen to divide into fine forks next the margin, traceable only by favorable light as pallid threads, and similar oblique off-shoots run from the upper branch to the costa in the apical half of the wing. The general color is but little darker than the light gray stone on which it occurs, and is nearly uniform, but a faint darker cloud traverses the wing just beyond the middle. It is profusely punctate, the puncta much the largest at the base and growing gradually finer, somewhat more approximated, and slightly less distinct in passing down the wing.

Length of tegmina, 21^{mm}.

North Fork of Similkameen River.—One specimen, No. 96, Dr. G. M. Dawson, 1888.

PALECPHORA Scudder.

Palecphora SCUDD., Tert. Ins. N. A., 324 (1890).

This group was established on half a dozen very common species found at Florissant, Colorado, but not one of them can compare in size with the species here recorded, which is very imperfect, but seems to be nearly allied to this group.

Palecphora sp.

Pl. 1, fig. 7.

It is unfortunate that this species is so poorly represented, for it is perhaps the largest insect that has been found in the British Columbia tertiaries. It shows the overlying tegmina and wings, the separation of the obverse and reverse having torn the former so that only a portion of each can be seen. Perhaps by removing the overlying portion on each, the whole of the tegmina might be exposed on one, the whole of one of the wings on the other. Enough is preserved in

sight to indicate that it probably belongs to Paleophora or its near vicinity, but not enough to properly characterize it. The tegmina, however, were about two and a half times as long as broad, and punctate throughout, but not deeply and rather distantly, especially near the base; it appears also to have been of a light testaceous color, and to have been traversed by three narrow, transverse, black or blackish belts (not shown in the figure) of somewhat irregular and broken course, one just before the middle, one midway between this and the base, and one midway between the median belt and the tip. The neuration of the wings, the only part at all shown, and in a fragmentary way, is apparently very similar to that of Paleophora.

Length of tegmina, 25^{mm}.; breadth, 9.75^{mm}.

North Fork of Similkameen River.—One specimen, No. 93ab, Dr. G. M. Dawson, 1888.

STENECPHORA (*στεινός, ἑξζοφία*) Gen. nov.

This new type of Cercopidæ is to be characterized only from its tegmina, which have a remarkably broad apex, a very slender clavus, and radial and ulnar veins that fork extremely far towards the base, the former at about the middle of the basal half of the tegmina, the latter still earlier; they are all united by delicate continuous transversals at about the base of the apical sixth of the wings and beyond that fork more or less, or send from the transversals delicate shoots, forming between them the apical cells; similar shoots are thrown off to the costal margin by the apical half of the upper branch of the radial nervure before the transversals.

A single species has been found.

Stenecephora punctulata.

Pl. 1, fig. 9.

Apparently the tegmina are of uniform width, but the clavus is not preserved (though it must have been very slender, to judge from the rest of the tegmina) with the apex rather broadly rounded, and the costa tolerably straight but slightly, broadly, and roundly bent opposite the divarication of the radial vein, to form a shoulder. The tegmina are almost uniformly dark brownish fuliginous, profusely and uniformly punctulate, and most of the minor veinlets at the extreme apex of the wing are forked just before the margin. The base of the wing is broken so that the exact length cannot be

certainly told, but an impression of the base of the costal margin renders it tolerably certain.

Length of tegmina, 19.5^{mm}.; breadth, 6.5^{mm}.

North Fork of Similkameen River.—One specimen and its reverse, No. 94ab, Dr. G. M. Dawson, 1888.

DAWSONITES, Gen. nov.

A stout-bodied, rather large form of Cercopidæ, not very far removed from the tertiary *Paleophora* Scudd., of Colorado, and somewhat resembling the existing *Philænus* Stål, of the Old World, but with distinctive neuration of the tegmina, in that the radial vein forks at the middle of the wing, and that the transversals near the tip of the wing form between the radial forks and the interspace between the radial and ulnar veins, but not between the ulnar forks, a double set of similar and small cellules a little longer than broad.

A single species occurs. The name is given in honor of Dr. George M. Dawson.

Dawsonites veter.

Pl. I, fig. 10.

A crushed body with displaced parts shows nothing characteristic except a very broad head and the two tegmina, one of them turned end for end. These show the peculiar neuration described under the genus. They are slightly more than two and a half times longer than broad, with a very gently convex costa, tapering rapidly in the apical fourth so that the apex is sharply rounded with six or seven apical cells around its narrowest part; the tegmina are mostly very dark brown, but a more or less distinct, moderately broad, pallid belt crosses the middle of the wing, most distinct in the costal half, and all the cells are more or less conspicuously pallid, excepting at the veins.

Width of head, 3.6^{mm}.; length of tegmina, 9.5^{mm}.; breadth of same, 3.65^{mm}.

North Fork of Similkameen River.—One specimen and its reverse, No. 87ab, Dr. G. M. Dawson, 1888.

STENOLOCRIIS (*στενολοκρίς*, Loeris, nom. gen.) Gen. nov.

This name is proposed for an insect of large size, apparently belonging to the Cercopidæ, but imperfectly known. Only the basal half or more of the tegmina is preserved, but this shows a very

anomalous neuration. The costal vein is of extraordinary stoutness and importance, running about midway between the radial vein and the margin, and extending certainly halfway to the tip, the heaviest vein in the wing. But what is more striking is that the radial vein forks very near the base, scarcely beyond the costal shoulder, while the ulnar, instead of having an earlier divarication, does not fork until the vein has passed as far beyond the radial fork, as the latter is from the base of the wing.

A single species is known, of a large size.

Stenolocris venosa.

Pl. 1, fig. 11.

The fragment represents about half of a very large wing-cover, having the general form of that of *Cercopis grandescens* from the same bed. The costal margin is the only one that remains intact; this shows a broadly angulate rounded shoulder. The wing is a little darker than the stone, but the veins are heavily marked, the costal vein in black, the others in dark brown, the latter color also extending in an oblique broad crenulate belt across the middle of the inner half of the fragment, the same area, as well as the embrowned vein margins, profusely and rather finely granulate.

Length of fragment, 14^{mm}; probable length of tegmina, 24^{mm}; breadth of fragment, 7.5^{mm}.

North Fork of Similkameen River.—One specimen, No. 86, Dr. G. M. Dawson, 1888.

Sub-family APHROPHORINÆ.

Although not so abundant in the species of this group as the tertiaries of the United States, the British Columbia beds show more variety in structure, as indicated by the number of generic groups, half of which are here made known for the first time, while the others agree with those from the United States deposits.

PALAPHRODES Scudder.

Palaphrodes SCUDD., Tert. Ins. N. A., 333 (1890).

To this genus, recently established upon a number of species found at Florissant, Colorado, must pretty certainly be referred an incomplete fragment from the Similkameen.

Palaphrodes sp.

The presence of a species of this genus in the British Columbia tertiaries is indicated by a part of the overlapping hind wings of one

individual in which the characteristic part of the venation appears ; but whether it is identical with any of the species from the Florissant tertiaries cannot be told on account of the incompleteness of the fragment ; and on this account it has not seemed worth while to figure it.

North Fork of Similkameen River.—One specimen, No. 99, Dr. G. M. Dawson, 1888.

APHROPHORA Germar.

Half a dozen fossil species from different parts of Europe, as well as one from Florissant, have been referred to this group as typical of the sub-family. The one here added not only certainly belongs to the sub-family, but if not an *Aphrophora* proper, must be exceedingly close to it, as the structure of the hind wings is almost identical with that of *A. alni* of Europe.

Aphrophora sp.

Pl. I, fig. 4.

The abdomen and the greater part of the hind wing of a single individual are all that represent this species. The abdomen shows nothing but some crushed tapering segments ; the wing is characteristically that of *Aphrophora*, the second and third longitudinal veins bending toward the transverse cross vein which unites them near the middle of the apical half of the wing, the third and fourth being united by a transverse vein near the middle of the wing (farther back than usual) and the latter forked about midway between the two cross veins ; the sixth and seventh veins, however, if united at all, are so only at the extreme base of the wing.

Length of fragment of wing, 14^{mm}. ; probable complete length, 17^{mm}. ; breadth, 7^{mm}.

North Fork of Similkameen River.—One specimen, No. 88ab, Dr. G. M. Dawson, 1888.

PTYSMAPHORA (*πτύσμα, ξέρω*) Gen. nov.

This genus is peculiar among *Aphrophorinae* for the very early forking of both the uinar and radial veins, both within the middle of the wing, and for the great length of the apical cells. The tegmina are elongated and subequal, only tapering in the apical sixth, the apex roundly pointed. The upper radial fork sends several shoots to the costal margin in the apical half of the tegmina forming several marginal cells.

The genus most resembles *Palæoptysma* from the same beds, but is a much larger form with straight costa beyond the shoulder and with much earlier divarication of the radial vein. A single species is known.

Ptysmaphora fletcheri.

Pl. I, fig. 6.

The tegmina are light brown in color, a little darker near the margins, with the veins delicately traced as pallid lines. The transversals forming the base of the apical cells run in a somewhat zigzag course across the middle of the outer half of the wing uniting the outermost veins, and beyond these transversals the veins are nearly all more or less forked. The tegmina appear to have a coriaceous texture but no trace of punctuation can anywhere be seen.

Length of tegmina, 14.5^{mm}.; breadth, 4^{mm}.

Named for the Government Entomologist of Canada.

North Fork of Similkameen River.—One specimen, No. 95ab, Dr. G. M. Dawson, 1888.

PALEOPTYSMA (*παλαιὸς, πτόσμα*). Gen. nov.

Known only by its tegmina, which are elongated, equal, subcultriform, obliquely truncate at the tip with the angles rounded. The radial vein recedes remarkably from the costal margin in the basal half of the tegmina, and forks apparently before the middle of the tegmina (the base of which is lost), the upper branch sending a single offshoot to form a marginal cell previous to the anastomosis, which is in about the middle of the apical two-fifths of the tegmina; the main apical cells are thus very long; the ulnar vein forks by or before the middle of the basal half of the tegmina.

This is a very slender form of *Aphrophorinæ*, and I scarcely know with what modern type to compare it. A single species occurs in British Columbia.

Palæoptysma venosa.

Pl. I, fig. 8.

The single specimen exhibits only the greater part of one of the tegmina, showing that they were nearly or quite three and a half times longer than broad, faintly cultriform (a characteristic exaggerated in the figure by too strong a curvature), the costal margin gently and regularly convex. The general color was a nearly uniform light brown, but with all the veins heavily marked in very dark

brown, while the light brown of the base becomes pallid in a large round spot occupying all the apex of the wing to beyond the transversals, heightening the effect of the dark veins at this point. The transversals forming the base of the apical cells run in a perfectly straight course between the lower forks of the radial and ulnar veins, but above this become zigzag; beyond the transversals most of the veins are forked. No punctuation can be detected.

Length of fragment, 9.5^{mm}.; probable length of the tegmina, 11^{mm}.; breadth, 2.7^{mm}. The drawing represents the wing too broad.

North Fork of Similkameen River.—One specimen, No. 92, Dr. G. M. Dawson, 1888.

HETEROPTERA.

Family HYDROBATIDÆ.

A single species of this family has been found in British Columbia which I formerly placed, with reserve, in *Hygrotrechus*, but have since studied more carefully and concluded that it should form the type of an extinct genus, to which also I referred a species from the tertiaries of Wyoming.

TELMATRECHUS Scudder.

Telmatrechus SCUDD., Tert. Ins. N. A., 351 (1890).

This genus is closely allied to *Hygrotrechus* Stål, and combining as it does many of the features of this genus and *Limnotrechus* Stål, may well have been the lineal predecessor of both. The antennæ have the first joint only a little longer than the second. The eyes are not at all prominent. The thorax is relatively shorter than in *Hygrotrechus*. The legs are very long, the tibiæ of each pair of legs about as long as the femora of the same legs, an equality which I have not found in any other genera of Hydrobatidæ; in the fore legs the equality is perfect; in the middle legs the tibiæ are slightly longer, in the hind legs slightly shorter, than the femora; the hind femora are slightly longer than the middle pair; so far as can be told from the imperfect remains the tarsi of the middle and hind legs are much shorter than, not a half or probably a third the length of, their respective tibiæ. The posterior lateral edges of the sixth abdominal segment are produced to a tooth precisely as in *Limnotrechus*.

Telmatrechus stali.

Hygrotrechus stali SCUDD., Rep. Progr. Geol. Surv. Can., 1877-78, 183-184B (1879).

Telmatrechus stali SCUDD., Tert. Ins. N. A., 351-353, pl. II, figs. 11, 12 (1890).

The thorax seems to be shorter than in *Hygrotrechus*, with the limits of the prosternum more visibly marked from above ; the eyes do not appear to be so prominent, and the first antennal joint would seem, from the position of the others, to be shorter than in *Hygrotrechus*. The insect is about the same size as our *H. remigis* (Say). The head, as seen on a side view, is small and rounded ; thorax minutely scabrous like the head, narrowing rather rapidly and uniformly, the posterior limit of the prosternum marked by a slight depression next the anterior coxæ, the whole thorax considerably longer than broad. Abdomen tapering, the apical angles of the sixth segment produced to a sharp but short spine, reaching the middle of the succeeding segment. Antennæ nearly (perhaps quite) as long as the head and thorax together. Fore femora equal, stout, as long as the thorax ; fore tibiæ of the same length ; middle and hind legs very slender ; middle femora considerably more than twice as long as the fore femora, the tibiæ nearly three times as long as the fore tibiæ and of the same length as the hind femora ; hind tibiæ a little more than twice as long as the fore femora ; first joint of hind tarsi about one-fifth the length of the hind tibiæ. On one of the specimens, preserved on a dorsal view, a line is seen proceeding from either side of the thorax, directly in front of the middle coxæ, and passing toward and nearly to the middle of the hinder edge of the second abdominal segment with some distinctness, accompanied on the second and third segments by other lines which seem to indicate the veins of the tegmina, the first-mentioned line being the sutura clavi ; but all trace of lines is lost beyond the third segment, as if the wings did not extend over more than half the abdomen ; on the specimen preserved on a side view, they appear to extend to the hind edge of the sixth abdominal segment. Attached to the posterior extremity of the abdomen is a pair of stout lappets, nearly straight, but curving slightly outward, equal, about twice as long as broad, rounded and very slightly produced at the tip.

In a specimen (No. 70) which I have considered an immature individual of this species, but which may possibly be a *Metrobates*, the middle and hind femora are of equal length.

Length of body, 19.75^{mm}; of head, 1.5^{mm}; of thorax 5^{mm}; breadth of anterior extremity of thorax, 1.75^{mm}; of posterior extremity, 3.5^{mm}; of sixth abdominal segment, 2^{mm}; length of fore femora, 5^{mm}; of fore tibiæ, 5^{mm}; of middle femora, 12.5^{mm}; of middle tibiæ, 14^{mm}; of hind femora, 14^{mm}; of hind tibiæ, 11.5^{mm}; of first joint of hind tarsi, 2.3^{mm}; of abdominal lappets, 1.3^{mm}; breadth of hind femora, 0.35^{mm}; of hind tibiæ, 0.2^{mm}; of hind tarsi, 0.15^{mm}.

I name the interesting species after my lamented friend, Dr. C. Stål, of Stockholm, whose marvelous industry and keen insight into the structure of Hemiptera is known to all entomologists.

Three miles up the North Fork of the Similkameen River.—Three specimens, Nos. 70, 71 and 72, 73. Dr. G. M. Dawson, 1877.

Family PENTATOMIDÆ.

The only other one of the Heteroptera and the last species to record is one of the sub-family Pentatominae, which I formerly referred to *Euschistus*, but which a careful study in connection with other American tertiary Pentatominae shows to belong to an extinct type, which has two other members, both at Florissant, Colorado.

TELEOSCHISTUS Scudder.

Teleoschistus SCUDD., Tert. Ins. N.A., 454 (1890).

Head of moderate size, nearly half as broad as the thorax, and distinctly broader than long, scarcely longer than the intraocular width, the portion in front of the eyes subquadrate, with broadly rounded front, rounded angles, the tylum and juga of equal length. Rostrum reaching, as seen through the specimen, opposite a point a little beyond the base of the scutellum. The thorax is pentagonal, the base at least half as long again as the straight, oblique, posterior lateral margins, the nearly straight but slightly convex anterior lateral margins at right angles to the posterior and a little longer than they, the apical border emarginate for its whole length for the reception of the head, less than half as long as the breadth of the widest part of the thorax and scarcely shorter than the middle length of the thorax. Scutellum triangular, vaulted, of nearly equal length and breadth, the tip angulate and not produced, reaching less than half-way to the tip of the abdomen. Mesosternum much longer than the metasternum, the coxal cavities of the two hinder pairs of legs contiguous, separated only by a common paries.

Teleoschistus antiquus.

Euschistus antiquus SCUDD., Rep. Progr. Geol. Surv. Can., 1876-
'77, 459-461 (1878).

Teleoschistus antiquus SCUDD., Tert. Ins. N.A., 454-456, pl. II,
figs. 17-19 (1890).

The principal specimen is unusually perfect, and appears to be a male. The head is slightly longer than broad, equal beyond the expanding base, broadly rounded and somewhat flattened in front; the slight carinae marking the borders of the middle lobe are parallel throughout and extend to the front of the head. The thorax is so imperfectly preserved as to throw doubt upon the generic affinities of the insect, but it appears to have been more than twice as broad as long, with a median furrow, and its front margin very slightly concave behind the head; probably, also, it was considerably produced at the hinder lateral angles, and had its lateral margin slightly denticulate anteriorly. The scutellum is large, a little narrower than the breadth of the base of the abdomen, of nearly equal length and breadth, pretty regularly triangular, but with a slight emargination of the sides on their basal half; the tip bluntly pointed and rounded off, extending a little way upon the middle of the strongly advanced fourth abdominal segment. The surface of the head, prothorax, and scutellum is covered pretty uniformly and abundantly with distinct round punctures, which are, however, deepest, most sharply defined, and so abundant as nearly to occupy the entire surface, on the front half of the head and next the margins of the prothorax. The corium of the tegmina includes more than half the wing, and is covered with punctures, deeply impressed, and much minuter and more frequent than on the scutellum; there is also a distinct vein passing down the middle, a little to one side, and another separating the clavus from the corium, but distinct on the specimen only apically, where it is continuous with the inner margin of the membrane. The membrane is well rounded, but slightly produced at the outer angle, and the space is occupied by nine nearly longitudinal veins, distributed in three sets of three each: the first set is composed of three obscure veins, pretty close together next the inner edge, originating from the same point, equidistant from one another, the innermost hugging the inner margin; from apparently the same point originates the next cluster, starting in a single vein, which almost immediately forks, and sends its innermost branch parallel to those mentioned; the other branch diverges strongly from it and again forks, the two branches running

parallel to the first ; while from opposite the point of origin of the last fork the third cluster takes its rise, starting as a shouldered vein, which forks at its shoulder into two slightly divergent veins which run subparallel to the previous veins ; but the innermost of these again forks beyond its middle, crowding the veins together at this point ; there is also a short, tenth, independent vein close to the outer extremity of the produced coriaceous field. The outer margin of the wing is delicately wrinkled with a simulation of veinlets. The abdomen is ovate, somewhat regularly tapering at its outer half ; the apex obscure but apparently regularly rounded ; the pleuræ are punctured like the scutellum, while the dorsal surface is minutely and profusely but obscurely punctulate. Such portions of the chitine as remain are of an intense black. The specimen is apparently a male, but whether two small triangular pieces, nearly equiangular, following the posterior edge of the sixth abdominal segment laterally, are to be considered the anal cerci is doubtful.

Directly beside this specimen, and, in fact, partly underlying it, are the abdomen and part of the sternum of another insect, which, although much smaller, should doubtless be regarded as the female of the same species. This abdomen shows the under surface ; it is very rounded and ovate, the extremity well rounded, the sixth segment represented by a circular fissured plate. The sides of the abdomen are punctulate, as in the other specimen, but the punctulation dies out before reaching the middle of the abdomen. Little can be said of the other parts of the body, excepting that the rostrum appears to terminate at the front limit of the middle coxæ, and the sternal parts of the thorax are coarsely punctate as above and more particularly at the margins of the separate pieces.

Length of the male, 15^{mm} ; of head, 2.9^{mm} ; breadth of same beyond the base, 2.4^{mm} ; length of thorax, 3.25^{mm} ; of tegmina, 11^{mm} ; breadth of same near tip, 4.35^{mm} ; length of scutellum, 4.2^{mm} ; breadth of same, 4.5^{mm} ; greatest breadth of abdomen, 8^{mm} ; breadth of its dorsal face at tip of scutellum, 6^{mm}. Length of abdomen of female, measured beneath, 4^{mm} ; breadth of same, 5^{mm} ; width of fissured plate, 1.25^{mm}.

Quesnel.—One specimen, No. 38, Dr. G. M. Dawson, 1876.

PLATE I.

From India ink drawings by Mrs. Katherine Pierson Ramsay.

- Fig. 1. *Cercopites torpescens*, $\frac{2}{1}$.
2. *Cercopis grandescens*, $\frac{2}{1}$.
3. *Ricania antiquata*, $\frac{8}{3}$.
4. *Aphrophora* sp., $\frac{2}{1}$.
5. *Enchophora* sp. ; the frontal process, $\frac{2}{1}$.
6. *Ptysmaphora fletcheri*, $\frac{2}{1}$.
7. *Palecphora* sp., $\frac{2}{1}$.
8. *Palæoptysma venosa*, $\frac{8}{3}$.
9. *Stenecphora punctulata*, $\frac{2}{1}$.
10. *Dawsonites veter*, $\frac{8}{3}$.
11. *Stenoloeris venosa*, $\frac{2}{1}$.

Geological Survey of Canada.

CONTR. TO CAN PAL., VOL. II

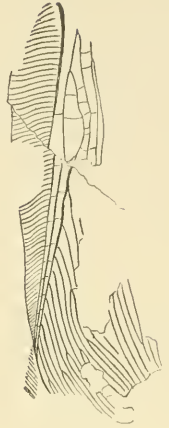
PLATE I



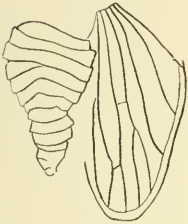
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GEOLOGICAL SURVEY OF CANADA.

CONTRIBUTIONS TO CANADIAN PALEONTOLOGY.

VOLUME II.

CANADIAN FOSSIL INSECTS.

BY SAMUEL H. SCUDDER.

2. The Coleoptera hitherto found fossil in Canada.

Coleoptera have been found fossil in seven distinct localities in Canada and at three very different horizons, viz., in Post-pliocene deposits (Scarboro', Ontario, and Green's Creek, Gloucester, Ontario), the Tertiary series proper and probably its lower half (the four localities in British Columbia from which fossil insects are known), and the Cretaceous rocks (Millwood, Manitoba). The last has yielded but a single species, now first described—a Curculionid. The lower Tertiary rocks have fourteen species, belonging to as many as eight families, only the Chrysomelidæ, Buprestidæ and Elateridæ having more than one each. The Post-pliocene deposits have proved the most prolific with thirty-two species, though here only seven families are represented, of which the Carabidæ and Staphylinidæ, but especially the former, very largely preponderate. The greatest interest attaches to the interglacial locality near Scarboro', Ont., which alone has yielded twenty-nine species*, and is the largest assemblage of insects ever found in such a deposit anywhere. These clays have been studied and their fossils collected by Dr. G. J. Hinde†, who sets forth the reasons why he regards them as interglacial, lying as they do upon a morainal till of a special character and overlain by till of a distinct kind. The elytra and other parts of beetles found by him represent five families and fifteen genera: they are largely Carabidæ, there being half-a-dozen species each of *Platynus* and *Pterostichus*, and species also of *Patrobus*, *Bembidium*, *Loricera* and *Elaphrus*.

The next family in importance is the Staphylinidæ, of which there are five genera, *Geodromicus*, *Arpedium*, *Bledius*, *Oxyporus* and *Lathrobium*, each with a single species. Hydrophilidæ are represented by *Hydrochus* and *Helophorus*, each with one species, and the Chrysomelidæ by two species of *Donacia*. Finally a species of Scolytidæ must have made the borings under the bark of juniper described below.

* This statement includes four species (*Hydrochus amictus*, *Helophorus rigescens*, *Pterostichus dormitans*, and *Bembidium fragmentum*), found by Dr. Hinde near Cleveland, Ohio, on the shores of Lake Erie, in clay beds very similar to those found near Scarboro', on the shores of Lake Ontario, but not found at Scarboro' itself. They undoubtedly belong to the same category.

† Can. Journ. Sc., N.S., xv, 388-413 (1887).

Looking at the assemblage of forms as a whole and noting the distribution of the species to which they seem to be most nearly related, they are plainly indigenous to the soil, but would perhaps be thought to have come from a somewhat more northern locality than that in which they were found ; not one of them can be referred to existing species, but the nearest allies of not a few of them are to be sought in the Lake Superior and Hudson Bay region, while the larger part are inhabitants of Canada and the northern United States, or the general district in which the deposit occurs. In no single instance have any special affinities been found with any characteristically southern form, though several are most nearly allied to species found there as well as in the north. A few seem to be most nearly related to Pacific forms, such as the *Elaphrus* and one each of the species of *Platynus* and *Pterostichus*. On the whole, the fauna has a boreal aspect, though by no means so decidedly boreal as one would anticipate under the circumstances.

The other locality for Pleistocene insects is Green's Creek, where in nodules otherwise containing mainly marine organisms still living, three species of land beetles have been found, each belonging to a distinct family, and one of them, *Byrrhidæ*, a family not otherwise represented among Canadian fossils.

The eight families represented in the older tertiaries of British Columbia, are with two exceptions (*Scarabæidæ* and *Nitidulidæ*, each with a single species) also found in the later tertiaries to the eastward. Of these, half a dozen species have been found in each of the two basins where they are most common, namely, on the Nicola River and the north fork of the Similkameen, the deposits at Nine-Mile Creek having been laid down, according to Dr. Dawson, in the same lake with the latter ; in each case these half dozen species belong to four families, but only one of these families, the *Elateridæ*, is represented in both. All this indicates that what we have found is the merest fragment of a very diversified fauna. Yet it remains to be added that Quesnel, perhaps the most prolific locality of all these, has produced but a single beetle, of a family, *Nitidulidæ*, not elsewhere represented.

Family SCOLYTTIDÆ.

HYLASTES Erichson.

Hylastes ? squalidens.

Scolytidæ sp., SCUDD., Can. Ent., XVIII, 194—96 (1886).

Hylastes ? squalidens SCUDD., Tert. Ins. N.A., 468--469, Pl. 1, figs. 23-25 (1890).

Prof. G. J. Hinde sent me a branch of a conifer obtained by him from the interglacial clays near Toronto on account of its being scored with insect

tracks. From an examination of the cell structure, Dr. G. L. Goodale has determined it to be the branch of *Juniperus communis*. It is about 12·5^{mm} in length and 13 by 18^{mm} in thickness; the scorings, which cover a considerable part of the surface, are made by several distinct tracks of a scolytid larva, which appears to be referable to *Hylastes*, *Phloeosinus*, or some near ally. There are parts of at least six different sets of tracks on this small fragment.

The mating chamber is more or less triangular, resembling often a shark's tooth in form (whence the name), generally equiangular or tridentate, the apex upward. Two of these chambers from which no main galleries take their rise occur on the stick; they may, however, have some other explanation, since they are much narrower and much more deeply excavated than the other mating chambers. Possibly they were unsatisfactory to the constructor and left unfinished.

From the mating chambers, which are not deep, and are about 3^{mm} in diameter, pass the main galleries: these generally run obliquely, but more nearly transverse than longitudinal, are subequal, and take their rise one on either side of the mating chamber at the lateral angles and run in exactly or almost exactly opposite directions. In one case, however, there is but one main gallery, and in another they are at right angles to each other, one being longitudinal; but in this latter case the mating chamber is in the reverse of the usual position, the apex being downward. These main galleries vary from 1·5 to 8^{mm} in length, and are slightly more than a millimetre wide, with dentate edges, marking probably the sinuses where the eggs are laid by the parent.

At least this is the custom with the mining beetles; but here, as in some other rare cases, the young larvæ do not begin to mine at right angles to the main gallery, but all start from one spot, either the summit of the mating chamber or the extremity of one of the main galleries, and thence burrow in irregular and somewhat interlacing mines in a longitudinal direction, but nearly all apparently either upward or else downward, not, as usually, in the two directions almost equally. Apparently they may often turn upon their course again and again, or they may mine in an almost perfectly straight line or in a tortuous line for as much as 5^{cm} in the whole of which distance the mine will scarcely have doubled in width; indeed, in many cases it is difficult to tell in which direction the larva has moved. The greatest width of these mines is scarcely more than half a millimetre, and they vary greatly in depth.

The connection between the main gallery and the mines is often obscure, owing doubtless to the younger larvæ burrowing more in the bark than in the wood (the bark being here entirely lost). In one case there is a mating chamber and a pair of short galleries, but nothing more; here apparently the mother fell a prey to some enemy before oviposition.

This mode of origin of the larval mines seems to be different from anything hitherto described, and it is therefore difficult to decide to what minor group of insects the creature constructing the mines belonged. In the Museum of Comparative Zoology at Cambridge is a mine of *Scolytus rugulosus* on cherry, which shows a somewhat similar distribution of the larval mines, emerging and diverging from one point of the mating chamber; but the main galleries are reduced to almost nothing, and the figures of the mines of this species given by Ratzeburg are altogether different.

This specimen is one of those branches "of some coniferous tree," which Mr. Hinde in his article on the glacial and interglacial strata of Scarborough Heights (*loc. cit.*) states to occur in the layers between the beds of clay and sand found between his "till No. 1" and "till No. 2," and which are described as "flattened by pressure, their edges . . . worn as if they had been long macerated in water." This is exactly true of the present fragment.

Interglacial clays of Scarborough, Ont.—G. J. Hinde.

Family CURCULIONIDÆ.

HYLOBIITES.

Under this new generic term, for convenience sake, I place the fragment of a very well marked but imperfect elytron, which seems to come as near *Pachylobius* as any of our genera, and to fall probably in the *Hylobiini*.

Hylobiites cretaceus.

Pl. 11, fig. 5.

The single specimen is the fragment of an elytron, including its entire tip, showing that there were ten slender striæ of which the first and tenth, second and ninth, third and eighth severally united at an acute angle at slight and regularly increasing distances from the apex, while the fourth and fifth are confluent just before reaching the eighth, and the sixth and seventh are confluent and a little incurved just before reaching the fifth, and where they are scarcely farther from the tip than from the inner margin; these striæ are deeply impressed, shining piceous, and distinctly punctate, the puncta slight and a little elongate; the interspaces are strongly convex, as is the elytron itself, and are minutely and profusely punctulate, the puncta more or less laterally confluent, at the apex of the elytra forming irregular arcuate transverse ridges between the striæ, having their concavity forward.

Length, 4.5^{mm}.; breadth 1.5^{mm}.

Millwood on the Assiniboine River, north-western Manitoba, from nodules in the Pierre shales.—J. B. Tyrrell, 1888.

This is the second cretaceous insect that has been discovered in North America, the first being *Corydalites* from the Laramie beds of Colorado.

Family TENEBRIONIDÆ.

TENEBRIO Linné.

Tenebrio primigenius.

Tenebrio primigenius SCUDD., Rep. Prog. Geol. Surv. Can., 1877-78, 183 B (1879);
 Id., Tert. Ins. N. A., 483-484, Pl. II., fig. 32 (1890).

A single, complete, and well-preserved elytron represents a species of Tenebrionidæ, a little larger than, and somewhat resembling, *Tenebrio molitor* (Linn.), the beetle of the common meal-worm. It has been flattened by pressure, so as to show but little sign of having been arched; while at the same time the shape is fairly preserved. Wherever it differs in colour from the stone it is piceous. The margins are very nearly parallel, approaching each other rather gradually and very regularly toward the tip; there are eight equidistant, pretty strongly impressed, rather coarse, longitudinal striæ, besides others next the outer margin, whose number cannot be determined, and a short scutellar striæ, about as long as in *T. molitor*, but quite as distinct as the others; the surface between the striæ appears to be very minutely subrugulose, and shows in favourable light a faint transverse corrugation.

Length of elytron, 11^{mm}; breadth, 4·4^{mm}.

Nine-Mile Creek, British Columbia. One specimen, No. 63—Dr. G. M. Dawson.

Tenebrio calculensis.

Pl. III, figs. 1, 6.

In a clay nodule are exposed, besides other objects, the partly twisted more or less separated and broken members of a beetle, the anterior half of the under surface of which is also seen. It appears to belong to the Tenebrionidæ in the near vicinity of *Tenebrio*, but to combine with a delicate punctuation and independent feeble striation of the elytra, a coarsely punctate, almost rugose metasternum very foreign to *Tenebrio* and more such as is found in *Cibdelis* where, however, the elytra have by no means the delicacy found in the fossil. Other and more important reasons for placing it in or near *Tenebrio* are the close approximation of the fore and middle legs when the pronotum is bent down, the slight

separation of the insertion of opposite legs, and the form of the metasternum.

The insect must have been of about the size of the common *T. molitor*. Head well rounded, shaped, so far as can be seen, exactly as in *T. molitor*, the surface uniformly more finely, more densely, and perhaps not quite so deeply punctate. Fore and middle coxæ attingent or subattingent when the prothorax is bent down, the middle pair separated from each other by about half the middle length of the metasternum: the metasternum is shaped in general as in *T. molitor*, but is relatively shorter, and the anterior mesial lobe, which separates the middle coxæ, is much broader and shorter, and its front border is slightly emarginate; as in *T. molitor* there is a median sulcus, deepest posteriorly, but the surface sculpture is very different, being coarsely and profusely punctate, coarsest and more separated on the anterior mesial lobe, more or less confluent, transversely, next the rest of the anterior margin. The femora are much shorter and stouter than in *T. molitor*, rather coarsely punctate, the tibiæ far stouter, resembling the femora and similarly punctate. The elytra are punctate exactly like the head, with sharply incised, fine, but by no means deep striæ, which become evanescent toward the tip.

Width of metasternum, 4.9^{mm}; length of same, 1.25^{mm}; length of hind femora, 2.25^{mm}.

Tenebrio molitor occurs in North America from Nova Scotia to Mexico, and is also found in Alaska. It is a European insect.*

Green's Creek, township of Gloucester, Ontario. One specimen, with reverse—Henry M. Ami, 1884.

Family CHRYSOMELIDÆ.

GALERUCELLA Crotch.

Galerucella picea.

Galerucella picea SCUDD., Rep. Prog. Geol. Surv. Can., 1877-1878, 182-183 B (1879).

Galerucella picea SCUDD., Tert. Ins. N.A., 485, Pl. II, fig. 31 (1890).

A pair of rather poorly preserved elytra, parted at the tip and showing between and through them the outlines of the abdominal segments, represents a species of Chrysomelidæ, which appears to be most nearly allied to the genus in which I have placed it, and to be about the form of, and a little smaller than, *G. maritima* LeC. The elytra are uniformly piceous throughout, showing no marks of lighter coloured borders; there are faint

* For information on the distribution of American Coleoptera I always rely upon the ready and efficient aid of my friend, Mr. Samuel Henshaw, of Cambridge.

indications of one or two marginal impressed lines in their outer half, and the whole surface seems to have been very minutely punctate, more faintly and finely than in the existing species mentioned. The abdomen is very broadly and very regularly rounded, subovate, and at least five segments of similar length can be determined.

Breadth of the pair of elytra at base, 3.75^{mm}; length of elytra, 5.5^{mm}; breadth of abdomen, 3.25^{mm}; length of penultimate segment, 0.4^{mm}.

Nine-Mile Creek, British Columbia. One specimen, No. 62—Dr. G. M. Dawson.

CRYPTOCEPHALITES Gen. nov. (*Cryptocephalus*, nom. gen.)

Under this name I am compelled to place, until further material is at hand, an elytron of a beetle which presents certain peculiar features I have not been able to find in any modern form, and by which it seems to be allied to the tribe Cryptocephalini among Chrysomelidæ. This feature consists in the presence of an apparently flat, narrow and narrowing area along the sutural margin, corresponding to that which would lie within the first complete stria of the Cryptocephalini, and covering the longer or shorter humeral stria (where one exists); this is accompanied by an independent arching of the rest of the elytron with its striæ. The form of the elytron, especially its considerable apical narrowing and the sculpture of its surface, does not agree well with this group of Chrysomelidæ, and I am by no means confident that its place has been properly indicated by this reference.

Cryptocephalites punctatus.

Pl. II, fig. 4.

The single elytron is nearly perfect, only a fragment of the outer base being lost. It is a little more than twice as long as broad, broadest before the middle of the basal half, narrowing, at first gradually, afterwards more rapidly, by the curvature of the outer margin, the apex rapidly narrowing on both sides and bluntly subacuminate. There are four blunt and dull-beaded ridges, with five narrower, slighter, and more finely beaded but sharper ridges between them and outside the outer ones, while the interspaces are marked by irregular longitudinal series of minute beads, all the so-called beads being probably shallow puncta seen in reverse; the flat inner area appears to have no definite sculpture, but to be not altogether smooth.

Length, 4^{mm}; breadth, 1.8^{mm}.

North fork of Similkameen River, British Columbia. One specimen, No. 101—Dr. G. M. Dawson, 1888.

DONACIA Fabricius.

Donacia stiria.

Donacia stiria SCUDD., Tert. Ins. N.A., Pl. 1, fig. 28 (1890).

This is represented by the mere fragment of an elytron, but with a distinct kind of sculpturing. It seems to come as near *D. porosicollis* Lac., as any of our modern species I have seen. The tip is the part preserved; it is of a deep blue-black colour, with an excessively fine, microscopic, transverse rugulation, delicately impressed narrow striæ, the striæ minutely punctulate, the first and last striæ moderately distant from the margins, deeply impressed, and less distinctly punctate. It is apparently a rather small species.

Length of fragment, 3.2^{mm}; breadth of same, 1.4^{mm}.

Donacia porosicollis has been found in Massachusetts and on the shores of Lake Superior.

Interglacial clays of the neighbourhood of Scarborough, Ontario. One specimen, No. 14558—G. J. Hinde.

Donacia pompatica.

Donacia pompatica SCUDD., Tert. Ins. N.A., 486-487, Pl. 1, figs. 33, 34 (1890).

This species, of which there are several examples at hand, is most nearly allied to our living *D. pubicollis* Suffr., but is much smaller, or about the size of *D. emarginata* Kirby. As to the sculpture of the surface of the elytra (the only part preserved in any specimen), it would be difficult to say in what respect it differed from the former species, except in the obliteration of the markings at the tip of the elytra, which seems to be characteristic of the fossil. In colour it varies extremely: in one (No. 14582) it is bluish purple; in another (No. 14566) it is deep brilliant violet; still another (No. 14577) has it dark metallic green. In all, the colours are as fresh as if living. The punctured striæ are rather deep, and the whole surface of the elytra transversely wrinkled at the punctures.

Length of elytron, 5^{mm}; breadth, 1.45^{mm}.

Donacia pubicollis occurs in Illinois.

Interglacial clays of Scarborough, Ontario. Five specimens, Nos. 14566, 14573, 14577, 14581, 14582—G. J. Hinde.

Family SCARABÆIDÆ.

Trox Fabricius.

Trox oustaleti.

Trox oustaleti SCUDD., Rep. Prog. Geol. Surv. Can., 1877-78, 179-180 B (1879);
 Id., Tert. Ins. N. A., 487, pl. II, fig. 22 (1890).

A single elytron, well preserved, appears to represent a species of *Trox* of about the size of *T. terrestris* Say, but with rather slender elytra. The elytron is subequal, narrowing rapidly and regularly at the tip, well arched, and was apparently still more arched originally, the middle portion having a flattened appearance, as if from pressure, with a narrow flattened outer margin; the surface is completely and uniformly covered with thirteen or fourteen equal equidistant rows of frequent dull tubercles, as distant from one another in the rows as each row from its neighbour, and obsolescent toward the apex and the base, especially towards the former. In certain places there is a very slight appearance of greater prominence to every fourth row, which would hardly be noticed if its resemblance to modern species of *Trox* did not lead one to look for it; the extreme tip is broken. The colour is dark brown, approaching black, but the whole central portion of a faded brown, nearly resembling the natural colour of the stone in which it is preserved.

Length of elytron, 4.25^{mm}; breadth, 1.85^{mm}.

Named after M. Emile Oustalet, of the Jardin des Plantes, whose researches on the Tertiary insects of Auvergne and Aix are well known.

Nine-Mile Creek, British Columbia. One specimen, No. 61—Dr. G. M. Dawson.

Family BUPRESTIDÆ.

BUPRESTIS Linné.

Buprestis tertiaria.

Buprestis tertiaria SCUDD., Rep. Prog. Geol. Surv. Can., 1877-78, 180-181 B (1879);
 Id., Tert. Ins. N.A., 493-494, pl. II, fig. 23 (1890).

Three specimens were obtained of this species, all of them elytra. One shows the two elytra crossed at the base, and a reverse of this shows the cast of the upper surface; the other two are single and perfect elytra, both exhibiting the upper surface, one in relief, the other as a cast, but they are not reverses. This and the two following species classed under *Buprestis* agree closely together, but do not seem to be plainly referable to any recent American genus, although approaching nearest *Buprestis* or

Ancylacheira. They seem to be nearly related also to the Tertiary species from Sieblos, described by Heyden under the name of *B. senecta*. For the present I place them in *Buprestis*.

The elytra are very long and slender, nearly four times as long as broad, equal throughout the basal two-thirds, then gradually and very regularly tapering by the sloping of the outer edge, the tip a little produced and rounded, and about one-fourth as broad as the middle of the elytron. The surface is ornamented by ten rows of very distinct striae with rather deeply impressed puncta; these striae are a little sinuous near the base, and there is also a scutellar stria extending down nearly one-third of the elytron; the outer stria unites with the margin in the middle of the outer half of the elytron; the three inner and two other outer striae extend to the apex, while the four interior striae terminate: the inner pair a little beyond the termination of the outer stria, the outer pair still a little farther toward the apex, thus allowing for the narrowing of the elytra; the surface between the striae is much broken by slight transverse corrugations, giving, with the punctate striae, a rough appearance to the elytra. This species differs from the two following by the great slenderness of the elytra and the more delicate tapering of its tip.

Length of elytron, 6.5^{mm}; breadth, 1.7^{mm}.

Nicola River, below main coal seam, British Columbia. Three specimens, Nos. 48, 51 and 52, 54—Dr. G. M. Dawson.

Buprestis saxigena.

Buprestis saxigena SCUDD., Rep. Prog. Geol. Surv. Can., 1877-78, 181 B (1879);
Id., Tert. Ins. N. A., 494-495, pl. II, figs. 24, 25 (1890).

This species is represented by several elytra or fragments of elytra, sometimes preserved by pairs in natural connection. It is very closely allied to the last, but differs from it in having the elytra less slender, the breadth being contained about three and a half times in the length, and in the rather greater coarseness of the punctuation and transverse corrugation. The striae are the same in number, but are, perhaps, a little more sinuous, and the scutellar stria is shorter, hardly extending so much as a quarter-way down the inner margin; the outer striae terminate in much the same way as in *B. tertiaria*, but the seventh stria (from the suture) frequently runs to, or very nearly to, the tip; the extreme tip is formed precisely as in *B. tertiaria*, but the sides of the elytra, running parallel throughout three-quarters of their length, taper toward the apex more abruptly than in the preceding species, though with the same regularity. This species stands midway between the other two here described in the form of the apical third of the elytra.

Length, 6.2^{mm}; breadth, 1.7^{mm}.

Nicola River, below main coal seam, British Columbia. Five specimens, Nos. 47 and 54, 49, 50, 55, 56—Dr. G. M. Dawson.

Buprestis sepulta.

Buprestis sepulta SCUDD., Rep. Prog. Geol. Surv. Can., 1877-1878, 181B (1879);
ID., Tert. Ins. N.A., 495, Pl. II, fig. 26 (1890).

A single specimen, showing the greater part of both elytra in natural conjunction, must be separated from the two preceding by its still broader elytra with more rapidly tapering apex. The elytra are slightly less than three and a half times longer than broad, with sides parallel throughout three-quarters of their length, then suddenly tapering, the extreme tip shaped as in the other species, only more produced, so as to form more distinctly a kind of lobe, the outer margin being very slightly and roundly excised just before the produced tip. The surface is perhaps even rougher than in the other species, but the striae appear to be less sinuous; the scutellar stria is destroyed in both elytra of the single specimen before me; the outer stria terminates as in *B. tertiaria*, but the inner pair of the middle series of striae is here the longer, extending barely to the tip of the outer stria, while the outer pair is a little shorter; the produced tip of the elytra is a little shorter than in the preceding species, but similarly rounded apically.

Length of elytron, 6.7^{mm}; breadth, 2^{mm}.

Nicola River, below main coal seam, British Columbia. One specimen, No. 53—Dr. G. M. Dawson.

Family ELATERIDÆ.

LIMONIUS Eschscholtz.

Limonius impunctus.

Pl. II, fig. 3.

A long and slender elytron of moderately large size plainly belongs to the Elateridæ and seems to fall in the near vicinity of *Limonius*, though when its complete remains are found it will be likely to prove distinct. As preserved, the elytron is of a dead black or black-brown colour, nearly flat, with nearly parallel sides, and about four times as long as broad; unfortunately the tip is broken, but it would appear not to have been much produced. The scutellum must have been as in *Limonius*. There are nine striae, or rather series of deeply impressed linear punctures, often, especially in the outer series, coalescing: the first unites with the second by the middle of the basal half of the elytron, and there is some confusion

and irregularity at the base of the four outer series; the fifth and sixth unite before the middle of the distal half of the elytron, and shortly after these with the fourth; while the seventh and eighth unite a little before the tip, and still further out these with the other united series; at the base all curve toward the inner base of the elytron: interspaces between striae flat, without punctures but roughened.

Length of fragment, 9.3^{mm}; probable complete length, 10-10.5^{mm}; breadth, 2.6^{mm}.

North fork of Similkameen River, British Columbia. One specimen and its reverse, No. 100^{ab}—Dr. G. M. Dawson, 1888.

CRYPTOHYPNUS Eschscholtz.

Cryptohypnus? terrestris.

Cryptohypnus? terrestris SCUDD., Rep. Prog. Geol. Surv. Can., 1877-1878, 181-182 B (1879); ID., Tert. Ins. N. A., 497, Pl. II, fig. 30 (1890).

A single, very nearly perfect, elytron, broken slightly at the base, which belongs, with little doubt, to the Elateridæ, is provisionally referred to this genus. The form of the elytron is as in *C. planatus* LeC., which is slightly larger than the fossil species. The surface is very minutely punctato-rugose, and the striae are sharp and clearly defined. In nearly all Elateridæ the fourth stria from the suture unites with the third rather than with the fifth, although it often runs independently to the tip. In *Cryptohypnus* there appears to be more latitude, nearly any of the striae uniting with either of their neighbours; and in this species the fourth unites with the fifth some distance before the tip, while the first three run to the extremity of the elytron, and the sixth, seventh and eighth, following the curve of the outer margin, terminate near the tip of the third stria.

Length of elytron, 5.5^{mm}; breadth, 1.75^{mm}.

Nicola River, below main coal seam, British Columbia. One specimen, No. 59—Dr. G. M. Dawson.

From the same locality were brought the remains of another insect, consisting of the metasternal plates, one side complete, the other broken, and plainly belonging to the Elateridæ. The perfect side agrees so well with the same part in *Cryptohypnus planatus* LeC., that I refer it to the fossil species above described, which its size renders entirely admissible. It is, however, relatively longer than in *C. planatus*, the perfect half being about a-third longer than broad, not including, of course, the side pieces, which are not preserved. The surface is densely and rather heavily punctate, more densely and perhaps less deeply next the coxal cavities;

the median line (separating the two lateral halves of the whole metasternum) is very deeply impressed, but the furrow dies out anteriorly in the projection between the coxæ.

Length of metasternum, 2·1^{mm}.

Cryptohypnus planatus occurs in Canada and the northern United States.

FORNAX Laporte.

Fornax ledensis.

Pl. III, figs. 3 and 4.

A single elytron is preserved in a nodule, which contains also the remains of a fish (*Mallotus villosus*, according to Sir William Dawson). A portion of the black chitine still remains at the base and tip, and the form of the whole and the sculpturing of the surface are perfectly preserved. It is most nearly allied to *F. calceatus* (Say), but differs from it too much to be placed with it. The narrowing of the elytra is scarcely perceptible before the distal fourth, where it is distinct and rapid, the apical angle slightly less than a right angle. It is very distinctly striate, considerably more so than in *F. calceatus*, the interspaces between the striæ more densely punctured even than in that species, though not so deeply, producing a very rugulose appearance; the punctuation appears to be disposed to a noticeable extent in slightly oblique transverse rows, as is also the case in *F. calceatus*, and in which there are about four or five punctures across an interspace; in each puncture is a circular pit, the point of insertion of a hair (not preserved), which is only 0·01^{mm} in diameter, while the punctures are nearly 0·04^{mm} in diameter; the striæ in the broadest part of the elytron are 0·2^{mm} apart, the width of the elytron 1·7^{mm}, and its length 5·5^{mm}.

The species differs from *F. calceatus* in the slightly more rapid and apical attenuation of the elytra, the stronger striation, shallower but more dense punctuation, and the smaller hair pits; from *F. hornii* in its darker colour, the stronger striation, shallower, denser and more rugulose punctuation: and from *F. badius* in the broader and more suddenly narrowed elytra, more distinct striation, and much more distinct punctuation.

Fornax calceatus is found in Canada, about Lake Superior, and in Massachusetts.

Post-pliocene (Leda clays) of Green's Creek, Ottawa, Canada—Sir William Dawson.

Elaterites sp.

Pl. III, fig. 5.

One can say scarcely more of this slender elytron than to describe its form, which is represented in the figure, and to state that as preserved it appears almost perfectly flat, and to show indications of longitudinal series of punctures after the general method of the shards of Elateridæ.

Length, 5.5^{mm}; breadth, 1.6^{mm}.

North fork of Similkameen River, British Columbia. One specimen, No. 102 (on the same stone with the wing of a fly, *Plecia*.)—Dr. G. M. Dawson, 1888.

Elateridæ ? sp.

Elateridæ sp., SCUDD., Rep. Prog. Geol. Surv. Can., 1877-1878, 182B (1879); ID., Tert. Ins. N.A., 498, Pl. II, fig. 28 (1890).

In the collection of the Geological Survey of Canada there is an elytron with the base nearly destroyed, which resembles in striation the Hydrophilidæ, but is far too elongated to belong to that family, resembling rather the Elateridæ. It is so imperfectly preserved that, perhaps, a nearer determination is impossible at present. There are eight rather faintly impressed but distinct striae, the outermost a little more distinct, especially toward the tip.

Width of elytron, 1.25^{mm}; its apparent length, 4.5^{mm}.

Nicola River, below main coal seam, British Columbia. One specimen, No. 60—Dr. G. M. Dawson.

Family BYRRHIDÆ.

BYRRHUS Linné.

Byrrhus ottawaensis.

Plate II, figs. 6-8.

This species is very closely allied to *B. geminatus* LeC., more closely to it than to any other living American form, unless it be *B. pettiti*, which I have not been able to examine. So far as can be told from the condition of the fragment, it does not differ from it in size or form, excepting that the prothorax is more regularly vaulted, the front portion being regularly oval and not, as in *B. geminatus*, slightly flattened in front. What is, however, more relied upon for the distinction of the species is the surface sculpture beneath the clothing of pile (of which latter, except in one or two spots, no sign appears in the fossil), characters which have

been mainly neglected in the descriptions of our native species. It is in these that its close affinity to *B. geminatus* appears, but from which it differs in points which distinguish it as clearly as *B. americanus* and *B. kirbyi* differ from each other, but by no means so sharply as either of these differ from each other. In the present fossil species the sculpture of the upper surface of the body is a clean and sharp, close, deep and delicate, uniform set of circular punctures, differing from those of *B. geminatus* (Pl. II, figs. 9, 10) only in their being less coarse and less distant, differences only observable under a strong lens. In the two other living species referred to, the punctures are more or less confused in a transverse direction, at least upon the elytra, and are duller, less deeply impressed, and more distant. The fossil species differs from *B. geminatus* in the entire absence of the very slight median sulcus or stria of the prothorax, though the sulci of the elytra do not differ. The only other difference observed is in the puncturing of the abdominal segments, which is more distant and feeble in the fossil than in *B. geminatus*, while that of the tibiae is distinctly obscure, producing a blurred and subdued sculpture not seen in the modern form.

Breadth, 5^{mm}; length of thorax, 2^{mm}; probable length of body, 7.5^{mm}.

The specimen is preserved at the edge of a fine-grained clay nodule, and has thereby lost the hinder extremity of the body, but its parts are remarkably preserved, the chitine as clear as in life, but with the loss of all the pile which clothed the parts; the chitinous shell can be raised from certain parts, where the sculpturing of the surface is seen to have left its cast in the fine clay as in the most delicate wax, though showing not the remotest trace of the dermal hairs.

Byrrhus geminatus occurs on the shores of Lake Superior, in Canada West, and in New Hampshire.

Green's Creek, Ottawa River.—H. M. Ami and A. E. Barlow, 1886.

Family NITIDULIDÆ.

PROMETOPIA Erichson.

Prometopia depilis.

Prometopia depilis SCUDD., Rep. Prog. Geol. Surv. Can., 1875-1876, 278-279 (French ed., 308-309) (1877); *Id.*, Tert. Ins. N. A., 500, Pl. II, fig. 29 (1890).

This beetle appears to belong to the Nitidulidæ, but where it should be generically located is a matter of some doubt. It resembles most among our American forms the genus in which I have provisionally placed it,

but so few really generic features remain that one can judge by little other than accessory characters. The head is wanting and the thorax is broken, and though exhibiting the under surface, the markings of the elytra can be readily seen, as is frequently the case in fossil beetles. The form of the elytra and scutellum is precisely that of *Prometobia sermactulata*, excepting that the base of the elytra is more distinctly angulate; beneath, the elytra are expanded just as there, and punctured in much the same irregular and minute manner, but equally so at the extreme border beneath, instead of being furnished at this point with transverse rugæ; the punctures are 0.028^{mm} in diameter, and do not give origin to hairs; the elytra are dark castaneous, and have a dull ridge along the sutural margin. The thorax is black, and proportionally shorter than in *Prometopia*, but otherwise it appears to have the same form, although the characteristic lateral projections of the front border are broken off, only the slightest indication of that on the left side appearing in a portion of the curve of the front border. The thorax is more minutely punctate than the elytra, and the puncta are connected by the slightest possible impressed lines, giving it somewhat of a corrugated appearance; a few of the abdominal segments may be seen, the pygidium extending just beyond the elytra: all these joints are black, smooth, and shining, without trace of hairs or punctures.

Length of fragment, 5.5^{mm} ; length of middle of thorax, 1.25^{mm} ; breadth of same, 3.2^{mm} ; length of elytra, 3.75^{mm} ; breadth of united elytra, 3.35^{mm} .

Quesnel, British Columbia. One specimen, No. 24—Dr. G. M. Dawson.

Family STAPHYLINIDÆ.

ARPEDIUM Erichson.

Arpedium stillicidii.

Pl. II, fig. 2.

Allied to *A. cribratum* Fauv., but less sharply punctured. A single elytron, broken at the humeral angle. It is about twice as broad as long, the sides parallel and delicately margined; the posterior border is straight, the outer posterior angle much rounded. Most of the deflexed portion of the outer margin is broken off, but to judge from what is left it was probably of considerable breadth, and it certainly extended considerably beyond the middle of the outer half of the elytron. The surface of the elytron is rather coarsely and profusely punctate at the base, the puncta becoming shallower, rather larger, and more distant apically and nearly fading out at the tip. The texture is tolerably firm and the colour blackish

castaneous. The excision of the inner basal angle indicates a moderate sized equiangular scutellum.

Length of elytron, 2.4^{mm}; breadth, 1.1^{mm}.

Arpedium cribratum is known only from Michigan.

Interglacial clays, Scarboro', Ont., No. 14511—Dr. G. J. Hinde.

GEODROMICUS Redtenbacher.

Geodromicus stircidii.

Pl. II, fig. 1.

A single elytron, indicating a species scarcely smaller than *G. nigrita* Müll. It is black and of a tolerably dense texture, more than twice as long as broad, with straight and parallel sides, both borders delicately margined, the posterior margin straight on the inner half or more, the inner posterior angle rectangular, the outer well rounded off. The deflexed outer margin is moderately narrow, equal, sculptured like the upper surface, and terminates at the middle of the outer half of the elytron. The surface is irregularly punctate with shallow, moderately abundant, rather minute punctures. The excision of the inner basal angle indicates a rather small equiangular scutellum.

Length of elytron, 1.75^{mm}; breadth, 0.75^{mm}.

Interglacial clays of Scarboro', Ont. One specimen, No. 14537.—Dr. G. J. Hinde.

BLEDIUS Leach.

Bledius glaciatus.

Bledius glaciatus SCUDD., Tert. Ins. N. A., 505. Pl. I, fig. 35 (1890).

Allied to *B. brevidens* LeC. A single elytron, about twice as long as broad, the sides almost parallel and straight, slightly broader than elsewhere just before the tip, the apical margin straight, not inclined, the outer posterior angle gently rounded, the outer border slightly, the inner scarcely, margined, the deflexed portion of the outer margin narrow, equal, terminating at the middle of the outer half. Texture delicate, the surface slightly, irregularly, and not very closely punctate. A very small and rather broad scutellum is indicated by the shape of the inner basal angle, which is not quite accurately given on the plate.

Length of elytron, 1.9^{mm}; breadth, 1.1^{mm}.

Bledius brevidens is found in New York.

Interglacial clays of the neighbourhood of Scarboro', Ontario. One specimen, No. 14540—G. J. Hinde.

OXYPORUS Fabricius.

Oxyporus stiriacus.

Oxyporus stiriacus SCUDD., Tert. Ins. N. A., 505, Pl. I, fig. 36 (1890).

A single elytron, less than twice as long as broad, somewhat broken at the base, with very straight and almost parallel sides, enlarging to the least possible degree apically. It is a rather small species, of delicate texture, with smooth, unsculptured surface, except for the slightly impressed lines which follow the sutural and outer margins, giving a thickened appearance to either edge. The outer margin is gently and regularly convex, the outer posterior angle gently rounded, and the deflexed portion of the outer margin very narrow, equal, and reaching as far as the rounded apical part.

Length of elytron, 1.8^{mm}; breadth, 1.12^{mm}.

Interglacial clays of Scarboro', Ontario. One specimen, No. 14552.—G. J. Hinde.

LATHROBIUM Gravenhorst.

Lathrobium interglaciale.

Lathrobium interglaciale SCUDD., Tert. Ins. N. A., 506, Pl. I, fig. 38 (1890).

A single elytron indicates a species nearly as large as *L. grande* LeC., but with coarser sculpturing than is common in this genus and more as in *Cryptobium*; but in the latter genus the posterior margin is outwardly produced. The inner basal angle indicates a pretty large scutellum. The elytron is of nearly uniform width, with a nearly straight outer margin but gently rounded, the greatest width close to the tip; the posterior outer angle is rounded off and the posterior margin straight. The deflexed portion of the outer margin is narrow, subequal, rapidly tapering just before its termination, extending just beyond the middle of the apical half of the elytron; inner margin simple. Texture dense, the surface of elytron coarsely, rather shallowly, and not very closely, irregularly punctate, and marked besides by four or five short, shallow, irregular, longitudinal grooves just within and before the middle.

Length of elytron, 2.5^{mm}; width of upper surface, 1.25^{mm}.

Interglacial clays near Scarboro', Ontario. One specimen, No. 14555.—G. J. Hinde.

Family HYDROPHILIDÆ.

CERCYON Leach.

Cercyon ? terrigena.

Cercyon ? terrigena SCUDD., Rep. Prog. Geol. Surv. Can., 1877-1878, 179 B (1879);
Id., Tert. Ins. N.A., 510-511, Pl. II, fig. 21 (1890).

A single elytron with the base broken off appears to represent a species of Hydrophilidæ, and perhaps is most nearly related to Cercyon, but of this there is much doubt. The elytron is pretty well arched, equal nearly to the tip, then rapidly rounded off, indicating an ovate beetle with the shape of a Hydrobius or a shorter insect, and of about the size of *Helophorus lineatus* Say. Eight faintly impressed unimpunctured striæ are visible, the outer one, and to some extent the one next it, deeper; these two unite close to the tip, curving strongly apically; the next two curve slightly near their extremity, but are much shorter, not reaching the fourth stria from the suture, which, like the remaining three, pursues a straight course to the seventh stria. The surface between the striæ is nearly smooth, piceous.

Length of fragment, 2.4^{mm}; breadth of elytron, 1.35^{mm}; distance apart of the striæ, 0.15^{mm}.

Nicola River, below main coal seam, British Columbia. One specimen, No. 57—Dr. G. M. Dawson.

HYDROCHIUS Germar.

Hydrochus amictus.

Hydrochus amictus SCUDD., Tert. Ins. N.A., 515-516, Pl. I, fig. 47 (1890).

This species is mentioned here only to correct an error in my Tertiary Insects, where it was credited to Scarboro', Ontario, on the shores of Lake Ontario. It was really found by Dr. G. J. Hinde on the shores of Lake Erie, near Cleveland, Ohio, in clay beds very similar to those of Scarboro'.

HELOPHORUS Illiger.

Helophorus regescens.

Helophorus regescens SCUDD., Tert. Ins. N.A., 516-517, Pl. I, fig. 53 (1890).

This species also is mentioned here only to correct an error in my Tertiary Insects, where it was credited to Scarboro', Ontario, on the shores of Lake Ontario. It was really found by Dr. G. J. Hinde on the shores of Lake Erie, near Cleveland, Ohio, in clay beds very similar to those of Scarboro'.

Family CARABIDÆ.

PLATYNUS Bonelli.

With a single exception, the several species of *Platynus* here described from the interglacial clay beds belong to one type, somewhat distantly represented to-day by *P. crenistriatus* LeC., and *P. rubripes* Zimm., in which the striae are coarse and punctured, the sutural stria insignificant or obsolescent, and the surface texture a very delicate transverse ribbing, nowhere broken up into a reticulation.

Table of the Interglacial Species of Platynus.

Elytra with distinctly punctured striae.

Fifth and sixth elytral striae united near the middle of the apical half of the elytra.

Elytra less than three times as long as broad *casus*.

Elytra more than three times as long as broad.

Striae rather delicately punctate *hindei*.

Striae heavily punctate *halli*.

Fifth and sixth elytral striae united in the apical sixth of the elytra.

Striae and stria punctures shallow *dissipatus*.

Striae and stria punctures deep *desuctus*.

Elytra with stria punctures very faint *dilapidatus*.

Platynus casus.

Platynus casus SCUDG., Tert. Ins. N.A., 519-520, Pl. 1, fig. 42 (1890).

A single elytron is preserved in the beds which have yielded so many Platyni, which seems to be better comparable with *P. rubripes* Zimm. than with any other living form, but better still with the fossil forms from the same beds, with which it agrees also better in size, though it is a trifle broader, with a considerably more rounded humeral angle, a more rounded outer margin, and the first stria closely approximated to the suture. Except in these particulars it agrees best with *P. halli*; but, somewhat as in *P. rubripes* though with less regularity in size and distribution, the interspaces are filled with irregular shallow punctures, which run more or less together so as to form interrupted, longitudinal, adventitious series between the striae. The intimate texture of the surface is much as in *P. halli*, the fifth and sixth striae meet at a distance from the tip and the sutural stria is obsolescent and brief.

Length, 4.7^{mm}; breadth, 1.6^{mm}.

Interglacial clay beds, Scarborough, Ontario. One specimen, No. 14523—G. J. Hinde.

Platynus hindei.

Platynus hindei SCUDD., Tert. Ins. N. A., 520, Pl. 1, fig. 54 (1890).

A number of fragments occur of a species which seems to be allied to *P. rubripes* Zimm., but is much smaller than it and differs from it considerably. The shape of the elytron is much the same as there, but the humeral angle is more pronounced, the striæ are rather coarser and perhaps a little more heavily punctate, while the interspaces, instead of being faintly and shallowly punctate, are not only very faintly and irregularly transversely corrugate, but the fine sharp reticulation of the living species seen under strong magnifying power is entirely absent from the piceous surface of the fossil, being replaced by a scarcely perceptible dull transverse ribbing. The fifth and sixth striæ are also united only a little beyond the middle of the distal half of the elytron, and the sutural stria is very short indeed and generally inconspicuous.

Length, 4.65^{mm}; breadth, 1.5^{mm}.

Platynus rubripes is found in New Hampshire, Massachusetts and Virginia.

Clay beds of interglacial deposits, Scarboro', Ontario. Nine specimens, Nos. 14512, 14514, 14518, 14528, 14533, 14544, 14546, 14554, 14562—G. J. Hinde.

I take pleasure in dedicating this species to Dr. G. J. Hinde, to whose industry and zeal we are indebted for the interesting series of interglacial Coleoptera here described.

Platynus halli.

Platynus halli SCUDD., Tert. Ins., N. A., 520-521, Pl. 1, fig. 41 (1890).

Another species of *Platynus*, allied to *P. crenistriatus* LeC., is still more nearly related to *P. hindei* just described, and is of the same size, and therefore considerably smaller than the living species, to which it bears the nearest resemblance. Its relations to *P. hindei* are very much the same as those of *P. rubripes* to *P. crenistriatus*, the striæ being deeper and coarser than in *P. hindei* and the punctures larger and heavier. Though the humeral angle is scarcely so prominent as in *P. hindei*, the texture of the surface is scarcely different, unless in being slightly more marked, while in *P. crenistriatus* there is no reticulation or cross-ribbing whatever. The early union of the fifth and sixth striæ again marks its affinity with *P. hindei*, and the sutural stria is of much the same character, though slightly variable.

Length, 4.65^{mm}; breadth, 1.5^{mm}.

Platynus crenistriatus is found in Illinois, Louisiana and Missouri.

Clay beds of interglacial age, Scarboro', Ontario. Three specimens, Nos. 14520, 14524, 14525—G. J. Hinde.

Named in honour of the veteran New York palæontologist, Prof. James Hall.

Platynus dissipatus.

Platynus dissipatus SCUDD., Tert. Ins. N. A., 521, Pl. I, fig. 37 (1890).

This species, which is of the same size as *P. halli* and agrees with it in its general features and in the minute texture of the surface, is separated from it solely on account of the grosser sculpture of the elytra, since the striæ, which are equally broad, are much shallower—a characteristic which applies as well to the punctures—and are less distinct on the sides than on the interior half. Neither of the fragments is perfect, though one has all but a little of the tip and permits us to see that the fifth and sixth striæ would unite early, as in those species, did they not fade out altogether before uniting. There is at least one puncture in the third interspace as far from the base as the width of the elytron.

Breadth of elytron, 1.5^{mm}.

Interglacial clay beds of Scarboro', Ontario. Two specimens, Nos. 14515, 14563.—G. J. Hinde.

Platynus desuetus.

Platynus desuetus SCUDD., Tert. Ins. N. A., 521-522, Pl. I, figs. 43, 51, 58 (1890).

This, the largest of the species from the clay beds of Scarboro', is more nearly allied to *P. crenistriatus* LeC., than to any other living species, agreeing with it also in size, which none of the other fossils do; but in other particulars, including the intimate texture of the surface, it agrees better with its contemporaries. It is nearest perhaps to *P. halli*, but the striæ and punctures are a little less pronounced, the insect is much larger, and the fifth and sixth striæ meet at no great distance from the tip of the elytron, as in the modern species mentioned. There appear to be three punctures in the third interspace.

Length of elytron, 5^{mm}; breadth, 2^{mm}.

Clay beds of interglacial times, Scarboro', Ontario. Six specimens, Nos. 14477, 14478, 14486, 14516, 14526, 14538—G. J. Hinde.

Platynus harttii.

Platynus harttii SCUDD., Tert. Ins. N. A., 522, Pl. I, fig. 31 (1890).

This species, represented by a couple of specimens only, is the smallest of those found in the interglacial deposits, and in its peculiarities, especi-

ally in the distant union of the fifth and sixth striæ, is most nearly allied to the largest. Its outer margin is well rounded, scarcely marginate, the humeral angle tolerably prominent but well rounded; the striæ are coarse and deep, with rather heavy but not very distinct punctures, scarcely broadening the striæ, while the piceous surface is delicately and rather faintly cross-ribbed. The marginal stria is obsolescent. There are apparently two or three interspatial punctures. It is very small for a *Platynus*.

Length of elytron, 3.6^{mm}; width of one, 1.35^{mm}.

Interglacial clays of Scarboro', Ontario. Two specimens, Nos. 14475, 14480—G. J. Hinde.

Named in memory of my fellow-student, Prof. C. F. Hartt, formerly director of the Geological Survey of Brazil.

Platynus dilapidatus.

Pl. III, fig. 2.

This species of *Platynus* is very different from those described above from the same deposits, and does not fall into the peculiar group which they form. It belongs rather in the near vicinity of *P. maculicollis* Dej. The single elytron, which is a fragment only, but which represents a species apparently fully as large as this, has a very flat surface, with coarse and rather deeply impressed striæ very different from *P. maculicollis*, without punctures, so far as can easily be seen on the upper surface, though they are barely perceptible and the under surface gives distinct signs of them, the interspaces dotted with microscopic scattered pustules, much as in the modern species mentioned, though without the clean and sharp reticulation which is found in it, but instead an excessively fine and faint cross-ribbing, too fine to appear on a drawing of the size of ours. The sutural stria is very short; the colour of the whole dark castaneous.

Length of fragment, 2.65^{mm}.

Platynus maculicollis is found in Oregon, California, Arizona and Guadaloupe Island.

Interglacial clay beds of Scarboro', Ontario. One specimen, No. 14513—Dr. G. J. Hinde.

PTEROSTICHUS Bonelli.

Table of the Interglacial species of Pterostichus.

Sutural stria uniting with the first near the base.

Cell inclosed by sutural and first striæ not twice as long as the width of interspace between first and second striæ; striæ without punctures. *abrogatus*.

Cell inclosed by sutural and first striæ fully three times as long as width of interspace between first and second striæ.

Striæ punctate.

Striæ heavily punctate.

Fifth and sixth striæ united in the apical sixth of the elytra *dormitans*.

Fifth and sixth striæ united near the middle of the distal half of the elytra *destitutus*.

Striæ faintly punctate. *fractus*.

Striæ impunctate. *destructus*.

Sutural stria independent of the first. *gelidus*.

Pterostichus abrogatus.

Pterostichus abrogatus SCUDD., Tert. Ins. N.A., 525, Pl. I, fig. 39 (1890).

A fragment of an elytron indicates a species closely allied to *P. herculeanus* Mann. in elytral structure and of probably about the same size. The sutural stria is similar; there are the same broad and deep, simple striæ, only they are, if anything, broader and deeper in the fossil. The interspaces are, however, flatter than in the recent species, and the intimate texture of the surface, instead of showing a very distinct reticulation of minute imbricated cells with sharply defined walls, is almost entirely smooth, the faintest sign only of such tracery being visible with strong magnification. The first stria is also at an unusual distance from the margin. The colour is piceous.

Length of fragment, 5^{mm}; width of same, 2^{mm}; presumed length of elytron, 7.5^{mm}.

Pterostichus herculeanus is found in Alaska and Vancouver Island.

Interglacial clays of Scarboro', Ont. One specimen, No. 14560—G. J. Hinde.

Pterostichus dormitans.

Pterostichus dormitans SCUDD., Tert. Ins. N.A., 526, Pl. I, figs. 49, 55 (1890.)

This species is mentioned here only to correct an error in my Tertiary Insects, where it was credited to Scarboro', Ontario, on the shores of Lake

Ontario. It was really found by Dr. G. J. Hinde on the shores of Lake Erie, near Cleveland, Ohio, in clay beds very similar to those of Scarborough'.

Pterostichus destitutus.

Pterostichus destitutus SCUDD., Tert. Ins. N.A., 526, Pl. I, fig. 44 (1890).

This species is represented by a single elytron of a mahogany colour, which seems to be nearly related to *P. sayi* Brullé, and is of the same shape, though a considerably smaller species. The character of the striae in depth and punctuation is quite as in *P. sayi*, but the interspaces are flatter, and the delicate transverse reticulate striation, finely traced in *P. sayi*, is here inconspicuous and dull and more irregular. The present species has a similar sutural stria, but apparently no puncta in the third or any other interspace, though it is possible that one exists in the place occupied by the posterior one in *P. sayi*. One peculiarity of the present species is the early union of the fifth and sixth striae, well in advance of the interruption of the marginal curve.

Length of elytron, 6^{mm}; breadth, 2.5^{mm}.

Pterostichus sayi occurs in Canada and the Mississippi valley from Illinois to Texas.

Interglacial clay beds of Scarborough, Ontario. One specimen, No. 14522—G. J. Hinde.

Pterostichus fractus.

Pterostichus fractus SCUDD., Tert. Ins. N.A., 527, Pl. I, figs. 29, 30 (1890).

Closely allied to *P. destitutus*, with the same early union of the fifth and sixth striae, but still smaller and with less distinct strial punctuation, this being indeed very inconspicuous. A single elytron is preserved, with the extreme apex broken. There is a distinct punctum in the third interspace opposite the union of the fifth and sixth striae, which is just before the break. The interspaces are flattened, as in *P. destitutus*, and the intimate structure of their surface is exactly as there, except in showing scarcely any sign of reticulation.

Length of fragment, 4.5^{mm}; breadth, 2^{mm}.

Interglacial clays of Scarborough, Ontario. One specimen, No. 14532—G. J. Hinde.

Pterostichus destructus.

Pterostichus destructus SCUDD., Tert. Ins. N.A., 527, Pl. I, fig. 46 (1890).

A couple of elytra, from each of which the entire apex is broken, closely resemble *P. patruelis* Dej. in shape and sculpture, but represent a species

a little larger than it. The sutural stria is exactly as in that species, and the striae are finely impressed and without punctures; the interspaces would appear to be flatter than in *P. patruelis*, and the third interspace does not appear to have the three punctures found in that species, but only the central one. The colour is blackish castaneous.

Length of one fragment, 3.5^{mm}; probable length of elytron, 4.75^{mm}; width of same, 1.5^{mm}. Length of another fragment, 3.8^{mm}; width, 1.45^{mm}.

Pterostichus patruelis is found in the middle and western United States and also in Canada and about Lake Superior.

Interglacial clays of Scarboro', Ontario. Two specimens, Nos. 14519, 14549—G. J. Hinde.

Pterostichus gelidus.

Lozandrus gelidus SCUDD., Bull. U.S. Geol. Geog. Surv. Terr., 111, 763-764 (1877).

Pterostichus gelidus SCUDD., Tert. Ins. N.A., 527-528, Pl. 1, figs. 52, 59-61 (1890).

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; a prothorax slightly cracked and a portion of one of the mandibles. A species is indicated of about the same size as *P. hudsonicus* LeC., and closely resembling it. The elytra are piceous, with a metallic-blue reflection; 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 next its inner side. 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 neighbouring striae, for a very short distance between the base of the sixth and seventh striae. The first stria turns outward next the base, to make room for a scutellar stria. The obliquely cut marginal foveae agree with those of *P. hudsonicus*. The prothorax is quadrate, the front margin very slightly angled, 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. The surface of the prothorax is smooth; the abdomen is also smooth. The part of the mandible remain-

ing is only the basal "molar" portion, armed with six or seven mammillate 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}.

The species differs from *P. hudsonicus* in the shape of the prothorax (if that belongs here), broader striae, and less convex elytra.

Pterostichus hudsonicus is a northern species found in Alaska, the Hudson Bay territories, Lake Superior and New Hampshire.

Interglacial clays of Scarboro' Heights, near Toronto, Canada. Several specimens, among others Nos. 14521, 16418—G. J. Hinde.

PATROBUS Megerle.

Patrobus gelatus.

Patrobus gelatus SCUDD., Tert. Ins. N. A., 530, Pl. I, fig. 48 (1890).

Of this species the only remains are a single prothoracic shield perfectly preserved. It is piceous, posteriorly truncate, its angles rectangular and as broad as the length, in advance of the hinder fourth expanding to nearly one-fourth greater width in the middle of the anterior half, and then again narrowing to the declivous front angles; the disk convex, with a uniformly and rather deeply incised median line, each lateral half thus divided marked posteriorly by an abrupt flat and punctate depression, with well marked rounded outline, distinctly separated from the median incision on one side or the very narrow, marginate, lateral border on the other, and separated from the latter also by a longitudinal furrow; otherwise the surface is smooth. It is undoubtedly related very closely to *P. septentrionis* Dej., differing principally in the sharp and sudden depression of the fossae in the hind angles and their separation from the lateral border by a distinct incised longitudinal furrow.

Length of prothorax, 2.1^{mm}; greatest breadth, 2.75^{mm}.

Patrobus septentrionis is found in Arctic America and Europe, including the mountains of Central Europe, and also in Michigan and New Hampshire.

Interglacial clays of Scarboro', Ontario. One specimen, No. 14586—G. J. Hinde.

BEMBIDIUM Latreille.

Bembidium glaciatum.

Bembidium glaciatum SCUDD., Tert. Ins. N. A., 531, Pl. I, fig. 40 (1890).

A couple of elytra represent this species, which seems to be nearly allied to the scarcely smaller *B. longulum* LeC. The humeral angle is

not quite so prominent, and the striae and punctures are more heavily marked. The striae are indeed rather deeply impressed and equally so over the whole width of the elytron, but all become less pronounced and even obsolescent apically; the same is true of the punctures which on the basal half of the elytra are very heavy, making transverse creases in the neighbouring interspaces, so that they are rather transverse than longitudinal or even circular. The sutural stria is as in *B. longulum*, and the texture of the surface of the interspaces, instead of being as in the modern species almost structureless, is marked with a fine but decided cross-ribbing, verging upon reticulation. The colour is a rich carbonaceous with a purplish tinge.

Length of elytron, 3.2^{mm}; width, 1.35^{mm}.

Bembidium longulum is found about Lake Superior and in Wyoming.

Interglacial clays of Scarboro', Ontario. Two specimens, Nos. 14536, 14541—G. J. Hinde.

Bembidium fragmentum.

Bembidium fragmentum SCUDD., Tert. Ins. N. A., 531-532, Pl. 1, fig. 45 (1890).

This species is mentioned here only to correct an error in my Tertiary Insects, where it was credited to Scarboro', Ontario, on the shores of Lake Ontario. It was really found by Dr. G. J. Hinde on the shores of Lake Erie, near Cleveland, Ohio, in clay beds very similar to those of Scarboro'.

NEBRIA Latreille.

Nebria paleomelas.

Nebria paleomelas SCUDD., Rep. Prog. Geol. Surv. Can., 1877-78, 179 B (1879);
 Id., Tert. Ins. N.A., 532, Pl. 1, fig. 20 (1890).

A nearly perfect elytron with the humeral angle broken off represents a carabid, probably related to *Nebria*. A species is indicated which is of about the size of *N. sahlbergi* Fisch. The elytron is about two and a half times longer than broad; the surface is nearly smooth, piceous, with nine striae, which are rather deeply impressed, and a scutellar stria, which unites with the first longitudinal stria at about one-sixth the distance from the base, in such a way as to make it appear equally forked in passing toward the base, its outer fork striking close to the base of the second longitudinal stria; the fifth and sixth striae are united to each other and to the united third and fourth striae, near the apex, by a wavy continuation of the sixth, after it has bent toward the fifth in running parallel to the seventh, as it curves toward and runs to tip of the elytron;

the ninth stria, which forms the edge of the elytron as it is preserved, shows no appearance whatever of ocellate punctures, although under the microscope some of the central striæ show slight signs of faintly indicated punctures near the middle of the elytron.

Length of elytron, 5.2^{mm}; breadth, 1.8^{mm}.

Nicola River, below main coal seam, British Columbia. One specimen, No. 58—Dr. G. M. Dawson.

LORICERA Latreille.

Loricera glacialis.

Loricera glacialis SCUDD., Bull. U.S. Geol. Geog. Surv. Terr., III, 763 (1877);
ID., Tert. Ins. N.A., 533, Pl. I, figs. 50, 57 (1890).

Of this species a pair of elytra are preserved nearly complete, but cracked and flattened somewhat out of shape. It is allied to *L. cærulescens* L., 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 colour. 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. cærulescens*, 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. Seen on the under surface, each of the punctures of the striæ are surrounded by a circle reaching to the circles around the adjoining punctures, reminding one somewhat of the upper surface of *Elaphrus*. The elytra are shaped as in *L. decempunctata*, particularly at the apex.

Length of elytron, 4.4^{mm}; breadth, 1.6^{mm}.

Loricera cærulescens is found in northern Europe and also in Michigan and about Lake Superior.

Interglacial clays, Scarboro' Heights, near Toronto, Canada. Two specimens, Nos. 16416, 16417—G. J. Hinde.

Loricera? lutosa.

Loricera? lutosa SCUDD., Tert. Ins. N.A., 533-534, Pl. I, fig. 32 (1890).

A single elytron in a perfect state of preservation. It is almost two and a-half times longer than broad, scarcely broader in the middle than at the base, the humeral angle roundly angulated. There are ten series of very coarsely punctured striae, the four inner running almost to the apical margin, the others, however, curving inward to abut against them, the outermost meeting the innermost at the apex; the elevated narrow interspaces smooth and shining; the whole piceous.

This can hardly be referred to *Loricera*, but I can find no other genus with which it better agrees. I am inclined to the belief that it will be found to belong to an extinct type of *Loricerini*. There seems to be, as there, a faint internal plica, but the specimen is broken only at just this point.

Length of elytron, 3.3^{mm}; breadth, 1.4^{mm}.

Clay beds of Scarboro', Ontario, Canada. One specimen, No. 14559.—G. J. Hinde.

ELAPHRUS Fabricius.***Elaphrus Irregularis.***

Elaphrus irregularis SCUDD., Tert. Ins. N. A., 534, Pl. I, fig. 56 (1890).

An elytron only is preserved, which by its surface sculpture appears to resemble *E. viridis*, of California (which I have not seen), more than any other, though in size it agrees better with *E. riparius* and *E. ruscarius*, the nearest allied of the species I have examined. The elytron is distinctly slenderer than in these latter species, with the middle scarcely, if at all, wider than the base, but with entirely similar apex. Surface uniformly punctured, the punctures coarser than in *E. riparius*, with ill-defined obscure foveæ, the basal one of the second series from the suture being the only one as distinct as in *E. riparius*; spaces between the foveæ remarkably elevated, forming longitudinal, more or less tortuous ridges which are highest (and rarely polished) in longitudinal dashes as long as the diameter of the foveæ and in the same lines with them, *i. e.*, between foveæ of the same longitudinal series and not in the interspaces between the series. It is in these elevated spaces that its relationship to *E. viridis* especially appears, and their irregularity, through their more or less tortuous, connecting, less elevated ridges, which has suggested the name. Colour dull piceous, with faint dark metallic green reflection, which is quite distinct on the inflected margin.

Length of elytron, 4.5^{mm}; breadth, 1.5^{mm}.

Clay beds of Scarboro', Ontario. One specimen, No. 14527—G. J. Hinde.

PLATE II.

Figs. 1 and 2 were drawn in pencil by J. H. Blake and engraved on wood by John Andrew & Son Co.; figs. 3-5 were drawn in ink by Mrs. Katherine P. Ramsay, and figs. 6-10 by J. H. Blake, and all photo-engraved by John Andrew & Son Co.

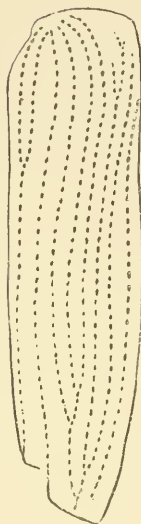
- Fig. 1. *Geodromicus stircidii*, $\frac{1}{1}^0$.
2. *Arpedium stillicidii*, $\frac{1}{1}^0$.
3. *Limonius impunctus*, $\frac{7}{1}$.
4. *Cryptocephalites punctatus*, $\frac{9}{1}$.
5. *Hylobiites cretaceus*, $\frac{8}{1}$.
6. *Byrrhus ottawaensis*, $\frac{5.0}{1}$; a fragment of the elytron very highly magnified.
7. *The same*, $\frac{1.2}{1}$; a larger fragment of the elytron less highly magnified.
8. *The same*, $\frac{6}{1}$; one surface of the nodule showing the cast.
9. *Byrrhus geminatus* LeC., $\frac{5.0}{1}$ (recent); a fragment of the elytron for comparison with fig. 6.
10. *The same*, $\frac{1.2}{1}$, for comparison with fig. 7.



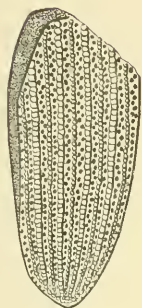
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PLATE III.

Figures 1, 3, 4, 6 were drawn in pencil by J. H. Blake and engraved on wood by John Andrew & Son Co. ; fig. 2 was drawn in ink by J. H. Blake and 5 by Mrs. Katherine P. Ramsay, and both photo-engraved by John Andrew & Son Co.

- Fig. 1. *Tenebrio calculensis*, $\frac{6}{1}$; showing the upper surface (see also fig. 6).
2. *Platynus dilapidatus*, $\frac{8}{1}$.
 3. *Fornax ledensis*, $\frac{2^0}{1}$; a fragment of the elytron highly enlarged.
 4. *The same*, $\frac{4}{1}$; the entire elytron.
 5. *Elaterites* sp., $\frac{3}{2}$.
 6. *Tenebrio calculensis*, $\frac{6}{1}$; the reverse of fig. 1, showing the under surface.

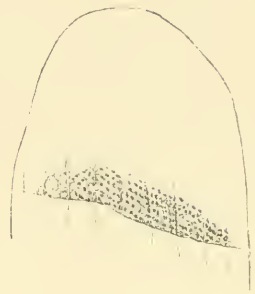
Geological Survey of Canada.

CONTR. TO CAN. PAL. VOL. II.

PLATE III.



1



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4



2



5



6

GEOLOGICAL SURVEY OF CANADA.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY.

VOLUME II.

CANADIAN FOSSIL INSECTS.

BY SAMUEL H. SCUDDER.

3. *Notes upon myriapods and arachnids found in sigillarian stumps in the Nova Scotia coal field.*

Sir William Dawson more than thirty years ago published in England the first account* of a gally-worm which was found in the cavities of erect sigillarian stumps in Nova Scotia, and which he called *Xylobius sigillarie*. Nearly twenty years ago he kindly submitted to my examination all the material he had collected, and in a couple of papers published in the United States † descriptions were given of five species and two genera, *Xylobius* and *Archiulus*, of myriapods found therein. Since then *Archiulus* has been found in other American Carboniferous deposits and *Xylobius* in the coal measures of Europe.

By the aid of a grant from the Royal Society of London, Sir William afterwards made a further search among the sigillarian trees in Nova Scotia and placed in my hands the remains of the articulates then found, upon which I made a brief report some ten years ago in connection with his own, ‡ but until now have been unable to complete my study of them.

The fragments, for such they all are, which were sent to me for examination, consist almost exclusively of myriapodal remains, often of single segments only, and generally in a more or less crushed, flattened, and distorted condition. All the species formerly separated in my first study of remains from these stumps occur in the present collection, but very little additional information can be gained from them. Such as it is it will be found below. A few specimens of different species exhibit the marks which were formerly interpreted as the opening of the stink-glands, foramina repugnatoria, common in recent myriapods, but these are now presumed to be the casts of the bases of spines; in no case have the spines themselves been preserved, and whatever spines they possessed must have been wholly insignificant compared with those of the bristling Archipolypoda

* Quart. Journ. Geol. Soc., Lond., xvi., 268-273, figs. 4-9.

† Mem. Bost. Soc. Nat. Hist., ii., 231-239, 561-562, figs. 1-7; Foss. Ins. N. A., i., 21-3

‡ Phil. Trans. Roy. Soc., Lon., 1882, ii., 621-659, pl. 39-47.

of the Mazon Creek nodules discovered since Sir William Dawson wrote. Careful search has been made for any other of those special features which distinguish the Archipolypoda from recent Diplopoda, but in vain, beyond the single but not unimportant point that the ventral plates, in *Archiulus* at least, are very broad and probably almost equally extensive in lateral expansion with the dorsal plates, a feature nowhere found in modern Diplopoda. This is perhaps most clearly shown in the two new species of *Archiulus* described below.

But besides these new and old forms, all of which belong to the Archiulidæ, the only family of Archipolypoda heretofore known from these peculiar deposits, a couple of specimens appear to indicate the presence of *Amynilyspes*, one of the Euphoberidæ, but the fragments are too imperfect to render the conclusion clear. A few others prove incontestably the presence of Arachnida of the order Scorpiones. All of the fragments are very imperfect; most of them, indeed, are but mere bits of the test, but we are enabled in some fashion to interpret these by the aid of some of the others which show with little doubt the presence here of *Mazonia*, a type of Carboniferous scorpions first made known from the beds of Mazon Creek in Illinois, and help to indicate that its separation from *Eoscorpium*, to which most other Carboniferous scorpions are referred, was justifiable. Two species are indicated, but to only one of them, as capable of somewhat definite though partial characterization, is a name given. It is possible there are also others, but we may expect between different parts of the body a certain—though not an unlimited—amount of diversity in the surface sculpture.

The nature of the entombment warranted no expectation of finding the relatively softer integument of hexapod insects with the myriapodal remains, yet Sir William Dawson in his examination of the reptilian coprolites of these sigillarian stumps has extracted the fragment of a faceted eye about three-quarters of a millimetre square and containing from one to two hundred perfectly regular hexagonal facets arranged in regular rows and each about 0.05^{mm} in diameter. This could have belonged to nothing but a true insect, and in all probability is that of a cockroach, since these were the prevalent insects of Carboniferous times, though otherwise unknown from these deposits. This specimen has already been referred to by Sir William Dawson in his *Air-breathers of the coal period*, p. 59, and figured by him on Pl. 6, fig. 56.

Sir William Dawson has also submitted to me another fragment containing a considerable number of delicate black acicular spines two or three millimetres long, or even longer, and about 0.1^{mm} in diameter, with the surface sometimes smooth, sometimes striate, but it is impossible to say to what sort of creature they may have belonged, possibly to a spined myriapod.

MYRIAPODA.

Family EUPHOBERIDÆ.

Amynilyspes ? sp.

Pl. IV., figs. 1, 2.

A couple of fragments, one of them with its reverse and both drawn upon the plate, are remains of a larger myriapod than any of the others found in the sigillarian stumps with the sole exception of *Xylobius similis* with the largest specimens of which its size agrees. But that it cannot be a *Xylobius* the entire absence of frustral divisions clearly shows. On the other hand, the free termination of the sides of the dorsal scutes and their transverse ridging show a close resemblance to *Amynilyspes*, and there are besides vague appearances of the bases of spines just where they occur in *A. wortheni*, though they are too obscure for satisfaction. Little more can be said, as the specimens consist only of a dozen or less adjoining segments, crushed and more or less distorted, but showing that the segments were about five times as broad as long and the surface rather smooth with sparse and fine granulations scattered over it; the breadth must have been about 6^{mm}. It is a smaller species than *A. wortheni*, but presents no characters by which it can be distinguished from it.

Family ARCHIULIDÆ.

Archinulus xylobioides Scudder.

Pl. IV., fig. 4.

There are seven fragments which are referred here, but they show nothing noteworthy in addition to what has been given formerly, for they consist almost entirely of single segments or fragments of the same, one of which is figured, in which the contrasts between the anterior and posterior parts of the segment, here equal, are very clearly seen; the surface is quite smooth.

Archinulus euphoberioides sp. nov.

Pl. IV., figs. 5, 6.

The materials for the elucidation of this species are not satisfactory; no more so than in the case of the species of *Xylobius* described from the same stumps. They consist of fragments of the scutes only, no appendages of any kind being visible; they are crushed and flattened, but enough exist to make sure that they cannot be referred to any of the forms of myriapods previously described from Carboniferous deposits.

Some ten specimens have been found, some of them doubtfully referred here, of which two of the best, occurring on a single small slab, have been selected for illustration. The species is the first referred to in my note on sigillarian articulates appended to Sir William Dawson's account of his recent explorations* as having "perfectly flat segments showing only a very slight and narrow transverse ridge at the anterior margin, occupying not more than one-fourth of the segment." In the form of the segment it is comparable to *Xylobius mazonus* from Illinois, the anterior ridge having the effect of a strap around the body (see fig. 6). The flatness of the segments is no doubt due in part to crushing, but the effect is to impress one with the belief that the body was broader than high. Some specimens seem to indicate that the transverse ridge was generally half as broad as the remaining portion of the segment, and was separated from it by a suture, when viewed from the under side of the dorsal scutes, so that the body may be said to be made up of shorter and more elevated, and longer and more depressed flattened segments. The surface itself of the segments appears to be perfectly smooth and shows no signs whatever of frustra; the dorsal scute of the largest specimen when laterally expanded and crushed is 0.65^{mm} long and 5.75^{mm} broad. Several specimens show more or less connected fragments, making together a length of from 25 to 40^{mm}, and there can hardly be reason to doubt from all the appearances taken together that the creature reached at least a length of from 60 to 70^{mm}. Remains of serially connected ventral scutes show that these were nearly as broad as the dorsal and twice as numerous. The absolute smoothness of the dorsal scutes, however, shows that the genus cannot be referred to Euphoberia, although in every thing but the armature (so far as the fragments go) the relation is close.

Archiulus Iyelli sp. nov.

Pl. iv., figs. 3, 7.

This additional species from the same locality as the preceding affords no better material for study than it, but indicates as clearly the presence of a hitherto unknown form. It is the second of the species referred to in the note above alluded to as smaller than the preceding, and having "shorter and more simple segments, made slightly concave by the gentle elevation of both front and hind margins, but with no anterior ridge."

Four specimens are referred to this species, of which two are figured. They all indicate a small species perhaps 35^{mm} long (the longest connected fragment is perhaps 20^{mm} long) and 2^{mm} broad. The segments appear to average about four times as broad as long, to be smooth and entirely des-

*Phil. Trans. Roy. Soc., Lond., 1882, 649.

titute of armature, the anterior and posterior margins a little elevated, and the body of the segment between them gently concave. The species does not appear to have been flattened to so great a degree as the preceding, and from the preservation of some of the fragments evidently tapered toward the hinder extremity. In the preceding, no specimens indicated any tapering, though not enough of them were preserved to say that they did not taper. The hinder extremity being preserved in one specimen here, it is seen to be bluntly rounded. The largest number of contiguous segments in any preserved fragment is 37.

Like the preceding, these specimens all come from the sigillarian stumps of Nova Scotia, and are due to the researches of Sir William Dawson. It has seemed fitting to dedicate the species to one who with him first made the discovery of this imprisoned fauna of the fossil trees.

Xylobius sigillariæ Dawson.

A couple of imperfect fragments are referred here, but add nothing whatever to what was before known.

Xylobius similis Scudder.

Pl. v., figs. 1, 2.

Five specimens of a *Xylobius* larger than the others, of which the best preserved fragment is figured on the plate, are referred to the largest of the species previously described, with which they agree fairly well in structure. As none of them shows more than a portion of the animal, they add nothing to our knowledge of its form. The segments are not very convex, and in the specimens seen vary from a little less to a little more than five times as broad as long, and have a length of a little more than a millimetre; the frustra are generally somewhat longer than broad, but in the three segments shown in fig. 1 (which represents, still further enlarged, three segments from just to the left of the middle of fig. 2) they are but very little longer, though the figure somewhat exaggerates the similarity of the dimensions.

Xylobius fractus Scudder.

Three specimens are referred here, but with much doubt; they consist in each case of only a very few and imperfect adjoining segments.

Xylobius dawsoni Scudder.

Pl. v., fig. 3.

Seven specimens are referred to this species, but they consist in all cases of only a few contiguous segments. The longest is shown in fig. 3,

but presents little that is characteristic, the elevation of the transverse anterior ridge being obliterated and the frustra too faint to be represented. There are here, however, as in some of the other specimens, faint signs of what appears to be a series of minute warts, probably the bases of spines situated on one side upon the anterior ridge, and some of the others show possible marks of a second series a little above the base of the legs; though this is by no means clear.

ARACHNIDA.

Order SCORPIONES.

Mazonia Meek and Worthen.

In his memoir on the Carboniferous scorpions of Scotland,* Mr. B. N. Peach endeavours to show (p. 408-409) that this genus is identical with *Eoscorpium* of the same authors, to which he refers all the Scottish species. He endeavours to account for the absence of the smaller lateral eyes by the overhanging of the cephalothorax in front, but while this would have undoubtedly concealed the eyes along the anterior border, such an explanation will hardly account for the absence of those at the sides behind the anterior lateral corners, and Messrs. Meek and Worthen expressly state that "the anterior lateral margins (particularly on one side) are well preserved." There is, moreover, another difference which should have some weight, for the cephalothorax of *Mazonia* is broadest in front and narrows regularly though slightly backward, and is longer than broad; while in all the species of *Eoscorpium* yet discovered, though they have in general the same subquadrate form, the reverse is true, the base being enlarged considerably, so that the anterior is distinctly less than the posterior breadth, and the basal breadth is greater than the length; and since in *Cyclophthalmus*, more satisfactorily distinguishable from *Eoscorpium* by the definitely different arrangement of the smaller eyes, the cephalothorax is broadest in the middle and narrows in both anterior and posterior directions, it seems probable that when we discover the arrangement of the eyes in *Mazonia*, we shall detect something further and more satisfactory to distinguish the genus and that hence, pending discoveries, it is well not to relegate it to the same immediate group as *Eoscorpium*.

This conclusion seems the more reasonable when we state that there occur among the sigillarian relics imperfect remains of a scorpion which, though the anterior lateral margins are imperfect, shows just these same characters of the cephalothorax, which is longer than broad, is broadest anteriorly, and narrows gently and regularly toward the base. It seems better, therefore, until further light is thrown upon *Mazonia* to regard it

*Trans. Roy. Soc. Edinb., xxx., 397-412, pl. 22, 23. 4^o. Edinburgh, 1882.

as distinct from *Eoscorpium*. Regarding the possible position and arrangement of the lateral eyes, remarks will be found under the species.

Mazonia acadica.

Pl. v., figs. 5, 6 (also figs. 8, 9?).

The species here referred to *Mazonia* and regarded as distinct from *M. woodiana* from the Carboniferous deposits of Mazon Creek, Ill., is primarily founded upon a single specimen and its reverse shown in figs. 5 and 6. These show the whole of the dorsal surface of the cephalothorax (fig. 5) and its reverse (fig. 6), together with the basal segment of the abdomen and part of the segment behind it. The cephalothorax is shown to have had somewhat the shape of a horse's hoof, well arched anteriorly, broadest in the middle of the apical half, narrowing very gently and regularly to the abdomen which is of equal width with its base; it is a little longer than broad, tumid centrally but depressed broadly around the sides, very strongly and abruptly elevated anteriorly behind the marginate border and at the broadest portion, forming a slender transverse semi-lunate prominence upon which the eyes (here abraded) are seated. On the lateral margins, along the middle of the depressed portion and running backward from opposite the ocellar prominence, is a regular series of about half a dozen minute, subequidistant, subconical, and apparently crateriform verrucosities, which the condition of the specimen permits to be seen on only one side. If, as seems probable, these are the lateral eyes, their number, position, and arrangement show that this scorpion cannot be placed in either *Eoscorpium* or *Cyclophthalmus*, and renders our conclusion that *Mazonia* may be retained the more justifiable. Behind the median ocellar prominence and leading from the lunar horns of the same, there is on either side an obscure ridge running parallel to the sides and, next the posterior border of the cephalothorax, slightly elevated into a broad boss. The first abdominal segment shows just behind these elevations a pair of strongly elevated, subconical prominences only less raised than the ocellar prominence, and from which run, backward and inward, converging on the posterior part of the second abdominal segment, a pair of low ridges. Wherever the surface structure can be clearly seen, it appears to be smooth and light coloured, excepting for tolerably regularly scattered dark circular pustules, in some places apparently slightly elevated or roughened which are separated from each other by their own diameter or a little more, and which have a diameter of from one-half to one-third that of the supposed lateral ocelli.

Length of cephalothorax, 8^{mm}; its greatest width, 7.25^{mm}; width at base, 6.75^{mm}.

Two other fragments are drawn upon the plate, showing in some part a coarse embossing such as appears upon the side of the cephalothorax in the reverse of the original specimen (fig. 6), of which no special mention was made; by figure 6 it appears that the lateral borders of the cephalothorax, outside the supposed lateral eyes, were occupied by a close series of circular or subquadrate abruptly depressed pits (which in reverse would appear as a sort of pavement of elevated bosses) more or less linearly arranged and considerably larger than the supposed lateral eyes. In one of these other fragments they also appear in reverse and are more highly magnified in the illustration (fig. 8), but the fragment is so imperfect and broken that it is impossible to say from what part of the body it comes, and the bosses are seen to vary greatly in size. In another fragment, shown in figure 9, the same are seen as pits upon the surface of a small piece of the test covered otherwise by two other fragments of quite different character and which I cannot regard as in place, since one shows a strongly convex, the other an as strongly concave, surface; at first sight I thought I had here the fragment of a cephalothorax of different construction which bore some resemblance to one side of Peach's figure of the cephalothorax of *Eoscorpheus inflatus* (l. c., pl. 23, fig. 12a), but the reversal of the two subtriangular pieces which lie atop the pitted test renders this supposition quite impossible, and indeed makes any attempt to understand the connection of the two out of question. Both these pitted tests, then, agree so closely with what appears in fig. 6 that there is no reason to suppose we are dealing with another species.

Mazonia sp.

Pl. v., fig. 4.

Quite otherwise, however, is it with the fragment shown in fig. 4. Here we have a large piece of test, which has the appearance of being the anterior lateral third of a cephalothorax as large as that of figs. 5, 6, and of very much the same contour. It is, however, otherwise totally different, for the whole is very gently and regularly vaulted with no ocellar elevation, nor median eyes, the margin followed by a broad and tolerably deep sulcus in which (apparently) are traces of two or three minute semi-globular ocelli: while the test itself, smooth or nearly so over most of its surface, is distantly punctate in front,* and behind is foveolate with abruptly sunken circular or longitudinally ovate pits of differing size and depth, but in general becoming larger and deeper posteriorly. If this really represents a portion of the cephalothorax of a scorpion, then it probably belongs to a distinct species of *Mazonia*, for the general form

*The artist accidentally drew this upside down, and the shading required that it should be so placed upon the plate.

and the position of the supposed lateral ocelli (on the upper surface of a depressed sublaminar lateral margin near its middle) would indicate that it was probably a *Mazonia*; but the special character of the test, the gentle convexity of the upper surface, and the very distant withdrawal from the anterior margin of the median eyes (for only here is there any place for them on this specimen) would certainly show a different, and a very different, species.

There remains to be mentioned specifically only the fragment of test shown in fig. 7, where the only certainly natural margin is shown above; whether the other two nearly straight margins are also natural is uncertain from the conditions of their preservation. This bit of test shows a nearly flat, irregularly punctured surface, and I can only conjecture that it belonged to either the upper or more probably the under surface of one of the larger abdominal segments. In that case it would appear to be too large to have corresponded to an individual of the size shown in fig. 5, but rather to have belonged to one nearly or quite half as large again. Whether it can have belonged to the same species seems very doubtful, for apart from the disparity in size, the character of the surface sculpture bears no sort of agreement with that seen in the other specimens; but of course nothing can be predicated of it without further material.

Note by Sir J. William Dawson.

As stated above by Mr. Scudder, the remains described by him in this paper were discovered in the interior of erect trees in the coal-formation of Nova Scotia, into which after they became hollow by decay, amphibians, millipedes, scorpions, and land snails had fallen or crept, and had subsequently been covered up and so preserved, when the hollow trees were filled with sand and mud.

Repositories of this kind were first discovered at the South Joggins in Nova Scotia, by Sir C. Lyell and the writer, in 1851, and an account of an amphibian and a land snail found in one of them was published in 1853.* Additional discoveries, including a millipede, *Xylobius sigillarius*, were published in 1859.† Subsequently, in several visits to the locality, and with the aid of a grant from the Royal Society, a number of other trees were taken out and examined. The whole of these trees, with one exception, occur in the sandstone beds forming the cliff and reef of Coal Mine Point, near the Joggins coal mine, and constituting a part of division 4, group xv., of my sectional list of this coal field.‡ From these

* Journ. Geol. Soc., Lon., ix., 58.

† Ibid., xvi., 268.

‡ Acadian Geology, 156-192.

beds I have at various times extracted twenty-six trees, besides studying the remains of others which have fallen naturally.

These singular receptacles naturally contain only remains of land animals, along with debris of wood and bark, and occasional fragments of leaves, fruits, and other vegetable substances. In the memoir above referred to, I have described twelve species of amphibians, of the groups Microsauria and Labyrinthodontia, and three species of land snails, besides the arthropod remains. Of the amphibians specimens representing fifty-three individuals have been found, and a great number of land snails, especially of the species *Pupa vetusta*, as well as numerous remains mostly fragmental of millipedes. Fragments of scorpions and of insects are comparatively rare. Details respecting the reptilian remains will be found in my memoir in the transactions of the Royal Society of London, part ii., 1882, and respecting the land snails in the American Journal of Science, for November, 1880, while some later discoveries of amphibian remains are noticed in papers in the Geological Magazine, April, 1891, and June, 1891.

Much credit is due to Mr. Scudder for the care and skill with which he has worked up the fragmentary remains from the contents of the erect sigillariæ of the Joggins coal measures. With reference to the condition of the specimens it is to be observed that these remains are found in the matter filling the bases of hollow trees originally open to the air, into which small amphibians have fallen and have possibly lived in these singular prisons for some time. Hence no doubt in part the fragmentary condition of the myriapodal and arachnidan remains. Indeed segments of millipedes and remains of insects have been found in the coprolitic matter associated with the reptilian bones, so that it is quite likely that the arthropods have been pulled to pieces and partially devoured by their amphibian companions in misfortune. In addition to this the loose and unequal character of the material filling the lower part of the hollow trees has caused much crushing and distortion of the flexible crusts of these creatures, and has rendered it difficult to obtain from the mass even such fragments as those I was able to submit to Mr. Scudder's inspection. On the other hand it is a rare chance to find even such fragments preserved at all, and but for the accident of the mode of decay and entombment of these trees, we might have known nothing of these curious and ancient air-breathers of the coal-formation of Nova Scotia.

The identification of remains of scorpions is further of interest from the light which it casts on one at least of the uses of the scaly armour of the smaller amphibians of the coal measures. They may, as Mr. Scudder has already suggested, have required protection from the active and venomous arachnidans with which they had to compete, or on which they may in some cases have fed.

PLATE IV.

All the drawings are by J. Henry Blake.

- Fig. 1. *Amynilyspes*? sp. $\frac{3}{1}$.
2. *Amynilyspes*? sp. $\frac{3}{1}$.
3. *Archiulus lyelli*, a few contiguous segments, $\frac{8}{1}$.
4. *Archiulus xylobioides*, part of a single segment, $\frac{8}{1}$.
5. *Archiulus euphoberioides*, the largest fragment, $\frac{8}{1}$.
6. *Archiulus euphoberioides*, a few contiguous segments, $\frac{8}{1}$.
7. *Archiulus lyelli*, the largest fragment, $\frac{8}{1}$.

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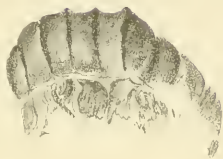
PLATE IV



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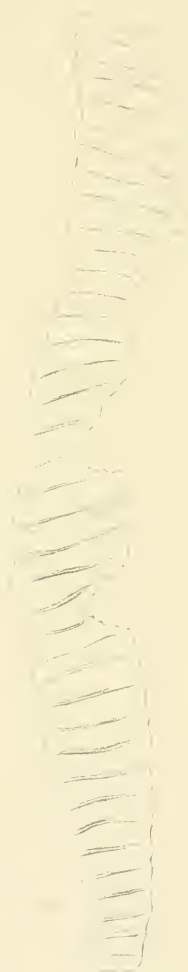


PLATE V.

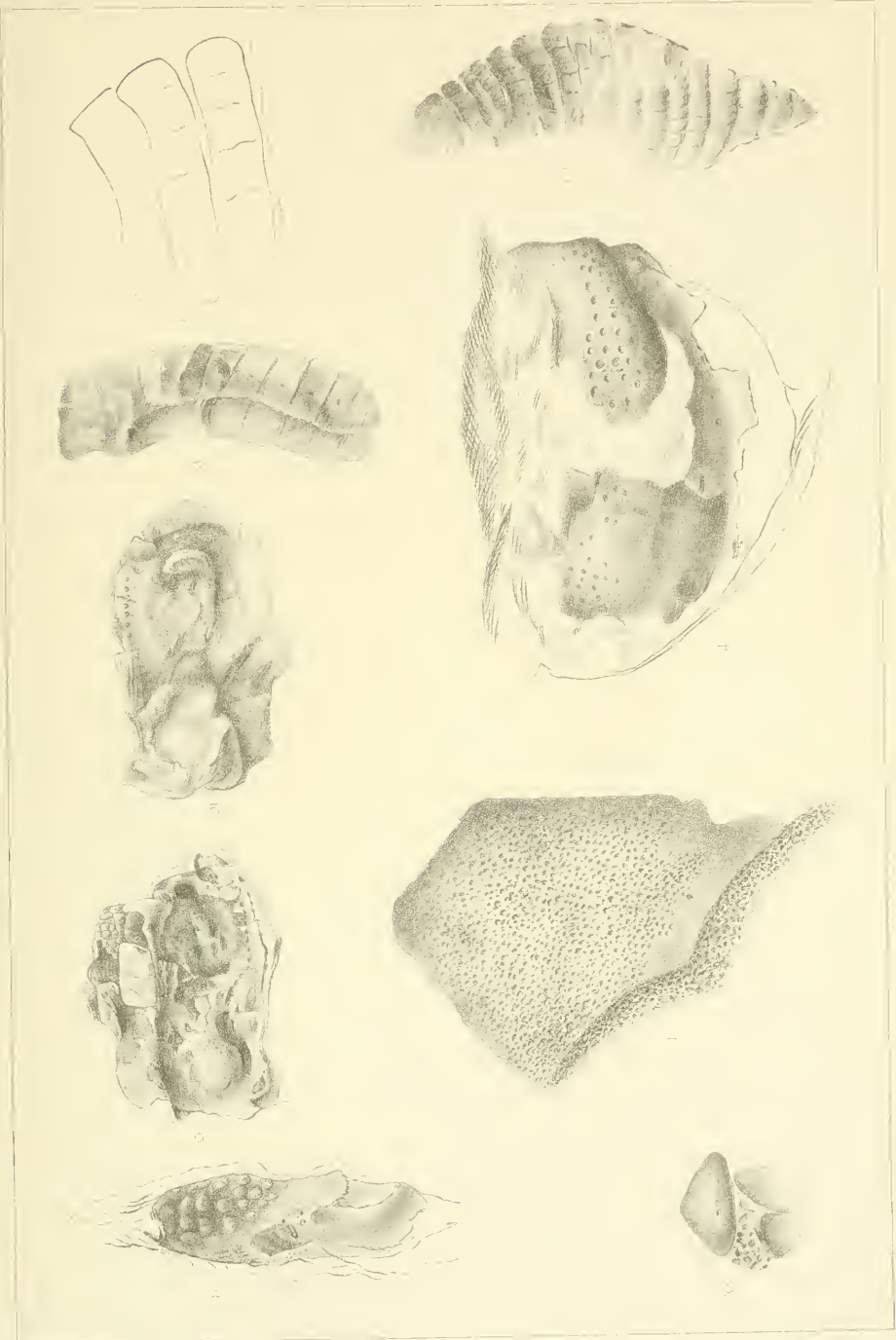
All the drawings are by J. Henry Blake.

- Fig. 1. *Xylobius similis*, $\frac{8}{1}$; three segments from just in front of the middle of fig. 2, further enlarged and shown in outline.
2. *Xylobius similis*, $\frac{3}{1}$; see also fig. 1.
3. *Xylobius dawsoni*, $\frac{8}{1}$.
4. *Mazonia* sp., $\frac{6}{1}$; the anterior portion is below.
5. *Mazonia acadica*, $\frac{3}{1}$.
6. *Mazonia acadica*, $\frac{3}{1}$.
7. Perhaps a part of the inferior? abdominal surface of a *Mazonia*, $\frac{10}{1}$.
8. *Mazonia* sp., perhaps *acadica*, $\frac{6}{1}$.
9. *Mazonia* sp., perhaps *acadica*, $\frac{4}{1}$.

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CONTR. GEOL. PAL. 1904. 21

PLATE I



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